Stantec Consulting Ltd.
607 Torbay Road
St. John's, NL A1A 4Y6
Tel: (709) 576-1458
Fax: (709) 576-2126

Baseline Water Quality Program, Valentine Lake Prospect

Prepared for

Marathon Gold Corp.
36 Birchview Drive
Pasadena, NL A0L 1K0

Final Report

File No. 121510621

Date: April 19, 2011

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1.0 INTRODUCTION

At the request of Marathon Gold Corp. (Marathon), Stantec Consulting Ltd. (Stantec) was engaged to design and conduct a water quality monitoring program at the Valentine Lake prospect. The purpose of the water quality monitoring program is to characterize baseline water quality at the site area during an exploration drilling program and before any future mine development on the property.

1.1 Overview

Activity at the Valentine Lake prospect is currently focused at two locations, the Leprechaun Pond site and the Valentine East site. The Leprechaun Pond site is comprised of two small watersheds one flowing north to Valentine Lake and the other flowing south to Victoria Lake. The Valentine East site contains a series of small streams which drain the property. In consultation with Marathon, representative water sampling locations were selected at each site.

This report documents the work carried out by Stantec and summarizes the findings of the water quality sampling during the initial water sampling event conducted in March, 2011. All water quality samples were analyzed for RCAp-MS, mercury and total suspended solids (TSS).

2.0 METHODOLOGY

Target sampling sites were selected based on a review of 1 to 50,000 topographical maps in consultation with Marathon. The initial water quality sampling program was carried out on 05 and 06 March, 2011 by Barry Wicks of Stantec and Scott McCrindle of Marathon. Sample sites were accessed by snowmobile or by foot by use of snow shoes. Many of the target sample locations were covered by ice and snow, thus sample site locations were slightly modified in the field based on the availability of open, flowing water. Water samples were collected at 12 locations (five within the Leprechaun Pond site and seven within the Valentine East site). Sampling coordinates for each location are included in Table 2.1 and sampling locations are illustrated in Figure 2.1.

Table 2.1 Sampling Location Coordinates UTM (NAD 83 21 U)

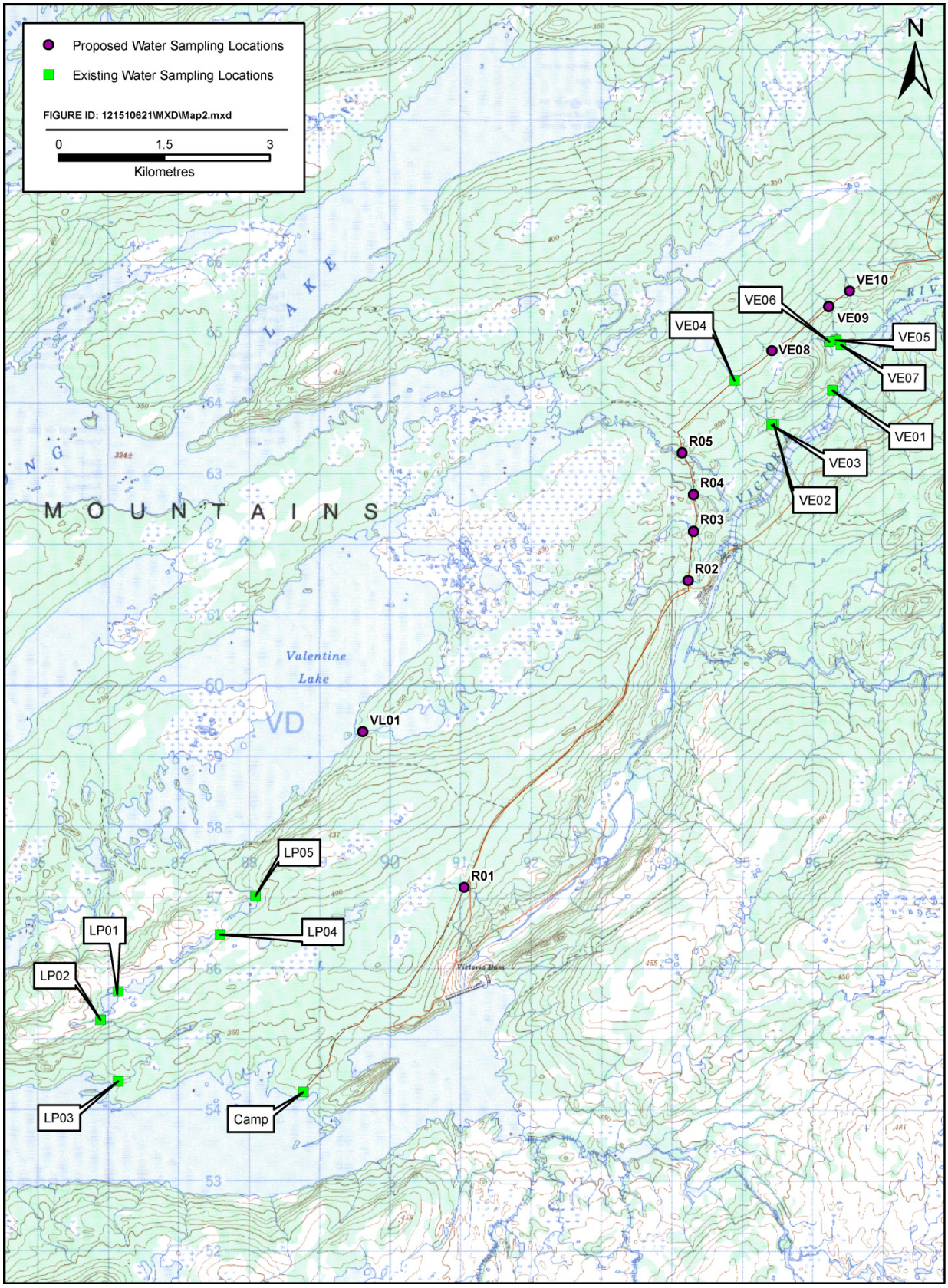
Status	ID	X_Easting	Y_Northing
Existing	LP01	486228	5355908
Existing	LP02	485980	5355505
Existing	LP03	486225	5354638
Existing	LP04	487675	5356713
Existing	LP05	488180	5357259
Existing	VE01	496364	5364413
Existing	VE02	495531	5363937

Status	ID	X_Easting	Y_Northing
Existing	VE03	495502	5363922
Existing	VE04	494970	5364554
Existing	VE05	496415	5365122
Existing	VE06	496321	5365101
Existing	VE07	496482	5365059
Proposed	VE08	495503	5364967
Proposed	VE09	496315	5365601
Proposed	VE10	496610	5365813
Proposed	R01	491143	5357374
Proposed	R02	494316	5361719
Proposed	R03	494394	5362419
Proposed	R04	494393	5362939
Proposed	R05	494236	5363528
Proposed	VL01	489702	5359578

All water samples were collected in clean laboratory-prepared containers specific to each analysis, and were stored and shipped in coolers at 4ºC. A detailed water sampling protocol is included as Appendix A.

Water samples were submitted to Maxxam Analytics Inc. in St. John's, NL for laboratory analysis for RCAp-MS, which includes general water quality parameters, as well as a metals scan using ICP-MS. In addition, the water samples were analyzed separately for mercury and TSS, which are not included in the RCAp package.

Figure 2.1 Location of Water Quality Monitoring Sites



3.0 RESULTS

The complete list of analytical results is included in Appendix B. A summary of results is presented in Table 3.1. The summary includes the following:

- parameters;
- units of measurement;
- reportable detection limit (RDL), which is the level that can be reliably reported considering factors such as sample volume and sample matrices (i.e., other elements and compounds that may be present);
- number of samples with reportable quantified values (values above RDL);
- maximum value recorded for all samples;
- minimum value recorded for all values;
- mean value, only if all samples had reportable values (otherwise blank);
- median value (blank if no reported values for the parameter); and
- Guideline for Aquatic Life (CCME 2011).

Where possible, results for individual parameters are compared to Guidelines for the Protection of Freshwater Aquatic Life published by the Canadian Council of Ministers of the Environment (CCME, 2011). Where numerical guidelines exist for a parameter, the number is listed in Table 3.1. Parameters that have no guideline are listed as NG. The following notes apply to the Guidelines for Aquatic Life:

Note 1. Colour can be expressed as True Colour or Apparent Colour. True Colour is the mean absorbance of filtered water samples at 456 nm shall not be significantly higher than the seasonally adjusted expected value for the system under consideration. Apparent Colour is the mean percent transmission of white light per metre shall not be significantly less than the seasonally adjusted expected value for the system under consideration (CCME).

Note 2. Turbidity can be expressed as Clear Flow or High Flow (turbid water). Clear Flow Maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTUs from background levels for a longer term exposure (e.g., 30-d period). High flow or turbid waters Maximum increase of 8 NTUs from background levels at any one time when background levels are between 8 and 80 NTUs. Should not increase more than 10% of background levels when background is >80 NTUs (CCME).

Note 3. The guideline values for cadmium, selenium and silver are all lower than the RDLs. However, no values were reported above the RDL for these parameters.

Note 4. Canadian Trigger Ranges from ultra-oligotrophic <4 to hyper-eutrophic >100 (CCME).

Table 3.1 Summary of Water Quality Monitoring Results (March, 2011)

Parameters	Units	RDL	Number > RDL	Min	Max	Mean	Median	Guideline
RCAP Calculations								
Anion Sum	me/L	N/A	12	0.19	0.49	0.2775	0.22	NG
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	12	5	20	9.08	6.5	NG
Calculated TDS	mg/L	1	12	15	30	19.6	17.5	NG
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	0	ND	ND	ND	ND	NG
Cation Sum	me/L	N/A	12	0.26	0.59	0.35	0.31	NG
Hardness (CaCO3)	mg/L	1	12	9	24	12.8	11	NG
Ion Balance (% Difference)	%	N/A	12	6.98	21.6	13.2	12.15	NG
Inorganics								
Total Alkalinity (Total as CaCO3)	mg/L	5	12	5	20	9.08	6.5	NG
Dissolved Chloride (Cl)	mg/L	1	12	2	4	2.9	3	NG
Colour	TCU	5	12	28	79	48.3	43.5	Note 1
Nitrate + Nitrite	mg/L	0.05	11	ND	0.3			NG
Nitrite (N)	mg/L	0.01	0	ND	ND	ND	ND	0.6
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	1	ND	0.06			NG
Total Organic Carbon (C)	mg/L	0.5	12	5.9	7.5	6.4	6.4	NG
Orthophosphate (P)	mg/L	0.01	0	ND	ND	ND	ND	NG
pH	pH	N/A	12	6.41	6.93	6.6	6.695	6.5 to 9.0
Reactive Silica (SiO2)	mg/L	0.5	12	2.2	4.2	3.2	3.55	NG
Total Suspended Solids	mg/L	1	4	ND	5			NG
Dissolved Sulphate (SO4)	mg/L	2	0	ND	ND	ND	ND	NG
Turbidity	NTU	0.1	12	0.3	1.2	0.59	0.5	Note 2
Conductivity	uS/cm	1	12	26	55	34	29	NG
Metals								
Total Aluminum (Al)	ug/L	5.0	12	63.5	156	110	107.5	100
Total Antimony (Sb)	ug/L	1.0	0	ND	ND	ND	ND	NG
Total Arsenic (As)	ug/L	1.0	1	ND	1			NG
Total Barium (Ba)	ug/L	1.0	12	1.7	5.8	2.75	2.1	NG
Total Beryllium (Be)	ug/L	1.0	0	ND	ND	ND	ND	NG
Total Bismuth (Bi)	ug/L	2.0	0	ND	ND	ND	ND	NG
Total Boron (B)	ug/L	50	0	ND	ND	ND	ND	NG
Total Cadmium (Cd)	ug/L	0.017	2	ND	0.02			Note 3
Total Calcium (Ca)	ug/L	100	12	2690	7630	3965	3275	NG
Total Chromium (Cr)	ug/L	1.0	6	ND	52.9			8.9[1]
Total Cobalt (Co)	ug/L	0.40	0	ND	ND	ND	ND	NG
Total Copper (Cu)	ug/L	2.0	0	ND	ND	ND	ND	2.0
Total Iron (Fe)	ug/L	50	12	92	344	191.5	169.5	300
Total Lead (Pb)	ug/L	0.50	0	ND	ND	ND	ND	1.0
Total Magnesium (Mg)	ug/L	100	12	504	1120	656.25	597	NG
Total Manganese (Mn)	ug/L	2.0	12	5.2	322	144.2	137	NG
Total Mercury (Hg)	ug/L	0.01	0	ND	ND	ND	ND	0.026[2]
Total Molybdenum (Mo)	ug/L	2.0	1	ND	2.5			73
Total Nickel (Ni)	ug/L	2.0	0	ND	ND	ND	ND	25
Total Phosphorus (P)	ug/L	100	0	ND	ND	ND	ND	Note 4
Total Potassium (K)	ug/L	100	12	126	625	227.0	171	NG

Parameters	Units	RDL	Number > RDL	Min	Max	Mean	Median	Guideline
Total Selenium (Se)	ug/L	1.0	0	ND	ND	ND	ND	Note 3
Total Silver (Ag)	ug/L	0.10	0	ND	ND	ND	ND	Note 3
Total Sodium (Na)	ug/L	100	12	1700	3390	2100	1960	NG
Total Strontium (Sr)	ug/L	2.0	12	6.4	34.8	13.3	8.85	NG
Total Thallium (Tl)	ug/L	0.10	0	ND	ND	ND	ND	0.8
Total Tin (Sn)	ug/L	2.0	0	ND	ND	ND	ND	NG
Total Titanium (Ti)	ug/L	2.0	12	2.2	4.8	3.5	3.55	NG
Total Uranium (U)	ug/L	0.10	0	ND	ND	ND	ND	NG
Total Vanadium (V)	ug/L	2.0	0	ND	ND	ND	ND	NG
Total Zinc (Zn)	ug/L	5.0	7	ND	68			30

1 CCME Guideline used is for trivalent chromium
2 CCME Guideline used is for inorganic mercury

Results specific to individual sample locations are in a table as Appendix B. Instances where the CCME guideline is exceeded are indicated with red highlight. The complete laboratory reports are included as Appendix C.

The following parameters exceeded the guidelines:

- aluminum at eight out of twelve sites (LP01, LP04, LP05, VE02, VE04, VE05, VE06 and VE07);
- chromium at one site (VE06);
- iron at one site (VE04);
- pH at one site (VE-01); and
- zinc at two sites (LP03 and VE-05).

4.0 DISCUSSION AND CONCLUSIONS

A water quality monitoring program was designed and implemented at the Valentine Lake prospect in March 2011. The results of the initial sampling campaign revealed that aluminum exceeded the Freshwater Aquatic Life guideline at multiple sites (eight out of twelve sites). Natural aluminum values that exceed the CCME guideline are common in Newfoundland and have been documented at other developments in close proximity to the Valentine Lake prospect.

Two other parameters (iron and chromium) exceeded the guideline at one sample site. The guideline for iron was exceeded at VE04 and the guideline for chromium was exceeded at VE06. Station VE04 was selected to serve as a reference station, as it is upstream of anticipated drilling activities at the Valentine East site. Due to significant snow and ice cover, Station VE04 could not be sampled as far upstream from the road crossing as was intended. The only available open water was immediately adjacent to the road crossing (located approximately 2 m upstream of the road). The proximity of Station VE04 to the road crossing may be contributing to the high iron value at this station. Future sampling at this station and all stations associated with stream crossings should be conducted at a minimum distance of 50 m

upstream of the crossing. The chromium result at VE-06 (52.9 µg/L) is significantly higher than results from any other station, making the result suspect.

Zinc exceeded the guideline at station LP03 and VE-05.

In addition, one pH result at VE-01 was slightly below the recommended pH range of 6.5 to 9.0.

5.0 RECOMMENDATIONS FOR FUTURE SAMPLING

After the completion of the first sampling round in March, 2011 discussions were held with Marathon regarding the continuation of the water monitoring program. It was decided that Marathon will continue collecting water samples, submit them to the analytical lab and provide the results to Stantec who will assist in compiling and interpreting the results. The recommended sampling protocol for subsequent monitoring activities is included in Appendix A.

The following recommendations are made for continuation of the water monitoring program.

- Water sampling will continue on a monthly basis for one year;
- water samples will be analyzed for the parameters analyzed in the initial sampling round (RCAp-MS, TSS and Mercury);
- based on the anticipated expansion of current activities, nine additional water sampling locations will be added to the program. The existing and additional water sampling locations are illustrated in Figure 2.1;
- Water sampling will be conducted by Marathon staff and shipped to Maxxam Analytics in St. John's for analysis;
- Analysis results will be reported to Stantec who will compile results monthly and report results to Marathon on a quarterly basis.

6.0 REFERENCES

CCME (Canadian Council of Ministers of Environment). 2011 (Website). Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life. http://st-ts.ccme.ca/?chems=all&chapters=1

APPENDIX A

Water Sampling Protocol

RATIONALE

A water quality monitoring program will be conducted at the Valentine Lake property to characterize baseline water quality at the site prior to continued exploration drilling and any future mining development activity on the property. The data will be suitable for environmental assessment and environmental monitoring as the project proceeds.

STATIONS

All station locations should be labeled with station identifiers in the field to aid with station identification during future sampling events.

SAMPLING METHOD:

There will be one set of samples collected at each station. Samples will be analysed for:

RCAP–MS	200 mL and 50 mL plastic bottles
TSS	500 mL plastic bottle
Mercury	100 mL amber glass bottle

Labels should be affixed prior to sampling as they stick to a dry bottle better than a wet one. Label should record:

- Station identifier
- Date
- Time of day
- Initials of collector

Once labels have been affixed and all information recorded, the bottles should be taped with clear packing tape to ensure labels do not peel off during transport.

At each station, water should be collected in the following manner:

- All samples should be collected directly into the sample container – no other jugs or bottles should be used.
- In winter, it is preferred that samples are collected from open flowing water if at all possible. Making holes in ice and collecting samples from standing water has the potential to be non-representative. If sample has to be collected through a hole in the ice – it is best if it can be taken from moving water.
- If you are able to sample in open water, sample should be collected by entering the water and facing upstream.
- Dip water upstream from where you are standing so that any disturbance of the sediment will not contaminate the sample.

- If there is enough water depth, collect sample just under the surface with air bubbling out of the container. Be careful that sediment is not disturbed when working in shallow water.
- Fill the bottle half full three times, rinse and discard. Note**: Do not perform this step if the bottle contains preservative.**
- On the fourth time, fill the bottle to the top and place cap securely on.
- Double check the sample label to see that everything is correct.
- If the sample is to be collected at a road crossing location (bridge), ensure sample is collected approximately 50 m upstream of the crossing.
- All samples should be kept cool and dark – in a portable cooler or strong cardboard box.
- Sample should be shipped for analysis as soon as possible.

CARE SHOULD BE TAKEN TO ENSURE THAT FILLED SAMPLE BOTTLES DO NOT FREEZE EITHER DURING SAMPLING OR WHILE BEING TRANSPORTED – BOTTLE BREAKAGE CAN OCCUR IF SAMPLES FREEZE

SAFETY CONSIDERATIONS

- Proper winter clothing should be worn for safety and comfort.
- Personal Floatation Devices should be worn when working in or near water.
- Attach a safety line when working on ice that may not be safe.

ADDITIONAL INFORMATION

- During each sampling event the bench mark water level should be recorded for each stream system.
- Flow should be described as nil, low, medium, or high based on local experience
- Air and water temperatures should be recorded if possible
- Water appearance should be described as coloured or colourless, clear (as in not cloudy), note foam or any other character
- Ice cover should be noted as percent coverage and thickness
- If possible a photograph should be taken of the sampling station – to show water or hole in the ice
- Weather conditions should be noted for the current time and for the previous day (i.e., note recent snow or rain)
- Any other observations or activities that might be relevant should be noted.

Appendix B

Water Quality Results

	Units	RDL	LP-01	LP-02	LP-03	LP-04	LP-05	VE-01	VE-02	VE-03	VE-04	VE-05	VE-06	VE-07	Guideline
Calculated Parameters															
Anion Sum	me/L	N/A	0.460	0.400	0.220	0.220	0.490	0.190	0.220	0.220	0.240	0.220	0.250	0.200	NG
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	17	15	6	7	20	5	6	6	7	6	8	6	NG
Calculated TDS	mg/L	1	29	24	15	16	30	16	17	17	18	18	19	17	NG
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NG
Cation Sum	me/L	N/A	0.570	0.460	0.280	0.330	0.590	0.260	0.280	0.280	0.310	0.290	0.320	0.310	NG
Hardness (CaCO3)	mg/L	1	20	17	10	11	24	9	10	9	11	10	12	11	NG
Ion Balance (% Difference)	%	N/A	10.7	6.98	12.0	20.0	9.26	15.6	12.0	12.0	12.7	13.7	12.3	21.6	NG
Inorganics															
Total Alkalinity (Total as CaCO3)	mg/L	5	17	15	6	7	20	5	6	6	7	6	8	6	NG
Dissolved Chloride (Cl)	mg/L	1	4	3	3	3	3	3	3	3	3	3	2	2	NG
Colour	TCU	5	44	45	41	66	68	43	38	40	79	28	46	42	Note 1
Nitrate + Nitrite	mg/L	0.05	0.06	0.05	0.06	ND	0.08	0.24	0.22	0.23	0.10	0.30	0.21	0.22	NG
Nitrite (N)	mg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.6
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	ND	ND	ND	ND	0.06	ND	ND	ND	ND	ND	ND	ND	NG
Total Organic Carbon (C)	mg/L	0.5	6.2	6.2	6.0	6.5	6.7	6.4	6.3	6.8	7.5	5.9	6.4	6.4	NG
Orthophosphate (P)	mg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NG
pH	pH	N/A	6.92	6.90	6.53	6.53	6.93	6.41	6.72	6.69	6.70	6.61	6.74	6.55	6.5 to 9.0
Reactive Silica (SiO2)	mg/L	0.5	2.4	2.2	2.6	2.4	3.1	3.8	3.7	3.6	3.5	4.0	4.2	4.0	NG
Total Suspended Solids	mg/L	1	ND	ND	3	ND	ND	ND	ND	ND	2	5	2	ND	NG
Dissolved Sulphate (SO4)	mg/L	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NG
Turbidity	NTU	0.1	1.0	0.6	0.4	1.0	0.5	0.3	0.3	0.3	0.4	1.2	0.6	0.5	Note 2
Conductivity	uS/cm	1	51	46	28	29	55	26	28	28	29	29	31	29	NG
Metals															
Total Mercury (Hg)	ug/L	0.013	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.026
Metals															
Total Aluminum (Al)	ug/L	5.0	143	95.8	63.5	156	112	85.6	109	95.0	128	104	129	106	100
Total Antimony (Sb)	ug/L	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NG
Total Arsenic (As)	ug/L	1.0	ND	ND	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	NG
Total Barium (Ba)	ug/L	1.0	5.8	4.9	2.1	2.5	2.1	1.7	1.8	2.3	2.1	3.8	2.0	1.9	NG
Total Beryllium (Be)	ug/L	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NG
Total Bismuth (Bi)	ug/L	2.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NG

	Units	RDL	LP-01	LP-02	LP-03	LP-04	LP-05	VE-01	VE-02	VE-03	VE-04	VE-05	VE-06	VE-07	Guideline
Calculated Parameters															
Total Boron (B)	ug/L	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NG
Total Cadmium (Cd)	ug/L	0.017	ND	0.018	ND	ND	ND	ND	ND	ND	ND	0.020	ND	ND	Note 3
Total Calcium (Ca)	ug/L	100	6430	5530	2980	3450	7630	2690	2980	2880	3360	2900	3560	3190	NG
Total Chromium (Cr)	ug/L	1.0	ND	5.1	ND	ND	ND	3.3	ND	ND	1.3	2.6	52.9	6.9	8.9
Total Cobalt (Co)	ug/L	0.40	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NG
Total Copper (Cu)	ug/L	2.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0
Total Iron (Fe)	ug/L	50	184	152	92	270	276	130	228	205	344	155	154	108	300
Total Lead (Pb)	ug/L	0.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0
Total Magnesium (Mg)	ug/L	100	902	775	522	574	1120	504	539	540	507	632	640	620	NG
Total Manganese (Mn)	ug/L	2.0	312	295	5.7	195	322	5.2	111	21.3	163	32.7	195	72.5	NG
Total Molybdenum (Mo)	ug/L	2.0	ND	2.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	73
Total Nickel (Ni)	ug/L	2.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	25
Total Phosphorus (P)	ug/L	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Note 4
Total Potassium (K)	ug/L	100	625	448	155	180	170	126	139	163	165	172	203	179	NG
Total Selenium (Se)	ug/L	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Note 3
Total Silver (Ag)	ug/L	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Note 3
Total Sodium (Na)	ug/L	100	3390	2310	1910	2210	2310	1770	1770	1950	1930	1970	1700	1990	NG
Total Strontium (Sr)	ug/L	2.0	34.8	33.1	9.3	6.9	18.3	6.9	8.7	9.0	11.1	6.4	8.2	7.2	NG
Total Thallium (Tl)	ug/L	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.8
Total Tin (Sn)	ug/L	2.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NG
Total Titanium (Ti)	ug/L	2.0	3.8	2.2	2.6	4.8	3.8	3.3	3.5	3.6	4.4	2.9	4.0	3.1	NG
Total Uranium (U)	ug/L	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NG
Total Vanadium (V)	ug/L	2.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NG
Total Zinc (Zn)	ug/L	5.0	ND (1)	ND	68	ND (1)	ND (1)	ND (1)	29	28	5.2	61.3	14.8	7.0	30

Appendix C

Laboratory Reports

Your P.O. #: 16300R-40
Your Project #: 121510621
Your C.O.C. #: ES243711

Attention: Barry Wicks
Stantec Consulting Ltd
St. John's - Standing Offer
607 Torbay Rd
St. John's, NL
A1A 4Y6

Report Date: 2011/03/23

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B134942
Received: 2011/03/16, 10:27

Sample Matrix: Water
Samples Received: 12

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonate, Bicarbonate and Hydroxide	12	N/A	2011/03/21	CAM SOP-00102	APHA 4500-CO2 D
Alkalinity	12	N/A	2011/03/18	ATL SOP 00013 R4	Based on EPA310.2
Chloride	12	N/A	2011/03/21	ATL SOP 00014 R6	Based on SM4500-Cl-
Colour	12	N/A	2011/03/18	ATL SOP 00020 R3.	Based on SM2120C
Conductance - water	12	N/A	2011/03/21	ATL SOP 00004 R5/00006 R4	Based on SM2510B
Hardness (calculated as CaCO3)	12	N/A	2011/03/18	ATL SOP 00048	Based on SM2340B
Mercury - Total (CVAA,LL)	12	2011/03/17	2011/03/18	ATL SOP 00026 R6	Based on EPA245.1
Metals Water Total MS	12	2011/03/17	2011/03/18	ATL SOP 00059 R1	Based on EPA6020A
Ion Balance (% Difference)	12	N/A	2011/03/22		
Anion and Cation Sum	12	N/A	2011/03/22		
Nitrogen Ammonia - water	12	N/A	2011/03/21	ATL SOP 00015 R5	Based on USEPA 350.1
Nitrogen - Nitrate + Nitrite	12	N/A	2011/03/21	ATL SOP 00016 R4	Based on USGS - Enz.
Nitrogen - Nitrite	12	N/A	2011/03/18	ATL SOP 00017 R4	Based on SM4500-NO2B
Nitrogen - Nitrate (as N)	12	N/A	2011/03/21	ATL SOP 00018 R3	Based on ASTMD3867
pH	12	N/A	2011/03/21	ATL SOP 00003 R5/00005 R7	Based on SM4500H+
Phosphorus - ortho	12	N/A	2011/03/21	ATL SOP 00021 R3	Based on USEPA 365.1
Sat. pH and Langelier Index (@ 20C)	12	N/A	2011/03/22		
Sat. pH and Langelier Index (@ 4C)	12	N/A	2011/03/22		
Reactive Silica	12	N/A	2011/03/21	ATL SOP 00022 R3	Based on EPA 366.0
Sulphate	12	N/A	2011/03/21	ATL SOP 00023 R3	Based on EPA 375.4
Total Dissolved Solids (TDS calc)	12	N/A	2011/03/22		
Organic carbon - Total (TOC)	11	N/A	2011/03/18	ATL SOP 00037 R4	Based on SM5310C
Organic carbon - Total (TOC)	1	N/A	2011/03/23	ATL SOP 00037 R4	Based on SM5310C
Total Suspended Solids	12	N/A	2011/03/17	ATL SOP 00007 R3	based on EPA 160.2
Turbidity	12	N/A	2011/03/22	ATL SOP 00011 R5	based on EPA 180.1

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

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Maxxam Job #: B134942
Report Date: 2011/03/23

Stantec Consulting Ltd
Client Project #: 121510621

Your P.O. #: 16300R-40
Sampler Initials: BW

Encryption Key

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

MICHELLE HILL, Project Manager
Email: MHill@maxxam.ca
Phone# (902) 420-0203

==========

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: 2

Maxxam Job #: B134942
Report Date: 2011/03/23

Stantec Consulting Ltd
Client Project #: 121510621

Your P.O. #: 16300R-40
Sampler Initials: BW

RESULTS OF ANALYSES OF WATER

Maxxam ID		IX5398	IX5403		IX5404			IX5405		
Sampling Date		2011/03/09	2011/03/09		2011/03/09			2011/03/09		
	Units	**LP-01**	**LP-02**	**QC Batch**	**LP-03**	**RDL**	**QC Batch**	**LP-04**	**RDL**	**QC Batch**
Calculated Parameters										
Anion Sum	me/L	0.460	0.400	2431573	0.220	N/A	2431573	0.220	N/A	2431573
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	17	15	2431570	6	1	2431570	7	1	2431570
Calculated TDS	mg/L	29	24	2431577	15	1	2431577	16	1	2431577
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	ND	2431570	ND	1	2431570	ND	1	2431570
Cation Sum	me/L	0.570	0.460	2431573	0.280	N/A	2431573	0.330	N/A	2431573
Hardness (CaCO3)	mg/L	20	17	2431571	10	1	2431571	11	1	2431571
Ion Balance (% Difference)	%	10.7	6.98	2431572	12.0	N/A	2431572	20.0	N/A	2431572
Langelier Index (@ 20C)	N/A	-2.33	-2.47	2431575	-3.46		2431575	-3.36		2431575
Langelier Index (@ 4C)	N/A	-2.58	-2.72	2431576	-3.71		2431576	-3.62		2431576
Nitrate (N)	mg/L	0.06	0.05	2431574	0.06	0.05	2431574	ND	0.05	2431574
Saturation pH (@ 20C)	N/A	9.25	9.37	2431575	9.99		2431575	9.89		2431575
Saturation pH (@ 4C)	N/A	9.50	9.62	2431576	10.2		2431576	10.1		2431576
Inorganics										
Total Alkalinity (Total as CaCO3)	mg/L	17	15	2434048	6	5	2434048	7	5	2434048
Dissolved Chloride (Cl)	mg/L	4	3	2434050	3	1	2434050	3	1	2434050
Colour	TCU	44	45	2434064	41	5	2434064	66	30	2434064
Nitrate + Nitrite	mg/L	0.06	0.05	2434066	0.06	0.05	2434066	ND	0.05	2434066
Nitrite (N)	mg/L	ND	ND	2434067	ND	0.01	2434067	ND	0.01	2434067
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	2435725	ND	0.05	2435725	ND	0.05	2435725
Total Organic Carbon (C)	mg/L	6.2	6.2	2434384	6.0	0.5	2434384	6.5	0.5	2434384
Orthophosphate (P)	mg/L	ND	ND	2434065	ND	0.01	2434065	ND	0.01	2434065
pH	pH	6.92	6.90	2436134	6.53	N/A	2436134	6.53	N/A	2436134
Reactive Silica (SiO2)	mg/L	2.4	2.2	2434056	2.6	0.5	2434056	2.4	0.5	2434056
Total Suspended Solids	mg/L	ND	ND	2432501	3	1	2432499	ND	1	2432501
Dissolved Sulphate (SO4)	mg/L	ND	ND	2434053	ND	2	2434053	ND	2	2434053
Turbidity	NTU	1.0	0.6	2436969	0.4	0.1	2436969	1.0	0.1	2436969
Conductivity	uS/cm	51	46	2436148	28	1	2436148	29	1	2436148

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B134942
Report Date: 2011/03/23

Stantec Consulting Ltd
Client Project #: 121510621

Your P.O. #: 16300R-40
Sampler Initials: BW

RESULTS OF ANALYSES OF WATER

Maxxam ID		IX5406			IX5407		IX5408			IX5409		
Sampling Date		2011/03/10			2011/03/10		2011/03/10			2011/03/10		
	Units	**LP-05**	**RDL**	**QC Batch**	**VE-01**	**RDL**	**VE-02**	**RDL**	**QC Batch**	**VE-03**	**RDL**	**QC Batch**
Calculated Parameters												
Anion Sum	me/L	0.490	N/A	2431573	0.190	N/A	0.220	N/A	2431573	0.220	N/A	2431573
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	20	1	2431570	5	1	6	1	2431570	6	1	2431570
Calculated TDS	mg/L	30	1	2431577	16	1	17	1	2431577	17	1	2431577
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1	2431570	ND	1	ND	1	2431570	ND	1	2431570
Cation Sum	me/L	0.590	N/A	2431573	0.260	N/A	0.280	N/A	2431573	0.280	N/A	2431573
Hardness (CaCO3)	mg/L	24	1	2431571	9	1	10	1	2431571	9	1	2431571
Ion Balance (% Difference)	%	9.26	N/A	2431572	15.6	N/A	12.0	N/A	2431572	12.0	N/A	2431572
Langelier Index (@ 20C)	N/A	-2.17		2431575	-3.73		-3.29		2431575	-3.34		2431575
Langelier Index (@ 4C)	N/A	-2.42		2431576	-3.98		-3.54		2431576	-3.59		2431576
Nitrate (N)	mg/L	0.08	0.05	2431574	0.24	0.05	0.22	0.05	2431574	0.23	0.05	2431574
Saturation pH (@ 20C)	N/A	9.10		2431575	10.1		10.0		2431575	10.0		2431575
Saturation pH (@ 4C)	N/A	9.35		2431576	10.4		10.3		2431576	10.3		2431576
Inorganics												
Total Alkalinity (Total as CaCO3)	mg/L	20	5	2434048	5	5	6	5	2434048	6	5	2434048
Dissolved Chloride (Cl)	mg/L	3	1	2434050	3	1	3	1	2434050	3	1	2434050
Colour	TCU	68	30	2434064	43	5	38	5	2434064	40	5	2434064
Nitrate + Nitrite	mg/L	0.08	0.05	2434066	0.24	0.05	0.22	0.05	2434066	0.23	0.05	2434066
Nitrite (N)	mg/L	ND	0.01	2434067	ND	0.01	ND	0.01	2434067	ND	0.01	2434067
Nitrogen (Ammonia Nitrogen)	mg/L	0.06	0.05	2435725	ND	0.05	ND	0.05	2435725	ND	0.05	2435725
Total Organic Carbon (C)	mg/L	6.7	0.5	2434384	6.4	0.5	6.3	0.5	2434384	6.8	0.5	2434384
Orthophosphate (P)	mg/L	ND	0.01	2434065	ND	0.01	ND	0.01	2434065	ND	0.01	2434065
pH	pH	6.93	N/A	2436134	6.41	N/A	6.72	N/A	2436134	6.69	N/A	2436134
Reactive Silica (SiO2)	mg/L	3.1	0.5	2434056	3.8	0.5	3.7	0.5	2434056	3.6	0.5	2434056
Total Suspended Solids	mg/L	ND	1	2432501	ND	1	ND	2	2432499	ND	1	2432501
Dissolved Sulphate (SO4)	mg/L	ND	2	2434053	ND	2	ND	2	2434053	ND	2	2434053
Turbidity	NTU	0.5	0.1	2436969	0.3	0.1	0.3	0.1	2436969	0.3	0.1	2436969
Conductivity	uS/cm	55	1	2436148	26	1	28	1	2436148	28	1	2436148

N/A = Not Applicable
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QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B134942
Report Date: 2011/03/23

Stantec Consulting Ltd
Client Project #: 121510621

Your P.O. #: 16300R-40
Sampler Initials: BW

RESULTS OF ANALYSES OF WATER

Maxxam ID		IX5410			IX5411	IX5412		IX5413	IX5413		
Sampling Date		2011/03/10			2011/03/10	2011/03/10		2011/03/10	2011/03/10		
	Units	**VE-04**	**RDL**	**QC Batch**	**VE-05**	**VE-06**	**QC Batch**	**VE-07**	**VE-07 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters											
Anion Sum	me/L	0.240	N/A	2431573	0.220	0.250	2431573	0.200		N/A	2431573
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	7	1	2431570	6	8	2431570	6		1	2431570
Calculated TDS	mg/L	18	1	2431577	18	19	2431577	17		1	2431577
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1	2431570	ND	ND	2431570	ND		1	2431570
Cation Sum	me/L	0.310	N/A	2431573	0.290	0.320	2431573	0.310		N/A	2431573
Hardness (CaCO3)	mg/L	11	1	2431571	10	12	2431571	11		1	2431571
Ion Balance (% Difference)	%	12.7	N/A	2431572	13.7	12.3	2431572	21.6		N/A	2431572
Langelier Index (@ 20C)	N/A	-3.18		2431575	-3.42	-3.07	2431575	-3.43			2431575
Langelier Index (@ 4C)	N/A	-3.43		2431576	-3.67	-3.32	2431576	-3.68			2431576
Nitrate (N)	mg/L	0.10	0.05	2431574	0.30	0.21	2431574	0.22		0.05	2431574
Saturation pH (@ 20C)	N/A	9.88		2431575	10.0	9.81	2431575	9.98			2431575
Saturation pH (@ 4C)	N/A	10.1		2431576	10.3	10.1	2431576	10.2			2431576
Inorganics											
Total Alkalinity (Total as CaCO3)	mg/L	7	5	2434048	6	8	2434048	6	6	5	2434048
Dissolved Chloride (Cl)	mg/L	3	1	2434050	3	2	2434050	2	3	1	2434050
Colour	TCU	79	30	2434064	28	46	2434064	42	44	5	2434064
Nitrate + Nitrite	mg/L	0.10	0.05	2434066	0.30	0.21	2434066	0.22	0.28	0.05	2434066
Nitrite (N)	mg/L	ND	0.01	2434067	ND	ND	2434067	ND	ND	0.01	2434067
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.05	2435725	ND	ND	2435725	ND		0.05	2435725
Total Organic Carbon (C)	mg/L	7.5	0.5	2434384	5.9	6.4	2434384	6.4		0.5	2438671
Orthophosphate (P)	mg/L	ND	0.01	2434065	ND	ND	2434065	ND	ND	0.01	2434065
pH	pH	6.70	N/A	2436134	6.61	6.74	2436134	6.55		N/A	2436134
Reactive Silica (SiO2)	mg/L	3.5	0.5	2434056	4.0	4.2	2434056	4.0	4.0	0.5	2434056
Total Suspended Solids	mg/L	2	1	2432501	5	2	2432501	ND		1	2432499
Dissolved Sulphate (SO4)	mg/L	ND	2	2434053	ND	ND	2434053	ND	ND	2	2434053
Turbidity	NTU	0.4	0.1	2437494	1.2	0.6	2437204	0.5		0.1	2437204
Conductivity	uS/cm	29	1	2436148	29	31	2436148	29		1	2436148

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Maxxam Job #: B134942
Report Date: 2011/03/23

Stantec Consulting Ltd
Client Project #: 121510621

Your P.O. #: 16300R-40
Sampler Initials: BW

MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		IX5398	IX5403	IX5404	IX5405	IX5406	IX5407		
Sampling Date		2011/03/09	2011/03/09	2011/03/09	2011/03/09	2011/03/10	2011/03/10		
	Units	**LP-01**	**LP-02**	**LP-03**	**LP-04**	**LP-05**	**VE-01**	**RDL**	**QC Batch**
Metals									
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	0.013	2433844

Maxxam ID		IX5408	IX5409	IX5410	IX5411	IX5412	IX5413		
Sampling Date		2011/03/10	2011/03/10	2011/03/10	2011/03/10	2011/03/10	2011/03/10		
	Units	**VE-02**	**VE-03**	**VE-04**	**VE-05**	**VE-06**	**VE-07**	**RDL**	**QC Batch**
Metals									
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	0.013	2433844

ND = Not detected
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QC Batch = Quality Control Batch

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Maxxam Job #: B134942
Report Date: 2011/03/23

Stantec Consulting Ltd
Client Project #: 121510621

Your P.O. #: 16300R-40
Sampler Initials: BW

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		IX5398		IX5403		IX5404	IX5405	IX5406	IX5407	IX5408		
Sampling Date		2011/03/09		2011/03/09		2011/03/09	2011/03/09	2011/03/10	2011/03/10	2011/03/10		
	Units	**LP-01**	**RDL**	**LP-02**	**RDL**	**LP-03**	**LP-04**	**LP-05**	**VE-01**	**VE-02**	**RDL**	**QC Batch**
Metals												
Total Aluminum (Al)	ug/L	143	5.0	95.8	5.0	63.5	156	112	85.6	109	5.0	2432668
Total Antimony (Sb)	ug/L	ND	1.0	ND	1.0	ND	ND	ND	ND	ND	1.0	2432668
Total Arsenic (As)	ug/L	ND	1.0	ND	1.0	1.0	ND	ND	ND	ND	1.0	2432668
Total Barium (Ba)	ug/L	5.8	1.0	4.9	1.0	2.1	2.5	2.1	1.7	1.8	1.0	2432668
Total Beryllium (Be)	ug/L	ND	1.0	ND	1.0	ND	ND	ND	ND	ND	1.0	2432668
Total Bismuth (Bi)	ug/L	ND	2.0	ND	2.0	ND	ND	ND	ND	ND	2.0	2432668
Total Boron (B)	ug/L	ND	50	ND	50	ND	ND	ND	ND	ND	50	2432668
Total Cadmium (Cd)	ug/L	ND	0.017	0.018	0.017	ND	ND	ND	ND	ND	0.017	2432668
Total Calcium (Ca)	ug/L	6430	100	5530	100	2980	3450	7630	2690	2980	100	2432668
Total Chromium (Cr)	ug/L	ND	1.0	5.1	1.0	ND	ND	ND	3.3	ND	1.0	2432668
Total Cobalt (Co)	ug/L	ND	0.40	ND	0.40	ND	ND	ND	ND	ND	0.40	2432668
Total Copper (Cu)	ug/L	ND	2.0	ND	2.0	ND	ND	ND	ND	ND	2.0	2432668
Total Iron (Fe)	ug/L	184	50	152	50	92	270	276	130	228	50	2432668
Total Lead (Pb)	ug/L	ND	0.50	ND	0.50	ND	ND	ND	ND	ND	0.50	2432668
Total Magnesium (Mg)	ug/L	902	100	775	100	522	574	1120	504	539	100	2432668
Total Manganese (Mn)	ug/L	312	2.0	295	2.0	5.7	195	322	5.2	111	2.0	2432668
Total Molybdenum (Mo)	ug/L	ND	2.0	2.5	2.0	ND	ND	ND	ND	ND	2.0	2432668
Total Nickel (Ni)	ug/L	ND	2.0	ND	2.0	ND	ND	ND	ND	ND	2.0	2432668
Total Phosphorus (P)	ug/L	ND	100	ND	100	ND	ND	ND	ND	ND	100	2432668
Total Potassium (K)	ug/L	625	100	448	100	155	180	170	126	139	100	2432668
Total Selenium (Se)	ug/L	ND	1.0	ND	1.0	ND	ND	ND	ND	ND	1.0	2432668
Total Silver (Ag)	ug/L	ND	0.10	ND	0.10	ND	ND	ND	ND	ND	0.10	2432668
Total Sodium (Na)	ug/L	3390	100	2310	100	1910	2210	2310	1770	1770	100	2432668
Total Strontium (Sr)	ug/L	34.8	2.0	33.1	2.0	9.3	6.9	18.3	6.9	8.7	2.0	2432668
Total Thallium (Tl)	ug/L	ND	0.10	ND	0.10	ND	ND	ND	ND	ND	0.10	2432668
Total Tin (Sn)	ug/L	ND	2.0	ND	2.0	ND	ND	ND	ND	ND	2.0	2432668
Total Titanium (Ti)	ug/L	3.8	2.0	2.2	2.0	2.6	4.8	3.8	3.3	3.5	2.0	2432668
Total Uranium (U)	ug/L	ND	0.10	ND	0.10	ND	ND	ND	ND	ND	0.10	2432668
Total Vanadium (V)	ug/L	ND	2.0	ND	2.0	ND	ND	ND	ND	ND	2.0	2432668
Total Zinc (Zn)	ug/L	ND(1)	20	ND	5.0	68	ND(1)	ND(1)	ND(1)	29	20	2432668

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) - Elevated reporting limit due to lab contamination.

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Maxxam Job #: B134942
Report Date: 2011/03/23

Stantec Consulting Ltd
Client Project #: 121510621

Your P.O. #: 16300R-40
Sampler Initials: BW

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		IX5409			IX5410	IX5411	IX5411	IX5412	IX5413		
Sampling Date		2011/03/10			2011/03/10	2011/03/10	2011/03/10	2011/03/10	2011/03/10		
	Units	**VE-03**	**RDL**	**QC Batch**	**VE-04**	**VE-05**	**VE-05 Lab-Dup**	**VE-06**	**VE-07**	**RDL**	**QC Batch**
Metals											
Total Aluminum (Al)	ug/L	95.0	5.0	2432668	128	104	103	129	106	5.0	2432801
Total Antimony (Sb)	ug/L	ND	1.0	2432668	ND	ND	ND	ND	ND	1.0	2432801
Total Arsenic (As)	ug/L	ND	1.0	2432668	ND	ND	ND	ND	ND	1.0	2432801
Total Barium (Ba)	ug/L	2.3	1.0	2432668	2.1	3.8	3.7	2.0	1.9	1.0	2432801
Total Beryllium (Be)	ug/L	ND	1.0	2432668	ND	ND	ND	ND	ND	1.0	2432801
Total Bismuth (Bi)	ug/L	ND	2.0	2432668	ND	ND	ND	ND	ND	2.0	2432801
Total Boron (B)	ug/L	ND	50	2432668	ND	ND	ND	ND	ND	50	2432801
Total Cadmium (Cd)	ug/L	ND	0.017	2432668	ND	0.020	ND	ND	ND	0.017	2432801
Total Calcium (Ca)	ug/L	2880	100	2432668	3360	2900	2830	3560	3190	100	2432801
Total Chromium (Cr)	ug/L	ND	1.0	2432668	1.3	2.6	2.7	52.9	6.9	1.0	2432801
Total Cobalt (Co)	ug/L	ND	0.40	2432668	ND	ND	ND	ND	ND	0.40	2432801
Total Copper (Cu)	ug/L	ND	2.0	2432668	ND	ND	ND	ND	ND	2.0	2432801
Total Iron (Fe)	ug/L	205	50	2432668	344	155	175	154	108	50	2432801
Total Lead (Pb)	ug/L	ND	0.50	2432668	ND	ND	ND	ND	ND	0.50	2432801
Total Magnesium (Mg)	ug/L	540	100	2432668	507	632	607	640	620	100	2432801
Total Manganese (Mn)	ug/L	21.3	2.0	2432668	163	32.7	31.9	195	72.5	2.0	2432801
Total Molybdenum (Mo)	ug/L	ND	2.0	2432668	ND	ND	ND	ND	ND	2.0	2432801
Total Nickel (Ni)	ug/L	ND	2.0	2432668	ND	ND	ND	ND	ND	2.0	2432801
Total Phosphorus (P)	ug/L	ND	100	2432668	ND	ND	ND	ND	ND	100	2432801
Total Potassium (K)	ug/L	163	100	2432668	165	172	175	203	179	100	2432801
Total Selenium (Se)	ug/L	ND	1.0	2432668	ND	ND	ND	ND	ND	1.0	2432801
Total Silver (Ag)	ug/L	ND	0.10	2432668	ND	ND	ND	ND	ND	0.10	2432801
Total Sodium (Na)	ug/L	1950	100	2432668	1930	1970	1900	1700	1990	100	2432801
Total Strontium (Sr)	ug/L	9.0	2.0	2432668	11.1	6.4	6.8	8.2	7.2	2.0	2432801
Total Thallium (Tl)	ug/L	ND	0.10	2432668	ND	ND	ND	ND	ND	0.10	2432801
Total Tin (Sn)	ug/L	ND	2.0	2432668	ND	ND	ND	ND	ND	2.0	2432801
Total Titanium (Ti)	ug/L	3.6	2.0	2432668	4.4	2.9	4.4	4.0	3.1	2.0	2432801
Total Uranium (U)	ug/L	ND	0.10	2432668	ND	ND	ND	ND	ND	0.10	2432801
Total Vanadium (V)	ug/L	ND	2.0	2432668	ND	ND	ND	ND	ND	2.0	2432801
Total Zinc (Zn)	ug/L	28	20	2432668	5.2	61.3	59.5	14.8	7.0	5.0	2432801

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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GENERAL COMMENTS

Sample IX5398-01: Total Suspended Solids: Sample integrity may have been compromised, the sample exceeded it's hold time prior to being analyzed. RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5403-01: Total Suspended Solids: Sample integrity may have been compromised, the sample exceeded it's hold time prior to being analyzed. RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5404-01: Total Suspended Solids: Sample integrity may have been compromised, the sample exceeded it's hold time prior to being analyzed. RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5405-01: Total Suspended Solids: Sample integrity may have been compromised, the sample exceeded it's hold time prior to being analyzed. RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5406-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5407-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5408-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5409-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5410-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5411-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5412-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5413-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

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Report Date: 2011/03/23

Stantec Consulting Ltd
Client Project #: 121510621

Your P.O. #: 16300R-40
Sampler Initials: BW

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2432499	Total Suspended Solids	2011/03/17					ND, RDL=1	mg/L	3.5	25	100	80 - 120
2432501	Total Suspended Solids	2011/03/17					ND, RDL=1	mg/L	NC	25	99	80 - 120
2432668	Total Aluminum (Al)	2011/03/18	105	80 - 120	107	80 - 120	6.7, RDL=5.0(1)	ug/L	NC(2)	25		
2432668	Total Antimony (Sb)	2011/03/18	101	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432668	Total Arsenic (As)	2011/03/18	100	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432668	Total Barium (Ba)	2011/03/18	NC	80 - 120	95	80 - 120	ND, RDL=1.0	ug/L	2.9	25		
2432668	Total Beryllium (Be)	2011/03/18	95	80 - 120	91	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432668	Total Bismuth (Bi)	2011/03/18	101	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432668	Total Boron (B)	2011/03/18	100	80 - 120	95	80 - 120	ND, RDL=50	ug/L	NC	25		
2432668	Total Cadmium (Cd)	2011/03/18	101	80 - 120	98	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2432668	Total Calcium (Ca)	2011/03/18	100	80 - 120	102	80 - 120	ND, RDL=100	ug/L	0.1	25		
2432668	Total Chromium (Cr)	2011/03/18	103	80 - 120	102	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432668	Total Cobalt (Co)	2011/03/18	99	80 - 120	100	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2432668	Total Copper (Cu)	2011/03/18	94	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432668	Total Iron (Fe)	2011/03/18	108	80 - 120	109	80 - 120	ND, RDL=50	ug/L	NC	25		
2432668	Total Lead (Pb)	2011/03/18	99	80 - 120	97	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2432668	Total Magnesium (Mg)	2011/03/18	112	80 - 120	110	80 - 120	ND, RDL=100	ug/L	3.7	25		
2432668	Total Manganese (Mn)	2011/03/18	100	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432668	Total Molybdenum (Mo)	2011/03/18	108	80 - 120	106	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432668	Total Nickel (Ni)	2011/03/18	103	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432668	Total Phosphorus (P)	2011/03/18	104	80 - 120	105	80 - 120	ND, RDL=100	ug/L	NC	25		
2432668	Total Potassium (K)	2011/03/18	110	80 - 120	107	80 - 120	ND, RDL=100	ug/L	NC	25		
2432668	Total Selenium (Se)	2011/03/18	102	80 - 120	101	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432668	Total Silver (Ag)	2011/03/18	109	80 - 120	104	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2432668	Total Sodium (Na)	2011/03/18	109	80 - 120	108	80 - 120	ND, RDL=100	ug/L	4.7	25		
2432668	Total Strontium (Sr)	2011/03/18	100	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	6.0	25		
2432668	Total Thallium (Tl)	2011/03/18	103	80 - 120	101	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2432668	Total Tin (Sn)	2011/03/18	102	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432668	Total Titanium (Ti)	2011/03/18	102	80 - 120	107	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432668	Total Uranium (U)	2011/03/18	106	80 - 120	103	80 - 120	ND, RDL=0.10	ug/L	3.0	25		
2432668	Total Vanadium (V)	2011/03/18	103	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432668	Total Zinc (Zn)	2011/03/18	101	80 - 120	100	80 - 120	ND, RDL=5.0	ug/L	NC(3)	25		
2432801	Total Aluminum (Al)	2011/03/18			111	80 - 120	7.1, RDL=5.0(1)	ug/L	1.1	25		
2432801	Total Antimony (Sb)	2011/03/18			104	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432801	Total Arsenic (As)	2011/03/18			101	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432801	Total Barium (Ba)	2011/03/18			99	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432801	Total Beryllium (Be)	2011/03/18			92	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432801	Total Bismuth (Bi)	2011/03/18			102	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432801	Total Boron (B)	2011/03/18			98	80 - 120	ND, RDL=50	ug/L	NC	25		

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2432801	Total Cadmium (Cd)	2011/03/18			99	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2432801	Total Calcium (Ca)	2011/03/18			104	80 - 120	ND, RDL=100	ug/L	2.3	25		
2432801	Total Chromium (Cr)	2011/03/18			104	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432801	Total Cobalt (Co)	2011/03/18			100	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2432801	Total Copper (Cu)	2011/03/18			99	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432801	Total Iron (Fe)	2011/03/18			110	80 - 120	ND, RDL=50	ug/L	NC	25		
2432801	Total Lead (Pb)	2011/03/18			99	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2432801	Total Magnesium (Mg)	2011/03/18			110	80 - 120	ND, RDL=100	ug/L	4.1	25		
2432801	Total Manganese (Mn)	2011/03/18			101	80 - 120	ND, RDL=2.0	ug/L	2.5	25		
2432801	Total Molybdenum (Mo)	2011/03/18			108	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432801	Total Nickel (Ni)	2011/03/18			101	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432801	Total Phosphorus (P)	2011/03/18			106	80 - 120	ND, RDL=100	ug/L	NC	25		
2432801	Total Potassium (K)	2011/03/18			109	80 - 120	ND, RDL=100	ug/L	NC	25		
2432801	Total Selenium (Se)	2011/03/18			101	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432801	Total Silver (Ag)	2011/03/18			105	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2432801	Total Sodium (Na)	2011/03/18			108	80 - 120	ND, RDL=100	ug/L	3.8	25		
2432801	Total Strontium (Sr)	2011/03/18			103	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432801	Total Thallium (Tl)	2011/03/18			103	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2432801	Total Tin (Sn)	2011/03/18			103	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432801	Total Titanium (Ti)	2011/03/18			105	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432801	Total Uranium (U)	2011/03/18			107	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2432801	Total Vanadium (V)	2011/03/18			104	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432801	Total Zinc (Zn)	2011/03/18			100	80 - 120	ND, RDL=5.0	ug/L	2.9	25		
2433844	Total Mercury (Hg)	2011/03/18	97	80 - 120	88	80 - 120	ND, RDL=0.013	ug/L	NC	25	88	80 - 120
2434048	Total Alkalinity (Total as CaCO3)	2011/03/18	98	80 - 120	109	80 - 120	ND, RDL=5	mg/L	NC	25	106	80 - 120
2434050	Dissolved Chloride (Cl)	2011/03/21	101	80 - 120	101	80 - 120	ND, RDL=1	mg/L	NC	25	99	80 - 120
2434053	Dissolved Sulphate (SO4)	2011/03/21	107	80 - 120	102	80 - 120	ND, RDL=2	mg/L	NC	25	96	80 - 120
2434056	Reactive Silica (SiO2)	2011/03/21	94	80 - 120	101	80 - 120	ND, RDL=0.5	mg/L	0.7	25	101	75 - 125
2434064	Colour	2011/03/18					ND, RDL=5	TCU	5.5	25	101	80 - 120
2434065	Orthophosphate (P)	2011/03/21	93	80 - 120	103	80 - 120	ND, RDL=0.01	mg/L	NC	25	101	80 - 120
2434066	Nitrate + Nitrite	2011/03/21	95	80 - 120	97	80 - 120	ND, RDL=0.05	mg/L	NC	25	102	80 - 120
2434067	Nitrite (N)	2011/03/18	82	80 - 120	98	80 - 120	ND, RDL=0.01	mg/L	NC	25	101	80 - 120
2434384	Total Organic Carbon (C)	2011/03/18	98	80 - 120	100	80 - 120	ND, RDL=0.5	mg/L	NC	25	98	80 - 120
2435725	Nitrogen (Ammonia Nitrogen)	2011/03/21	94	80 - 120	98	80 - 120	ND, RDL=0.05	mg/L	NC	25	99	80 - 120
2436134	pH	2011/03/21					5.59, RDL=N/A	pH	1.7	25	101	80 - 120
2436148	Conductivity	2011/03/21					1, RDL=1	uS/cm	1.6	25	102	80 - 120
2436969	Turbidity	2011/03/22					ND, RDL=0.1	NTU	NC	25	96	80 - 120
2437204	Turbidity	2011/03/22					ND, RDL=0.1	NTU	NC	25	94	80 - 120

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2437494	Turbidity	2011/03/22					ND, RDL=0.1	NTU	NC	25	95	80 - 120
2438671	Total Organic Carbon (C)	2011/03/23	103	80 - 120	99	80 - 120	ND, RDL=0.5	mg/L	NC	25	103	80 - 120

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) - Low level lab contamination. Minimal impact on data quality.
(2) - Poor RPD due to sample inhomogeneity.
(3) - Elevated reporting limit due to lab contamination.

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Validation Signature Page

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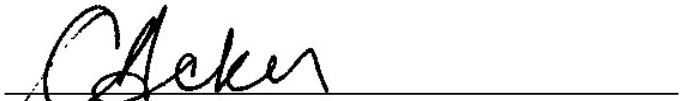
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



COLLEEN ACKER,

JERRY ARENOVICH, Inorganics Manager

KEVIN MACDONALD, Inorganics Supervisor

==========

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.

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Stantec Consulting Ltd.
607 Torbay Road
St. John's, NL A1A 4Y6
Tel: (709) 576-1458
Fax: (709) 576-2126

2011 Baseline Waterfowl and Waterfowl Habitat Study
Valentine Lake Project

Prepared for

Marathon Gold Corporation
Suite 1505, 330 Bay Street
Toronto, ON

Final Report

File No. 121510621

Date: August 13, 2014

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1.0 INTRODUCTION

Marathon Gold Corp. (Marathon) is currently conducting a drilling program for gold at its Valentine Lake prospect in Central Newfoundland. Drilling activities to date have targeted two locations, at Valentine East and at Leprechaun Pond. To prepare for an anticipated environmental assessment, Marathon commissioned Stantec Consulting Ltd (Stantec), to prepare a baseline waterfowl and waterfowl habitat report as part of overall baseline aquatic and terrestrial studies for the Valentine Lake Gold Project (the Project).

Given its location in Newfoundland and surrounding wetland habitat, the Project is expected to interact with a variety of waterfowl associated species such as American Black Duck, Ring-necked Duck, Red-breasted Merganser, American Green-winged Teal, Canada Goose, Common Goldeneye, and Common Loon. Other wildlife expected in this type of habitat include colonial nesting seabirds, migrating shorebirds, raptors, passerines and large and small mammals.

In addition to their role as wildlife habitat, wetlands also contribute to water storage and flood regulation, and store vast amounts of carbon. Thus, various agencies, organizations and governments have recently placed emphasis on the need to preserve and maintain wetlands. The Federal Policy on Wetland Conservation (Government of Canada 1991) states its main objective is “to promote the conservation of Canada’s wetlands to sustain their ecological and socio-economic functions, now and in the future.” The Federal Policy on Wetland Conservation, as well as similar wetland policies in many provinces, also aims to ensure “maintenance of the functions and values derived from wetlands throughout Canada” and “no net loss of wetland functions on all federal lands and waters in Canada”.

This *Waterfowl and Waterfowl Habitat Study* presents information on these resources in the area of current and possible future mineral exploration activity. Also relevant for these resources and therefore included, is a high-level evaluation of wetlands completed to further describe waterfowl habitat in the area. The results of aerial surveys for waterfowl in 2011 (and incidental observations from 2011) and an evaluation of waterfowl habitat (wetlands) within the proposed “area of interest” to the Project comprise the field investigations.

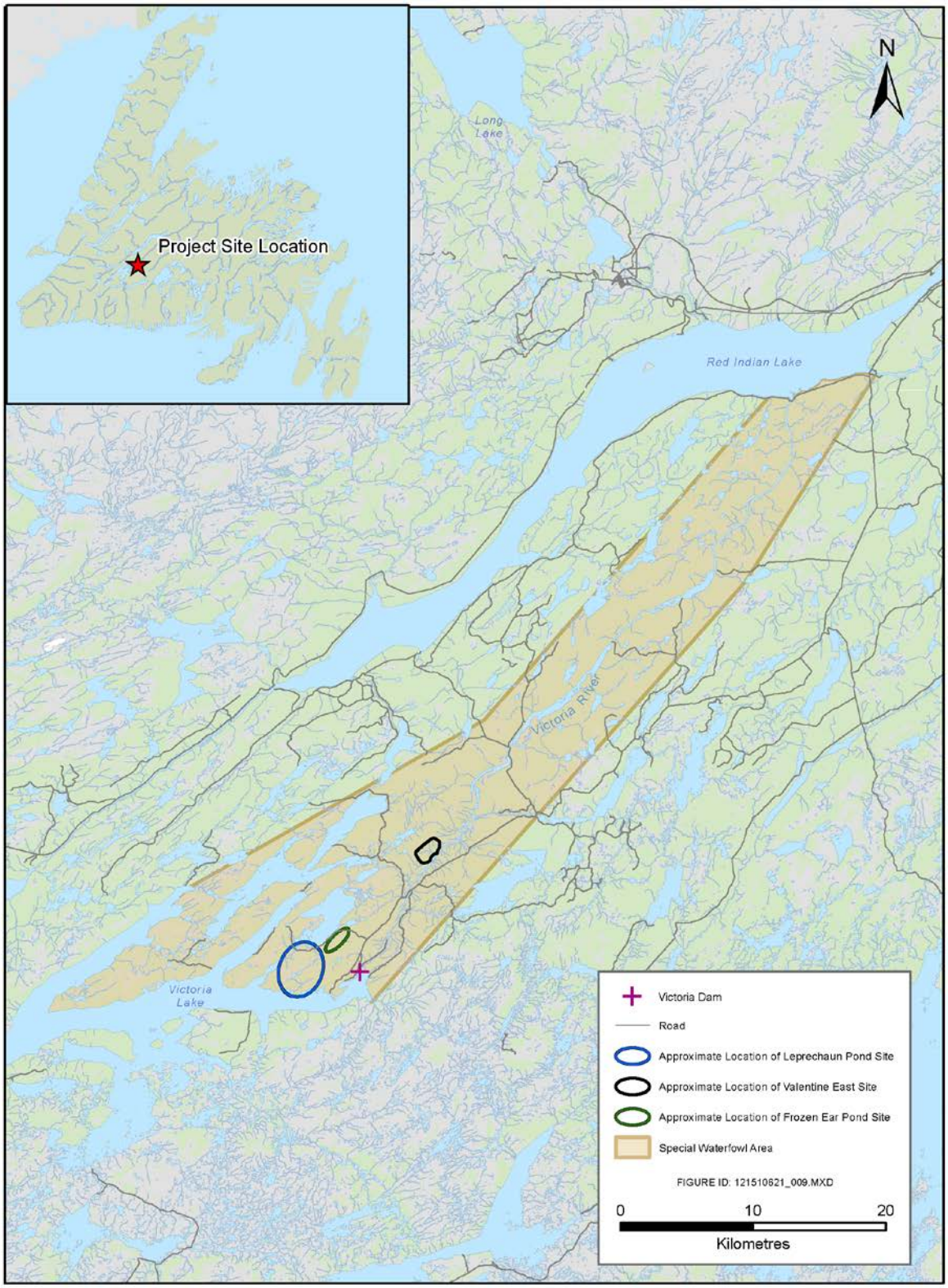
2.0 STUDY AREA

The Project involves the exploration, construction and operation of mining infrastructure in west central Newfoundland. The Valentine Lake Project is located approximately 57 km south of Buchans (Figure 2.1). The Project area is accessible by paved and gravel roads and extends from Victoria Lake in the south, northeast along the Victoria River and west to Valentine Lake. There are three areas of particular interest to Marathon: the Valentine Lake East Site, the

Frozen Ear Pond site and the Leprechaun Pond Site. Only the latter location appears to encompass waterbodies of sufficient size to support waterfowl.

The Project area is characterized by remote, upland forest interspersed by wetlands (bogs/fens), scrub lands, barrens and water. There has been previous timber harvesting and mining activity in the Project area and there is a network of various abandoned forest access roads and bridges. Of note is the presence of a “Protected or Special Management Area” that is known as the Victoria Steadies Special Waterfowl Area (SWA). This SWA was designated by the Newfoundland and Labrador Department of Environment and Conservation Wildlife Division (NLDEC).

Figure 2-1 Site Location Map



3.0 STUDY PURPOSE

At this stage of the Project, Marathon is developing a more detailed understanding of selected biophysical components of the environment potentially affected by the Project. This includes the distribution of these biophysical components in relation to on-going and proposed Project infrastructure (conceptual). The purpose of this *Waterfowl and Waterfowl Habitat Study* is to survey waterfowl use of the Project area, and identify the types of habitat (i.e., wetlands) within the area of the proposed activity. Planning and design work for the proposed Project will have the objective of avoiding difficult terrain and environmentally sensitive areas, such as wetlands, wherever possible.

The biophysical components considered in this report include waterfowl, waterfowl habitat (i.e., wetlands), and other wildlife, including terrestrial mammals and other incidental bird observations (e.g., raptors, passerines and shorebirds). The actual scope of any future environmental assessment will depend on the final Project description and direction from the regulating agencies, based on stakeholder input. The eventual location of all Project components will influence potential interactions with and effects on waterfowl and their habitats (i.e., wetlands). This will involve identifying (and attempting to avoid, where possible) wetlands and wetland habitats, for both practical and environmental considerations.

4.0 METHODS

Prior to completing field surveys, Stantec verified permitting requirements with provincial and federal regulators. Neither a provincial nor federal permit was required for this scope of work. Standard operating procedures developed by Stantec were employed for the waterfowl surveys. Daily safety meetings were held each day prior to starting field work. Safety meetings included a review of a health and safety checklist, safe work practices, and personal protective equipment required for safe completion of the work scope.

4.1 Waterfowl Breeding Pair Survey

Waterfowl species in the Project area are migratory, arriving at breeding sites in spring. Waterfowl occur as highly visible, breeding pairs at this time, prior to the onset of continuous incubation. The timing of this arrival varies between species according to ecological preferences/niches. Based on breeding chronology of waterfowl in Newfoundland, mid-May is an optimal time to observe both earlier and later nesting waterfowl species at breeding locations (Jacques Whitford 1995).

The study team consisted of an observer in the front of the aircraft who also aided in navigation through the study area, and two rear observers, one on either side of the aircraft (Table 4.1).

Table 4.1 Field Team for breeding waterfowl survey at Valentine Lake, 16 May 2011

Role	Personnel
Project Manager	Mr. Barry Wicks
Navigator and Observer	Mr. Bruce Turner
Observers	Mr. Sean Bennett, Ms. Tina Newbury
Pilot (Universal Helicopters)	Mr. Darren Barrett

On the morning of the survey, the navigator confirmed the expected route, weather conditions, location for refueling and other details with the pilot. Coordinates of the starting point for the survey was uploaded to the aircraft prior to departure for ease of navigation. The navigator guided the pilot through the Study Area and recorded observations directly on 1:50,000 National Topographic map sheets and on survey data sheets. A Bell 206LR helicopter (equipped with enhanced visibility or 'bubble' windows), flew at speeds of ≤ 70 km/h and altitudes of approximately 15 m above forest cover or the ground. The flight path was oriented according to the presence of waterbodies with the navigator ensuring that all features of potential breeding pair habitat were examined. Using a '12-hour' clock system of communication, the navigator guided the pilot (or vice-versa) when necessary. The recording and geo-referencing of environmental conditions, time of day, search effort, incidental observations of waterfowl and other wildlife, and any other noteworthy observations followed protocols established by Thomas (2006). Coordinates for each sighting were determined using a hand-held Global Positioning System (GPS) employed by one of the rear observers. The social status of all waterfowl observed were classified (i.e., lone male, lone female, breeding pair, flocked males and number, flocked females and number, mixed flocks and actual number by sex) and also described in terms of 'indicated pairs' (Dzubin 1969) to distinguish individuals that would likely breed in a given area. Spacing between individuals, group size and behavior were used in making this determination. All incidental sightings and sign of other wildlife species were also recorded. Digital photos were taken to demonstrate environmental conditions (i.e., snow and ice coverage) at the time of the survey and to document the variety of habitats within the study area. Note that while not usually considered a waterfowl species, observations of Common Loon were included for the purposes of this report. Appendix A contains latin names of waterfowl and other wildlife observed.

4.2 Waterfowl Brood Survey

A brood survey was planned to better define areas of productivity in the Project area. Insight from this aspect of waterfowl ecology can provide a measure of reproductive success for a given area (Bookhout 1994; Cassirer and Groves 1992). Early July was determined as an appropriate time for the brood survey as ducks and geese typically require 30-35 days to complete a clutch and to incubate to hatching, and another 45-55 days to days to raise young to flight (Jacques Whitford 1995). Therefore the young of any waterfowl laying in early May, an appropriate date for the area, will be flightless until at least the middle of July. Late-nesting species and re-nesting attempts may result in some clutch initiations not occurring until late May or possibly early June. Also as broods age they become more visible as they grow larger. The Study Team has also found that early July coincides with the moulting period in Newfoundland.

The brood survey focused on locations around Valentine Lake where breeding pairs were observed in May, and examined a 50 km stretch of the Victoria River extending northeast and downstream. The field team (Table 4.2) followed similar protocols as for the breeding pair survey.

Table 4.2 Field Team for Waterfowl Brood Survey at Valentine Lake, 7 July 2011

Role	Personnel
Project Manager	Mr. Barry Wicks
Navigator and Observer	Mr. Bruce Turner
Observers	Ms. Mary-Ann Aylward, Ms. Tina Newbury
Pilot (Canadian Helicopters)	Mr. Glenn Pearcey

The brood survey occurred on 7 July, 2011, approximately seven weeks after the breeding pair survey. All safety precautions and operating procedures described above for the breeding pair surveys were repeated. An exception was the use of an A-star helicopter (instead of a Long Ranger) for this survey. Observations of waterfowl broods were aged following standards outlined in Gollop and Marshall (1954). The behaviour of females in particular was noted as possible cues for undetected broods. All incidental sightings of other wildlife were recorded.

4.3 Wetlands Characterization

Wetlands and wetland/waterfowl habitats were classified according to criteria outlined in the Canadian Wetland Classification System (Warner and Rubec 1997). This hierarchical system was used to identify three general levels of wetland features – class, form, and type. Assigned wetland classes (e.g., bog, fen, swamp, marsh, shallow water) were based on properties reflecting their origin and the nature of the wetland environment. Each class of wetland was divided on the basis of ecological and floristic features, into a variety of wetland forms on the basis of surface morphology of the wetland (e.g., slope, raised, flat), position in the landscape (e.g., valley, delta, basin), surface features (e.g., ridges, nets, ribbed, mounds) and proximity to water bodies and tidal effects. The final level, known as wetland types, were further subdivisions of their forms and subforms based on the physiognomic characteristics of their vegetation communities (Warner and Rubec 1997).

Wetlands were opportunistically evaluated during waterfowl surveys of the Project area in May 2011. Owing to the nature of this study, wetlands were generally described according to their class, with a general overview of each wetland form inferred from aerial observations performed during the study. In the context of this study, the ability of the wetlands to provide habitat for waterfowl was assessed through an evaluation of their structural attributes and through direct observations of wildlife usage. In particular, wetlands were assessed in relation to their value as waterfowl habitat. As surveys were conducted primarily by helicopter, a key feature in the evaluation of wetlands was the interspersion of vegetation and open water used to provide general information on the ability of a wetland to provide habitat for a diversity of wildlife.

5.0 RESULTS

5.1 Breeding Waterfowl Survey

The breeding pair survey occurred on 16 May 2011 during excellent conditions (i.e., clear sky with calm to light northeast winds up to 15 km/hr, no precipitation, temperature 0°C). Only traces of snow and ice remained at this time. The aerial survey required 2.25 hours to examine an area of approximately 104 km^2. Thirty-four observations of seven waterfowl species were recorded (Table 5.1).

Observations of Common Loon, Canada Goose and five duck species, occurred on waterbodies and wetlands throughout the Project area and locations of interest to the Project (Figure 5.1). Four observations of Ring-necked Duck (pairs plus individuals) were observed on a fen northeast of Valentine Lake, other individual observations of this species were on Victoria River and a small pond in the northern part of the Project area. Five observations of American Black Duck (i.e., four pairs and a single male) were noted in the south-central portion of the Project area. One observation of Red-breasted Merganser was further south on Victoria Lake. Ten observations of paired and single Common Loon were made on larger waterbodies throughout the Project area. Two individual observations of Common Goldeneye were noted in the central portion of the Project area. Four observations of Common Merganser included two pairs on a fen northeast of Valentine Lake and two individual males to the east of this fen. Seven out of eight observations of Canada Goose (single and paired) were made on the fens west and north east of Valentine Lake. The other sighting of a Canada Goose, was of a single individual on the Victoria River. Note that of the three locations of interest to Marathon, waterfowl were only observed at the Leprechaun Pond Site and in the vicinity of the Frozen Ear Pond site. No sightings occurred at the Valentine Lake East Site. (Figure 5-1).

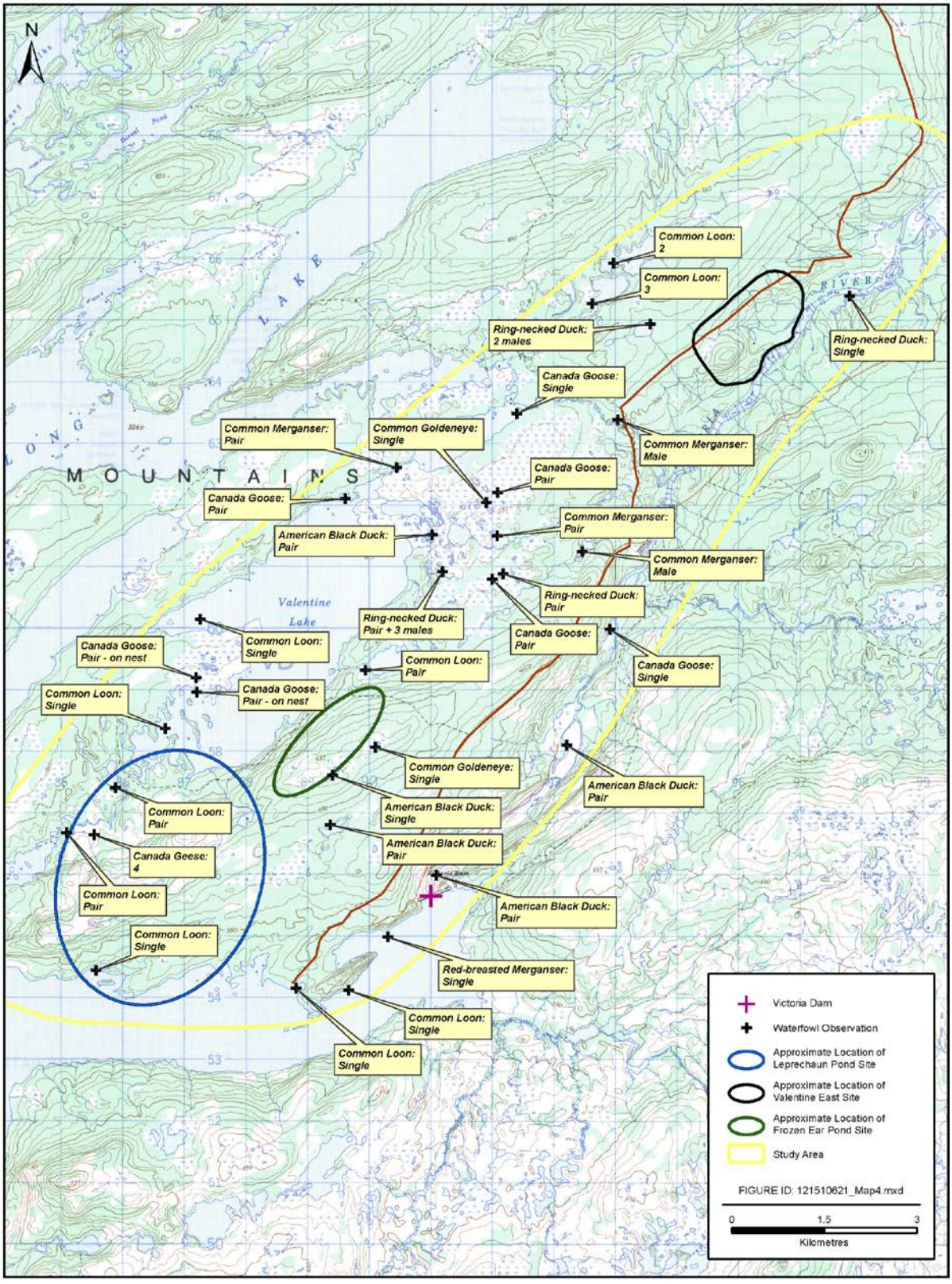
Observations of three mammal species or their sign (i.e., beaver, caribou and moose) and eight additional avian species (i.e., American Bittern, Black-capped Chickadee, greater Yellowlegs, Herring Gull, Merlin, Ruby-crowned Kinglet, Spotted Sandpiper and Yellow-rumped Warbler) were made during this survey. A list of these observations and their location is presented in Appendix B. An adult female moose and yearling were observed at the Valentine Lake East Site, no wildlife was observed within the Frozen Ear Pond site. At the Leprechaun Pond Site, a beaver lodge, a moose, a Merlin and two sightings of Greater Yellowlegs were recorded.

Table 5.1 Waterfowl Detected during Breeding Pair Survey, 16 May 2011

Waterfowl Observation (listed sequentially)	Social Structure				
	Lone Male	Lone Female	Unidentified Individual	Pair	Flocked Males
Ring-necked Duck	•				
Canada Goose				•	
American Black Duck				•	
American Black Duck				•	
Red-breasted Merganser			•		
Common Loon			•		
Common Loon			•		
Common Loon			•		
Common Loon				•	
Canada Goose			4		
Common Loon				•	
Common Loon			•		
Canada Goose				• with nest	
Canada Goose				• with nest	
American Black Duck				•	
Ring-necked Duck				• +3 individuals	
Canada Goose				•	
Common Goldeneye	•				
Canada Goose			•		
Common Merganser	•				
Common Merganser	•				
Ring-necked Duck				•	
Canada Goose				•	
Common Loon				•	
Common Merganser				•	
Ring-necked Duck					2
Common Loon			3		
Common Loon			2		
Common Merganser				•	
Canada Goose				•	
Common Loon			•		
American Black Duck	•				
Common Goldeneye			•		
American Black Duck				•	

Note: • indicates social structure (e.g., lone male, pair)

Figure 5-1 Waterfowl Observed during Breeding Pair Survey, 16 May 2011



5.1.1 Waterfowl Brood Survey

The survey occurred under suitable survey conditions (i.e., overcast skies with southwest winds gusting from 30 km/hr to 50 km/hr, intermittent, light rain at mid-day, temperature 14°C). Fog formed during the morning and caused some delays. The aerial survey required 3.2 hours to examine and area of approximately 142 km^2 which included the same area surveyed during the breeding waterfowl survey in May as well as an approximately 50 km section of Victoria River extending from Red Indian Lake to Victoria Lake.

Seventy-six observations of seven waterfowl species (and three unidentified species) occurred during this survey that included broods and evidence of adult moulting activity (Table 5.2). Most of the observations occurred along Victoria River (Figure 5.2). Broods were common as 16 were observed with an attending female. In addition, there were three observations of broods or young not accompanied by a female. The age of these 19 observations of young ranged from approximately one to six weeks.

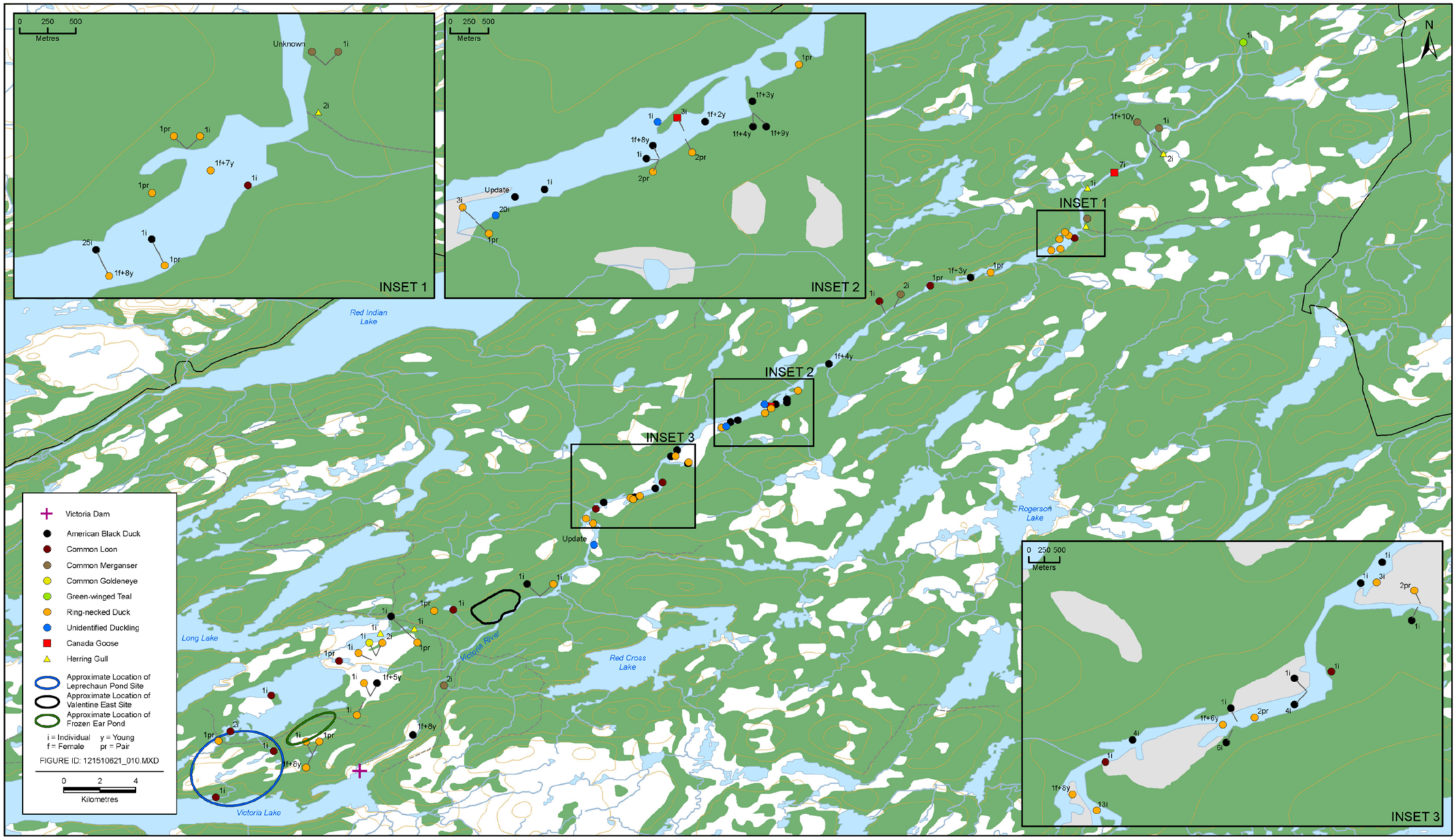
Table 5.2 Waterfowl Detected during Brood Survey, 7 July 2011

Waterfowl Observation (listed sequentially)	Structure	Moulting (yes or no)	# of young	Age class	Accompanied by female (yes or no)
Green-winged Teal				1a	N
Merganser	Female				
Merganser			9	1b	Y
Canada Goose		Y	7		
Merganser			5	1b	Y
Merganser	Adult				
Common Loon	Individual				
Ring-necked Duck	Pair				
American Black Duck	Individual	N			
Ring-necked Duck			8	1a	Y
American Black Duck	25	Y			
Ring-necked Duck			7	1a	Y
Ring-necked Duck	Pair + female	N			
Ring-necked Duck	Pair	N			
Ring-necked Duck	Pair	N			
American Black Duck			3	2b	Y
Common Loon	Pair				
Merganser sp.	2	N			
Common Loon	1				
American Black Duck			4	2b	Y
Ring-necked Duck	Pair	N			
American Black Duck			3	1a	Y
American Black Duck			4	1c	Y
Ring-necked Duck			9	1a	Y
American Black Duck			2	2b	Y
Canada Goose	3 adults				
Ring-necked Duck	2 pairs	N			
Ring-necked Duck	2 pairs				
American Black Duck			8	1c	Y

Waterfowl Observation (listed sequentially)	Structure	Moulting (yes or no)	# of young	Age class	Accompanied by female (yes or no)
American Black Duck	1	Y			
Unidentified duckling	1				
American Black Duck	1	Y			
American Black Duck			1	2b	
Unidentified ducklings	20 (in flight)	N			
Ring-necked Ducks	Pair plus 3				
Ring-necked Duck	3 males	N			
Ring-necked Duck	2 pairs	N			
American Black Duck	1	N			
American Black Duck	1	N			
American Black Duck	1	N			
Common Loon	1				
American Black Duck	1	Y			
American Black Duck	4	N			
Ring-necked Duck	2 pairs	N			
American Black Duck	1	N			
Ring-necked Duck			6	1b	Y
Ring-necked Duck	2 females; 4 males				
American Black Duck	4	N			
American Black Duck	1	N			
Common Loon	1				
Ring-necked Duck			8	1b	Y
Ring-necked Duck	1 female ;12 males	Y			
Unidentified duck	1	N			
American Black Duck	1	N			
Ring-necked Duck	1	Female			
Common merganser	2				
American Black Duck			8	1c	Y
Ring-necked Duck	Pair	N			
Common Loon	2				
Common Loon	1				
Common Loon	Pair				
Ring-necked Duck	Male	N			
Ring-necked Duck	2 males	N			
Common Goldeneye	Male	N			
Ring-necked Duck	Pair	N			
Common Loon	1				
Ring-necked Duck	Pair	N			
American Black Duck			5	2c	Y
Ring-necked Duck	Female	N			
Ring-necked Duck	Male	N			
Ring-necked Duck	Pair				
Ring-necked Duck			8	1b	Y
Common Loon	1				

Note: N = no; Y= yes
1a, 1b, 1c, 2a, 2b and 2c = age classes of ducklings (Gollop and Marshall 1954)

Figure 5-2 Waterfowl Observed during Brood Survey, 7 July 2011



The same species of waterfowl observed during the breeding pair surveys were also observed in the July brood survey. The most frequently encountered species was Ring-necked Duck. There were 27 observations of paired birds, females with broods, individuals and groups. These were found throughout the Project area but were concentrated along the Victoria River. American Black Duck were also common with 22 observations (individuals, females with broods and groups) recorded throughout the Project area and along the Victoria River. Two Common Mergansers were observed at the southern end of the Victoria River. Four observations (individuals as well as two broods with females) of Merganser species were made along the Victoria River (mid-section to northern end). One male Common Goldeneye was observed on a fen northeast of Valentine Lake. A Green-winged Teal duckling was observed at the northern end of the Victoria River. Unidentified ducklings were observed in three locations along the central section of the Victoria River. There were ten observations of pairs and individual Common Loon throughout the Project area and along the Victoria River. Note that of the three locations of interest to Marathon, waterfowl were observed at the Leprechaun Pond Site and in the vicinity of the Frozen Ear Pond Site. No observations were made in the Valentine Lake East Site (Figure 5-2).

Table 5.3 Waterfowl Detected during Brood Survey, 7 July 2011

Species	Number of Broods Observed on 7 July 2011	Breeding Pairs Observed on 16 May 2011
American Black Duck	9	4
Canada Goose	0	6
Common Loon	0	3
Green-winged Teal	1	0
Merganser species	2	2
Ring-necked Duck	6	2
Unidentified ducklings	2	0

Observations of beaver (sign only), caribou, moose and 11 additional avian species (American Bittern, Caspian Tern, Common Raven, Greater Yellowlegs, Herring Gull, Osprey, Rusty Blackbird, Spotted Sandpiper, unidentified blackbird, unidentified gulls, unidentified sandpipers, and unidentified shorebirds) were also observed during this survey. The observations of Rusty Blackbird were of two individuals observed together on the Victoria River, approximately 36 km downstream from Victoria Dam. This species is listed both provincially (*vulnerable*) (SSAC 2007) and federally (*special concern*) (COSEWIC 2006). A list of other wildlife observations and their location is presented in Appendix C. There were five incidences of beaver activity (i.e. dams and lodges) and one caribou found northeast of Valentine Lake. There was no wildlife detected in the three areas of interest to Marathon. Additional avifauna observed in this area were Greater Yellowlegs, Sandpiper sp. and Common Raven.

5.2 Wetlands / Waterfowl Habitat

Wetlands were distributed throughout the Project area where they form a mosaic with upland habitats. The majority of the wetland classes encountered were bogs and fens, with shallow water wetlands observed in association with lakes and large rivers in the region. Within the

Project area these wetland classes were further divided into three bog forms (i.e., domed bog, slope bog and basin bog) and two fen forms (i.e., slope fen and ribbed fen). Alternatively, some of the wetlands suggested characteristics of two or more wetland forms. Although these wetlands occur adjacent to one another, it was inferred that they maintain the same hydrological, ecological and floristic features that normally characterize each ecosystem.

Fens

By order of magnitude, fens comprised the largest land area characterized by wetlands within the Project area. These were minerotrophic peat lands with fluctuating water levels (Warner and Rubec 1997). Surface water movement was common within fens and may be observed in pools or small channels. Their vegetation was influenced by water depth and chemistry and were dominated by graminoids, bryophytes, shrubs, and/or trees. Large, sloped fens were identified at two sites within the Project area, northeast of Valentine Lake and at a point of land extending into Valentine Lake from the west. Complexes of sloped and ribbed fens were also observed. Smaller fens were present elsewhere within the Project area but were difficult to distinguish from the helicopter.

Fens have relatively higher biological productivity when compared to bogs but less than that of marshes. The potential for fens to provide habitat for wildlife species is highly variable dependent on location, form and wildlife in the area. However, fens may provide habitat to more species than that of the bog wetlands.

Bogs

Bogs were the second most prominent wetland class and were distributed throughout the Project area. Numerous smaller peat deposits were distributed across the site and generally characterized as slope and basin bogs.

Bogs are peat wetlands which are raised or level with the surrounding terrain and are unaffected by runoff waters or groundwater from the surrounding mineral soils (Warner and Rubec 1997). Water levels are generally at or slightly below the surface of the bog. Because they receive their nutrient and water input from atmospheric deposition, they are typically nutrient poor and have a low pH. They have a well-developed peat layer comprised of peatmoss and the woody remains of shrubs. Both bog types are typically treeless and shallow, rarely exceeding peat depths of more than 2 m (Wells and Pollett 1983).

Bogs have a relatively low rate of biological productivity when compared to the other wetland classes in the area. Lower biological productivity generally means there is less consumable biomass (food). However, wildlife may also use wetlands for shelter, travel routes and as staging areas. Various wetland forms will provide particular habitat requirements for a number of species and therefore affect habitat values. For example, string bogs and the associated open water pools will provide more suitable habitat to waterfowl than domed bogs.

Shallow Water

Within the Project area, the shallow water wetlands were characteristically associated with Valentine Lake and the Victoria River, but smaller components were also observed to be independent of these features.

Shallow water wetlands usually occupy the transitional areas between wetlands that are saturated or seasonal wet and permanent, deep water bodies, such as are associated with lakes. They have standing or flowing water that is <2 m deep during mid-summer but their hydrological character is quite varied. Water levels with shallow water wetlands may be seasonally stable, permanently flooded, or intermittently exposed during droughts, low flows, or intertidal periods (Warner and Rubec 1997).

Wetland Complexes

Wetland complexes, characterized by two or more individual wetlands with overlapping ecological function, were observed within two large wetlands in the area of Valentine Lake Project. However, this observation likely reflected the manner in which wetlands were identified. That is, wetlands within the Project area were not subject to field surveys and the collection of detailed site information, but were based on observations from the air during the waterfowl survey. As such, their current classification may reflect limitations that are commonly associated with such survey techniques (including identifying their vegetative composition, boundaries, and connectivity to other patches of wetland).

6.0 SUMMARY

The two aerial surveys that took place in May and July, 2011 provide an overview of the waterfowl habitat potential of the Project area; waterfowl utilization of this habitat; as well as the nesting, breeding and brood rearing habitat preferences. The waterfowl species observed were typical of the region (Jacques Whitford 1995).

The extensive fens northeast of Valentine Lake, and on the point of land extending into Valentine Lake provide waterfowl with breeding and brood raising habitat. Canada Geese nest on two large fens within the Project area. Canada Geese use fens throughout the breeding season for feeding and brood rearing. Observations of the other six waterfowl species observed during the 16 May survey were distributed along the Victoria River and throughout smaller waterbodies and wetlands throughout the Project area. Open water provides habitat for many species of waterfowl throughout the breeding season. The fens, particularly the fen northeast of Valentine Lake, provided habitat requirements during the breeding season for American Black Duck, Ring-necked Duck, Common Merganser and Canada Geese, in particular. Other prior surveys by Stantec in the region also indicate Canada Geese use fens for breeding (Jacques Whitford 1995). Note that none of these observations occurred within the Valentine Lake East Site where potential waterfowl habitat is limited. There was a single American Black Duck observed on the periphery of the Frozen Ear Pond site during the breeding waterfowl survey

and an individual plus pair of Ring-necked Ducks in this area during the waterfowl brood survey. The Leprechaun Pond Site has some waterbodies and wetland areas present. Waterfowl were found in this area during the brood survey.

The concentrations of waterfowl along the Victoria River (outside the three locations of interest to Marathon) included individuals, pairs and broods of several species. Of note was that there were more observations of broods made for Green-winged Teal, Ring-necked Duck, American Black Duck and unidentified ducks in July than there were breeding pair observations in May. There were two merganser breeding pairs observed and two broods of this species observed. Although there were numerous Common Loon and Canada Geese breeding pairs detected, no broods were detected during the early July survey. During the brood survey observations of several species were also observed using the fen northeast of Valentine Lake: Common Goldeneye, Common Loon, American Black Duck, Ring-necked Duck, Common Loon and the only observation of Common Goldeneye (a single male).

The only listed wildlife species recorded was two observations of individual Rusty Blackbird on Victoria River, outside the locations of interest to Marathon and downstream of the Dam. This species is of interest given its provincial and federal status. The provincial government management plan for this species in Newfoundland and Labrador is pending.

The distribution and abundance of wetlands within the Project area are consistent with this region of Newfoundland in terms of wetland class and form (South. 1983). Of these three wetland classes, bogs have the lowest biological productivity and shallow water wetlands have the highest. While bogs are an important habitat for many wildlife species, the increased biological productivity in fens and, in particular, marshes, results in higher overall habitat values. Due to their location within the landscape, fens and marshes play more of a role in attenuating surface water flows than bogs.

With respect to the ability of the wetlands in the Project area to provide habitat for wildlife, particularly waterfowl, wetland habitats within the survey area possess features, including the interspersion of open water (i.e., shallow pools) and vegetation (i.e., narrow ridges or strings of hummocky vegetation), in which waterfowl (e.g., breeding pairs of Canada geese) or other waterbirds were observed. Vegetation interspersion is a measure of the abundance of edges between vegetation and/or open water, and is a valuable attribute for wildlife. Wetlands that contain vegetation interspersed with open water are more likely to support greater on-site diversity and/or abundance of wildlife species. Those with dense vegetation and no channels or open water areas are less likely to be important within this context (Tiner 2009). For wetlands characterized by multiple vegetative communities, the increased structural diversity and amount of edge associated with greater interspersion is generally positively correlated with wildlife habitat quality (Tiner 2009). Wetlands for which the degree of interspersion between vegetation and open water was generally associated with areas of sloped fen / ribbed fen wetland complex; although some other wetland types were represented in this designation.

The surveys conducted for this study indicate that only the Leprechaun Pond Site appears to have sufficient aquatic and wetland habitat to attract waterfowl. Such habitat appears

insufficient to attract waterfowl at either the Valentine Lake East Site or the Frozen Ear Pond site.

The inadvertent disturbance or loss of nest sites and/or eggs associated with the development of projects is referred to as incidental take. The potential for incidental take is a current issue with Environment Canada and this agency requires that proponents show due diligence in reducing or eliminating the risk of incidental take (Environment Canada, 2011).

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APPENDIX A

Table A-1 Common and Scientific Names of Wildlife Observed during Aerial Surveys in 2011

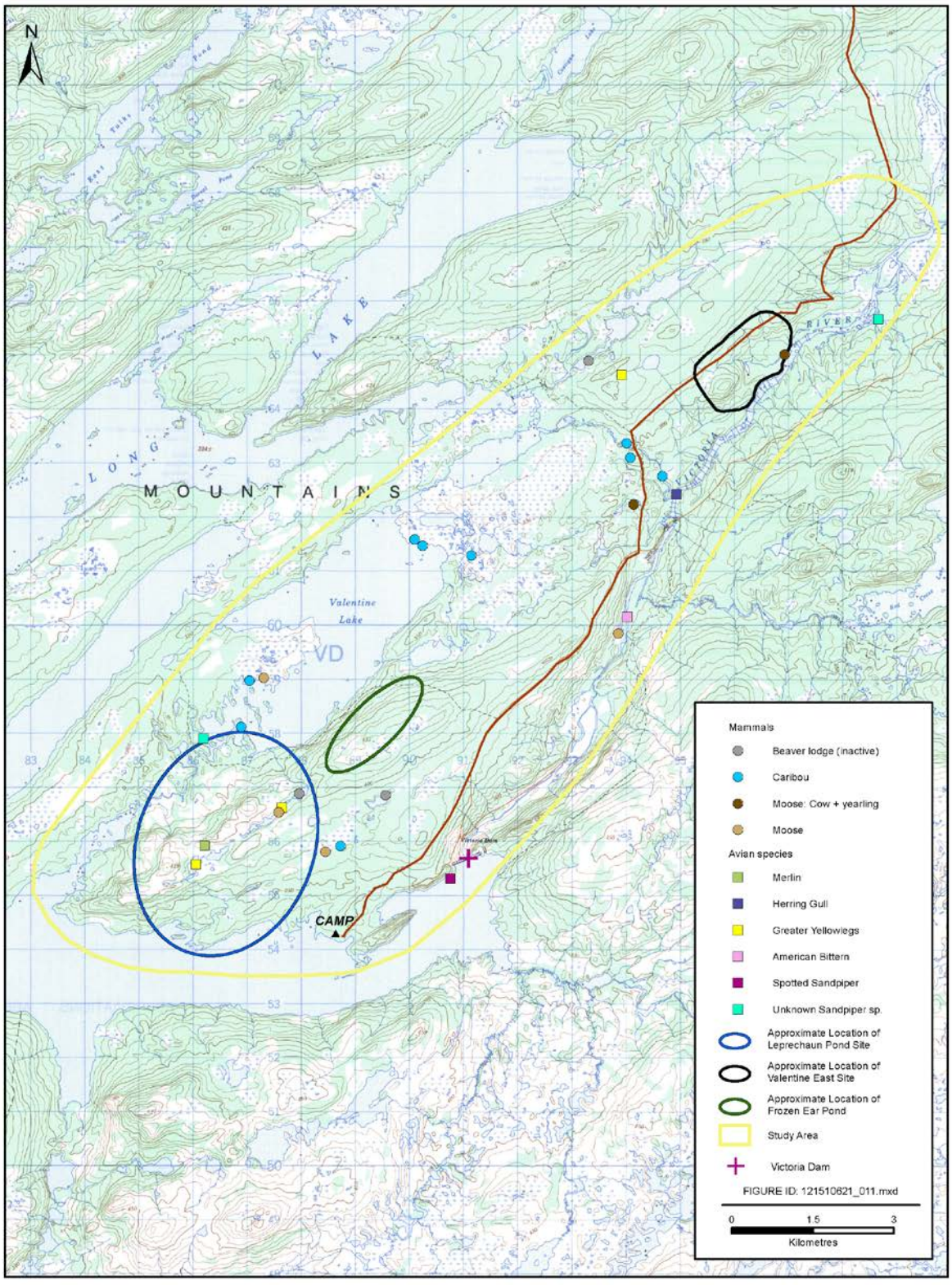
Birds	
Common Name	**Scientific Name**
American Bittern	*Botaurus lentiginosus*
American Black Duck	*Anas rubripes*
Black-capped Chickadee	*Poecile atricapillus*
Canada Goose	*Branta canadensis*
Caspian Tern	*Hydroprogne caspia*
Common Goldeneye	*Bucephala clangula*
Common Loon	*Gavia immer*
Common merganser	*Mergus merganser*
Common Raven	*Corvus corax*
Greater Yellowlegs	*Tringa melanoleuca*
Green-winged Teal	*Anas crecca*
Herring Gull	*Larus argentatus*
Merlin	*Falco columbarius*
Osprey	*Pandion haliaetus*
Red-breasted merganser	*Mergus serrator*
Ring-necked Duck	*Aythya collaris*
Ruby-crowned Kinglet	*Regulus calendula*
Rusty Blackbird	*Euphagus carolinus*
Spotted Sandpiper	*Actitis macularius*
Yellow-rumped Warbler	*Dendroica coronata*
Mammals	
Common Name	**Scientific Name**
Beaver	*Castor canadensis*
Caribou	*Rangifer tarandus*
Moose	*Alces alces*

APPENDIX B

Table B-1 Incidental Observations of Other Wildlife, 16 May 2011

Avian	
Species	**Sign**
American Bittern	individual (observed)
Black-capped Chickadee	Individual (heard)
Greater Yellowlegs	Individuals (observed)
Herring Gull	Individual (observed)
Merlin	Individual (observed)
Ruby-crowned Kinglet	Individual (heard)
Spotted Sandpiper	Individuals (observed)
Yellow-rumped Warbler	Individual (heard)
Mammal	
Species	**Sign**
Beaver	old lodges
Caribou	Individuals
Moose	4 individuals and 2cows with yearlings

Figure B-1 Locations of Other Wildlife Observed, 16 May 2011



APPENDIX C

Table C-1 Incidental Observations of Other Wildlife in the Valentine Lake Area, 7 July 2011

Avian	
Species	**Sign**
American Bittern	individual (observed)
Caspian Tern	Individual (observed)
Common Raven	Individuals
Greater Yellowlegs	Individuals (observed)
Herring Gull	Individual (observed)
Osprey	Individual (observed)
Rusty Blackbird	2 individuals (observed)
Spotted Sandpiper	Individuals (observed)
Unidentified blackbird	Individual (observed)
Unidentified gulls	Individuals (observed)
Unidentified sandpipers	Individuals (observed)
Unidentified shorebirds	Individuals (observed)
Mammal	
Species	**Sign**
Beaver	old and active lodges and dams
Caribou	cow plus calf
Moose	Individual

Figure C-2 Locations of Other Wildlife Observed, 7 July 2011

2011 Forest Songbird Surveys at the Valentine Lake Prospect

Prepared for

Marathon Gold Corporation
Suite 1505, 33 Bay Street
Toronto, ON

Final Report

File No. 121510621

Date: August 13, 2014

Stantec Consulting Ltd.
607 Torbay Road
St. John's, NL A1A 4Y6
Tel: (709) 576-1458
Fax: (709) 576-2126

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1.0 INTRODUCTION

A breeding songbird point count survey was carried out between 14 and 18 June 2011 to document the species present and provide insight regarding forest songbird populations in the areas surveyed. The survey occurred at a time when all migrants had returned to the area based on the presence of Yellow-bellied Flycatchers, typically a late arriving migrant. Songbirds are members of the Order *Passeriformes* and are defined as 'perching birds'. Songbirds are important species in many regards but as foragers of insects they serve to keep many insect species in check and are beneficial to forests and crops in this way. Songbirds have been in decline in recent years and this may be attributed to a decline in winter habitat as well as breeding habitat fragmentation (USFWS 2002).

The 2011 breeding songbird surveys were completed in advance of an Ecological Land Classification, so transects were placed in areas that were identified to Stantec as areas of current and future exploration: Leprechaun Pond, Valentine Lake East and Frozen Ear Pond. Four transects were completed over five mornings. All bird species detected during point count surveys were recorded.

A total of 38 species were identified. The most common species recorded were: White-throated Sparrow, Ruby-crowned Kinglet, Swainson's Thrush and Yellow-bellied Flycatcher. Two federally and provincially listed (*threatened*) species were detected: Olive-sided Flycatcher (COSEWIC 2007; SSAC 2009) and Common Nighthawk (COSEWIC 2007; SSAC 2007).

2.0 METHODOLOGY

No permits were required to conduct forest songbird surveys. Internally, Stantec completed a review of health and safety issues related to the project. A health and safety checklist was reviewed with participants on 14 June. A safety toolbox meeting was completed and documented the following 4 days.

All bird species detected during the point count surveys were recorded. This methodology entails having an observer stand in a fixed location for a pre-determined amount of time and tallying all bird species observed or heard. The data collected can be used to determine the relative abundance of species. Over time, trends in abundance may be assessed (Huff et al. 2000). Songbird point count surveys were conducted between 14 and 18 June 2011 at existing and future disturbances as well as adjacent areas at the Valentine Lake prospect site. One Survey Team participated in the field program, comprised of a lead ornithologist and a field technician. 1:50,000 National Topographic Series map sheets, GPS, and compass were used for field navigation. Sites were accessed each morning by ATV, truck and by foot. While the focus of these surveys was on forest songbirds, observations of all avifauna and other wildlife were recorded. The Stantec team was led by the Project Manager, Mr. Barry Wicks and

included Ms. Tina Newbury who participated as lead ornithologist on each of the five days. Ms. Marina Joury (Marathon employee) participated as field technician from 14 to 18 June, 2011.

A series of ten minute point count surveys were conducted at locations spaced at least 300 m apart. Each waypoint was recorded with a handheld GPS unit. Surveys commenced at dawn (approximately 0515 h) and no point counts were initiated after 0900 h, due to documented declines in the frequency of song later in the morning (Ralph et al. 1993). All birds heard or seen during this period were recorded by the ornithologist. Vegetation data including forest, shrub and ground cover species was recorded (Appendix A). Photographs of habitat were taken at each point count. Data were organized by birds heard and/or seen during two consecutive five minute surveys at each 300 m spaced point count. As these surveys rely on auditory cues, poor weather (i.e., precipitation and/or windy conditions) resulted in a delay (or postponement for that day) until conditions improved. High winds (winds ranking greater than 2 on Beaufort Scale) and heavy rain negatively affect the observers' ability to detect avian species. Bibby et al. (2000) recommend the restriction of point counts to wind conditions of Beaufort 3 and below, with a preference for 2 and below if possible, and to avoid counting in precipitation exceeding occasional light drizzle or brief showers.

3.0 RESULTS

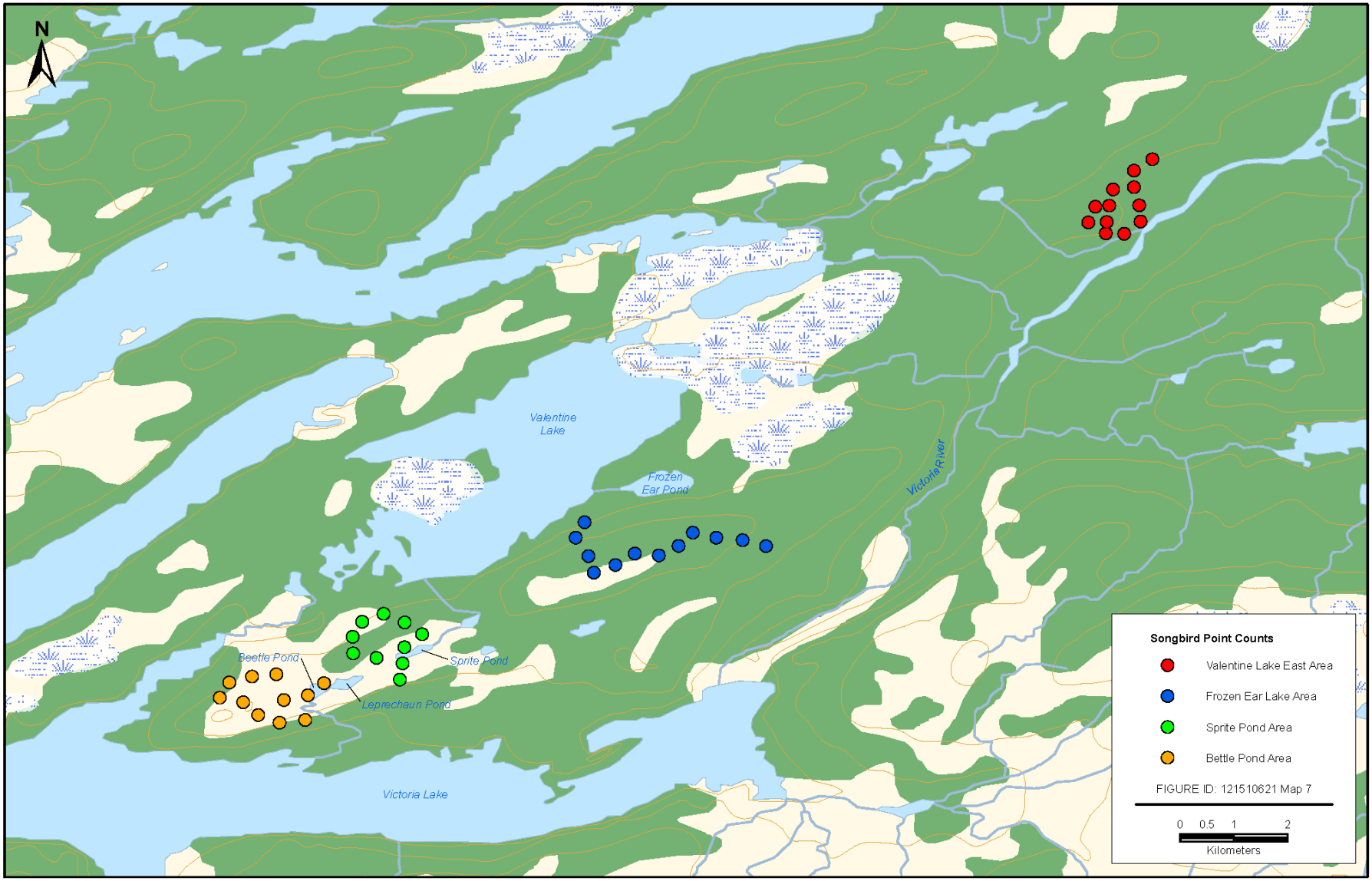
Forty-five point counts were conducted within the areas of interest at the Valentine Lake prospect during 14 to18 June 2011. Weather conditions were favourable (i.e. no precipitation, and nil to light wind conditions) except for the morning of the 16 June when there was rain. A partial transect (3 point counts) was completed on this date. In the Leprechaun Pond area there were two transects: Beetle Pond (N=11), Sprite Pond (N=10). There was one transect completed in the Frozen Ear Pond area (N=12) and one transect completed in the Valentine Lake East area (N=12) (Figure 3-1).

Surveys began as early as 0520 hrs. and the latest point count was finished at 0905 hrs. Species richness ranged between 4.84 and 5.36 and abundance ranged between 6.20 and 7.33 (Table 3.1). No trend was detected over time.

Table 3.1 Species richness and abundance hourly following sunrise

Survey Time	# points	Mean # of species	Mean # of individuals
0431-0530 h	3	5.33	7.33
0531-0630 h	10	5.10	6.90
0631-0730 h	13	4.84	6.15
0731-0830 h	14	5.36	7
0831-0930 h	5	5.2	6.2
Note: mean # of species and mean # of individuals calculated from first 5 minute sampling period at each point count			

Figure 3-1 Songbird Point Count Locations, June 14 – 18, 2011 at Valentine Lake Prospect



A total of 38 breeding songbirds plus one unidentified woodpecker were detected during point count surveys. There were six additional avian species as well as six mammals and one amphibian detected on the Valentine Lake property incidentally (Appendix B).

The Valentine Lake Property is entirely within the Maritime Barrens Ecoregion. This ecoregion is characterized by foggy weather with cool summer temperatures and as having balsam fir (*Abies balsamea*) as the dominant tree species (http://www.heritage.nf.ca/environment/ecoregions_nfld.html). Point counts were conducted in seven habitat types encountered: wetlands, barren, black spruce (stunted), mature black spruce forest, mature balsam fir forest, riparian and mixed wood forest. Wetlands, barren, black spruce (stunted), and mature balsam fir forest had the largest avian communities that ranged from 19 to 26 species (Table 3.2). Riparian and mixed wood forest habitat types had notably smaller avian communities with a total of nine and five species, respectively. Mature black spruce forest had a mid-range avian community with a total of fifteen species detected.

Table 3.2 Presence of avian species in surveyed habitat types on the Valentine Lake Prospect, June 2011

Species	Wetlands (bog/fen) (N=7)	Barren (hilltop) (N=9)	Black spruce (stunted) (N=5)	Black spruce (forest)[1] (N=6)	Balsam fir (forest)[2] (N=15)	Riparian (N=2)	Mixed wood (Deciduous)[3] (N=1)
American Goldfinch			•				
American Robin		•			•		
Black-and-White Warbler	•		•	•			
Blackpoll Warbler	•	•	•			•	
Black-throated Green Warbler		•			•		•
Boreal Chickadee	•	•	•		•	•	
Brown Creeper					•		
Common Loon[4]	•	•		•			
Common Yellowthroat		•	•		•	•	
Fox Sparrow	•	•	•	•	•		
Golden-crowned Kinglet					•		
Gray Jay	•						
Greater Yellowlegs	•	•			•	•	
Hermit Thrush	•	•	•	•			
Least Flycatcher							•
Lincoln's Sparrow	•	•	•		•	•	
Magnolia Warbler			•	•	•		
Merlin	•						
Mourning Warbler				•	•		
Nashville Warbler					•		
Northern Goshawk					•		
Northern Waterthrush		•	•	•	•		•

Species	Wetlands (bog/fen) (N=7)	Barren (hilltop) (N=9)	Black spruce (stunted) (N=5)	Black spruce (forest)[1] (N=6)	Balsam fir (forest)[2] (N=15)	Riparian (N=2)	Mixed wood (Deciduous)[3] (N=1)
Olive-sided Flycatcher	•	•	•	•	•		
Palm Warbler			•	•			
Pine Grosbeak	•						
Pine Siskin		•	•				
Pine Warbler		•					
Ruby-crowned Kinglet	•	•	•	•	•		
Savannah Sparrow		•					
Slate-coloured Junco	•	•	•	•	•	•	
Swainson's Thrush	•	•	•	•	•	•	•
Swamp Sparrow	•	•			•		
White-throated Sparrow	•	•	•	•	•	•	•
White-winged Crossbill					•		
Wilson's Snipe	•				•		
Yellow-bellied Flycatcher	•	•	•	•	•		
Yellow-rumped Warble	•	•	•	•	•	•	
Yellow-shafted Flicker					•		
Unidentified Woodpecker					•		

All data, GPS waypoints and photographs of habitat at each waypoint are available electronically. The avian community detected in the Valentine Lake area is typical for these habitat types found within Newfoundland. The only exception is the Common Nighthawk which is considered a rarity on the island.

4.0 LISTED SPECIES

The Olive-sided Flycatcher (*Contopus cooperi*) is listed federally and provincially as *threatened* (COSEWIC 2007; SSAC 2009) and individuals were detected at six point count surveys during the 2011 field season. These individuals were observed in habitat typically associated with this species, i.e., bog (edge); Balsam Fir mature forest and Black Spruce mature forest. This habitat is not limiting within the study area or within the province. The Olive-sided Flycatcher is found throughout the island and southern Labrador.

The Common Nighthawk (*Chordeiles minor*) is listed both provincially and federally as *threatened* (COSEWIC 2007; SSAC 2007). One individual was incidentally encountered along

open, roadside habitat during the 2011 field season - outside of the point count surveys. This species is typically found open habitat (ex: gravel beaches, grasslands, rocky outcrops, burns). This habitat type is not limiting within the province. Within the province this species is known to breed in southern Labardor but is considered a rarity on the island of Newfoundland.

Both the Olive-sided Flycatcher and Common Nighthawk are boreal forest birds. The provincial and federal listings for these two species result from habitat decline throughout their range. Listed species range from *vulnerable* (provincial designation) or *special concern* (federal designation) to *extinct* with *threatened* as the second ranking. A species that has been listed as *vulnerable* is likely to become *endangered* if the factors affecting its vulnerability are not reversed (COSEWIC 2011).

The inadvertent disturbance or loss of nest sites and/or eggs is referred to as incidental take. Incidental take is a current issue and Environment Canada has outlined an approach to be taken (Environment Canada 2011). This approach asks proponents to show due diligence in reducing or eliminating the risk of incidental take. The Provincial Government Management plans for these two species in Newfoundland and Labrador are pending.

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http://www.heritage.nf.ca/environment/ecoregions_nfld.html Ecoregions of Newfoundland map (accessed electronically 11 August 2011)

APPENDIX A

Data Sheet

Songbird Point Count Surveys- 2011

Valentine Lake area

Observer: _____ **Assistant:** _____ **Start time:** _____ **End time:**_____ **Date:** **June 2011**

Waypoint: _____ **Grid Ref:** ____ **Latitude:** _____ **Longitude:** _____ **Photo#:**_____

%CC: ___ **Temp(°C):** ___ **Precip:** _____ **Wind direction:**_____ **Wind speed (Beaufort scale):**_____

Canopy: species _____ **% cover:**_____

Shrub layer: dominant species _____

Ground veg: dominant species _____

	First 5 min.			Second 5 min.		
Species	<50 m	<100 m	>100 **m**	<50 m	<100 m	>100 m
COLO						
CAGO						
MALL						
OSPR						
RUGR						
SPGR						
GRYE						
SOSA						
SPSA						
WISN						
HERG						
NOFL						
HAWO						
BBWO						
TTWO						
YBFL						
ALFL						
LEFL						
OSFL						
TRES						
BANS						
GRAJ						
BLUJ						
AMCR						
CORA						
BCCH						
BOCH						
RBNU						
BRCR						
RCKI						
GCKI						
WIWR						
SWTH						
GCTH						
HETH						
AMRO						
NOSH						
EUST						
CEDW						
REVI						
TEWA						
OCWA						

	First 5 min.			Second 5 min.		
Species	<50 m	<100 m	>100 m	<50 m	<100 m	>100 m
NAWA						
YWAR						
MAWA						
YRWA						
BTNW						
PAWA						
BLPW						
BAWW						
AMRE						
NOWA						
MOWA						
WIWA						
SAVS						
FOSP						
SOSP						
LISP						
SWSP						
WTSP						
WCSP						
SCJU						
RUBL						
AMGO						
EVGR						
PIGR						
PUFI						
WWCR						
PISI						

Additional Observations: (species seen/heard between point counts as well as flyovers)

APPENDIX B

Incidental wildlife observations encountered on the Valentine Lake Prospect outside of point count surveys from 14 to 18 June, 2011

SPECIES	SIGN
Birds	
Common Raven (*Corvus corax*)	observed
Common Nighthawk (*Chordeiles minor*)	observed
Great Horned Owl (*Bubo virginianus*)	observed
Spruce Grouse (*Falcipennis canadensis*)	scat
Tree Swallow (*Tachycineta bicolor*)	observed
White-crowned Sparrow (*Zonotrichia leucophrys*)	observed
Other Wildlife	
American toad (*Bufo americanus*)	observed
Caribou (*Rangifer tarandus*)	tracks
Eastern coyote (*Canis latrans thammos*)	tracks/others at camp heard
Lynx (*Lynx canadensis*)	unconfirmed scat
Moose (*Alces alces*)	tracks
Red squirrel (*Tamiasciurus hudsonicus*)	heard/middens observed
Snowshoe hare (*Lepus americanus*)	scat

MARINE
Stantec Consulting Ltd.
607 Torbay Road
St. John's, NL A1A 4Y6
Tel: (709) 576-1458
Fax: (709) 576-2126

Marathon Baseline Fish and Fish Habitat Data Report

Prepared for

Marathon Gold Incorporated

Draft Report

File No. 121510621.300

Date: January 10, 2012

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1.0 INTRODUCTION

Marathon Gold Corp. (Marathon) is currently conducting a drilling program at its Valentine Lake prospect in Central Newfoundland (Figure 1.1). Drilling activities to date have targeted two sites the Valentine East site and the Leprechaun Pond site. Stantec Consulting Ltd. (Stantec) was engaged to design and conduct a Baseline Fish and Fish Habitat sampling program at the Valentine Lake prospect. The purpose of the sampling program is to characterize baseline fish and fish habitat conditions on site prior to any future mine development on the property. This report provides a summary of data from a field survey conducted June 15 to June 20, 2011.

1.1 Study Area

The study area for the 2011 field investigations is illustrated in Figure 1.2 and is comprised of:

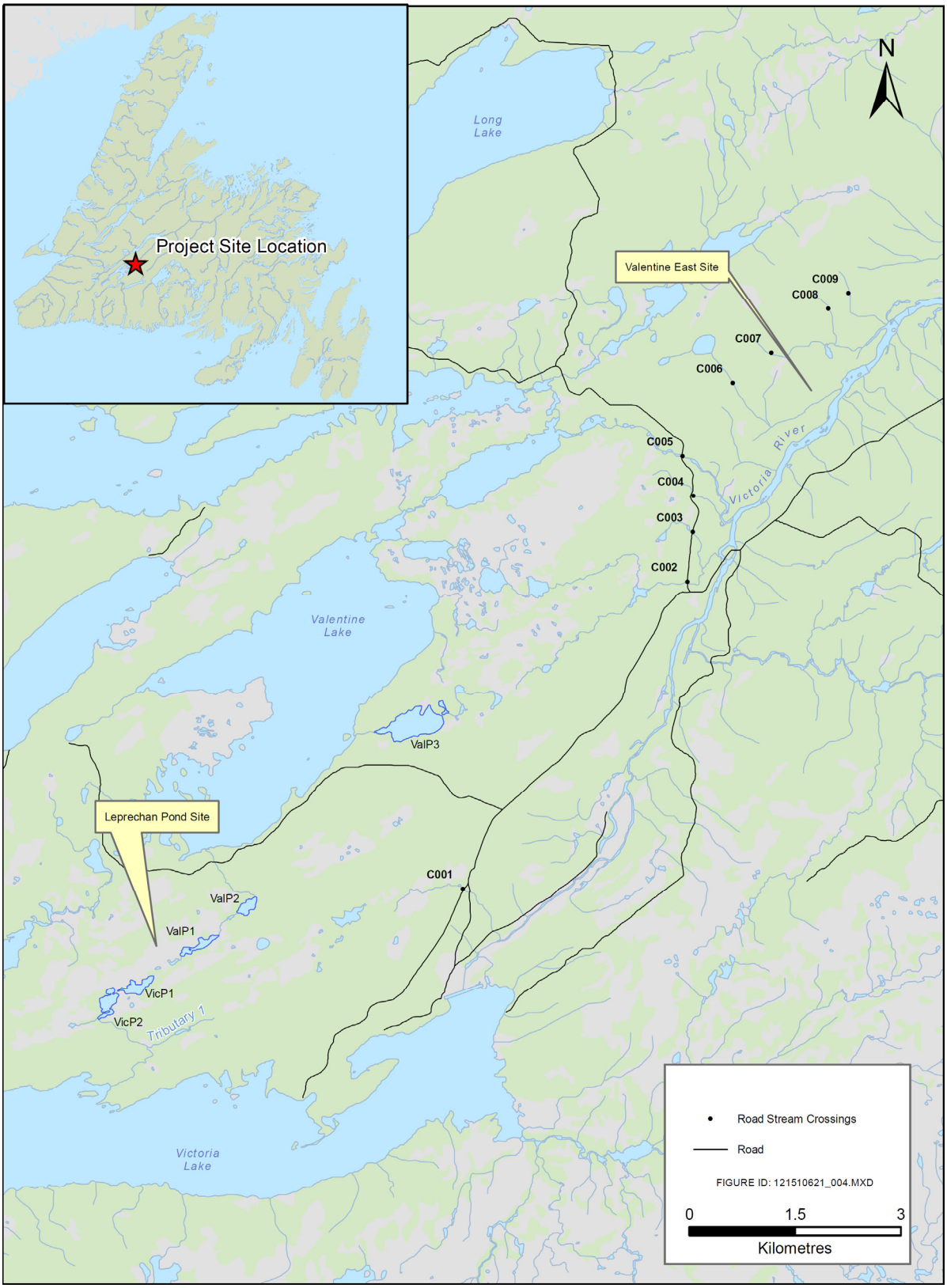
1. Ponds VicP1 and VicP2 plus connecting streams flowing south to Victoria Lake.
2. Ponds ValP1 and ValP2 and connecting streams flowing north to Valentine Lake.
3. An approximate 200 m section of stream located on the east side of Valentine Lake flowing from ValP3 to Valentine Lake.
4. Stream crossings C001 to C009 to a distance 50 m upstream and downstream of the road crossing.

1.2 Objectives

The objectives of the Baseline Fish and Fish Habitat study are:

1. Conduct fish sampling to determine fish presence within the ponds and streams in the study area.
2. Conduct bathymetric and substrate surveys of ponds ValP1, ValP2, VicP1 and VicP2 to determine existing fish habitat, as characterized by depth, substrate, presence of aquatic vegetation and extent of the littoral zone.
3. Characterize habitat for the following stream sections:
   - ValP1 to ValP2
   - ValP2 to Valentine lake
   - VicP1 to VicP2
   - VicP2 to Victoria Lake
   - Tributary 1
   - 200 m steam section between ValP3 and Valentine Lake
   - crossings C001 to C009 to a distance 50 m upstream and 50 m downstream of the stream crossing.

Figure 1.1 Study Area Site Map



1.3 Study Team

Bill Tibble and Scott Finlay conducted the field surveys for this study. James Harrison and Barry Wicks compiled this report and Bruce Bennett provided senior review. Barry Wicks served as project Manager. Sherry Dunsworth was the Marathon client contact and provided project details/coordination to support the field study and reviewed the report.

2.0 METHODS

The 2011 field investigations included an assessment of fish presence and habitat classification of ponds and streams within the study area. The field surveys for this study were conducted June 15 to 20, 2011.

Fishing methods used in this study are described in Sooley et al. (1997). Methods associated with habitat classification are described in Bradbury et al. (2001) for pond habitat characterization and McCarthy et al. (2007 Draft) for stream habitat characterization.

2.1 Fish Sampling

All fishing activity was conducted in accordance with an Experimental Licence obtained from Fisheries and Oceans Canada (DFO). Fish sampling in ponds was conducted by fyke trapping and gillnetting. A minimum of two overnight fyke trap sets were conducted in each pond. Since no salmonids were captured by fyke trapping, a minimum of two gillnet sets were conducted using mesh sizes of 25 and 38 mm. Gillnets were checked at least daily (visual assessment) and left to fish for up to three nights, if no fish captures were evident.

Access to ValP2 prevented the transport of a boat to this pond, thus no fyke net trapping was conducted. To compensate for the lack of fyke trap sets in ValP2, additional gillnet sets (eight sets) were conducted in the littoral area of ValP2. Gillnet sets in ValP2 were deployed by wading the shallow water shoreline area to a depth of approximately 1 metre (m) (Photo 1).

Photo 1 Gill Net Set in Pond Margin Area of ValP2

Fish sampling in streams was conducted by index (qualitative) electrofishing using a backpack electrofishing unit. The time fished for each stream section was recorded and captured fish were measured, a representative number were weighed, identified to species and released alive. Fish data obtained from the sampling are included in Appendix A.

2.2 Pond Bathymetry and Fish Habitat Mapping

Bathymetry profiles of VicP1, VicP2 and ValP1 were obtained by establishing transects that criss-crossed each water body. An inflatable Zodiac travelled along each transect at a relatively constant speed, while the field team recorded depth soundings and GPS readings at regular intervals. Pond substrate along each transect was described based on visual observations or probing with a paddle, where necessary. Substrate was characterized based on substrate descriptions provided in Table 2.1. A bathymetry map was created for each pond using ArcGis software and substrate type was overlain on the bathymetry map.

The inability to get a boat in ValP2 prevented complete bathymetry mapping of the pond. Bathymetry of pond margin areas (to a depth of 1 m) was completed by wading the pond margin area and recording depth readings, GPS coordinates and substrate descriptions.

Table 2.1 Classification of Substrate

Class	Substrate	Description
Coarse	Bedrock (Br)	Continuous solid rock exposed by scouring forces.
	Boulder (B)	Boulder-sized rocks from 25 cm to greater than 1 m in diameter.
Medium	Rubble (R)	Large rocks from 14 to 25 cm in diameter.
	Cobble (C)	Moderate to small size rocks from 3 to 13 cm in diameter.
	Gravel (G)	Small stones from 2 mm to 3 cm in diameter.
Fine	Sand (S)	Fine deposits ranging from 0.06 to 2 mm in diameter.
	Silt (Si)	Fine material less than 0.06 mm in diameter, often carried by currents.
	Muck (M)	Silt and clay containing greater than 85% organic (detritus).
	Clay (mud)	Material of inorganic origin with greasy feel between fingers and no apparent structure.
	Fines (F)	Smaller-sized material of less than 0.06 mm. This classification is used for an indeterminate mix of sand, silt, muck and clay when the dominant component is not determined.
Adapted from: Bradbury et al. (2001) and McCarthy et al (2007 Draft)		

2.3 Stream Habitat Mapping

Stream habitat sections were assessed based on substrate composition, stream velocity readings and depth measurements. Water depth and flow measurements were obtained by recording measurements at ¼, ½ and ¾ stream widths at 25 m increments. All flows were obtained at 60% of the water depth using a SonTek FlowTracker®. Percent substrate composition was estimated for 50 m cells based on criteria outlined in Table 2.1. The percentage of aquatic vegetation composition was also noted. Photographs were taken viewing upstream and downstream at each transect and the percent coverage of riparian vegetation was noted.

Potential barriers to fish migration were described, marked with GPS coordinates and photographed.

3.0 RESULTS

3.1 Fish Sampling

All stream sections and ponds within the study area were sampled to determine the fish species present and to determine if all areas represent fish habitat.

3.1.1 Pond Sampling

Fish sampling in ponds was conducted using a combination of fyke trap and gillnet sets. The results showed evidence of three spine stickleback in the ponds but no evidence of salmonids. Results of the pond sampling efforts are summarized in Table 3.1.

Table 3.1 Summary of Fyke Netting and Gillnetting Effort and Catch

Pond	Method	Location	Catch			Fishing Time
			BT	AS	TSS	
VicP1	Fyke	FN01	0	0	16	Overnight
VicP1	Fyke	FN02	0	0	50	Overnight
VicP1	Gillnet	GN01	0	0	0	3 nights
VicP1	Gillnet	GN02	0	0	0	3 nights
VicP2	Fyke	FN01	0	0	64	Overnight
VicP2	Fyke	FN02	0	0	74	Overnight
VicP2	Gillnet	GN01	0	0	0	3 nights
VicP2	Gillnet	GN02	0	0	0	3 nights
ValP1	Fyke	FN01	0	0	6	Overnight
ValP1	Fyke	FN02	0	0	3	Overnight
ValP1	Fyke	FN03	0	0	10	2 nights
ValP1	Fyke	FN04	0	0	12	2 nights
ValP1	Gillnet	GN01	0	0	0	2 nights
ValP1	Gillnet	GN02	0	0	0	2 nights
ValP2	Gillnet	GN01	0	0	0	6 hrs 35 min
ValP2	Gillnet	GN02	0	0	0	7 hrs 9 min
ValP2	Gillnet	GN03	0	0	0	6 hrs 37 min
ValP2	Gillnet	GN04	0	0	0	6 hrs 16 min
ValP2	Gillnet	GN05	0	0	0	2 nights
ValP2	Gillnet	GN06	0	0	0	2 nights
ValP2	Gillnet	GN07	0	0	0	2 nights
ValP2	Gillnet	GN08	0	0	0	2 nights

A total of eight overnight fyke trap sets and 14 gillnet sets (of varying duration) were conducted during the survey. A total of 235 stickleback were captured by fyke trapping, none were captured by gillnetting. No salmonids were captured by either sampling method.

3.1.2 Stream Sampling

Fish sampling in streams was conducted by index (qualitative) electrofishing. Stream sampling confirmed the presence of Atlantic salmon (Photo 2), brook trout (Photo 3) and three spine stickleback within the study area. A summary of fish sampling is provided in Table 3.2, which shows the location fished, the fishing time, the number of fish caught, the minimum, mean and maximum fork lengths of brook trout and Atlantic salmon and the total number of stickleback caught. The complete fish sampling data are provided in Appendix A.

Photo 3 Representative Photo of Atlantic Salmon

Photo 2 Representative Photo of Brook Trout

Table 3.2 Summary of Stream Electrofishing Results

Stream	Distance (m)	Fishing Time (secs)	Brook Trout Forklengths (mm)				Atlantic Salmon Forklengths (mm)				TSS
			N	Min	Mean	Max	N	Min	Mean	Max	N
C01	0-50m US/DS	316	29	29	76	162	0	-	-	-	0
C02	0-50m US/DS	135	0	-	-	-	1	-	118	-	0
C03	0-50m US/DS	151	3	70	82	90	0	-	-	-	0
C04	0-50m US/DS	93	0	-	-	-	0	-	-	-	0
C05	0-50m US/DS	166	1	-	46	-	8	58	80	115	0
C06	0-50m US/DS	152	6	36	149	149	0	-	-	-	0
C07	0-50m US/DS	NA	No stream evident at this location								
C08	0-50m DS	53*	0	-	-	-	0	-	-	-	0
C09	0-50m US/DS	116	0	-	-	-	0	-	-	-	0
Valentine Lake Streams											
ValLK-ValP2	0-450	844	50	33	70	120	9	28	63	84	1
	450-885	927	0	-	-	-	0	-	-	-	5
ValP1-ValP2	0-200	207	0	-	-	-	0	-	-	-	21
ValP3-ValLK	0-200	338	20	35	88	166	2	78	82	86	0
Victoria Lake Streams											
VicP2-VicLK	0-200	769	0	-	-	-	0	-	-	-	5
	200-750	706	61	31	74	135	0	-	-	-	0
	750-950	NA	Beaver pond – could not fish								
	950-1550	1053	81	31	74	135	9	64	80	93	10
VicP1-VicP2	0-22	388	0	-	-	-	0	-	-	-	0
Tributary		120	6	39	55	90	0	-	-	-	0
Note * Fished 50 m DS only, US too deep to fish.											

Electrofishing surveys at stream crossings confirmed that salmonids were present at five crossings (C01, C02, C03, C05, and C06) and absent at three crossings (C04, C08 and C09). Stream crossing C07 did not exist.

For streams within the Valentine Lake watershed, salmonids were present at two of the three streams investigated (ValLK-ValP2 and ValP3-ValLK), but were absent from ValP1 to ValP2 with only sticklebacks captured in this stream. For stream section ValLK-ValP2 salmonids are only present from 0-450 m US of Valentine Lake. A barrier (waterfall) at 450 m has precluded salmonid migration upstream of this point (Photo 4). Only sticklebacks were captured from 450-885 m upstream and in ponds ValP1 and ValP2.

For streams within the Victoria Lake watershed, salmonids were present in stream section VicP2 to Victoria Lake and in a tributary that confluences with this stream. Salmonids were absent from stream section VicP1-VicP2, with only sticklebacks captured in this stream section. For stream section VicP2 to Victoria Lake, salmonids are only present downstream of 200m from pond VicP2. A barrier at 200 m has precluded salmonid migration upstream of that point (Photo 5). Only stickleback were captured upstream of 200 m and in Ponds VicP1 and VicP2.

Photo 4 Barrier on ValLK to Val P2

Photo 5 Barrier Located on VicP2 to VicLK

3.2 Habitat Characterization

3.2.1 Ponds

A bathymetric map for each pond was developed from the data collected at the transect stations. Substrate data were superimposed on the same maps and general areas of habitat type were delineated. Each map depicts the pond outline, bathymetric contours, substrate areas by type and the presence of aquatic vegetation. Given the shallow nature of the ponds

investigated all habitat types can be considered to occur within the littoral zone. The habitat types included fine substrate with vegetation, fine without vegetation, medium substrate with vegetation, medium without vegetation and coarse substrate without vegetation. Given the shallow nature of the ponds investigated all habitat types can be considered to occur within the littoral zone. Habitat maps for ponds within the Valentine Lake and Victoria Lake watersheds are included in Figures 3.1 and 3.2 respectively. Areas associated with each habitat type are summarized in Table 3.3.

Figure 3.1 Bathymetry and Substrate Map for ValP1 and ValP2

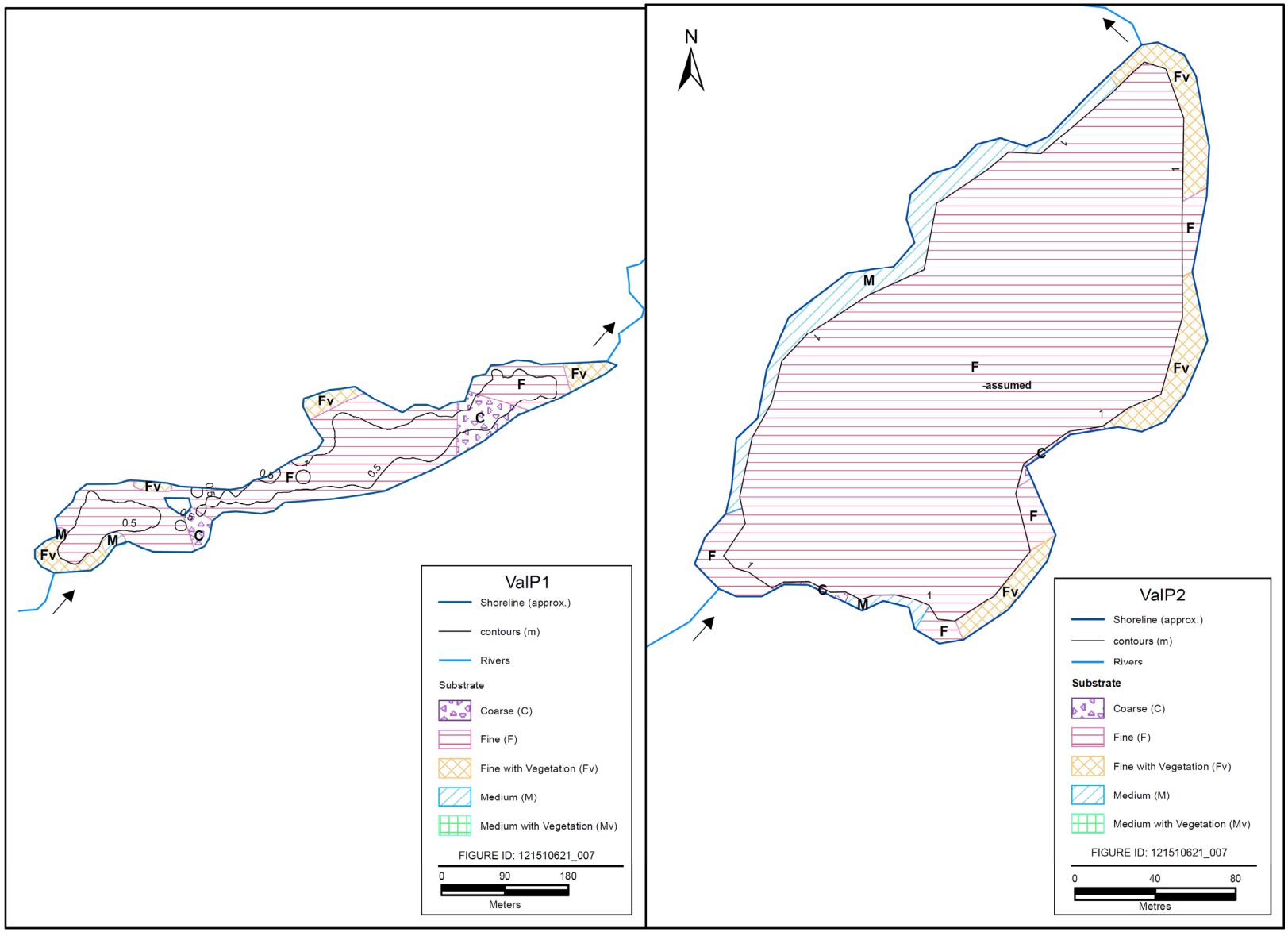


Figure 3.2 Bathymetry and Substrate Map for VicP1 and VicP2

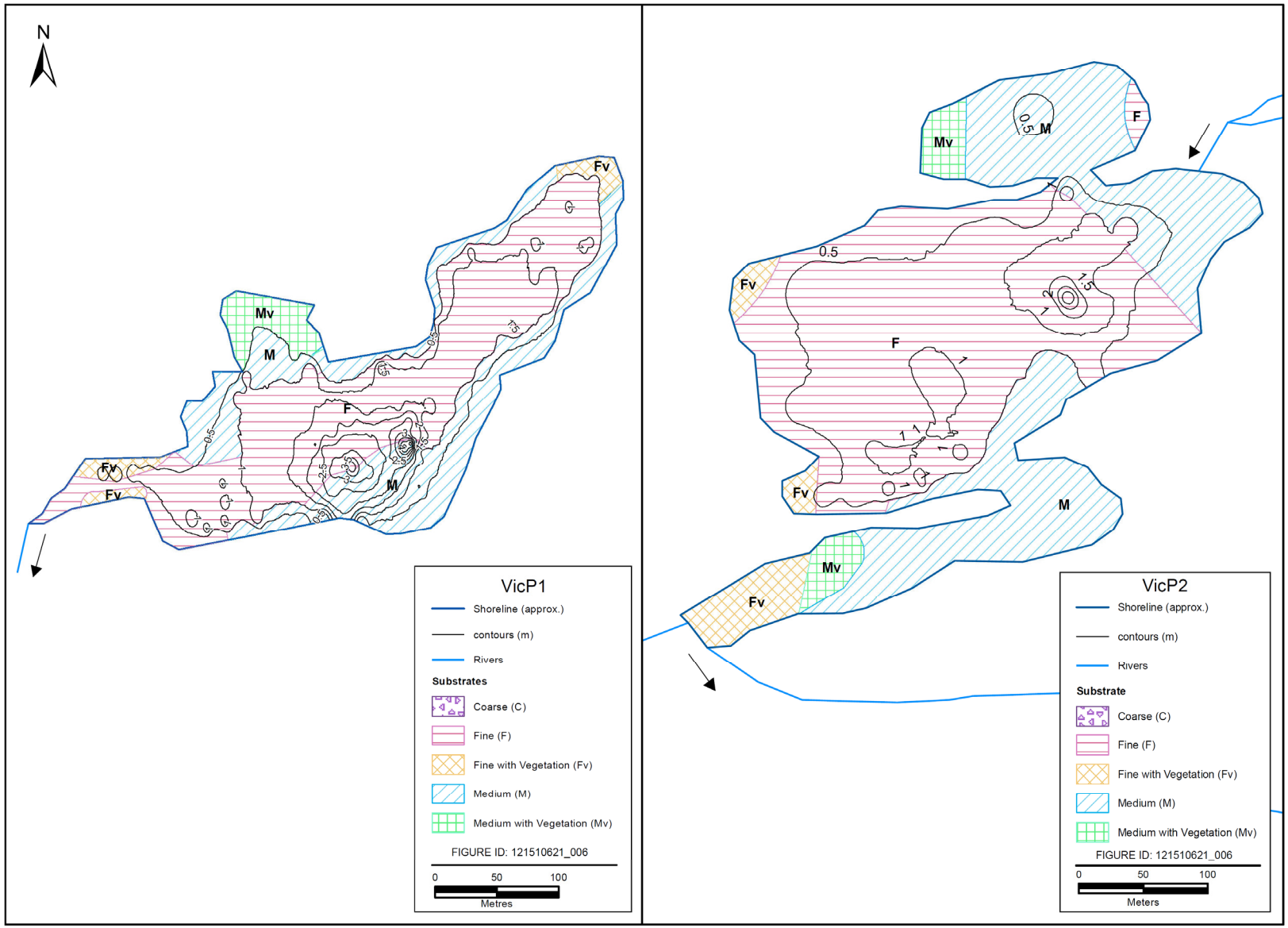


Table 3.3 Summary of Pond Habitat Areas

Substrate	Area M^2			
	VicP1	VicP2	ValP1	ValP2
Fine	32304.9	36339.6	36173.6	35984.5
Fine_Veg	2397.3	3810.8	4694.4	2794
Medium	19762.3	23459.5	622.9	2948.7
Medium_Veg	2945.8	2481.6	0	0
Coarse	0	0	4306.2	185
Total	**57410.3**	**66091.5**	**45797.1**	**41912.2**

3.2.2 Streams

Stream sections within the study area are characterized based on stream velocity measurements, substrate type, depth and the percent coverage of aquatic and riparian vegetation. A summary of habitat attributes is provided in Table 3.4 outlining the stream section surveyed, the distance along the stream section (50 m intervals) and the minimum, maximum and average stream width, velocity and mean depth. In addition, percent substrate, riparian vegetation and aquatic vegetation are identified. The complete habitat classification data set is included in Appendix B.

Table 3.4 Stream Habitat Summary Data

Location	Distance (m)	Stream Width (m)			Velocity (m/s)			Mean Depth (cm)			Substrate Composition (%)							Riparian Vegetation (%)			Aquatic Vegetation (%)
		Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	BR	B	R	C	G	S	F	S	G	T	
ValP1-ValP2	0 to 50	0.83	0.75	0.90	0.05	0.00	0.18	13	6	21	0	0	0	20	10	0	70	35	65	0	10
ValP1-ValP2	50 to 100	1.23	0.60	2.35	0.05	0.00	0.18	39	20	80	0	40	0	0	0	0	60	40	60	0	15
ValP1-ValP2	100 to 150	2.33	2.00	2.65	0.01	0.00	0.03	42	18	80	0	10	0	60	0	30	0	30	70	0	<5
ValP1-ValP2	150 to 200	1.73	1.45	2.00	0.03	0.00	0.04	18	10	20	0	30	0	40	0	0	30	30	70	0	10
VicP1 to VicP2	0 to 22	2.05	1.00	3.10	0.04	0.02	0.06	9	4	16	0	0	0	55	40	5	0	40	0	50	0
ValP3-ValLk	0 to 50	4.27	3.10	5.30	0.49	0.09	0.93	32	18	58	0	40	40	20	0	0	0	70	0	30	0
ValP3-ValLk	50 to 100	3.95	3.15	4.40	0.36	0.01	0.58	29	10	58	0	45	40	15	0	0	0	70	0	30	0
ValP3-ValLk	100 to 150	4.70	3.00	6.80	0.40	0.09	0.82	26	10	34	0	70	30	0	0	0	0	70	0	30	0
ValP3-ValLk	150 to 200	6.60	5.2	7.8	0.35	0.09	0.72	20	16	26	0	40	30	30	0	0	0	65	15	20	5
ValLK-ValP2	0 to 50	1.53	0.75	2.30	0.11	0.00	0.58	15	8	22	20	50	0	30	0	0	0	35	5	60	0
ValLK-ValP2	50 to 100	1.68	1.55	2.10	0.16	0.00	0.34	8	4	14	0	20	0	50	30	0	0	60	0	40	0
ValLK-ValP2	100 to 150	2.07	1.80	2.40	0.12	0.00	0.41	13	4	22	0	60	0	40	0	0	0	45	25	30	0
ValLK-ValP2	150 to 200	1.95	1.80	2.20	0.10	0.00	0.41	16	10	22	0	40	0	40	20	0	0	60	0	40	0
ValLK-ValP2	200 to 250	2.30	2.20	2.45	0.06	0.00	0.26	13	6	20	0	80	0	20	0	0	0	50	15	35	0
ValLK-ValP2	250 to 300	2.00	1.85	2.25	0.12	0.00	0.45	14	6	20	0	60	0	40	0	0	0	65	5	30	0
ValLK-ValP2	300 to 350	1.98	1.90	2.15	0.08	0.00	0.38	15	6	20	0	10	0	40	50	0	0	65	5	30	0
ValLK-ValP2	350 to 400	2.07	1.90	2.20	0.02	0.00	0.08	13	5	22	0	30	0	40	30	0	0	55	15	30	0
ValLK-ValP2	400 to 450	2.25	2.10	2.50	0.10	0.00	0.42	7	4	10	0	70	0	30	0	0	0	50	10	40	0
ValLK-ValP2	450 to 500	1.65	1.05	2.15	0.12	0.00	0.35	10	6	14	0	80	0	20	0	0	0	35	5	60	0
ValLK-ValP2	500 to 550	1.65	1.55	1.75	0.13	0.00	0.35	11	6	20	40	40	0	20	0	0	0	55	10	35	0

Location	Distance (m)	Stream Width (m)			Velocity (m/s)			Mean Depth (cm)			Substrate Composition (%)							Riparian Vegetation (%)			Aquatic Vegetation (%)
		Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	BR	B	R	C	G	S	F	S	G	T	
ValLK-ValP2	550 to 600	1.60	1.50	1.65	0.05	1.00	0.10	23	14	34	20	20	20	25	15	0	0	55	5	40	5
ValLK-ValP2	600 to 650	1.63	1.30	1.95	0.10	0.00	0.25	24	16	34	0	80	0	20	0	0	0	70	5	25	5
ValLK-ValP2	650 to 700	2.40	1.95	2.85	0.08	0.00	0.25	31	8	72	0	80	0	20	0	0	0	55	5	40	10
ValLK-ValP2	700 to 750	1.47	0.75	2.40	0.21	0.00	0.72	10	8	12	0	80	0	20	0	0	0	55	5	40	5
ValLK-ValP2	750 to 800	1.12	0.50	2.10	0.24	0.00	0.72	27	8	70	0	80	0	20	0	0	0	60	10	30	5
ValLK-ValP2	800 to 850	1.25	0.65	2.10	0.10	0.00	0.47	28	10	70	0	50	0	50	0	0	0	60	10	30	15
ValLK-ValP2	850 to 885	0.70	0.40	1.00	0.13	0.02	0.34	12	10	14	0	70	0	30	0	0	0	60	10	30	10
VicP2-VicLK	0 to 50	0.88	0.80	0.95	0.14	0.00	0.33	8	4	12	0	0	0	30	10	0	60	65	15	20	40
VicP2-VicLK	50 to 100	0.93	0.60	1.40	0.16	0.00	0.33	13	10	20	0	0	0	30	50	0	20	65	20	15	50
VicP2-VicLK	100 to 150	1.15	0.75	1.40	0.16	0.00	0.43	12	8	17	0	0	0	40	50	0	10	45	10	45	20
VicP2-VicLK	150 to 200	0.82	0.60	1.10	0.21	0.00	0.73	12	8	14	0	10	0	50	40	0	0	35	20	45	10
VicP2-VicLK	200 to 250	1.23	1.10	1.50	0.10	0.00	0.26	14	8	28	80	10	0	10	0	0	0	30	30	40	0
VicP2-VicLK	250 to 300	1.63	1.40	2.00	0.09	0.00	0.22	11	6	20	60	20	0	20	0	0	0	50	35	15	0
VicP2-VicLK	300 to 350	1.42	1.35	1.50	0.18	0.01	0.53	8	6	12	80	10	0	10	0	0	0	50	35	15	0
VicP2-VicLK	350 to 400	1.75	1.50	1.90	0.12	0.00	0.53	13	8	18	50	0	0	35	15	0	0	15	15	70	0
VicP2-VicLK	400 to 450	1.38	1.00	1.90	0.16	0.00	0.75	14	4	20	0	0	10	80	10	0	0	15	15	70	0
VicP2-VicLK	450 to 500	1.13	0.95	1.25	0.12	0.00	0.42	8	4	12	0	10	0	70	20	0	0	45	10	45	0
VicP2-VicLK	500 to 550	0.88	0.65	1.20	0.05	0.00	0.15	16	10	26	0	0	0	0	45	45	10	60	10	30	0
VicP2-VicLK	550 to 600	0.77	0.65	0.95	0.09	0.01	0.15	17	10	26	0	0	0	0	50	40	10	50	30	20	<5
VicP2-VicLK	600 to 650	1.02	0.95	1.10	0.12	0.00	0.27	13	6	22	0	0	0	20	70	0	10	50	65	15	0
VicP2-VicLK	650 to 700	1.37	0.80	2.20	0.16	0.00	0.31	11	6	14	0	0	0	60	35	0	5	60	35	5	0
VicP2-VicLK	700 to 750	1.12	0.45	2.20	0.13	0.02	0.31	16	8	22	0	0	0	20	70	0	10	60	40	0	<5

Location	Distance (m)	Stream Width (m)			Velocity (m/s)			Mean Depth (cm)			Substrate Composition (%)							Riparian Vegetation (%)			Aquatic Vegetation (%)
		Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	BR	B	R	C	G	S	F	S	G	T	
VicP2-VicLK	750 to 800	0.70	0.70	0.70	0.16	0.12	0.21	21	20	22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
VicP2-VicLK	800 t0 850	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
VicP2-VicLK	850 to 900	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
VicP2-VicLK	900 to 950	2.20	2.20	2.20	0.02	0.01	0.03	47	44	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
VicP2-VicLK	950 to 1000	1.98	1.75	2.20	0.23	0.00	0.45	22	6	50	0	0	0	70	30	0	0	60	30	10	0
VicP2-VicLK	1000 to 1050	2.08	2.00	2.20	0.19	0.00	0.63	10	5	14	0	10	0	60	30	0	0	35	35	30	0
VicP2-VicLK	1050 to 1100	1.73	1.55	2.05	0.20	0.00	0.63	8	5	12	0	0	20	60	20	0	0	40	40	20	0
VicP2-VicLK	1100 to 1150	1.68	1.40	2.10	0.14	0.00	0.46	11	6	18	0	10	0	60	30	0	0	50	50	0	<5
VicP2-VicLK	1150 to 1200	1.78	1.55	2.10	0.15	0.06	0.38	16	12	22	0	0	0	50	45	0	5	60	40	0	0
VicP2-VicLK	1200 to 1250	1.40	1.00	1.70	0.18	0.00	0.38	18	13	20	0	0	0	35	60	0	5	50	50	0	5
VicP2-VicLK	1250 to 1300	1.15	1.00	1.35	0.19	0.04	0.49	17	12	24	0	0	0	40	60	0	0	50	50	0	10
VicP2-VicLK	1300 to 1350	2.62	1.10	3.50	0.17	0.00	0.49	13	6	20	0	10	0	60	30	0	0	60	40	0	5
VicP2-VicLK	1350 to 1400	2.93	2.65	3.50	0.10	0.00	0.30	10	6	14	20	50	0	30	0	0	0	60	30	10	0
VicP2-VicLK	1400 to 1450	1.87	0.95	2.65	0.22	0.00	0.45	10	6	14	30	40	0	30	0	0	0	50	15	35	0
VicP2-VicLK	1450 to 1500	2.02	0.80	3.25	0.17	0.00	0.39	10	4	14	10	10	50	30	0	0	0	40	30	30	0
VicP2-VicLK	1500 to 1550	2.02	1.30	3.25	0.19	0.00	0.42	12	8	20	0	0	30	50	20	0	0	65	0	35	0
Trib	0 to 125	1.3	1.05	1.55	0.1	0.3	0.15	13	8	22	0	5	10	45	40	0	0	35	50	15	0
Trib	125 to 175	1.88	1.55	2.20	0.09	0.00	0.20	8	6	9	0	10	10	40	40	0	0	0	0	0	0
C01	0 to 50 US	2.40	1.80	3.40	0.06	0.00	0.18	17	4	30	0	20	15	50	10	0	5	70	15	15	0
C01	0 to 50 DS	2.10	1.00	3.40	0.04	0.00	0.14	16	10	30	0	10	30	50	10	0	5	70	10	20	0

Location	Distance (m)	Stream Width (m)			Velocity (m/s)			Mean Depth (cm)			Substrate Composition (%)							Riparian Vegetation (%)			Aquatic Vegetation (%)
		Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	BR	B	R	C	G	S	F	S	G	T	
C02	0 to 50 US	3.57	3.20	4.10	0.26	0.00	0.72	29	8	62	0	50	10	40	0	0	0	40	10	50	0
C02	0 to 50 DS	4.07	3.20	4.70	0.33	0.12	0.82	24	8	62	0	30	0	50	20	0	0	50	5	45	0
C03	0 to 50 US	2.43	1.95	2.90	0.16	0.01	0.30	19	12	27	0	40	20	40	0	0	0	50	50	0	0
C03	0 to 50 DS	2.50	1.70	2.90	0.28	0.03	0.49	11	4	20	30	0	0	30	40	0	0	70	15	15	0
C04	0 to 50 US	1.38	1.10	1.90	0.14	0.00	0.62	16	6	28	0	0	0	5	50	45	0	35	10	55	0
C04	0 to 50 DS	1.00	0.90	1.15	0.04	0.00	0.20	18	10	30	0	0	0	10	30	70	0	45	5	50	0
C05	0 to 50 US	10.60	10.60	10.60	0.65	0.06	1.08	30	14	40	0	100	0	0	0	0	0	30	0	70	0
C05	0 to 50 DS	10.60	10.60	10.60	0.95	0.87	1.08	34	22	40	0	100	0	0	0	0	0	30	0	70	0
C06	0 to 50 US	1.30	0.90	1.60	0.21	0.00	0.39	14	2	24	0	0	20	20	60	0	0	50	35	15	0
C06	0 to 50 DS	1.33	0.90	1.70	0.19	0.02	0.39	16	2	22	0	0	0	50	50	0	0	65	25	10	0
C07	0 to 50 US	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C07	0 to 50 DS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C08	0 to 50 US	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
C08	0 to 50 DS	0.88	0.65	1.20	0.12	0.04	0.21	10	4	20	0	0	0	0	0	0	100	55	40	5	0
C09	0 to 50 US	1.73	1.30	2.00	0.01	0.00	0.04	24	12	28	0	0	0	0	0	0	100	60	25	15	<5
C09	0 to 50 DS	0.88	0.45	1.30	0.02	0.00	0.11	13	8	16	0	0	20	0	0	0	80	70	15	15	<5

Notes:
- Substrate classifications are: BR = Bedrock, B = Boulder, R = Rubble, C = Cobble, G = Gravel, S = Sand, F = Fines
- Riparian vegetation categories are: S = Shrubs, G = Grass, T = Trees

4.0 DISCUSSION

The 2011 baseline study confirmed the presence of Atlantic salmon, brook trout and three-spine stickleback in portions of the study area. Atlantic salmon and brook trout were only captured in stream habitats and were absent from the four ponds investigated. Substantial barriers (falls) exist 200 m downstream of VicP2 and approximately 450 m downstream of ValP2. No salmonids were captured in ponds or stream sections located upstream these barriers.

Four small ponds are present in the study area ranging in size from 4.19 hectares (ValP2) to 6.61 hectares (VicP2). The most prevalent habitat type is fine, followed by medium, fine with vegetation, medium with vegetation and coarse. Water depths encountered during the survey confirmed that all pond habitat types occur within the littoral zone. Note that this is assumed for pond ValP2 as complete bathymetry mapping was not conducted.

For streams, the most prevalent substrate type is cobble, followed by boulder, gravel, bedrock, rubble, fines and sand. Stream sections rarely exceeded 3 m in width, with the exception of stream section ValP3 – Val Lake which has an average width of 4.9 m. In addition, stream crossing C002 and C005 has an average width of 3.8 and 10.6 m respectively. Stream velocities were variable, but can be categorized as mainly slow (<0.2 m/s). Stream velocities ranged from 0 m/s in steady areas to a maximum of 1.08 m/s in cascade/rapid areas. The composition of riparian vegetation varies, with shrubs being the overall dominant type. Aquatic vegetation is absent or in low abundance in most stream sections and has its highest abundance 0-100 m downstream of VicP2.

5.0 REFERENCES

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APPENDIX A

Fish Data 2011

APPENDIX A: Fish Sampling Data 2011

Legend

Method:	Fyke Trap (FN), Gillnet (GN) and Electrofishing (EF)
Site:	Unique identifier assigned to each water body fished.
Location:	Established fish sampling areas for Gillnets and Fyke Nets or stream segment electrofished (0-50 m DS = fished from 0 to 50 m in a Downstream direction).
Start Date:	Date fishing commenced
End Date:	Date fishing ended
Fishing Time:	Number of seconds electrofishing was conducted or number of nights gillnetting or fyke trapping was conducted (1N = 1 Night, 2N = 2 Nights)
Species:	Atlantic salmon (AS), brook trout (BT), threespine stickleback (TSS)
Count:	Number of fish associated with line entry
Length:	Forklength in mm
Weight:	Total weight in grams.
(K) Condition:	Condition factor calculated as: $K = W \times 10^5 / L3$, where K = condition, W = Weight in g, L = Length in mm.

Appendix A Fish Sampling Data 2011

Method	Site	Location	Start Date	End Date	Fishing Time	Species	Count	L (mm)	W (g)	K
EF	C01	0-50m US	15-Jun-11		166s	BT	1	161	55.6	1.33
EF	C01	0-50m US	15-Jun-11		166s	BT	1	162	61.9	1.46
EF	C01	0-50m US	15-Jun-11		166s	BT	1	133	28.9	1.23
EF	C01	0-50m US	15-Jun-11		166s	BT	1	115	21.5	1.41
EF	C01	0-50m US	15-Jun-11		166s	BT	1	105	13	1.12
EF	C01	0-50m US	15-Jun-11		166s	BT	1	106	16.3	1.37
EF	C01	0-50m US	15-Jun-11		166s	BT	1	91	10.4	1.38
EF	C01	0-50m US	15-Jun-11		166s	BT	1	94	10.9	1.31
EF	C01	0-50m US	15-Jun-11		166s	BT	1	101	11	1.07
EF	C01	0-50m US	15-Jun-11		166s	BT	1	92	10.8	1.39
EF	C01	0-50m US	15-Jun-11		166s	BT	1	37	0.7	1.38
EF	C01	0-50m US	15-Jun-11		166s	BT	1	31	0.5	1.68
EF	C01	0-50m US	15-Jun-11		166s	BT	1	32	0.3	0.92
EF	C01	0-50m US	15-Jun-11		166s	BT	1	35	0.4	0.93
EF	C01	0-50m US	15-Jun-11		166s	BT	1	30	0.5	1.85
EF	C01	0-50m US	15-Jun-11		166s	BT	1	35	0.4	0.93
EF	C01	0-50m US	15-Jun-11		166s	BT	1	39	0.8	1.35
EF	C01	0-50m US	15-Jun-11		166s	BT	1	30	0.3	1.11
EF	C01	0-50m DS	15-Jun-11		150s	BT	1	114	19.1	1.29
EF	C01	0-50m DS	15-Jun-11		150s	BT	1	134	33.2	1.38
EF	C01	0-50m DS	15-Jun-11		150s	BT	1	92	9.6	1.23
EF	C01	0-50m DS	15-Jun-11		150s	BT	1	94	10.3	1.24
EF	C01	0-50m DS	15-Jun-11		150s	BT	1	84	9.8	1.65
EF	C01	0-50m DS	15-Jun-11		150s	BT	1	103	12.7	1.16

Appendix A Fish Sampling Data 2011

Method	Site	Location	Start Date	End Date	Fishing Time	Species	Count	L (mm)	W (g)	K
EF	C01	0-50m DS	15-Jun-11		150s	BT	1	37	0.4	0.79
EF	C01	0-50m DS	15-Jun-11		150s	BT	1	35	0.6	1.4
EF	C01	0-50m DS	15-Jun-11		150s	BT	1	29	0.2	0.82
EF	C01	0-50m DS	15-Jun-11		150s	BT	1	30	0.4	1.48
EF	C01	0-50m DS	15-Jun-11		150s	BT	1	33	0.4	1.11
FN	VICP1	FN01	16-Jun-11	17-Jun-11	1N	TSS	16			
FN	VICP1	FN02	16-Jun-11	17-Jun-11	1N	TSS	50			
FN	VICP2	FN02	16-Jun-11	17-Jun-11	1N	TSS	74			
FN	VICP2	FN01	16-Jun-11	17-Jun-11	1N	TSS	64			
EF	VicP2-VicLK	0-50m DS	16-Jun-11		123s	TSS	1	42	0.6	0.81
EF	VicP2-VicLK	0-50m DS	16-Jun-11		123s	TSS	1	37	0.4	0.79
EF	VicP2-VicLK	0-50m DS	16-Jun-11		123s	TSS	1	41	0.6	0.87
EF	VicP2-VicLK	0-50m DS	16-Jun-11		123s	TSS	1	34	0.5	1.27
EF	VicP2-VicLK	0-50m DS	16-Jun-11		123s	TSS	1	35	0.3	0.7
EF	VicP2-VicLK	50-100m DS	16-Jun-11		189s	NC	NA	NA	NA	NA
EF	VicP2-VicLK	100-150mDS	16-Jun-11		272s	NC	NA	NA	NA	NA
EF	VicP2-VicLK	150-200m DS	16-Jun-11		185s	NC	NA	NA	NA	NA
EF	VicP2-VicLK	200-250m DS	16-Jun-11		78s	BT	1	97	13.2	1.45
EF	VicP2-VicLK	200-250m DS	16-Jun-11		78s	BT	1	126	30.4	1.52
EF	VicP2-VicLK	200-250m DS	16-Jun-11		78s	BT	1	72	4.6	1.23
EF	VicP2-VicLK	200-250m DS	16-Jun-11		78s	BT	1	103	13.3	1.22
EF	VicP2-VicLK	200-250m DS	16-Jun-11		78s	BT	1	80	5.4	1.05
EF	VicP2-VicLK	200-250m DS	16-Jun-11		78s	BT	1	85	7.6	1.24
EF	VicP2-VicLK	200-250m DS	16-Jun-11		78s	BT	1	74	3.8	0.94

Appendix A Fish Sampling Data 2011

Method	Site	Location	Start Date	End Date	Fishing Time	Species	Count	L (mm)	W (g)	K
EF	VicP2-VicLK	250-300m DS	16-Jun-11		80s	BT	1	135	30.5	1.24
EF	VicP2-VicLK	250-300m DS	16-Jun-11		80s	BT	1	110	15.8	1.19
EF	VicP2-VicLK	250-300m DS	16-Jun-11		80s	BT	1	121	21.1	1.19
EF	VicP2-VicLK	250-300m DS	16-Jun-11		80s	BT	1	126	19.2	0.96
EF	VicP2-VicLK	250-300m DS	16-Jun-11		80s	BT	1	98	11.5	1.22
EF	VicP2-VicLK	250-300m DS	16-Jun-11		80s	BT	1	115	16.5	1.08
EF	VicP2-VicLK	250-300m DS	16-Jun-11		80s	BT	1	105	12.6	1.09
EF	VicP2-VicLK	250-300m DS	16-Jun-11		80s	BT	1	76	5.6	1.28
EF	VicP2-VicLK	300-350m DS	16-Jun-11		92s	BT	1	84	6.7	1.13
EF	VicP2-VicLK	300-350m DS	16-Jun-11		92s	BT	1	84	6.9	1.16
EF	VicP2-VicLK	300-350m DS	16-Jun-11		92s	BT	1	82	5.9	1.07
EF	VicP2-VicLK	300-350m DS	16-Jun-11		92s	BT	1	85	6.3	1.03
EF	VicP2-VicLK	300-350m DS	16-Jun-11		92s	BT	1	75	4.4	1.04
EF	VicP2-VicLK	300-350m DS	16-Jun-11		92s	BT	1	72	4.2	1.13
EF	VicP2-VicLK	350-400m DS	16-Jun-11		109s	BT	1	103	5.2	0.48
EF	VicP2-VicLK	350-400m DS	16-Jun-11		109s	BT	1	100	5.1	0.51
EF	VicP2-VicLK	350-400m DS	16-Jun-11		109s	BT	1	81	6.6	1.24
EF	VicP2-VicLK	350-400m DS	16-Jun-11		109s	BT	1	83	7	1.22
EF	VicP2-VicLK	350-400m DS	16-Jun-11		109s	BT	1	84	6.9	1.16
EF	VicP2-VicLK	350-400m DS	16-Jun-11		109s	BT	1	85	7.8	1.27
EF	VicP2-VicLK	350-400m DS	16-Jun-11		109s	BT	1	81	6.1	1.15
EF	VicP2-VicLK	350-400m DS	16-Jun-11		109s	BT	1	69	4.7	1.43
EF	VicP2-VicLK	350-400m DS	16-Jun-11		109s	BT	1	69	4.2	1.28
EF	VicP2-VicLK	350-400m DS	16-Jun-11		109s	BT	1	63	4	1.6

Appendix A Fish Sampling Data 2011

Method	Site	Location	Start Date	End Date	Fishing Time	Species	Count	L (mm)	W (g)	K
EF	VicP2-VicLK	350-400m DS	16-Jun-11		109s	BT	1	35	0.55	1.28
EF	VicP2-VicLK	400-450m DS	19-Jun-11		47s	BT	1	78		NA
EF	VicP2-VicLK	400-450m DS	19-Jun-11		47s	BT	1	74		NA
EF	VicP2-VicLK	400-450m DS	19-Jun-11		47s	BT	1	100		NA
EF	VicP2-VicLK	400-450m DS	19-Jun-11		47s	BT	1	77		NA
EF	VicP2-VicLK	400-450m DS	19-Jun-11		47s	BT	1	77		NA
EF	VicP2-VicLK	450-500m DS	19-Jun-11		54s	BT	1	60		NA
EF	VicP2-VicLK	450-500m DS	19-Jun-11		54s	BT	1	47		NA
EF	VicP2-VicLK	500-550m DS	19-Jun-11		46s	BT	1	60		NA
EF	VicP2-VicLK	500-550m DS	19-Jun-11		46s	BT	1	43		NA
EF	VicP2-VicLK	550-600m DS	19-Jun-11		47s	BT	1	37		NA
EF	VicP2-VicLK	550-600m DS	19-Jun-11		47s	BT	1	65		NA
EF	VicP2-VicLK	600-650m DS	19-Jun-11		54s	BT	1	33		NA
EF	VicP2-VicLK	600-650m DS	19-Jun-11		54s	BT	1	35		NA
EF	VicP2-VicLK	600-650m DS	19-Jun-11		54s	BT	1	37		NA
EF	VicP2-VicLK	600-650m DS	19-Jun-11		54s	BT	1	35		NA
EF	VicP2-VicLK	650-700m DS	19-Jun-11		43s	BT	1	98		NA
EF	VicP2-VicLK	650-700m DS	19-Jun-11		43s	BT	1	39		NA
EF	VicP2-VicLK	650-700m DS	19-Jun-11		43s	BT	1	64		NA
EF	VicP2-VicLK	650-700m DS	19-Jun-11		43s	BT	1	74		NA
EF	VicP2-VicLK	650-700m DS	19-Jun-11		43s	BT	1	65		NA
EF	VicP2-VicLK	650-700m DS	19-Jun-11		43s	BT	1	62		NA
EF	VicP2-VicLK	700-750m DS	19-Jun-11		56s	BT	1	78		NA
EF	VicP2-VicLK	700-750m DS	19-Jun-11		56s	BT	1	87		NA

Appendix A Fish Sampling Data 2011

Method	Site	Location	Start Date	End Date	Fishing Time	Species	Count	L (mm)	W (g)	K
EF	VicP2-VicLK	700-750m DS	19-Jun-11		56s	BT	1	37		NA
EF	VicP2-VicLK	700-750m DS	19-Jun-11		56s	BT	1	38		NA
EF	VicP2-VicLK	700-750m DS	19-Jun-11		56s	BT	1	34		NA
EF	VicP2-VicLK	700-750m DS	19-Jun-11		56s	BT	1	32		NA
EF	VicP2-VicLK	700-750m DS	19-Jun-11		56s	BT	1	38		NA
EF	VicP2-VicLK	700-750m DS	19-Jun-11		56s	BT	1	31		NA
EF	VicP2-VicLK	750-800m DS	19-Jun-11	Wetland bog area and Beaver Complex -- No fish sampling performed						
EF	VicP2-VicLK	800-850m DS	19-Jun-11	Wetland bog area and Beaver Complex -- No fish sampling performed						
EF	VicP2-VicLK	850-900m DS	19-Jun-11	Wetland bog area and Beaver Complex -- No fish sampling performed						
EF	VicP2-VicLK	900-950m DS	19-Jun-11	Wetland bog area and Beaver Complex -- No fish sampling performed						
EF	VicP2-VicLK	950-1000m DS	19-Jun-11		125s	BT	1	75		NA
EF	VicP2-VicLK	950-1000m DS	19-Jun-11		125s	BT	1	64		NA
EF	VicP2-VicLK	950-1000m DS	19-Jun-11		125s	BT	1	41		NA
EF	VicP2-VicLK	950-1000m DS	19-Jun-11		125s	BT	1	75		NA
EF	VicP2-VicLK	950-1000m DS	19-Jun-11		125s	TSS	1	52		NA
EF	VicP2-VicLK	950-1000m DS	19-Jun-11		125s	TSS	1	35		NA
EF	VicP2-VicLK	950-1000m DS	19-Jun-11		125s	BT	1	37		NA
EF	VicP2-VicLK	1000-1050m DS	19-Jun-11		78s	BT	1	34		NA
EF	VicP2-VicLK	1000-1050m DS	19-Jun-11		78s	BT	1	40		NA
EF	VicP2-VicLK	1000-1050m DS	19-Jun-11		78s	BT	1	98		NA
EF	VicP2-VicLK	1000-1050m DS	19-Jun-11		78s	BT	1	122		NA
EF	VicP2-VicLK	1000-1050m DS	19-Jun-11		78s	AS	1	87		NA
EF	VicP2-VicLK	1000-1050m DS	19-Jun-11		78s	BT	1	82		NA
EF	VicP2-VicLK	1000-1050m DS	19-Jun-11		78s	BT	1	73		NA

Appendix A Fish Sampling Data 2011

Method	Site	Location	Start Date	End Date	Fishing Time	Species	Count	L (mm)	W (g)	K
EF	VicP2-VicLK	1000-1050m DS	19-Jun-11		78s	BT	1	66		NA
EF	VicP2-VicLK	1000-1050m DS	19-Jun-11		78s	BT	1	97		NA
EF	VicP2-VicLK	1000-1050m DS	19-Jun-11		78s	BT	1	74		NA
EF	VicP2-VicLK	1050-1100m DS	19-Jun-11		48s	TSS	1	55		NA
EF	VicP2-VicLK	1050-1100m DS	19-Jun-11		48s	BT	1	63		NA
EF	VicP2-VicLK	1050-1100m DS	19-Jun-11		48s	BT	1	33		NA
EF	VicP2-VicLK	1100-1150m DS	19-Jun-11		116s	BT	1	36		NA
EF	VicP2-VicLK	1100-1150m DS	19-Jun-11		116s	BT	1	43		NA
EF	VicP2-VicLK	1100-1150m DS	19-Jun-11		116s	BT	1	40		NA
EF	VicP2-VicLK	1100-1150m DS	19-Jun-11		116s	BT	1	156		NA
EF	VicP2-VicLK	1100-1150m DS	19-Jun-11		116s	BT	1	81		NA
EF	VicP2-VicLK	1100-1150m DS	19-Jun-11		116s	BT	1	66		NA
EF	VicP2-VicLK	1100-1150m DS	19-Jun-11		116s	BT	1	73		NA
EF	VicP2-VicLK	1100-1150m DS	19-Jun-11		116s	BT	1	76		NA
EF	VicP2-VicLK	1100-1150m DS	19-Jun-11		116s	BT	1	77		NA
EF	VicP2-VicLK	1100-1150m DS	19-Jun-11		116s	BT	1	73		NA
EF	VicP2-VicLK	1100-1150m DS	19-Jun-11		116s	BT	1	85		NA
EF	VicP2-VicLK	1100-1150m DS	19-Jun-11		116s	BT	1	63		NA
EF	VicP2-VicLK	1100-1150m DS	19-Jun-11		116s	BT	1	59		NA
EF	VicP2-VicLK	1100-1150m DS	19-Jun-11		116s	BT	1	66		NA
EF	VicP2-VicLK	1150-1200m DS	19-Jun-11		57s	BT	1	41		NA
EF	VicP2-VicLK	1200-1250m DS	19-Jun-11		37s	BT	1	36		NA
EF	VicP2-VicLK	1200-1250m DS	19-Jun-11		37s	BT	1	39		NA
EF	VicP2-VicLK	1200-1250m DS	19-Jun-11		37s	BT	1	107		NA

Appendix A Fish Sampling Data 2011

Method	Site	Location	Start Date	End Date	Fishing Time	Species	Count	L (mm)	W (g)	K
EF	VicP2-VicLK	1200-1250m DS	19-Jun-11		37s	BT	1	96		NA
EF	VicP2-VicLK	1200-1250m DS	19-Jun-11		37s	BT	1	102		NA
EF	VicP2-VicLK	1200-1250m DS	19-Jun-11		37s	BT	1	70		NA
EF	VicP2-VicLK	1250-1300m DS	19-Jun-11		94s	AS	1	84	8.5	1.43
EF	VicP2-VicLK	1250-1300m DS	19-Jun-11		94s	TSS	1	39	NA	NA
EF	VicP2-VicLK	1250-1300m DS	19-Jun-11		94s	BT	1	125		NA
EF	VicP2-VicLK	1250-1300m DS	19-Jun-11		94s	BT	1	63		NA
EF	VicP2-VicLK	1250-1300m DS	19-Jun-11		94s	BT	1	67		NA
EF	VicP2-VicLK	1250-1300m DS	19-Jun-11		94s	BT	1	92		NA
EF	VicP2-VicLK	1250-1300m DS	19-Jun-11		94s	BT	1	88		NA
EF	VicP2-VicLK	1250-1300m DS	19-Jun-11		94s	BT	1	40		NA
EF	VicP2-VicLK	1250-1300m DS	19-Jun-11		94s	BT	1	31		NA
EF	VicP2-VicLK	1250-1300m DS	19-Jun-11		94s	BT	1	66		NA
EF	VicP2-VicLK	1250-1300m DS	19-Jun-11		94s	BT	1	31		NA
EF	VicP2-VicLK	1300-1350m DS	19-Jun-11		168s	BT	1	163	50.1	1.16
EF	VicP2-VicLK	1300-1350m DS	19-Jun-11		168s	BT	1	35	0.4	0.93
EF	VicP2-VicLK	1300-1350m DS	19-Jun-11		168s	BT	1	138	31.9	1.21
EF	VicP2-VicLK	1300-1350m DS	19-Jun-11		168s	BT	1	30	0.1	0.37
EF	VicP2-VicLK	1300-1350m DS	19-Jun-11		168s	TSS	1	42	0.7	0.94
EF	VicP2-VicLK	1300-1350m DS	19-Jun-11		168s	BT	1	39	0.7	1.18
EF	VicP2-VicLK	1300-1350m DS	19-Jun-11		168s	BT	1	73	4.2	1.08
EF	VicP2-VicLK	1300-1350m DS	19-Jun-11		168s	BT	1	136	27.7	1.1
EF	VicP2-VicLK	1300-1350m DS	19-Jun-11		168s	BT	1	37	0.3	0.59
EF	VicP2-VicLK	1300-1350m DS	19-Jun-11		168s	BT	1	30	0.3	1.11

Appendix A Fish Sampling Data 2011

Method	Site	Location	Start Date	End Date	Fishing Time	Species	Count	L (mm)	W (g)	K
EF	VicP2-VicLK	1300-1350m DS	19-Jun-11		168s	BT	1	93	10.2	1.27
EF	VicP2-VicLK	1300-1350m DS	19-Jun-11		168s	TSS	1	41	NA	NA
EF	VicP2-VicLK	1300-1350m DS	19-Jun-11		168s	TSS	1	48	NA	NA
EF	VicP2-VicLK	1300-1350m DS	19-Jun-11		168s	BT	1	35		NA
EF	VicP2-VicLK	1300-1350m DS	19-Jun-11		168s	BT	1	82		NA
EF	VicP2-VicLK	1350-1400m DS	19-Jun-11		104s	BT	1	100	10	1
EF	VicP2-VicLK	1350-1400m DS	19-Jun-11		104s	BT	1	84	5.8	0.98
EF	VicP2-VicLK	1350-1400m DS	19-Jun-11		104s	AS	1	93	9.4	1.17
EF	VicP2-VicLK	1350-1400m DS	19-Jun-11		104s	BT	1	58	2.9	1.49
EF	VicP2-VicLK	1350-1400m DS	19-Jun-11		104s	BT	1	78	4.3	0.91
EF	VicP2-VicLK	1350-1400m DS	19-Jun-11		104s	BT	1	37	0.5	0.99
EF	VicP2-VicLK	1350-1400m DS	19-Jun-11		104s	BT	1	37	0.4	0.79
EF	VicP2-VicLK	1350-1400m DS	19-Jun-11		104s	BT	1	40	0.7	1.09
EF	VicP2-VicLK	1350-1400m DS	19-Jun-11		104s	BT	1	68	3.7	1.18
EF	VicP2-VicLK	1350-1400m DS	19-Jun-11		104s	BT	1	60	2.4	1.11
EF	VicP2-VicLK	1400-1450m DS	19-Jun-11		66s	BT	1	39	0.5	0.84
EF	VicP2-VicLK	1400-1450m DS	19-Jun-11		66s	BT	1	68	4	1.27
EF	VicP2-VicLK	1400-1450m DS	19-Jun-11		66s	BT	1	73	4.5	1.16
EF	VicP2-VicLK	1400-1450m DS	19-Jun-11		66s	BT	1	39	0.5	0.84
EF	VicP2-VicLK	1400-1450m DS	19-Jun-11		66s	BT	1	42	0.5	0.67
EF	VicP2-VicLK	1450-1500m DS	19-Jun-11		84s	AS	1	83	7.5	1.31
EF	VicP2-VicLK	1450-1500m DS	19-Jun-11		84s	AS	1	87	7.5	1.14
EF	VicP2-VicLK	1450-1500m DS	19-Jun-11		84s	BT	1	74	4.3	1.06
EF	VicP2-VicLK	1450-1500m DS	19-Jun-11		84s	BT	1	60	2.6	1.2

Appendix A Fish Sampling Data 2011

Method	Site	Location	Start Date	End Date	Fishing Time	Species	Count	L (mm)	W (g)	K
EF	VicP2-VicLK	1450-1500m DS	19-Jun-11		84s	TSS	1		NA	NA
EF	VicP2-VicLK	1450-1500m DS	19-Jun-11		84s	AS	1	64	2.8	1.07
EF	VicP2-VicLK	1450-1500m DS	19-Jun-11		84s	AS	1	65	2.9	1.06
EF	VicP2-VicLK	1500-1550m DS	19-Jun-11		154s	AS	1	78	5.9	1.24
EF	VicP2-VicLK	1500-1550m DS	19-Jun-11		154s	AS	1	77	6.1	1.34
EF	VicP2-VicLK	1500-1550m DS	19-Jun-11		154s	BT	1	112	18.6	1.32
EF	VicP2-VicLK	1500-1550m DS	19-Jun-11		154s	BT	1	70	4	1.17
EF	VicP2-VicLK	1500-1550m DS	19-Jun-11		154s	BT	1	77	5	1.1
EF	VicP2-VicLK	1500-1550m DS	19-Jun-11		154s	BT	1	85	7.9	1.29
EF	VicP2-VicLK	1500-1550m DS	19-Jun-11		154s	BT	1	60	2.7	1.25
EF	VicP2-VicLK	1500-1550m DS	19-Jun-11		154s	BT	1	79	5.6	1.14
EF	VicP2-VicLK	1500-1550m DS	19-Jun-11		154s	BT	1	58	2.5	1.28
EF	VicP2-VicLK	1500-1550m DS	19-Jun-11		154s	TSS	1	58	1.5	0.77
EF	VicP2-VicLK	1500-1550m DS	19-Jun-11		154s	TSS	1	51	1.3	0.98
EF	Tributary	0-50m US	19-Jun-11		65s	BT	1	90		NA
EF	Tributary	0-50m US	19-Jun-11		65s	BT	1	39		NA
EF	Tributary	0-50m US	19-Jun-11		65s	BT	1	39		NA
EF	Tributary	50-100m US	19-Jun-11		55s	BT	1	39		NA
EF	Tributary	50-100m US	19-Jun-11		55s	BT	1	47		NA
EF	Tributary	50-100m US	19-Jun-11		55s	BT	1	74		NA
EF	Vicp1-Vicp2	0-22m US	17-Jun-11		388s	TSS	1	51	NA	NA
EF	Vicp1-Vicp2	0-22m US	17-Jun-11		388s	TSS	1	61	NA	NA
EF	Vicp1-Vicp2	0-22m US	17-Jun-11		388s	TSS	1	53	NA	NA
EF	Vicp1-Vicp2	0-22m US	17-Jun-11		388s	TSS	1	71	NA	NA

Appendix A Fish Sampling Data 2011

Method	Site	Location	Start Date	End Date	Fishing Time	Species	Count	L (mm)	W (g)	K
EF	Vicp1-Vicp2	0-22m US	17-Jun-11		388s	TSS	1	49	NA	NA
EF	Vicp1-Vicp2	0-22m US	17-Jun-11		388s	TSS	1	37	NA	NA
EF	Vicp1-Vicp2	0-22m US	17-Jun-11		388s	TSS	1	59	NA	NA
EF	Vicp1-Vicp2	0-22m US	17-Jun-11		388s	TSS	1	33	NA	NA
EF	Vicp1-Vicp2	0-22m US	17-Jun-11		388s	TSS	1	30	NA	NA
EF	Vicp1-Vicp2	0-22m US	17-Jun-11		388s	TSS	1	29	NA	NA
EF	Vicp1-Vicp2	0-22m US	17-Jun-11		388s	TSS	1	37	NA	NA
GN	VicP2	GN01	17-Jun-11	20-Jun-11	3N	NC	NA	NA	NA	NA
GN	VicP2	GN02	17-Jun-11	20-Jun-11	3N	NC	NA	NA	NA	NA
GN	VicP1	GN01	17-Jun-11	20-Jun-11	3N	NC	NA	NA	NA	NA
GN	VicP1	GN02	17-Jun-11	20-Jun-11	3N	NC	NA	NA	NA	NA
FN	ValP1	FN01	17-Jun-11	18-Jun-11	1N	TSS	6			
FN	ValP1	FN04	18-Jun-11	20-Jun-11	2N	TSS	12			
FN	ValP1	FN02	17-Jun-11	18-Jun-11	1N	TSS	3			
FN	ValP1	FN03	18-Jun-11	20-Jun-11	2N	TSS	10			
GN	ValP1	GN01	18-Jun-11	20-Jun-11	2N	NC	NA	NA	NA	NA
GN	ValP1	GN02	18-Jun-11	20-Jun-11	2N	NC	NA	NA	NA	NA
EF	ValP1-ValP2	0-50m DS	18-Jun-11		207s	TSS	1	50	1.1	0.88
EF	ValP1-ValP2	0-50m DS	18-Jun-11		207s	TSS	1	48	0.9	0.81
EF	ValP1-ValP2	0-50m DS	18-Jun-11		207s	TSS	1	48	0.6	0.54
EF	ValP1-ValP2	0-50m DS	18-Jun-11		207s	TSS	1	38	0.4	0.73
EF	ValP1-ValP2	0-50m DS	18-Jun-11		207s	TSS	1	47	0.9	0.87
EF	ValP1-ValP2	0-50m DS	18-Jun-11		207s	TSS	1	40	0.6	0.94
EF	ValP1-ValP2	0-50m DS	18-Jun-11		207s	TSS	1	40	0.5	0.78

Appendix A Fish Sampling Data 2011

Method	Site	Location	Start Date	End Date	Fishing Time	Species	Count	L (mm)	W (g)	K
EF	ValP1-ValP2	0-50m DS	18-Jun-11		207s	TSS	1	44	0.8	0.94
EF	ValP1-ValP2	0-50m DS	18-Jun-11		207s	TSS	1	38	0.5	0.91
EF	ValP1-ValP2	0-50m DS	18-Jun-11		207s	TSS	1	54	1.3	0.83
EF	ValP1-ValP2	0-50m DS	18-Jun-11		207s	TSS	1	45	0.6	0.66
EF	ValP1-ValP2	0-50m DS	18-Jun-11		207s	TSS	1	42	0.5	0.67
EF	ValP1-ValP2	0-50m DS	18-Jun-11		207s	TSS	1	57	1.6	0.86
EF	ValP1-ValP2	50-100m DS	18-Jun-11		120s	TSS	1	42	0.8	1.08
EF	ValP1-ValP2	50-100m DS	18-Jun-11		120s	TSS	1	47	1.1	1.06
EF	ValP1-ValP2	100-150m DS	18-Jun-11		148s	TSS	1	52	1.6	1.14
EF	ValP1-ValP2	100-150m DS	18-Jun-11		148s	TSS	1	49	1.5	1.27
EF	ValP1-ValP2	100-150m DS	18-Jun-11		148s	TSS	1	40	0.6	0.94
EF	ValP1-ValP2	100-150m DS	18-Jun-11		148s	TSS	1	49	0.9	0.76
EF	ValP1-ValP2	100-150m DS	18-Jun-11		148s	TSS	1	41	0.5	0.73
EF	ValP1-ValP2	100-150m DS	18-Jun-11		148s	TSS	1	45	0.9	0.99
EF	ValP1-ValP2	150-200m DS	18-Jun-11	Stream too deep to fish						
GN	ValP2	GN01	18-Jun-11	18-Jun-11	6 hrs 35 m	NC	NA	NA	NA	NA
GN	ValP2	GN08	18-Jun-11	20-Jun-11	2N	NC	NA	NA	NA	NA
GN	ValP2	GN02	18-Jun-11	18-Jun-11	7 hrs 9 min	NC	NA	NA	NA	NA
GN	ValP2	GN07	18-Jun-11	20-Jun-11	2N	NC	NA	NA	NA	NA
GN	ValP2	GN03	18-Jun-11	18-Jun-11	6 hrs 37 m	NC	NA	NA	NA	NA
GN	ValP2	GN06	18-Jun-11	20-Jun-11	2N	NC	NA	NA	NA	NA
GN	ValP2	GN04	18-Jun-11	18-Jun-11	6 hrs 16 m	NC	NA	NA	NA	NA
GN	ValP2	GN05	18-Jun-11	20-Jun-11	2N	NC	NA	NA	NA	NA
EF	ValLK-ValP2	0-50m US	18-Jun-11		180s	BT	1	92	8.1	1.04

Appendix A Fish Sampling Data 2011

Method	Site	Location	Start Date	End Date	Fishing Time	Species	Count	L (mm)	W (g)	K
EF	ValLK-ValP2	0-50m US	18-Jun-11		180s	AS	1	63	3.2	1.28
EF	ValLK-ValP2	0-50m US	18-Jun-11		180s	BT	1	76	4.9	1.12
EF	ValLK-ValP2	0-50m US	18-Jun-11		180s	AS	1	84	5.3	0.89
EF	ValLK-ValP2	0-50m US	18-Jun-11		180s	BT	1	92	7.1	0.91
EF	ValLK-ValP2	0-50m US	18-Jun-11		180s	AS	1	80	5.3	1.04
EF	ValLK-ValP2	0-50m US	18-Jun-11		180s	BT	1	90	7.4	1.02
EF	ValLK-ValP2	0-50m US	18-Jun-11		180s	BT	1	38	0.6	1.09
EF	ValLK-ValP2	0-50m US	18-Jun-11		180s	BT	1	81	6	1.13
EF	ValLK-ValP2	0-50m US	18-Jun-11		180s	AS	1	70	3.7	1.08
EF	ValLK-ValP2	0-50m US	18-Jun-11		180s	AS	1	70	2.6	0.76
EF	ValLK-ValP2	0-50m US	18-Jun-11		180s	AS	1	75	4.4	1.04
EF	ValLK-ValP2	0-50m US	18-Jun-11		180s	BT	1	34	0.4	1.02
EF	ValLK-ValP2	0-50m US	18-Jun-11		180s	BT	1	33	0.4	1.11
EF	ValLK-ValP2	0-50m US	18-Jun-11		180s	AS	1	30	0.2	0.74
EF	ValLK-ValP2	0-50m US	18-Jun-11		180s	BT	1	36	0.4	0.86
EF	ValLK-ValP2	0-50m US	18-Jun-11		180s	AS	1	28	0.1	0.46
EF	ValLK-ValP2	50-100m US	18-Jun-11		105s	BT	1	84	7.1	1.2
EF	ValLK-ValP2	50-100m US	18-Jun-11		105s	BT	1	123	16.2	0.87
EF	ValLK-ValP2	50-100m US	18-Jun-11		105s	BT	1	81	5.5	1.03
EF	ValLK-ValP2	50-100m US	18-Jun-11		105s	BT	1	68	3.8	1.21
EF	ValLK-ValP2	50-100m US	18-Jun-11		105s	BT	1	117	17.7	1.11
EF	ValLK-ValP2	50-100m US	18-Jun-11		105s	BT	1	39	0.6	1.01
EF	ValLK-ValP2	50-100m US	18-Jun-11		105s	BT	1	92	8.6	1.1
EF	ValLK-ValP2	50-100m US	18-Jun-11		105s	BT	1	34	0.4	1.02

Appendix A Fish Sampling Data 2011

Method	Site	Location	Start Date	End Date	Fishing Time	Species	Count	L (mm)	W (g)	K
EF	ValLK-ValP2	50-100m US	18-Jun-11		105s	BT	1	82	5.7	1.03
EF	ValLK-ValP2	50-100m US	18-Jun-11		105s	BT	1	40	0.6	0.94
EF	ValLK-ValP2	100-150m US	18-Jun-11		101s	BT	1	35	0.3	0.7
EF	ValLK-ValP2	100-150m US	18-Jun-11		101s	BT	1	72	3.9	1.04
EF	ValLK-ValP2	100-150m US	18-Jun-11		101s	BT	1	39	0.5	0.84
EF	ValLK-ValP2	100-150m US	18-Jun-11		101s	AS	1	70	3.4	0.99
EF	ValLK-ValP2	100-150m US	18-Jun-11		101s	BT	1	77	5.1	1.12
EF	ValLK-ValP2	100-150m US	18-Jun-11		101s	BT	1	34	0.8	2.04
EF	ValLK-ValP2	150-200m US	18-Jun-11		106s	BT	1	81	5.5	1.03
EF	ValLK-ValP2	150-200m US	18-Jun-11		106s	BT	1	110	13.1	0.98
EF	ValLK-ValP2	150-200m US	18-Jun-11		106s	BT	1	117	15.5	0.97
EF	ValLK-ValP2	150-200m US	18-Jun-11		106s	BT	1	78	5	1.05
EF	ValLK-ValP2	200-250m US	18-Jun-11		109s	BT	1	81	5.2	0.98
EF	ValLK-ValP2	200-250m US	18-Jun-11		109s	BT	1	120	16.8	0.97
EF	ValLK-ValP2	200-250m US	18-Jun-11		109s	BT	1	35	0.4	0.93
EF	ValLK-ValP2	200-250m US	18-Jun-11		109s	BT	1	78	4.7	0.99
EF	ValLK-ValP2	200-250m US	18-Jun-11		109s	BT	1	43	0.7	0.88
EF	ValLK-ValP2	250-300m US	18-Jun-11		80s	BT	1	83	7.4	1.29
EF	ValLK-ValP2	250-300m US	18-Jun-11		80s	BT	1	74	5.2	1.28
EF	ValLK-ValP2	300-350m US	18-Jun-11		39s	BT	1	38		NA
EF	ValLK-ValP2	300-350m US	18-Jun-11		39s	BT	1	39		NA
EF	ValLK-ValP2	300-350m US	18-Jun-11		39s	BT	1	42	0.5	0.67
EF	ValLK-ValP2	300-350m US	18-Jun-11		39s	BT	1	40	0.7	1.09
EF	ValLK-ValP2	300-350m US	18-Jun-11		39s	BT	1	75	4.8	1.14

Appendix A Fish Sampling Data 2011

Method	Site	Location	Start Date	End Date	Fishing Time	Species	Count	L (mm)	W (g)	K
EF	ValLK-ValP2	350-400m US	18-Jun-11		54s	TSS	1	63	2.3	0.92
EF	ValLK-ValP2	350-400m US	18-Jun-11		54s	BT	1	85	7.1	1.16
EF	ValLK-ValP2	350-400m US	18-Jun-11		54s	BT	1	80	7.3	1.43
EF	ValLK-ValP2	350-400m US	18-Jun-11		54s	BT	1	116	18.2	1.17
EF	ValLK-ValP2	350-400m US	18-Jun-11		54s	BT	1	87	6.1	0.93
EF	ValLK-ValP2	350-400m US	18-Jun-11		54s	BT	1	94	8	0.96
EF	ValLK-ValP2	400-450m US	18-Jun-11		70s	BT	1	85	8.2	1.34
EF	ValLK-ValP2	400-450m US	18-Jun-11		70s	BT	1	92	9.5	1.22
EF	ValLK-ValP2	400-450m US	18-Jun-11		70s	BT	1	85	6.4	1.04
EF	ValLK-ValP2	400-450m US	18-Jun-11		70s	BT	1	80	5.6	1.09
EF	ValLK-ValP2	400-450m US	18-Jun-11		70s	BT	1	38	0.5	0.91
EF	ValLK-ValP2	450-500m US	18-Jun-11		89s	NC	NA	NA	NA	NA
EF	ValLK-ValP2	500-550m US	18-Jun-11		112s	NC	NA	NA	NA	NA
EF	ValLK-ValP2	550-600m US	18-Jun-11		128s	TSS	1	57	NA	NA
EF	ValLK-ValP2	600-650m US	18-Jun-11		101s	NC	NA	NA	NA	NA
EF	ValLK-ValP2	650-700m US	18-Jun-11		123s	NC	NA	NA	NA	NA
EF	ValLK-ValP2	700-750m US	18-Jun-11		107s	TSS	1	54	NA	NA
EF	ValLK-ValP2	700-750m US	18-Jun-11		107s	TSS	1	39	NA	NA
EF	ValLK-ValP2	750-800m US	18-Jun-11		114s	NC	NA	NA	NA	NA
EF	ValLK-ValP2	800-850m US	18-Jun-11		61s	TSS	1	65	NA	NA
EF	ValLK-ValP2	800-850m US	18-Jun-11		61s	TSS	1	61	NA	NA
EF	ValLK-ValP2	850-885m US	18-Jun-11		92s	NC	NA	NA	NA	NA
EF	ValP3-ValLk	0-50m DS	20-Jun-11		92s	BT	1	45	1.7	1.87
EF	ValP3-ValLk	0-50m DS	20-Jun-11		92s	BT	1	160	62.1	1.52

Appendix A Fish Sampling Data 2011

Method	Site	Location	Start Date	End Date	Fishing Time	Species	Count	L (mm)	W (g)	K
EF	ValP3-ValLk	0-50m DS	20-Jun-11		92s	BT	1	79	8	1.62
EF	ValP3-ValLk	0-50m DS	20-Jun-11		92s	BT	1	166	37.7	0.82
EF	ValP3-ValLk	0-50m DS	20-Jun-11		92s	BT	1	114	17.4	1.17
EF	ValP3-ValLk	0-50m DS	20-Jun-11		92s	BT	1	137	25.4	0.99
EF	ValP3-ValLk	0-50m DS	20-Jun-11		92s	BT	1	35	0.9	2.1
EF	ValP3-ValLk	0-50m DS	20-Jun-11		92s	BT	1	41	1.7	2.47
EF	ValP3-ValLk	0-50m DS	20-Jun-11		92s	BT	1	35	0.7	1.63
EF	ValP3-ValLk	50-100m DS	20-Jun-11		50s	BT	1	95	9.6	1.12
EF	ValP3-ValLk	50-100m DS	20-Jun-11		50s	BT	1	89	8.5	1.21
EF	ValP3-ValLk	50-100m DS	20-Jun-11		50s	BT	1	88	9.4	1.38
EF	ValP3-ValLk	50-100m DS	20-Jun-11		50s	BT	1	92	9.9	1.27
EF	ValP3-ValLk	50-100m DS	20-Jun-11		50s	BT	1	43	1.7	2.14
EF	ValP3-ValLk	100-150m DS	20-Jun-11		133s	AS	1	78	4.9	1.03
EF	ValP3-ValLk	100-150m DS	20-Jun-11		133s	AS	1	86	6.9	1.08
EF	ValP3-ValLk	100-150m DS	20-Jun-11		133s	BT	1	97	10.5	1.15
EF	ValP3-ValLk	100-150m DS	20-Jun-11		133s	BT	1	131	22.4	1
EF	ValP3-ValLk	150-200m DS	20-Jun-11		63s	BT	1	111	16.3	1.19
EF	ValP3-ValLk	150-200m DS	20-Jun-11		63s	BT	1	79	5.8	1.18
EF	ValP3-ValLk	150-200m DS	20-Jun-11		63s	BT	1	81	6.1	1.15
EF	ValP3-ValLk	150-200m DS	20-Jun-11		63s	BT	1	41	0.7	1.02
EF	C09	0-50m US	19-Jun-11		63s	NC	NA	NA	NA	NA
EF	C09	0-50m DS	19-Jun-11		53s	NC	NA	NA	NA	NA
EF	C08	0-50m US	19-Jun-11	Fished Downstream only – Upstream too deep to fish						
EF	C08	0-50m DS	19-Jun-11		53s	NC	NA	NA	NA	NA

Appendix A Fish Sampling Data 2011

Method	Site	Location	Start Date	End Date	Fishing Time	Species	Count	L (mm)	W (g)	K
EF	C07	0-50m US	19-Jun-11	No Stream Visible						
EF	C07	0-50m DS	19-Jun-11	No Stream Visible						
EF	C06	0-50m US	19-Jun-11		41s	BT	1	149	37.1	1.12
EF	C06	0-50m US	19-Jun-11		41s	BT	1	42	1.2	1.62
EF	C06	0-50m US	19-Jun-11		41s	BT	1	43	0.6	0.75
EF	C06	0-50m DS	19-Jun-11		111s	BT	1	113	16.4	1.14
EF	C06	0-50m DS	19-Jun-11		111s	BT	1	45	0.9	0.99
EF	C06	0-50m DS	19-Jun-11		111s	BT	1	36	0.4	0.86
EF	C03	0-25m US	19-Jun-11		65s	BT	1	70	5.3	1.55
EF	C03	0-50m DS	19-Jun-11		86s	BT	1	86	9.3	1.46
EF	C03	0-50m DS	19-Jun-11		86s	BT	1	90	9.4	1.29
EF	C02	0-50m US	19-Jun-11		73s	AS	1	118	17.5	1.07
EF	C02	0-50m DS	19-Jun-11		62s	NC	NA	NA	NA	NA
EF	C04	0-50m US	19-Jun-11		63s	NC	NA	NA	NA	NA
EF	C04	0-50m DS	19-Jun-11		30s	NC	NA	NA	NA	NA
EF	C05	0-50m US	19-Jun-11		98s	AS	1	70	3.3	0.96
EF	C05	0-50m US	19-Jun-11		98s	AS	1	82	6.3	1.14
EF	C05	0-50m US	19-Jun-11		98s	AS	1	58	2.3	1.18
EF	C05	0-50m US	19-Jun-11		98s	AS	1	58	1	0.51
EF	C05	0-50m US	19-Jun-11		98s	AS	1	115	16.3	1.07
EF	C05	0-50m DS	19-Jun-11		68s	AS	1	115	15.6	1.03
EF	C05	0-50m DS	19-Jun-11		68s	AS	1	71	2.7	0.75
EF	C05	0-50m DS	19-Jun-11		68s	AS	1	68	4.1	1.3
EF	C05	0-50m DS	19-Jun-11		68s	BT	1	46	0.9	0.92

APPENDIX B

Stream Habitat Classification Data

Appendix B Stream Habitat Classification Data

Location	Sub-Section	Distance (m)	Stream Width (m)	Velocity (m/s)			Mean Depth (cm)			Substrate (%)							Riparian Veg (%)			Aquatic Veg (%)	Comment
				1/4	1/2	3/4	1/4	1/2	3/4	BR	B	R	C	G	S	F	S	G	T		
ValP1-ValP2	0 to 50 m DS	0	0.85	0.09	0.06	0.00	6	8	6	0	0	0	20	10	0	70	35	65	0	10	Channel narrows and meanders through grass / shrub habitat. Flow type is steady.
		25	0.90	0.01	0.01	0.01	6	16	14												
		50	0.75	0.18	0.03	0.03	21	20	20												
ValP1-ValP2	50 to 100 m	50	0.75	0.18	0.03	0.03	21	20	20	0	40	0	0	0	0	60	40	60	0	15	Flow type is steady.
		75	0.60	0.08	0.15	0.00	21	24	26												
		100	2.35	0.01	0.00	0.01	80	76	62												
ValP1-ValP2	100 to 150 m	100	2.35	0.01	0.00	0.01	80	76	62	0	10	0	60	0	30	0	30	70	0	<5	Channel widens & slows. Some undercut banks. Flow type is steady.
		125	2.65	0.01	0.01	0.00	37	34	30												
		150	2.00	0.02	0.03	0.00	18	20	20												
ValP1-ValP2	150 to 200 m	150	2.00	0.02	0.03	0.00	18	20	20	0	30	0	40	0	0	30	30	70	0	10	Stream deepens and slows to beyond wadeable depths. Flow type is steady.
		175	1.45	0.00	0.04	0.10	19	10	20												
		200	N/A	N/A	N/A	N/A	N/A	N/A	N/A												
ValLK-ValP2	0 to 50 m US	0	0.75	0.58	0.10	0.09	21	20	20	20	50	0	30	0	0	0	35	5	60	0	A series of drop - pools leading to a riffle at inflow to lake.
		25	2.30	0.03	0.01	0.00	22	12	12												
		50	1.55	0.00	0.00	0.17	12	8	10												
ValLK-ValP2	50 to 100 m	50	1.55	0.00	0.00	0.17	12	8	10	0	20	0	50	30	0	0	60	0	40	0	A series of riffle-runs leading to the steep drop-pool section at bottom.
		75	2.10	0.34	0.24	0.28	6	6	6												
		100	2.00	0.14	0.22	0.08	14	5	4												
ValLK-ValP2	100 to 150 m	100	2.00	0.14	0.22	0.08	14	5	4	0	60	0	40	0	0	0	45	25	30	0	Riffle-run with one major pool at 125m below log jam.
		125	2.40	0.01	0.11	0.01	17	22	10												
		150	1.80	0.41	0.09	0.00	17	16	14												
ValLK-ValP2	150 to 200 m	150	1.80	0.41	0.09	0.00	17	16	14	0	40	0	40	20	0	0	60	0	40	0	Series of riffle-drop-runs.
		175	1.85	0.07	0.01	0.23	16	16	22												
		200	2.20	0.00	0.10	0.00	10	18	16												

Appendix B Stream Habitat Classification Data

Location	Sub-Section	Distance (m)	Stream Width (m)	Velocity (m/s)			Mean Depth (cm)			Substrate (%)							Riparian Veg (%)			Aquatic Veg (%)	Comment
				1/4	1/2	3/4	1/4	1/2	3/4	BR	B	R	C	G	S	F	S	G	T		
ValLK-ValP2	200 to 250 m	200	2.20	0.00	0.10	0.00	10	18	16	0	80	0	20	0	0	0	50	15	35	0	Mostly riffles with some short cascade-runs.
		225	2.45	0.00	0.11	0.03	10	8	14												
		250	2.25	0.00	0.26	0.00	6	16	20												
ValLK-ValP2	250 to 300 m	250	2.25	0.00	0.26	0.00	6	16	20	0	60	0	40	0	0	0	65	5	30	0	Series of drop-runs with two small log jam pools.
		275	1.85	0.45	0.06	0.08	12	10	6												
		300	1.90	0.09	0.09	0.05	18	20	18												
ValLK-ValP2	300 to 350 m	300	1.90	0.09	0.09	0.05	18	20	18	0	10	0	40	50	0	0	65	5	30	0	Long slow runs separated by small riffles.
		325	2.15	0.02	0.38	0.03	12	6	12												
		350	1.90	0.08	0.00	0.00	16	18	12												
ValLK-ValP2	350 to 400 m	350	1.90	0.08	0.00	0.00	16	18	12	0	30	0	40	30	0	0	55	15	30	0	Series of small riffle-drop-runs.
		375	2.20	0.00	0.02	0.02	14	22	18												
		400	2.10	0.00	0.04	0.00	10	5	6												
ValLK-ValP2	400 to 450 m	400	2.10	0.00	0.04	0.00	10	5	6	0	70	0	30	0	0	0	50	10	40	0	Series of drop-pools & drop-runs. Barrier to fish passage @ 425-450m US of lake @wpt 422 (Photo 3266).
		425	2.50	0.00	0.42	0.20	5	4	6												
		450	2.15	0.23	0.00	0.01	6	10	10												
ValLK-ValP2	450 to 500 m	450	2.15	0.23	0.00	0.01	6	10	10	0	80	0	20	0	0	0	35	5	60	0	Series of drop-runs. Channel getting steeper at around 475m US.
		475	1.05	0.14	0.23	0.00	14	12	14												
		500	1.75	0.00	0.35	0.14	8	6	6												
ValLK-ValP2	500 to 550 m	500	1.75	0.00	0.35	0.14	8	6	6	40	40	0	20	0	0	0	55	10	35	0	Series of drop-pools or drop-runs.
		525	1.55	0.08	0.22	0.20	10	10	12												
		550	1.65	0.10	0.05	0.00	14	20	16												
ValLK-ValP2	550 to 600 m	550	1.65	0.10	0.05	0.00	14	20	16	20	20	20	25	15	0	0	55	5	40	5	Falls DS of 575 and slow narrow run above. Barrier to fish passage (falls) 575 m US of lake @ wpt 428 (photo 3273).
		575	1.50	0.10	0.09	0.00	30	26	16												
		600	1.65	0.05	0.09	0.00	32	34	22												

Appendix B Stream Habitat Classification Data

Location	Sub-Section	Distance (m)	Stream Width (m)	Velocity (m/s)			Mean Depth (cm)			Substrate (%)							Riparian Veg (%)			Aquatic Veg (%)	Comment
				1/4	1/2	3/4	1/4	1/2	3/4	BR	B	R	C	G	S	F	S	G	T		
ValLK-ValP2	600 to 650 m	600	1.65	0.05	0.09	0.00	32	34	22	0	80	0	20	0	0	0	70	5	25	5	Mostly pool-run with a small riffle @ 650m US.
		625	1.30	0.20	0.13	0.10	16	31	25												
		650	1.95	0.00	0.10	0.25	24	16	16												
ValLK-ValP2	650 to 700 m	650	1.95	0.00	0.10	0.25	24	16	16	0	80	0	20	0	0	0	55	5	40	10	Mostly small run with small riffle section at 700m.
		675	2.85	0.04	0.01	0.01	60	72	64												
		700	2.40	0.23	0.00	0.05	10	10	8												
ValLK-ValP2	700 to 750 m	700	2.40	0.23	0.00	0.05	10	10	8	0	80	0	20	0	0	0	55	5	40	5	Series of drop-runs with a long slow run in middle.
		725	1.25	0.42	0.15	0.00	10	10	8												
		750	0.75	0.16	0.72	0.15	12	12	12												
ValLK-ValP2	750 to 800 m	750	0.75	0.16	0.72	0.15	12	12	12	0	80	0	20	0	0	0	60	10	30	5	Long run with one long riffle in middle.
		775	0.50	0.50	0.27	0.31	8	12	12												
		800	2.10	0.01	0.00	0.03	42	70	60												
ValLK-ValP2	800 to 850 m	800	2.10	0.01	0.00	0.03	42	70	60	0	50	0	50	0	0	0	60	10	30	15	Series of drop-runs w a long flat at bottom.
		825	0.65	0.03	0.16	0.47	14	12	20												
		850	1.00	0.02	0.16	0.06	10	14	10												
ValLK-ValP2	850 to 885 m	850	1.00	0.02	0.16	0.06	10	14	10	0	70	0	30	0	0	0	60	10	30	10	A series of drop-runs with moderate slope and a small falls @ 875m (3288)
		875	0.40	0.34	0.21	0.03	12	12	14												
		885	N/A	N/A	N/A	N/A	N/A	N/A	N/A												
ValP3-ValLK	0 to 50 m DS	0	3.10	0.52	0.40	0.93	20	40	36	0	40	40	20	0	0	0	70	0	30	0	Plunge-run series.
		25	5.30	0.47	0.49	0.45	20	30	18												
		50	4.40	0.58	0.09	0.45	58	34	36												
ValP3-ValLK	50 to 100 m	50	4.40	0.58	0.09	0.45	58	34	36	0	45	40	15	0	0	0	70	0	30	0	Rapids / cascades.
		75	3.15	0.32	0.01	0.24	14	20	26												
		100	4.30	0.41	0.83	0.31	34	30	10												

Appendix B Stream Habitat Classification Data

Location	Sub-Section	Distance (m)	Stream Width (m)	Velocity (m/s)			Mean Depth (cm)			Substrate (%)							Riparian Veg (%)			Aquatic Veg (%)	Comment
				1/4	1/2	3/4	1/4	1/2	3/4	BR	B	R	C	G	S	F	S	G	T		
ValP3-ValLK	100 to 150 m	100	4.30	0.41	0.83	0.31	34	30	10	0	70	30	0	0	0	0	70	0	30	0	Cascade / rapids with I small falls at 125m DS.
		125	3.00	0.72	0.82	0.13	34	28	34												
		150	6.80	0.14	0.09	0.15	22	24	16												
ValP3-ValLK	150 to 200 m	150	6.80	0.14	0.09	0.15	22	24	16	0	40	30	30	0	0	0	65	15	20	5	Long riffle with one small pool before widening out to shallow riffle.
		175	5.20	0.41	0.72	0.66	26	20	16												
		200	7.80	0.28	0.42	0.32	20	20	18												
VicP1 to VicP2	0 to 22 m DS	0	1.00	0.06	0.02		16	8	4	0	0	0	55	40	5	0	40	0	60	0	Flat under lake effect leading to small riffle section at IF to VicP2
		22	3.10	N/A	N/A	N/A	N/A	N/A	N/A												
VicP2-VicLK	0 to 50 m DS	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0	0	30	10	0	60	65	15	20	40	Flow type is steady through marsh area.
		25	0.95	0.30	0.09	0.00	6	8	4												
		50	0.80	0.33	0.10	0.00	10	10	12												
VicP2-VicLK	50 to 100 m	50	0.80	0.33	0.10	0.00	10	10	12	0	0	0	30	50	0	20	65	20	15	50	Flow type is steady through marsh area.
		75	0.60	0.17	0.30	0.19	12	20	14												
		100	1.40	0.20	0.17	0.03	12	12	17												
VicP2-VicLK	100 to 150 m	100	1.40	0.20	0.17	0.03	12	12	17	0	0	0	40	50	0	10	45	10	45	20	Flow type is steady through marsh area.
		125	1.30	0.39	0.00	0.00	12	12	12												
		150	0.75	0.43	0.08	N/A	12	14	8												
VicP2-VicLK	150 to 200 m	150	0.75	0.43	0.08	N/A	12	14	8	0	10	0	50	40	0	0	35	20	45	10	Flow type is steady through marsh area.
		175	0.60	0.00	0.17	0.73	10	10	12												
		200	1.10	0.19	0.08	0.01	14	16	12												
VicP2-VicLK	200 to 250 m	200	1.10	0.19	0.08	0.01	14	16	12	80	10	0	10	0	0	0	30	30	40	0	Barrier to fish passage at 225m DS (photo 3182 / 83), > 1m high. Flow type is riffle-run with one falls.
		225	1.10	0.00	0.26	0.00	28	10	16												
		250	1.50	0.10	0.18	N/A	8	10	N/A												
VicP2-VicLK	250 to 300 m	250	1.50	0.10	0.18	N/A	8	10	N/A	69	20	0	20	0	0	0	50	35	15	0	Flow type is riffle.
		275	2.00	0.00	0.02	0.02	16	16	20												
		300	1.40	0.03	0.22	0.20	8	6	6												

Appendix B Stream Habitat Classification Data

Location	Sub-Section	Distance (m)	Stream Width (m)	Velocity (m/s)			Mean Depth (cm)			Substrate (%)							Riparian Veg (%)			Aquatic Veg (%)	Comment
				1/4	1/2	3/4	1/4	1/2	3/4	BR	B	R	C	G	S	F	S	G	T		
VicP2-VicLK	300 to 350 m	300	1.40	0.03	0.22	0.20	8	6	6	80	10	0	10	0	0	0	50	35	15	0	Flow type is riffle.
		325	1.35	0.29	0.08	0.15	8	6	9												
		350	1.50	0.53	0.01	0.09	12	10	10												
VicP2-VicLK	350 to 400 m	350	1.50	0.53	0.01	0.09	12	10	10	50	0	0	35	15	0	0	15	15	70	0	Flow type is riffle.
		375	1.86	0.16	0.09	0.00	11	12	8												
		400	1.90	0.00	0.23	0.00	18	16	16												
VicP2-VicLK	400 to 450 m	400	1.90	0.00	0.23	0.00	18	16	16	0	0	10	80	10	0	0	15	15	70	0	Series of drop-pool-run habitat. Moderate slope and undercut banks. Met up with previous section.
		425	1.00	0.00	0.75	0.10	20	14	16												
		450	1.25	0.31	0.00	0.02	12	8	4												
VicP2-VicLK	450 to 500 m	450	1.25	0.31	0.00	0.02	12	8	4	0	10	0	70	20	0	0	45	10	45	0	Short falls (0.6m) at 1075 m US of lake (photo 3341). Low slope riffle-run habitat below falls & plunge-run habitat above falls.
		475	0.95	0.42	0.18	N/A	5	6	N/A												
		500	1.20	0.00	0.03	0.00	12	10	10												
VicP2-VicLK	500 to 550 m	500	1.20	0.00	0.03	0.00	12	10	10	0	0	0	0	45	45	10	60	10	30	0	Banks high and undercut. Riffle - run habitat
		525	0.80	0.15	0.00	0.05	15	14	12												
		550	0.65	0.07	0.09	0.09	24	24	26												
VicP2-VicLK	550 to 600 m	550	0.65	0.07	0.09	0.09	24	24	26	0	0	0	0	50	40	10	50	30	20	<5	Mostly run habitat with a few short riffle sections. Channel splits between 975-1000m US becoming braided channel through wetland area.
		575	0.70	0.09	0.10	0.13	14	14	10												
		600	0.95	0.12	0.15	0.01	12	14	14												
VicP2-VicLK	600 to 650 m	600	0.95	0.12	0.15	0.01	12	14	14	0	0	0	20	70	0	10	50	35	15	0	Shallow meandering riffle-run flowing through marsh area. High undercut banks.
		625	1.00	0.08	0.12	0.09	10	18	22												
		650	1.10	0.00	0.23	0.27	12	10	6												
VicP2-VicLK	650 to 700 m	650	1.10	0.00	0.23	0.27	12	10	6	0	0	0	60	35	0	5	60	35	5	0	Shallow run with a few riffles. Low slope, wet, shrub / grass approach.
		675	0.80	0.16	0.14	0.13	12	14	14												
		700	2.20	0.12	0.31	0.08	14	10	8												

Appendix B Stream Habitat Classification Data

Location	Sub-Section	Distance (m)	Stream Width (m)	Velocity (m/s)			Mean Depth (cm)			Substrate (%)							Riparian Veg (%)			Aquatic Veg (%)	Comment
				1/4	1/2	3/4	1/4	1/2	3/4	BR	B	R	C	G	S	F	S	G	T		
VicP2-VicLK	700 to 750 m	700	2.20	0.12	0.31	0.08	14	10	8	0	0	0	20	70	0	10	60	40	0	<5	Stream shallow and slow flowing, predominately riffle or run with steep, undercut banks and low wet approach.
		725	0.45	0.02	0.13	0.13	16	18	12												
		750	0.70	0.15	0.12	0.21	22	22	20												
VicP2-VicLK	750 to 775 m	750	0.70	0.15	0.12	0.21	22	22	20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Beaver pond / steady upstream of dam at wpt# . Wetland area from 750 to 950 m DS of outflow.
		775	N/A	N/A	N/A	N/A	N/A	N/A	N/A												
		800	N/A	N/A	N/A	N/A	N/A	N/A	N/A												
VicP2-VicLK	800 to 850 m	800	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
		825	N/A	N/A	N/A	N/A	N/A	N/A	N/A												
		850	N/A	N/A	N/A	N/A	N/A	N/A	N/A												
VicP2-VicLK	850 to 900 m	850	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
		875	N/A	N/A	N/A	N/A	N/A	N/A	N/A												
		900	N/A	N/A	N/A	N/A	N/A	N/A	N/A												
VicP2-VicLK	900 to 950 m	900	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
		925	N/A	N/A	N/A	N/A	N/A	N/A	N/A												
		950	2.20	0.03	0.01	0.02	50	48	44												
VicP2-VicLK	950 to 1000 m	950	2.20	0.03	0.01	0.02	50	48	44	0	0	0	70	30	0	0	60	30	10	0	Flow type is steady. Beaver dam at upstream end of section
		975	1.75	0.45	0.42	0.00	6	7	6												
		1000	2.00	0.11	0.08	0.31	12	12	10												
VicP2-VicLK	1000 to 1050 m	1000	2.00	0.11	0.08	0.31	12	12	10	0	10	0	60	30	0	0	35	35	30	0	Mostly run habitat with a few small riffles.
		1025	2.20	0.00	0.19	0.04	14	14	8												
		1050	2.05	0.11	0.63	0.22	10	5	5												
VicP2-VicLK	1050 to 1100 m	1050	2.05	0.11	0.63	0.22	10	5	5	0	0	20	60	20	0	0	40	40	20	0	Series of riffle-runs with abundant undercuts.
		1075	1.60	0.23	0.19	0.19	10	12	10												
		1100	1.55	0.25	0.00	0.01	6	6	10												

Appendix B Stream Habitat Classification Data

Location	Sub-Section	Distance (m)	Stream Width (m)	Velocity (m/s)			Mean Depth (cm)			Substrate (%)							Riparian Veg (%)			Aquatic Veg (%)	Comment
				1/4	1/2	3/4	1/4	1/2	3/4	BR	B	R	C	G	S	F	S	G	T		
VicP2-VicLK	1100 to 1150 m	1100	1.55	0.25	0.00	0.01	6	6	10	0	10	0	60	30	0	0	50	50	0	<5	Long runs separated by riffles.
		1125	1.40	0.10	0.46	0.07	14	10	6												
		1150	2.10	0.17	0.12	0.10	14	18	18												
VicP2-VicLK	1150 to 1200 m	1150	2.10	0.17	0.12	0.10	14	18	18	0	0	0	50	45	0	5	60	40	0	0	Mostly runs with a few riffle sections.
		1175	1.55	0.06	0.07	0.11	12	14	22												
		1200	1.70	0.18	0.38	0.17	13	14	20												
VicP2-VicLK	1200 to 1250 m	1200	1.70	0.18	0.38	0.17	13	14	20	0	0	0	35	60	0	5	50	50	0	5	One long run meandering through shrub/grass wetland.
		1225	1.50	0.23	0.25	0.00	20	20	20												
		1250	1.00	0.04	0.19	0.21	20	18	16												
VicP2-VicLK	1250 to 1300 m	1250	1.00	0.04	0.19	0.21	20	18	16	0	0	0	40	60	0	0	50	50	0	10	Long flat through marsh.
		1275	1.35	0.15	0.14	0.08	24	20	20												
		1300	1.10	0.49	0.35	0.04	14	12	12												
VicP2-VicLK	1300 to 1350 m	1300	1.10	0.49	0.35	0.04	14	12	12	0	10	0	60	30	0	0	60	40	0	5	Long run with a small riffle in the middle.
		1325	3.25	0.00	0.20	0.00	16	20	14												
		1350	3.50	0.30	0.05	0.08	14	10	6												
VicP2-VicLK	1350 to 1400 m	1350	3.50	0.30	0.05	0.08	14	10	6	20	50	0	30	0	0	0	60	30	10	0	Flow type is riffle.
		1375	2.65	0.00	0.00	0.04	12	16	10												
		1400	2.65	0.08	0.08	0.28	10	6	6												
VicP2-VicLK	1400 to 1450 m	1400	2.65	0.08	0.08	0.28	10	6	6	30	40	0	30	0	0	0	50	15	35	0	Mostly runs with a few riffle sections.
		1425	0.95	0.45	0.00	0.40	14	18	6												
		1450	N/A	N/A	N/A	N/A	N/A	N/A	N/A												
VicP2-VicLK	1450 to 1500 m	1450	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10	10	50	30	0	0	0	40	30	30	0	Series of riffle-runs with several small drops. Moderate slope. Discharge = 0.0248 m3/s, area = 0.152 m2
		1475	0.80	0.22	0.07	0.00	12	10	4												
		1500	3.25	0.39	0.30	0.04	8	12	14												

Appendix B Stream Habitat Classification Data

Location	Sub-Section	Distance (m)	Stream Width (m)	Velocity (m/s)			Mean Depth (cm)			Substrate (%)							Riparian Veg (%)			Aquatic Veg (%)	Comment
				1/4	1/2	3/4	1/4	1/2	3/4	BR	B	R	C	G	S	F	S	G	T		
VicP2-VicLK	1500 to 1550 m	1500	3.25	0.39	0.30	0.04	8	12	14	0	0	30	50	20	0	0	65	0	35	0	Mostly riffles separated by short runs. Frequent undercut banks.
		1525	1.30	0.10	0.24	0.19	10	10	20												
		1550	1.50	0.07	0.42	0.00	8	14	8												
Trib	0 to 125 m	0	1.05	0.03	0.15	0.12	12	22	18	0	5	10	45	40	0	0	35	50	15	0	Side stream flowing into VicP2-VicLK stream at wpt 484. Started 75m upstream of confluence at wpt 485.
		125	1.55	0.08	0.11	N/A	8	8	8												
Trib	125 to 175 m	125	1.55	0.08	0.11	N/A	8	8	8	0	10	10	40	40	40	0	35	50	15	0	Riffle-run habitat through grass/shrub lowland in spruce forest.
		175	2.2	0.03	0.15	0.12	12	22	18												
C01	0 to 50 m US	50 m	1.80	0.14	0.01	0.01	20	20	22	0	20	15	50	10	0	5	70	15	15	0	Small riffle flowing into pool upstream of crossing.
		25 m	2.00	0.18	0.10	N/A	8	10	4												
		0	3.40	0.00	0.01	0.02	30	27	14												
C01	0 to 50 m DS	0	3.40	0.00	0.01	0.02	30	27	14	0	10	30	50	10	0	0	70	10	20	0	Pool below crossing becoming shallow riffle.
		25 m	1.00	0.07	0.08	0.00	10	16	12												
		50 m	1.90	0.05	0.00	0.14	10	12	16												
C02	0 to 50 m US	50 m	3.40	0.33	0.72	N/A	14.00	16.00	8.00	0	50	10	40	0	0	0	40	10	50	0	Steep banks lined with trees and mosses. Flow type is a series of plunges / pools.
		25 m	4.10	0.24	0.27	0.00	22.00	32.00	24.00												
		0	3.20	0.21	0.19	0.13	62.00	38.00	48.00												
C02	0 to 50 m DS	0	3.20	0.21	0.19	0.13	62.00	38.00	48.00	0	30	0	50	20	0	0	50	5	45	0	Series of riffle / drop / runs. One pool at bottom end of section caused by log jam.
		25 m	4.30	0.12	0.82	0.56	13.00	10.00	8.00												
		50 m	4.70	0.62	0.14	0.16	10.00	19.00	10.00												
C03	0 to 50 m US	50 m	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	40	20	40	0	0	0	50	50	0	0	Flow type is a series of riffle / drop / runs. Beaver dam and pond at upper end of upstream section.
		25 m	1.95	0.30	0.26	0.27	16.00	14.00	12.00												
		0	2.90	0.06	0.01	0.08	27.00	27.00	17.00												
C03	0 to 50 m DS	0	2.90	0.06	0.01	0.08	27.00	27.00	17.00	30	0	0	30	40	0	0	70	15	15	0	Flow type is a series of riffle / drop / runs, with one large pool directly below crossing.
		25 m	1.70	0.49	0.03	N/A	10.00	7.00	4.00												
		50 m	2.90	0.20	0.28	0.41	12.00	20.00	10.00												

Appendix B Stream Habitat Classification Data

Location	Sub-Section	Distance (m)	Stream Width (m)	Velocity (m/s)			Mean Depth (cm)			Substrate (%)							Riparian Veg (%)			Aquatic Veg (%)	Comment
				1/4	1/2	3/4	1/4	1/2	3/4	BR	B	R	C	G	S	F	S	G	T		
C04	0 to 50 m US	50 m	1.10	0.01	0.02	0.00	18.00	28.00	18.00	0	0	0	5	50	45	0	35	10	55	0	Becomes braided channel in upper 25m, going underground at times.
		25 m	1.90	0.12	0.62	0.27	8.00	6.00	6.00												
		0	1.15	0.02	0.00	0.20	20.00	18.00	22.00												
C04	0 to 50 m DS	0	1.15	0.02	0.00	0.20	20.00	18.00	22.00	0	0	0	10	25	65	0	45	5	50	0	Riffle-run habitat in top 25m becoming braided, slow wetland in bottom 25m.
		25 m	0.90	0.00	0.00	0.00	18.00	30.00	16.00												
		50 m	0.95	0.04	0.05	0.02	14.00	18.00	10.00												
C05	0 to 50 m US	50 m	N/A	0.32	0.06	0.89	26.00	14.00	46.00	0	100	0	0	0	0	0	30	0	70	0	Rapids
		25 m	N/A	0.68	0.59	0.50	24.00	20.00	36.00												
		0	10.60	0.90	0.87	1.08	40.00	22.00	40.00												
C05	0 to 50 m DS	0	10.60	0.90	0.87	1.08	40.00	22.00	40.00	0	100	0	0	0	0	0	30	0	70	0	Rapids. Unable to measure flows due to unsafe wading conditions. Current very fast and deep.
		25 m	N/A	N/A	N/A	N/A	N/A	N/A	N/A												
		50 m	N/A	N/A	N/A	N/A	N/A	N/A	N/A												
C06	0 to 50 m US	50 m	1.60	0.00	0.05	0.04	20.00	22.00	24.00	0	0	20	20	60	0	0	50	35	15	0	Riffle-run habitat.
		25 m	1.40	0.33	0.10	0.39	6.00	10.00	10.00												
		0	0.90	0.31	0.39	0.25	10.00	20.00	2.00												
C06	0 to 50 m DS	0	0.90	0.31	0.39	0.25	10.00	20.00	2.00	0	0	0	50	50	0	0	65	25	10	0	Series of riffle-runs with two small log jams.
		25 m	1.70	0.08	0.14	0.09	20.00	10.00	26.00												
		50 m	1.40	0.02	0.25	0.20	16.00	22.00	14.00												
C07	0 to 50 m US	50 m	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	No channel found. A series of seeps from wetland area north of site.
		25 m	N/A	N/A	N/A	N/A	N/A	N/A	N/A												
		0	N/A	N/A	N/A	N/A	N/A	N/A	N/A												
C07	0 to 50 m DS	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
		25 m	N/A	N/A	N/A	N/A	N/A	N/A	N/A												
		50 m	N/A	N/A	N/A	N/A	N/A	N/A	N/A												

Appendix B Stream Habitat Classification Data

Location	Sub-Section	Distance (m)	Stream Width (m)	Velocity (m/s)			Mean Depth (cm)			Substrate (%)							Riparian Veg (%)			Aquatic Veg (%)	Comment
				1/4	1/2	3/4	1/4	1/2	3/4	BR	B	R	C	G	S	F	S	G	T		
C08	0 to 50 m US	50 m	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	No channel US of crossing. Crossing receives drainage along skidder trail (Photos-3360-3362).
		25 m	N/A	N/A	N/A	N/A	N/A	N/A	N/A												
		0	N/A	N/A	N/A	N/A	N/A	N/A	N/A												
C08	0 to 50 m DS	0	1.20	0.04	0.21	0.12	6.00	4.00	5.00	0	0	0	0	0	0	100	55	40	5	0	Channel becomes heavily overgrown and braided around 20m DS of crossing, becoming marsh area.
		25 m	0.80	0.00	0.00	0.00	8.00	8.00	6.00												
C09	0 to 50 m US	50 m	1.90	0.00	0.00	0.00	28.00	28.00	28.00	0	0	0	0	0	0	100	60	25	15	<5	Slow flow through marshy area with woody debris in channel.
		25 m	2.00	0.03	0.04	0.00	26.00	28.00	26.00												
		0	1.30	0.03	0.00	0.00	16.00	22.00	12.00												
C09	0 to 50 m DS	0	1.30	0.03	0.00	0.00	16.00	22.00	12.00	0	0	20	0	0	0	80	70	15	15	<5	Stream becomes braided @ 50 m DS.
		25 m	0.90	0.11	0.00	0.00	14.00	16.00	10.00												
		50 m	0.45	0.01	0.01	0.00	10.00	8.00	10.00												

Notes:
- Substrate classifications are: BR = Bedrock, B = Boulder, R = Rubble, C = Cobble, G = Gravel, S = Sand, F = Fines
- Riparian vegetation categories are: S = Shrubs, G = Grass, T = Trees

Baseline Water Quality Program
Valentine Lake Prospect

Stantec Consulting Ltd.
607 Torbay Road
St. John's, NL A1A 4Y6
Tel: (709) 576-1458
Fax: (709) 576-2126

Prepared for

Marathon Gold Corp.
36 Birchview Drive
Pasadena, NL A0L 1K0

Interim Report

File No. 121511074

Date: November 2, 2012

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1.0 INTRODUCTION

Marathon Gold Corp. (Marathon), engaged Stantec Consulting Ltd. (Stantec) to design and conduct a water quality monitoring program at the Valentine Lake prospect. The purpose of the water quality monitoring program is to characterize baseline water quality at the site area during an exploration drilling program and before any future mine development on the property.

1.1 Overview

Drilling activity at the Valentine Lake prospect has primarily focused on two locations, the Leprechaun Pond site and the Valentine East site. The Leprechaun Pond site is comprised of two small watersheds; one flowing north to Valentine Lake and the other flowing south to Victoria Lake (Figure 1.1). The Valentine East site contains a series of small streams which drain to Victoria River. In consultation with Marathon, representative water sampling locations were selected to monitor water quality at each site. Additional drilling activity in 2012 has focused on the J. Frank Zone, thus two additional water quality monitoring stations will be established for monitoring in this zone. These two stations will be added for subsequent rounds of water sampling.

This report documents the work carried out by Marathon and Stantec and summarizes the findings of the water quality sampling conducted from March, 2011 to September, 2012. All water quality samples were analyzed for RCAp-MS, mercury and total suspended solids (TSS).

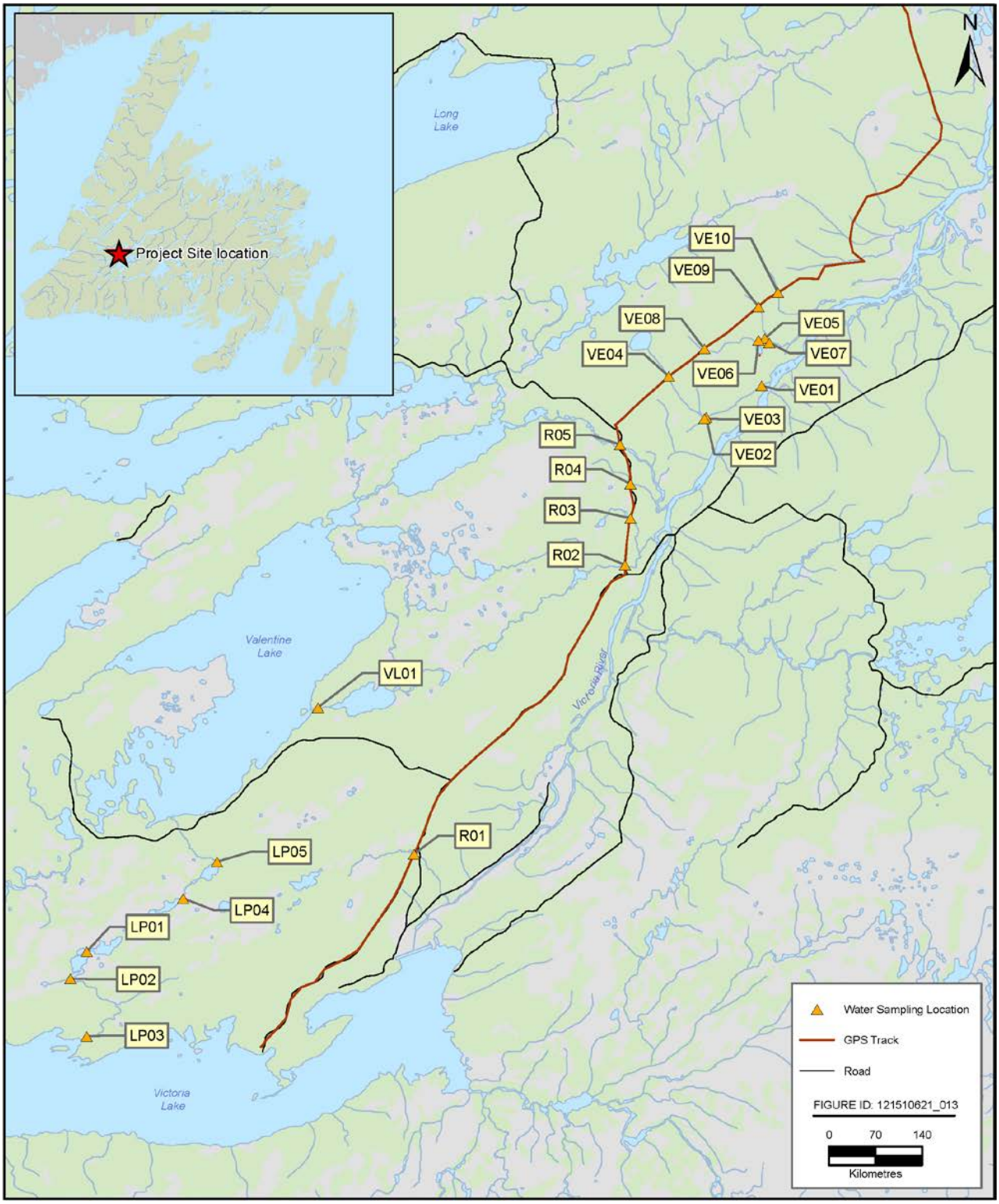

Figure 1.1 Valentine Lake Baseline Water Quality Sampling Locations

2.0 METHODOLOGY

Sampling sites were selected based on a review of the 1:50,000 topographical maps (Victoria Lake 12 A/6 edition 3) in consultation with Marathon. Stantec visited the site during March, 2011 and conducted the initial sampling campaign. Sample collection for all subsequent sampling campaigns was completed by Marathon staff. Analytical results from all sampling campaigns were provided to Stantec, who assisted with data compilation and interpretation.

Sampling conducted in March and April 2011 involved the collection of water samples at 12 locations (LP01 to LP05 and VE01 to VE07). Nine additional water sampling locations (VE08, VE09, VE10, VL01 and R01 to R05) were added to the program for Round 3 and all subsequent rounds of water sampling. Water samples have been collected on approximately a monthly basis since March 2011. The timing of the water sampling campaigns and the stations sampled during each round of sampling are summarized in Table 2.1, and the coordinates for each location are provided in Table 2.2.

A total of 290 samples have been collected to date.

To aid with interpretation of results a location upstream of all site activity was chosen as a Reference Station (VE04).

Table 2.1 Summary of Stations Sampled During Water Sampling Campaigns

Round	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Date	9-Mar 2011	30-Ma 2011	18-May 2011	25-Jun 2011	7-Aug 2011	5-Sep 2011	8-Oct 2011	12-Nov 2011	17-Jan 2012	22-Feb 2012	17-Mar 2012	15-May 2012	21-Jun 2012	3-Aug-2012	16-Sep-2012
√ = Sampling conducted, NC = Sampling not conducted															
Station															
LP01	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
LP02	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
LP03	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
LP04	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
LP05	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
VE01	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
VE02	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
VE03	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
VE04	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
VE05	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
VE06	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
VE07	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
VE08	NC	NC	√	√	√	√	√	√	NC	NC	√	√	NC	NC	√
VE09	NC	NC	√	√	√	√	√	√	NC	NC	√	√	√	√	√
VE10	NC	NC	√	√	√	√	√	√	√	√	√	√	√	√	√
R01	NC	NC	√	√	√	√	√	√	√	√	√	√	√	√	√
R02	NC	NC	√	√	√	√	√	√	√	√	√	√	√	√	√
R03	NC	NC	√	√	√	√	√	√	√	√	√	√	√	√	√
R04	NC	NC	√	√	√	√	√	√	NC	√	√	√	√	√	√
R05	NC	NC	√	√	√	√	√	√	√	√	√	√	√	√	√
VL01	NC	NC	√	√	√	√	√	√	√	√	√	√	√	√	√

Table 2.2 Sampling Location Coordinates UTM (NAD 83 Zone 21 U)

Sample Station ID	X_Easting	Y_Northing
LP01	486228	5355908
LP02	485980	5355505
LP03	486225	5354638
LP04	487675	5356713
LP05	488180	5357259
VE01	496364	5364413
VE02	495531	5363937
VE03	495502	5363922
VE04	494970	5364554
VE05	496415	5365122
VE06	496321	5365101
VE07	496482	5365059
VE08	495490	5364983
VE09	496306	5365644
VE10	496634	5365825
R01	491135	5357375
R02	494307	5361717
R03	494376	5362429
R04	494358	5362890
R05	494215	5363502
VL01	489694	5359562

All water samples were collected in clean laboratory-prepared containers specific to each analysis, and were stored and shipped in coolers at 4ºC. A detailed water sampling protocol is included as Appendix A.

Water samples were submitted to Maxxam Analytics Inc. in St. John's, NL for laboratory analysis for RCAp-MS, which includes general water quality parameters, as well as a metals scan using ICP-MS. In addition, water samples were analyzed separately for mercury and TSS.

3.0 RESULTS

Fifteen rounds of water sampling were conducted from March 2011 to September 2012. The complete list of analytical results is included in Appendix B. A summary of results is presented in Table 3.1, which includes:

- parameters;
- units of measurement;
- reportable detection limit (RDL), which is the level that can be reliably reported considering factors such as sample volume and sample matrices (i.e., other elements and compounds that may be present);
- number of samples with reportable quantified values (values above RDL);
- maximum value recorded for parameter;
- minimum value recorded for parameter;
- mean value, if 80% of samples had values above RDL, mean was calculated by using RDL/2 for non-detect results. If less than 80% of samples had values below the RDL, no mean is calculated;
- median value (reported if 80% of samples had values above RDL, otherwise blank)); and
- CCME Guideline for the Protection of Aquatic Life (CCME 2011).

Results for individual parameters are compared to Guidelines for the Protection of Freshwater Aquatic Life, where they exist. These guidelines are published by the Canadian Council of Ministers of the Environment (CCME, 2011). Where numerical guidelines exist for a parameter, the number is listed in Table 3.1. Parameters that have no guideline are listed as NG. The following notes apply to the Guidelines for Aquatic Life:

Note 1. Colour can be expressed as True Colour or Apparent Colour. True Colour is the mean absorbance of filtered water samples at 456 nm shall not be significantly higher than the seasonally adjusted expected value for the system under consideration. Apparent Colour is the mean percent transmission of white light per metre shall not be significantly less than the seasonally adjusted expected value for the system under consideration (CCME).

Note 2. Turbidity can be expressed as Clear Flow or High Flow (turbid water). Clear Flow Maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTUs from background levels for a longer term exposure (e.g., 30-d period). High flow or turbid waters Maximum increase of 8 NTUs from background levels at any one time when background levels are between 8 and 80 NTUs. Should not increase more than 10% of background levels when background is >80 NTUs (CCME).

Note 3. The guideline values for selenium and silver are all lower than the RDLs. However, no values were reported above the RDL for these parameters.

Note 4. Canadian Trigger Ranges from ultra-oligotrophic <4 to hyper-eutrophic >100 (CCME).

Table 3.1 Summary of Water Quality Monitoring Results (March, 2011 to September 2012)

	Units	RDL	N	Number >RDL	Min	Max	Mean	Median	CCME Guideline	Number > CCME Guidleline
Anion Sum	me/L	N/A	290	290	0.03	1.18	0.36	0.33	NG	
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	1	290	282	ND	49	14.5	12	NG	
Calculated TDS	mg/L	1	290	290	5	63	22.1	21	NG	
Carb. Alkalinity (calc. as CaCO3)	mg/L	1	290	0	ND	ND	ND	ND	NG	
Cation Sum	me/L	N/A	290	290	0.16	1.10	0.41	0.36	NG	
Hardness (CaCO3)	mg/L	1	290	290	5	42	15.98	14	NG	
Ion Balance (% Difference)	%	N/A	290	290	0	76.0	9.2	7.14	NG	
Nitrate (N)			290	151	ND	0.61	-	-	NG	
Total Alkalinity (Total as CaCO3)	mg/L	5	290	282	ND	50	14.58	12	NG	
Dissolved Chloride (Cl)	mg/L	1	290	286	ND	8	2.3	2.0	NG	
Colour	TCU	5	290	290	7.1	88	37.44	36	Note 1	
Nitrate + Nitrite	mg/L	0.05	290	152	ND	0.61	-	-	NG	
Nitrite (N)	mg/L	0.01	290	3	ND	0.18	-	-	0.6	
Nitrogen (Ammonia Nitrogen)	mg/L	0.05	290	12	ND	0.14	-	-	NG	
Total Organic Carbon (C)	mg/L	0.5	290	290	2.1	16.0	7.04	6.8	NG	
Orthophosphate (P)	mg/L	0.01	290	7	ND	0.055	-	-	NG	
pH	pH	N/A	290	290	6.06	7.7	6.99	6.99	6.5 to 9.0	10
Reactive Silica (SiO2)	mg/L	0.5	290	263	ND	7.8	2.42	2.3	NG	
Total Suspended Solids	mg/L	1	290	169	ND	60	-	-	NG	
Dissolved Sulphate (SO4)	mg/L	2	290	6	ND	4.3	-	-	NG	
Turbidity	NTU	0.1	290	269	ND	23	0.93	0.50	Note 2	
Conductivity	uS/cm	1	290	290	15	120	38.01	34	NG	
Total Aluminum (Al)	ug/L	5.0	290	290	14.1	1640	108.8	77.6	100	93
Total Antimony (Sb)	ug/L	1.0	290	0	ND	ND	ND	ND	NG	

	Units	RDL	N	Number >RDL	Min	Max	Mean	Median	CCME Guideline	Number > CCME Guidleline
Total Arsenic (As)	ug/L	1.0	290	99	ND	9.0	-	-	5.0	
Total Barium (Ba)	ug/L	1.0	290	267	ND	14.1	2.54	1.8	NG	
Total Beryllium (Be)	ug/L	1.0	290	0	ND	ND	ND	ND	NG	
Total Bismuth (Bi)	ug/L	2.0	290	0	ND	ND	ND	ND	NG	
Total Boron (B)	ug/L	50	290	0	ND	ND	ND	ND	NG	
Total Cadmium (Cd)	ug/L	0.017	290	25	ND	2.25	-	-	0.017	24
Total Calcium (Ca)	ug/L	100	290	290	1490	13800	5049	4470	NG	
Total Chromium (Cr)	ug/L	1.0	290	73	ND	90.7	-	-	8.9	19
Total Cobalt (Co)	ug/L	0.40	290	23	ND	2.19	-	-	NG	
Total Copper (Cu)	ug/L	2.0	290	7	ND	55.9	-	-	2	7
Total Iron (Fe)	ug/L	50	290	281	ND	3270	258.6	171	300	60
Total Lead (Pb)	ug/L	0.50	290	9	ND	2.72	-		1	5
Total Magnesium (Mg)	ug/L	100	290	290	263	2320	802	705	NG	
Total Manganese (Mn)	ug/L	2.0	290	290	5.2	4530	188.5	72.8	NG	
Total Mercury (Hg)	ug/L	0.013	290	25	ND	0.076			0.026	5
Total Molybdenum (Mo)	ug/L	2.0	290	1	ND	2.5	-	-	73	
Total Nickel (Ni)	ug/L	2.0	290	2	ND	3.6	-	-	25	
Total Phosphorus (P)	ug/L	100	290	2	ND	120	-	-	Note 4	
Total Potassium (K)	ug/L	100	290	239	ND	1240	199	152.0	NG	
Total Selenium (Se)	ug/L	1.0	290	0	ND	ND	ND	ND	Note 3	
Total Silver (Ag)	ug/L	0.10	290	0	ND	ND	ND	ND	Note 3	
Total Sodium (Na)	ug/L	100	290	290	896	5220	1814	1690	NG	
Total Strontium (Sr)	ug/L	2.0	290	290	3.6	95.2	15.1	10.6	NG	
Total Thallium (Tl)	ug/L	0.10	290	0	ND	ND	ND	ND	0.8	
Total Tin (Sn)	ug/L	2.0	290	0	ND	ND	ND	ND	NG	
Total Titanium (Ti)	ug/L	2.0	290	147	ND	115	-	-	NG	
Total Uranium (U)	ug/L	0.10	290	11	ND	0.24	-	-	NG	
Total Vanadium (V)	ug/L	2.0	290	3	ND	6	-	-	NG	
Total Zinc (Zn)	ug/L	5.0	290	87	ND	91.3	-	-	30	4

Notes:
1 CCME Guideline used is for trivalent chromium
2 CCME Guideline used is for inorganic mercury

The nine parameters that showed excedences of the CCME guideline are listed in Table 3.2, which shows the guideline values and the number of excedences, or in the case of pH, fell outside the guideline range.

Table 3.2 Number of Instances Parameter Concentrations Exceeded CCME Guideline

Parameters	CCME Guideline	Number >CCME Guideline
pH	6.5 to 9.0	11
Total Aluminum (Al)	100	93
Total Cadmium	0.017	24
Total Chromium (Cr)	8.9	19
Total Copper (Cu)	2	7
Total Iron (Fe)	300	60
Total Lead (Pb)	1	5
Mercury	0.026	5
Total Zinc (Zn)	30	4

The number of times that parameters exceeded CCME guidelines at each station is shown in Table 3.3. Exceedences of the CCME guidelines were recorded most often at station LP01 (33 in total), followed by station VE05 (24), VE08 (20), VE09 (19), VE07 (18) and LP04 (17).

A reference site (VE04), located upstream of current site activities, exceeded the CCME guideline for: aluminum for five of 15 samples; iron for five of 15 samples; chromium for one of 15 samples and zinc for one of 15 samples. These results indicate that some exceedences of the CCME guideline appear to be naturally occurring and represent baseline conditions at the Valentine Lake prospect.

Table 3.3 Number of Instances Parameter Concentrations Exceeded CCME Guideline at each Sampling Station

Station	Number of Times Parameter Exceeded CCME Guideline									
	pH	Aluminum	Cadmium	Chromium	Copper	Iron	Lead	Mercury	Zinc	Total
LP01		11	2	2	3	10	3	1	1	33
LP02		8	1			4		1		14
LP03		2		1		1		1	1	6
LP04		10		2	1	4				17
LP05		6		1	1					8
VE01	1	1		2		1				5
VE02		3	1			1				5
VE03		1								1
VE04		5		1		5			1	12
VE05		8	5	2		7	1		1	24
VE06		8		1		3				12
VE07		7	3	2	1	4	1			18
VE08	8	8				4				20
VE09		6	5	1		6		1		19

Station	Number of Times Parameter Exceeded CCME Guideline									
	pH	Aluminum	Cadmium	Chromium	Copper	Iron	Lead	Mercury	Zinc	Total
VE10		3	4	1		5		1		14
R01			1	2		2				5
R02										0
R03		2		1		3				6
R04	1	2								3
R05					1					1
VL01		2	2							4
Total	10	93	24	19	7	60	5	5	4	227

The number of exceedences of the CCME guideline recorded for monthly samples is summarized in Table 3.4. Most exceedences of the CCME guidelines were recorded during August, 2011 (24 exceedences), followed by October, 2011 (20), November, 2011 (19), May, 2012 (19), June, 2011 (18), and September, 2011 (18).

Table 3.4 Number of Instances Parameter Concentrations Exceeded CCME Guideline for Individual Rounds of Water Sampling

Round							Number of Times Parameter Exceeded CCME Guideline				
	Date	pH	Aluminum	Cadmium	Chromium	Copper	Iron	Lead	Mercury	Zinc	Total
1	9-Mar-11	1	8	2	1		1			2	15
2	30-Mar-11		5	1	1		3			2	12
3	18-May-11	2	5	1	1		2				11
4	25-Jun-11	1	8		1	3	4	1			18
5	7-Aug-11		3	3	7	1	5		5		24
6	5-Sep-11	1	4	2	5		6				18
7	8-Oct-11	1	8	1	3	1	5	1			20
8	12-Nov-11	1	10	1		1	5	1			19
9	17-Jan-12		8	1			6				15
10	27-Feb-12		5	2			1	1			9
11	17-Mar-12	1	8	1		1	5	1			17
12	15-May-12	1	11	5			2				19
13	21-Jun-12		2	1			5				8
14	03-Aug-12			1			8				9
15	16-Sep-12	1	8	2			2				13
Total		10	93	24	19	7	60	5	5	4	227

- Values for pH most commonly fell outside the recommended range during the May, 2011 sampling (2 values below the guideline range of 6.5 to 9).

- Aluminum concentrations most commonly exceeded the guideline during the May, 2012 sampling (11), November, 2011 (10), March, 2011 (8), June, 2011 (8), October, 2011 (8), January, 2012 (8) and September, 2012 (8).
- Cadmium concentrations most commonly exceeded the guideline during the May, 2012 sampling (5), August, 2011 (3), March, 2011 (2), September, 2011 (2), February, 2012 (2) and September 2012 (2).
- Chromium concentrations most commonly exceeded guideline during August, 2011 (7), September, 2011 (5) and October, 2011 (3).
- Copper concentrations most commonly exceeded the guideline during June, 2011 (3).
- Iron concentrations most commonly exceeded guideline during August 2012 (8), September, 2011 (6), January, 2012 (6), August, 2011 (5), October, 2011 (5), November, 2011 (5), March, 2012 (5) and June, 2012 (5).
- Lead concentrations exceeded guideline during June, 2011 (1), October, 2011 (1) November, 2011 (1), February, 2012 (1) and March, 2012 (1).
- Mercury concentrations only exceeded guideline during August, 2011 (5).
- Zinc concentrations exceeded guideline during the March 09, 2011 sampling (2) and the March 30, 2011 sampling (2).

4.0 DISCUSSION AND CONCLUSIONS

A water quality monitoring program was designed and implemented at the Valentine Lake prospect in March 2011. A total of fifteen rounds of sampling were conducted from March, 2011 to September, 2012 with 290 samples collected during that period.

Comparison of the results with CCME guidelines for each parameter indicates that there were 227 instances of CCME guidelines being exceeded. Parameters most commonly exceeding the guideline include aluminum (93 exceedences), iron (60), cadmium (24) and chromium (19). Aluminum, iron and chromium concentrations also exceeded the CCME guideline at the Reference Station (VE04) for 33%, 33% and 6.7% of samples respectively. This indicates that elevated levels of these parameters are naturally occurring and likely represent baseline conditions at the project site.

With respect to individual sampling stations, the CCME guideline was most often exceeded at LP01 (33 instances of guideline exceedence), followed by station VE05 (24), VE08 (20), VE09 (19), VE07 (18) and LP04 (17). Since station LP01 is the closest station to current drilling activities at Leprechaun pond, drilling activities may be contributing to the number of exceedences at this station. However, if drilling activity is contributing to exceedences at LP01, the effect is localized, as LP02 (located immediately downstream of LP01) accounted for only 14 exceedences.

With respect to timing of sampling collection, most exceedences of the CCME guideline were recorded during the August, 2011 sampling event (24 instances of guideline exceedence),

followed by October, 2011 (20), November, 2011 (19), May, 2012 (19), June, 2011 (18) and September, 2011 (18). All (5) exceedences of mercury concentrations were recorded for samples collected in August, 2011. The stations with mercury concentrations above the CCME guideline in August include LP01, LP02, LP03, VE09 and VE10.

5.0 RECOMMENDATIONS FOR FUTURE SAMPLING

It is planned that the water sampling program will continue on a monthly basis until February 2013, thus providing two years of data. Water samples will be collected by Marathon staff and shipped to Maxxam Analytics in St. John's for analysis by RCAp-MS as well as for TSS and mercury. Analytical results will be provided to Stantec who will compile results monthly and report results to Marathon on a bi-annual basis.

With this in mind, the following recommendations are made for continuation of the water monitoring program.

- Two additional water sampling stations should be added to the program to document baseline conditions at watersheds located in proximity to the J. Frank Zone. The location of these two sampling stations will be chosen in consultation with Marathon and will be added to all subsequent water sampling rounds;
- water sampling will be conducted at the 21 sample sites illustrated in Figure 1; plus two sites in proximity to the J. Frank Zone;
- a staff gauge should be installed at a suitable location to aid with interpretation of results.

6.0 REFERENCES

CCME (Canadian Council of Ministers of Environment). 2011 (Website). Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life. http://st-ts.ccme.ca/?chems=all&chapters=1

APPENDIX A

Water Sampling Protocol

RATIONALE

A water quality monitoring program will be conducted at the Valentine Lake property to characterize baseline water quality at the site prior to continued exploration drilling and any future mining development activity on the property. The data will be suitable for environmental assessment and environmental monitoring as the project proceeds.

STATIONS

All station locations should be labeled with station identifiers in the field to aid with station identification during future water sampling rounds.

SAMPLING METHOD:

There will be one set of samples collected at each station. Samples will be analysed for:

RCAP–MS	200 mL and 50 mL plastic bottles
TSS	500 mL plastic bottle
Mercury	100 mL amber glass bottle

Labels should be affixed prior to sampling as they stick to a dry bottle better than a wet one. Label should record:

- Station identifier
- Date
- Time of day
- Initials of collector

Once labels have been affixed and all information recorded, the bottles should be taped with clear packing tape to ensure labels do not peel off during transport.

At each station, water should be collected in the following manner:

- All samples should be collected directly into the sample container – no other jugs or bottles should be used.
- In winter, it is preferred that samples are collected from open flowing water if at all possible. Making holes in ice and collecting samples from standing water has the potential to be non-representative. If sample has to be collected through a hole in the ice – it is best if it can be taken from moving water.
- If you are able to sample in open water, sample should be collected by entering the water and facing upstream.
- Dip water upstream from where you are standing so that any disturbance of the sediment will not contaminate the sample.

- If there is enough water depth, collect sample just under the surface with air bubbling out of the container. Be careful that sediment is not disturbed when working in shallow water.
- Fill the bottle half full three times, rinse and discard. Note**: Do not perform this step if the bottle contains preservative.**
- On the fourth time, fill the bottle to the top and place cap securely on.
- Double check the sample label to see that everything is correct.
- If the sample is to be collected at a road crossing location (bridge), ensure sample is collected approximately 50 m upstream of the crossing.
- All samples should be kept cool and dark – in a portable cooler or strong cardboard box.
- Sample should be shipped for analysis as soon as possible.

CARE SHOULD BE TAKEN TO ENSURE THAT FILLED SAMPLE BOTTLES DO NOT FREEZE EITHER DURING SAMPLING OR WHILE BEING TRANSPORTED – BOTTLE BREAKAGE CAN OCCUR IF SAMPLES FREEZE

SAFETY CONSIDERATIONS

- Proper winter clothing should be worn for safety and comfort.
- Personal Floatation Devices should be worn when working in or near water.
- Attach a safety line when working on ice that may not be safe.

ADDITIONAL INFORMATION

- During each sampling event the bench mark water level should be recorded for each stream system.
- Flow should be described as nil, low, medium, or high based on local experience
- Air and water temperatures should be recorded if possible
- Water appearance should be described as coloured or colourless, clear (as in not cloudy), note foam or any other character
- Ice cover should be noted as percent coverage and thickness
- If possible a photograph should be taken of the sampling station – to show water or hole in the ice
- Weather conditions should be noted for the current time and for the previous day (i.e., note recent snow or rain)
- Any other observations or activities that might be relevant should be noted.

Appendix B

Laboratory Reports

Round 1

Your P.O. #: 16300R-40
Your Project #: 121510621
Your C.O.C. #: ES243711

Attention: Barry Wicks
Stantec Consulting Ltd
St. John's - Standing Offer
607 Torbay Rd
St. John's, NL
A1A 4Y6

Report Date: 2011/03/23

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B134942
Received: 2011/03/16, 10:27

Sample Matrix: Water
Samples Received: 12

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonate, Bicarbonate and Hydroxide	12	N/A	2011/03/21	CAM SOP-00102	APHA 4500-CO2 D
Alkalinity	12	N/A	2011/03/18	ATL SOP 00013 R4	Based on EPA310.2
Chloride	12	N/A	2011/03/21	ATL SOP 00014 R6	Based on SM4500-Cl-
Colour	12	N/A	2011/03/18	ATL SOP 00020 R3.	Based on SM2120C
Conductance - water	12	N/A	2011/03/21	ATL SOP 00004 R5/00006 R4	Based on SM2510B
Hardness (calculated as CaCO3)	12	N/A	2011/03/18	ATL SOP 00048	Based on SM2340B
Mercury - Total (CVAA,LL)	12	2011/03/17	2011/03/18	ATL SOP 00026 R6	Based on EPA245.1
Metals Water Total MS	12	2011/03/17	2011/03/18	ATL SOP 00059 R1	Based on EPA6020A
Ion Balance (% Difference)	12	N/A	2011/03/22		
Anion and Cation Sum	12	N/A	2011/03/22		
Nitrogen Ammonia - water	12	N/A	2011/03/21	ATL SOP 00015 R5	Based on USEPA 350.1
Nitrogen - Nitrate + Nitrite	12	N/A	2011/03/21	ATL SOP 00016 R4	Based on USGS - Enz.
Nitrogen - Nitrite	12	N/A	2011/03/18	ATL SOP 00017 R4	Based on SM4500-NO2B
Nitrogen - Nitrate (as N)	12	N/A	2011/03/21	ATL SOP 00018 R3	Based on ASTMD3867
pH	12	N/A	2011/03/21	ATL SOP 00003 R5/00005 R7	Based on SM4500H+
Phosphorus - ortho	12	N/A	2011/03/21	ATL SOP 00021 R3	Based on USEPA 365.1
Sat. pH and Langelier Index (@ 20C)	12	N/A	2011/03/22		
Sat. pH and Langelier Index (@ 4C)	12	N/A	2011/03/22		
Reactive Silica	12	N/A	2011/03/21	ATL SOP 00022 R3	Based on EPA 366.0
Sulphate	12	N/A	2011/03/21	ATL SOP 00023 R3	Based on EPA 375.4
Total Dissolved Solids (TDS calc)	12	N/A	2011/03/22		
Organic carbon - Total (TOC)	11	N/A	2011/03/18	ATL SOP 00037 R4	Based on SM5310C
Organic carbon - Total (TOC)	1	N/A	2011/03/23	ATL SOP 00037 R4	Based on SM5310C
Total Suspended Solids	12	N/A	2011/03/17	ATL SOP 00007 R3	based on EPA 160.2
Turbidity	12	N/A	2011/03/22	ATL SOP 00011 R5	based on EPA 180.1

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

../2

Maxxam Job #: B134942
Report Date: 2011/03/23

Stantec Consulting Ltd
Client Project #: 121510621

Your P.O. #: 16300R-40
Sampler Initials: BW

Encryption Key

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

MICHELLE HILL, Project Manager
Email: MHill@maxxam.ca
Phone# (902) 420-0203

==========

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: 2

Maxxam Job #: B134942
Report Date: 2011/03/23

Stantec Consulting Ltd
Client Project #: 121510621

Your P.O. #: 16300R-40
Sampler Initials: BW

RESULTS OF ANALYSES OF WATER

Maxxam ID		IX5398	IX5403		IX5404			IX5405		
Sampling Date		2011/03/09	2011/03/09		2011/03/09			2011/03/09		
	Units	**LP-01**	**LP-02**	**QC Batch**	**LP-03**	**RDL**	**QC Batch**	**LP-04**	**RDL**	**QC Batch**
Calculated Parameters										
Anion Sum	me/L	0.460	0.400	2431573	0.220	N/A	2431573	0.220	N/A	2431573
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	17	15	2431570	6	1	2431570	7	1	2431570
Calculated TDS	mg/L	29	24	2431577	15	1	2431577	16	1	2431577
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	ND	2431570	ND	1	2431570	ND	1	2431570
Cation Sum	me/L	0.570	0.460	2431573	0.280	N/A	2431573	0.330	N/A	2431573
Hardness (CaCO3)	mg/L	20	17	2431571	10	1	2431571	11	1	2431571
Ion Balance (% Difference)	%	10.7	6.98	2431572	12.0	N/A	2431572	20.0	N/A	2431572
Langelier Index (@ 20C)	N/A	-2.33	-2.47	2431575	-3.46		2431575	-3.36		2431575
Langelier Index (@ 4C)	N/A	-2.58	-2.72	2431576	-3.71		2431576	-3.62		2431576
Nitrate (N)	mg/L	0.06	0.05	2431574	0.06	0.05	2431574	ND	0.05	2431574
Saturation pH (@ 20C)	N/A	9.25	9.37	2431575	9.99		2431575	9.89		2431575
Saturation pH (@ 4C)	N/A	9.50	9.62	2431576	10.2		2431576	10.1		2431576
Inorganics										
Total Alkalinity (Total as CaCO3)	mg/L	17	15	2434048	6	5	2434048	7	5	2434048
Dissolved Chloride (Cl)	mg/L	4	3	2434050	3	1	2434050	3	1	2434050
Colour	TCU	44	45	2434064	41	5	2434064	66	30	2434064
Nitrate + Nitrite	mg/L	0.06	0.05	2434066	0.06	0.05	2434066	ND	0.05	2434066
Nitrite (N)	mg/L	ND	ND	2434067	ND	0.01	2434067	ND	0.01	2434067
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	2435725	ND	0.05	2435725	ND	0.05	2435725
Total Organic Carbon (C)	mg/L	6.2	6.2	2434384	6.0	0.5	2434384	6.5	0.5	2434384
Orthophosphate (P)	mg/L	ND	ND	2434065	ND	0.01	2434065	ND	0.01	2434065
pH	pH	6.92	6.90	2436134	6.53	N/A	2436134	6.53	N/A	2436134
Reactive Silica (SiO2)	mg/L	2.4	2.2	2434056	2.6	0.5	2434056	2.4	0.5	2434056
Total Suspended Solids	mg/L	ND	ND	2432501	3	1	2432499	ND	1	2432501
Dissolved Sulphate (SO4)	mg/L	ND	ND	2434053	ND	2	2434053	ND	2	2434053
Turbidity	NTU	1.0	0.6	2436969	0.4	0.1	2436969	1.0	0.1	2436969
Conductivity	uS/cm	51	46	2436148	28	1	2436148	29	1	2436148

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B134942
Report Date: 2011/03/23

Stantec Consulting Ltd
Client Project #: 121510621

Your P.O. #: 16300R-40
Sampler Initials: BW

RESULTS OF ANALYSES OF WATER

Maxxam ID		IX5406			IX5407		IX5408			IX5409		
Sampling Date		2011/03/10			2011/03/10		2011/03/10			2011/03/10		
	Units	**LP-05**	**RDL**	**QC Batch**	**VE-01**	**RDL**	**VE-02**	**RDL**	**QC Batch**	**VE-03**	**RDL**	**QC Batch**
Calculated Parameters												
Anion Sum	me/L	0.490	N/A	2431573	0.190	N/A	0.220	N/A	2431573	0.220	N/A	2431573
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	20	1	2431570	5	1	6	1	2431570	6	1	2431570
Calculated TDS	mg/L	30	1	2431577	16	1	17	1	2431577	17	1	2431577
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1	2431570	ND	1	ND	1	2431570	ND	1	2431570
Cation Sum	me/L	0.590	N/A	2431573	0.260	N/A	0.280	N/A	2431573	0.280	N/A	2431573
Hardness (CaCO3)	mg/L	24	1	2431571	9	1	10	1	2431571	9	1	2431571
Ion Balance (% Difference)	%	9.26	N/A	2431572	15.6	N/A	12.0	N/A	2431572	12.0	N/A	2431572
Langelier Index (@ 20C)	N/A	-2.17		2431575	-3.73		-3.29		2431575	-3.34		2431575
Langelier Index (@ 4C)	N/A	-2.42		2431576	-3.98		-3.54		2431576	-3.59		2431576
Nitrate (N)	mg/L	0.08	0.05	2431574	0.24	0.05	0.22	0.05	2431574	0.23	0.05	2431574
Saturation pH (@ 20C)	N/A	9.10		2431575	10.1		10.0		2431575	10.0		2431575
Saturation pH (@ 4C)	N/A	9.35		2431576	10.4		10.3		2431576	10.3		2431576
Inorganics												
Total Alkalinity (Total as CaCO3)	mg/L	20	5	2434048	5	5	6	5	2434048	6	5	2434048
Dissolved Chloride (Cl)	mg/L	3	1	2434050	3	1	3	1	2434050	3	1	2434050
Colour	TCU	68	30	2434064	43	5	38	5	2434064	40	5	2434064
Nitrate + Nitrite	mg/L	0.08	0.05	2434066	0.24	0.05	0.22	0.05	2434066	0.23	0.05	2434066
Nitrite (N)	mg/L	ND	0.01	2434067	ND	0.01	ND	0.01	2434067	ND	0.01	2434067
Nitrogen (Ammonia Nitrogen)	mg/L	0.06	0.05	2435725	ND	0.05	ND	0.05	2435725	ND	0.05	2435725
Total Organic Carbon (C)	mg/L	6.7	0.5	2434384	6.4	0.5	6.3	0.5	2434384	6.8	0.5	2434384
Orthophosphate (P)	mg/L	ND	0.01	2434065	ND	0.01	ND	0.01	2434065	ND	0.01	2434065
pH	pH	6.93	N/A	2436134	6.41	N/A	6.72	N/A	2436134	6.69	N/A	2436134
Reactive Silica (SiO2)	mg/L	3.1	0.5	2434056	3.8	0.5	3.7	0.5	2434056	3.6	0.5	2434056
Total Suspended Solids	mg/L	ND	1	2432501	ND	1	ND	2	2432499	ND	1	2432501
Dissolved Sulphate (SO4)	mg/L	ND	2	2434053	ND	2	ND	2	2434053	ND	2	2434053
Turbidity	NTU	0.5	0.1	2436969	0.3	0.1	0.3	0.1	2436969	0.3	0.1	2436969
Conductivity	uS/cm	55	1	2436148	26	1	28	1	2436148	28	1	2436148

N/A = Not Applicable
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QC Batch = Quality Control Batch

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Maxxam Job #: B134942
Report Date: 2011/03/23

Stantec Consulting Ltd
Client Project #: 121510621

Your P.O. #: 16300R-40
Sampler Initials: BW

RESULTS OF ANALYSES OF WATER

Maxxam ID		IX5410			IX5411	IX5412		IX5413	IX5413		
Sampling Date		2011/03/10			2011/03/10	2011/03/10		2011/03/10	2011/03/10		
	Units	**VE-04**	**RDL**	**QC Batch**	**VE-05**	**VE-06**	**QC Batch**	**VE-07**	**VE-07 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters											
Anion Sum	me/L	0.240	N/A	2431573	0.220	0.250	2431573	0.200		N/A	2431573
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	7	1	2431570	6	8	2431570	6		1	2431570
Calculated TDS	mg/L	18	1	2431577	18	19	2431577	17		1	2431577
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1	2431570	ND	ND	2431570	ND		1	2431570
Cation Sum	me/L	0.310	N/A	2431573	0.290	0.320	2431573	0.310		N/A	2431573
Hardness (CaCO3)	mg/L	11	1	2431571	10	12	2431571	11		1	2431571
Ion Balance (% Difference)	%	12.7	N/A	2431572	13.7	12.3	2431572	21.6		N/A	2431572
Langelier Index (@ 20C)	N/A	-3.18		2431575	-3.42	-3.07	2431575	-3.43			2431575
Langelier Index (@ 4C)	N/A	-3.43		2431576	-3.67	-3.32	2431576	-3.68			2431576
Nitrate (N)	mg/L	0.10	0.05	2431574	0.30	0.21	2431574	0.22		0.05	2431574
Saturation pH (@ 20C)	N/A	9.88		2431575	10.0	9.81	2431575	9.98			2431575
Saturation pH (@ 4C)	N/A	10.1		2431576	10.3	10.1	2431576	10.2			2431576
Inorganics											
Total Alkalinity (Total as CaCO3)	mg/L	7	5	2434048	6	8	2434048	6	6	5	2434048
Dissolved Chloride (Cl)	mg/L	3	1	2434050	3	2	2434050	2	3	1	2434050
Colour	TCU	79	30	2434064	28	46	2434064	42	44	5	2434064
Nitrate + Nitrite	mg/L	0.10	0.05	2434066	0.30	0.21	2434066	0.22	0.28	0.05	2434066
Nitrite (N)	mg/L	ND	0.01	2434067	ND	ND	2434067	ND	ND	0.01	2434067
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.05	2435725	ND	ND	2435725	ND		0.05	2435725
Total Organic Carbon (C)	mg/L	7.5	0.5	2434384	5.9	6.4	2434384	6.4		0.5	2438671
Orthophosphate (P)	mg/L	ND	0.01	2434065	ND	ND	2434065	ND	ND	0.01	2434065
pH	pH	6.70	N/A	2436134	6.61	6.74	2436134	6.55		N/A	2436134
Reactive Silica (SiO2)	mg/L	3.5	0.5	2434056	4.0	4.2	2434056	4.0	4.0	0.5	2434056
Total Suspended Solids	mg/L	2	1	2432501	5	2	2432501	ND		1	2432499
Dissolved Sulphate (SO4)	mg/L	ND	2	2434053	ND	ND	2434053	ND	ND	2	2434053
Turbidity	NTU	0.4	0.1	2437494	1.2	0.6	2437204	0.5		0.1	2437204
Conductivity	uS/cm	29	1	2436148	29	31	2436148	29		1	2436148

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Report Date: 2011/03/23

Stantec Consulting Ltd
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MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		IX5398	IX5403	IX5404	IX5405	IX5406	IX5407		
Sampling Date		2011/03/09	2011/03/09	2011/03/09	2011/03/09	2011/03/10	2011/03/10		
	Units	**LP-01**	**LP-02**	**LP-03**	**LP-04**	**LP-05**	**VE-01**	**RDL**	**QC Batch**
Metals									
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	0.013	2433844

Maxxam ID		IX5408	IX5409	IX5410	IX5411	IX5412	IX5413		
Sampling Date		2011/03/10	2011/03/10	2011/03/10	2011/03/10	2011/03/10	2011/03/10		
	Units	**VE-02**	**VE-03**	**VE-04**	**VE-05**	**VE-06**	**VE-07**	**RDL**	**QC Batch**
Metals									
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	0.013	2433844

ND = Not detected
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QC Batch = Quality Control Batch

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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		IX5398		IX5403		IX5404	IX5405	IX5406	IX5407	IX5408		
Sampling Date		2011/03/09		2011/03/09		2011/03/09	2011/03/09	2011/03/10	2011/03/10	2011/03/10		
	Units	**LP-01**	**RDL**	**LP-02**	**RDL**	**LP-03**	**LP-04**	**LP-05**	**VE-01**	**VE-02**	**RDL**	**QC Batch**
Metals												
Total Aluminum (Al)	ug/L	143	5.0	95.8	5.0	63.5	156	112	85.6	109	5.0	2432668
Total Antimony (Sb)	ug/L	ND	1.0	ND	1.0	ND	ND	ND	ND	ND	1.0	2432668
Total Arsenic (As)	ug/L	ND	1.0	ND	1.0	1.0	ND	ND	ND	ND	1.0	2432668
Total Barium (Ba)	ug/L	5.8	1.0	4.9	1.0	2.1	2.5	2.1	1.7	1.8	1.0	2432668
Total Beryllium (Be)	ug/L	ND	1.0	ND	1.0	ND	ND	ND	ND	ND	1.0	2432668
Total Bismuth (Bi)	ug/L	ND	2.0	ND	2.0	ND	ND	ND	ND	ND	2.0	2432668
Total Boron (B)	ug/L	ND	50	ND	50	ND	ND	ND	ND	ND	50	2432668
Total Cadmium (Cd)	ug/L	ND	0.017	0.018	0.017	ND	ND	ND	ND	ND	0.017	2432668
Total Calcium (Ca)	ug/L	6430	100	5530	100	2980	3450	7630	2690	2980	100	2432668
Total Chromium (Cr)	ug/L	ND	1.0	5.1	1.0	ND	ND	ND	3.3	ND	1.0	2432668
Total Cobalt (Co)	ug/L	ND	0.40	ND	0.40	ND	ND	ND	ND	ND	0.40	2432668
Total Copper (Cu)	ug/L	ND	2.0	ND	2.0	ND	ND	ND	ND	ND	2.0	2432668
Total Iron (Fe)	ug/L	184	50	152	50	92	270	276	130	228	50	2432668
Total Lead (Pb)	ug/L	ND	0.50	ND	0.50	ND	ND	ND	ND	ND	0.50	2432668
Total Magnesium (Mg)	ug/L	902	100	775	100	522	574	1120	504	539	100	2432668
Total Manganese (Mn)	ug/L	312	2.0	295	2.0	5.7	195	322	5.2	111	2.0	2432668
Total Molybdenum (Mo)	ug/L	ND	2.0	2.5	2.0	ND	ND	ND	ND	ND	2.0	2432668
Total Nickel (Ni)	ug/L	ND	2.0	ND	2.0	ND	ND	ND	ND	ND	2.0	2432668
Total Phosphorus (P)	ug/L	ND	100	ND	100	ND	ND	ND	ND	ND	100	2432668
Total Potassium (K)	ug/L	625	100	448	100	155	180	170	126	139	100	2432668
Total Selenium (Se)	ug/L	ND	1.0	ND	1.0	ND	ND	ND	ND	ND	1.0	2432668
Total Silver (Ag)	ug/L	ND	0.10	ND	0.10	ND	ND	ND	ND	ND	0.10	2432668
Total Sodium (Na)	ug/L	3390	100	2310	100	1910	2210	2310	1770	1770	100	2432668
Total Strontium (Sr)	ug/L	34.8	2.0	33.1	2.0	9.3	6.9	18.3	6.9	8.7	2.0	2432668
Total Thallium (Tl)	ug/L	ND	0.10	ND	0.10	ND	ND	ND	ND	ND	0.10	2432668
Total Tin (Sn)	ug/L	ND	2.0	ND	2.0	ND	ND	ND	ND	ND	2.0	2432668
Total Titanium (Ti)	ug/L	3.8	2.0	2.2	2.0	2.6	4.8	3.8	3.3	3.5	2.0	2432668
Total Uranium (U)	ug/L	ND	0.10	ND	0.10	ND	ND	ND	ND	ND	0.10	2432668
Total Vanadium (V)	ug/L	ND	2.0	ND	2.0	ND	ND	ND	ND	ND	2.0	2432668
Total Zinc (Zn)	ug/L	ND(1)	20	ND	5.0	68	ND(1)	ND(1)	ND(1)	29	20	2432668

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) - Elevated reporting limit due to lab contamination.

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Client Project #: 121510621

Your P.O. #: 16300R-40
Sampler Initials: BW

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		IX5409			IX5410	IX5411	IX5411	IX5412	IX5413		
Sampling Date		2011/03/10			2011/03/10	2011/03/10	2011/03/10	2011/03/10	2011/03/10		
	Units	**VE-03**	**RDL**	**QC Batch**	**VE-04**	**VE-05**	**VE-05 Lab-Dup**	**VE-06**	**VE-07**	**RDL**	**QC Batch**
Metals											
Total Aluminum (Al)	ug/L	95.0	5.0	2432668	128	104	103	129	106	5.0	2432801
Total Antimony (Sb)	ug/L	ND	1.0	2432668	ND	ND	ND	ND	ND	1.0	2432801
Total Arsenic (As)	ug/L	ND	1.0	2432668	ND	ND	ND	ND	ND	1.0	2432801
Total Barium (Ba)	ug/L	2.3	1.0	2432668	2.1	3.8	3.7	2.0	1.9	1.0	2432801
Total Beryllium (Be)	ug/L	ND	1.0	2432668	ND	ND	ND	ND	ND	1.0	2432801
Total Bismuth (Bi)	ug/L	ND	2.0	2432668	ND	ND	ND	ND	ND	2.0	2432801
Total Boron (B)	ug/L	ND	50	2432668	ND	ND	ND	ND	ND	50	2432801
Total Cadmium (Cd)	ug/L	ND	0.017	2432668	ND	0.020	ND	ND	ND	0.017	2432801
Total Calcium (Ca)	ug/L	2880	100	2432668	3360	2900	2830	3560	3190	100	2432801
Total Chromium (Cr)	ug/L	ND	1.0	2432668	1.3	2.6	2.7	52.9	6.9	1.0	2432801
Total Cobalt (Co)	ug/L	ND	0.40	2432668	ND	ND	ND	ND	ND	0.40	2432801
Total Copper (Cu)	ug/L	ND	2.0	2432668	ND	ND	ND	ND	ND	2.0	2432801
Total Iron (Fe)	ug/L	205	50	2432668	344	155	175	154	108	50	2432801
Total Lead (Pb)	ug/L	ND	0.50	2432668	ND	ND	ND	ND	ND	0.50	2432801
Total Magnesium (Mg)	ug/L	540	100	2432668	507	632	607	640	620	100	2432801
Total Manganese (Mn)	ug/L	21.3	2.0	2432668	163	32.7	31.9	195	72.5	2.0	2432801
Total Molybdenum (Mo)	ug/L	ND	2.0	2432668	ND	ND	ND	ND	ND	2.0	2432801
Total Nickel (Ni)	ug/L	ND	2.0	2432668	ND	ND	ND	ND	ND	2.0	2432801
Total Phosphorus (P)	ug/L	ND	100	2432668	ND	ND	ND	ND	ND	100	2432801
Total Potassium (K)	ug/L	163	100	2432668	165	172	175	203	179	100	2432801
Total Selenium (Se)	ug/L	ND	1.0	2432668	ND	ND	ND	ND	ND	1.0	2432801
Total Silver (Ag)	ug/L	ND	0.10	2432668	ND	ND	ND	ND	ND	0.10	2432801
Total Sodium (Na)	ug/L	1950	100	2432668	1930	1970	1900	1700	1990	100	2432801
Total Strontium (Sr)	ug/L	9.0	2.0	2432668	11.1	6.4	6.8	8.2	7.2	2.0	2432801
Total Thallium (Tl)	ug/L	ND	0.10	2432668	ND	ND	ND	ND	ND	0.10	2432801
Total Tin (Sn)	ug/L	ND	2.0	2432668	ND	ND	ND	ND	ND	2.0	2432801
Total Titanium (Ti)	ug/L	3.6	2.0	2432668	4.4	2.9	4.4	4.0	3.1	2.0	2432801
Total Uranium (U)	ug/L	ND	0.10	2432668	ND	ND	ND	ND	ND	0.10	2432801
Total Vanadium (V)	ug/L	ND	2.0	2432668	ND	ND	ND	ND	ND	2.0	2432801
Total Zinc (Zn)	ug/L	28	20	2432668	5.2	61.3	59.5	14.8	7.0	5.0	2432801

ND = Not detected
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Your P.O. #: 16300R-40
Sampler Initials: BW

GENERAL COMMENTS

Sample IX5398-01: Total Suspended Solids: Sample integrity may have been compromised, the sample exceeded it's hold time prior to being analyzed. RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5403-01: Total Suspended Solids: Sample integrity may have been compromised, the sample exceeded it's hold time prior to being analyzed. RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5404-01: Total Suspended Solids: Sample integrity may have been compromised, the sample exceeded it's hold time prior to being analyzed. RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5405-01: Total Suspended Solids: Sample integrity may have been compromised, the sample exceeded it's hold time prior to being analyzed. RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5406-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5407-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5408-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5409-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5410-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5411-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5412-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample IX5413-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2432499	Total Suspended Solids	2011/03/17					ND, RDL=1	mg/L	3.5	25	100	80 - 120
2432501	Total Suspended Solids	2011/03/17					ND, RDL=1	mg/L	NC	25	99	80 - 120
2432668	Total Aluminum (Al)	2011/03/18	105	80 - 120	107	80 - 120	6.7, RDL=5.0(1)	ug/L	NC(2)	25		
2432668	Total Antimony (Sb)	2011/03/18	101	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432668	Total Arsenic (As)	2011/03/18	100	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432668	Total Barium (Ba)	2011/03/18	NC	80 - 120	95	80 - 120	ND, RDL=1.0	ug/L	2.9	25		
2432668	Total Beryllium (Be)	2011/03/18	95	80 - 120	91	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432668	Total Bismuth (Bi)	2011/03/18	101	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432668	Total Boron (B)	2011/03/18	100	80 - 120	95	80 - 120	ND, RDL=50	ug/L	NC	25		
2432668	Total Cadmium (Cd)	2011/03/18	101	80 - 120	98	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2432668	Total Calcium (Ca)	2011/03/18	100	80 - 120	102	80 - 120	ND, RDL=100	ug/L	0.1	25		
2432668	Total Chromium (Cr)	2011/03/18	103	80 - 120	102	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432668	Total Cobalt (Co)	2011/03/18	99	80 - 120	100	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2432668	Total Copper (Cu)	2011/03/18	94	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432668	Total Iron (Fe)	2011/03/18	108	80 - 120	109	80 - 120	ND, RDL=50	ug/L	NC	25		
2432668	Total Lead (Pb)	2011/03/18	99	80 - 120	97	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2432668	Total Magnesium (Mg)	2011/03/18	112	80 - 120	110	80 - 120	ND, RDL=100	ug/L	3.7	25		
2432668	Total Manganese (Mn)	2011/03/18	100	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432668	Total Molybdenum (Mo)	2011/03/18	108	80 - 120	106	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432668	Total Nickel (Ni)	2011/03/18	103	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432668	Total Phosphorus (P)	2011/03/18	104	80 - 120	105	80 - 120	ND, RDL=100	ug/L	NC	25		
2432668	Total Potassium (K)	2011/03/18	110	80 - 120	107	80 - 120	ND, RDL=100	ug/L	NC	25		
2432668	Total Selenium (Se)	2011/03/18	102	80 - 120	101	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432668	Total Silver (Ag)	2011/03/18	109	80 - 120	104	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2432668	Total Sodium (Na)	2011/03/18	109	80 - 120	108	80 - 120	ND, RDL=100	ug/L	4.7	25		
2432668	Total Strontium (Sr)	2011/03/18	100	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	6.0	25		
2432668	Total Thallium (Tl)	2011/03/18	103	80 - 120	101	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2432668	Total Tin (Sn)	2011/03/18	102	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432668	Total Titanium (Ti)	2011/03/18	102	80 - 120	107	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432668	Total Uranium (U)	2011/03/18	106	80 - 120	103	80 - 120	ND, RDL=0.10	ug/L	3.0	25		
2432668	Total Vanadium (V)	2011/03/18	103	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432668	Total Zinc (Zn)	2011/03/18	101	80 - 120	100	80 - 120	ND, RDL=5.0	ug/L	NC(3)	25		
2432801	Total Aluminum (Al)	2011/03/18			111	80 - 120	7.1, RDL=5.0(1)	ug/L	1.1	25		
2432801	Total Antimony (Sb)	2011/03/18			104	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432801	Total Arsenic (As)	2011/03/18			101	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432801	Total Barium (Ba)	2011/03/18			99	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432801	Total Beryllium (Be)	2011/03/18			92	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432801	Total Bismuth (Bi)	2011/03/18			102	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432801	Total Boron (B)	2011/03/18			98	80 - 120	ND, RDL=50	ug/L	NC	25		

Maxxam Job #: B134942
Report Date: 2011/03/23

Stantec Consulting Ltd
Client Project #: 121510621

Your P.O. #: 16300R-40
Sampler Initials: BW

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2432801	Total Cadmium (Cd)	2011/03/18			99	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2432801	Total Calcium (Ca)	2011/03/18			104	80 - 120	ND, RDL=100	ug/L	2.3	25		
2432801	Total Chromium (Cr)	2011/03/18			104	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432801	Total Cobalt (Co)	2011/03/18			100	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2432801	Total Copper (Cu)	2011/03/18			99	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432801	Total Iron (Fe)	2011/03/18			110	80 - 120	ND, RDL=50	ug/L	NC	25		
2432801	Total Lead (Pb)	2011/03/18			99	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2432801	Total Magnesium (Mg)	2011/03/18			110	80 - 120	ND, RDL=100	ug/L	4.1	25		
2432801	Total Manganese (Mn)	2011/03/18			101	80 - 120	ND, RDL=2.0	ug/L	2.5	25		
2432801	Total Molybdenum (Mo)	2011/03/18			108	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432801	Total Nickel (Ni)	2011/03/18			101	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432801	Total Phosphorus (P)	2011/03/18			106	80 - 120	ND, RDL=100	ug/L	NC	25		
2432801	Total Potassium (K)	2011/03/18			109	80 - 120	ND, RDL=100	ug/L	NC	25		
2432801	Total Selenium (Se)	2011/03/18			101	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2432801	Total Silver (Ag)	2011/03/18			105	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2432801	Total Sodium (Na)	2011/03/18			108	80 - 120	ND, RDL=100	ug/L	3.8	25		
2432801	Total Strontium (Sr)	2011/03/18			103	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432801	Total Thallium (Tl)	2011/03/18			103	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2432801	Total Tin (Sn)	2011/03/18			103	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432801	Total Titanium (Ti)	2011/03/18			105	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432801	Total Uranium (U)	2011/03/18			107	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2432801	Total Vanadium (V)	2011/03/18			104	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2432801	Total Zinc (Zn)	2011/03/18			100	80 - 120	ND, RDL=5.0	ug/L	2.9	25		
2433844	Total Mercury (Hg)	2011/03/18	97	80 - 120	88	80 - 120	ND, RDL=0.013	ug/L	NC	25	88	80 - 120
2434048	Total Alkalinity (Total as CaCO3)	2011/03/18	98	80 - 120	109	80 - 120	ND, RDL=5	mg/L	NC	25	106	80 - 120
2434050	Dissolved Chloride (Cl)	2011/03/21	101	80 - 120	101	80 - 120	ND, RDL=1	mg/L	NC	25	99	80 - 120
2434053	Dissolved Sulphate (SO4)	2011/03/21	107	80 - 120	102	80 - 120	ND, RDL=2	mg/L	NC	25	96	80 - 120
2434056	Reactive Silica (SiO2)	2011/03/21	94	80 - 120	101	80 - 120	ND, RDL=0.5	mg/L	0.7	25	101	75 - 125
2434064	Colour	2011/03/18					ND, RDL=5	TCU	5.5	25	101	80 - 120
2434065	Orthophosphate (P)	2011/03/21	93	80 - 120	103	80 - 120	ND, RDL=0.01	mg/L	NC	25	101	80 - 120
2434066	Nitrate + Nitrite	2011/03/21	95	80 - 120	97	80 - 120	ND, RDL=0.05	mg/L	NC	25	102	80 - 120
2434067	Nitrite (N)	2011/03/18	82	80 - 120	98	80 - 120	ND, RDL=0.01	mg/L	NC	25	101	80 - 120
2434384	Total Organic Carbon (C)	2011/03/18	98	80 - 120	100	80 - 120	ND, RDL=0.5	mg/L	NC	25	98	80 - 120
2435725	Nitrogen (Ammonia Nitrogen)	2011/03/21	94	80 - 120	98	80 - 120	ND, RDL=0.05	mg/L	NC	25	99	80 - 120
2436134	pH	2011/03/21					5.59, RDL=N/A	pH	1.7	25	101	80 - 120
2436148	Conductivity	2011/03/21					1, RDL=1	uS/cm	1.6	25	102	80 - 120
2436969	Turbidity	2011/03/22					ND, RDL=0.1	NTU	NC	25	96	80 - 120
2437204	Turbidity	2011/03/22					ND, RDL=0.1	NTU	NC	25	94	80 - 120

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B134942
Report Date: 2011/03/23

Stantec Consulting Ltd
Client Project #: 121510621

Your P.O. #: 16300R-40
Sampler Initials: BW

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2437494	Turbidity	2011/03/22					ND, RDL=0.1	NTU	NC	25	95	80 - 120
2438671	Total Organic Carbon (C)	2011/03/23	103	80 - 120	99	80 - 120	ND, RDL=0.5	mg/L	NC	25	103	80 - 120

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) - Low level lab contamination. Minimal impact on data quality.
(2) - Poor RPD due to sample inhomogeneity.
(3) - Elevated reporting limit due to lab contamination.

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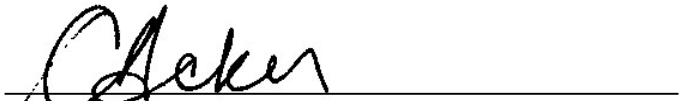
Validation Signature Page

Maxxam Job #: B134942

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



COLLEEN ACKER,

JERRY ARENOVICH, Inorganics Manager

KEVIN MACDONALD, Inorganics Supervisor

==========

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.

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Round 2

Your P.O. #: 16300R-40
Your Project #: 121510621
Site: VICTORIA LAKE, CENTRAL NL
Your C.O.C. #: ES251611

Attention: Barry Wicks
Stantec Consulting Ltd
St. John's - Standing Offer
607 Torbay Rd
St. John's, NL
A1A 4Y6

Report Date: 2011/04/19

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B149922
Received: 2011/04/13, 10:41

Sample Matrix: Water
Samples Received: 12

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonate, Bicarbonate and Hydroxide	12	N/A	2011/04/15	CAM SOP-00102	APHA 4500-CO2 D
Alkalinity	12	N/A	2011/04/15	ATL SOP 00013 R4	Based on EPA310.2
Chloride	12	N/A	2011/04/18	ATL SOP 00014 R6	Based on SM4500-Cl-
Colour	12	N/A	2011/04/15	ATL SOP 00020 R3.	Based on SM2120C
Conductance - water	12	N/A	2011/04/14	ATL SOP 00004 R5/00006 R4	Based on SM2510B
Hardness (calculated as CaCO3)	6	N/A	2011/04/15	ATL SOP 00048	Based on SM2340B
Hardness (calculated as CaCO3)	6	N/A	2011/04/18	ATL SOP 00048	Based on SM2340B
Mercury - Total (CVAA,LL)	12	2011/04/15	2011/04/18	ATL SOP 00026 R6	Based on EPA245.1
Metals Water Total MS	6	2011/04/14	2011/04/14	ATL SOP 00059 R1	Based on EPA6020A
Metals Water Total MS	6	2011/04/15	2011/04/16	ATL SOP 00059 R1	Based on EPA6020A
Ion Balance (% Difference)	12	N/A	2011/04/19		
Anion and Cation Sum	12	N/A	2011/04/19		
Nitrogen Ammonia - water	12	N/A	2011/04/18	ATL SOP 00015 R5	Based on USEPA 350.1
Nitrogen - Nitrate + Nitrite	12	N/A	2011/04/18	ATL SOP 00016 R4	Based on USGS - Enz.
Nitrogen - Nitrite	12	N/A	2011/04/15	ATL SOP 00017 R4	Based on SM4500-NO2B
Nitrogen - Nitrate (as N)	12	N/A	2011/04/19	ATL SOP 00018 R3	Based on ASTMD3867
pH	12	N/A	2011/04/14	ATL SOP 00003 R5/00005 R7	Based on SM4500H+B
Phosphorus - ortho	12	N/A	2011/04/15	ATL SOP 00021 R3	Based on USEPA 365.1
Sat. pH and Langelier Index (@ 20C)	12	N/A	2011/04/19		
Sat. pH and Langelier Index (@ 4C)	12	N/A	2011/04/19		
Reactive Silica	12	N/A	2011/04/15	ATL SOP 00022 R3	Based on EPA 366.0
Sulphate	12	N/A	2011/04/15	ATL SOP 00023 R3	Based on EPA 375.4
Total Dissolved Solids (TDS calc)	12	N/A	2011/04/19		
Organic carbon - Total (TOC)	12	N/A	2011/04/18	ATL SOP 00037 R4	Based on SM5310C
Total Suspended Solids	12	N/A	2011/04/14	ATL SOP 00007 R3	based on EPA 160.2
Turbidity	12	N/A	2011/04/18	ATL SOP 00011 R5	based on EPA 180.1

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

../2

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Maxxam Job #: B149922
Report Date: 2011/04/19

Stantec Consulting Ltd
Client Project #: 121510621
Project name: VICTORIA LAKE, CENTRAL NL
Your P.O. #: 16300R-40
Sampler Initials: SM

Encryption Key

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

MICHELLE HILL, Project Manager
Email: MHill@maxxam.ca
Phone# (902) 420-0203

==========

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: 2

Maxxam Job #: B149922
Report Date: 2011/04/19

Stantec Consulting Ltd
Client Project #: 121510621
Project name: VICTORIA LAKE, CENTRAL NL
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		JE5769	JE5769	JE5793		JE5794	JE5794			JE5795		
Sampling Date		2011/03/30	2011/03/30	2011/03/30		2011/03/30	2011/03/30			2011/03/30		
	Units	**LP-01**	**LP-01 Lab-Dup**	**LP-02**	**RDL**	**LP-03**	**LP-03 Lab-Dup**	**RDL**	**QC Batch**	**LP-04**	**RDL**	**QC Batch**
Calculated Parameters												
Anion Sum	me/L	0.440		0.380	N/A	0.300		N/A	2457126	0.600	N/A	2457126
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	13		12	1	11		1	2457122	24	1	2457122
Calculated TDS	mg/L	27		23	1	20		1	2457131	33	1	2457131
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND		ND	1	ND		1	2457122	ND	1	2457122
Cation Sum	me/L	0.500		0.420	N/A	0.370		N/A	2457126	0.610	N/A	2457126
Hardness (CaCO3)	mg/L	16		14	1	14		1	2457124	25	1	2457124
Ion Balance (% Difference)	%	6.38		5.00	N/A	10.5		N/A	2457125	0.830	N/A	2457125
Langelier Index (@ 20C)	N/A	-2.82		-2.87		-2.86			2457129	-2.22		2457129
Langelier Index (@ 4C)	N/A	-3.07		-3.12		-3.11			2457130	-2.47		2457130
Nitrate (N)	mg/L	ND		0.08	0.05	0.09		0.05	2457127	ND	0.05	2457127
Saturation pH (@ 20C)	N/A	9.46		9.53		9.62			2457129	9.02		2457129
Saturation pH (@ 4C)	N/A	9.71		9.78		9.87			2457130	9.27		2457130
Inorganics												
Total Alkalinity (Total as CaCO3)	mg/L	13		12	5	11		5	2458685	24	5	2458685
Dissolved Chloride (Cl)	mg/L	6		5	1	3		1	2458686	4	1	2458686
Colour	TCU	55		48	10	36		5	2458689	46	10	2458689
Nitrate + Nitrite	mg/L	ND		0.08	0.05	0.09		0.05	2458699	ND	0.05	2458699
Nitrite (N)	mg/L	ND		ND	0.01	ND		0.01	2458700	ND	0.01	2458700
Nitrogen (Ammonia Nitrogen)	mg/L	ND		ND	0.05	ND	ND	0.05	2461192	ND	0.05	2461193
Total Organic Carbon (C)	mg/L	6.3		6.0	0.5	4.8		0.5	2461804	5.5	0.5	2461804
Orthophosphate (P)	mg/L	ND		ND	0.01	ND		0.01	2458690	ND	0.01	2458690
pH	pH	6.64		6.66	N/A	6.76		N/A	2458630	6.80	N/A	2458630
Reactive Silica (SiO2)	mg/L	2.2		1.7	0.5	3.0		0.5	2458688	2.8	0.5	2458688
Total Suspended Solids	mg/L	3		2	1	ND		1	2458269	ND	1	2458269
Dissolved Sulphate (SO4)	mg/L	ND		ND	2	ND		2	2458687	ND	2	2458687
Turbidity	NTU	1.7	2.2	1.2	0.1	0.5		0.1	2461634	0.7	0.1	2461634
Conductivity	uS/cm	48		42	1	34		1	2458638	61	1	2458638

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B149922
Report Date: 2011/04/19

Stantec Consulting Ltd
Client Project #: 121510621
Project name: VICTORIA LAKE, CENTRAL NL
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		JE5796		JE5799	JE5950	JE5950	JE5951		
Sampling Date		2011/03/30		2011/03/31	2011/03/31	2011/03/31	2011/03/31		
	Units	**LP-05**	**RDL**	**VE-01**	**VE-02**	**VE-02 Lab-Dup**	**VE-03**	**RDL**	**QC Batch**
Calculated Parameters									
Anion Sum	me/L	0.530	N/A	0.270	0.250		0.240	N/A	2457126
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	21	1	9	9		8	1	2457122
Calculated TDS	mg/L	30	1	19	18		17	1	2457131
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1	ND	ND		ND	1	2457122
Cation Sum	me/L	0.570	N/A	0.320	0.310		0.300	N/A	2457126
Hardness (CaCO3)	mg/L	23	1	12	11		11	1	2457124
Ion Balance (% Difference)	%	3.64	N/A	8.47	10.7		11.1	N/A	2457125
Langelier Index (@ 20C)	N/A	-2.29		-3.12	-3.13		-3.16		2457129
Langelier Index (@ 4C)	N/A	-2.54		-3.37	-3.38		-3.41		2457130
Nitrate (N)	mg/L	0.07	0.05	0.15	0.16		0.18	0.05	2457127
Saturation pH (@ 20C)	N/A	9.10		9.75	9.78		9.84		2457129
Saturation pH (@ 4C)	N/A	9.35		10.0	10.0		10.1		2457130
Inorganics									
Total Alkalinity (Total as CaCO3)	mg/L	21	5	9	9		8	5	2458685
Dissolved Chloride (Cl)	mg/L	4	1	2	2		2	1	2458686
Colour	TCU	43	30	32	34		41	5	2458689
Nitrate + Nitrite	mg/L	0.07	0.05	0.15	0.16		0.18	0.05	2458699
Nitrite (N)	mg/L	ND	0.01	ND	ND		ND	0.01	2458700
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.05	ND	ND	ND	ND	0.05	2461193
Total Organic Carbon (C)	mg/L	6.5	0.5	4.9	5.2		5.7	0.5	2461804
Orthophosphate (P)	mg/L	ND	0.01	ND	ND		ND	0.01	2458690
pH	pH	6.81	N/A	6.63	6.65		6.68	N/A	2458630
Reactive Silica (SiO2)	mg/L	2.6	0.5	4.2	3.7		3.4	0.5	2458688
Total Suspended Solids	mg/L	ND	1	3	2		1	1	2458269
Dissolved Sulphate (SO4)	mg/L	ND	2	ND	ND		ND	2	2458687
Turbidity	NTU	0.7	0.1	0.7	0.4		0.4	0.1	2461634
Conductivity	uS/cm	56	1	30	28		27	1	2458638

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B149922
Report Date: 2011/04/19

Stantec Consulting Ltd
Client Project #: 121510621
Project name: VICTORIA LAKE, CENTRAL NL
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		JE5952		JE5953	JE5954	JE5955	JE5955		
Sampling Date		2011/03/31		2011/03/31	2011/03/31	2011/03/31	2011/03/31		
	Units	**VE-04**	**RDL**	**VE-05**	**VE-06**	**VE-07**	**VE-07 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters									
Anion Sum	me/L	0.250	N/A	0.260	0.400	0.420		N/A	2457126
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	9	1	8	16	14		1	2457122
Calculated TDS	mg/L	18	1	20	28	28		1	2457131
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1	ND	ND	ND		1	2457122
Cation Sum	me/L	0.320	N/A	0.330	0.490	0.440		N/A	2457126
Hardness (CaCO3)	mg/L	11	1	12	20	18		1	2457124
Ion Balance (% Difference)	%	12.3	N/A	11.9	10.1	2.33		N/A	2457125
Langelier Index (@ 20C)	N/A	-3.17		-3.23	-2.48	-2.66			2457129
Langelier Index (@ 4C)	N/A	-3.42		-3.49	-2.73	-2.92			2457130
Nitrate (N)	mg/L	0.10	0.05	0.38	0.25	0.29		0.05	2457127
Saturation pH (@ 20C)	N/A	9.80		9.81	9.29	9.41			2457129
Saturation pH (@ 4C)	N/A	10.1		10.1	9.54	9.67			2457130
Inorganics									
Total Alkalinity (Total as CaCO3)	mg/L	9	5	8	16	14	13	5	2458685
Dissolved Chloride (Cl)	mg/L	2	1	2	2	2	2	1	2458686
Colour	TCU	58	30	22	34	28	30	5	2458689
Nitrate + Nitrite	mg/L	0.10	0.05	0.38	0.25	0.29	0.29	0.05	2458699
Nitrite (N)	mg/L	ND	0.01	ND	ND	ND	ND	0.01	2458700
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.05	ND	ND	ND		0.05	2461193
Total Organic Carbon (C)	mg/L	7.2	0.5	4.8	4.5	4.3		0.5	2461804
Orthophosphate (P)	mg/L	ND	0.01	ND	ND	ND	ND	0.01	2458690
pH	pH	6.63	N/A	6.58	6.81	6.75		N/A	2458630
Reactive Silica (SiO2)	mg/L	3.4	0.5	4.4	5.2	5.0	4.9	0.5	2458688
Total Suspended Solids	mg/L	42	2	ND	ND	1		1	2458269
Dissolved Sulphate (SO4)	mg/L	ND	2	ND	ND	3	ND	2	2458687
Turbidity	NTU	0.7	0.1	0.4	0.5	0.3		0.1	2461634
Conductivity	uS/cm	27	1	30	45	41		1	2458638

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B149922
Report Date: 2011/04/19

Stantec Consulting Ltd
Client Project #: 121510621
Project name: VICTORIA LAKE, CENTRAL NL
Your P.O. #: 16300R-40
Sampler Initials: SM

MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		JE5769	JE5769	JE5793	JE5794	JE5795	JE5796	JE5799		
Sampling Date		2011/03/30	2011/03/30	2011/03/30	2011/03/30	2011/03/30	2011/03/30	2011/03/31		
	Units	**LP-01**	**LP-01 Lab-Dup**	**LP-02**	**LP-03**	**LP-04**	**LP-05**	**VE-01**	**RDL**	**QC Batch**
Metals										
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.013	2461198

Maxxam ID		JE5950	JE5951	JE5952	JE5953	JE5954	JE5955		
Sampling Date		2011/03/31	2011/03/31	2011/03/31	2011/03/31	2011/03/31	2011/03/31		
	Units	**VE-02**	**VE-03**	**VE-04**	**VE-05**	**VE-06**	**VE-07**	**RDL**	**QC Batch**
Metals									
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	0.013	2461198

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		JE5769	JE5793	JE5793	JE5794	JE5795	JE5796	JE5799		
Sampling Date		2011/03/30	2011/03/30	2011/03/30	2011/03/30	2011/03/30	2011/03/30	2011/03/31		
	Units	**LP-01**	**LP-02**	**LP-02 Lab-Dup**	**LP-03**	**LP-04**	**LP-05**	**VE-01**	**RDL**	**QC Batch**
Metals										
Total Aluminum (Al)	ug/L	232	128	137	50.0	81.5	106	77.7	5.0	2458303
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	2458303
Total Arsenic (As)	ug/L	ND	ND	ND	1.5	ND	ND	ND	1.0	2458303
Total Barium (Ba)	ug/L	6.1	4.5	4.3	3.1	2.2	2.1	5.0	1.0	2458303
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	2458303
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2458303
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	ND	50	2458303
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.017	2458303
Total Calcium (Ca)	ug/L	5040	4630	4810	4270	7780	7440	3640	100	2458303
Total Chromium (Cr)	ug/L	ND	5.0	5.1	1.6	ND	2.1	2.7	1.0	2458303
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.40	2458303
Total Copper (Cu)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2458303
Total Iron (Fe)	ug/L	328	176	181	111	189	157	208	50	2458303
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.50	2458303
Total Magnesium (Mg)	ug/L	731	663	685	678	1230	1100	597	100	2458303
Total Manganese (Mn)	ug/L	219	110	112	28.9	196	67.3	83.4	2.0	2458303
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2458303
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2458303
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	ND	100	2458303
Total Potassium (K)	ug/L	664	461	471	237	195	168	159	100	2458303
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	2458303
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.10	2458303
Total Sodium (Na)	ug/L	3740	2720	2810	2010	2410	2270	1690	100	2458303
Total Strontium (Sr)	ug/L	26.3	26.0	27.8	14.3	14.1	19.0	9.3	2.0	2458303
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.10	2458303
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2458303
Total Titanium (Ti)	ug/L	7.5	4.4	4.3	ND	2.5	3.0	3.6	2.0	2458303
Total Uranium (U)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.10	2458303
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2458303
Total Zinc (Zn)	ug/L	73.9	5.4	6.1	8.6	ND	6.7	8.0	5.0	2458303

ND = Not detected
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Maxxam Job #: B149922
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Stantec Consulting Ltd
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Your P.O. #: 16300R-40
Sampler Initials: SM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		JE5950	JE5951	JE5952	JE5953	JE5954	JE5955		
Sampling Date		2011/03/31	2011/03/31	2011/03/31	2011/03/31	2011/03/31	2011/03/31		
	Units	**VE-02**	**VE-03**	**VE-04**	**VE-05**	**VE-06**	**VE-07**	**RDL**	**QC Batch**
Metals									
Total Aluminum (Al)	ug/L	62.2	53.7	246	101	66.8	63.1	5.0	2459994
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2459994
Total Arsenic (As)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2459994
Total Barium (Ba)	ug/L	1.5	1.1	4.3	3.6	1.8	2.2	1.0	2459994
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2459994
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2459994
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	50	2459994
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	ND	0.048	0.017	2459994
Total Calcium (Ca)	ug/L	3600	3490	3420	3520	6380	5500	100	2459994
Total Chromium (Cr)	ug/L	ND	1.1	3.0	22.9	ND	4.9	1.0	2459994
Total Cobalt (Co)	ug/L	ND	ND	0.44	ND	ND	ND	0.40	2459994
Total Copper (Cu)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2459994
Total Iron (Fe)	ug/L	163	186	573	445	160	99	50	2459994
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	ND	0.50	2459994
Total Magnesium (Mg)	ug/L	582	561	669	730	977	945	100	2459994
Total Manganese (Mn)	ug/L	45.0	16.1	260	174	377	120	2.0	2459994
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2459994
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2459994
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	100	2459994
Total Potassium (K)	ug/L	131	131	184	160	181	187	100	2459994
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2459994
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	0.10	2459994
Total Sodium (Na)	ug/L	1660	1660	1670	1740	1830	1850	100	2459994
Total Strontium (Sr)	ug/L	9.0	9.5	10.3	8.4	14.2	13.7	2.0	2459994
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	0.10	2459994
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2459994
Total Titanium (Ti)	ug/L	3.2	2.7	10.3	3.7	3.2	2.8	2.0	2459994
Total Uranium (U)	ug/L	ND	ND	ND	ND	ND	ND	0.10	2459994
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2459994
Total Zinc (Zn)	ug/L	ND	ND	91.3	27.9	ND	11.5	5.0	2459994

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Stantec Consulting Ltd
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Package 1	14.8°C

Each temperature is the average of up to three cooler temperatures taken at receipt

GENERAL COMMENTS

All samples for TSS analysis received past the 7 day hold time for this test.
Sample integrity may have been compromised.

Sample JE5769-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JE5794-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JE5799-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JE5950-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JE5951-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JE5952-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JE5953-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JE5954-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

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Your P.O. #: 16300R-40
Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2458269	Total Suspended Solids	2011/04/14					ND, RDL=1	mg/L	2.5	25	99	80 - 120
2458303	Total Aluminum (Al)	2011/04/14	97	80 - 120	98	80 - 120	5.7, RDL=5.0(1)	ug/L	6.3	25		
2458303	Total Antimony (Sb)	2011/04/14	102	80 - 120	106	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2458303	Total Arsenic (As)	2011/04/14	98	80 - 120	100	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2458303	Total Barium (Ba)	2011/04/14	101	80 - 120	103	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2458303	Total Beryllium (Be)	2011/04/14	103	80 - 120	107	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2458303	Total Bismuth (Bi)	2011/04/14	98	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2458303	Total Boron (B)	2011/04/14	102	80 - 120	100	80 - 120	ND, RDL=50	ug/L	NC	25		
2458303	Total Cadmium (Cd)	2011/04/14	99	80 - 120	99	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2458303	Total Calcium (Ca)	2011/04/14	95	80 - 120	97	80 - 120	ND, RDL=100	ug/L	3.9	25		
2458303	Total Chromium (Cr)	2011/04/14	99	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	2.0	25		
2458303	Total Cobalt (Co)	2011/04/14	97	80 - 120	96	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2458303	Total Copper (Cu)	2011/04/14	98	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2458303	Total Iron (Fe)	2011/04/14	103	80 - 120	105	80 - 120	ND, RDL=50	ug/L	NC	25		
2458303	Total Lead (Pb)	2011/04/14	97	80 - 120	100	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2458303	Total Magnesium (Mg)	2011/04/14	104	80 - 120	101	80 - 120	ND, RDL=100	ug/L	3.3	25		
2458303	Total Manganese (Mn)	2011/04/14	95	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	1.8	25		
2458303	Total Molybdenum (Mo)	2011/04/14	105	80 - 120	105	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2458303	Total Nickel (Ni)	2011/04/14	99	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2458303	Total Phosphorus (P)	2011/04/14	95	80 - 120	97	80 - 120	ND, RDL=100	ug/L	NC	25		
2458303	Total Potassium (K)	2011/04/14	105	80 - 120	106	80 - 120	ND, RDL=100	ug/L	NC	25		
2458303	Total Selenium (Se)	2011/04/14	98	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2458303	Total Silver (Ag)	2011/04/14	105	80 - 120	106	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2458303	Total Sodium (Na)	2011/04/14	97	80 - 120	95	80 - 120	ND, RDL=100	ug/L	3.3	25		
2458303	Total Strontium (Sr)	2011/04/14	100	80 - 120	105	80 - 120	ND, RDL=2.0	ug/L	6.5	25		
2458303	Total Thallium (Tl)	2011/04/14	100	80 - 120	101	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2458303	Total Tin (Sn)	2011/04/14	102	80 - 120	104	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2458303	Total Titanium (Ti)	2011/04/14	99	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2458303	Total Uranium (U)	2011/04/14	105	80 - 120	108	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2458303	Total Vanadium (V)	2011/04/14	101	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2458303	Total Zinc (Zn)	2011/04/14	96	80 - 120	96	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2458630	pH	2011/04/14					5.09, RDL=N/A	pH	0.5	25	102	80 - 120
2458638	Conductivity	2011/04/14					ND, RDL=1	uS/cm	0.5	25	100	80 - 120
2458685	Total Alkalinity (Total as CaCO3)	2011/04/15	108	80 - 120	110	80 - 120	ND, RDL=5	mg/L	NC	25	104	80 - 120
2458686	Dissolved Chloride (Cl)	2011/04/18	102	80 - 120	104	80 - 120	ND, RDL=1	mg/L	NC	25	100	80 - 120
2458687	Dissolved Sulphate (SO4)	2011/04/15	119	80 - 120	116	80 - 120	ND, RDL=2	mg/L	NC	25	110	80 - 120
2458688	Reactive Silica (SiO2)	2011/04/15	93	80 - 120	99	80 - 120	ND, RDL=0.5	mg/L	0.9	25	97	75 - 125
2458689	Colour	2011/04/15					ND, RDL=5	TCU	5.7	25	109	80 - 120
2458690	Orthophosphate (P)	2011/04/15	90	80 - 120	101	80 - 120	ND, RDL=0.01	mg/L	NC	25	101	80 - 120

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Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2458699	Nitrate + Nitrite	2011/04/18	98	80 - 120	103	80 - 120	ND, RDL=0.05	mg/L	1.5	25	101	80 - 120
2458700	Nitrite (N)	2011/04/15	97	80 - 120	106	80 - 120	ND, RDL=0.01	mg/L	NC	25	104	80 - 120
2459994	Total Aluminum (Al)	2011/04/16	108	80 - 120	102	80 - 120	ND, RDL=5.0	ug/L	3.2	25		
2459994	Total Antimony (Sb)	2011/04/16	106	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2459994	Total Arsenic (As)	2011/04/16	101	80 - 120	96	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2459994	Total Barium (Ba)	2011/04/16	NC	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	20.6	25		
2459994	Total Beryllium (Be)	2011/04/16	103	80 - 120	100	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2459994	Total Bismuth (Bi)	2011/04/16	102	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2459994	Total Boron (B)	2011/04/16	111	80 - 120	97	80 - 120	ND, RDL=50	ug/L	NC	25		
2459994	Total Cadmium (Cd)	2011/04/16	101	80 - 120	97	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2459994	Total Calcium (Ca)	2011/04/16	NC	80 - 120	99	80 - 120	ND, RDL=100	ug/L	11.6	25		
2459994	Total Chromium (Cr)	2011/04/16	104	80 - 120	100	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2459994	Total Cobalt (Co)	2011/04/16	100	80 - 120	96	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2459994	Total Copper (Cu)	2011/04/16	NC	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	6.9	25		
2459994	Total Iron (Fe)	2011/04/16	109	80 - 120	104	80 - 120	ND, RDL=50	ug/L	NC	25		
2459994	Total Lead (Pb)	2011/04/16	100	80 - 120	96	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2459994	Total Magnesium (Mg)	2011/04/16	111	80 - 120	106	80 - 120	ND, RDL=100	ug/L	9.9	25		
2459994	Total Manganese (Mn)	2011/04/16	102	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2459994	Total Molybdenum (Mo)	2011/04/16	109	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2459994	Total Nickel (Ni)	2011/04/16	100	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2459994	Total Phosphorus (P)	2011/04/16	106	80 - 120	101	80 - 120	ND, RDL=100	ug/L	NC	25		
2459994	Total Potassium (K)	2011/04/16	107	80 - 120	101	80 - 120	ND, RDL=100	ug/L	NC	25		
2459994	Total Selenium (Se)	2011/04/16	103	80 - 120	96	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2459994	Total Silver (Ag)	2011/04/16	107	80 - 120	101	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2459994	Total Sodium (Na)	2011/04/16	NC	80 - 120	101	80 - 120	ND, RDL=100	ug/L	6.5	25		
2459994	Total Strontium (Sr)	2011/04/16	102	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	2.5	25		
2459994	Total Thallium (Tl)	2011/04/16	103	80 - 120	98	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2459994	Total Tin (Sn)	2011/04/16	108	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2459994	Total Titanium (Ti)	2011/04/16	107	80 - 120	106	80 - 120	3.1, RDL=2.0(2)	ug/L	NC	25		
2459994	Total Uranium (U)	2011/04/16	108	80 - 120	103	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2459994	Total Vanadium (V)	2011/04/16	104	80 - 120	101	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2459994	Total Zinc (Zn)	2011/04/16	100	80 - 120	96	80 - 120	ND, RDL=5.0	ug/L	2.2	25		
2461192	Nitrogen (Ammonia Nitrogen)	2011/04/18	99	80 - 120	107	80 - 120	ND, RDL=0.05	mg/L	NC	25	101	80 - 120
2461193	Nitrogen (Ammonia Nitrogen)	2011/04/18	98	80 - 120	107	80 - 120	ND, RDL=0.05	mg/L	NC	25	106	80 - 120
2461198	Total Mercury (Hg)	2011/04/18	103	80 - 120	82	80 - 120	ND, RDL=0.013	ug/L	NC	25	100	80 - 120

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2461634	Turbidity	2011/04/18					ND, RDL=0.1	NTU	23.4	25	96	80 - 120
2461804	Total Organic Carbon (C)	2011/04/18	101	80 - 120	104	80 - 120	ND, RDL=0.5	mg/L	NC	25	99	80 - 120

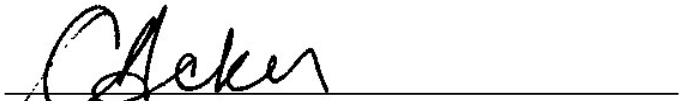
N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) - Low level lab contamination. Minimal impact on data quality.
(2) - Low level lab contamination. Minimal impact on data quality.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

Validation Signature Page

Maxxam Job #: B149922

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



COLLEEN ACKER,

KEVIN MACDONALD, Inorganics Supervisor

==========

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Round 3

Your P.O. #: 16300R-40
Your Project #: 121510621.100
Site: VALENTINE LAKE
Your C.O.C. #: ES267911

Attention: Barry Wicks
Stantec Consulting Ltd
St. John's - Standing Offer
607 Torbay Rd
St. John's, NL
A1A 4Y6

Report Date: 2011/06/02

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B174226
Received: 2011/05/26, 9:57

Sample Matrix: Water
Samples Received: 21

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonate, Bicarbonate and Hydroxide	21	N/A	2011/06/01	CAM SOP-00102	APHA 4500-CO2 D
Alkalinity	21	N/A	2011/06/01	ATL SOP 00013 R4	Based on EPA310.2
Chloride	21	N/A	2011/06/01	ATL SOP 00014 R6	Based on SM4500-Cl-
Colour	21	N/A	2011/06/01	ATL SOP 00020 R3.	Based on SM2120C
Conductance - water	20	N/A	2011/05/31	ATL SOP 00004 R5/00006 R4	Based on SM2510B
Conductance - water	1	N/A	2011/06/01	ATL SOP 00004 R5/00006 R4	Based on SM2510B
Hardness (calculated as CaCO3)	21	N/A	2011/05/30	ATL SOP 00048	Based on SM2340B
Mercury - Total (CVAA,LL)	13	2011/05/27	2011/05/30	ATL SOP 00026 R6	Based on EPA245.1
Mercury - Total (CVAA,LL)	8	2011/05/31	2011/06/01	ATL SOP 00026 R6	Based on EPA245.1
Metals Water Total MS	21	2011/05/27	2011/05/28	ATL SOP 00059 R1	Based on EPA6020A
Ion Balance (% Difference)	21	N/A	2011/06/02		
Anion and Cation Sum	3	N/A	2011/06/01		
Anion and Cation Sum	18	N/A	2011/06/02		
Nitrogen Ammonia - water	2	N/A	2011/05/31	ATL SOP 00015 R5	Based on USEPA 350.1
Nitrogen Ammonia - water	19	N/A	2011/06/01	ATL SOP 00015 R5	Based on USEPA 350.1
Nitrogen - Nitrate + Nitrite	21	N/A	2011/06/01	ATL SOP 00016 R4	Based on USGS - Enz.
Nitrogen - Nitrite	21	N/A	2011/06/01	ATL SOP 00017 R4	Based on SM4500-NO2B
Nitrogen - Nitrate (as N)	21	N/A	2011/06/02	ATL SOP 00018 R3	Based on ASTMD3867
pH	20	N/A	2011/05/31	ATL SOP 00003 R5/00005 R7	Based on SM4500H+B
pH	1	N/A	2011/06/01	ATL SOP 00003 R5/00005 R7	Based on SM4500H+B
Phosphorus - ortho	21	N/A	2011/06/02	ATL SOP 00021 R3	Based on USEPA 365.1
Sat. pH and Langelier Index (@ 20C)	21	N/A	2011/06/02		
Sat. pH and Langelier Index (@ 4C)	21	N/A	2011/06/02		
Reactive Silica	21	N/A	2011/06/02	ATL SOP 00022 R3	Based on EPA 366.0
Sulphate	21	N/A	2011/06/01	ATL SOP 00023 R3	Based on EPA 375.4
Total Dissolved Solids (TDS calc)	21	N/A	2011/06/02		
Organic carbon - Total (TOC)	21	N/A	2011/06/01	ATL SOP 00037 R4	Based on SM5310C
Total Suspended Solids	16	N/A	2011/05/26	ATL SOP 00007 R3	based on EPA 160.2
Total Suspended Solids	5	N/A	2011/05/27	ATL SOP 00007 R3	based on EPA 160.2
Turbidity	7	N/A	2011/06/01	ATL SOP 00011 R5	based on EPA 180.1
Turbidity	14	N/A	2011/06/02	ATL SOP 00011 R5	based on EPA 180.1

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

../2

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Maxxam Job #: B174226
Report Date: 2011/06/02

Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

Encryption Key

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

MICHELLE HILL, Project Manager
Email: MHill@maxxam.ca
Phone# (902) 420-0203

==========

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Total cover pages: 2

Maxxam Job #: B174226
Report Date: 2011/06/02

Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		JP7081	JP7081		JP7085	JP7085		JP7086			JP7087		
Sampling Date		2011/05/18	2011/05/18		2011/05/18	2011/05/18		2011/05/18			2011/05/18		
	Units	**LP01**	**LP01 Lab-Dup**	**QC Batch**	**LP02**	**LP02 Lab-Dup**	**QC Batch**	**LP03**	**RDL**	**QC Batch**	**LP04**	**RDL**	**QC Batch**
Calculated Parameters													
Anion Sum	me/L	0.430		2498809	0.190		2498809	0.210	N/A	2498809	0.190	N/A	2498809
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	17		2498806	7		2498806	8	1	2498806	8	1	2498806
Calculated TDS	mg/L	25		2498814	10		2498814	13	1	2498814	11	1	2498814
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND		2498806	ND		2498806	ND	1	2498806	ND	1	2498806
Cation Sum	me/L	0.550		2498809	0.220		2498809	0.260	N/A	2498809	0.240	N/A	2498809
Hardness (CaCO3)	mg/L	21		2498807	8		2498807	10	1	2498807	10	1	2498807
Ion Balance (% Difference)	%	12.2		2498808	7.32		2498808	10.6	N/A	2498808	11.6	N/A	2498808
Langelier Index (@ 20C)	N/A	-2.04		2498812	-3.40		2498812	-3.01		2498812	-3.06		2498812
Langelier Index (@ 4C)	N/A	-2.29		2498813	-3.65		2498813	-3.26		2498813	-3.32		2498813
Nitrate (N)	mg/L	ND		2498816	ND		2498816	ND	0.05	2498816	ND	0.05	2498816
Saturation pH (@ 20C)	N/A	9.21		2498812	10.0		2498812	9.85		2498812	9.88		2498812
Saturation pH (@ 4C)	N/A	9.46		2498813	10.3		2498813	10.1		2498813	10.1		2498813
Inorganics													
Total Alkalinity (Total as CaCO3)	mg/L	17		2505067	7		2505067	9	5	2505067	8	5	2505067
Dissolved Chloride (Cl)	mg/L	3		2505068	2		2505068	1	1	2505068	1	1	2505068
Colour	TCU	31		2505071	37		2505071	45	5	2505071	47	30	2505071
Nitrate + Nitrite	mg/L	ND		2505073	ND		2505073	ND	0.05	2505073	ND	0.05	2505073
Nitrite (N)	mg/L	ND		2505074	ND		2505074	ND	0.01	2505074	ND	0.01	2505074
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	2504246	ND	ND	2504247	ND	0.05	2504248	ND	0.05	2505615
Total Organic Carbon (C)	mg/L	4.7	4.5	2505861	5.2		2505861	6.2	0.5	2505861	6.0	0.5	2505861
Orthophosphate (P)	mg/L	ND		2505072	ND		2505072	ND	0.01	2505072	ND	0.01	2505072
pH	pH	7.17		2503840	6.60	6.74	2503846	6.84	N/A	2503846	6.82	N/A	2503846
Reactive Silica (SiO2)	mg/L	0.7		2505070	ND		2505070	1.3	0.5	2505070	ND	0.5	2505070
Total Suspended Solids	mg/L	2		2499154	2		2499154	ND	1	2499154	1	1	2499154
Dissolved Sulphate (SO4)	mg/L	ND		2505069	ND		2505069	ND	2	2505069	ND	2	2505069
Turbidity	NTU	0.9		2506030	0.5		2506030	0.3	0.1	2506030	0.4	0.1	2506030
Conductivity	uS/cm	49		2503842	22	22	2503849	25	1	2503849	22	1	2503849

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B174226
Report Date: 2011/06/02

Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		JP7088		JP7089	JP7090		JP7091		JP7092		JP7093		
Sampling Date		2011/05/18		2011/05/19	2011/05/19		2011/05/19		2011/05/19		2011/05/19		
	Units	**LP05**	**RDL**	**VL01**	**R01**	**QC Batch**	**R02**	**RDL**	**R03**	**RDL**	**R04**	**RDL**	**QC Batch**
Calculated Parameters													
Anion Sum	me/L	0.170	N/A	0.170	0.200	2498809	0.230	N/A	0.200	N/A	0.0300	N/A	2498809
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	9	1	6	8	2498806	9	1	8	1	ND	1	2498806
Calculated TDS	mg/L	11	1	11	12	2498814	14	1	13	1	5	1	2498814
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1	ND	ND	2498806	ND	1	ND	1	ND	1	2498806
Cation Sum	me/L	0.260	N/A	0.220	0.250	2498809	0.270	N/A	0.260	N/A	0.170	N/A	2498809
Hardness (CaCO3)	mg/L	10	1	8	9	2498807	10	1	10	1	6	1	2498807
Ion Balance (% Difference)	%	20.9	N/A	12.8	11.1	2498808	8.00	N/A	13.0	N/A	70.0	N/A	2498808
Langelier Index (@ 20C)	N/A	-2.95		-3.29	-3.06	2498812	-2.91		-3.01		NC		2498812
Langelier Index (@ 4C)	N/A	-3.20		-3.55	-3.31	2498813	-3.16		-3.26		NC		2498813
Nitrate (N)	mg/L	ND	0.05	ND	ND	2498816	ND	0.05	ND	0.05	0.06	0.05	2498816
Saturation pH (@ 20C)	N/A	9.80		10.1	9.87	2498812	9.77		9.83		NC		2498812
Saturation pH (@ 4C)	N/A	10.1		10.3	10.1	2498813	10.0		10.1		NC		2498813
Inorganics													
Total Alkalinity (Total as CaCO3)	mg/L	9	5	6	8	2505067	9	5	8	5	ND	5	2505067
Dissolved Chloride (Cl)	mg/L	ND	1	1	1	2505068	1	1	1	1	1	1	2505068
Colour	TCU	54	30	41	46	2505071	46	5	49	10	39	5	2505071
Nitrate + Nitrite	mg/L	ND	0.05	ND	ND	2505073	ND	0.05	ND	0.05	0.06	0.05	2505073
Nitrite (N)	mg/L	ND	0.01	ND	ND	2505074	ND	0.01	ND	0.01	ND	0.01	2505074
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.05	ND	ND	2505615	ND	0.05	ND	0.05	ND	0.05	2505615
Total Organic Carbon (C)	mg/L	6.5	0.5	6.2	6.6	2505861	6.0	0.5	6.1	0.5	5.9	0.5	2505861
Orthophosphate (P)	mg/L	ND	0.01	ND	ND	2505072	ND	0.01	0.01	0.01	ND	0.01	2505072
pH	pH	6.85	N/A	6.77	6.81	2503846	6.86	N/A	6.82	N/A	6.49	N/A	2503846
Reactive Silica (SiO2)	mg/L	0.6	0.5	1.5	1.0	2505070	1.4	0.5	1.7	0.5	0.7	0.5	2505070
Total Suspended Solids	mg/L	ND	1	1	ND	2499090	ND	1	2	1	2	1	2499090
Dissolved Sulphate (SO4)	mg/L	ND	2	ND	ND	2505069	ND	2	ND	2	ND	2	2505069
Turbidity	NTU	0.4	0.1	0.2	0.2	2506030	0.5	0.1	0.3	0.1	0.3	0.1	2507083
Conductivity	uS/cm	24	1	20	22	2503849	24	1	24	1	15	1	2503849

N/A = Not Applicable
ND = Not detected
NC = Non-calculable
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B174226
Report Date: 2011/06/02

Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		JP7094	JP7095	JP7096	JP7097		JP7098		
Sampling Date		2011/05/19	2011/05/19	2011/05/19	2011/05/19		2011/05/19		
	Units	**R05**	**VE01**	**VE02**	**VE03**	**RDL**	**VE04**	**RDL**	**QC Batch**
Calculated Parameters									
Anion Sum	me/L	0.180	0.200	0.170	0.160	N/A	0.0300	N/A	2498809
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	7	8	7	6	1	ND	1	2498806
Calculated TDS	mg/L	10	13	12	10	1	6	1	2498814
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	ND	ND	ND	1	ND	1	2498806
Cation Sum	me/L	0.210	0.260	0.230	0.220	N/A	0.220	N/A	2498809
Hardness (CaCO3)	mg/L	8	10	9	8	1	6	1	2498807
Ion Balance (% Difference)	%	7.69	13.0	15.0	15.8	N/A	76.0	N/A	2498808
Langelier Index (@ 20C)	N/A	-3.29	-3.10	-3.21	-3.34		NC		2498812
Langelier Index (@ 4C)	N/A	-3.54	-3.35	-3.46	-3.59		NC		2498813
Nitrate (N)	mg/L	ND	ND	ND	ND	0.05	ND	0.05	2498816
Saturation pH (@ 20C)	N/A	10.0	9.90	10.0	10.1		NC		2498812
Saturation pH (@ 4C)	N/A	10.3	10.2	10.2	10.3		NC		2498813
Inorganics									
Total Alkalinity (Total as CaCO3)	mg/L	7	8	7	6	5	ND	5	2505067
Dissolved Chloride (Cl)	mg/L	1	1	1	1	1	1	1	2505068
Colour	TCU	12	46	40	40	5	53	10	2505071
Nitrate + Nitrite	mg/L	ND	ND	ND	ND	0.05	ND	0.05	2505073
Nitrite (N)	mg/L	ND	ND	ND	ND	0.01	ND	0.01	2505074
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	ND	ND	0.05	ND	0.05	2505615
Total Organic Carbon (C)	mg/L	3.2	6.0	6.4	6.4	0.5	7.1	0.5	2505861
Orthophosphate (P)	mg/L	ND	ND	ND	ND	0.01	ND	0.01	2505072
pH	pH	6.72	6.80	6.79	6.75	N/A	6.62	N/A	2503846
Reactive Silica (SiO2)	mg/L	0.5	1.8	1.3	0.9	0.5	ND	0.5	2505070
Total Suspended Solids	mg/L	3	ND	2	ND	1	2	2	2499090
Dissolved Sulphate (SO4)	mg/L	ND	ND	ND	ND	2	ND	2	2505069
Turbidity	NTU	0.3	0.4	0.2	0.3	0.1	0.4	0.1	2507083
Conductivity	uS/cm	22	24	21	20	1	16	1	2503849

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Maxxam Job #: B174226
Report Date: 2011/06/02

Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		JP7098		JP7099		JP7100		JP7101	JP7101		
Sampling Date		2011/05/19		2011/05/19		2011/05/19		2011/05/19	2011/05/19		
	Units	**VE04 Lab-Dup**	**RDL**	**VE05**	**RDL**	**VE06**	**RDL**	**VE07**	**VE07 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters											
Anion Sum	me/L		N/A	0.210	N/A	0.280	N/A	0.260		N/A	2498809
Bicarb. Alkalinity (calc. as CaCO3)	mg/L		1	8	1	11	1	11		1	2498806
Calculated TDS	mg/L		1	15	1	19	1	17		1	2498814
Carb. Alkalinity (calc. as CaCO3)	mg/L		1	ND	1	ND	1	ND		1	2498806
Cation Sum	me/L		N/A	0.280	N/A	0.370	N/A	0.340		N/A	2498809
Hardness (CaCO3)	mg/L		1	10	1	15	1	13		1	2498807
Ion Balance (% Difference)	%		N/A	14.3	N/A	13.9	N/A	13.3		N/A	2498808
Langelier Index (@ 20C)	N/A			-3.12		-2.57		-2.71			2498812
Langelier Index (@ 4C)	N/A			-3.37		-2.82		-2.97			2498813
Nitrate (N)	mg/L		0.05	0.12	0.05	0.06	0.05	0.08		0.05	2498816
Saturation pH (@ 20C)	N/A			9.88		9.54		9.62			2498812
Saturation pH (@ 4C)	N/A			10.1		9.79		9.88			2498813
Inorganics											
Total Alkalinity (Total as CaCO3)	mg/L		5	8	5	11	5	11	10	5	2505067
Dissolved Chloride (Cl)	mg/L		1	1	1	2	1	2	2	1	2505068
Colour	TCU		10	36	5	55	30	45	45	10	2505071
Nitrate + Nitrite	mg/L		0.05	0.12	0.05	0.06	0.05	0.08	0.08	0.05	2505073
Nitrite (N)	mg/L		0.01	ND	0.01	ND	0.01	ND	ND	0.01	2505074
Nitrogen (Ammonia Nitrogen)	mg/L		0.05	ND	0.05	ND	0.05	ND		0.05	2505615
Total Organic Carbon (C)	mg/L		0.5	6.8	0.5	7.1	0.5	7.1		0.5	2505861
Orthophosphate (P)	mg/L		0.01	ND	0.01	ND	0.01	ND	ND	0.01	2505072
pH	pH		N/A	6.76	N/A	6.97	N/A	6.91		N/A	2503846
Reactive Silica (SiO2)	mg/L		0.5	2.6	0.5	2.4	0.5	2.4	2.3	0.5	2505070
Total Suspended Solids	mg/L	2	2	3	1	2	1	1		1	2499090
Dissolved Sulphate (SO4)	mg/L		2	ND	2	ND	2	ND	ND	2	2505069
Turbidity	NTU		0.1	0.1	0.1	0.3	0.1	0.2		0.1	2507083
Conductivity	uS/cm		1	25	1	34	1	32		1	2503849

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QC Batch = Quality Control Batch

Maxxam Job #: B174226
Report Date: 2011/06/02

Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		JP7102			JP7103			JP8207	JP8207		
Sampling Date		2011/05/19			2011/05/19			2011/05/19	2011/05/19		
	Units	**VE09**	**RDL**	**QC Batch**	**VE10**	**RDL**	**QC Batch**	**VE08**	**VE08 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters											
Anion Sum	me/L	0.300	N/A	2498809	0.370	N/A	2498809	0.0400		N/A	2498809
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	13	1	2498806	7	1	2498806	ND		1	2498806
Calculated TDS	mg/L	19	1	2498814	18	1	2498814	6		1	2498814
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1	2498806	ND	1	2498806	ND		1	2498806
Cation Sum	me/L	0.420	N/A	2498809	0.240	N/A	2498809	0.180		N/A	2498809
Hardness (CaCO3)	mg/L	16	1	2498807	8	1	2498807	5		1	2498807
Ion Balance (% Difference)	%	16.7	N/A	2498808	21.3	N/A	2498808	63.6		N/A	2498808
Langelier Index (@ 20C)	N/A	-2.49		2498812	-3.27		2498812	NC			2498812
Langelier Index (@ 4C)	N/A	-2.74		2498813	-3.52		2498813	NC			2498813
Nitrate (N)	mg/L	0.06	0.05	2498816	ND	0.05	2499530	0.19		0.05	2499530
Saturation pH (@ 20C)	N/A	9.51		2498812	10.1		2498812	NC			2498812
Saturation pH (@ 4C)	N/A	9.76		2498813	10.3		2498813	NC			2498813
Inorganics											
Total Alkalinity (Total as CaCO3)	mg/L	13	5	2505075	7	5	2505075	ND		5	2505075
Dissolved Chloride (Cl)	mg/L	1	1	2505076	8	1	2505076	1		1	2505076
Colour	TCU	61	30	2505081	49	5	2505081	44		10	2505081
Nitrate + Nitrite	mg/L	0.06	0.05	2505083	ND	0.05	2505083	0.19		0.05	2505083
Nitrite (N)	mg/L	ND	0.01	2505084	ND	0.01	2505084	ND		0.01	2505084
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.05	2505615	ND	0.05	2505615	0.05		0.05	2505615
Total Organic Carbon (C)	mg/L	10	0.5	2505861	8.0	0.5	2505861	9.5	9.9	0.5	2505889
Orthophosphate (P)	mg/L	ND	0.01	2505082	ND	0.01	2505082	ND		0.01	2505082
pH	pH	7.02	N/A	2503846	6.80	N/A	2503846	6.40		N/A	2505090
Reactive Silica (SiO2)	mg/L	0.8	0.5	2505080	0.6	0.5	2505080	ND		0.5	2505080
Total Suspended Solids	mg/L	1	1	2499090	3	1	2499090	6		1	2499154
Dissolved Sulphate (SO4)	mg/L	ND	2	2505079	ND	2	2505079	ND		2	2505079
Turbidity	NTU	0.5	0.1	2507083	0.1	0.1	2507083	0.1		0.1	2507083
Conductivity	uS/cm	33	1	2503849	22	1	2503849	16		1	2505095

N/A = Not Applicable
ND = Not detected
NC = Non-calculable
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B174226
Report Date: 2011/06/02

Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		JP7081	JP7085	JP7086		JP7087	JP7087	JP7088	JP7089	JP7090	JP7091		
Sampling Date		2011/05/18	2011/05/18	2011/05/18		2011/05/18	2011/05/18	2011/05/18	2011/05/19	2011/05/19	2011/05/19		
	Units	**LP01**	**LP02**	**LP03**	**QC Batch**	**LP04**	**LP04 Lab-Dup**	**LP05**	**VL01**	**R01**	**R02**	**RDL**	**QC Batch**
Metals													
Total Mercury (Hg)	ug/L	ND	ND	ND	2502347	ND	ND	ND	ND	ND	ND	0.013	2502350

Maxxam ID		JP7092	JP7093	JP7094	JP7095	JP7096		JP7097	JP7097	JP7098		
Sampling Date		2011/05/19	2011/05/19	2011/05/19	2011/05/19	2011/05/19		2011/05/19	2011/05/19	2011/05/19		
	Units	**R03**	**R04**	**R05**	**VE01**	**VE02**	**QC Batch**	**VE03**	**VE03 Lab-Dup**	**VE04**	**RDL**	**QC Batch**
Metals												
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	2502350	ND	ND	ND	0.013	2505064

Maxxam ID		JP7099	JP7100	JP7101	JP7102	JP7103	JP8207		
Sampling Date		2011/05/19	2011/05/19	2011/05/19	2011/05/19	2011/05/19	2011/05/19		
	Units	**VE05**	**VE06**	**VE07**	**VE09**	**VE10**	**VE08**	**RDL**	**QC Batch**
Metals									
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	0.013	2505064

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B174226
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Stantec Consulting Ltd
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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		JP7081	JP7085	JP7086	JP7086	JP7087	JP7088	JP7089	JP7090	JP7091	JP7092		
Sampling Date		2011/05/18	2011/05/18	2011/05/18	2011/05/18	2011/05/18	2011/05/18	2011/05/19	2011/05/19	2011/05/19	2011/05/19		
	Units	**LP01**	**LP02**	**LP03**	**LP03 Lab-Dup**	**LP04**	**LP05**	**VL01**	**R01**	**R02**	**R03**	**RDL**	**QC Batch**
Metals													
Total Aluminum (Al)	ug/L	100	79.3	47.9	49.3	101	94.3	77.2	48.6	63.8	78.6	5.0	2500663
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2500663
Total Arsenic (As)	ug/L	ND	ND	1.7	2.0	ND	ND	1.4	3.4	2.3	1.2	1.0	2500663
Total Barium (Ba)	ug/L	3.3	2.4	1.7	1.4	1.3	1.4	2.3	2.4	1.4	1.5	1.0	2500663
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2500663
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2500663
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	50	2500663
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	ND	ND	0.064	ND	ND	ND	0.017	2500663
Total Calcium (Ca)	ug/L	6840	2560	3070	3300	3030	3370	2500	3060	3360	3290	100	2500663
Total Chromium (Cr)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	1.0	2500663
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.40	2500663
Total Copper (Cu)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2500663
Total Iron (Fe)	ug/L	225	112	96	99	126	114	74	128	120	111	50	2500663
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.50	2500663
Total Magnesium (Mg)	ug/L	858	357	440	473	467	483	394	400	443	410	100	2500663
Total Manganese (Mn)	ug/L	79.8	17.0	21.9	23.4	15.3	14.5	17.4	24.0	21.6	24.3	2.0	2500663
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2500663
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2500663
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100	2500663
Total Potassium (K)	ug/L	459	181	160	174	111	ND	105	120	104	ND	100	2500663
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2500663
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2500663
Total Sodium (Na)	ug/L	2610	1290	1370	1460	1030	1070	1290	1270	1320	1240	100	2500663
Total Strontium (Sr)	ug/L	38.9	15.8	9.1	9.6	5.2	7.5	6.4	7.2	6.7	5.9	2.0	2500663
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2500663
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2500663
Total Titanium (Ti)	ug/L	4.9	3.1	ND	2.8	2.7	ND	2.1	2.5	ND	4.1	2.0	2500663
Total Uranium (U)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2500663
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2500663
Total Zinc (Zn)	ug/L	16.8	ND	ND	ND	ND	ND	ND	ND	5.5	ND	5.0	2500663

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B174226
Report Date: 2011/06/02

Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		JP7093	JP7094	JP7095		JP7096	JP7097	JP7098		
Sampling Date		2011/05/19	2011/05/19	2011/05/19		2011/05/19	2011/05/19	2011/05/19		
	Units	**R04**	**R05**	**VE01**	**QC Batch**	**VE02**	**VE03**	**VE04**	**RDL**	**QC Batch**
Metals										
Total Aluminum (Al)	ug/L	78.1	31.8	63.3	2500663	68.3	79.1	466	5.0	2500698
Total Antimony (Sb)	ug/L	ND	ND	ND	2500663	ND	ND	ND	1.0	2500698
Total Arsenic (As)	ug/L	ND	ND	ND	2500663	ND	ND	3.2	1.0	2500698
Total Barium (Ba)	ug/L	1.3	5.9	2.3	2500663	2.1	1.3	7.0	1.0	2500698
Total Beryllium (Be)	ug/L	ND	ND	ND	2500663	ND	ND	ND	1.0	2500698
Total Bismuth (Bi)	ug/L	ND	ND	ND	2500663	ND	ND	ND	2.0	2500698
Total Boron (B)	ug/L	ND	ND	ND	2500663	ND	ND	ND	50	2500698
Total Cadmium (Cd)	ug/L	ND	ND	ND	2500663	ND	ND	0.017	0.017	2500698
Total Calcium (Ca)	ug/L	1790	2590	3000	2500663	2680	2430	1890	100	2500698
Total Chromium (Cr)	ug/L	ND	ND	76.2	2500663	ND	ND	1.7	1.0	2500698
Total Cobalt (Co)	ug/L	ND	ND	ND	2500663	ND	ND	0.51	0.40	2500698
Total Copper (Cu)	ug/L	ND	ND	ND	2500663	ND	ND	ND	2.0	2500698
Total Iron (Fe)	ug/L	114	ND	88	2500663	82	109	1360	50	2500698
Total Lead (Pb)	ug/L	ND	ND	ND	2500663	ND	ND	ND	0.50	2500698
Total Magnesium (Mg)	ug/L	263	346	479	2500663	429	385	297	100	2500698
Total Manganese (Mn)	ug/L	52.9	17.4	16.9	2500663	32.0	58.0	291	2.0	2500698
Total Molybdenum (Mo)	ug/L	ND	ND	ND	2500663	ND	ND	ND	2.0	2500698
Total Nickel (Ni)	ug/L	ND	ND	ND	2500663	ND	ND	ND	2.0	2500698
Total Phosphorus (P)	ug/L	ND	ND	ND	2500663	ND	ND	ND	100	2500698
Total Potassium (K)	ug/L	ND	115	225	2500663	174	181	163	100	2500698
Total Selenium (Se)	ug/L	ND	ND	ND	2500663	ND	ND	ND	1.0	2500698
Total Silver (Ag)	ug/L	ND	ND	ND	2500663	ND	ND	ND	0.10	2500698
Total Sodium (Na)	ug/L	1200	1180	1460	2500663	1330	1270	1130	100	2500698
Total Strontium (Sr)	ug/L	3.6	6.5	8.1	2500663	7.5	7.3	6.4	2.0	2500698
Total Thallium (Tl)	ug/L	ND	ND	ND	2500663	ND	ND	ND	0.10	2500698
Total Tin (Sn)	ug/L	ND	ND	ND	2500663	ND	ND	ND	2.0	2500698
Total Titanium (Ti)	ug/L	2.4	3.0	ND	2500663	2.1	3.2	15.3	2.0	2500698
Total Uranium (U)	ug/L	ND	ND	ND	2500663	ND	ND	ND	0.10	2500698
Total Vanadium (V)	ug/L	ND	ND	ND	2500663	ND	ND	ND	2.0	2500698
Total Zinc (Zn)	ug/L	ND	6.8	9.9	2500663	7.9	ND	5.2	5.0	2500698

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QC Batch = Quality Control Batch

Maxxam Job #: B174226
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Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		JP7099	JP7100	JP7101	JP7102	JP7103	JP8207		
Sampling Date		2011/05/19	2011/05/19	2011/05/19	2011/05/19	2011/05/19	2011/05/19		
	Units	**VE05**	**VE06**	**VE07**	**VE09**	**VE10**	**VE08**	**RDL**	**QC Batch**
Metals									
Total Aluminum (Al)	ug/L	86.2	108	84.8	205	89.4	183	5.0	2500698
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2500698
Total Arsenic (As)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2500698
Total Barium (Ba)	ug/L	1.9	2.3	1.7	3.1	1.9	1.2	1.0	2500698
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2500698
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2500698
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	50	2500698
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	ND	ND	0.017	2500698
Total Calcium (Ca)	ug/L	3040	4790	4200	4370	2360	1490	100	2500698
Total Chromium (Cr)	ug/L	ND	1.1	ND	ND	ND	ND	1.0	2500698
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	ND	ND	0.40	2500698
Total Copper (Cu)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2500698
Total Iron (Fe)	ug/L	94	156	110	328	151	219	50	2500698
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	ND	0.50	2500698
Total Magnesium (Mg)	ug/L	602	684	653	1100	580	407	100	2500698
Total Manganese (Mn)	ug/L	20.3	90.4	59.4	282	25.6	34.0	2.0	2500698
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2500698
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2500698
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	100	2500698
Total Potassium (K)	ug/L	163	206	184	275	141	274	100	2500698
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2500698
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	0.10	2500698
Total Sodium (Na)	ug/L	1570	1550	1510	2020	1460	1310	100	2500698
Total Strontium (Sr)	ug/L	7.0	10.1	10.0	15.1	5.4	4.0	2.0	2500698
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	0.10	2500698
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2500698
Total Titanium (Ti)	ug/L	2.7	4.2	3.1	10.8	3.1	6.1	2.0	2500698
Total Uranium (U)	ug/L	ND	ND	ND	0.12	ND	ND	0.10	2500698
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2500698
Total Zinc (Zn)	ug/L	ND	6.4	ND	ND	ND	6.3	5.0	2500698

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Maxxam Job #: B174226
Report Date: 2011/06/02

Stantec Consulting Ltd
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Package 1	3.0°C

Each temperature is the average of up to three cooler temperatures taken at receipt

GENERAL COMMENTS

Samples LP01, LP02, LP03, LP04 and LP05 received past the 7 day holding time for Total Suspended Solids analysis.

Sample JP7081-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JP7085-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JP7086-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JP7087-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JP7088-01: Total Suspended Solids: Sample integrity may have been compromised, the sample exceeded it's hold time prior to being analyzed. RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JP7089-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JP7090-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JP7091-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JP7092-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JP7093-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JP7094-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JP7095-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JP7096-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JP7097-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JP7098-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JP7099-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample JP7100-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

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Sample	JP7101-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.
Sample	JP7102-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.
Sample	JP7103-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.
Sample	JP8207-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

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Maxxam Job #: B174226
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Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALENTINE LAKE
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Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2499090	Total Suspended Solids	2011/05/26					ND, RDL=1	mg/L	NC	25	98	80 - 120
2499154	Total Suspended Solids	2011/05/27					ND, RDL=1	mg/L	5.1	25	99	80 - 120
2500663	Total Aluminum (Al)	2011/05/28	110	80 - 120	112	80 - 120	ND, RDL=5.0	ug/L	2.8	25		
2500663	Total Antimony (Sb)	2011/05/28	100	80 - 120	106	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2500663	Total Arsenic (As)	2011/05/28	98	80 - 120	105	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2500663	Total Barium (Ba)	2011/05/28	98	80 - 120	106	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2500663	Total Beryllium (Be)	2011/05/28	102	80 - 120	113	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2500663	Total Bismuth (Bi)	2011/05/28	99	80 - 120	106	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2500663	Total Boron (B)	2011/05/28	98	80 - 120	108	80 - 120	ND, RDL=50	ug/L	NC	25		
2500663	Total Cadmium (Cd)	2011/05/28	100	80 - 120	107	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2500663	Total Calcium (Ca)	2011/05/28	102	80 - 120	108	80 - 120	ND, RDL=100	ug/L	7.3	25		
2500663	Total Chromium (Cr)	2011/05/28	101	80 - 120	108	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2500663	Total Cobalt (Co)	2011/05/28	97	80 - 120	104	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2500663	Total Copper (Cu)	2011/05/28	100	80 - 120	105	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2500663	Total Iron (Fe)	2011/05/28	109	80 - 120	116	80 - 120	ND, RDL=50	ug/L	NC	25		
2500663	Total Lead (Pb)	2011/05/28	97	80 - 120	104	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2500663	Total Magnesium (Mg)	2011/05/28	109	80 - 120	113	80 - 120	ND, RDL=100	ug/L	NC	25		
2500663	Total Manganese (Mn)	2011/05/28	98	80 - 120	105	80 - 120	ND, RDL=2.0	ug/L	6.8	25		
2500663	Total Molybdenum (Mo)	2011/05/28	108	80 - 120	115	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2500663	Total Nickel (Ni)	2011/05/28	99	80 - 120	105	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2500663	Total Phosphorus (P)	2011/05/28	110	80 - 120	112	80 - 120	ND, RDL=100	ug/L	NC	25		
2500663	Total Potassium (K)	2011/05/28	104	80 - 120	111	80 - 120	ND, RDL=100	ug/L	NC	25		
2500663	Total Selenium (Se)	2011/05/28	100	80 - 120	105	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2500663	Total Silver (Ag)	2011/05/28	105	80 - 120	109	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2500663	Total Sodium (Na)	2011/05/28	99	80 - 120	104	80 - 120	ND, RDL=100	ug/L	6.6	25		
2500663	Total Strontium (Sr)	2011/05/28	100	80 - 120	107	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2500663	Total Thallium (Tl)	2011/05/28	100	80 - 120	108	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2500663	Total Tin (Sn)	2011/05/28	105	80 - 120	109	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2500663	Total Titanium (Ti)	2011/05/28	102	80 - 120	112	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2500663	Total Uranium (U)	2011/05/28	103	80 - 120	110	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2500663	Total Vanadium (V)	2011/05/28	100	80 - 120	108	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2500663	Total Zinc (Zn)	2011/05/28	98	80 - 120	102	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2500698	Total Aluminum (Al)	2011/05/28	121(1, 2)	80 - 120	115	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2500698	Total Antimony (Sb)	2011/05/28	104	80 - 120	104	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2500698	Total Arsenic (As)	2011/05/28	108	80 - 120	101	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2500698	Total Barium (Ba)	2011/05/28	105	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2500698	Total Beryllium (Be)	2011/05/28	108	80 - 120	100	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2500698	Total Bismuth (Bi)	2011/05/28	106	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2500698	Total Boron (B)	2011/05/28	104	80 - 120	98	80 - 120	ND, RDL=50	ug/L	NC	25		

Maxxam Job #: B174226
Report Date: 2011/06/02

Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2500698	Total Cadmium (Cd)	2011/05/28	107	80 - 120	101	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2500698	Total Calcium (Ca)	2011/05/28	111	80 - 120	106	80 - 120	ND, RDL=100	ug/L	0.03	25		
2500698	Total Chromium (Cr)	2011/05/28	111	80 - 120	103	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2500698	Total Cobalt (Co)	2011/05/28	105	80 - 120	100	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2500698	Total Copper (Cu)	2011/05/28	NC	80 - 120	101	80 - 120	ND, RDL=2.0	ug/L	10.3	25		
2500698	Total Iron (Fe)	2011/05/28	118	80 - 120	115	80 - 120	ND, RDL=50	ug/L	0.8	25		
2500698	Total Lead (Pb)	2011/05/28	104	80 - 120	99	80 - 120	ND, RDL=0.50	ug/L	17.7	25		
2500698	Total Magnesium (Mg)	2011/05/28	117	80 - 120	113	80 - 120	ND, RDL=100	ug/L	1.6	25		
2500698	Total Manganese (Mn)	2011/05/28	109	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L	0.2	25		
2500698	Total Molybdenum (Mo)	2011/05/28	114	80 - 120	109	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2500698	Total Nickel (Ni)	2011/05/28	107	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2500698	Total Phosphorus (P)	2011/05/28	119	80 - 120	114	80 - 120	ND, RDL=100	ug/L				
2500698	Total Potassium (K)	2011/05/28	113	80 - 120	109	80 - 120	ND, RDL=100	ug/L	2.3	25		
2500698	Total Selenium (Se)	2011/05/28	107	80 - 120	101	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2500698	Total Silver (Ag)	2011/05/28	111	80 - 120	105	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2500698	Total Sodium (Na)	2011/05/28	NC	80 - 120	104	80 - 120	ND, RDL=100	ug/L	0.07	25		
2500698	Total Strontium (Sr)	2011/05/28	110	80 - 120	106	80 - 120	ND, RDL=2.0	ug/L	4.5	25		
2500698	Total Thallium (Tl)	2011/05/28	107	80 - 120	103	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2500698	Total Tin (Sn)	2011/05/28	109	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2500698	Total Titanium (Ti)	2011/05/28	112	80 - 120	109	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2500698	Total Uranium (U)	2011/05/28	111	80 - 120	105	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2500698	Total Vanadium (V)	2011/05/28	111	80 - 120	105	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2500698	Total Zinc (Zn)	2011/05/28	NC	80 - 120	102	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2502347	Total Mercury (Hg)	2011/05/30	96	80 - 120	102	80 - 120	ND, RDL=0.013	ug/L	NC	25	90	80 - 120
2502350	Total Mercury (Hg)	2011/05/30	101	80 - 120	101	80 - 120	ND, RDL=0.013	ug/L	NC	25	102	80 - 120
2503840	pH	2011/05/31			102	N/A	5.77, RDL=N/A	pH	1.6	25	102	80 - 120
2503842	Conductivity	2011/05/31			100	N/A	1, RDL=1	uS/cm	0.8	25	100	80 - 120
2503846	pH	2011/05/31			102	N/A	5.79, RDL=N/A	pH	2.1	25	102	80 - 120
2503849	Conductivity	2011/05/31			100	N/A	1, RDL=1	uS/cm	2.7	25	100	80 - 120
2504246	Nitrogen (Ammonia Nitrogen)	2011/05/31	96	80 - 120	94	80 - 120	ND, RDL=0.05	mg/L	NC	25	97	80 - 120
2504247	Nitrogen (Ammonia Nitrogen)	2011/05/31	98	80 - 120	95	80 - 120	ND, RDL=0.05	mg/L	NC	25	103	80 - 120
2504248	Nitrogen (Ammonia Nitrogen)	2011/06/01	95	80 - 120	97	80 - 120	ND, RDL=0.05	mg/L	NC	25	100	80 - 120
2505064	Total Mercury (Hg)	2011/06/01	92	80 - 120	90	80 - 120	ND, RDL=0.013	ug/L	NC	25	94	80 - 120
2505067	Total Alkalinity (Total as CaCO3)	2011/06/01	99	80 - 120	107	80 - 120	ND, RDL=5	mg/L	NC	25	104	80 - 120
2505068	Dissolved Chloride (Cl)	2011/06/01	104	80 - 120	107	80 - 120	ND, RDL=1	mg/L	NC	25	102	80 - 120
2505069	Dissolved Sulphate (SO4)	2011/06/01	106	80 - 120	104	80 - 120	ND, RDL=2	mg/L	NC	25	98	80 - 120
2505070	Reactive Silica (SiO2)	2011/06/02	100	80 - 120	106	80 - 120	ND, RDL=0.5	mg/L	NC	25	103	75 - 125
2505071	Colour	2011/06/01					ND, RDL=5	TCU	NC	25	116	80 - 120
2505072	Orthophosphate (P)	2011/06/02	89	80 - 120	104	80 - 120	ND, RDL=0.01	mg/L	NC	25	102	80 - 120

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Maxxam Job #: B174226
Report Date: 2011/06/02

Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2505073	Nitrate + Nitrite	2011/06/01	95	80 - 120	102	80 - 120	ND, RDL=0.05	mg/L	NC	25	104	80 - 120
2505074	Nitrite (N)	2011/06/01	84	80 - 120	101	80 - 120	ND, RDL=0.01	mg/L	NC	25	102	80 - 120
2505075	Total Alkalinity (Total as CaCO3)	2011/06/01	NC	80 - 120	97	80 - 120	ND, RDL=5	mg/L	3.4	25	105	80 - 120
2505076	Dissolved Chloride (Cl)	2011/06/01	107	80 - 120	95	80 - 120	ND, RDL=1	mg/L	2.4	25	102	80 - 120
2505079	Dissolved Sulphate (SO4)	2011/06/01	101	80 - 120	90	80 - 120	ND, RDL=2	mg/L	NC	25	99	80 - 120
2505080	Reactive Silica (SiO2)	2011/06/02	NC	80 - 120	104	80 - 120	ND, RDL=0.5	mg/L	1.8	25	103	75 - 125
2505081	Colour	2011/06/01					ND, RDL=5	TCU	NC	25	110	80 - 120
2505082	Orthophosphate (P)	2011/06/02	111	80 - 120	101	80 - 120	ND, RDL=0.01	mg/L	NC	25	97	80 - 120
2505083	Nitrate + Nitrite	2011/06/01	99	80 - 120	97	80 - 120	ND, RDL=0.05	mg/L	NC	25	106	80 - 120
2505084	Nitrite (N)	2011/06/01	NC(3)	80 - 120	86	80 - 120	ND, RDL=0.01	mg/L	NC(4)	25	94	80 - 120
2505090	pH	2011/06/01			101	N/A	5.81, RDL=N/A	pH	1.1	25	102	80 - 120
2505095	Conductivity	2011/06/01			100	N/A	1, RDL=1	uS/cm	0.2	25	100	80 - 120
2505615	Nitrogen (Ammonia Nitrogen)	2011/06/01	97	80 - 120	101	80 - 120	ND, RDL=0.05	mg/L	NC	25	100	80 - 120
2505861	Total Organic Carbon (C)	2011/06/01	102	80 - 120	105	80 - 120	ND, RDL=0.5	mg/L	3.1	25	104	80 - 120
2505889	Total Organic Carbon (C)	2011/06/01	104	80 - 120	104	80 - 120	ND, RDL=0.5	mg/L	3.3	25	107	80 - 120
2506030	Turbidity	2011/06/01					ND, RDL=0.1	NTU	NC	25	100	80 - 120
2507083	Turbidity	2011/06/02					ND, RDL=0.1	NTU	NC	25	103	80 - 120

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.
(2) - Recovery within acceptance limits.
(3) - Matrix spike recovery is based on a 100x pre-dilution of sample due to matrix interference.
(4) - Elevated detection limit due to matrix interference.

Validation Signature Page

Maxxam Job #: B174226

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

JERRY ARENOVICH, Inorganics Manager

COLLEEN ACKER,

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Round 4

Your P.O. #: 16300R-40
Your Project #: 121510621.100
Site: VALINTINE LAKE
Your C.O.C. #: ES268011

Attention: Barry Wicks
Stantec Consulting Ltd
St. John's - Standing Offer
607 Torbay Rd
St. John's, NL
A1A 4Y6

Report Date: 2011/07/13

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B199010
Received: 2011/07/06, 10:05

Sample Matrix: Water
Samples Received: 21

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonate, Bicarbonate and Hydroxide	15	N/A	2011/07/08	CAM SOP-00102	APHA 4500-CO2 D
Carbonate, Bicarbonate and Hydroxide	6	N/A	2011/07/11	CAM SOP-00102	APHA 4500-CO2 D
Alkalinity	21	N/A	2011/07/12	ATL SOP 00013 R4	Based on EPA310.2
Chloride	21	N/A	2011/07/12	ATL SOP 00014 R6	Based on SM4500-Cl-
Colour	21	N/A	2011/07/12	ATL SOP 00020 R3.	Based on SM2120C
Conductance - water	15	N/A	2011/07/08	ATL SOP 00004 R5/00006 R4	Based on SM2510B
Conductance - water	6	N/A	2011/07/11	ATL SOP 00004 R5/00006 R4	Based on SM2510B
Hardness (calculated as CaCO3)	20	N/A	2011/07/12	ATL SOP 00048	Based on SM2340B
Hardness (calculated as CaCO3)	1	N/A	2011/07/13	ATL SOP 00048	Based on SM2340B
Mercury - Total (CVAA,LL)	5	2011/07/07	2011/07/08	ATL SOP 00026 R6	Based on EPA245.1
Mercury - Total (CVAA,LL)	16	2011/07/08	2011/07/11	ATL SOP 00026 R6	Based on EPA245.1
Metals Water Total MS	21	2011/07/11	2011/07/12	ATL SOP 00059 R1	Based on EPA6020A
Ion Balance (% Difference)	21	N/A	2011/07/13		
Anion and Cation Sum	21	N/A	2011/07/13		
Nitrogen Ammonia - water	21	N/A	2011/07/12	ATL SOP 00015 R5	Based on USEPA 350.1
Nitrogen - Nitrate + Nitrite	21	N/A	2011/07/13	ATL SOP 00016 R4	Based on USGS - Enz.
Nitrogen - Nitrite	21	N/A	2011/07/12	ATL SOP 00017 R4	Based on SM4500-NO2B
Nitrogen - Nitrate (as N)	21	N/A	2011/07/13	ATL SOP 00018 R3	Based on ASTMD3867
pH	15	N/A	2011/07/08	ATL SOP 00003 R5/00005 R7	Based on SM4500H+B
pH	6	N/A	2011/07/11	ATL SOP 00003 R5/00005 R7	Based on SM4500H+B
Phosphorus - ortho	21	N/A	2011/07/12	ATL SOP 00021 R3	Based on USEPA 365.1
Sat. pH and Langelier Index (@ 20C)	21	N/A	2011/07/13		
Sat. pH and Langelier Index (@ 4C)	21	N/A	2011/07/13		
Reactive Silica	21	N/A	2011/07/12	ATL SOP 00022 R3	Based on EPA 366.0
Sulphate	21	N/A	2011/07/12	ATL SOP 00023 R3	Based on EPA 375.4
Total Dissolved Solids (TDS calc)	21	N/A	2011/07/13		
Organic carbon - Total (TOC)	16	N/A	2011/07/11	ATL SOP 00037 R4	Based on SM5310C
Organic carbon - Total (TOC)	5	N/A	2011/07/12	ATL SOP 00037 R4	Based on SM5310C
Total Suspended Solids	10	N/A	2011/07/07	ATL SOP 00007 R3	based on EPA 160.2
Total Suspended Solids	11	N/A	2011/07/08	ATL SOP 00007 R3	based on EPA 160.2
Turbidity	13	N/A	2011/07/11	ATL SOP 00011 R5	based on EPA 180.1
Turbidity	8	N/A	2011/07/12	ATL SOP 00011 R5	based on EPA 180.1

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

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Maxxam Job #: B199010
Report Date: 2011/07/13

Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALINTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

Encryption Key

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

MICHELLE HILL, Project Manager
Email: MHill@maxxam.ca
Phone# (902) 420-0203

==========

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: 2

Maxxam Job #: B199010
Report Date: 2011/07/13

Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALINTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		KB4494		KB4515	KB4516			KB4517	KB4517		KB4518		
Sampling Date		2011/06/25		2011/06/25	2011/06/25			2011/06/25	2011/06/25		2011/06/25		
	Units	**LP01**	**QC Batch**	**LP02**	**LP03**	**RDL**	**QC Batch**	**LP04**	**LP04 Lab-Dup**	**QC Batch**	**LP05**	**RDL**	**QC Batch**
Calculated Parameters													
Anion Sum	me/L	0.490	2541721	0.290	0.350	N/A	2541721	0.280		2541721	0.290	N/A	2541721
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	20	2541718	11	15	1	2541718	11		2541718	12	1	2541718
Calculated TDS	mg/L	26	2541724	16	19	1	2541724	15		2541724	15	1	2541724
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	2541718	ND	ND	1	2541718	ND		2541718	ND	1	2541718
Cation Sum	me/L	0.540	2541721	0.350	0.360	N/A	2541721	0.330		2541721	0.330	N/A	2541721
Hardness (CaCO3)	mg/L	20	2541719	12	14	1	2541719	13		2541719	13	1	2541719
Ion Balance (% Difference)	%	4.85	2541720	9.38	1.41	N/A	2541720	8.20		2541720	6.45	N/A	2541720
Langelier Index (@ 20C)	N/A	-1.48	2541722	-2.24	-2.24		2541722	-2.47		2541722	-2.05		2541722
Langelier Index (@ 4C)	N/A	-1.73	2541723	-2.49	-2.49		2541723	-2.72		2541723	-2.30		2541723
Nitrate (N)	mg/L	ND	2541872	ND	ND	0.05	2541872	ND		2541872	ND	0.05	2541872
Saturation pH (@ 20C)	N/A	9.17	2541722	9.62	9.46		2541722	9.60		2541722	9.57		2541722
Saturation pH (@ 4C)	N/A	9.42	2541723	9.87	9.71		2541723	9.85		2541723	9.82		2541723
Inorganics													
Total Alkalinity (Total as CaCO3)	mg/L	20	2546713	11	15	5	2546713	11		2546713	12	5	2546713
Dissolved Chloride (Cl)	mg/L	3	2546714	2	2	1	2546714	2		2546714	2	1	2546714
Colour	TCU	27	2546719	33	37	5	2546719	55		2546719	56	30	2546719
Nitrate + Nitrite	mg/L	ND	2546721	ND	ND	0.05	2546721	ND		2546721	ND	0.05	2546721
Nitrite (N)	mg/L	ND	2546722	ND	ND	0.01	2546722	ND		2546722	ND	0.01	2546722
Nitrogen (Ammonia Nitrogen)	mg/L	ND	2547457	ND	ND	0.05	2547457	ND		2547457	ND	0.05	2547457
Total Organic Carbon (C)	mg/L	6.8	2546520	6.5	6.7	0.5	2546520	8.9		2546520	8.8	0.5	2546520
Orthophosphate (P)	mg/L	ND	2546720	ND	ND	0.01	2546720	ND		2546720	ND	0.01	2546720
pH	pH	7.69	2544372	7.38	7.22	N/A	2544372	7.13	7.07	2544372	7.52	N/A	2544399
Reactive Silica (SiO2)	mg/L	ND	2546716	ND	0.9	0.5	2546716	ND		2546716	ND	0.5	2546716
Total Suspended Solids	mg/L	8	2542199	2	ND	1	2542948	2		2542199	2	1	2542199
Dissolved Sulphate (SO4)	mg/L	ND	2546715	ND	ND	2	2546715	ND		2546715	ND	2	2546715
Turbidity	NTU	5.9	2546269	1.1	0.5	0.1	2546269	0.6		2546269	0.7	0.1	2546269
Conductivity	uS/cm	50	2544373	31	32	1	2544373	30	30	2544373	30	1	2544400

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B199010
Report Date: 2011/07/13

Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALINTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		KB4519	KB4520		KB4521			KB4522		KB4523		
Sampling Date		2011/06/26	2011/06/26		2011/06/26			2011/06/26		2011/06/26		
	Units	**VLO1**	**R01**	**QC Batch**	**R02**	**RDL**	**QC Batch**	**R03**	**RDL**	**R04**	**RDL**	**QC Batch**
Calculated Parameters												
Anion Sum	me/L	0.210	0.300	2541721	0.250	N/A	2541721	0.300	N/A	0.260	N/A	2541721
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	8	13	2541718	10	1	2541718	13	1	10	1	2541718
Calculated TDS	mg/L	12	17	2541724	14	1	2541724	17	1	16	1	2541724
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	ND	2541718	ND	1	2541718	ND	1	ND	1	2541718
Cation Sum	me/L	0.240	0.330	2541721	0.280	N/A	2541721	0.330	N/A	0.280	N/A	2541721
Hardness (CaCO3)	mg/L	9	13	2541719	11	1	2541719	13	1	11	1	2541719
Ion Balance (% Difference)	%	6.67	4.76	2541720	5.66	N/A	2541720	4.76	N/A	3.70	N/A	2541720
Langelier Index (@ 20C)	N/A	-2.66	-2.38	2541722	-2.59		2541722	-2.53		-2.87		2541722
Langelier Index (@ 4C)	N/A	-2.92	-2.64	2541723	-2.84		2541723	-2.78		-3.12		2541723
Nitrate (N)	mg/L	ND	ND	2541872	ND	0.05	2541872	ND	0.05	0.07	0.05	2541872
Saturation pH (@ 20C)	N/A	9.90	9.50	2541722	9.68		2541722	9.54		9.72		2541722
Saturation pH (@ 4C)	N/A	10.2	9.76	2541723	9.93		2541723	9.79		9.97		2541723
Inorganics												
Total Alkalinity (Total as CaCO3)	mg/L	8	13	2546713	11	5	2546713	13	5	10	5	2546713
Dissolved Chloride (Cl)	mg/L	2	1	2546714	2	1	2546714	2	1	2	1	2546714
Colour	TCU	34	29	2546719	50	5	2546719	47	10	39	5	2546719
Nitrate + Nitrite	mg/L	ND	ND	2546721	ND	0.05	2546721	ND	0.05	0.07	0.05	2546721
Nitrite (N)	mg/L	ND	ND	2546722	ND	0.01	2546722	ND	0.01	ND	0.01	2546722
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	2547457	ND	0.05	2547457	ND	0.05	ND	0.05	2547457
Total Organic Carbon (C)	mg/L	6.7	5.7	2546520	6.8	0.5	2546520	7.1	0.5	6.9	0.5	2546520
Orthophosphate (P)	mg/L	ND	ND	2546720	ND	0.01	2546720	ND	0.01	ND	0.01	2546720
pH	pH	7.24	7.12	2544399	7.09	N/A	2544399	7.01	N/A	6.85	N/A	2544399
Reactive Silica (SiO2)	mg/L	0.7	0.9	2546716	0.8	0.5	2546716	1.3	0.5	1.8	0.5	2546716
Total Suspended Solids	mg/L	2	ND	2542199	ND	1	2542948	1	1	ND	1	2542199
Dissolved Sulphate (SO4)	mg/L	ND	ND	2546715	ND	2	2546715	ND	2	ND	2	2546715
Turbidity	NTU	0.2	ND	2546269	0.2	0.1	2546269	0.2	0.1	ND	0.1	2546269
Conductivity	uS/cm	22	29	2544400	25	1	2544400	29	1	24	1	2544400

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B199010
Report Date: 2011/07/13

Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALINTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		KB4524	KB4525	KB4526		KB4527			KB4528	KB4528		
Sampling Date		2011/06/26	2011/06/26	2011/06/26		2011/06/26			2011/06/26	2011/06/26		
	Units	**R05**	**VE01**	**VE02**	**QC Batch**	**VE03**	**RDL**	**QC Batch**	**VE04**	**VE04 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters												
Anion Sum	me/L	0.200	0.190	0.260	2541721	0.220	N/A	2541721	0.190		N/A	2541721
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	8	8	11	2541718	9	1	2541718	8		1	2541718
Calculated TDS	mg/L	11	14	16	2541724	13	1	2541724	11		1	2541724
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	ND	ND	2541718	ND	1	2541718	ND		1	2541718
Cation Sum	me/L	0.230	0.370	0.320	2541721	0.290	N/A	2541721	0.240		N/A	2541721
Hardness (CaCO3)	mg/L	8	14	12	2541719	11	1	2541719	8		1	2541719
Ion Balance (% Difference)	%	6.98	32.1	10.3	2541720	13.7	N/A	2541720	11.6		N/A	2541720
Langelier Index (@ 20C)	N/A	-3.11	-2.87	-2.77	2541722	-2.90		2541722	-3.13			2541722
Langelier Index (@ 4C)	N/A	-3.36	-3.12	-3.03	2541723	-3.15		2541723	-3.38			2541723
Nitrate (N)	mg/L	ND	ND	0.05	2541872	ND	0.05	2541872	ND		0.05	2542453
Saturation pH (@ 20C)	N/A	9.95	9.72	9.65	2541722	9.80		2541722	9.94			2541722
Saturation pH (@ 4C)	N/A	10.2	9.97	9.91	2541723	10.0		2541723	10.2			2541723
Inorganics												
Total Alkalinity (Total as CaCO3)	mg/L	8	8	11	2546713	9	5	2546713	8		5	2546713
Dissolved Chloride (Cl)	mg/L	2	1	1	2546714	1	1	2546714	1		1	2546714
Colour	TCU	11	28	33	2546719	32	5	2546719	52		30	2546719
Nitrate + Nitrite	mg/L	ND	ND	0.05	2546721	ND	0.05	2546721	ND		0.05	2546721
Nitrite (N)	mg/L	ND	ND	ND	2546722	ND	0.01	2546722	ND		0.01	2546722
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	ND	2547457	ND	0.05	2547457	ND		0.05	2547457
Total Organic Carbon (C)	mg/L	3.1	4.2	6.6	2546520	7.1	0.5	2546520	8.7		0.5	2546520
Orthophosphate (P)	mg/L	ND	ND	ND	2546720	ND	0.01	2546720	ND		0.01	2546720
pH	pH	6.84	6.85	6.88	2544399	6.90	N/A	2544399	6.81	6.77	N/A	2544399
Reactive Silica (SiO2)	mg/L	ND	0.6	1.6	2546716	1.1	0.5	2546716	ND		0.5	2546716
Total Suspended Solids	mg/L	2	ND	1	2542952	ND	1	2542952	ND		1	2542952
Dissolved Sulphate (SO4)	mg/L	ND	ND	ND	2546715	ND	2	2546715	ND		2	2546715
Turbidity	NTU	0.3	ND	ND	2546269	1.0	0.1	2547585	0.2		0.1	2547585
Conductivity	uS/cm	22	20	26	2544400	24	1	2544400	20	20	1	2544400

N/A = Not Applicable
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Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B199010
Report Date: 2011/07/13

Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALINTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		KB4529			KB4530	KB4530		KB4531		KB4532		
Sampling Date		2011/06/26			2011/06/26	2011/06/26		2011/06/26		2011/06/26		
	Units	**VE05**	**RDL**	**QC Batch**	**VE06**	**VE06 Lab-Dup**	**RDL**	**VE07**	**RDL**	**VE08**	**RDL**	**QC Batch**
Calculated Parameters												
Anion Sum	me/L	0.290	N/A	2541721	0.310		N/A	0.340	N/A	0.120	N/A	2541721
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	12	1	2541718	13		1	15	1	5	1	2541718
Calculated TDS	mg/L	15	1	2541724	19		1	21	1	9	1	2541724
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1	2541718	ND		1	ND	1	ND	1	2541718
Cation Sum	me/L	0.160	N/A	2541721	0.360		N/A	0.420	N/A	0.210	N/A	2541721
Hardness (CaCO3)	mg/L	6	1	2541719	14		1	17	1	7	1	2541719
Ion Balance (% Difference)	%	28.9	N/A	2541720	7.46		N/A	10.5	N/A	27.3	N/A	2541720
Langelier Index (@ 20C)	N/A	-2.97		2541722	-2.57			-2.48		-3.85		2541722
Langelier Index (@ 4C)	N/A	-3.22		2541723	-2.82			-2.73		-4.10		2541723
Nitrate (N)	mg/L	0.10	0.05	2542453	ND		0.05	0.06	0.05	0.17	0.05	2542453
Saturation pH (@ 20C)	N/A	9.92		2541722	9.51			9.39		10.3		2541722
Saturation pH (@ 4C)	N/A	10.2		2541723	9.76			9.64		10.5		2541723
Inorganics												
Total Alkalinity (Total as CaCO3)	mg/L	12	5	2546713	13		5	15	5	5	5	2546713
Dissolved Chloride (Cl)	mg/L	1	1	2546714	2		1	2	1	ND	1	2546714
Colour	TCU	29	5	2546719	67		30	52	10	39	5	2546719
Nitrate + Nitrite	mg/L	0.10	0.05	2546721	ND		0.05	0.06	0.05	0.17	0.05	2546721
Nitrite (N)	mg/L	ND	0.01	2546722	ND		0.01	ND	0.01	ND	0.01	2546722
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.05	2547457	ND		0.05	ND	0.05	ND	0.05	2547457
Total Organic Carbon (C)	mg/L	6.6	0.5	2546520	8.7	9.0	0.5	8.1	0.5	10	0.5	2548114
Orthophosphate (P)	mg/L	ND	0.01	2546720	ND		0.01	ND	0.01	ND	0.01	2546720
pH	pH	6.95	N/A	2546049	6.94		N/A	6.91	N/A	6.42	N/A	2546049
Reactive Silica (SiO2)	mg/L	2.5	0.5	2546716	1.8		0.5	2.0	0.5	0.6	0.5	2546716
Total Suspended Solids	mg/L	3	1	2542952	1		1	1	1	24	1	2542952
Dissolved Sulphate (SO4)	mg/L	ND	2	2546715	ND		2	ND	2	ND	2	2546715
Turbidity	NTU	0.3	0.1	2547585	0.6		0.1	0.3	0.1	0.3	0.1	2547585
Conductivity	uS/cm	31	1	2546052	35		1	36	1	17	1	2546052

N/A = Not Applicable
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QC Batch = Quality Control Batch

Maxxam Job #: B199010
Report Date: 2011/07/13

Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALINTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		KB4532		KB4533	KB4533		KB4534	KB4534		
Sampling Date		2011/06/26		2011/06/26	2011/06/26		2011/06/26	2011/06/26		
	Units	**VE08 Lab-Dup**	**QC Batch**	**VE09**	**VE09 Lab-Dup**	**QC Batch**	**VE10**	**VE10 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters										
Anion Sum	me/L		2541721	0.570		2541721	0.280		N/A	2541721
Bicarb. Alkalinity (calc. as CaCO3)	mg/L		2541718	27		2541718	12		1	2541718
Calculated TDS	mg/L		2541724	31		2541724	16		1	2541724
Carb. Alkalinity (calc. as CaCO3)	mg/L		2541718	ND		2541718	ND		1	2541718
Cation Sum	me/L		2541721	0.570		2541721	0.340		N/A	2541721
Hardness (CaCO3)	mg/L		2541719	22		2541719	13		1	2541719
Ion Balance (% Difference)	%		2541720	0.00		2541720	9.68		N/A	2541720
Langelier Index (@ 20C)	N/A		2541722	-2.09		2541722	-2.75			2541722
Langelier Index (@ 4C)	N/A		2541723	-2.34		2541723	-3.01			2541723
Nitrate (N)	mg/L		2542453	ND		2542453	ND		0.05	2542453
Saturation pH (@ 20C)	N/A		2541722	9.07		2541722	9.62			2541722
Saturation pH (@ 4C)	N/A		2541723	9.32		2541723	9.88			2541723
Inorganics										
Total Alkalinity (Total as CaCO3)	mg/L	5	2546713	27		2546724	12		5	2546724
Dissolved Chloride (Cl)	mg/L	ND	2546714	1		2546748	1		1	2546748
Colour	TCU	39	2546719	47		2546754	35		5	2546754
Nitrate + Nitrite	mg/L	0.17	2546721	ND		2546758	ND		0.05	2546758
Nitrite (N)	mg/L	ND	2546722	ND		2546760	ND		0.01	2546760
Nitrogen (Ammonia Nitrogen)	mg/L		2547457	ND	ND	2547457	ND		0.05	2547460
Total Organic Carbon (C)	mg/L		2548114	9.0		2548114	8.1		0.5	2548114
Orthophosphate (P)	mg/L	ND	2546720	ND		2546756	ND		0.01	2546756
pH	pH		2546049	6.98		2546049	6.87		N/A	2546049
Reactive Silica (SiO2)	mg/L	0.6	2546716	1.4		2546753	0.8		0.5	2546753
Total Suspended Solids	mg/L		2542952	3		2542952	3		1	2542952
Dissolved Sulphate (SO4)	mg/L	ND	2546715	ND		2546752	ND		2	2546752
Turbidity	NTU		2547585	0.4		2547585	0.3	ND	0.1	2547585
Conductivity	uS/cm		2546052	53		2546052	27		1	2546052

N/A = Not Applicable
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Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B199010
Report Date: 2011/07/13

Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALINTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		KB4494	KB4515	KB4516	KB4517	KB4518		KB4519	KB4519	KB4520	KB4521		
Sampling Date		2011/06/25	2011/06/25	2011/06/25	2011/06/25	2011/06/25		2011/06/26	2011/06/26	2011/06/26	2011/06/26		
	Units	**LP01**	**LP02**	**LP03**	**LP04**	**LP05**	**QC Batch**	**VLO1**	**VLO1 Lab-Dup**	**R01**	**R02**	**RDL**	**QC Batch**
Metals													
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	2544406	ND	ND	ND	ND	0.013	2546282

Maxxam ID		KB4522	KB4523	KB4524	KB4525	KB4526	KB4527	KB4528		
Sampling Date		2011/06/26	2011/06/26	2011/06/26	2011/06/26	2011/06/26	2011/06/26	2011/06/26		
	Units	**R03**	**R04**	**R05**	**VE01**	**VE02**	**VE03**	**VE04**	**RDL**	**QC Batch**
Metals										
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.013	2546282

Maxxam ID		KB4529	KB4530	KB4531	KB4532	KB4533	KB4534		
Sampling Date		2011/06/26	2011/06/26	2011/06/26	2011/06/26	2011/06/26	2011/06/26		
	Units	**VE05**	**VE06**	**VE07**	**VE08**	**VE09**	**VE10**	**RDL**	**QC Batch**
Metals									
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	0.013	2546282

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B199010
Report Date: 2011/07/13

Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALINTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		KB4494	KB4515	KB4515	KB4516	KB4516	KB4517	KB4518	KB4519	KB4520	KB4521		
Sampling Date		2011/06/25	2011/06/25	2011/06/25	2011/06/25	2011/06/25	2011/06/25	2011/06/25	2011/06/26	2011/06/26	2011/06/26		
	Units	**LP01**	**LP02**	**LP02 Lab-Dup**	**LP03**	**LP03 Lab-Dup**	**LP04**	**LP05**	**VLO1**	**R01**	**R02**	**RDL**	**QC Batch**
Metals													
Total Aluminum (Al)	ug/L	321	121	113	43.2	42.2	124	91.2	56.5	28.1	46.0	5.0	2546381
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2546381
Total Arsenic (As)	ug/L	1.0	ND	ND	2.1	2.2	ND	ND	2.0	3.6	3.9	1.0	2546381
Total Barium (Ba)	ug/L	5.8	2.7	2.6	2.0	1.9	1.3	ND	1.2	1.2	ND	1.0	2546381
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2546381
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2546381
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	50	2546381
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.017	2546381
Total Calcium (Ca)	ug/L	6580	4000	4000	4470	4400	4130	4230	2810	4410	3700	100	2546381
Total Chromium (Cr)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2546381
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.40	2546381
Total Copper (Cu)	ug/L	2.7	ND	ND	ND	ND	ND	2.9	ND	ND	ND	2.0	2546381
Total Iron (Fe)	ug/L	374	170	177	118	118	160	142	75	112	157	50	2546381
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.50	2546381
Total Magnesium (Mg)	ug/L	851	585	584	641	632	679	647	430	554	439	100	2546381
Total Manganese (Mn)	ug/L	64.7	16.0	16.8	42.3	41.5	21.3	29.6	16.4	29.4	16.5	2.0	2546381
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2546381
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2546381
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100	2546381
Total Potassium (K)	ug/L	577	312	308	176	192	167	105	107	ND	ND	100	2546381
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2546381
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2546381
Total Sodium (Na)	ug/L	2620	1960	1980	1700	1670	1440	1280	1380	1400	1220	200	2546381
Total Strontium (Sr)	ug/L	40.4	26.1	27.1	16.3	16.2	8.1	11.4	8.0	10.6	7.9	2.0	2546381
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2546381
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2546381
Total Titanium (Ti)	ug/L	12.8	9.7	12.9	ND(1)	5.6	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	5.0	2546381
Total Uranium (U)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2546381
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2546381
Total Zinc (Zn)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	2546381

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) - Elevated reporting limit due to instrument performance.

Maxxam Job #: B199010
Report Date: 2011/07/13

Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALINTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		KB4522	KB4523	KB4524			KB4525	KB4525	KB4526	KB4527	KB4528		
Sampling Date		2011/06/26	2011/06/26	2011/06/26			2011/06/26	2011/06/26	2011/06/26	2011/06/26	2011/06/26		
	Units	**R03**	**R04**	**R05**	**RDL**	**QC Batch**	**VE01**	**VE01 Lab-Dup**	**VE02**	**VE03**	**VE04**	**RDL**	**QC Batch**
Metals													
Total Aluminum (Al)	ug/L	116	114	46.3	5.0	2546381	50.6	49.5	57.2	52.2	62.6	5.0	2546408
Total Antimony (Sb)	ug/L	ND	ND	ND	1.0	2546381	ND	ND	ND	ND	ND	1.0	2546408
Total Arsenic (As)	ug/L	2.5	1.1	ND	1.0	2546381	ND	ND	ND	ND	ND	1.0	2546408
Total Barium (Ba)	ug/L	2.4	2.1	6.1	1.0	2546381	1.4	1.3	2.2	ND	1.1	1.0	2546408
Total Beryllium (Be)	ug/L	ND	ND	ND	1.0	2546381	ND	ND	ND	ND	ND	1.0	2546408
Total Bismuth (Bi)	ug/L	ND	ND	ND	2.0	2546381	ND	ND	ND	ND	ND	2.0	2546408
Total Boron (B)	ug/L	ND	ND	ND	50	2546381	ND	ND	ND	ND	ND	50	2546408
Total Cadmium (Cd)	ug/L	ND	ND	ND	0.017	2546381	ND	ND	ND	ND	ND	0.017	2546408
Total Calcium (Ca)	ug/L	4260	3470	2710	100	2546381	4510	4390	3890	3370	2730	100	2546408
Total Chromium (Cr)	ug/L	ND	ND	ND	1.0	2546381	4.3	4.0	1.3	1.6	ND	1.0	2546408
Total Cobalt (Co)	ug/L	ND	ND	ND	0.40	2546381	ND	ND	ND	ND	ND	0.40	2546408
Total Copper (Cu)	ug/L	ND	ND	2.3	2.0	2546381	ND	ND	ND	ND	ND	2.0	2546408
Total Iron (Fe)	ug/L	303	129	79	50	2546381	133	126	107	86	160	50	2546408
Total Lead (Pb)	ug/L	ND	ND	ND	0.50	2546381	ND	ND	ND	ND	ND	0.50	2546408
Total Magnesium (Mg)	ug/L	547	461	364	100	2546381	708	687	606	540	376	100	2546408
Total Manganese (Mn)	ug/L	300	117	71.3	2.0	2546381	35.3	33.6	86.2	16.0	45.4	2.0	2546408
Total Molybdenum (Mo)	ug/L	ND	ND	ND	2.0	2546381	ND	ND	ND	ND	ND	2.0	2546408
Total Nickel (Ni)	ug/L	ND	ND	ND	2.0	2546381	ND	ND	ND	ND	ND	2.0	2546408
Total Phosphorus (P)	ug/L	ND	ND	ND	100	2546381	ND	ND	ND	ND	ND	100	2546408
Total Potassium (K)	ug/L	ND	ND	121	100	2546381	123	115	140	130	115	100	2546408
Total Selenium (Se)	ug/L	ND	ND	ND	1.0	2546381	ND	ND	ND	ND	ND	1.0	2546408
Total Silver (Ag)	ug/L	ND	ND	ND	0.10	2546381	ND	ND	ND	ND	ND	0.10	2546408
Total Sodium (Na)	ug/L	1390	1510	1300	200	2546381	1830	1790	1630	1540	1410	100	2546408
Total Strontium (Sr)	ug/L	8.8	5.9	7.6	2.0	2546381	11.2	11.7	10.9	10.5	9.2	2.0	2546408
Total Thallium (Tl)	ug/L	ND	ND	ND	0.10	2546381	ND	ND	ND	ND	ND	0.10	2546408
Total Tin (Sn)	ug/L	ND	ND	ND	2.0	2546381	ND	ND	ND	ND	ND	2.0	2546408
Total Titanium (Ti)	ug/L	ND(1)	ND(1)	ND(1)	5.0	2546381	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	5.0	2546408
Total Uranium (U)	ug/L	ND	ND	ND	0.10	2546381	ND	ND	ND	ND	ND	0.10	2546408
Total Vanadium (V)	ug/L	ND	ND	ND	2.0	2546381	ND	ND	ND	ND	ND	2.0	2546408
Total Zinc (Zn)	ug/L	ND	ND	ND	5.0	2546381	ND	ND	ND	ND	ND	5.0	2546408

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
(1) - Elevated reporting limit due to instrument performance.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B199010
Report Date: 2011/07/13

Stantec Consulting Ltd
Client Project #: 121510621.100
Project name: VALINTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		KB4529	KB4530	KB4531	KB4532	KB4533	KB4534		
Sampling Date		2011/06/26	2011/06/26	2011/06/26	2011/06/26	2011/06/26	2011/06/26		
	Units	**VE05**	**VE06**	**VE07**	**VE08**	**VE09**	**VE10**	**RDL**	**QC Batch**
Metals									
Total Aluminum (Al)	ug/L	41.8	222	77.5	159	112	86.6	5.0	2546408
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2546408
Total Arsenic (As)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2546408
Total Barium (Ba)	ug/L	1.2	3.7	1.9	ND	3.0	3.5	1.0	2546408
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2546408
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2546408
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	50	2546408
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	ND	ND	0.017	2546408
Total Calcium (Ca)	ug/L	1830	4450	5260	1840	6240	3710	100	2546408
Total Chromium (Cr)	ug/L	6.5	2.8	22.1	ND	ND	ND	1.0	2546408
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	0.44	ND	0.40	2546408
Total Copper (Cu)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2546408
Total Iron (Fe)	ug/L	104	468	138	259	342	236	50	2546408
Total Lead (Pb)	ug/L	2.72	ND	0.53	ND	ND	ND	0.50	2546408
Total Magnesium (Mg)	ug/L	354	729	843	526	1640	859	100	2546408
Total Manganese (Mn)	ug/L	37.6	349	89.3	96.7	828	127	2.0	2546408
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2546408
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2546408
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	100	2546408
Total Potassium (K)	ug/L	ND	174	180	ND	191	ND	100	2546408
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2546408
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	0.10	2546408
Total Sodium (Na)	ug/L	896	1410	1770	1540	2430	1710	100	2546408
Total Strontium (Sr)	ug/L	4.7	10.8	13.7	5.0	22.7	10.3	2.0	2546408
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	0.10	2546408
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2546408
Total Titanium (Ti)	ug/L	ND(1)	11.3	ND(1)	5.1	ND(1)	ND(1)	5.0	2546408
Total Uranium (U)	ug/L	ND	ND	ND	ND	0.14	ND	0.10	2546408
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2546408
Total Zinc (Zn)	ug/L	ND	ND	ND	ND	ND	7.4	5.0	2546408

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Maxxam Job #: B199010
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Stantec Consulting Ltd
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Sampler Initials: SM

Package 1	7.3°C

Each temperature is the average of up to three cooler temperatures taken at receipt

GENERAL COMMENTS

TSS samples received past the recommended 7 day holding time.

Sample KB4515-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KB4517-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KB4518-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KB4519-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KB4521-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KB4524-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KB4525-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KB4526-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KB4527-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KB4528-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KB4529-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KB4530-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KB4531-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KB4532-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KB4534-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

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Stantec Consulting Ltd
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Your P.O. #: 16300R-40
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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2542199	Total Suspended Solids	2011/07/07					ND, RDL=1	mg/L	0	25	101	80 - 120
2542948	Total Suspended Solids	2011/07/07					ND, RDL=1	mg/L	NC	25	101	80 - 120
2542952	Total Suspended Solids	2011/07/08					ND, RDL=1	mg/L	5.2	25	96	80 - 120
2544372	pH	2011/07/08					5.83, RDL=N/A	pH	0.8	25	102	80 - 120
2544373	Conductivity	2011/07/08			100	80 - 120	ND, RDL=1	uS/cm	1	25		
2544399	pH	2011/07/08					5.79, RDL=N/A	pH	0.6	25	102	80 - 120
2544400	Conductivity	2011/07/08			99	80 - 120	1, RDL=1	uS/cm	0.5	25		
2544406	Total Mercury (Hg)	2011/07/08	81	80 - 120	95	80 - 120	ND, RDL=0.013	ug/L	NC	25	99	80 - 120
2546049	pH	2011/07/11					5.67, RDL=N/A	pH	2.0	25	102	80 - 120
2546052	Conductivity	2011/07/11			100	80 - 120	2, RDL=1	uS/cm	0.2	25		
2546269	Turbidity	2011/07/11					ND, RDL=0.1	NTU	20.6	25	100	80 - 120
2546282	Total Mercury (Hg)	2011/07/11	94	80 - 120	95	80 - 120	ND, RDL=0.013	ug/L	NC	25	95	80 - 120
2546381	Total Aluminum (Al)	2011/07/12	98	80 - 120	102	80 - 120	6.3, RDL=5.0(1)	ug/L	2.2	25		
2546381	Total Antimony (Sb)	2011/07/12	95	80 - 120	96	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2546381	Total Arsenic (As)	2011/07/12	95	80 - 120	95	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2546381	Total Barium (Ba)	2011/07/12	96	80 - 120	100	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2546381	Total Beryllium (Be)	2011/07/12	98	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2546381	Total Bismuth (Bi)	2011/07/12	96	80 - 120	95	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2546381	Total Boron (B)	2011/07/12	96	80 - 120	92	80 - 120	ND, RDL=50	ug/L	NC	25		
2546381	Total Cadmium (Cd)	2011/07/12	97	80 - 120	98	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2546381	Total Calcium (Ca)	2011/07/12	91	80 - 120	99	80 - 120	ND, RDL=100	ug/L	1.5	25		
2546381	Total Chromium (Cr)	2011/07/12	95	80 - 120	96	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2546381	Total Cobalt (Co)	2011/07/12	95	80 - 120	94	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2546381	Total Copper (Cu)	2011/07/12	NC	80 - 120	95	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2546381	Total Iron (Fe)	2011/07/12	105	80 - 120	108	80 - 120	ND, RDL=50	ug/L	NC	25		
2546381	Total Lead (Pb)	2011/07/12	99	80 - 120	99	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2546381	Total Magnesium (Mg)	2011/07/12	103	80 - 120	104	80 - 120	ND, RDL=100	ug/L	1.4	25		
2546381	Total Manganese (Mn)	2011/07/12	98	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L	1.9	25		
2546381	Total Molybdenum (Mo)	2011/07/12	99	80 - 120	101	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2546381	Total Nickel (Ni)	2011/07/12	94	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2546381	Total Phosphorus (P)	2011/07/12	99	80 - 120	100	80 - 120	ND, RDL=100	ug/L	NC	25		
2546381	Total Potassium (K)	2011/07/12	103	80 - 120	104	80 - 120	ND, RDL=100	ug/L	NC	25		
2546381	Total Selenium (Se)	2011/07/12	92	80 - 120	96	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2546381	Total Silver (Ag)	2011/07/12	101	80 - 120	103	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2546381	Total Sodium (Na)	2011/07/12	NC	80 - 120	98	80 - 120	ND, RDL=200	ug/L	1.5	25		
2546381	Total Strontium (Sr)	2011/07/12	100	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L	0.4	25		
2546381	Total Thallium (Tl)	2011/07/12	96	80 - 120	96	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2546381	Total Tin (Sn)	2011/07/12	94	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2546381	Total Titanium (Ti)	2011/07/12	104	80 - 120	102	80 - 120	ND, RDL=5.0(2)	ug/L	NC	25		

Maxxam Job #: B199010
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Stantec Consulting Ltd
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Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2546381	Total Uranium (U)	2011/07/12	106	80 - 120	105	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2546381	Total Vanadium (V)	2011/07/12	97	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2546381	Total Zinc (Zn)	2011/07/12	NC	80 - 120	95	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2546408	Total Aluminum (Al)	2011/07/12	102	80 - 120	105	80 - 120	8.0, RDL=5.0(1)	ug/L	2.3	25		
2546408	Total Antimony (Sb)	2011/07/12	100	80 - 120	100	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2546408	Total Arsenic (As)	2011/07/12	102	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2546408	Total Barium (Ba)	2011/07/12	102	80 - 120	100	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2546408	Total Beryllium (Be)	2011/07/12	102	80 - 120	102	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2546408	Total Bismuth (Bi)	2011/07/12	100	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2546408	Total Boron (B)	2011/07/12	93	80 - 120	91	80 - 120	ND, RDL=50	ug/L	NC	25		
2546408	Total Cadmium (Cd)	2011/07/12	103	80 - 120	103	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2546408	Total Calcium (Ca)	2011/07/12	103	80 - 120	103	80 - 120	ND, RDL=100	ug/L	2.6	25		
2546408	Total Chromium (Cr)	2011/07/12	104	80 - 120	101	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2546408	Total Cobalt (Co)	2011/07/12	101	80 - 120	99	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2546408	Total Copper (Cu)	2011/07/12	102	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2546408	Total Iron (Fe)	2011/07/12	114	80 - 120	110	80 - 120	ND, RDL=50	ug/L	NC	25		
2546408	Total Lead (Pb)	2011/07/12	103	80 - 120	103	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2546408	Total Magnesium (Mg)	2011/07/12	111	80 - 120	110	80 - 120	ND, RDL=100	ug/L	3.0	25		
2546408	Total Manganese (Mn)	2011/07/12	104	80 - 120	104	80 - 120	ND, RDL=2.0	ug/L	4.9	25		
2546408	Total Molybdenum (Mo)	2011/07/12	103	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2546408	Total Nickel (Ni)	2011/07/12	103	80 - 120	101	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2546408	Total Phosphorus (P)	2011/07/12	108	80 - 120	105	80 - 120	ND, RDL=100	ug/L	NC	25		
2546408	Total Potassium (K)	2011/07/12	108	80 - 120	109	80 - 120	ND, RDL=100	ug/L	NC	25		
2546408	Total Selenium (Se)	2011/07/12	100	80 - 120	101	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2546408	Total Silver (Ag)	2011/07/12	109	80 - 120	105	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2546408	Total Sodium (Na)	2011/07/12	105	80 - 120	104	80 - 120	ND, RDL=100	ug/L	2.5	25		
2546408	Total Strontium (Sr)	2011/07/12	108	80 - 120	106	80 - 120	ND, RDL=2.0	ug/L	4.3	25		
2546408	Total Thallium (Tl)	2011/07/12	100	80 - 120	99	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2546408	Total Tin (Sn)	2011/07/12	100	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2546408	Total Titanium (Ti)	2011/07/12	113	80 - 120	109	80 - 120	ND, RDL=5.0(2)	ug/L	NC(2)	25		
2546408	Total Uranium (U)	2011/07/12	111	80 - 120	109	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2546408	Total Vanadium (V)	2011/07/12	105	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2546408	Total Zinc (Zn)	2011/07/12	100	80 - 120	98	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2546520	Total Organic Carbon (C)	2011/07/11	104	80 - 120	101	80 - 120	ND, RDL=0.5	mg/L	6.7	25	101	80 - 120
2546713	Total Alkalinity (Total as CaCO3)	2011/07/12	98	80 - 120	103	80 - 120	ND, RDL=5	mg/L	NC	25	109	80 - 120
2546714	Dissolved Chloride (Cl)	2011/07/12	94	80 - 120	96	80 - 120	ND, RDL=1	mg/L	NC	25	96	80 - 120
2546715	Dissolved Sulphate (SO4)	2011/07/12	108	80 - 120	104	80 - 120	ND, RDL=2	mg/L	NC	25	104	80 - 120
2546716	Reactive Silica (SiO2)	2011/07/12	101	80 - 120	101	80 - 120	ND, RDL=0.5	mg/L	NC	25	101	75 - 125
2546719	Colour	2011/07/12					ND, RDL=5	TCU	0.03	25	107	80 - 120

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2546720	Orthophosphate (P)	2011/07/12	96	80 - 120	110	80 - 120	ND, RDL=0.01	mg/L	NC	25	100	80 - 120
2546721	Nitrate + Nitrite	2011/07/13	98	80 - 120	99	80 - 120	ND, RDL=0.05	mg/L	NC	25	105	80 - 120
2546722	Nitrite (N)	2011/07/12	90	80 - 120	101	80 - 120	ND, RDL=0.01	mg/L	NC	25	103	80 - 120
2546724	Total Alkalinity (Total as CaCO3)	2011/07/12	100	80 - 120	104	80 - 120	ND, RDL=5	mg/L	NC	25	103	80 - 120
2546748	Dissolved Chloride (Cl)	2011/07/12	NC	80 - 120	96	80 - 120	ND, RDL=1	mg/L	1.3	25	97	80 - 120
2546752	Dissolved Sulphate (SO4)	2011/07/12	103	80 - 120	102	80 - 120	ND, RDL=2	mg/L	NC	25	100	80 - 120
2546753	Reactive Silica (SiO2)	2011/07/12	NC	80 - 120	101	80 - 120	ND, RDL=0.5	mg/L	0.9	25	100	75 - 125
2546754	Colour	2011/07/12					ND, RDL=5	TCU	NC	25	109	80 - 120
2546756	Orthophosphate (P)	2011/07/12	98	80 - 120	102	80 - 120	ND, RDL=0.01	mg/L	NC	25	100	80 - 120
2546758	Nitrate + Nitrite	2011/07/13	96	80 - 120	96	80 - 120	ND, RDL=0.05	mg/L	NC	25	105	80 - 120
2546760	Nitrite (N)	2011/07/12	97	80 - 120	101	80 - 120	ND, RDL=0.01	mg/L	NC	25	102	80 - 120
2547457	Nitrogen (Ammonia Nitrogen)	2011/07/12	97	80 - 120	94	80 - 120	ND, RDL=0.05	mg/L	NC	25	100	80 - 120
2547460	Nitrogen (Ammonia Nitrogen)	2011/07/13	87	80 - 120	94	80 - 120	ND, RDL=0.05	mg/L	NC	25	96	80 - 120
2547585	Turbidity	2011/07/12					ND, RDL=0.1	NTU	NC	25	103	80 - 120
2548114	Total Organic Carbon (C)	2011/07/12	98	80 - 120	100	80 - 120	ND, RDL=0.5	mg/L	3.7	25	100	80 - 120

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) - Low level lab contamination. Minimal impact on data quality.
(2) - Elevated reporting limit due to instrument performance.

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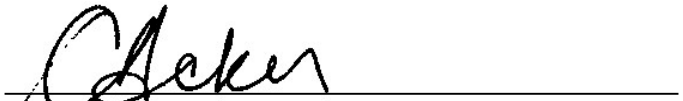
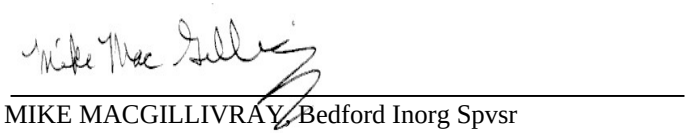
Validation Signature Page

Maxxam Job #: B199010

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



COLLEEN ACKER,



MIKE MACGILLIVRAY, Bedford Inorg Spvsr

KEVIN MACDONALD, Inorganics Supervisor

==========

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Round 5

Your P.O. #: 16300R-40
Your Project #: 121510621.100
Site Location: VALENTINE LAKE
Your C.O.C. #: ES268111

Attention: Barry Wicks
Stantec Consulting Ltd
St. John's - Standing Offer
607 Torbay Rd
St. John's, NL
A1A 4Y6

Report Date: 2011/08/18

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B1C0960
Received: 2011/08/11, 10:43

Sample Matrix: Water
Samples Received: 21

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonate, Bicarbonate and Hydroxide	21	N/A	2011/08/16	CAM SOP-00102	APHA 4500-CO2 D
Alkalinity	19	N/A	2011/08/16	ATL SOP 00013 R4	Based on EPA310.2
Alkalinity	2	N/A	2011/08/17	ATL SOP 00013 R4	Based on EPA310.2
Chloride	21	N/A	2011/08/17	ATL SOP 00014 R6	Based on SM4500-Cl-
Colour	21	N/A	2011/08/17	ATL SOP 00020 R3.	Based on SM2120C
Conductance - water	21	N/A	2011/08/16	ATL SOP 00004 R5/00006 R4	Based on SM2510B
Hardness (calculated as CaCO3)	9	N/A	2011/08/16	ATL SOP 00048	Based on SM2340B
Hardness (calculated as CaCO3)	12	N/A	2011/08/17	ATL SOP 00048	Based on SM2340B
Mercury - Total (CVAA,LL)	1	2011/08/12	2011/08/15	ATL SOP 00026 R6	Based on EPA245.1
Mercury - Total (CVAA,LL)	17	2011/08/15	2011/08/16	ATL SOP 00026 R6	Based on EPA245.1
Mercury - Total (CVAA,LL)	3	2011/08/17	2011/08/18	ATL SOP 00026 R6	Based on EPA245.1
Metals Water Total MS	9	2011/08/15	2011/08/15	ATL SOP 00059 R1	Based on EPA6020A
Metals Water Total MS	12	2011/08/15	2011/08/16	ATL SOP 00059 R1	Based on EPA6020A
Ion Balance (% Difference)	11	N/A	2011/08/17		
Ion Balance (% Difference)	10	N/A	2011/08/18		
Anion and Cation Sum	11	N/A	2011/08/17		
Anion and Cation Sum	10	N/A	2011/08/18		
Nitrogen Ammonia - water	15	N/A	2011/08/16	ATL SOP 00015 R5	Based on USEPA 350.1
Nitrogen Ammonia - water	6	N/A	2011/08/18	ATL SOP 00015 R5	Based on USEPA 350.1
Nitrogen - Nitrate + Nitrite	21	N/A	2011/08/17	ATL SOP 00016 R4	Based on USGS - Enz.
Nitrogen - Nitrite	21	N/A	2011/08/17	ATL SOP 00017 R4	Based on SM4500-NO2B
Nitrogen - Nitrate (as N)	21	N/A	2011/08/17	ATL SOP 00018 R3	Based on ASTMD3867
pH	21	N/A	2011/08/16	ATL SOP 00003 R5/00005 R7	Based on SM4500H+B
Phosphorus - ortho	21	N/A	2011/08/17	ATL SOP 00021 R3	Based on USEPA 365.1
Sat. pH and Langelier Index (@ 20C)	11	N/A	2011/08/17		
Sat. pH and Langelier Index (@ 20C)	10	N/A	2011/08/18		
Sat. pH and Langelier Index (@ 4C)	11	N/A	2011/08/17		
Sat. pH and Langelier Index (@ 4C)	10	N/A	2011/08/18		
Reactive Silica	21	N/A	2011/08/16	ATL SOP 00022 R3	Based on EPA 366.0
Sulphate	21	N/A	2011/08/16	ATL SOP 00023 R3	Based on EPA 375.4
Total Dissolved Solids (TDS calc)	11	N/A	2011/08/17		
Total Dissolved Solids (TDS calc)	10	N/A	2011/08/18		
Organic carbon - Total (TOC)	21	N/A	2011/08/16	ATL SOP 00037 R4	Based on SM5310C
Total Suspended Solids	21	N/A	2011/08/12	ATL SOP 00007 R3	based on EPA 160.2
Turbidity	21	N/A	2011/08/17	ATL SOP 00011 R5	based on EPA 180.1

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

../2

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B1C0960
Report Date: 2011/08/18

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: RM

Encryption Key

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

MICHELLE HILL, Project Manager
Email: MHill@maxxam.ca
Phone# (902) 420-0203

==========

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: 2

Maxxam Job #: B1C0960
Report Date: 2011/08/18

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: RM

RESULTS OF ANALYSES OF WATER

Maxxam ID		KM6433		KM6785	KM6786			KM6787	KM6787		KM6788		
Sampling Date		2011/08/07		2011/08/07	2011/08/07			2011/08/07	2011/08/07		2011/08/07		
	Units	**VE01**	**QC Batch**	**VE02**	**VE03**	**RDL**	**QC Batch**	**VE04**	**VE04 Lab-Dup**	**RDL**	**VE05**	**RDL**	**QC Batch**
Calculated Parameters													
Anion Sum	me/L	0.420	2578855	0.360	0.330	N/A	2578855	0.270		N/A	0.390	N/A	2578855
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	18	2578852	15	14	1	2578852	11		1	19	1	2578852
Calculated TDS	mg/L	26	2578858	22	20	1	2578858	16		1	26	1	2578858
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	2578852	ND	ND	1	2578852	ND		1	ND	1	2578852
Cation Sum	me/L	0.480	2578855	0.400	0.370	N/A	2578855	0.310		N/A	0.480	N/A	2578855
Hardness (CaCO3)	mg/L	19	2578853	16	15	1	2578853	12		1	18	1	2580226
Ion Balance (% Difference)	%	6.67	2578854	5.26	5.71	N/A	2578854	6.90		N/A	10.3	N/A	2578854
Langelier Index (@ 20C)	N/A	-1.58	2578856	-2.21	-2.30		2578856	-2.62			-2.26		2578856
Langelier Index (@ 4C)	N/A	-1.83	2578857	-2.46	-2.56		2578857	-2.87			-2.51		2578857
Nitrate (N)	mg/L	0.07	2580108	0.08	0.08	0.05	2580108	0.24		0.05	0.11	0.05	2580108
Saturation pH (@ 20C)	N/A	9.24	2578856	9.39	9.46		2578856	9.66			9.25		2578856
Saturation pH (@ 4C)	N/A	9.49	2578857	9.64	9.72		2578857	9.91			9.50		2578857
Inorganics													
Total Alkalinity (Total as CaCO3)	mg/L	18	2583359	15	14	5	2583359	11		5	19	5	2583359
Dissolved Chloride (Cl)	mg/L	2	2583368	2	2	1	2583368	1		1	ND	1	2583368
Colour	TCU	36	2583375	31	30	5	2583375	56		30	37	5	2583375
Nitrate + Nitrite	mg/L	0.07	2583378	0.08	0.08	0.05	2583378	0.24		0.05	0.11	0.05	2583378
Nitrite (N)	mg/L	ND	2583383	ND	ND	0.01	2583383	ND		0.01	ND	0.01	2583383
Nitrogen (Ammonia Nitrogen)	mg/L	ND	2583587	ND	ND	0.05	2583587	ND		0.05	ND	0.05	2583587
Total Organic Carbon (C)	mg/L	6.3	2584126	6.3	6.9	0.5	2584126	10	10	0.5	6.9	0.5	2584145
Orthophosphate (P)	mg/L	ND	2583376	ND	ND	0.01	2583376	0.01		0.01	0.01	0.01	2583376
pH	pH	7.66	2583207	7.18	7.16	N/A	2583207	7.04		N/A	6.99	N/A	2583207
Reactive Silica (SiO2)	mg/L	3.4	2583372	2.7	1.9	0.5	2583372	0.7		0.5	3.9	0.5	2583372
Total Suspended Solids	mg/L	ND	2579330	ND	ND	1	2579330	ND		1	5	2	2579330
Dissolved Sulphate (SO4)	mg/L	ND	2583371	ND	ND	2	2583371	ND		2	ND	2	2583371
Turbidity	NTU	0.4	2584613	ND	0.1	0.1	2584614	0.3		0.1	1.3	0.1	2584614
Conductivity	uS/cm	42	2583208	36	33	1	2583208	27		1	40	1	2583208

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B1C0960
Report Date: 2011/08/18

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: RM

RESULTS OF ANALYSES OF WATER

Maxxam ID		KM6789	KM6789			KM6790	KM6790		KM6791	KM6792	KM6793		
Sampling Date		2011/08/07	2011/08/07			2011/08/07	2011/08/07		2011/08/07	2011/08/07	2011/08/07		
	Units	**VE06**	**VE06 Lab-Dup**	**RDL**	**QC Batch**	**VE07**	**VE07 Lab-Dup**	**QC Batch**	**VE08**	**VE09**	**VE10**	**RDL**	**QC Batch**
Calculated Parameters													
Anion Sum	me/L	0.410		N/A	2580228	0.510		2580228	0.680	0.700	0.460	N/A	2580228
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	17		1	2580224	21		2580224	31	33	21	1	2580224
Calculated TDS	mg/L	25		1	2580232	32		2580232	43	39	26	1	2580232
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND		1	2580224	ND		2580224	ND	ND	ND	1	2580224
Cation Sum	me/L	0.490		N/A	2580228	0.580		2580228	0.760	0.700	0.500	N/A	2580228
Hardness (CaCO3)	mg/L	20		1	2580226	24		2580226	32	28	20	1	2580226
Ion Balance (% Difference)	%	8.89		N/A	2580227	6.42		2580227	5.56	0.00	4.17	N/A	2580227
Langelier Index (@ 20C)	N/A	-2.27			2580230	-2.11		2580230	-1.81	-1.79	-2.19		2580230
Langelier Index (@ 4C)	N/A	-2.52			2580231	-2.37		2580231	-2.06	-2.04	-2.44		2580231
Nitrate (N)	mg/L	0.20		0.05	2580108	0.61		2580108	ND	ND	0.15	0.05	2580108
Saturation pH (@ 20C)	N/A	9.25			2580230	9.09		2580230	8.79	8.88	9.21		2580230
Saturation pH (@ 4C)	N/A	9.50			2580231	9.35		2580231	9.04	9.13	9.46		2580231
Inorganics													
Total Alkalinity (Total as CaCO3)	mg/L	17	19	5	2583359	21		2583385	31	33	21	5	2583385
Dissolved Chloride (Cl)	mg/L	2	2	1	2583368	2		2583404	2	1	1	1	2583404
Colour	TCU	63	71	30	2583375	47		2583413	45	36	41	5	2583413
Nitrate + Nitrite	mg/L	0.20	0.19	0.05	2583378	0.61		2583414	ND	ND	0.15	0.05	2583414
Nitrite (N)	mg/L	ND	ND	0.01	2583383	ND		2583415	ND	ND	ND	0.01	2583415
Nitrogen (Ammonia Nitrogen)	mg/L	ND		0.05	2583587	0.05		2583587	ND	ND	ND	0.05	2583587
Total Organic Carbon (C)	mg/L	9.3		0.5	2584145	7.7		2584145	10	8.2	9.3	0.5	2584145
Orthophosphate (P)	mg/L	0.01	ND	0.01	2583376	ND		2583412	ND	ND	ND	0.01	2583412
pH	pH	6.98		N/A	2583207	6.98	7.04	2583207	6.98	7.09	7.02	N/A	2583209
Reactive Silica (SiO2)	mg/L	2.4	2.4	0.5	2583372	3.5		2583411	7.8	2.5	2.3	0.5	2583411
Total Suspended Solids	mg/L	ND		2	2579330	2		2579330	12	ND	5	2	2579330
Dissolved Sulphate (SO4)	mg/L	ND	ND	2	2583371	ND		2583410	ND	ND	ND	2	2583410
Turbidity	NTU	0.7		0.1	2584614	0.4		2584614	3.4	0.6	0.4	0.1	2584614
Conductivity	uS/cm	47		1	2583208	54	54	2583208	62	62	43	1	2583211

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B1C0960
Report Date: 2011/08/18

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: RM

RESULTS OF ANALYSES OF WATER

Maxxam ID		KM6793	KM6794		KM6795	KM6796		KM6797	KM6798	KM6798		
Sampling Date		2011/08/07	2011/08/08		2011/08/08	2011/08/08		2011/08/08	2011/08/08	2011/08/08		
	Units	**VE10 Lab-Dup**	**LP01**	**QC Batch**	**LP02**	**LP03**	**RDL**	**LP04**	**LP05**	**LP05 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters												
Anion Sum	me/L		0.610	2580228	0.400	0.530	N/A	0.400	0.370		N/A	2580228
Bicarb. Alkalinity (calc. as CaCO3)	mg/L		26	2580224	16	24	1	17	16		1	2580224
Calculated TDS	mg/L		34	2580232	21	30	1	21	19		1	2580232
Carb. Alkalinity (calc. as CaCO3)	mg/L		ND	2580224	ND	ND	1	ND	ND		1	2580224
Cation Sum	me/L		0.690	2580228	0.400	0.600	N/A	0.440	0.400		N/A	2580228
Hardness (CaCO3)	mg/L		26	2580226	15	25	1	18	17		1	2580226
Ion Balance (% Difference)	%		6.15	2580227	0.00	6.19	N/A	4.76	3.90		N/A	2580227
Langelier Index (@ 20C)	N/A		-1.79	2580230	-2.18	-1.80		-2.16	-2.20			2580230
Langelier Index (@ 4C)	N/A		-2.04	2580231	-2.44	-2.05		-2.41	-2.45			2580231
Nitrate (N)	mg/L		0.07	2580108	0.06	0.07	0.05	0.11	ND		0.05	2580108
Saturation pH (@ 20C)	N/A		8.96	2580230	9.37	9.01		9.29	9.33			2580230
Saturation pH (@ 4C)	N/A		9.21	2580231	9.63	9.26		9.54	9.58			2580231
Inorganics												
Total Alkalinity (Total as CaCO3)	mg/L		26	2583385	16	24	5	17	16		5	2583385
Dissolved Chloride (Cl)	mg/L		3	2583404	2	2	1	1	2		1	2583404
Colour	TCU		36	2583413	31	31	5	56	57		30	2583413
Nitrate + Nitrite	mg/L		0.07	2583414	0.06	0.07	0.05	0.11	ND		0.05	2583414
Nitrite (N)	mg/L		ND	2583415	ND	ND	0.01	ND	ND		0.01	2583415
Nitrogen (Ammonia Nitrogen)	mg/L		ND	2583587	ND	ND	0.05	0.07	0.07	0.06	0.05	2583587
Total Organic Carbon (C)	mg/L		8.9	2584145	8.1	6.7	0.5	9.7	9.7		0.5	2584145
Orthophosphate (P)	mg/L		ND	2583412	ND	ND	0.01	ND	ND		0.01	2583412
pH	pH		7.17	2583209	7.19	7.21	N/A	7.13	7.13		N/A	2583209
Reactive Silica (SiO2)	mg/L		0.6	2583411	ND	1.6	0.5	ND	ND		0.5	2583411
Total Suspended Solids	mg/L		4	2579330	ND	ND	2	ND	2		2	2579364
Dissolved Sulphate (SO4)	mg/L		ND	2583410	ND	ND	2	ND	ND		2	2583410
Turbidity	NTU	0.5	2.3	2584614	0.9	0.3	0.1	1.0	0.8		0.1	2584897
Conductivity	uS/cm		61	2583211	39	51	1	41	38		1	2583211

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B1C0960
Report Date: 2011/08/18

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: RM

RESULTS OF ANALYSES OF WATER

Maxxam ID		KM6799	KM6800			KM6801		KM6802		KM6803		KM6804		
Sampling Date		2011/08/07	2011/08/07			2011/08/07		2011/08/07		2011/08/07		2011/08/07		
	Units	**VL01**	**R01**	**RDL**	**QC Batch**	**R02**	**RDL**	**R03**	**RDL**	**R04**	**RDL**	**R05**	**RDL**	**QC Batch**
Calculated Parameters														
Anion Sum	me/L	0.280	0.520	N/A	2580228	0.380	N/A	0.400	N/A	0.320	N/A	0.200	N/A	2580228
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	12	23	1	2580224	17	1	18	1	13	1	7	1	2580224
Calculated TDS	mg/L	15	29	1	2580232	20	1	23	1	20	1	11	1	2580232
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	ND	1	2580224	ND	1	ND	1	ND	1	ND	1	2580224
Cation Sum	me/L	0.290	0.550	N/A	2580228	0.370	N/A	0.440	N/A	0.360	N/A	0.230	N/A	2580228
Hardness (CaCO3)	mg/L	12	24	1	2580226	16	1	19	1	14	1	9	1	2580226
Ion Balance (% Difference)	%	1.75	2.80	N/A	2580227	1.33	N/A	4.76	N/A	5.88	N/A	6.98	N/A	2580227
Langelier Index (@ 20C)	N/A	-2.57	-1.90		2580230	-2.14		-2.11		-2.50		-2.98		2580230
Langelier Index (@ 4C)	N/A	-2.82	-2.16		2580231	-2.39		-2.36		-2.75		-3.24		2580231
Nitrate (N)	mg/L	ND	0.15	0.05	2580108	ND	0.05	ND	0.05	0.10	0.05	ND	0.05	2580229
Saturation pH (@ 20C)	N/A	9.64	9.02		2580230	9.32		9.25		9.50		9.94		2580230
Saturation pH (@ 4C)	N/A	9.89	9.28		2580231	9.57		9.50		9.75		10.2		2580231
Inorganics														
Total Alkalinity (Total as CaCO3)	mg/L	12	23	5	2583385	17	5	18	5	13	5	7	5	2583385
Dissolved Chloride (Cl)	mg/L	2	2	1	2583404	2	1	2	1	2	1	2	1	2583404
Colour	TCU	36	31	5	2583413	47	10	47	5	32	5	10	5	2583413
Nitrate + Nitrite	mg/L	ND	0.15	0.05	2583414	ND	0.05	ND	0.05	0.10	0.05	ND	0.05	2583414
Nitrite (N)	mg/L	ND	ND	0.01	2583415	ND	0.01	ND	0.01	ND	0.01	ND	0.01	2583415
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	0.05	2585064	ND	0.05	ND	0.05	ND	0.05	ND	0.05	2585064
Total Organic Carbon (C)	mg/L	8.0	6.4	0.5	2584145	7.6	0.5	7.2	0.5	6.2	0.5	3.2	0.5	2584145
Orthophosphate (P)	mg/L	ND	ND	0.01	2583412	ND	0.01	ND	0.01	ND	0.01	ND	0.01	2583412
pH	pH	7.07	7.12	N/A	2583209	7.18	N/A	7.14	N/A	7.00	N/A	6.96	N/A	2583209
Reactive Silica (SiO2)	mg/L	0.9	2.5	0.5	2583411	1.5	0.5	2.5	0.5	2.9	0.5	ND	0.5	2583411
Total Suspended Solids	mg/L	2	ND	2	2579364	ND	2	ND	2	3	1	12	2	2579364
Dissolved Sulphate (SO4)	mg/L	ND	ND	2	2583410	ND	2	ND	2	ND	2	ND	2	2583410
Turbidity	NTU	0.7	0.5	0.1	2584897	0.6	0.1	0.7	0.1	1.1	0.1	0.9	0.1	2584897
Conductivity	uS/cm	28	48	1	2583211	36	1	41	1	33	1	23	1	2583211

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B1C0960
Report Date: 2011/08/18

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: RM

MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		KM6433		KM6785	KM6786	KM6787	KM6788	KM6789	KM6790	KM6791	KM6792		
Sampling Date		2011/08/07		2011/08/07	2011/08/07	2011/08/07	2011/08/07	2011/08/07	2011/08/07	2011/08/07	2011/08/07		
	Units	**VE01**	**QC Batch**	**VE02**	**VE03**	**VE04**	**VE05**	**VE06**	**VE07**	**VE08**	**VE09**	**RDL**	**QC Batch**
Metals													
Total Mercury (Hg)	ug/L	0.020	2582400	ND	ND	ND	ND	ND	ND	0.014	0.076	0.013	2583802

Maxxam ID		KM6793	KM6794	KM6795	KM6796	KM6797	KM6798	KM6799	KM6800		
Sampling Date		2011/08/07	2011/08/08	2011/08/08	2011/08/08	2011/08/08	2011/08/08	2011/08/07	2011/08/07		
	Units	**VE10**	**LP01**	**LP02**	**LP03**	**LP04**	**LP05**	**VL01**	**R01**	**RDL**	**QC Batch**
Metals											
Total Mercury (Hg)	ug/L	0.060	0.050	0.047	0.035	0.024	ND	0.014	ND	0.013	2583802

Maxxam ID		KM6801		KM6802	KM6802	KM6803	KM6804		
Sampling Date		2011/08/07		2011/08/07	2011/08/07	2011/08/07	2011/08/07		
	Units	**R02**	**QC Batch**	**R03**	**R03 Lab-Dup**	**R04**	**R05**	**RDL**	**QC Batch**
Metals									
Total Mercury (Hg)	ug/L	ND	2583802	ND	ND	ND	ND	0.013	2586067

ND = Not detected
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QC Batch = Quality Control Batch

Maxxam Job #: B1C0960
Report Date: 2011/08/18

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: RM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		KM6433	KM6785	KM6786	KM6787	KM6788	KM6789	KM6790	KM6791	KM6792		
Sampling Date		2011/08/07	2011/08/07	2011/08/07	2011/08/07	2011/08/07	2011/08/07	2011/08/07	2011/08/07	2011/08/07		
	Units	**VE01**	**VE02**	**VE03**	**VE04**	**VE05**	**VE06**	**VE07**	**VE08**	**VE09**	**RDL**	**QC Batch**
Metals												
Total Aluminum (Al)	ug/L	45.3	36.6	44.2	56.7	105	79.1	57.9	197	79.6	5.0	2582719
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2582719
Total Arsenic (As)	ug/L	ND	ND	ND	1.0	1.0	ND	ND	ND	ND	1.0	2582719
Total Barium (Ba)	ug/L	1.5	1.2	1.3	1.6	3.9	1.9	1.8	2.3	4.9	1.0	2582719
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2582719
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2582719
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	50	2582719
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	0.022	ND	ND	ND	0.023	0.017	2582719
Total Calcium (Ca)	ug/L	6120	5210	4720	3850	5650	6340	7580	10400	7880	100	2582719
Total Chromium (Cr)	ug/L	26.0	1.2	ND	18.2	2.7	5.8	ND	ND	3.1	1.0	2582719
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	0.64	0.40	2582719
Total Copper (Cu)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2582719
Total Iron (Fe)	ug/L	214	98	104	188	713	293	219	400	460	50	2582719
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.50	2582719
Total Magnesium (Mg)	ug/L	937	784	733	549	1040	989	1170	1440	1970	100	2582719
Total Manganese (Mn)	ug/L	79.8	55.5	81.0	68.4	392	363	264	133	2040	2.0	2582719
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2582719
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2582719
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	100	2582719
Total Potassium (K)	ug/L	ND	ND	ND	ND	ND	137	119	267	157	100	2582719
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2582719
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2582719
Total Sodium (Na)	ug/L	1960	1690	1640	1470	1990	1740	2040	2250	2780	100	2582719
Total Strontium (Sr)	ug/L	14.6	13.2	13.4	11.6	13.9	14.0	18.1	20.1	26.0	2.0	2582719
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2582719
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2582719
Total Titanium (Ti)	ug/L	ND	ND	ND	ND	ND	2.0	ND	7.8	2.3	2.0	2582719
Total Uranium (U)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.15	ND	0.10	2582719
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2582719
Total Zinc (Zn)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	2582719

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B1C0960
Report Date: 2011/08/18

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: RM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		KM6793	KM6794	KM6795	KM6796	KM6797	KM6798	KM6799		
Sampling Date		2011/08/07	2011/08/08	2011/08/08	2011/08/08	2011/08/08	2011/08/08	2011/08/07		
	Units	**VE10**	**LP01**	**LP02**	**LP03**	**LP04**	**LP05**	**VL01**	**RDL**	**QC Batch**
Metals										
Total Aluminum (Al)	ug/L	70.4	231	60.6	30.0	99.3	70.0	46.6	5.0	2583215
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	2583215
Total Arsenic (As)	ug/L	ND	1.1	1.2	3.2	ND	ND	2.7	1.0	2583215
Total Barium (Ba)	ug/L	3.5	6.0	2.0	1.5	1.9	ND	1.3	1.0	2583215
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	2583215
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2583215
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	ND	50	2583215
Total Cadmium (Cd)	ug/L	0.027	ND	ND	ND	ND	ND	ND	0.017	2583215
Total Calcium (Ca)	ug/L	5820	8540	4930	8070	5640	5460	3710	100	2583215
Total Chromium (Cr)	ug/L	32.2	75.3	4.5	16.0	17.5	ND	ND	1.0	2583215
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.40	2583215
Total Copper (Cu)	ug/L	ND	ND	ND	ND	55.9	ND	ND	2.0	2583215
Total Iron (Fe)	ug/L	406	427	99	180	208	108	90	50	2583215
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.50	2583215
Total Magnesium (Mg)	ug/L	1370	1150	723	1170	992	819	557	100	2583215
Total Manganese (Mn)	ug/L	419	144	20.5	112	37.7	38.5	30.5	2.0	2583215
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2583215
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2583215
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	ND	100	2583215
Total Potassium (K)	ug/L	ND	1030	344	215	129	ND	ND	100	2583215
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	2583215
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.10	2583215
Total Sodium (Na)	ug/L	1850	3040	1970	1950	1420	1200	1330	100	2583215
Total Strontium (Sr)	ug/L	14.3	47.9	31.4	25.5	11.3	12.2	9.9	2.0	2583215
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.10	2583215
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2583215
Total Titanium (Ti)	ug/L	ND	8.8	ND	ND	ND	ND	ND	2.0	2583215
Total Uranium (U)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.10	2583215
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2583215
Total Zinc (Zn)	ug/L	6.7	15.3	5.3	6.5	7.0	ND	7.7	5.0	2583215

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B1C0960
Report Date: 2011/08/18

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: RM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		KM6800	KM6801	KM6801	KM6802	KM6803	KM6804		
Sampling Date		2011/08/07	2011/08/07	2011/08/07	2011/08/07	2011/08/07	2011/08/07		
	Units	**R01**	**R02**	**R02 Lab-Dup**	**R03**	**R04**	**R05**	**RDL**	**QC Batch**
Metals									
Total Aluminum (Al)	ug/L	23.5	33.7	34.8	54.0	96.3	57.8	5.0	2583215
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2583215
Total Arsenic (As)	ug/L	6.5	6.3	6.9	2.8	1.3	ND	1.0	2583215
Total Barium (Ba)	ug/L	1.7	1.0	ND	1.1	2.4	6.6	1.0	2583215
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2583215
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2583215
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	50	2583215
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	ND	ND	0.017	2583215
Total Calcium (Ca)	ug/L	7950	5360	5700	6150	4630	2810	100	2583215
Total Chromium (Cr)	ug/L	90.7	4.8	3.4	ND	ND	ND	1.0	2583215
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	ND	ND	0.40	2583215
Total Copper (Cu)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2583215
Total Iron (Fe)	ug/L	209	191	208	213	123	75	50	2583215
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	ND	0.50	2583215
Total Magnesium (Mg)	ug/L	932	618	648	791	624	377	100	2583215
Total Manganese (Mn)	ug/L	73.9	23.5	24.7	81.7	96.2	108	2.0	2583215
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2583215
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2583215
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	100	2583215
Total Potassium (K)	ug/L	166	ND	ND	ND	ND	102	100	2583215
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2583215
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	0.10	2583215
Total Sodium (Na)	ug/L	1390	1130	1200	1380	1570	1160	100	2583215
Total Strontium (Sr)	ug/L	17.4	10.4	10.8	10.9	7.5	7.0	2.0	2583215
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	0.10	2583215
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2583215
Total Titanium (Ti)	ug/L	ND	ND	ND	ND	2.0	2.0	2.0	2583215
Total Uranium (U)	ug/L	ND	ND	ND	ND	ND	ND	0.10	2583215
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2583215
Total Zinc (Zn)	ug/L	6.0	ND	ND	ND	ND	ND	5.0	2583215

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Maxxam Job #: B1C0960
Report Date: 2011/08/18

Stantec Consulting Ltd
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Sampler Initials: RM

Package 1	1.9°C

Each temperature is the average of up to three cooler temperatures taken at receipt

GENERAL COMMENTS

Sample KM6433-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KM6785-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KM6786-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KM6787-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KM6788-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KM6789-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KM6790-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KM6791-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KM6794-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KM6795-01: Total Suspended Solids: Used a smaller aliquot for analysis based on visual inspection of sample, DL raised.

Sample KM6796-01: Total Suspended Solids: Used a smaller aliquot for analysis based on visual inspection of sample, DL raised. RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KM6797-01: Total Suspended Solids: Used a smaller aliquot for analysis based on visual inspection of sample, DL raised.

Sample KM6800-01: Total Suspended Solids: Used all sample provided for TSS, DL raised.

Sample KM6802-01: Total Suspended Solids: Used all sample provided for TSS, DL raised.

Sample KM6803-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample KM6804-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B1C0960
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Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
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Sampler Initials: RM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2579330	Total Suspended Solids	2011/08/12					ND, RDL=1	mg/L	7.8	25	96	80 - 120
2579364	Total Suspended Solids	2011/08/12					ND, RDL=1	mg/L	1.3	25	96	80 - 120
2582400	Total Mercury (Hg)	2011/08/15	104	80 - 120	99	80 - 120	ND, RDL=0.013	ug/L	NC	25	104	80 - 120
2582719	Total Aluminum (Al)	2011/08/15	97	80 - 120	101	80 - 120	ND, RDL=5.0	ug/L	4.1	25		
2582719	Total Antimony (Sb)	2011/08/15	91	80 - 120	90	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2582719	Total Arsenic (As)	2011/08/15	93	80 - 120	95	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2582719	Total Barium (Ba)	2011/08/15	88	80 - 120	92	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2582719	Total Beryllium (Be)	2011/08/15	94	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2582719	Total Bismuth (Bi)	2011/08/15	92	80 - 120	91	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2582719	Total Boron (B)	2011/08/15	90	80 - 120	101	80 - 120	ND, RDL=50	ug/L	NC	25		
2582719	Total Cadmium (Cd)	2011/08/15	94	80 - 120	93	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2582719	Total Calcium (Ca)	2011/08/15	97	80 - 120	100	80 - 120	ND, RDL=100	ug/L	0.6	25		
2582719	Total Chromium (Cr)	2011/08/15	95	80 - 120	95	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2582719	Total Cobalt (Co)	2011/08/15	96	80 - 120	96	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2582719	Total Copper (Cu)	2011/08/15	95	80 - 120	95	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2582719	Total Iron (Fe)	2011/08/15	NC	80 - 120	102	80 - 120	ND, RDL=50	ug/L	0.9	25		
2582719	Total Lead (Pb)	2011/08/15	92	80 - 120	93	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2582719	Total Magnesium (Mg)	2011/08/15	102	80 - 120	103	80 - 120	ND, RDL=100	ug/L	1.6	25		
2582719	Total Manganese (Mn)	2011/08/15	NC	80 - 120	93	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2582719	Total Molybdenum (Mo)	2011/08/15	94	80 - 120	92	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2582719	Total Nickel (Ni)	2011/08/15	92	80 - 120	93	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2582719	Total Phosphorus (P)	2011/08/15	97	80 - 120	100	80 - 120	ND, RDL=100	ug/L	NC	25		
2582719	Total Potassium (K)	2011/08/15	97	80 - 120	98	80 - 120	ND, RDL=100	ug/L	2.1	25		
2582719	Total Selenium (Se)	2011/08/15	98	80 - 120	96	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2582719	Total Silver (Ag)	2011/08/15	97	80 - 120	96	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2582719	Total Sodium (Na)	2011/08/15	98	80 - 120	97	80 - 120	ND, RDL=100	ug/L	0.4	25		
2582719	Total Strontium (Sr)	2011/08/15	90	80 - 120	94	80 - 120	ND, RDL=2.0	ug/L	0.3	25		
2582719	Total Thallium (Tl)	2011/08/15	91	80 - 120	91	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2582719	Total Tin (Sn)	2011/08/15	93	80 - 120	91	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2582719	Total Titanium (Ti)	2011/08/15	93	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2582719	Total Uranium (U)	2011/08/15	106	80 - 120	104	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2582719	Total Vanadium (V)	2011/08/15	95	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2582719	Total Zinc (Zn)	2011/08/15	96	80 - 120	95	80 - 120	ND, RDL=5.0(1)	ug/L	NC	25		
2583207	pH	2011/08/16					5.76, RDL=N/A	pH	0.9	25	103	80 - 120
2583208	Conductivity	2011/08/16			100	80 - 120	2, RDL=1	uS/cm	1.3	25		
2583209	pH	2011/08/16					5.84, RDL=N/A	pH	2.8	25	103	80 - 120
2583211	Conductivity	2011/08/16			100	80 - 120	ND, RDL=1	uS/cm	0.8	25		
2583215	Total Aluminum (Al)	2011/08/16	105	80 - 120	110	80 - 120	7.2, RDL=5.0(2)	ug/L	3.3	25		
2583215	Total Antimony (Sb)	2011/08/16	97	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L	NC	25		

Maxxam Job #: B1C0960
Report Date: 2011/08/18

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: RM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2583215	Total Arsenic (As)	2011/08/16	99	80 - 120	101	80 - 120	ND, RDL=1.0	ug/L	9.1	25		
2583215	Total Barium (Ba)	2011/08/16	96	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2583215	Total Beryllium (Be)	2011/08/16	100	80 - 120	103	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2583215	Total Bismuth (Bi)	2011/08/16	98	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2583215	Total Boron (B)	2011/08/16	100	80 - 120	103	80 - 120	ND, RDL=50	ug/L	NC	25		
2583215	Total Cadmium (Cd)	2011/08/16	98	80 - 120	101	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2583215	Total Calcium (Ca)	2011/08/16	105	80 - 120	106	80 - 120	ND, RDL=100	ug/L	6.1	25		
2583215	Total Chromium (Cr)	2011/08/16	99	80 - 120	101	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2583215	Total Cobalt (Co)	2011/08/16	101	80 - 120	102	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2583215	Total Copper (Cu)	2011/08/16	99	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2583215	Total Iron (Fe)	2011/08/16	108	80 - 120	109	80 - 120	ND, RDL=50	ug/L	NC	25		
2583215	Total Lead (Pb)	2011/08/16	99	80 - 120	101	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2583215	Total Magnesium (Mg)	2011/08/16	107	80 - 120	111	80 - 120	ND, RDL=100	ug/L	4.8	25		
2583215	Total Manganese (Mn)	2011/08/16	NC	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	5.1	25		
2583215	Total Molybdenum (Mo)	2011/08/16	96	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2583215	Total Nickel (Ni)	2011/08/16	97	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2583215	Total Phosphorus (P)	2011/08/16	105	80 - 120	108	80 - 120	ND, RDL=100	ug/L	NC	25		
2583215	Total Potassium (K)	2011/08/16	103	80 - 120	105	80 - 120	ND, RDL=100	ug/L	NC	25		
2583215	Total Selenium (Se)	2011/08/16	99	80 - 120	102	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2583215	Total Silver (Ag)	2011/08/16	101	80 - 120	103	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2583215	Total Sodium (Na)	2011/08/16	101	80 - 120	103	80 - 120	ND, RDL=100	ug/L	6.2	25		
2583215	Total Strontium (Sr)	2011/08/16	98	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L	4.4	25		
2583215	Total Thallium (Tl)	2011/08/16	98	80 - 120	101	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2583215	Total Tin (Sn)	2011/08/16	96	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2583215	Total Titanium (Ti)	2011/08/16	103	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2583215	Total Uranium (U)	2011/08/16	113	80 - 120	115	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2583215	Total Vanadium (V)	2011/08/16	100	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2583215	Total Zinc (Zn)	2011/08/16	98	80 - 120	102	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2583359	Total Alkalinity (Total as CaCO3)	2011/08/16	109	80 - 120	110	80 - 120	ND, RDL=5	mg/L	NC	25	109	80 - 120
2583368	Dissolved Chloride (Cl)	2011/08/17	101	80 - 120	103	80 - 120	ND, RDL=1	mg/L	NC	25	97	80 - 120
2583371	Dissolved Sulphate (SO4)	2011/08/16	116	80 - 120	117	80 - 120	ND, RDL=2	mg/L	NC	25	111	80 - 120
2583372	Reactive Silica (SiO2)	2011/08/16	101	80 - 120	102	80 - 120	ND, RDL=0.5	mg/L	NC	25	101	75 - 125
2583375	Colour	2011/08/17					ND, RDL=5	TCU	NC	25	106	80 - 120
2583376	Orthophosphate (P)	2011/08/17	91	80 - 120	104	80 - 120	ND, RDL=0.01	mg/L	NC	25	103	80 - 120
2583378	Nitrate + Nitrite	2011/08/17	101	80 - 120	99	80 - 120	ND, RDL=0.05	mg/L	NC	25	104	80 - 120
2583383	Nitrite (N)	2011/08/17	92	80 - 120	101	80 - 120	ND, RDL=0.01	mg/L	NC	25	103	80 - 120
2583385	Total Alkalinity (Total as CaCO3)	2011/08/17	NC	80 - 120	109	80 - 120	ND, RDL=5	mg/L	0.7	25	107	80 - 120
2583404	Dissolved Chloride (Cl)	2011/08/17	99	80 - 120	101	80 - 120	ND, RDL=1	mg/L	0.4	25	95	80 - 120
2583410	Dissolved Sulphate (SO4)	2011/08/16	111	80 - 120	113	80 - 120	ND, RDL=2	mg/L	NC	25	111	80 - 120

Maxxam Job #: B1C0960
Report Date: 2011/08/18

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: RM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2583411	Reactive Silica (SiO2)	2011/08/16	NC	80 - 120	102	80 - 120	ND, RDL=0.5	mg/L	0.5	25	100	75 - 125
2583412	Orthophosphate (P)	2011/08/17	100	80 - 120	102	80 - 120	ND, RDL=0.01	mg/L	NC	25	102	80 - 120
2583413	Colour	2011/08/17					ND, RDL=5	TCU	NC	25	105	80 - 120
2583414	Nitrate + Nitrite	2011/08/17	NC	80 - 120	100	80 - 120	ND, RDL=0.05	mg/L	0.7	25	103	80 - 120
2583415	Nitrite (N)	2011/08/17	102	80 - 120	99	80 - 120	ND, RDL=0.01	mg/L	NC	25	103	80 - 120
2583587	Nitrogen (Ammonia Nitrogen)	2011/08/16	92.4%	80 - 120	101	80 - 120	ND, RDL=0.05	mg/L	NC	25	102	80 - 120
2583802	Total Mercury (Hg)	2011/08/16	95	80 - 120	105	80 - 120	ND, RDL=0.013	ug/L	NC	25	100	80 - 120
2584126	Total Organic Carbon (C)	2011/08/16	98	80 - 120	96	80 - 120	ND, RDL=0.5	mg/L	NC	25	98	80 - 120
2584145	Total Organic Carbon (C)	2011/08/16	96	80 - 120	96	80 - 120	ND, RDL=0.5	mg/L	0.9	25	98	80 - 120
2584613	Turbidity	2011/08/17					ND, RDL=0.1	NTU	NC	25	104	80 - 120
2584614	Turbidity	2011/08/17					ND, RDL=0.1	NTU	NC	25	100	80 - 120
2584897	Turbidity	2011/08/17					ND, RDL=0.1	NTU	15.4	25	103	80 - 120
2585064	Nitrogen (Ammonia Nitrogen)	2011/08/18	92	80 - 120	94	80 - 120	ND, RDL=0.05	mg/L	NC	25	100	80 - 120
2586067	Total Mercury (Hg)	2011/08/18	111	80 - 120	108	80 - 120	ND, RDL=0.013	ug/L	NC	25	107	80 - 120

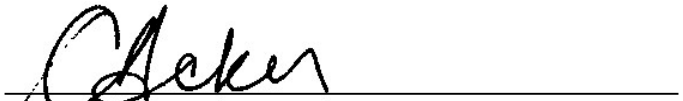
N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) - Data biased low ~ 1 RDL due to low level lab contamination.
(2) - Low level lab contamination. Minimal impact on data quality.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

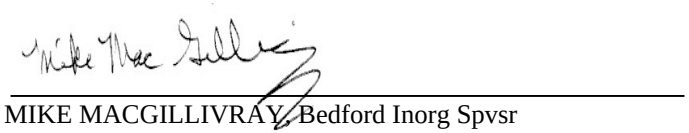
Validation Signature Page

Maxxam Job #: B1C0960

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



COLLEEN ACKER,



MIKE MACGILLIVRAY, Bedford Inorg Spvsr

KEVIN MACDONALD, Inorganics Supervisor

==========

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.

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Round 6

Your P.O. #: 16300R-40
Your Project #: 121510621.100
Site Location: VALENTINE LAKE
Your C.O.C. #: ES268311

Attention: Barry Wicks
Stantec Consulting Ltd
St. John's - Standing Offer
607 Torbay Rd
St. John's, NL
A1A 4Y6

Report Date: 2011/09/21

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B1E0914
Received: 2011/09/14, 10:24

Sample Matrix: Water
Samples Received: 21

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonate, Bicarbonate and Hydroxide	12	N/A	2011/09/15	CAM SOP-00102	APHA 4500-CO2 D
Carbonate, Bicarbonate and Hydroxide	9	N/A	2011/09/16	CAM SOP-00102	APHA 4500-CO2 D
Alkalinity	21	N/A	2011/09/20	ATL SOP 00013 R4	Based on EPA310.2
Chloride	21	N/A	2011/09/20	ATL SOP 00014 R6	Based on SM4500-Cl-
Colour	21	N/A	2011/09/20	ATL SOP 00020 R3.	Based on SM2120C
Conductance - water	21	N/A	2011/09/15	ATL SOP 00004 R5/00006 R4	Based on SM2510B
Hardness (calculated as CaCO3)	20	N/A	2011/09/16	ATL SOP 00048	Based on SM2340B
Hardness (calculated as CaCO3)	1	N/A	2011/09/19	ATL SOP 00048	Based on SM2340B
Mercury - Total (CVAA,LL)	18	2011/09/15	2011/09/16	ATL SOP 00026 R6	Based on EPA245.1
Mercury - Total (CVAA,LL)	3	2011/09/16	2011/09/19	ATL SOP 00026 R6	Based on EPA245.1
Metals Water Total MS	21	2011/09/15	2011/09/15	ATL SOP 00059 R1	Based on EPA6020A
Ion Balance (% Difference)	21	N/A	2011/09/21		
Anion and Cation Sum	21	N/A	2011/09/21		
Nitrogen Ammonia - water	21	N/A	2011/09/20	ATL SOP 00015 R5	Based on USEPA 350.1
Nitrogen - Nitrate + Nitrite	21	N/A	2011/09/21	ATL SOP 00016 R4	Based on USGS - Enz.
Nitrogen - Nitrite	21	N/A	2011/09/20	ATL SOP 00017 R4	Based on SM4500-NO2B
Nitrogen - Nitrate (as N)	21	N/A	2011/09/21	ATL SOP 00018 R3	Based on ASTMD3867
pH	21	N/A	2011/09/15	ATL SOP 00003 R5/00005 R7	Based on SM4500H+B
Phosphorus - ortho	21	N/A	2011/09/20	ATL SOP 00021 R3	Based on USEPA 365.1
Sat. pH and Langelier Index (@ 20C)	21	N/A	2011/09/21		
Sat. pH and Langelier Index (@ 4C)	21	N/A	2011/09/21		
Reactive Silica	21	N/A	2011/09/19	ATL SOP 00022 R3	Based on EPA 366.0
Sulphate	21	N/A	2011/09/20	ATL SOP 00023 R3	Based on EPA 375.4
Total Dissolved Solids (TDS calc)	21	N/A	2011/09/21		
Organic carbon - Total (TOC)	21	N/A	2011/09/19	ATL SOP 00037 R4	Based on SM5310C
Total Suspended Solids	12	N/A	2011/09/15	ATL SOP 00007 R3	based on EPA 160.2
Total Suspended Solids	9	N/A	2011/09/16	ATL SOP 00007 R3	based on EPA 160.2
Turbidity	14	N/A	2011/09/16	ATL SOP 00011 R5	based on EPA 180.1
Turbidity	7	N/A	2011/09/19	ATL SOP 00011 R5	based on EPA 180.1

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

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Maxxam Job #: B1E0914
Report Date: 2011/09/21

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

Encryption Key

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

MICHELLE HILL, Project Manager
Email: MHill@maxxam.ca
Phone# (902) 420-0203

==========

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: 2

Maxxam Job #: B1E0914
Report Date: 2011/09/21

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		KW6210	KW6211	KW6212	KW6213	KW6214	KW6215	KW6216	KW6217	KW6218		
Sampling Date		2011/09/05	2011/09/05	2011/09/06	2011/09/05	2011/09/05	2011/09/06	2011/09/06	2011/09/06	2011/09/06		
	Units	**LP01**	**LP02**	**LP03**	**LP04**	**LP05**	**VL01**	**R01**	**R02**	**R03**	**RDL**	**QC Batch**
Calculated Parameters												
Anion Sum	me/L	0.790	0.460	0.770	0.730	0.510	0.340	0.700	0.620	0.660	N/A	2613536
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	34	19	35	33	23	15	32	28	30	1	2613533
Calculated TDS	mg/L	41	24	41	37	26	19	39	34	37	1	2613540
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	1	2613533
Cation Sum	me/L	0.780	0.460	0.720	0.740	0.520	0.350	0.670	0.610	0.650	N/A	2613536
Hardness (CaCO3)	mg/L	31	18	31	32	22	14	29	27	28	1	2613534
Ion Balance (% Difference)	%	0.640	0.00	3.36	0.680	0.970	1.45	2.19	0.810	0.760	N/A	2613535
Langelier Index (@ 20C)	N/A	-1.31	-1.99	-1.18	-1.51	-1.71	-2.40	-1.31	-1.39	-1.40		2613538
Langelier Index (@ 4C)	N/A	-1.56	-2.24	-1.44	-1.76	-1.96	-2.65	-1.56	-1.64	-1.65		2613539
Nitrate (N)	mg/L	ND	ND	0.07	ND	ND	ND	ND	ND	0.07	0.05	2614057
Saturation pH (@ 20C)	N/A	8.76	9.25	8.75	8.77	9.07	9.46	8.80	8.89	8.85		2613538
Saturation pH (@ 4C)	N/A	9.01	9.50	9.01	9.02	9.32	9.71	9.05	9.14	9.10		2613539
Inorganics												
Total Alkalinity (Total as CaCO3)	mg/L	35	19	35	33	23	15	32	28	30	5	2618811
Dissolved Chloride (Cl)	mg/L	4	3	2	2	2	2	2	2	2	1	2618821
Colour	TCU	20	16	23	36	27	23	27	23	27	5	2618828
Nitrate + Nitrite	mg/L	ND	ND	0.07	ND	ND	ND	ND	ND	0.07	0.05	2618833
Nitrite (N)	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01	2618834
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05	2619862
Total Organic Carbon (C)	mg/L	7.6	7.9	6.1	8.8	8.3	6.9	5.8	5.4	5.5	0.5	2618959
Orthophosphate (P)	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01	2618831
pH	pH	7.45	7.26	7.57	7.26	7.36	7.06	7.49	7.50	7.45	N/A	2614660
Reactive Silica (SiO2)	mg/L	0.6	ND	2.8	0.9	ND	1.4	4.0	2.9	3.8	0.5	2618825
Total Suspended Solids	mg/L	2	1	ND	2	2	3	2	1	1	1	2614683
Dissolved Sulphate (SO4)	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	2618823
Turbidity	NTU	1.5	1.0	0.6	1.0	0.9	0.9	1.3	0.5	0.8	0.1	2616365
Conductivity	uS/cm	79	47	71	70	50	33	66	59	64	1	2614662

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B1E0914
Report Date: 2011/09/21

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		KW6219	KW6219		KW6220	KW6220		KW6221	KW6221		
Sampling Date		2011/09/06	2011/09/06		2011/09/06	2011/09/06		2011/09/06	2011/09/06		
	Units	**R04**	**R04 Lab-Dup**	**QC Batch**	**R05**	**R05 Lab-Dup**	**QC Batch**	**VE01**	**VE01 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters											
Anion Sum	me/L	0.390		2613536	0.240		2613536	0.510		N/A	2613536
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	16		2613533	9		2613533	22		1	2613533
Calculated TDS	mg/L	24		2613540	13		2613540	31		1	2613540
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND		2613533	ND		2613533	ND		1	2613533
Cation Sum	me/L	0.410		2613536	0.240		2613536	0.530		N/A	2613536
Hardness (CaCO3)	mg/L	17		2613534	10		2613534	22		1	2613534
Ion Balance (% Difference)	%	2.50		2613535	0.00		2613535	1.92		N/A	2613535
Langelier Index (@ 20C)	N/A	-2.36		2613538	-2.84		2613538	-1.87			2613538
Langelier Index (@ 4C)	N/A	-2.61		2613539	-3.10		2613539	-2.12			2613539
Nitrate (N)	mg/L	0.19		2614057	ND		2614057	0.09		0.05	2614057
Saturation pH (@ 20C)	N/A	9.35		2613538	9.80		2613538	9.11			2613538
Saturation pH (@ 4C)	N/A	9.60		2613539	10.1		2613539	9.36			2613539
Inorganics											
Total Alkalinity (Total as CaCO3)	mg/L	16	17	2618811	9		2618838	22	22	5	2618838
Dissolved Chloride (Cl)	mg/L	2	2	2618821	2		2618840	2	2	1	2618840
Colour	TCU	25	25	2618828	9		2618844	40	38	5	2618844
Nitrate + Nitrite	mg/L	0.19	0.19	2618833	ND		2618847	0.09	0.10	0.05	2618847
Nitrite (N)	mg/L	ND	ND	2618834	ND		2618848	ND	ND	0.01	2618848
Nitrogen (Ammonia Nitrogen)	mg/L	ND		2619862	ND	ND	2619862	ND		0.05	2619868
Total Organic Carbon (C)	mg/L	5.5		2618959	2.8		2618959	6.9		0.5	2618959
Orthophosphate (P)	mg/L	ND	ND	2618831	ND		2618846	ND	ND	0.01	2618846
pH	pH	6.99		2614660	6.96		2614660	7.24		N/A	2614660
Reactive Silica (SiO2)	mg/L	3.3	3.3	2618825	0.8		2618843	4.3	4.3	0.5	2618843
Total Suspended Solids	mg/L	ND		2614683	ND		2614683	1		1	2614683
Dissolved Sulphate (SO4)	mg/L	ND	ND	2618823	ND		2618842	ND	ND	2	2618842
Turbidity	NTU	0.5		2616365	0.5		2616365	0.8		0.1	2616365
Conductivity	uS/cm	40		2614662	25		2614662	50		1	2614662

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Maxxam Job #: B1E0914
Report Date: 2011/09/21

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		KW6222		KW6223	KW6223		KW6224	KW6225	KW6226		
Sampling Date		2011/09/06		2011/09/06	2011/09/06		2011/09/06	2011/09/06	2011/09/06		
	Units	**VE02**	**QC Batch**	**VE03**	**VE03 Lab-Dup**	**QC Batch**	**VE04**	**VE05**	**VE06**	**RDL**	**QC Batch**
Calculated Parameters											
Anion Sum	me/L	0.450	2613536	0.400		2613536	0.350	0.490	0.750	N/A	2613536
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	19	2613533	17		2613533	14	21	34	1	2613533
Calculated TDS	mg/L	26	2613540	24		2613540	19	32	41	1	2613540
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	2613533	ND		2613533	ND	ND	ND	1	2613533
Cation Sum	me/L	0.450	2613536	0.440		2613536	0.350	0.530	0.740	N/A	2613536
Hardness (CaCO3)	mg/L	19	2613534	18		2613534	14	19	32	1	2613534
Ion Balance (% Difference)	%	0.00	2613535	4.76		2613535	0.00	3.92	0.670	N/A	2613535
Langelier Index (@ 20C)	N/A	-2.02	2613538	-2.04		2613538	-2.41	-2.08	-1.36		2613538
Langelier Index (@ 4C)	N/A	-2.28	2613539	-2.29		2613539	-2.66	-2.33	-1.62		2613539
Nitrate (N)	mg/L	0.14	2614057	0.14		2614057	0.06	0.30	0.05	0.05	2614057
Saturation pH (@ 20C)	N/A	9.23	2613538	9.30		2613538	9.47	9.21	8.75		2613538
Saturation pH (@ 4C)	N/A	9.49	2613539	9.55		2613539	9.72	9.46	9.01		2613539
Inorganics											
Total Alkalinity (Total as CaCO3)	mg/L	19	2618838	17		2618838	14	21	34	5	2618838
Dissolved Chloride (Cl)	mg/L	2	2618840	2		2618840	2	2	2	1	2618840
Colour	TCU	24	2618844	24		2618844	35	29	29	5	2618844
Nitrate + Nitrite	mg/L	0.14	2618847	0.14		2618847	0.06	0.30	0.05	0.05	2618847
Nitrite (N)	mg/L	ND	2618848	ND		2618848	ND	ND	ND	0.01	2618848
Nitrogen (Ammonia Nitrogen)	mg/L	ND	2619868	ND		2619868	ND	ND	ND	0.05	2619868
Total Organic Carbon (C)	mg/L	6.1	2618959	6.6		2618981	8.9	6.7	6.3	0.5	2618981
Orthophosphate (P)	mg/L	ND	2618846	ND		2618846	ND	ND	ND	0.01	2618846
pH	pH	7.21	2614660	7.26		2614660	7.06	7.13	7.39	N/A	2614660
Reactive Silica (SiO2)	mg/L	3.3	2618843	2.5		2618843	1.3	4.5	3.2	0.5	2618843
Total Suspended Solids	mg/L	4	2614677	2		2614677	2	2	1	1	2614677
Dissolved Sulphate (SO4)	mg/L	ND	2618842	ND		2618842	ND	ND	ND	2	2618842
Turbidity	NTU	0.8	2616365	0.7	0.6	2616365	0.8	0.8	1.0	0.1	2618565
Conductivity	uS/cm	44	2614662	42		2614662	34	46	73	1	2614662

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Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		KW6226		KW6227		KW6228		KW6229	KW6230		
Sampling Date		2011/09/06		2011/09/06		2011/09/06		2011/09/06	2011/09/06		
	Units	**VE06 Lab-Dup**	**QC Batch**	**VE07**	**RDL**	**VE08**	**RDL**	**VE09**	**VE10**	**RDL**	**QC Batch**
Calculated Parameters											
Anion Sum	me/L		2613536	0.640	N/A	0.250	N/A	0.740	0.630	N/A	2613536
Bicarb. Alkalinity (calc. as CaCO3)	mg/L		2613533	28	1	10	1	34	29	1	2613533
Calculated TDS	mg/L		2613540	36	1	19	1	42	38	1	2613540
Carb. Alkalinity (calc. as CaCO3)	mg/L		2613533	ND	1	ND	1	ND	ND	1	2613533
Cation Sum	me/L		2613536	0.650	N/A	0.320	N/A	0.720	0.620	N/A	2613536
Hardness (CaCO3)	mg/L		2613534	28	1	11	1	30	25	1	2613534
Ion Balance (% Difference)	%		2613535	0.780	N/A	12.3	N/A	1.37	0.800	N/A	2613535
Langelier Index (@ 20C)	N/A		2613538	-1.71		-3.43		-1.45	-1.91		2613538
Langelier Index (@ 4C)	N/A		2613539	-1.96		-3.68		-1.70	-2.16		2613539
Nitrate (N)	mg/L		2614057	0.17	0.05	0.18	0.05	0.06	0.10	0.05	2614057
Saturation pH (@ 20C)	N/A		2613538	8.90		9.81		8.85	8.98		2613538
Saturation pH (@ 4C)	N/A		2613539	9.15		10.1		9.10	9.23		2613539
Inorganics											
Total Alkalinity (Total as CaCO3)	mg/L		2618838	28	5	10	5	34	29	5	2618838
Dissolved Chloride (Cl)	mg/L		2618840	2	1	2	1	2	2	1	2618840
Colour	TCU		2618844	32	5	65	30	35	42	5	2618844
Nitrate + Nitrite	mg/L		2618847	0.17	0.05	0.18	0.05	0.06	0.10	0.05	2618847
Nitrite (N)	mg/L		2618848	ND	0.01	ND	0.01	ND	ND	0.01	2618848
Nitrogen (Ammonia Nitrogen)	mg/L		2619868	ND	0.05	ND	0.05	ND	ND	0.05	2619868
Total Organic Carbon (C)	mg/L		2618981	6.5	0.5	16	0.5	8.1	9.8	0.5	2618981
Orthophosphate (P)	mg/L		2618846	ND	0.01	ND	0.01	ND	ND	0.01	2618846
pH	pH	7.45	2614660	7.19	N/A	6.38	N/A	7.40	7.07	N/A	2615168
Reactive Silica (SiO2)	mg/L		2618843	3.7	0.5	4.5	0.5	4.3	4.6	0.5	2618843
Total Suspended Solids	mg/L		2614677	1	1	2	1	2	2	1	2614677
Dissolved Sulphate (SO4)	mg/L		2618842	ND	2	ND	2	ND	ND	2	2618842
Turbidity	NTU		2618565	0.8	0.1	0.7	0.1	0.9	1.7	0.1	2618565
Conductivity	uS/cm	73	2614662	65	1	28	1	68	58	1	2615169

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Maxxam Job #: B1E0914
Report Date: 2011/09/21

Stantec Consulting Ltd
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Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		KW6210	KW6210	KW6211	KW6212	KW6213	KW6214	KW6215	KW6216	KW6217	KW6218		
Sampling Date		2011/09/05	2011/09/05	2011/09/05	2011/09/06	2011/09/05	2011/09/05	2011/09/06	2011/09/06	2011/09/06	2011/09/06		
	Units	**LP01**	**LP01 Lab-Dup**	**LP02**	**LP03**	**LP04**	**LP05**	**VL01**	**R01**	**R02**	**R03**	**RDL**	**QC Batch**
Metals													
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.013	2616454

Maxxam ID		KW6219	KW6220	KW6221	KW6222	KW6223	KW6224		KW6225	KW6225	KW6226		
Sampling Date		2011/09/06	2011/09/06	2011/09/06	2011/09/06	2011/09/06	2011/09/06		2011/09/06	2011/09/06	2011/09/06		
	Units	**R04**	**R05**	**VE01**	**VE02**	**VE03**	**VE04**	**QC Batch**	**VE05**	**VE05 Lab-Dup**	**VE06**	**RDL**	**QC Batch**
Metals													
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	2616454	ND	ND	ND	0.013	2616462

Maxxam ID		KW6227		KW6228	KW6228	KW6229	KW6230		
Sampling Date		2011/09/06		2011/09/06	2011/09/06	2011/09/06	2011/09/06		
	Units	**VE07**	**QC Batch**	**VE08**	**VE08 Lab-Dup**	**VE09**	**VE10**	**RDL**	**QC Batch**
Metals									
Total Mercury (Hg)	ug/L	ND	2616462	ND	ND	ND	ND	0.013	2618459

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Report Date: 2011/09/21

Stantec Consulting Ltd
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Site Location: VALENTINE LAKE
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Sampler Initials: SM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		KW6210	KW6211	KW6212	KW6213	KW6214	KW6215	KW6216	KW6217	KW6218	KW6219		
Sampling Date		2011/09/05	2011/09/05	2011/09/06	2011/09/05	2011/09/05	2011/09/06	2011/09/06	2011/09/06	2011/09/06	2011/09/06		
	Units	**LP01**	**LP02**	**LP03**	**LP04**	**LP05**	**VL01**	**R01**	**R02**	**R03**	**R04**	**RDL**	**QC Batch**
Metals													
Total Aluminum (Al)	ug/L	51.6	51.2	28.8	59.7	79.8	50.4	25.9	30.9	32.7	48.3	5.0	2614984
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2614984
Total Arsenic (As)	ug/L	ND	1.6	4.3	1.5	ND	3.3	8.3	4.5	3.1	1.0	1.0	2614984
Total Barium (Ba)	ug/L	4.0	2.6	1.6	2.8	1.6	2.2	2.7	ND	1.4	1.8	1.0	2614984
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2614984
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2614984
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	50	2614984
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.017	2614984
Total Calcium (Ca)	ug/L	10100	5640	10100	10100	7220	4480	9880	9000	9510	5450	100	2614984
Total Chromium (Cr)	ug/L	4.8	8.2	ND	ND	69.3	ND	18.8	ND	20.0	ND	1.0	2614984
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.40	2614984
Total Copper (Cu)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2614984
Total Iron (Fe)	ug/L	149	132	227	477	107	103	457	166	204	70	50	2614984
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.50	2614984
Total Magnesium (Mg)	ug/L	1280	824	1440	1690	1050	650	1120	1020	1130	734	100	2614984
Total Manganese (Mn)	ug/L	117	40.8	257	63.8	43.9	119	494	43.5	156	68.4	2.0	2614984
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2614984
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2614984
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100	2614984
Total Potassium (K)	ug/L	948	380	196	192	193	106	203	127	165	100	100	2614984
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2614984
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2614984
Total Sodium (Na)	ug/L	3300	2130	1840	1720	1440	1430	1550	1580	1650	1580	100	2614984
Total Strontium (Sr)	ug/L	62.3	36.8	27.5	18.7	16.5	12.4	21.8	16.1	17.2	8.9	2.0	2614984
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2614984
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2614984
Total Titanium (Ti)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2614984
Total Uranium (U)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2614984
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2614984
Total Zinc (Zn)	ug/L	ND	ND	ND	6.6	8.1	ND	5.8	ND	ND	ND	5.0	2614984

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Site Location: VALENTINE LAKE
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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		KW6220		KW6221	KW6222	KW6223	KW6224	KW6225		
Sampling Date		2011/09/06		2011/09/06	2011/09/06	2011/09/06	2011/09/06	2011/09/06		
	Units	**R05**	**QC Batch**	**VE01**	**VE02**	**VE03**	**VE04**	**VE05**	**RDL**	**QC Batch**
Metals										
Total Aluminum (Al)	ug/L	20.0	2614984	63.7	42.3	101	51.5	224	5.0	2615039
Total Antimony (Sb)	ug/L	ND	2614984	ND	ND	ND	ND	ND	1.0	2615039
Total Arsenic (As)	ug/L	ND	2614984	ND	ND	ND	ND	2.7	1.0	2615039
Total Barium (Ba)	ug/L	4.7	2614984	1.7	1.8	1.7	1.3	7.8	1.0	2615039
Total Beryllium (Be)	ug/L	ND	2614984	ND	ND	ND	ND	ND	1.0	2615039
Total Bismuth (Bi)	ug/L	ND	2614984	ND	ND	ND	ND	ND	2.0	2615039
Total Boron (B)	ug/L	ND	2614984	ND	ND	ND	ND	ND	50	2615039
Total Cadmium (Cd)	ug/L	ND	2614984	ND	ND	ND	ND	0.044	0.017	2615039
Total Calcium (Ca)	ug/L	3120	2614984	7060	5900	5790	4470	5900	100	2615039
Total Chromium (Cr)	ug/L	2.0	2614984	1.4	ND	ND	ND	31.7	1.0	2615039
Total Cobalt (Co)	ug/L	ND	2614984	ND	ND	ND	ND	0.69	0.40	2615039
Total Copper (Cu)	ug/L	ND	2614984	ND	ND	ND	ND	ND	2.0	2615039
Total Iron (Fe)	ug/L	ND	2614984	229	155	177	201	1730	50	2615039
Total Lead (Pb)	ug/L	ND	2614984	ND	ND	ND	ND	ND	0.50	2615039
Total Magnesium (Mg)	ug/L	405	2614984	1040	917	876	638	1110	100	2615039
Total Manganese (Mn)	ug/L	21.4	2614984	110	142	159	153	882	2.0	2615039
Total Molybdenum (Mo)	ug/L	ND	2614984	ND	ND	ND	ND	ND	2.0	2615039
Total Nickel (Ni)	ug/L	ND	2614984	ND	ND	ND	ND	ND	2.0	2615039
Total Phosphorus (P)	ug/L	ND	2614984	ND	ND	ND	ND	ND	100	2615039
Total Potassium (K)	ug/L	124	2614984	178	178	179	122	206	100	2615039
Total Selenium (Se)	ug/L	ND	2614984	ND	ND	ND	ND	ND	1.0	2615039
Total Silver (Ag)	ug/L	ND	2614984	ND	ND	ND	ND	ND	0.10	2615039
Total Sodium (Na)	ug/L	1210	2614984	1820	1650	1600	1380	1820	100	2615039
Total Strontium (Sr)	ug/L	7.7	2614984	16.5	15.0	16.2	13.4	14.9	2.0	2615039
Total Thallium (Tl)	ug/L	ND	2614984	ND	ND	ND	ND	ND	0.10	2615039
Total Tin (Sn)	ug/L	ND	2614984	ND	ND	ND	ND	ND	2.0	2615039
Total Titanium (Ti)	ug/L	ND	2614984	ND	ND	ND	ND	5.5	2.0	2615039
Total Uranium (U)	ug/L	ND	2614984	ND	ND	ND	ND	ND	0.10	2615039
Total Vanadium (V)	ug/L	ND	2614984	ND	ND	ND	ND	ND	2.0	2615039
Total Zinc (Zn)	ug/L	5.6	2614984	ND	ND	ND	ND	6.6	5.0	2615039

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Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		KW6226	KW6227	KW6228	KW6229		KW6230		
Sampling Date		2011/09/06	2011/09/06	2011/09/06	2011/09/06		2011/09/06		
	Units	**VE06**	**VE07**	**VE08**	**VE09**	**QC Batch**	**VE10**	**RDL**	**QC Batch**
Metals									
Total Aluminum (Al)	ug/L	39.8	54.4	171	69.3	2615039	116	5.0	2615041
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	2615039	ND	1.0	2615041
Total Arsenic (As)	ug/L	ND	ND	ND	ND	2615039	1.2	1.0	2615041
Total Barium (Ba)	ug/L	1.5	2.1	1.0	3.5	2615039	6.4	1.0	2615041
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	2615039	ND	1.0	2615041
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	2615039	ND	2.0	2615041
Total Boron (B)	ug/L	ND	ND	ND	ND	2615039	ND	50	2615041
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	2615039	0.028	0.017	2615041
Total Calcium (Ca)	ug/L	10400	8900	3000	8230	2615039	7310	100	2615041
Total Chromium (Cr)	ug/L	ND	26.5	ND	4.3	2615039	4.8	1.0	2615041
Total Cobalt (Co)	ug/L	ND	ND	0.62	0.56	2615039	1.12	0.40	2615041
Total Copper (Cu)	ug/L	ND	ND	ND	ND	2615039	ND	2.0	2615041
Total Iron (Fe)	ug/L	247	204	567	380	2615039	667	50	2615041
Total Lead (Pb)	ug/L	ND	ND	ND	ND	2615039	ND	0.50	2615041
Total Magnesium (Mg)	ug/L	1440	1280	912	2170	2615039	1670	100	2615041
Total Manganese (Mn)	ug/L	283	327	275	1510	2615039	1860	2.0	2615041
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	2615039	ND	2.0	2615041
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	2615039	ND	2.0	2615041
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	2615039	ND	100	2615041
Total Potassium (K)	ug/L	252	261	ND	220	2615039	169	100	2615041
Total Selenium (Se)	ug/L	ND	ND	ND	ND	2615039	ND	1.0	2615041
Total Silver (Ag)	ug/L	ND	ND	ND	ND	2615039	ND	0.10	2615041
Total Sodium (Na)	ug/L	1960	1940	1610	2620	2615039	2000	100	2615041
Total Strontium (Sr)	ug/L	23.3	20.0	7.6	26.8	2615039	19.2	2.0	2615041
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	2615039	ND	0.10	2615041
Total Tin (Sn)	ug/L	ND	ND	ND	ND	2615039	ND	2.0	2615041
Total Titanium (Ti)	ug/L	ND	ND	5.9	3.2	2615039	6.4	2.0	2615041
Total Uranium (U)	ug/L	ND	ND	ND	ND	2615039	ND	0.10	2615041
Total Vanadium (V)	ug/L	ND	ND	ND	ND	2615039	ND	2.0	2615041
Total Zinc (Zn)	ug/L	6.4	6.7	ND	ND	2615039	16.8	5.0	2615041

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Package 1	4.0°C

Each temperature is the average of up to three cooler temperatures taken at receipt

GENERAL COMMENTS

Total Suspended Solids: Sample integrity may have been compromised, the samples exceeded their hold time prior to being analyzed.

Sample KW6228-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

ELEMENTS BY ICP/MS (WATER)

Metals Water Total MS: Low level lab contamination. Minimal impact on data quality.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

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Stantec Consulting Ltd
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Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2614660	pH	2011/09/15							0.8	25	99	80 - 120
2614662	Conductivity	2011/09/15			101	80 - 120	ND, RDL=1	uS/cm	0.4	25		
2614677	Total Suspended Solids	2011/09/16					ND, RDL=1	mg/L			97	80 - 120
2614683	Total Suspended Solids	2011/09/15					ND, RDL=1	mg/L	6.3	25	98	80 - 120
2614984	Total Aluminum (Al)	2011/09/15	100	80 - 120	100	80 - 120	9.4, RDL=5.0(1)	ug/L	NC	25		
2614984	Total Antimony (Sb)	2011/09/15	97	80 - 120	94	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2614984	Total Arsenic (As)	2011/09/15	96	80 - 120	94	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2614984	Total Barium (Ba)	2011/09/15	NC	80 - 120	91	80 - 120	ND, RDL=1.0	ug/L	0.5	25		
2614984	Total Beryllium (Be)	2011/09/15	92	80 - 120	92	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2614984	Total Bismuth (Bi)	2011/09/15	95	80 - 120	94	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2614984	Total Boron (B)	2011/09/15	92	80 - 120	94	80 - 120	ND, RDL=50	ug/L	NC	25		
2614984	Total Cadmium (Cd)	2011/09/15	98	80 - 120	96	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2614984	Total Calcium (Ca)	2011/09/15	NC	80 - 120	96	80 - 120	ND, RDL=100	ug/L	0.6	25		
2614984	Total Chromium (Cr)	2011/09/15	93	80 - 120	92	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2614984	Total Cobalt (Co)	2011/09/15	93	80 - 120	92	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2614984	Total Copper (Cu)	2011/09/15	92	80 - 120	92	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2614984	Total Iron (Fe)	2011/09/15	98	80 - 120	97	80 - 120	ND, RDL=50	ug/L	NC	25		
2614984	Total Lead (Pb)	2011/09/15	93	80 - 120	92	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2614984	Total Magnesium (Mg)	2011/09/15	99	80 - 120	97	80 - 120	ND, RDL=100	ug/L	0.9	25		
2614984	Total Manganese (Mn)	2011/09/15	93	80 - 120	93	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2614984	Total Molybdenum (Mo)	2011/09/15	99	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2614984	Total Nickel (Ni)	2011/09/15	93	80 - 120	92	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2614984	Total Phosphorus (P)	2011/09/15	100	80 - 120	98	80 - 120	ND, RDL=100	ug/L	NC	25		
2614984	Total Potassium (K)	2011/09/15	98	80 - 120	96	80 - 120	ND, RDL=100	ug/L	0.1	25		
2614984	Total Selenium (Se)	2011/09/15	96	80 - 120	96	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2614984	Total Silver (Ag)	2011/09/15	96	80 - 120	95	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2614984	Total Sodium (Na)	2011/09/15	NC	80 - 120	92	80 - 120	ND, RDL=100	ug/L	0.4	25		
2614984	Total Strontium (Sr)	2011/09/15	NC	80 - 120	91	80 - 120	ND, RDL=2.0	ug/L	0.4	25		
2614984	Total Thallium (Tl)	2011/09/15	96	80 - 120	95	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2614984	Total Tin (Sn)	2011/09/15	98	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2614984	Total Titanium (Ti)	2011/09/15	94	80 - 120	94	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2614984	Total Uranium (U)	2011/09/15	104	80 - 120	103	80 - 120	ND, RDL=0.10	ug/L	0.6	25		
2614984	Total Vanadium (V)	2011/09/15	94	80 - 120	93	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2614984	Total Zinc (Zn)	2011/09/15	93	80 - 120	92	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2615039	Total Aluminum (Al)	2011/09/15	99	80 - 120	103	80 - 120	7.7, RDL=5.0	ug/L	NC	25		
2615039	Total Antimony (Sb)	2011/09/15	100	80 - 120	101	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2615039	Total Arsenic (As)	2011/09/15	97	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2615039	Total Barium (Ba)	2011/09/15	93	80 - 120	96	80 - 120	ND, RDL=1.0	ug/L	0.5	25		
2615039	Total Beryllium (Be)	2011/09/15	97	80 - 120	94	80 - 120	ND, RDL=1.0	ug/L				

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Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2615039	Total Bismuth (Bi)	2011/09/15	97	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L				
2615039	Total Boron (B)	2011/09/15	99	80 - 120	96	80 - 120	ND, RDL=50	ug/L	NC	25		
2615039	Total Cadmium (Cd)	2011/09/15	102	80 - 120	101	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2615039	Total Calcium (Ca)	2011/09/15	98	80 - 120	101	80 - 120	ND, RDL=100	ug/L				
2615039	Total Chromium (Cr)	2011/09/15	94	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2615039	Total Cobalt (Co)	2011/09/15	94	80 - 120	97	80 - 120	ND, RDL=0.40	ug/L				
2615039	Total Copper (Cu)	2011/09/15	93	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L	1.8	25		
2615039	Total Iron (Fe)	2011/09/15	97	80 - 120	102	80 - 120	ND, RDL=50	ug/L	NC	25		
2615039	Total Lead (Pb)	2011/09/15	94	80 - 120	97	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2615039	Total Magnesium (Mg)	2011/09/15	98	80 - 120	103	80 - 120	ND, RDL=100	ug/L				
2615039	Total Manganese (Mn)	2011/09/15	94	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2615039	Total Molybdenum (Mo)	2011/09/15	100	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L				
2615039	Total Nickel (Ni)	2011/09/15	95	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L				
2615039	Total Phosphorus (P)	2011/09/15	99	80 - 120	104	80 - 120	ND, RDL=100	ug/L				
2615039	Total Potassium (K)	2011/09/15	98	80 - 120	102	80 - 120	ND, RDL=100	ug/L				
2615039	Total Selenium (Se)	2011/09/15	99	80 - 120	101	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2615039	Total Silver (Ag)	2011/09/15	96	80 - 120	100	80 - 120	ND, RDL=0.10	ug/L				
2615039	Total Sodium (Na)	2011/09/15	NC	80 - 120	96	80 - 120	ND, RDL=100	ug/L	1.7	25		
2615039	Total Strontium (Sr)	2011/09/15	93	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L				
2615039	Total Thallium (Tl)	2011/09/15	97	80 - 120	101	80 - 120	ND, RDL=0.10	ug/L				
2615039	Total Tin (Sn)	2011/09/15	102	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L				
2615039	Total Titanium (Ti)	2011/09/15	98	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L				
2615039	Total Uranium (U)	2011/09/15	106	80 - 120	109	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2615039	Total Vanadium (V)	2011/09/15	96	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L				
2615039	Total Zinc (Zn)	2011/09/15	95	80 - 120	99	80 - 120	ND, RDL=5.0	ug/L	1.6	25		
2615041	Total Aluminum (Al)	2011/09/15	105	80 - 120	105	80 - 120	9.8, RDL=5.0(1)	ug/L				
2615041	Total Antimony (Sb)	2011/09/15	104	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L				
2615041	Total Arsenic (As)	2011/09/15	101	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2615041	Total Barium (Ba)	2011/09/15	94	80 - 120	94	80 - 120	ND, RDL=1.0	ug/L				
2615041	Total Beryllium (Be)	2011/09/15	100	80 - 120	105	80 - 120	ND, RDL=1.0	ug/L				
2615041	Total Bismuth (Bi)	2011/09/15	98	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L				
2615041	Total Boron (B)	2011/09/15	101	80 - 120	103	80 - 120	ND, RDL=50	ug/L				
2615041	Total Cadmium (Cd)	2011/09/15	98	80 - 120	98	80 - 120	ND, RDL=0.017	ug/L				
2615041	Total Calcium (Ca)	2011/09/15	100	80 - 120	100	80 - 120	ND, RDL=100	ug/L				
2615041	Total Chromium (Cr)	2011/09/15	98	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L				
2615041	Total Cobalt (Co)	2011/09/15	97	80 - 120	97	80 - 120	ND, RDL=0.40	ug/L				
2615041	Total Copper (Cu)	2011/09/15	94	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L				
2615041	Total Iron (Fe)	2011/09/15	101	80 - 120	102	80 - 120	ND, RDL=50	ug/L				
2615041	Total Lead (Pb)	2011/09/15	95	80 - 120	95	80 - 120	ND, RDL=0.50	ug/L				

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Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2615041	Total Magnesium (Mg)	2011/09/15	105	80 - 120	102	80 - 120	ND, RDL=100	ug/L				
2615041	Total Manganese (Mn)	2011/09/15	100	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L				
2615041	Total Molybdenum (Mo)	2011/09/15	105	80 - 120	101	80 - 120	ND, RDL=2.0	ug/L				
2615041	Total Nickel (Ni)	2011/09/15	97	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L				
2615041	Total Phosphorus (P)	2011/09/15	105	80 - 120	104	80 - 120	ND, RDL=100	ug/L				
2615041	Total Potassium (K)	2011/09/15	99	80 - 120	101	80 - 120	ND, RDL=100	ug/L				
2615041	Total Selenium (Se)	2011/09/15	100	80 - 120	102	80 - 120	ND, RDL=1.0	ug/L				
2615041	Total Silver (Ag)	2011/09/15	96	80 - 120	101	80 - 120	ND, RDL=0.10	ug/L				
2615041	Total Sodium (Na)	2011/09/15	NC	80 - 120	98	80 - 120	ND, RDL=100	ug/L				
2615041	Total Strontium (Sr)	2011/09/15	96	80 - 120	95	80 - 120	ND, RDL=2.0	ug/L				
2615041	Total Thallium (Tl)	2011/09/15	99	80 - 120	99	80 - 120	ND, RDL=0.10	ug/L				
2615041	Total Tin (Sn)	2011/09/15	104	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L				
2615041	Total Titanium (Ti)	2011/09/15	107	80 - 120	107	80 - 120	ND, RDL=2.0	ug/L				
2615041	Total Uranium (U)	2011/09/15	109	80 - 120	105	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2615041	Total Vanadium (V)	2011/09/15	101	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L				
2615041	Total Zinc (Zn)	2011/09/15	97	80 - 120	99	80 - 120	ND, RDL=5.0	ug/L				
2615168	pH	2011/09/15							0	25	100	80 - 120
2615169	Conductivity	2011/09/15			102	80 - 120	1, RDL=1	uS/cm	0.3	25		
2616365	Turbidity	2011/09/16					ND, RDL=0.1	NTU	4.6	25	101	80 - 120
2616454	Total Mercury (Hg)	2011/09/16	98	80 - 120	84	80 - 120	ND, RDL=0.013	ug/L	NC	25	87	80 - 120
2616462	Total Mercury (Hg)	2011/09/16	103	80 - 120	98	80 - 120	ND, RDL=0.013	ug/L	NC	25	110	80 - 120
2618459	Total Mercury (Hg)	2011/09/19	98	80 - 120	99	80 - 120	ND, RDL=0.013	ug/L	NC	25	92	80 - 120
2618565	Turbidity	2011/09/19					ND, RDL=0.1	NTU	NC	25	102	80 - 120
2618811	Total Alkalinity (Total as CaCO3)	2011/09/20	108	80 - 120	110	80 - 120	ND, RDL=5	mg/L	NC	25	106	80 - 120
2618821	Dissolved Chloride (Cl)	2011/09/20	100	80 - 120	105	80 - 120	ND, RDL=1	mg/L	NC	25	104	80 - 120
2618823	Dissolved Sulphate (SO4)	2011/09/20	115	80 - 120	109	80 - 120	ND, RDL=2	mg/L	NC	25	109	80 - 120
2618825	Reactive Silica (SiO2)	2011/09/19	100	80 - 120	103	80 - 120	ND, RDL=0.5	mg/L	1.4	25	94	75 - 125
2618828	Colour	2011/09/20					ND, RDL=5	TCU	NC	25	115	80 - 120
2618831	Orthophosphate (P)	2011/09/20	104	80 - 120	108	80 - 120	ND, RDL=0.01	mg/L	NC	25	105	80 - 120
2618833	Nitrate + Nitrite	2011/09/21	103	80 - 120	103	80 - 120	ND, RDL=0.05	mg/L	NC	25	107	80 - 120
2618834	Nitrite (N)	2011/09/20	88	80 - 120	95	80 - 120	ND, RDL=0.01	mg/L	NC	25	98	80 - 120
2618838	Total Alkalinity (Total as CaCO3)	2011/09/20	NC	80 - 120	110	80 - 120	ND, RDL=5	mg/L	NC	25	106	80 - 120
2618840	Dissolved Chloride (Cl)	2011/09/20	104	80 - 120	101	80 - 120	ND, RDL=1	mg/L	NC	25	101	80 - 120
2618842	Dissolved Sulphate (SO4)	2011/09/20	117	80 - 120	106	80 - 120	ND, RDL=2	mg/L	NC	25	108	80 - 120
2618843	Reactive Silica (SiO2)	2011/09/19	100	80 - 120	103	80 - 120	ND, RDL=0.5	mg/L	0.7	25	101	75 - 125
2618844	Colour	2011/09/20					ND, RDL=5	TCU	4.4	25	109	80 - 120
2618846	Orthophosphate (P)	2011/09/20	102	80 - 120	108	80 - 120	ND, RDL=0.01	mg/L	NC	25	105	80 - 120
2618847	Nitrate + Nitrite	2011/09/21	106	80 - 120	102	80 - 120	ND, RDL=0.05	mg/L	NC	25	106	80 - 120
2618848	Nitrite (N)	2011/09/20	86	80 - 120	93	80 - 120	ND, RDL=0.01	mg/L	NC	25	99	80 - 120

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Maxxam Job #: B1E0914
Report Date: 2011/09/21

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2618959	Total Organic Carbon (C)	2011/09/19	98	80 - 120	100	80 - 120	ND, RDL=0.5	mg/L	NC	25	100	80 - 120
2618981	Total Organic Carbon (C)	2011/09/19	99	80 - 120	101	80 - 120	ND, RDL=0.5	mg/L	NC	25	99	80 - 120
2619862	Nitrogen (Ammonia Nitrogen)	2011/09/20	94	80 - 120	98	80 - 120	ND, RDL=0.05	mg/L	NC	25	104	80 - 120
2619868	Nitrogen (Ammonia Nitrogen)	2011/09/20	90	80 - 120	99	80 - 120	ND, RDL=0.05	mg/L	NC	25	104	80 - 120

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) - Low level lab contamination. Minimal impact on data quality.

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Validation Signature Page

Maxxam Job #: B1E0914

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

COLLEEN ACKER,

MIKE MACGILLIVRAY, Scientific Specialist (Inorganics)

==========

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.

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Round 7

Your P.O. #: 16300R-40
Your Project #: 121510621.100
Site Location: VALENTINE LAKE
Your C.O.C. #: ES268411

Attention: Barry Wicks
Stantec Consulting Ltd
St. John's - Standing Offer
607 Torbay Rd
St. John's, NL
A1A 4Y6

Report Date: 2011/10/21

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B1G0048
Received: 2011/10/14, 10:04

Sample Matrix: Water
Samples Received: 21

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonate, Bicarbonate and Hydroxide	21	N/A	2011/10/19	CAM SOP-00102	APHA 4500-CO2 D
Alkalinity	21	N/A	2011/10/19	ATL SOP 00013	Based on EPA310.2
Chloride	21	N/A	2011/10/20	ATL SOP 00014	Based on SM4500-Cl-
Colour	21	N/A	2011/10/20	ATL SOP 00020	Based on SM2120C
Conductance - water	21	N/A	2011/10/19	ATL SOP 00004/00006	Based on SM2510B
Hardness (calculated as CaCO3)	21	N/A	2011/10/19	ATL SOP 00048	Based on SM2340B
Mercury - Total (CVAA,LL)	10	2011/10/14	2011/10/17	ATL SOP 00026	Based on EPA245.1
Mercury - Total (CVAA,LL)	11	2011/10/18	2011/10/19	ATL SOP 00026	Based on EPA245.1
Metals Water Total MS	21	2011/10/17	2011/10/18	ATL SOP 00059	Based on EPA6020A
Ion Balance (% Difference)	21	N/A	2011/10/21		
Anion and Cation Sum	21	N/A	2011/10/20		
Nitrogen Ammonia - water	21	N/A	2011/10/19	ATL SOP 00015	Based on USEPA 350.1
Nitrogen - Nitrate + Nitrite	21	N/A	2011/10/20	ATL SOP 00016	Based on USGS - Enz.
Nitrogen - Nitrite	21	N/A	2011/10/19	ATL SOP 00017	Based on SM4500-NO2B
Nitrogen - Nitrate (as N)	21	N/A	2011/10/21	ATL SOP 00018	Based on ASTMD3867
pH	21	N/A	2011/10/19	ATL SOP 00003/00005	Based on SM4500H+B
Phosphorus - ortho	21	N/A	2011/10/20	ATL SOP 00021	Based on USEPA 365.1
Sat. pH and Langelier Index (@ 20C)	21	N/A	2011/10/21		
Sat. pH and Langelier Index (@ 4C)	21	N/A	2011/10/21		
Reactive Silica	21	N/A	2011/10/19	ATL SOP 00022	Based on EPA 366.0
Sulphate	21	N/A	2011/10/20	ATL SOP 00023	Based on EPA 375.4
Total Dissolved Solids (TDS calc)	21	N/A	2011/10/21		
Organic carbon - Total (TOC)	21	N/A	2011/10/19	ATL SOP 00037	Based on SM5310C
Total Suspended Solids	21	N/A	2011/10/17	ATL SOP 00007	based on EPA 160.2
Turbidity	21	N/A	2011/10/20	ATL SOP 00011	based on EPA 180.1

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

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Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B1G0048
Report Date: 2011/10/21

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

Encryption Key

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

MICHELLE HILL, Project Manager
Email: MHill@maxxam.ca
Phone# (902) 420-0203

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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: 2

Maxxam Job #: B1G0048
Report Date: 2011/10/21

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		LG2305		LG2314	LG2315	LG2315			LG2316	LG2316		
Sampling Date		2011/10/08		2011/10/08	2011/10/08	2011/10/08			2011/10/08	2011/10/08		
	Units	**LP01**	**RDL**	**LP02**	**LP03**	**LP03 Lab-Dup**	**RDL**	**QC Batch**	**LP04**	**LP04 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters												
Anion Sum	me/L	0.710	N/A	0.430	0.380		N/A	2649529	0.380		N/A	2649529
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	30	1	17	15		1	2649526	15		1	2649526
Calculated TDS	mg/L	41	1	24	23		1	2649532	21		1	2649532
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1	ND	ND		1	2649526	ND		1	2649526
Cation Sum	me/L	0.860	N/A	0.510	0.460		N/A	2649529	0.440		N/A	2649529
Hardness (CaCO3)	mg/L	30	1	19	18		1	2649527	18		1	2649527
Ion Balance (% Difference)	%	9.55	N/A	8.51	9.52		N/A	2649528	7.32		N/A	2649528
Langelier Index (@ 20C)	N/A	-1.44		-2.04	-2.23			2649530	-2.35			2649530
Langelier Index (@ 4C)	N/A	-1.70		-2.29	-2.48			2649531	-2.60			2649531
Nitrate (N)	mg/L	ND	0.05	ND	ND		0.05	2650428	0.07		0.05	2650428
Saturation pH (@ 20C)	N/A	8.84		9.27	9.34			2649530	9.37			2649530
Saturation pH (@ 4C)	N/A	9.10		9.52	9.59			2649531	9.62			2649531
Inorganics												
Total Alkalinity (Total as CaCO3)	mg/L	30	5	17	15		5	2652396	15		5	2652396
Dissolved Chloride (Cl)	mg/L	4	1	3	3		1	2652397	3		1	2652397
Colour	TCU	41	5	34	39		5	2652402	50		10	2652402
Nitrate + Nitrite	mg/L	ND	0.05	ND	ND		0.05	2652405	0.07		0.05	2652405
Nitrite (N)	mg/L	ND	0.01	ND	ND		0.01	2652407	ND		0.01	2652407
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.05	ND	ND	ND	0.05	2652293	ND		0.05	2652297
Total Organic Carbon (C)	mg/L	10	0.5	8.4	7.9		0.5	2652967	10		0.5	2652967
Orthophosphate (P)	mg/L	ND	0.01	ND	ND		0.01	2652403	ND		0.01	2652403
pH	pH	7.40	N/A	7.23	7.11		N/A	2652054	7.02	7.02	N/A	2652054
Reactive Silica (SiO2)	mg/L	1.1	0.5	0.7	1.7		0.5	2652400	0.8		0.5	2652400
Total Suspended Solids	mg/L	20	2	4	ND		1	2648630	3		1	2648630
Dissolved Sulphate (SO4)	mg/L	ND	2	ND	ND		2	2652399	ND		2	2652399
Turbidity	NTU	23	0.1	3.4	1.1		0.1	2653763	0.6		0.1	2653763
Conductivity	uS/cm	71	1	45	41		1	2652057	38	38	1	2652057

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Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B1G0048
Report Date: 2011/10/21

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		LG2317	LG2317		LG2318	LG2319		LG2320		LG2321		LG2327		
Sampling Date		2011/10/08	2011/10/08		2011/10/09	2011/10/09		2011/10/09		2011/10/09		2011/10/09		
	Units	**LP05**	**LP05 Lab-Dup**	**QC Batch**	**VL01**	**R01**	**RDL**	**R02**	**RDL**	**R03**	**RDL**	**R04**	**RDL**	**QC Batch**
Calculated Parameters														
Anion Sum	me/L	0.390		2649529	0.500	0.370	N/A	0.300	N/A	0.360	N/A	0.310	N/A	2649529
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	16		2649526	21	14	1	11	1	12	1	11	1	2649526
Calculated TDS	mg/L	22		2649532	30	22	1	18	1	22	1	19	1	2649532
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND		2649526	ND	ND	1	ND	1	ND	1	ND	1	2649526
Cation Sum	me/L	0.460		2649529	0.540	0.400	N/A	0.340	N/A	0.390	N/A	0.350	N/A	2649529
Hardness (CaCO3)	mg/L	19		2649527	22	16	1	14	1	16	1	14	1	2649527
Ion Balance (% Difference)	%	8.24		2649528	3.85	3.90	N/A	6.25	N/A	4.00	N/A	6.06	N/A	2649528
Langelier Index (@ 20C)	N/A	-2.42		2649530	-2.09	-2.37		-2.57		-2.50		-2.73		2649530
Langelier Index (@ 4C)	N/A	-2.68		2649531	-2.34	-2.62		-2.83		-2.76		-2.98		2649531
Nitrate (N)	mg/L	ND		2650428	ND	ND	0.05	ND	0.05	0.34	0.05	ND	0.05	2650428
Saturation pH (@ 20C)	N/A	9.29		2649530	9.17	9.40		9.56		9.46		9.56		2649530
Saturation pH (@ 4C)	N/A	9.55		2649531	9.42	9.65		9.82		9.72		9.81		2649531
Inorganics														
Total Alkalinity (Total as CaCO3)	mg/L	16		2652396	21	14	5	11	5	12	5	11	5	2652396
Dissolved Chloride (Cl)	mg/L	2		2652397	3	3	1	3	1	3	1	3	1	2652397
Colour	TCU	49		2652402	33	30	5	53	30	52	10	40	5	2652402
Nitrate + Nitrite	mg/L	ND		2652405	ND	ND	0.05	ND	0.05	0.34	0.05	ND	0.05	2652405
Nitrite (N)	mg/L	ND		2652407	ND	ND	0.01	ND	0.01	ND	0.01	ND	0.01	2652407
Nitrogen (Ammonia Nitrogen)	mg/L	ND		2652297	ND	ND	0.05	ND	0.05	ND	0.05	ND	0.05	2652297
Total Organic Carbon (C)	mg/L	9.4		2652967	7.4	6.4	0.5	8.9	0.5	9.0	0.5	9.2	0.5	2652967
Orthophosphate (P)	mg/L	ND		2652403	ND	ND	0.01	ND	0.01	ND	0.01	ND	0.01	2652403
pH	pH	6.87		2652058	7.08	7.03	N/A	6.99	N/A	6.96	N/A	6.83	N/A	2652058
Reactive Silica (SiO2)	mg/L	0.9		2652400	4.4	2.4	0.5	1.8	0.5	2.7	0.5	2.7	0.5	2652400
Total Suspended Solids	mg/L	2		2648630	ND	ND	1	1	1	ND	1	ND	1	2648630
Dissolved Sulphate (SO4)	mg/L	ND		2652399	ND	ND	2	ND	2	ND	2	ND	2	2652399
Turbidity	NTU	0.6	0.7	2653763	0.5	0.4	0.1	0.6	0.1	0.3	0.1	0.1	0.1	2653774
Conductivity	uS/cm	40		2652060	47	36	1	29	1	36	1	31	1	2652060

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Maxxam Job #: B1G0048
Report Date: 2011/10/21

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		LG2328	LG2329	LG2330	LG2331		LG2332		LG2333	LG2333		
Sampling Date		2011/10/09	2011/10/09	2011/10/09	2011/10/09		2011/10/09		2011/10/09	2011/10/09		
	Units	**R05**	**VE01**	**VE02**	**VE03**	**RDL**	**VE04**	**RDL**	**VE05**	**VE05 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters												
Anion Sum	me/L	0.240	0.320	0.280	0.280	N/A	0.270	N/A	0.330		N/A	2649529
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	9	12	11	10	1	10	1	12		1	2649526
Calculated TDS	mg/L	13	19	17	17	1	16	1	27		1	2649532
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	ND	ND	ND	1	ND	1	ND		1	2649526
Cation Sum	me/L	0.260	0.360	0.330	0.330	N/A	0.340	N/A	0.510		N/A	2649529
Hardness (CaCO3)	mg/L	10	14	13	12	1	13	1	16		1	2649527
Ion Balance (% Difference)	%	4.00	5.88	8.20	8.20	N/A	11.5	N/A	21.4		N/A	2649528
Langelier Index (@ 20C)	N/A	-2.89	-2.62	-2.70	-2.75		-2.79		-2.67			2649530
Langelier Index (@ 4C)	N/A	-3.15	-2.87	-2.95	-3.00		-3.04		-2.92			2649531
Nitrate (N)	mg/L	ND	ND	ND	ND	0.05	ND	0.05	0.09		0.05	2650428
Saturation pH (@ 20C)	N/A	9.79	9.55	9.65	9.68		9.67		9.52			2649530
Saturation pH (@ 4C)	N/A	10.0	9.80	9.90	9.93		9.92		9.77			2649531
Inorganics												
Total Alkalinity (Total as CaCO3)	mg/L	9	12	11	10	5	10	5	13	12	5	2652396
Dissolved Chloride (Cl)	mg/L	2	3	3	3	1	2	1	2	2	1	2652397
Colour	TCU	12	37	36	34	5	52	30	32	33	5	2652402
Nitrate + Nitrite	mg/L	ND	ND	ND	ND	0.05	ND	0.05	0.09	0.10	0.05	2652405
Nitrite (N)	mg/L	ND	ND	ND	ND	0.01	ND	0.01	ND	ND	0.01	2652407
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	ND	ND	0.05	ND	0.05	ND		0.05	2652297
Total Organic Carbon (C)	mg/L	3.7	8.2	8.6	8.7	0.5	11	0.5	8.6		0.5	2652967
Orthophosphate (P)	mg/L	ND	ND	ND	ND	0.01	ND	0.01	ND	ND	0.01	2652403
pH	pH	6.90	6.93	6.95	6.93	N/A	6.88	N/A	6.85		N/A	2652058
Reactive Silica (SiO2)	mg/L	0.6	2.3	1.9	1.7	0.5	1.1	0.5	4.0	4.1	0.5	2652400
Total Suspended Solids	mg/L	1	ND	2	1	1	1	1	24	24	2	2648630
Dissolved Sulphate (SO4)	mg/L	ND	ND	ND	ND	2	ND	2	ND	ND	2	2652399
Turbidity	NTU	0.3	0.4	0.3	0.4	0.1	0.6	0.1	2.0		0.1	2653774
Conductivity	uS/cm	25	32	29	28	1	28	1	33		1	2652060

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Maxxam Job #: B1G0048
Report Date: 2011/10/21

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		LG2334			LG2346	LG2346		LG2347	LG2348	LG2349	LG2349		
Sampling Date		2011/10/09			2011/10/09	2011/10/09		2011/10/09	2011/10/09	2011/10/09	2011/10/09		
	Units	**VE06**	**RDL**	**QC Batch**	**VE07**	**VE07 Lab-Dup**	**RDL**	**VE08**	**VE09**	**VE10**	**VE10 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters													
Anion Sum	me/L	0.310	N/A	2649529	0.330		N/A	0.220	0.320	0.320		N/A	2649529
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	12	1	2649526	12		1	7	12	12		1	2649526
Calculated TDS	mg/L	21	1	2649532	23		1	17	22	21		1	2649532
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1	2649526	ND		1	ND	ND	ND		1	2649526
Cation Sum	me/L	0.410	N/A	2649529	0.430		N/A	0.290	0.400	0.360		N/A	2649529
Hardness (CaCO3)	mg/L	16	1	2649527	17		1	10	15	14		1	2649527
Ion Balance (% Difference)	%	13.9	N/A	2649528	13.2		N/A	13.7	11.1	5.88		N/A	2649528
Langelier Index (@ 20C)	N/A	-2.64		2649530	-2.62			-3.66	-2.75	-2.85			2649530
Langelier Index (@ 4C)	N/A	-2.90		2649531	-2.87			-3.91	-3.00	-3.10			2649531
Nitrate (N)	mg/L	0.06	0.05	2650428	0.06		0.05	0.15	0.23	ND		0.05	2650428
Saturation pH (@ 20C)	N/A	9.51		2649530	9.48			10.0	9.57	9.61			2649530
Saturation pH (@ 4C)	N/A	9.77		2649531	9.73			10.3	9.82	9.86			2649531
Inorganics													
Total Alkalinity (Total as CaCO3)	mg/L	12	5	2652409	12		5	7	12	12		5	2652409
Dissolved Chloride (Cl)	mg/L	3	1	2652410	3		1	3	3	3		1	2652410
Colour	TCU	61	30	2652415	61		10	41	34	32		5	2652415
Nitrate + Nitrite	mg/L	0.06	0.05	2652417	0.06		0.05	0.15	0.23	ND		0.05	2652417
Nitrite (N)	mg/L	ND	0.01	2652418	ND		0.01	ND	ND	ND		0.01	2652418
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.05	2652297	0.09		0.05	ND	ND	ND		0.05	2652297
Total Organic Carbon (C)	mg/L	12	0.5	2652967	11	11	0.5	12	9.2	9.4		0.5	2652984
Orthophosphate (P)	mg/L	ND	0.01	2652416	ND		0.01	ND	ND	ND		0.01	2652416
pH	pH	6.87	N/A	2652058	6.86		N/A	6.38	6.82	6.76	6.82	N/A	2652058
Reactive Silica (SiO2)	mg/L	3.4	0.5	2652413	3.6		0.5	3.7	3.2	3.7		0.5	2652413
Total Suspended Solids	mg/L	2	1	2648630	2		1	2	1	1		1	2648630
Dissolved Sulphate (SO4)	mg/L	ND	2	2652411	ND		2	ND	ND	ND		2	2652411
Turbidity	NTU	0.6	0.1	2653774	0.7		0.1	0.5	0.3	0.4		0.1	2653774
Conductivity	uS/cm	35	1	2652060	36		1	26	34	32	32	1	2652060

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Maxxam Job #: B1G0048
Report Date: 2011/10/21

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		LG2305	LG2314	LG2315	LG2316	LG2317	LG2318	LG2319	LG2320	LG2321	LG2327		
Sampling Date		2011/10/08	2011/10/08	2011/10/08	2011/10/08	2011/10/08	2011/10/09	2011/10/09	2011/10/09	2011/10/09	2011/10/09		
	Units	**LP01**	**LP02**	**LP03**	**LP04**	**LP05**	**VL01**	**R01**	**R02**	**R03**	**R04**	**RDL**	**QC Batch**
Metals													
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.013	2649191

Maxxam ID		LG2328	LG2329	LG2330	LG2331		LG2332	LG2332		
Sampling Date		2011/10/09	2011/10/09	2011/10/09	2011/10/09		2011/10/09	2011/10/09		
	Units	**R05**	**VE01**	**VE02**	**VE03**	**QC Batch**	**VE04**	**VE04 Lab-Dup**	**RDL**	**QC Batch**
Metals										
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	2652225	ND	ND	0.013	2652226

Maxxam ID		LG2333	LG2334	LG2346	LG2347	LG2348	LG2349		
Sampling Date		2011/10/09	2011/10/09	2011/10/09	2011/10/09	2011/10/09	2011/10/09		
	Units	**VE05**	**VE06**	**VE07**	**VE08**	**VE09**	**VE10**	**RDL**	**QC Batch**
Metals									
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	0.013	2652226

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Site Location: VALENTINE LAKE
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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		LG2305	LG2314	LG2315	LG2316	LG2317	LG2318	LG2319	LG2320	LG2321	LG2327		
Sampling Date		2011/10/08	2011/10/08	2011/10/08	2011/10/08	2011/10/08	2011/10/09	2011/10/09	2011/10/09	2011/10/09	2011/10/09		
	Units	**LP01**	**LP02**	**LP03**	**LP04**	**LP05**	**VL01**	**R01**	**R02**	**R03**	**R04**	**RDL**	**QC Batch**
Metals													
Total Aluminum (Al)	ug/L	1200	246	84.0	128	76.9	63.1	36.5	61.3	64.8	77.7	5.0	2650524
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2650524
Total Arsenic (As)	ug/L	2.6	ND	2.3	ND	ND	1.1	5.7	5.1	2.0	ND	1.0	2650524
Total Barium (Ba)	ug/L	7.9	3.6	1.6	1.9	2.0	1.3	2.1	ND	ND	1.8	1.0	2650524
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2650524
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2650524
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	50	2650524
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.017	2650524
Total Calcium (Ca)	ug/L	9710	6050	5820	5490	6120	6420	5360	4620	5270	4550	100	2650524
Total Chromium (Cr)	ug/L	12.0	1.8	ND	18.1	4.0	ND	ND	ND	ND	ND	1.0	2650524
Total Cobalt (Co)	ug/L	0.56	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.40	2650524
Total Copper (Cu)	ug/L	2.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2650524
Total Iron (Fe)	ug/L	1720	346	187	172	138	166	300	240	172	85	50	2650524
Total Lead (Pb)	ug/L	1.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.50	2650524
Total Magnesium (Mg)	ug/L	1490	920	878	995	947	1510	683	556	695	611	100	2650524
Total Manganese (Mn)	ug/L	117	22.3	56.0	16.3	73.9	106	190	28.4	51.2	42.3	2.0	2650524
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2650524
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2650524
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100	2650524
Total Potassium (K)	ug/L	1240	480	288	207	141	195	191	109	113	ND	100	2650524
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2650524
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2650524
Total Sodium (Na)	ug/L	3780	2480	2000	1690	1520	1840	1470	1250	1430	1490	100	2650524
Total Strontium (Sr)	ug/L	58.9	38.1	21.0	10.6	13.1	18.7	11.1	8.0	8.5	7.1	2.0	2650524
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2650524
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2650524
Total Titanium (Ti)	ug/L	91.0	13.8	3.6	2.6	ND	ND	ND	ND	ND	ND	2.0	2650524
Total Uranium (U)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2650524
Total Vanadium (V)	ug/L	3.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2650524
Total Zinc (Zn)	ug/L	ND	ND	ND	5.1	ND	11.7	ND	ND	ND	ND	5.0	2650524

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B1G0048
Report Date: 2011/10/21

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		LG2328	LG2329	LG2330	LG2331		LG2332		
Sampling Date		2011/10/09	2011/10/09	2011/10/09	2011/10/09		2011/10/09		
	Units	**R05**	**VE01**	**VE02**	**VE03**	**QC Batch**	**VE04**	**RDL**	**QC Batch**
Metals									
Total Aluminum (Al)	ug/L	20.9	56.7	55.1	63.2	2650524	65.6	5.0	2650736
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	2650524	ND	1.0	2650736
Total Arsenic (As)	ug/L	ND	ND	ND	ND	2650524	ND	1.0	2650736
Total Barium (Ba)	ug/L	4.9	1.1	ND	1.2	2650524	1.3	1.0	2650736
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	2650524	ND	1.0	2650736
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	2650524	ND	2.0	2650736
Total Boron (B)	ug/L	ND	ND	ND	ND	2650524	ND	50	2650736
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	2650524	ND	0.017	2650736
Total Calcium (Ca)	ug/L	3270	4380	4000	3870	2650524	4060	100	2650736
Total Chromium (Cr)	ug/L	ND	ND	ND	ND	2650524	1.8	1.0	2650736
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	2650524	ND	0.40	2650736
Total Copper (Cu)	ug/L	ND	ND	ND	ND	2650524	ND	2.0	2650736
Total Iron (Fe)	ug/L	ND	151	136	146	2650524	225	50	2650736
Total Lead (Pb)	ug/L	ND	ND	ND	ND	2650524	ND	0.50	2650736
Total Magnesium (Mg)	ug/L	455	737	658	660	2650524	623	100	2650736
Total Manganese (Mn)	ug/L	16.6	33.8	54.8	72.8	2650524	77.5	2.0	2650736
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	2650524	ND	2.0	2650736
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	2650524	ND	2.0	2650736
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	2650524	ND	100	2650736
Total Potassium (K)	ug/L	145	133	144	149	2650524	158	100	2650736
Total Selenium (Se)	ug/L	ND	ND	ND	ND	2650524	ND	1.0	2650736
Total Silver (Ag)	ug/L	ND	ND	ND	ND	2650524	ND	0.10	2650736
Total Sodium (Na)	ug/L	1230	1670	1600	1620	2650524	1600	100	2650736
Total Strontium (Sr)	ug/L	7.5	10.5	10.6	10.6	2650524	12.0	2.0	2650736
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	2650524	ND	0.10	2650736
Total Tin (Sn)	ug/L	ND	ND	ND	ND	2650524	ND	2.0	2650736
Total Titanium (Ti)	ug/L	ND	ND	ND	ND	2650524	ND	2.0	2650736
Total Uranium (U)	ug/L	ND	ND	ND	ND	2650524	ND	0.10	2650736
Total Vanadium (V)	ug/L	ND	ND	ND	ND	2650524	ND	2.0	2650736
Total Zinc (Zn)	ug/L	ND	ND	ND	ND	2650524	ND	5.0	2650736

ND = Not detected
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Maxxam Job #: B1G0048
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Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		LG2333	LG2334	LG2346	LG2347	LG2348	LG2349		
Sampling Date		2011/10/09	2011/10/09	2011/10/09	2011/10/09	2011/10/09	2011/10/09		
	Units	**VE05**	**VE06**	**VE07**	**VE08**	**VE09**	**VE10**	**RDL**	**QC Batch**
Metals									
Total Aluminum (Al)	ug/L	433	135	128	148	114	70.9	5.0	2650736
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2650736
Total Arsenic (As)	ug/L	4.1	ND	ND	ND	ND	ND	1.0	2650736
Total Barium (Ba)	ug/L	13.5	1.6	1.9	ND	3.3	1.8	1.0	2650736
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2650736
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2650736
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	50	2650736
Total Cadmium (Cd)	ug/L	0.065	ND	ND	ND	ND	ND	0.017	2650736
Total Calcium (Ca)	ug/L	4730	5010	5100	2620	4340	3870	100	2650736
Total Chromium (Cr)	ug/L	ND	ND	ND	ND	30.0	ND	1.0	2650736
Total Cobalt (Co)	ug/L	1.44	ND	ND	0.47	ND	ND	0.40	2650736
Total Copper (Cu)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2650736
Total Iron (Fe)	ug/L	3270	250	309	476	180	217	50	2650736
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	ND	0.50	2650736
Total Magnesium (Mg)	ug/L	960	872	908	798	1120	982	100	2650736
Total Manganese (Mn)	ug/L	1290	134	243	208	499	92.7	2.0	2650736
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2650736
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2650736
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	100	2650736
Total Potassium (K)	ug/L	132	171	152	ND	133	ND	100	2650736
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2650736
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	0.10	2650736
Total Sodium (Na)	ug/L	1790	1690	1750	1670	1920	1830	100	2650736
Total Strontium (Sr)	ug/L	11.6	11.0	11.3	6.4	12.6	8.7	2.0	2650736
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	0.10	2650736
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2650736
Total Titanium (Ti)	ug/L	14.0	3.4	3.0	4.6	2.8	ND	2.0	2650736
Total Uranium (U)	ug/L	0.11	ND	ND	ND	ND	ND	0.10	2650736
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2650736
Total Zinc (Zn)	ug/L	7.0	ND	ND	ND	ND	ND	5.0	2650736

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B1G0048
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Stantec Consulting Ltd
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Site Location: VALENTINE LAKE
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Sampler Initials: SM

Package 1	5.8°C

Each temperature is the average of up to three cooler temperatures taken at receipt

GENERAL COMMENTS

Sample LG2305-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LG2314-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LG2315-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LG2316-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LG2317-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LG2320-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LG2327-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LG2329-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LG2330-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LG2331-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LG2332-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LG2333-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LG2334-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LG2346-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LG2347-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LG2348-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LG2349-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B1G0048
Report Date: 2011/10/21

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2648630	Total Suspended Solids	2011/10/17					ND, RDL=1	mg/L	1.7	25	99	80 - 120
2649191	Total Mercury (Hg)	2011/10/17	100	80 - 120	92	80 - 120	ND, RDL=0.013	ug/L	NC	25	92	80 - 120
2650524	Total Aluminum (Al)	2011/10/18	102	80 - 120	106	80 - 120	6.1, RDL=5.0(1)	ug/L	NC	25		
2650524	Total Antimony (Sb)	2011/10/18	102	80 - 120	101	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2650524	Total Arsenic (As)	2011/10/18	99	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L	1.9	25		
2650524	Total Barium (Ba)	2011/10/18	NC	80 - 120	95	80 - 120	ND, RDL=1.0	ug/L	0.2	25		
2650524	Total Beryllium (Be)	2011/10/18	96	80 - 120	95	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2650524	Total Bismuth (Bi)	2011/10/18	99	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2650524	Total Boron (B)	2011/10/18	97	80 - 120	96	80 - 120	ND, RDL=50	ug/L	NC	25		
2650524	Total Cadmium (Cd)	2011/10/18	96	80 - 120	97	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2650524	Total Calcium (Ca)	2011/10/18	NC	80 - 120	103	80 - 120	ND, RDL=100	ug/L	0.6	25		
2650524	Total Chromium (Cr)	2011/10/18	98	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2650524	Total Cobalt (Co)	2011/10/18	97	80 - 120	99	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2650524	Total Copper (Cu)	2011/10/18	96	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2650524	Total Iron (Fe)	2011/10/18	105	80 - 120	106	80 - 120	ND, RDL=50	ug/L	NC	25		
2650524	Total Lead (Pb)	2011/10/18	95	80 - 120	96	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2650524	Total Magnesium (Mg)	2011/10/18	NC	80 - 120	106	80 - 120	ND, RDL=100	ug/L	1.7	25		
2650524	Total Manganese (Mn)	2011/10/18	95	80 - 120	95	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2650524	Total Molybdenum (Mo)	2011/10/18	103	80 - 120	104	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2650524	Total Nickel (Ni)	2011/10/18	94	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2650524	Total Phosphorus (P)	2011/10/18	105	80 - 120	107	80 - 120	ND, RDL=100	ug/L	NC	25		
2650524	Total Potassium (K)	2011/10/18	99	80 - 120	100	80 - 120	ND, RDL=100	ug/L	0.9	25		
2650524	Total Selenium (Se)	2011/10/18	98	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2650524	Total Silver (Ag)	2011/10/18	99	80 - 120	101	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2650524	Total Sodium (Na)	2011/10/18	NC	80 - 120	96	80 - 120	ND, RDL=100	ug/L	0.2	25		
2650524	Total Strontium (Sr)	2011/10/18	NC	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L	0.7	25		
2650524	Total Thallium (Tl)	2011/10/18	100	80 - 120	101	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2650524	Total Tin (Sn)	2011/10/18	102	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2650524	Total Titanium (Ti)	2011/10/18	102	80 - 120	104	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2650524	Total Uranium (U)	2011/10/18	108	80 - 120	107	80 - 120	ND, RDL=0.10	ug/L	0.3	25		
2650524	Total Vanadium (V)	2011/10/18	99	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2650524	Total Zinc (Zn)	2011/10/18	98	80 - 120	100	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2650736	Total Aluminum (Al)	2011/10/18	105	80 - 120	107	80 - 120	6.9, RDL=5.0(1)	ug/L	NC	25		
2650736	Total Antimony (Sb)	2011/10/18	103	80 - 120	103	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2650736	Total Arsenic (As)	2011/10/18	100	80 - 120	100	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2650736	Total Barium (Ba)	2011/10/18	97	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L	2.1	25		
2650736	Total Beryllium (Be)	2011/10/18	99	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2650736	Total Bismuth (Bi)	2011/10/18	102	80 - 120	101	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2650736	Total Boron (B)	2011/10/18	101	80 - 120	98	80 - 120	ND, RDL=50	ug/L	NC	25		

Maxxam Job #: B1G0048
Report Date: 2011/10/21

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
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Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2650736	Total Cadmium (Cd)	2011/10/18	99	80 - 120	97	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2650736	Total Calcium (Ca)	2011/10/18	104	80 - 120	105	80 - 120	ND, RDL=100	ug/L	2.3	25		
2650736	Total Chromium (Cr)	2011/10/18	99	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2650736	Total Cobalt (Co)	2011/10/18	99	80 - 120	99	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2650736	Total Copper (Cu)	2011/10/18	98	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2650736	Total Iron (Fe)	2011/10/18	107	80 - 120	106	80 - 120	ND, RDL=50	ug/L	NC	25		
2650736	Total Lead (Pb)	2011/10/18	98	80 - 120	97	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2650736	Total Magnesium (Mg)	2011/10/18	106	80 - 120	107	80 - 120	ND, RDL=100	ug/L	2.6	25		
2650736	Total Manganese (Mn)	2011/10/18	96	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2650736	Total Molybdenum (Mo)	2011/10/18	105	80 - 120	105	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2650736	Total Nickel (Ni)	2011/10/18	96	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2650736	Total Phosphorus (P)	2011/10/18	109	80 - 120	108	80 - 120	ND, RDL=100	ug/L	NC	25		
2650736	Total Potassium (K)	2011/10/18	102	80 - 120	101	80 - 120	ND, RDL=100	ug/L	4.9	25		
2650736	Total Selenium (Se)	2011/10/18	100	80 - 120	100	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2650736	Total Silver (Ag)	2011/10/18	99	80 - 120	103	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2650736	Total Sodium (Na)	2011/10/18	96	80 - 120	97	80 - 120	ND, RDL=100	ug/L	2.1	25		
2650736	Total Strontium (Sr)	2011/10/18	98	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L	1.5	25		
2650736	Total Thallium (Tl)	2011/10/18	102	80 - 120	102	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2650736	Total Tin (Sn)	2011/10/18	105	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2650736	Total Titanium (Ti)	2011/10/18	104	80 - 120	104	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2650736	Total Uranium (U)	2011/10/18	110	80 - 120	110	80 - 120	ND, RDL=0.10	ug/L	5.7	25		
2650736	Total Vanadium (V)	2011/10/18	100	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2650736	Total Zinc (Zn)	2011/10/18	99	80 - 120	100	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2652054	pH	2011/10/19							0	25	102	80 - 120
2652057	Conductivity	2011/10/19			98	80 - 120	1, RDL=1	uS/cm	0.5	25		
2652058	pH	2011/10/19							0.9	25	102	80 - 120
2652060	Conductivity	2011/10/19			98	80 - 120	ND, RDL=1	uS/cm	0	25		
2652225	Total Mercury (Hg)	2011/10/19	97	80 - 120	90	80 - 120	ND, RDL=0.013	ug/L	NC	25	93	80 - 120
2652226	Total Mercury (Hg)	2011/10/19	100	80 - 120	98	80 - 120	ND, RDL=0.013	ug/L	NC	25	90	80 - 120
2652293	Nitrogen (Ammonia Nitrogen)	2011/10/19	97	80 - 120	97	80 - 120	ND, RDL=0.05	mg/L	NC	25	103	80 - 120
2652297	Nitrogen (Ammonia Nitrogen)	2011/10/19	91	80 - 120	98	80 - 120	ND, RDL=0.05	mg/L	NC	25	98	80 - 120
2652396	Total Alkalinity (Total as CaCO3)	2011/10/19	100	80 - 120	107	80 - 120	ND, RDL=5	mg/L	NC	25	110	80 - 120
2652397	Dissolved Chloride (Cl)	2011/10/20	97	80 - 120	97	80 - 120	ND, RDL=1	mg/L	NC	25	99	80 - 120
2652399	Dissolved Sulphate (SO4)	2011/10/20	100	80 - 120	99	80 - 120	ND, RDL=2	mg/L	NC	25	100	80 - 120
2652400	Reactive Silica (SiO2)	2011/10/19	101	80 - 120	103	80 - 120	ND, RDL=0.5	mg/L	0.4	25	98	75 - 125
2652402	Colour	2011/10/20					ND, RDL=5	TCU	1.5	25	103	80 - 120
2652403	Orthophosphate (P)	2011/10/20	89	80 - 120	100	80 - 120	ND, RDL=0.01	mg/L	NC	25	101	80 - 120
2652405	Nitrate + Nitrite	2011/10/20	101	80 - 120	99	80 - 120	ND, RDL=0.05	mg/L	NC	25	105	80 - 120
2652407	Nitrite (N)	2011/10/19	88	80 - 120	100	80 - 120	ND, RDL=0.01	mg/L	NC	25	102	80 - 120

Maxxam Job #: B1G0048
Report Date: 2011/10/21

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2652409	Total Alkalinity (Total as CaCO3)	2011/10/19	101	80 - 120	103	80 - 120	ND, RDL=5	mg/L	NC	25	109	80 - 120
2652410	Dissolved Chloride (Cl)	2011/10/20	97	80 - 120	97	80 - 120	ND, RDL=1	mg/L	NC	25	102	80 - 120
2652411	Dissolved Sulphate (SO4)	2011/10/20	100	80 - 120	94	80 - 120	ND, RDL=2	mg/L	NC	25	94	80 - 120
2652413	Reactive Silica (SiO2)	2011/10/19	101	80 - 120	102	80 - 120	ND, RDL=0.5	mg/L	0.5	25	99	75 - 125
2652415	Colour	2011/10/20					ND, RDL=5	TCU	1.2	25	98	80 - 120
2652416	Orthophosphate (P)	2011/10/20	90	80 - 120	100	80 - 120	ND, RDL=0.01	mg/L	NC	25	103	80 - 120
2652417	Nitrate + Nitrite	2011/10/20	100	80 - 120	101	80 - 120	ND, RDL=0.05	mg/L	NC	25	102	80 - 120
2652418	Nitrite (N)	2011/10/19	86	80 - 120	100	80 - 120	ND, RDL=0.01	mg/L	NC	25	101	80 - 120
2652967	Total Organic Carbon (C)	2011/10/19	97	80 - 120	98	80 - 120	ND, RDL=0.5	mg/L	0.4	25	101	80 - 120
2652984	Total Organic Carbon (C)	2011/10/19	96	80 - 120	98	80 - 120	ND, RDL=0.5	mg/L	0.2	25	99	80 - 120
2653763	Turbidity	2011/10/20					ND, RDL=0.1	NTU	16.8	25	100	80 - 120
2653774	Turbidity	2011/10/20					ND, RDL=0.1	NTU	NC	25	99	80 - 120

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) - Low level lab contamination. Minimal impact on data quality.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

Validation Signature Page

Maxxam Job #: B1G0048

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

COLLEEN ACKER,

KEVIN MACDONALD, Inorganics Supervisor

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Round 8

Your Project #: 121510621.100
Site Location: VALENTINE LAKE
Your C.O.C. #: ES268511

Attention: Barry Wicks
Stantec Consulting Ltd
St. John's - Standing Offer
607 Torbay Rd
St. John's, NL
A1A 4Y6

Report Date: 2011/12/06

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B1I7421
Received: 2011/11/29, 9:28

Sample Matrix: Water
Samples Received: 21

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonate, Bicarbonate and Hydroxide	11	N/A	2011/11/30	CAM SOP-00102	APHA 4500-CO2 D
Carbonate, Bicarbonate and Hydroxide	10	N/A	2011/12/01	CAM SOP-00102	APHA 4500-CO2 D
Alkalinity	4	N/A	2011/12/02	ATL SOP 00013	Based on EPA310.2
Alkalinity	17	N/A	2011/12/05	ATL SOP 00013	Based on EPA310.2
Chloride	21	N/A	2011/12/02	ATL SOP 00014	Based on SM4500-Cl-
Colour	21	N/A	2011/12/05	ATL SOP 00020	Based on SM2120C
Conductance - water	21	N/A	2011/11/30	ATL SOP 00004/00006	Based on SM2510B
Hardness (calculated as CaCO3)	21	N/A	2011/12/02	ATL SOP 00048	Based on SM2340B
Mercury - Total (CVAA,LL)	5	2011/11/30	2011/12/01	ATL SOP 00026	Based on EPA245.1
Mercury - Total (CVAA,LL)	16	2011/12/01	2011/12/02	ATL SOP 00026	Based on EPA245.1
Metals Water Total MS	19	2011/11/30	2011/12/01	ATL SOP 00059	Based on EPA6020A
Metals Water Total MS	2	2011/12/01	2011/12/01	ATL SOP 00059	Based on EPA6020A
Ion Balance (% Difference)	21	N/A	2011/12/05		
Anion and Cation Sum	21	N/A	2011/12/02		
Nitrogen Ammonia - water	21	N/A	2011/12/01	ATL SOP 00015	Based on USEPA 350.1
Nitrogen - Nitrate + Nitrite	21	N/A	2011/12/05	ATL SOP 00016	Based on USGS - Enz.
Nitrogen - Nitrite	21	N/A	2011/12/05	ATL SOP 00017	Based on SM4500-NO2B
Nitrogen - Nitrate (as N)	21	N/A	2011/12/05	ATL SOP 00018	Based on ASTMD3867
pH	21	N/A	2011/11/30	ATL SOP 00003	Based on SM4500H+B
Phosphorus - ortho	21	N/A	2011/12/05	ATL SOP 00021	Based on USEPA 365.1
Sat. pH and Langelier Index (@ 20C)	21	N/A	2011/12/05		
Sat. pH and Langelier Index (@ 4C)	21	N/A	2011/12/05		
Reactive Silica	21	N/A	2011/12/02	ATL SOP 00022	Based on EPA 366.0
Sulphate	21	N/A	2011/12/05	ATL SOP 00023	Based on EPA 375.4
Total Dissolved Solids (TDS calc)	21	N/A	2011/12/05		
Organic carbon - Total (TOC)	21	N/A	2011/12/02	ATL SOP 00037	Based on SM5310C
Total Suspended Solids	20	N/A	2011/11/30	ATL SOP 00007	based on EPA 160.2
Total Suspended Solids	1	N/A	2011/12/02	ATL SOP 00007	based on EPA 160.2
Turbidity	21	N/A	2011/11/30	ATL SOP 00011	based on EPA 180.1

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

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Maxxam Job #: B1I7421
Report Date: 2011/12/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Sampler Initials: SM

Encryption Key

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

MICHELLE HILL, Project Manager
Email: MHill@maxxam.ca
Phone# (902) 420-0203

==========

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Total cover pages: 2

Maxxam Job #: B1I7421
Report Date: 2011/12/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		LU4468		LU4471	LU4471		LU4473		LU4474	LU4474		
Sampling Date		2011/11/12		2011/11/12	2011/11/12		2011/11/12		2011/11/12	2011/11/12		
	Units	**LP01**	**RDL**	**LP02**	**LP02 Lab-Dup**	**RDL**	**LP03**	**RDL**	**LP04**	**LP04 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters												
Anion Sum	me/L	0.530	N/A	0.350		N/A	0.280	N/A	0.240		N/A	2696616
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	22	1	14		1	10	1	9		1	2696613
Calculated TDS	mg/L	32	1	21		1	17	1	15		1	2696620
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1	ND		1	ND	1	ND		1	2696613
Cation Sum	me/L	0.650	N/A	0.420		N/A	0.320	N/A	0.300		N/A	2696616
Hardness (CaCO3)	mg/L	23	1	14		1	12	1	11		1	2696614
Ion Balance (% Difference)	%	10.2	N/A	9.09		N/A	6.67	N/A	11.1		N/A	2696615
Langelier Index (@ 20C)	N/A	-1.69		-2.38			-2.72		-2.96			2696618
Langelier Index (@ 4C)	N/A	-1.95		-2.64			-2.97		-3.21			2696619
Nitrate (N)	mg/L	0.06	0.05	ND		0.05	ND	0.05	ND		0.05	2697292
Saturation pH (@ 20C)	N/A	9.09		9.49			9.69		9.78			2696618
Saturation pH (@ 4C)	N/A	9.35		9.75			9.94		10.0			2696619
Inorganics												
Total Alkalinity (Total as CaCO3)	mg/L	22	5	14		5	11	5	9	10	5	2699173
Dissolved Chloride (Cl)	mg/L	3	1	3		1	2	1	2	2	1	2699179
Colour	TCU	49	5	57		30	52	30	75	67	30	2699182
Nitrate + Nitrite	mg/L	0.06	0.05	ND		0.05	ND	0.05	ND	ND	0.05	2699184
Nitrite (N)	mg/L	ND	0.01	ND		0.01	ND	0.01	ND	ND	0.01	2699185
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.05	ND		0.05	ND	0.05	ND		0.05	2698113
Total Organic Carbon (C)	mg/L	8.4	0.5	8.6		0.5	8.1	0.5	9.3		0.5	2701122
Orthophosphate (P)	mg/L	ND	0.01	ND		0.01	ND	0.01	ND	ND	0.01	2699183
pH	pH	7.40	N/A	7.11		N/A	6.97	N/A	6.82		N/A	2697792
Reactive Silica (SiO2)	mg/L	1.7	0.5	1.3		0.5	1.8	0.5	1.5	1.5	0.5	2699181
Total Suspended Solids	mg/L	15	2	14	17	2	2	1	8		2	2697121
Dissolved Sulphate (SO4)	mg/L	ND	2	ND		2	ND	2	ND	ND	2	2699180
Turbidity	NTU	8.6	0.1	9.6		0.1	2.5	0.1	2.9		0.1	2697802
Conductivity	uS/cm	57	1	36		1	30	1	27		1	2697795

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B1I7421
Report Date: 2011/12/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		LU4475	LU4475			LU4476	LU4477		LU4478	LU4479		
Sampling Date		2011/11/12	2011/11/12			2011/11/13	2011/11/13		2011/11/13	2011/11/13		
	Units	**LP05**	**LP05 Lab-Dup**	**RDL**	**QC Batch**	**VL01**	**R01**	**RDL**	**R02**	**R03**	**RDL**	**QC Batch**
Calculated Parameters												
Anion Sum	me/L	0.180		N/A	2696616	0.220	0.170	N/A	0.0600	0.0500	N/A	2696616
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	6		1	2696613	8	5	1	ND	ND	1	2696613
Calculated TDS	mg/L	13		1	2696620	14	12	1	8	9	1	2696620
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND		1	2696613	ND	ND	1	ND	ND	1	2696613
Cation Sum	me/L	0.280		N/A	2696616	0.290	0.240	N/A	0.230	0.240	N/A	2696616
Hardness (CaCO3)	mg/L	11		1	2696614	11	9	1	9	9	1	2696614
Ion Balance (% Difference)	%	21.7		N/A	2696615	13.7	17.1	N/A	58.6	65.5	N/A	2696615
Langelier Index (@ 20C)	N/A	-3.22			2696618	-2.90	-3.25		NC	NC		2696618
Langelier Index (@ 4C)	N/A	-3.47			2696619	-3.16	-3.50		NC	NC		2696619
Nitrate (N)	mg/L	ND		0.05	2697292	ND	ND	0.05	ND	ND	0.05	2697292
Saturation pH (@ 20C)	N/A	9.96			2696618	9.84	10.1		NC	NC		2696618
Saturation pH (@ 4C)	N/A	10.2			2696619	10.1	10.3		NC	NC		2696619
Inorganics												
Total Alkalinity (Total as CaCO3)	mg/L	6		5	2699195	8	5	5	ND	ND	5	2699195
Dissolved Chloride (Cl)	mg/L	2		1	2699204	2	2	1	2	2	1	2699204
Colour	TCU	71		30	2699209	47	38	5	88	67	30	2699209
Nitrate + Nitrite	mg/L	ND		0.05	2699211	ND	ND	0.05	ND	ND	0.05	2699211
Nitrite (N)	mg/L	ND		0.01	2699212	ND	ND	0.01	ND	ND	0.01	2699212
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	0.05	2698113	ND	ND	0.05	ND	ND	0.05	2699620
Total Organic Carbon (C)	mg/L	10		0.5	2701122	8.3	5.7	0.5	9.0	8.9	0.5	2701122
Orthophosphate (P)	mg/L	ND		0.01	2699210	ND	ND	0.01	ND	ND	0.01	2699210
pH	pH	6.74		N/A	2697792	6.94	6.82	N/A	6.72	6.70	N/A	2697792
Reactive Silica (SiO2)	mg/L	1.9		0.5	2699206	1.8	1.8	0.5	1.6	2.0	0.5	2699206
Total Suspended Solids	mg/L	3		1	2697121	ND	ND	1	1	ND	1	2697121
Dissolved Sulphate (SO4)	mg/L	ND		2	2699205	ND	ND	2	ND	ND	2	2699205
Turbidity	NTU	1.3		0.1	2697802	0.5	ND	0.1	0.6	0.1	0.1	2697802
Conductivity	uS/cm	26		1	2697795	28	23	1	21	22	1	2697795

N/A = Not Applicable
ND = Not detected
NC = Non-calculable
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B1I7421
Report Date: 2011/12/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		LU4480	LU4480		LU4481	LU4481		LU4483	LU4483	LU4487		
Sampling Date		2011/11/13	2011/11/13		2011/11/13	2011/11/13		2011/11/13	2011/11/13	2011/11/13		
	Units	**R04**	**R04 Lab-Dup**	**RDL**	**R05**	**R05 Lab-Dup**	**QC Batch**	**VE01**	**VE01 Lab-Dup**	**VE02**	**RDL**	**QC Batch**
Calculated Parameters												
Anion Sum	me/L	0.170		N/A	0.200		2696616	0.170		0.170	N/A	2696616
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	5		1	8		2696613	5		6	1	2696613
Calculated TDS	mg/L	13		1	12		2696620	13		13	1	2696620
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND		1	ND		2696613	ND		ND	1	2696613
Cation Sum	me/L	0.250		N/A	0.230		2696616	0.260		0.260	N/A	2696616
Hardness (CaCO3)	mg/L	10		1	9		2696614	10		10	1	2696614
Ion Balance (% Difference)	%	19.1		N/A	6.98		2696615	20.9		20.9	N/A	2696615
Langelier Index (@ 20C)	N/A	-3.53			-2.90		2696618	-3.39		-3.24		2696618
Langelier Index (@ 4C)	N/A	-3.78			-3.16		2696619	-3.65		-3.49		2696619
Nitrate (N)	mg/L	ND		0.05	ND		2697292	0.06		0.07	0.05	2697292
Saturation pH (@ 20C)	N/A	10.0			9.92		2696618	10.1		10.0		2696618
Saturation pH (@ 4C)	N/A	10.3			10.2		2696619	10.3		10.3		2696619
Inorganics												
Total Alkalinity (Total as CaCO3)	mg/L	5		5	8		2699195	5		6	5	2699195
Dissolved Chloride (Cl)	mg/L	2		1	2		2699204	2		2	1	2699204
Colour	TCU	73		30	18		2699209	49		47	5	2699209
Nitrate + Nitrite	mg/L	ND		0.05	ND		2699211	0.06		0.07	0.05	2699211
Nitrite (N)	mg/L	ND		0.01	ND		2699212	ND		ND	0.01	2699212
Nitrogen (Ammonia Nitrogen)	mg/L	ND		0.05	ND		2699620	ND		ND	0.05	2699620
Total Organic Carbon (C)	mg/L	10	10	0.5	3.7		2701130	8.7		8.8	0.5	2701130
Orthophosphate (P)	mg/L	ND		0.01	ND		2699210	ND		ND	0.01	2699210
pH	pH	6.52		N/A	7.02	7.00	2697792	6.70	6.75	6.79	N/A	2697810
Reactive Silica (SiO2)	mg/L	2.2		0.5	0.8		2699206	2.4		2.1	0.5	2699206
Total Suspended Solids	mg/L	ND		1	4		2697121	ND		ND	1	2697121
Dissolved Sulphate (SO4)	mg/L	ND		2	ND		2699205	ND		ND	2	2699205
Turbidity	NTU	ND		0.1	0.9	1.0	2697802	0.2		0.2	0.1	2697803
Conductivity	uS/cm	22		1	24	24	2697795	25	25	25	1	2697812

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B1I7421
Report Date: 2011/12/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		LU4489		LU4492		LU4493		LU4494		
Sampling Date		2011/11/13		2011/11/13		2011/11/13		2011/11/13		
	Units	**VE03**	**RDL**	**VE04**	**RDL**	**VE05**	**RDL**	**VE06**	**RDL**	**QC Batch**
Calculated Parameters										
Anion Sum	me/L	0.170	N/A	0.200	N/A	0.220	N/A	0.190	N/A	2696616
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	5	1	7	1	7	1	6	1	2696613
Calculated TDS	mg/L	12	1	13	1	17	1	15	1	2696620
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1	ND	1	ND	1	ND	1	2696613
Cation Sum	me/L	0.250	N/A	0.260	N/A	0.300	N/A	0.270	N/A	2696616
Hardness (CaCO3)	mg/L	9	1	10	1	11	1	10	1	2696614
Ion Balance (% Difference)	%	19.1	N/A	13.0	N/A	15.4	N/A	17.4	N/A	2696615
Langelier Index (@ 20C)	N/A	-3.35		-3.26		-3.25		-3.44		2696618
Langelier Index (@ 4C)	N/A	-3.60		-3.51		-3.50		-3.69		2696619
Nitrate (N)	mg/L	0.08	0.05	ND	0.05	0.10	0.05	0.11	0.05	2697292
Saturation pH (@ 20C)	N/A	10.1		9.95		9.91		10.0		2696618
Saturation pH (@ 4C)	N/A	10.3		10.2		10.2		10.3		2696619
Inorganics										
Total Alkalinity (Total as CaCO3)	mg/L	5	5	7	5	7	5	6	5	2699195
Dissolved Chloride (Cl)	mg/L	2	1	2	1	2	1	2	1	2699204
Colour	TCU	49	5	69	30	44	5	64	30	2699209
Nitrate + Nitrite	mg/L	0.08	0.05	ND	0.05	0.10	0.05	0.11	0.05	2699211
Nitrite (N)	mg/L	ND	0.01	ND	0.01	ND	0.01	ND	0.01	2699212
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.05	ND	0.05	ND	0.05	ND	0.05	2699620
Total Organic Carbon (C)	mg/L	9.0	0.5	10	0.5	9.2	0.5	10	0.5	2701130
Orthophosphate (P)	mg/L	ND	0.01	ND	0.01	ND	0.01	ND	0.01	2699210
pH	pH	6.74	N/A	6.69	N/A	6.66	N/A	6.58	N/A	2697810
Reactive Silica (SiO2)	mg/L	1.9	0.5	1.6	0.5	3.3	0.5	3.1	0.5	2699206
Total Suspended Solids	mg/L	ND	1	1	1	ND	1	ND	1	2697121
Dissolved Sulphate (SO4)	mg/L	ND	2	ND	2	ND	2	ND	2	2699205
Turbidity	NTU	0.3	0.1	0.6	0.1	0.2	0.1	0.6	0.1	2697803
Conductivity	uS/cm	24	1	24	1	27	1	25	1	2697812

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B1I7421
Report Date: 2011/12/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		LU4495		LU4496		LU4497			LU4498		
Sampling Date		2011/11/13		2011/11/13		2011/11/13			2011/11/14		
	Units	**VE07**	**RDL**	**VE08**	**RDL**	**VE09**	**RDL**	**QC Batch**	**VE10**	**RDL**	**QC Batch**
Calculated Parameters											
Anion Sum	me/L	0.190	N/A	0.0900	N/A	0.220	N/A	2696616	0.210	N/A	2697845
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	6	1	ND	1	7	1	2696613	7	1	2697841
Calculated TDS	mg/L	15	1	10	1	16	1	2696620	15	1	2697848
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1	ND	1	ND	1	2696613	ND	1	2697841
Cation Sum	me/L	0.270	N/A	0.200	N/A	0.290	N/A	2696616	0.270	N/A	2697845
Hardness (CaCO3)	mg/L	10	1	7	1	11	1	2696614	9	1	2697843
Ion Balance (% Difference)	%	17.4	N/A	37.9	N/A	13.7	N/A	2696615	12.5	N/A	2697844
Langelier Index (@ 20C)	N/A	-3.41		NC		-3.23		2696618	-3.49		2697846
Langelier Index (@ 4C)	N/A	-3.66		NC		-3.49		2696619	-3.74		2697847
Nitrate (N)	mg/L	0.11	0.05	0.21	0.05	0.12	0.05	2697292	0.08	0.05	2697292
Saturation pH (@ 20C)	N/A	10.0		NC		9.95		2696618	10.0		2697846
Saturation pH (@ 4C)	N/A	10.3		NC		10.2		2696619	10.3		2697847
Inorganics											
Total Alkalinity (Total as CaCO3)	mg/L	6	5	ND	5	7	5	2699195	7	5	2699195
Dissolved Chloride (Cl)	mg/L	2	1	3	1	2	1	2699204	3	1	2699204
Colour	TCU	59	30	35	5	53	30	2699209	45	5	2699209
Nitrate + Nitrite	mg/L	0.11	0.05	0.21	0.05	0.12	0.05	2699211	0.08	0.05	2699211
Nitrite (N)	mg/L	ND	0.01	ND	0.01	ND	0.01	2699212	ND	0.01	2699212
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.05	ND	0.05	ND	0.05	2699620	ND	0.05	2699620
Total Organic Carbon (C)	mg/L	9.6	0.5	8.4	0.5	9.4	0.5	2701130	8.5	0.5	2701130
Orthophosphate (P)	mg/L	ND	0.01	ND	0.01	ND	0.01	2699210	ND	0.01	2699210
pH	pH	6.61	N/A	6.09	N/A	6.72	N/A	2697810	6.54	N/A	2697810
Reactive Silica (SiO2)	mg/L	3.2	0.5	2.8	0.5	3.4	0.5	2699206	3.2	0.5	2699206
Total Suspended Solids	mg/L	ND	1	ND	1	ND	1	2697121	ND	1	2697858
Dissolved Sulphate (SO4)	mg/L	ND	2	ND	2	ND	2	2699205	ND	2	2699205
Turbidity	NTU	0.7	0.1	0.1	0.1	0.2	0.1	2697803	ND	0.1	2697803
Conductivity	uS/cm	26	1	21	1	27	1	2697812	25	1	2697812

N/A = Not Applicable
ND = Not detected
NC = Non-calculable
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B1I7421
Report Date: 2011/12/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Sampler Initials: SM

MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		LU4468	LU4471	LU4473	LU4474	LU4475		LU4476	LU4476	LU4477	LU4478		
Sampling Date		2011/11/12	2011/11/12	2011/11/12	2011/11/12	2011/11/12		2011/11/13	2011/11/13	2011/11/13	2011/11/13		
	Units	**LP01**	**LP02**	**LP03**	**LP04**	**LP05**	**QC Batch**	**VL01**	**VL01 Lab-Dup**	**R01**	**R02**	**RDL**	**QC Batch**
Metals													
Total Mercury (Hg)	ug/L	0.013	0.013	0.013	0.017	0.017	2699207	ND	ND	ND	0.015	0.013	2700521

Maxxam ID		LU4479	LU4480	LU4481	LU4483	LU4487	LU4489	LU4492		
Sampling Date		2011/11/13	2011/11/13	2011/11/13	2011/11/13	2011/11/13	2011/11/13	2011/11/13		
	Units	**R03**	**R04**	**R05**	**VE01**	**VE02**	**VE03**	**VE04**	**RDL**	**QC Batch**
Metals										
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.013	2700521

Maxxam ID		LU4493	LU4494	LU4495	LU4496	LU4497	LU4498		
Sampling Date		2011/11/13	2011/11/13	2011/11/13	2011/11/13	2011/11/13	2011/11/14		
	Units	**VE05**	**VE06**	**VE07**	**VE08**	**VE09**	**VE10**	**RDL**	**QC Batch**
Metals									
Total Mercury (Hg)	ug/L	ND	ND	0.013	ND	ND	ND	0.013	2700521

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QC Batch = Quality Control Batch

Maxxam Job #: B1I7421
Report Date: 2011/12/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Sampler Initials: SM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		LU4468	LU4471	LU4473	LU4474	LU4475	LU4476	LU4476	LU4477	LU4478	LU4479		
Sampling Date		2011/11/12	2011/11/12	2011/11/12	2011/11/12	2011/11/12	2011/11/13	2011/11/13	2011/11/13	2011/11/13	2011/11/13		
	Units	**LP01**	**LP02**	**LP03**	**LP04**	**LP05**	**VL01**	**VL01 Lab-Dup**	**R01**	**R02**	**R03**	**RDL**	**QC Batch**
Metals													
Total Aluminum (Al)	ug/L	914	601	194	228	187	78.9	78.3	47.3	89.0	90.4	5.0	2699188
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2699188
Total Arsenic (As)	ug/L	2.2	1.8	1.7	ND	ND	2.1	2.2	2.7	3.8	1.3	1.0	2699188
Total Barium (Ba)	ug/L	9.2	7.3	2.3	1.9	1.6	1.9	1.6	1.3	1.0	ND	1.0	2699188
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2699188
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2699188
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	50	2699188
Total Cadmium (Cd)	ug/L	0.024	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.017	2699188
Total Calcium (Ca)	ug/L	7340	4470	3700	3550	3340	3520	3440	2970	3020	3050	100	2699188
Total Chromium (Cr)	ug/L	1.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2699188
Total Cobalt (Co)	ug/L	0.58	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.40	2699188
Total Copper (Cu)	ug/L	2.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2699188
Total Iron (Fe)	ug/L	1380	932	331	343	250	116	118	123	221	138	50	2699188
Total Lead (Pb)	ug/L	1.10	0.59	ND	ND	ND	ND	ND	ND	ND	ND	0.50	2699188
Total Magnesium (Mg)	ug/L	1080	708	578	596	574	560	551	401	352	403	100	2699188
Total Manganese (Mn)	ug/L	262	113	30.1	37.1	30.3	17.8	18.6	33.4	17.1	15.1	2.0	2699188
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2699188
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2699188
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100	2699188
Total Potassium (K)	ug/L	986	487	290	173	160	124	113	114	ND	ND	100	2699188
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2699188
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2699188
Total Sodium (Na)	ug/L	2790	2020	1570	1300	1270	1460	1450	1090	1010	1070	100	2699188
Total Strontium (Sr)	ug/L	44.3	28.0	13.7	6.5	6.1	8.5	8.1	6.4	5.6	5.0	2.0	2699188
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2699188
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2699188
Total Titanium (Ti)	ug/L	53.0	32.7	11.1	4.3	4.1	2.3	2.5	ND	ND	ND	2.0	2699188
Total Uranium (U)	ug/L	0.11	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2699188
Total Vanadium (V)	ug/L	2.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2699188
Total Zinc (Zn)	ug/L	7.5	5.3	ND	ND	ND	ND	ND	ND	ND	ND	5.0	2699188

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B1I7421
Report Date: 2011/12/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Sampler Initials: SM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		LU4480	LU4481	LU4483	LU4487	LU4489	LU4492	LU4493		
Sampling Date		2011/11/13	2011/11/13	2011/11/13	2011/11/13	2011/11/13	2011/11/13	2011/11/13		
	Units	**R04**	**R05**	**VE01**	**VE02**	**VE03**	**VE04**	**VE05**	**RDL**	**QC Batch**
Metals										
Total Aluminum (Al)	ug/L	107	33.0	83.3	90.4	89.5	89.7	180	5.0	2699188
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	2699188
Total Arsenic (As)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	2699188
Total Barium (Ba)	ug/L	1.4	5.4	1.2	1.3	1.2	1.5	2.8	1.0	2699188
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	2699188
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2699188
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	ND	50	2699188
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.017	2699188
Total Calcium (Ca)	ug/L	3150	2930	2970	3020	2910	3060	3180	100	2699188
Total Chromium (Cr)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	2699188
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.40	2699188
Total Copper (Cu)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2699188
Total Iron (Fe)	ug/L	144	58	144	170	156	226	552	50	2699188
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	0.93	ND	0.50	2699188
Total Magnesium (Mg)	ug/L	400	394	521	508	490	441	640	100	2699188
Total Manganese (Mn)	ug/L	17.2	18.2	13.4	54.9	42.8	44.4	201	2.0	2699188
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2699188
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2699188
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	ND	100	2699188
Total Potassium (K)	ug/L	ND	126	125	130	131	152	118	100	2699188
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	2699188
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.10	2699188
Total Sodium (Na)	ug/L	1180	1160	1350	1330	1310	1290	1460	100	2699188
Total Strontium (Sr)	ug/L	5.0	6.9	7.3	8.1	7.9	8.8	7.5	2.0	2699188
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.10	2699188
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2699188
Total Titanium (Ti)	ug/L	ND	6.4	ND	ND	ND	ND	4.4	2.0	2699188
Total Uranium (U)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.10	2699188
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2699188
Total Zinc (Zn)	ug/L	ND	ND	ND	ND	ND	ND	ND	5.0	2699188

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Stantec Consulting Ltd
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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		LU4494	LU4495	LU4496		LU4497	LU4498		
Sampling Date		2011/11/13	2011/11/13	2011/11/13		2011/11/13	2011/11/14		
	Units	**VE06**	**VE07**	**VE08**	**QC Batch**	**VE09**	**VE10**	**RDL**	**QC Batch**
Metals									
Total Aluminum (Al)	ug/L	169	147	93.1	2699188	165	96.0	5.0	2699255
Total Antimony (Sb)	ug/L	ND	ND	ND	2699188	ND	ND	1.0	2699255
Total Arsenic (As)	ug/L	ND	ND	ND	2699188	ND	ND	1.0	2699255
Total Barium (Ba)	ug/L	1.7	1.7	ND	2699188	1.9	1.4	1.0	2699255
Total Beryllium (Be)	ug/L	ND	ND	ND	2699188	ND	ND	1.0	2699255
Total Bismuth (Bi)	ug/L	ND	ND	ND	2699188	ND	ND	2.0	2699255
Total Boron (B)	ug/L	ND	ND	ND	2699188	ND	ND	50	2699255
Total Cadmium (Cd)	ug/L	ND	ND	ND	2699188	ND	ND	0.017	2699255
Total Calcium (Ca)	ug/L	2970	2960	1780	2699188	2850	2630	100	2699255
Total Chromium (Cr)	ug/L	ND	ND	ND	2699188	ND	ND	1.0	2699255
Total Cobalt (Co)	ug/L	ND	ND	ND	2699188	ND	ND	0.40	2699255
Total Copper (Cu)	ug/L	ND	ND	ND	2699188	ND	ND	2.0	2699255
Total Iron (Fe)	ug/L	262	223	226	2699188	191	188	50	2699255
Total Lead (Pb)	ug/L	ND	ND	ND	2699188	ND	ND	0.50	2699255
Total Magnesium (Mg)	ug/L	601	580	529	2699188	811	695	100	2699255
Total Manganese (Mn)	ug/L	79.9	89.9	52.5	2699188	124	16.2	2.0	2699255
Total Molybdenum (Mo)	ug/L	ND	ND	ND	2699188	ND	ND	2.0	2699255
Total Nickel (Ni)	ug/L	ND	ND	ND	2699188	ND	ND	2.0	2699255
Total Phosphorus (P)	ug/L	ND	ND	ND	2699188	ND	ND	100	2699255
Total Potassium (K)	ug/L	169	139	204	2699188	116	104	100	2699255
Total Selenium (Se)	ug/L	ND	ND	ND	2699188	ND	ND	1.0	2699255
Total Silver (Ag)	ug/L	ND	ND	ND	2699188	ND	ND	0.10	2699255
Total Sodium (Na)	ug/L	1370	1340	1240	2699188	1670	1580	100	2699255
Total Strontium (Sr)	ug/L	6.8	6.8	4.3	2699188	8.4	5.6	2.0	2699255
Total Thallium (Tl)	ug/L	ND	ND	ND	2699188	ND	ND	0.10	2699255
Total Tin (Sn)	ug/L	ND	ND	ND	2699188	ND	ND	2.0	2699255
Total Titanium (Ti)	ug/L	4.0	3.2	2.8	2699188	3.8	2.3	2.0	2699255
Total Uranium (U)	ug/L	ND	ND	ND	2699188	ND	ND	0.10	2699255
Total Vanadium (V)	ug/L	ND	ND	ND	2699188	ND	ND	2.0	2699255
Total Zinc (Zn)	ug/L	ND	ND	ND	2699188	6.2	5.1	5.0	2699255

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Maxxam Job #: B1I7421
Report Date: 2011/12/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Sampler Initials: SM

Package 1	4.1°C

Each temperature is the average of up to three cooler temperatures taken at receipt

GENERAL COMMENTS

Total Suspended Solids: Sample integrity may have been compromised, the samples exceeded their hold time prior to being analyzed.

Sample LU4468-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LU4471-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LU4473-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LU4474-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LU4475-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LU4476-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LU4477-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LU4478-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LU4479-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LU4480-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LU4481-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LU4483-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LU4487-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LU4489-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LU4492-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LU4493-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LU4494-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LU4495-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

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Sample LU4496-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LU4497-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample LU4498-01: Total Suspended Solids: Sample integrity may have been compromised, the sample exceeded it's hold time prior to being analyzed. RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2697121	Total Suspended Solids	2011/11/30					ND, RDL=1	mg/L	17.7	25	99	80 - 120
2697792	pH	2011/11/30							0.3	25	102	80 - 120
2697795	Conductivity	2011/11/30			100	80 - 120	ND, RDL=1	uS/cm	1.2	25		
2697802	Turbidity	2011/11/30					ND, RDL=0.1	NTU	8.2	25	99	80 - 120
2697803	Turbidity	2011/11/30					ND, RDL=0.1	NTU	2.9	25	98	80 - 120
2697810	pH	2011/11/30							0.7	25	102	80 - 120
2697812	Conductivity	2011/11/30			100	80 - 120	ND, RDL=1	uS/cm	2.0	25		
2697858	Total Suspended Solids	2011/12/02					ND, RDL=1	mg/L	3.1	25	98	80 - 120
2698113	Nitrogen (Ammonia Nitrogen)	2011/12/01	90	80 - 120	97	80 - 120	ND, RDL=0.05	mg/L	NC	25	105	80 - 120
2699173	Total Alkalinity (Total as CaCO3)	2011/12/02	104	80 - 120	111	80 - 120	ND, RDL=5	mg/L	NC	25	108	80 - 120
2699179	Dissolved Chloride (Cl)	2011/12/02	98	80 - 120	99	80 - 120	ND, RDL=1	mg/L	NC	25	99	80 - 120
2699180	Dissolved Sulphate (SO4)	2011/12/05	116	80 - 120	106	80 - 120	ND, RDL=2	mg/L	NC	25	107	80 - 120
2699181	Reactive Silica (SiO2)	2011/12/02	96	80 - 120	98	80 - 120	ND, RDL=0.5	mg/L	NC	25	92	75 - 125
2699182	Colour	2011/12/05					ND, RDL=5	TCU	NC	25	108	80 - 120
2699183	Orthophosphate (P)	2011/12/05	93	80 - 120	103	80 - 120	ND, RDL=0.01	mg/L	NC	25	104	80 - 120
2699184	Nitrate + Nitrite	2011/12/05	95	80 - 120	99	80 - 120	ND, RDL=0.05	mg/L	NC	25	99	80 - 120
2699185	Nitrite (N)	2011/12/05	83	80 - 120	100	80 - 120	ND, RDL=0.01	mg/L	NC	25	104	80 - 120
2699188	Total Aluminum (Al)	2011/12/01	100	80 - 120	100	80 - 120	ND, RDL=5.0	ug/L	0.7	25		
2699188	Total Antimony (Sb)	2011/12/01	101	80 - 120	107	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2699188	Total Arsenic (As)	2011/12/01	97	80 - 120	102	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2699188	Total Barium (Ba)	2011/12/01	94	80 - 120	100	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2699188	Total Beryllium (Be)	2011/12/01	101	80 - 120	100	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2699188	Total Bismuth (Bi)	2011/12/01	98	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2699188	Total Boron (B)	2011/12/01	101	80 - 120	101	80 - 120	ND, RDL=50	ug/L	NC	25		
2699188	Total Cadmium (Cd)	2011/12/01	101	80 - 120	102	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2699188	Total Calcium (Ca)	2011/12/01	95	80 - 120	99	80 - 120	ND, RDL=100	ug/L	2.1	25		
2699188	Total Chromium (Cr)	2011/12/01	94	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2699188	Total Cobalt (Co)	2011/12/01	95	80 - 120	100	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2699188	Total Copper (Cu)	2011/12/01	95	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2699188	Total Iron (Fe)	2011/12/01	100	80 - 120	105	80 - 120	ND, RDL=50	ug/L	NC	25		
2699188	Total Lead (Pb)	2011/12/01	93	80 - 120	97	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2699188	Total Magnesium (Mg)	2011/12/01	99	80 - 120	103	80 - 120	ND, RDL=100	ug/L	1.6	25		
2699188	Total Manganese (Mn)	2011/12/01	93	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	4.4	25		
2699188	Total Molybdenum (Mo)	2011/12/01	94	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2699188	Total Nickel (Ni)	2011/12/01	94	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2699188	Total Phosphorus (P)	2011/12/01	100	80 - 120	104	80 - 120	ND, RDL=100	ug/L	NC	25		
2699188	Total Potassium (K)	2011/12/01	95	80 - 120	100	80 - 120	ND, RDL=100	ug/L	NC	25		
2699188	Total Selenium (Se)	2011/12/01	97	80 - 120	102	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2699188	Total Silver (Ag)	2011/12/01	95	80 - 120	102	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2699188	Total Sodium (Na)	2011/12/01	94	80 - 120	97	80 - 120	ND, RDL=100	ug/L	0.6	25		

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Maxxam Job #: B1I7421
Report Date: 2011/12/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2699188	Total Strontium (Sr)	2011/12/01	93	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2699188	Total Thallium (Tl)	2011/12/01	97	80 - 120	102	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2699188	Total Tin (Sn)	2011/12/01	94	80 - 120	104	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2699188	Total Titanium (Ti)	2011/12/01	99	80 - 120	104	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2699188	Total Uranium (U)	2011/12/01	105	80 - 120	109	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2699188	Total Vanadium (V)	2011/12/01	96	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2699188	Total Zinc (Zn)	2011/12/01	98	80 - 120	102	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2699195	Total Alkalinity (Total as CaCO3)	2011/12/05	115	80 - 120	109	80 - 120	ND, RDL=5	mg/L	NC	25	104	80 - 120
2699204	Dissolved Chloride (Cl)	2011/12/02	NC	80 - 120	95	80 - 120	ND, RDL=1	mg/L	1.4	25	98	80 - 120
2699205	Dissolved Sulphate (SO4)	2011/12/05	102	80 - 120	104	80 - 120	ND, RDL=2	mg/L	NC	25	106	80 - 120
2699206	Reactive Silica (SiO2)	2011/12/02	NC	80 - 120	99	80 - 120	ND, RDL=0.5	mg/L	0.8	25	92	75 - 125
2699207	Total Mercury (Hg)	2011/12/01	98	80 - 120	104	80 - 120	ND, RDL=0.013	ug/L	NC	25	102	80 - 120
2699209	Colour	2011/12/05					ND, RDL=5	TCU	NC	25	110	80 - 120
2699210	Orthophosphate (P)	2011/12/05	97	80 - 120	103	80 - 120	ND, RDL=0.01	mg/L	NC	25	100	80 - 120
2699211	Nitrate + Nitrite	2011/12/05	100	80 - 120	99	80 - 120	ND, RDL=0.05	mg/L	3.4	25	100	80 - 120
2699212	Nitrite (N)	2011/12/05	98	80 - 120	97	80 - 120	ND, RDL=0.01	mg/L	NC	25	97	80 - 120
2699255	Total Aluminum (Al)	2011/12/01	103	80 - 120	103	80 - 120	9.4, RDL=5.0	ug/L				
2699255	Total Antimony (Sb)	2011/12/01	108	80 - 120	106	80 - 120	ND, RDL=1.0	ug/L				
2699255	Total Arsenic (As)	2011/12/01	100	80 - 120	100	80 - 120	ND, RDL=1.0	ug/L				
2699255	Total Barium (Ba)	2011/12/01	97	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L				
2699255	Total Beryllium (Be)	2011/12/01	101	80 - 120	101	80 - 120	ND, RDL=1.0	ug/L				
2699255	Total Bismuth (Bi)	2011/12/01	97	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L				
2699255	Total Boron (B)	2011/12/01	101	80 - 120	101	80 - 120	ND, RDL=50	ug/L				
2699255	Total Cadmium (Cd)	2011/12/01	99	80 - 120	98	80 - 120	ND, RDL=0.017	ug/L				
2699255	Total Calcium (Ca)	2011/12/01	NC	80 - 120	100	80 - 120	ND, RDL=100	ug/L				
2699255	Total Chromium (Cr)	2011/12/01	96	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L				
2699255	Total Cobalt (Co)	2011/12/01	97	80 - 120	97	80 - 120	ND, RDL=0.40	ug/L				
2699255	Total Copper (Cu)	2011/12/01	NC	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L				
2699255	Total Iron (Fe)	2011/12/01	101	80 - 120	102	80 - 120	ND, RDL=50	ug/L	NC	25		
2699255	Total Lead (Pb)	2011/12/01	97	80 - 120	98	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2699255	Total Magnesium (Mg)	2011/12/01	NC	80 - 120	102	80 - 120	ND, RDL=100	ug/L				
2699255	Total Manganese (Mn)	2011/12/01	95	80 - 120	95	80 - 120	ND, RDL=2.0	ug/L				
2699255	Total Molybdenum (Mo)	2011/12/01	102	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L				
2699255	Total Nickel (Ni)	2011/12/01	NC	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L				
2699255	Total Phosphorus (P)	2011/12/01	104	80 - 120	103	80 - 120	ND, RDL=100	ug/L				
2699255	Total Potassium (K)	2011/12/01	98	80 - 120	99	80 - 120	ND, RDL=100	ug/L				
2699255	Total Selenium (Se)	2011/12/01	101	80 - 120	102	80 - 120	ND, RDL=1.0	ug/L				
2699255	Total Silver (Ag)	2011/12/01	99	80 - 120	101	80 - 120	ND, RDL=0.10	ug/L				
2699255	Total Sodium (Na)	2011/12/01	NC	80 - 120	98	80 - 120	ND, RDL=100	ug/L				
2699255	Total Strontium (Sr)	2011/12/01	NC	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L				

Maxxam Job #: B1I7421
Report Date: 2011/12/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2699255	Total Thallium (Tl)	2011/12/01	101	80 - 120	101	80 - 120	ND, RDL=0.10	ug/L				
2699255	Total Tin (Sn)	2011/12/01	103	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L				
2699255	Total Titanium (Ti)	2011/12/01	103	80 - 120	105	80 - 120	ND, RDL=2.0	ug/L				
2699255	Total Uranium (U)	2011/12/01	110	80 - 120	108	80 - 120	ND, RDL=0.10	ug/L				
2699255	Total Vanadium (V)	2011/12/01	101	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L				
2699255	Total Zinc (Zn)	2011/12/01	NC	80 - 120	99	80 - 120	ND, RDL=5.0	ug/L				
2699620	Nitrogen (Ammonia Nitrogen)	2011/12/01	93	80 - 120	96	80 - 120	ND, RDL=0.05	mg/L	NC	25	102	80 - 120
2700521	Total Mercury (Hg)	2011/12/02	118	80 - 120	90	80 - 120	ND, RDL=0.013	ug/L	NC	25	100	80 - 120
2701122	Total Organic Carbon (C)	2011/12/02	95	80 - 120	98	80 - 120	ND, RDL=0.5	mg/L	NC	25	97	N/A
2701130	Total Organic Carbon (C)	2011/12/02	NC	80 - 120	99	80 - 120	ND, RDL=0.5	mg/L	1.9	25	99	80 - 120

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Validation Signature Page

Maxxam Job #: B1I7421

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

COLLEEN ACKER

KEVIN MACDONALD, Inorganics Supervisor

==========

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Round 9

Your Project #: 121510621.100
Site Location: VALENTINE LAKE
Your C.O.C. #: ES268611

Attention: Barry Wicks
Stantec Consulting Ltd
St. John's - Standing Offer
607 Torbay Rd
St. John's, NL
A1A 4Y6

Report Date: 2012/02/06

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B213437
Received: 2012/01/30, 8:15

Sample Matrix: Water
Samples Received: 18

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonate, Bicarbonate and Hydroxide	18	N/A	2012/01/31	CAM SOP-00102	APHA 4500-CO2 D
Alkalinity	18	N/A	2012/02/01	ATL SOP 00013	Based on EPA310.2
Chloride	18	N/A	2012/02/02	ATL SOP 00014	Based on SM4500-Cl-
Colour	18	N/A	2012/02/01	ATL SOP 00020	Based on SM2120C
Conductance - water	18	N/A	2012/01/31	ATL SOP 00004/00006	Based on SM2510B
Hardness (calculated as CaCO3)	18	N/A	2012/02/01	ATL SOP 00048	Based on SM2340B
Mercury - Total (CVAA,LL)	7	2012/01/30	2012/01/31	ATL SOP 00026	Based on EPA245.1
Mercury - Total (CVAA,LL)	11	2012/02/01	2012/02/02	ATL SOP 00026	Based on EPA245.1
Metals Water Total MS	18	2012/01/31	2012/01/31	ATL SOP 00059	Based on EPA6020A
Ion Balance (% Difference)	18	N/A	2012/02/03		
Anion and Cation Sum	18	N/A	2012/02/02		
Nitrogen Ammonia - water	16	N/A	2012/02/01	ATL SOP 00015	Based on USEPA 350.1
Nitrogen Ammonia - water	2	N/A	2012/02/02	ATL SOP 00015	Based on USEPA 350.1
Nitrogen - Nitrate + Nitrite	18	N/A	2012/02/03	ATL SOP 00016	Based on USGS - Enz.
Nitrogen - Nitrite	18	N/A	2012/02/01	ATL SOP 00017	Based on SM4500-NO2B
Nitrogen - Nitrate (as N)	18	N/A	2012/02/03	ATL SOP 00018	Based on ASTMD3867
pH	18	N/A	2012/01/31	ATL SOP 00003	Based on SM4500H+B
Phosphorus - ortho	18	N/A	2012/02/02	ATL SOP 00021	Based on USEPA 365.1
Sat. pH and Langelier Index (@ 20C)	18	N/A	2012/02/03		
Sat. pH and Langelier Index (@ 4C)	18	N/A	2012/02/03		
Reactive Silica	18	N/A	2012/02/01	ATL SOP 00022	Based on EPA 366.0
Sulphate	18	N/A	2012/02/03	ATL SOP 00023	Based on EPA 375.4
Total Dissolved Solids (TDS calc)	18	N/A	2012/02/03		
Organic carbon - Total (TOC)	9	N/A	2012/02/02	ATL SOP 00037	Based on SM5310C
Organic carbon - Total (TOC)	9	N/A	2012/02/03	ATL SOP 00037	Based on SM5310C
Total Suspended Solids	1	N/A	2012/01/30	ATL SOP 00007	based on EPA 160.2
Total Suspended Solids	17	N/A	2012/01/31	ATL SOP 00007	based on EPA 160.2
Turbidity	18	N/A	2012/01/31	ATL SOP 00011	based on EPA 180.1

Remarks:

Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

../2

Maxxam Job #: B213437
Report Date: 2012/02/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Sampler Initials: SM

Encryption Key

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

MICHELLE HILL, Project Manager
Email: MHill@maxxam.ca
Phone# (902) 420-0203

==========

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Total cover pages: 2

Maxxam Job #: B213437
Report Date: 2012/02/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		MJ4965		MJ4966		MJ4967	MJ4967			MJ4968		
Sampling Date		2012/01/17		2012/01/17		2012/01/17	2012/01/17			2012/01/17		
	Units	**LP-01**	**RDL**	**LP-02**	**QC Batch**	**LP-03**	**LP-03 Lab-Dup**	**RDL**	**QC Batch**	**LP-04**	**RDL**	**QC Batch**
Calculated Parameters												
Anion Sum	me/L	0.680	N/A	0.620	2749752	0.450		N/A	2749752	0.500	N/A	2749752
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	26.6	1.0	24.5	2749748	16.6		1.0	2749748	19.3	1.0	2749748
Calculated TDS	mg/L	40.0	1.0	35.0	2749756	27.0		1.0	2749756	30.0	1.0	2749756
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	ND	2749748	ND		1.0	2749748	ND	1.0	2749748
Cation Sum	me/L	0.760	N/A	0.640	2749752	0.470		N/A	2749752	0.550	N/A	2749752
Hardness (CaCO3)	mg/L	28	1.0	24	2749750	18		1.0	2749750	22	1.0	2749750
Ion Balance (% Difference)	%	5.56	N/A	1.59	2749751	2.17		N/A	2749751	4.76	N/A	2749751
Langelier Index (@ 20C)	N/A	-1.75		-1.92	2749754	-2.18			2749754	-2.22		2749754
Langelier Index (@ 4C)	N/A	-2.00		-2.17	2749755	-2.43			2749755	-2.48		2749755
Nitrate (N)	mg/L	0.11	0.050	0.080	2749753	0.12		0.050	2749753	0.17	0.050	2749753
Saturation pH (@ 20C)	N/A	8.92		9.02	2749754	9.31			2749754	9.16		2749754
Saturation pH (@ 4C)	N/A	9.17		9.27	2749755	9.56			2749755	9.42		2749755
Inorganics												
Total Alkalinity (Total as CaCO3)	mg/L	27	5.0	25	2752088	17	17	5.0	2752088	19	5.0	2752112
Dissolved Chloride (Cl)	mg/L	4.7	1.0	4.5	2752092	3.7	3.7	1.0	2752092	3.7	1.0	2752117
Colour	TCU	51	25	47	2752103	30	30	5.0	2752103	79	25	2752125
Nitrate + Nitrite	mg/L	0.11	0.050	0.080	2752108	0.12	0.12	0.050	2752108	0.17	0.050	2752127
Nitrite (N)	mg/L	ND	0.010	ND	2752110	ND	ND	0.010	2752110	ND	0.010	2752128
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.050	ND	2752058	ND		0.050	2752058	ND	0.050	2752058
Total Organic Carbon (C)	mg/L	9.0	0.50	8.5	2754020	5.4		0.50	2754020	9.8	0.50	2754020
Orthophosphate (P)	mg/L	0.055	0.010	ND	2752105	ND	ND	0.010	2752105	ND	0.010	2752126
pH	pH	7.17	N/A	7.10	2750697	7.13		N/A	2750697	6.94	N/A	2750697
Reactive Silica (SiO2)	mg/L	2.4	0.50	2.2	2752099	3.1	3.2	0.50	2752099	2.8	0.50	2752123
Total Suspended Solids	mg/L	2.4	1.0	ND	2750423	ND		1.0	2750423	4.0	1.0	2750423
Dissolved Sulphate (SO4)	mg/L	ND	2.0	ND	2752094	ND	ND	2.0	2752094	ND	2.0	2752122
Turbidity	NTU	3.5	0.10	2.8	2751123	0.76	0.74	0.10	2751127	0.95	0.10	2751127
Conductivity	uS/cm	72	1.0	63	2750698	46		1.0	2750698	54	1.0	2750698

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B213437
Report Date: 2012/02/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		MJ4969		MJ4970	MJ4971	MJ4972	MJ4972		
Sampling Date		2012/01/17		2012/01/22	2012/01/22	2012/01/22	2012/01/22		
	Units	**LP-05**	**RDL**	**VL-01**	**RO-01**	**RO-02**	**RO-02 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters									
Anion Sum	me/L	0.500	N/A	0.360	0.380	0.450		N/A	2749752
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	20.2	1.0	13.0	14.6	17.0		1.0	2749748
Calculated TDS	mg/L	29.0	1.0	23.0	23.0	27.0		1.0	2749756
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	ND	ND	ND		1.0	2749748
Cation Sum	me/L	0.520	N/A	0.370	0.360	0.430		N/A	2749752
Hardness (CaCO3)	mg/L	21	1.0	14	14	18		1.0	2749750
Ion Balance (% Difference)	%	1.96	N/A	1.37	2.70	2.27		N/A	2749751
Langelier Index (@ 20C)	N/A	-2.14		-2.67	-2.37	-2.05			2749754
Langelier Index (@ 4C)	N/A	-2.39		-2.92	-2.62	-2.30			2749755
Nitrate (N)	mg/L	0.11	0.050	0.11	0.099	0.32		0.050	2749753
Saturation pH (@ 20C)	N/A	9.15		9.52	9.46	9.29			2749754
Saturation pH (@ 4C)	N/A	9.40		9.77	9.71	9.54			2749755
Inorganics									
Total Alkalinity (Total as CaCO3)	mg/L	20	5.0	13	15	17		5.0	2752112
Dissolved Chloride (Cl)	mg/L	3.3	1.0	3.3	2.9	3.0		1.0	2752117
Colour	TCU	61	25	30	17	40		5.0	2752125
Nitrate + Nitrite	mg/L	0.11	0.050	0.11	0.099	0.32		0.050	2752127
Nitrite (N)	mg/L	ND	0.010	ND	ND	ND		0.010	2752128
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.050	ND	ND	ND	0.077	0.050	2752058
Total Organic Carbon (C)	mg/L	8.8	0.50	6.0	3.4	4.6		0.50	2754020
Orthophosphate (P)	mg/L	ND	0.010	ND	ND	ND		0.010	2752126
pH	pH	7.01	N/A	6.85	7.09	7.24	7.25	N/A	2750697
Reactive Silica (SiO2)	mg/L	2.8	0.50	4.3	4.3	4.0		0.50	2752123
Total Suspended Solids	mg/L	1.8	1.0	ND	ND	ND		1.0	2750423
Dissolved Sulphate (SO4)	mg/L	ND	2.0	ND	ND	ND		2.0	2752122
Turbidity	NTU	0.74	0.10	0.72	0.29	0.39		0.10	2751127
Conductivity	uS/cm	53	1.0	38	37	44	44	1.0	2750698

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Maxxam Job #: B213437
Report Date: 2012/02/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		MJ4973		MJ4974	MJ4974	MJ4975	MJ4976	MJ4977		
Sampling Date		2012/01/22		2012/01/22	2012/01/22	2012/01/22	2012/01/22	2012/01/22		
	Units	**RO-03**	**QC Batch**	**RO-05**	**RO-05 Lab-Dup**	**VE-01**	**VE-02**	**VE-03**	**RDL**	**QC Batch**
Calculated Parameters										
Anion Sum	me/L	0.500	2749752	0.260		0.350	0.360	0.330	N/A	2749752
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	20.7	2749748	10.0		12.7	13.4	11.4	1.0	2749748
Calculated TDS	mg/L	32.0	2749756	14.0		23.0	22.0	21.0	1.0	2749756
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	2749748	ND		ND	ND	ND	1.0	2749748
Cation Sum	me/L	0.530	2749752	0.250		0.380	0.350	0.350	N/A	2749752
Hardness (CaCO3)	mg/L	21	2749750	9.0		14	13	13	1.0	2749750
Ion Balance (% Difference)	%	2.91	2749751	1.96		4.11	1.41	2.94	N/A	2749751
Langelier Index (@ 20C)	N/A	-1.94	2749754	-2.80		-2.51	-2.53	-2.62		2749754
Langelier Index (@ 4C)	N/A	-2.19	2749755	-3.06		-2.76	-2.78	-2.87		2749755
Nitrate (N)	mg/L	0.13	2749753	0.070		0.14	0.14	0.19	0.050	2749753
Saturation pH (@ 20C)	N/A	9.12	2749754	9.80		9.52	9.54	9.63		2749754
Saturation pH (@ 4C)	N/A	9.37	2749755	10.1		9.77	9.79	9.88		2749755
Inorganics										
Total Alkalinity (Total as CaCO3)	mg/L	21	2752112	10		13	13	11	5.0	2752112
Dissolved Chloride (Cl)	mg/L	2.7	2752117	1.9		2.9	2.9	3.2	1.0	2752117
Colour	TCU	23	2752125	8.7		32	32	34	5.0	2752125
Nitrate + Nitrite	mg/L	0.13	2752127	0.070		0.14	0.14	0.19	0.050	2752127
Nitrite (N)	mg/L	ND	2752128	ND		ND	ND	ND	0.010	2752128
Nitrogen (Ammonia Nitrogen)	mg/L	0.063	2752090	0.14		ND	ND	ND	0.050	2752090
Total Organic Carbon (C)	mg/L	3.4	2754020	2.8	2.8	5.6	6.3	6.6	0.50	2755195
Orthophosphate (P)	mg/L	ND	2752126	ND		ND	ND	ND	0.010	2752126
pH	pH	7.18	2750699	7.00		7.01	7.01	7.01	N/A	2750699
Reactive Silica (SiO2)	mg/L	5.1	2752123	0.80		4.2	3.7	3.4	0.50	2752123
Total Suspended Solids	mg/L	2.8	2750423	1.4		5.2	1.0	ND	1.0	2750423
Dissolved Sulphate (SO4)	mg/L	ND	2752122	ND		ND	ND	ND	2.0	2752122
Turbidity	NTU	0.44	2751127	0.35		0.97	0.20	0.27	0.10	2751127
Conductivity	uS/cm	50	2750701	26		38	35	34	1.0	2750701

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Maxxam Job #: B213437
Report Date: 2012/02/06

Stantec Consulting Ltd
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Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		MJ4978		MJ4979	MJ4980	MJ4981	MJ4982	MJ4982		
Sampling Date		2012/01/22		2012/01/22	2012/01/22	2012/01/22	2012/01/22	2012/01/22		
	Units	**VE-04**	**RDL**	**VE-05**	**VE-06**	**VE-07**	**VE-10**	**VE-10 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters										
Anion Sum	me/L	0.330	N/A	0.360	0.640	0.600	0.370		N/A	2749752
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	11.5	1.0	12.4	27.8	25.5	13.6		1.0	2749748
Calculated TDS	mg/L	21.0	1.0	24.0	40.0	39.0	24.0		1.0	2749756
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	ND	ND	ND	ND		1.0	2749748
Cation Sum	me/L	0.350	N/A	0.360	0.660	0.640	0.350		N/A	2749752
Hardness (CaCO3)	mg/L	13	1.0	13	28	26	13		1.0	2749750
Ion Balance (% Difference)	%	2.94	N/A	0.00	1.54	3.23	2.78		N/A	2749751
Langelier Index (@ 20C)	N/A	-2.61		-2.65	-1.73	-1.82	-2.86			2749754
Langelier Index (@ 4C)	N/A	-2.87		-2.90	-1.98	-2.07	-3.11			2749755
Nitrate (N)	mg/L	0.11	0.050	0.34	0.17	0.21	0.22		0.050	2749753
Saturation pH (@ 20C)	N/A	9.59		9.60	8.89	8.96	9.58			2749754
Saturation pH (@ 4C)	N/A	9.85		9.85	9.14	9.21	9.83			2749755
Inorganics										
Total Alkalinity (Total as CaCO3)	mg/L	11	5.0	12	28	26	14		5.0	2752112
Dissolved Chloride (Cl)	mg/L	3.4	1.0	2.9	2.5	2.7	3.1		1.0	2752117
Colour	TCU	58	25	14	28	20	21		5.0	2752125
Nitrate + Nitrite	mg/L	0.11	0.050	0.34	0.17	0.21	0.22		0.050	2752127
Nitrite (N)	mg/L	ND	0.010	ND	ND	ND	ND		0.010	2752128
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.050	ND	ND	ND	ND		0.050	2752090
Total Organic Carbon (C)	mg/L	8.6	0.50	4.3	4.1	4.6	4.9		0.50	2755195
Orthophosphate (P)	mg/L	ND	0.010	ND	ND	ND	ND		0.010	2752126
pH	pH	6.98	N/A	6.95	7.16	7.14	6.72	6.75	N/A	2750699
Reactive Silica (SiO2)	mg/L	3.0	0.50	4.9	6.6	6.4	5.1		0.50	2752123
Total Suspended Solids	mg/L	1.2	1.0	9.8	1.8	17	1.0		1.0	2750423
Dissolved Sulphate (SO4)	mg/L	ND	2.0	ND	ND	ND	ND		2.0	2752122
Turbidity	NTU	0.43	0.10	0.73	0.40	4.6	0.20		0.10	2751127
Conductivity	uS/cm	35	1.0	36	69	66	36	36	1.0	2750701

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Maxxam Job #: B213437
Report Date: 2012/02/06

Stantec Consulting Ltd
Client Project #: 121510621.100
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MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		MJ4965	MJ4966	MJ4967	MJ4968	MJ4969	MJ4970	MJ4971		MJ4972	MJ4972		
Sampling Date		2012/01/17	2012/01/17	2012/01/17	2012/01/17	2012/01/17	2012/01/22	2012/01/22		2012/01/22	2012/01/22		
	Units	**LP-01**	**LP-02**	**LP-03**	**LP-04**	**LP-05**	**VL-01**	**RO-01**	**QC Batch**	**RO-02**	**RO-02 Lab-Dup**	**RDL**	**QC Batch**
Metals													
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	ND	2750762	ND	ND	0.013	2753292

Maxxam ID		MJ4973	MJ4974	MJ4975	MJ4976	MJ4977	MJ4978	MJ4979	MJ4980	MJ4981	MJ4982		
Sampling Date		2012/01/22	2012/01/22	2012/01/22	2012/01/22	2012/01/22	2012/01/22	2012/01/22	2012/01/22	2012/01/22	2012/01/22		
	Units	**RO-03**	**RO-05**	**VE-01**	**VE-02**	**VE-03**	**VE-04**	**VE-05**	**VE-06**	**VE-07**	**VE-10**	**RDL**	**QC Batch**
Metals													
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.013	2753292

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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		MJ4965	MJ4966	MJ4967	MJ4968	MJ4969	MJ4970	MJ4971	MJ4972	MJ4973	MJ4974		
Sampling Date		2012/01/17	2012/01/17	2012/01/17	2012/01/17	2012/01/17	2012/01/22	2012/01/22	2012/01/22	2012/01/22	2012/01/22		
	Units	**LP-01**	**LP-02**	**LP-03**	**LP-04**	**LP-05**	**VL-01**	**RO-01**	**RO-02**	**RO-03**	**RO-05**	**RDL**	**QC Batch**
Metals													
Total Aluminum (Al)	ug/L	533	209	72.8	170	134	67.6	24.4	36.3	109	14.1	5.0	2751559
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2751559
Total Arsenic (As)	ug/L	1.4	ND	1.4	ND	ND	1.4	2.7	2.8	4.3	ND	1.0	2751559
Total Barium (Ba)	ug/L	8.0	5.4	1.9	2.8	2.5	2.4	1.1	ND	3.6	4.8	1.0	2751559
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2751559
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2751559
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	50	2751559
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.017	2751559
Total Calcium (Ca)	ug/L	8990	7710	5720	6950	6840	4470	4610	5870	7150	2930	100	2751559
Total Chromium (Cr)	ug/L	ND	ND	ND	ND	1.1	ND	ND	ND	ND	ND	1.0	2751559
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	0.45	ND	0.40	2751559
Total Copper (Cu)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2751559
Total Iron (Fe)	ug/L	718	333	165	275	190	90	152	206	521	ND	50	2751559
Total Lead (Pb)	ug/L	0.52	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.50	2751559
Total Magnesium (Mg)	ug/L	1300	1110	861	1150	1010	674	617	699	841	397	100	2751559
Total Manganese (Mn)	ug/L	187	72.7	34.1	118	55.0	47.9	57.8	20.9	576	7.7	2.0	2751559
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2751559
Total Nickel (Ni)	ug/L	3.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2751559
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100	2751559
Total Potassium (K)	ug/L	1130	867	316	230	171	116	ND	ND	ND	115	100	2751559
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2751559
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2751559
Total Sodium (Na)	ug/L	3430	3020	2200	2210	1930	1870	1600	1630	1750	1320	100	2751559
Total Strontium (Sr)	ug/L	53.3	47.8	21.6	12.5	15.4	10.2	9.8	10.4	11.8	7.0	2.0	2751559
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2751559
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2751559
Total Titanium (Ti)	ug/L	29.5	13.9	3.9	3.1	2.6	ND	ND	ND	3.0	ND	2.0	2751559
Total Uranium (U)	ug/L	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2751559
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2751559
Total Zinc (Zn)	ug/L	6.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	2751559

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Site Location: VALENTINE LAKE
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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		MJ4975	MJ4976		MJ4977	MJ4978	MJ4979	MJ4980	MJ4981	MJ4982		
Sampling Date		2012/01/22	2012/01/22		2012/01/22	2012/01/22	2012/01/22	2012/01/22	2012/01/22	2012/01/22		
	Units	**VE-01**	**VE-02**	**QC Batch**	**VE-03**	**VE-04**	**VE-05**	**VE-06**	**VE-07**	**VE-10**	**RDL**	**QC Batch**
Metals												
Total Aluminum (Al)	ug/L	133	51.0	2751559	61.3	80.7	102	54.6	217	53.7	5.0	2751563
Total Antimony (Sb)	ug/L	ND	ND	2751559	ND	ND	ND	ND	ND	ND	1.0	2751563
Total Arsenic (As)	ug/L	ND	ND	2751559	ND	ND	1.1	ND	ND	ND	1.0	2751563
Total Barium (Ba)	ug/L	2.1	1.2	2751559	1.3	1.5	3.2	1.8	4.8	2.1	1.0	2751563
Total Beryllium (Be)	ug/L	ND	ND	2751559	ND	ND	ND	ND	ND	ND	1.0	2751563
Total Bismuth (Bi)	ug/L	ND	ND	2751559	ND	ND	ND	ND	ND	ND	2.0	2751563
Total Boron (B)	ug/L	ND	ND	2751559	ND	ND	ND	ND	ND	ND	50	2751563
Total Cadmium (Cd)	ug/L	ND	ND	2751559	ND	ND	ND	ND	0.031	ND	0.017	2751563
Total Calcium (Ca)	ug/L	4550	4130	2751559	3950	4240	3950	9370	8610	3740	100	2751563
Total Chromium (Cr)	ug/L	ND	ND	2751559	1.0	ND	ND	2.4	ND	ND	1.0	2751563
Total Cobalt (Co)	ug/L	ND	ND	2751559	ND	ND	ND	ND	0.51	ND	0.40	2751563
Total Copper (Cu)	ug/L	ND	ND	2751559	ND	ND	ND	ND	ND	ND	2.0	2751563
Total Iron (Fe)	ug/L	419	116	2751559	126	201	747	164	814	141	50	2751563
Total Lead (Pb)	ug/L	ND	ND	2751559	ND	ND	ND	ND	ND	ND	0.50	2751563
Total Magnesium (Mg)	ug/L	719	667	2751559	644	598	788	1210	1190	953	100	2751563
Total Manganese (Mn)	ug/L	143	24.8	2751559	33.3	50.7	347	550	1100	65.0	2.0	2751563
Total Molybdenum (Mo)	ug/L	ND	ND	2751559	ND	ND	ND	ND	ND	ND	2.0	2751563
Total Nickel (Ni)	ug/L	ND	ND	2751559	ND	ND	ND	ND	ND	ND	2.0	2751563
Total Phosphorus (P)	ug/L	ND	ND	2751559	ND	ND	ND	ND	ND	ND	100	2751563
Total Potassium (K)	ug/L	117	128	2751559	130	140	ND	195	194	ND	100	2751563
Total Selenium (Se)	ug/L	ND	ND	2751559	ND	ND	ND	ND	ND	ND	1.0	2751563
Total Silver (Ag)	ug/L	ND	ND	2751559	ND	ND	ND	ND	ND	ND	0.10	2751563
Total Sodium (Na)	ug/L	1760	1870	2751559	2030	1850	1710	1780	1780	1800	100	2751563
Total Strontium (Sr)	ug/L	10.6	10.6	2751559	10.4	12.9	8.8	19.6	19.3	8.4	2.0	2751563
Total Thallium (Tl)	ug/L	ND	ND	2751559	ND	ND	ND	ND	ND	ND	0.10	2751563
Total Tin (Sn)	ug/L	ND	ND	2751559	ND	ND	ND	ND	ND	ND	2.0	2751563
Total Titanium (Ti)	ug/L	4.3	ND	2751559	ND	ND	2.5	2.6	9.0	ND	2.0	2751563
Total Uranium (U)	ug/L	ND	ND	2751559	ND	ND	ND	ND	ND	ND	0.10	2751563
Total Vanadium (V)	ug/L	ND	ND	2751559	ND	ND	ND	ND	ND	ND	2.0	2751563
Total Zinc (Zn)	ug/L	ND	ND	2751559	ND	ND	ND	ND	5.6	ND	5.0	2751563

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Site Location: VALENTINE LAKE
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Package 1	1.8°C

Each temperature is the average of up to three cooler temperatures taken at receipt

GENERAL COMMENTS

TSS samples received past recommended 7 day holding time.

Sample MJ4965-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

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Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2750423	Total Suspended Solids	2012/01/31					ND, RDL=1.0	mg/L	3.5	25	96	80 - 120
2750697	pH	2012/01/31							0.1	25	100	80 - 120
2750698	Conductivity	2012/01/31			99	80 - 120	1.4, RDL=1.0	uS/cm	0	25		
2750699	pH	2012/01/31							0.4	25	100	80 - 120
2750701	Conductivity	2012/01/31			99	80 - 120	ND, RDL=1.0	uS/cm	0.3	25		
2750762	Total Mercury (Hg)	2012/01/31	103	80 - 120	110	80 - 120	ND, RDL=0.013	ug/L	NC	25	110	80 - 120
2751123	Turbidity	2012/01/31					ND, RDL=0.10	NTU	NC	25	102	80 - 120
2751127	Turbidity	2012/01/31					ND, RDL=0.10	NTU	2.7	25	101	80 - 120
2751559	Total Aluminum (Al)	2012/01/31	106	80 - 120	98	80 - 120	6.2, RDL=5.0	ug/L	NC	25		
2751559	Total Antimony (Sb)	2012/01/31	114	80 - 120	112	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2751559	Total Arsenic (As)	2012/01/31	96	80 - 120	95	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2751559	Total Barium (Ba)	2012/01/31	91	80 - 120	91	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2751559	Total Beryllium (Be)	2012/01/31	95	80 - 120	93	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2751559	Total Bismuth (Bi)	2012/01/31	98	80 - 120	95	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2751559	Total Boron (B)	2012/01/31	97	80 - 120	98	80 - 120	ND, RDL=50	ug/L	NC	25		
2751559	Total Cadmium (Cd)	2012/01/31	93	80 - 120	90	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2751559	Total Calcium (Ca)	2012/01/31	97	80 - 120	94	80 - 120	ND, RDL=100	ug/L	NC	25		
2751559	Total Chromium (Cr)	2012/01/31	93	80 - 120	92	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2751559	Total Cobalt (Co)	2012/01/31	94	80 - 120	92	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2751559	Total Copper (Cu)	2012/01/31	NC	80 - 120	86	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2751559	Total Iron (Fe)	2012/01/31	98	80 - 120	97	80 - 120	ND, RDL=50	ug/L	NC	25		
2751559	Total Lead (Pb)	2012/01/31	91	80 - 120	89	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2751559	Total Magnesium (Mg)	2012/01/31	96	80 - 120	96	80 - 120	ND, RDL=100	ug/L	NC	25		
2751559	Total Manganese (Mn)	2012/01/31	91	80 - 120	90	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2751559	Total Molybdenum (Mo)	2012/01/31	98	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2751559	Total Nickel (Ni)	2012/01/31	91	80 - 120	91	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2751559	Total Phosphorus (P)	2012/01/31	98	80 - 120	95	80 - 120	ND, RDL=100	ug/L				
2751559	Total Potassium (K)	2012/01/31	95	80 - 120	93	80 - 120	ND, RDL=100	ug/L	NC	25		
2751559	Total Selenium (Se)	2012/01/31	95	80 - 120	93	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2751559	Total Silver (Ag)	2012/01/31	94	80 - 120	93	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2751559	Total Sodium (Na)	2012/01/31	93	80 - 120	92	80 - 120	ND, RDL=100	ug/L	NC	25		
2751559	Total Strontium (Sr)	2012/01/31	93	80 - 120	91	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2751559	Total Thallium (Tl)	2012/01/31	99	80 - 120	97	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2751559	Total Tin (Sn)	2012/01/31	98	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2751559	Total Titanium (Ti)	2012/01/31	99	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2751559	Total Uranium (U)	2012/01/31	102	80 - 120	100	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2751559	Total Vanadium (V)	2012/01/31	94	80 - 120	93	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2751559	Total Zinc (Zn)	2012/01/31	94	80 - 120	93	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2751563	Total Aluminum (Al)	2012/01/31	99	80 - 120	100	80 - 120	ND, RDL=5.0	ug/L				
2751563	Total Antimony (Sb)	2012/01/31	113	80 - 120	113	80 - 120	ND, RDL=1.0	ug/L				

Maxxam Job #: B213437
Report Date: 2012/02/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2751563	Total Arsenic (As)	2012/01/31	94	80 - 120	94	80 - 120	ND, RDL=1.0	ug/L	0.06	25		
2751563	Total Barium (Ba)	2012/01/31	92	80 - 120	92	80 - 120	ND, RDL=1.0	ug/L				
2751563	Total Beryllium (Be)	2012/01/31	94	80 - 120	93	80 - 120	ND, RDL=1.0	ug/L				
2751563	Total Bismuth (Bi)	2012/01/31	95	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L				
2751563	Total Boron (B)	2012/01/31	100	80 - 120	100	80 - 120	ND, RDL=50	ug/L				
2751563	Total Cadmium (Cd)	2012/01/31	91	80 - 120	91	80 - 120	ND, RDL=0.017	ug/L				
2751563	Total Calcium (Ca)	2012/01/31	NC	80 - 120	97	80 - 120	ND, RDL=100	ug/L				
2751563	Total Chromium (Cr)	2012/01/31	91	80 - 120	93	80 - 120	ND, RDL=1.0	ug/L				
2751563	Total Cobalt (Co)	2012/01/31	92	80 - 120	93	80 - 120	ND, RDL=0.40	ug/L				
2751563	Total Copper (Cu)	2012/01/31	84	80 - 120	86	80 - 120	ND, RDL=2.0	ug/L				
2751563	Total Iron (Fe)	2012/01/31	97	80 - 120	99	80 - 120	ND, RDL=50	ug/L				
2751563	Total Lead (Pb)	2012/01/31	90	80 - 120	91	80 - 120	ND, RDL=0.50	ug/L				
2751563	Total Magnesium (Mg)	2012/01/31	94	80 - 120	98	80 - 120	ND, RDL=100	ug/L				
2751563	Total Manganese (Mn)	2012/01/31	90	80 - 120	91	80 - 120	ND, RDL=2.0	ug/L				
2751563	Total Molybdenum (Mo)	2012/01/31	99	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L				
2751563	Total Nickel (Ni)	2012/01/31	89	80 - 120	91	80 - 120	ND, RDL=2.0	ug/L				
2751563	Total Phosphorus (P)	2012/01/31	98	80 - 120	98	80 - 120	ND, RDL=100	ug/L				
2751563	Total Potassium (K)	2012/01/31	94	80 - 120	96	80 - 120	ND, RDL=100	ug/L				
2751563	Total Selenium (Se)	2012/01/31	93	80 - 120	94	80 - 120	ND, RDL=1.0	ug/L				
2751563	Total Silver (Ag)	2012/01/31	93	80 - 120	95	80 - 120	ND, RDL=0.10	ug/L				
2751563	Total Sodium (Na)	2012/01/31	93	80 - 120	94	80 - 120	ND, RDL=100	ug/L				
2751563	Total Strontium (Sr)	2012/01/31	NC	80 - 120	92	80 - 120	ND, RDL=2.0	ug/L				
2751563	Total Thallium (Tl)	2012/01/31	97	80 - 120	98	80 - 120	ND, RDL=0.10	ug/L				
2751563	Total Tin (Sn)	2012/01/31	97	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L				
2751563	Total Titanium (Ti)	2012/01/31	98	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L				
2751563	Total Uranium (U)	2012/01/31	102	80 - 120	102	80 - 120	ND, RDL=0.10	ug/L				
2751563	Total Vanadium (V)	2012/01/31	92	80 - 120	93	80 - 120	ND, RDL=2.0	ug/L				
2751563	Total Zinc (Zn)	2012/01/31	92	80 - 120	93	80 - 120	ND, RDL=5.0	ug/L				
2752058	Nitrogen (Ammonia Nitrogen)	2012/02/01	93	80 - 120	105	80 - 120	ND, RDL=0.050	mg/L	NC	25	97	80 - 120
2752088	Total Alkalinity (Total as CaCO3)	2012/02/01	92	80 - 120	97	80 - 120	ND, RDL=5.0	mg/L	NC	25	100	80 - 120
2752090	Nitrogen (Ammonia Nitrogen)	2012/02/01	90	80 - 120	97	80 - 120	ND, RDL=0.050	mg/L	NC	25	97	80 - 120
2752092	Dissolved Chloride (Cl)	2012/02/02	97	80 - 120	96	80 - 120	ND, RDL=1.0	mg/L	NC	25	99	80 - 120
2752094	Dissolved Sulphate (SO4)	2012/02/03	107	80 - 120	102	80 - 120	ND, RDL=2.0	mg/L	NC	25	110	80 - 120
2752099	Reactive Silica (SiO2)	2012/02/01	97	80 - 120	100	80 - 120	ND, RDL=0.50	mg/L	0.8	25	100	75 - 125
2752103	Colour	2012/02/01					ND, RDL=5.0	TCU	1.5	25	97	80 - 120
2752105	Orthophosphate (P)	2012/02/02	92	80 - 120	100	80 - 120	ND, RDL=0.010	mg/L	NC	25	100	80 - 120
2752108	Nitrate + Nitrite	2012/02/03	99	80 - 120	101	80 - 120	ND, RDL=0.050	mg/L	NC	25	109	80 - 120
2752110	Nitrite (N)	2012/02/01	92	80 - 120	97	80 - 120	ND, RDL=0.010	mg/L	NC	25	102	80 - 120
2752112	Total Alkalinity (Total as CaCO3)	2012/02/01	91	80 - 120	94	80 - 120	ND, RDL=5.0	mg/L	NC	25	100	80 - 120
2752117	Dissolved Chloride (Cl)	2012/02/02	95	80 - 120	96	80 - 120	ND, RDL=1.0	mg/L	NC	25	100	80 - 120

Maxxam Job #: B213437
Report Date: 2012/02/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2752122	Dissolved Sulphate (SO4)	2012/02/03	103	80 - 120	101	80 - 120	ND, RDL=2.0	mg/L	NC	25	111	80 - 120
2752123	Reactive Silica (SiO2)	2012/02/01	98	80 - 120	98	80 - 120	ND, RDL=0.50	mg/L	0.2	25	100	75 - 125
2752125	Colour	2012/02/01					ND, RDL=5.0	TCU	3.6	25	99	80 - 120
2752126	Orthophosphate (P)	2012/02/02	93	80 - 120	100	80 - 120	ND, RDL=0.010	mg/L	NC	25	100	80 - 120
2752127	Nitrate + Nitrite	2012/02/03	99	80 - 120	102	80 - 120	ND, RDL=0.050	mg/L	NC	25	108	80 - 120
2752128	Nitrite (N)	2012/02/01	92	80 - 120	98	80 - 120	ND, RDL=0.010	mg/L	NC	25	98	80 - 120
2753292	Total Mercury (Hg)	2012/02/02	84	80 - 120	96	80 - 120	ND, RDL=0.013	ug/L	NC	25	89	80 - 120
2754020	Total Organic Carbon (C)	2012/02/02	104	80 - 120	99	80 - 120	ND, RDL=0.50	mg/L	NC	25	101	80 - 120
2755195	Total Organic Carbon (C)	2012/02/03	98	80 - 120	100	80 - 120	ND, RDL=0.50	mg/L	0.8	25	99	80 - 120

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Validation Signature Page

Maxxam Job #: B213437

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

COLLEEN ACKER

MIKE MACGILLIVRAY, Scientific Specialist (Inorganics)

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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 International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

Round 10

Your P.O. #: 16300R-40
Your Project #: 121510621.100
Site Location: VALENTINE LAKE
Your C.O.C. #: ES268711

Attention: Barry Wicks
Stantec Consulting Ltd
St. John's - Standing Offer
607 Torbay Rd
St. John's, NL
A1A 4Y6

Report Date: 2012/03/06

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B228623
Received: 2012/02/29, 10:02

Sample Matrix: Water
Samples Received: 19

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonate, Bicarbonate and Hydroxide	5	N/A	2012/03/01	CAM SOP-00102	APHA 4500-CO2 D
Carbonate, Bicarbonate and Hydroxide	14	N/A	2012/03/05	CAM SOP-00102	APHA 4500-CO2 D
Alkalinity	19	N/A	2012/03/05	ATL SOP 00013	Based on EPA310.2
Chloride	19	N/A	2012/03/05	ATL SOP 00014	Based on SM4500-Cl-
Colour	19	N/A	2012/03/05	ATL SOP 00020	Based on SM2120C
Conductance - water	5	N/A	2012/03/01	ATL SOP 00004/00006	Based on SM2510B
Conductance - water	14	N/A	2012/03/05	ATL SOP 00004/00006	Based on SM2510B
Hardness (calculated as CaCO3)	16	N/A	2012/03/05	ATL SOP 00048	Based on SM2340B
Hardness (calculated as CaCO3)	3	N/A	2012/03/06	ATL SOP 00048	Based on SM2340B
Mercury - Total (CVAA,LL)	19	2012/02/29	2012/03/01	ATL SOP 00026	Based on EPA245.1
Metals Water Total MS	16	2012/03/01	2012/03/02	ATL SOP 00059	Based on EPA6020A
Metals Water Total MS	3	2012/03/02	2012/03/05	ATL SOP 00059	Based on EPA6020A
Ion Balance (% Difference)	19	N/A	2012/03/06		
Anion and Cation Sum	16	N/A	2012/03/05		
Anion and Cation Sum	3	N/A	2012/03/06		
Nitrogen Ammonia - water	19	N/A	2012/03/01	ATL SOP 00015	Based on USEPA 350.1
Nitrogen - Nitrate + Nitrite	19	N/A	2012/03/06	ATL SOP 00016	Based on USGS - Enz.
Nitrogen - Nitrite	19	N/A	2012/03/05	ATL SOP 00017	Based on SM4500-NO2B
Nitrogen - Nitrate (as N)	19	N/A	2012/03/06	ATL SOP 00018	Based on ASTMD3867
pH	5	N/A	2012/03/01	ATL SOP 00003	Based on SM4500H+B
pH	14	N/A	2012/03/05	ATL SOP 00003	Based on SM4500H+B
Phosphorus - ortho	19	N/A	2012/03/06	ATL SOP 00021	Based on USEPA 365.1
Sat. pH and Langelier Index (@ 20C)	19	N/A	2012/03/06		
Sat. pH and Langelier Index (@ 4C)	19	N/A	2012/03/06		
Reactive Silica	19	N/A	2012/03/05	ATL SOP 00022	Based on EPA 366.0
Sulphate	19	N/A	2012/03/05	ATL SOP 00023	Based on EPA 375.4
Total Dissolved Solids (TDS calc)	19	N/A	2012/03/06		
Organic carbon - Total (TOC)	19	N/A	2012/03/06	ATL SOP 00037	Based on SM5310C
Total Suspended Solids	19	N/A	2012/03/01	ATL SOP 00007	based on EPA 160.2
Turbidity	19	N/A	2012/03/02	ATL SOP 00011	based on EPA 180.1

Remarks:

Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

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Maxxam Job #: B228623
Report Date: 2012/03/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

Encryption Key

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

MICHELLE HILL, Project Manager
Email: MHill@maxxam.ca
Phone# (902) 420-0203

==========

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: 2

Maxxam Job #: B228623
Report Date: 2012/03/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		MR0505	MR0506	MR0507		MR0508		MR0509	MR0509		
Sampling Date		2012/02/22	2012/02/22	2012/02/22		2012/02/22		2012/02/22	2012/02/22		
	Units	**LP01**	**LP02**	**LP03**	**RDL**	**LP04**	**QC Batch**	**LP05**	**LP05 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters											
Anion Sum	me/L	0.650	0.480	0.400	N/A	0.340	2776402	0.370		N/A	2776402
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	25.7	17.7	15.2	1.0	13.2	2776397	14.3		1.0	2776397
Calculated TDS	mg/L	37.0	28.0	25.0	1.0	21.0	2776406	22.0		1.0	2776406
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	ND	ND	1.0	ND	2776397	ND		1.0	2776397
Cation Sum	me/L	0.720	0.510	0.440	N/A	0.390	2776402	0.400		N/A	2776402
Hardness (CaCO3)	mg/L	26	18	17	1.0	15	2776400	16		1.0	2776400
Ion Balance (% Difference)	%	5.11	3.03	4.76	N/A	6.85	2776401	3.90		N/A	2776401
Langelier Index (@ 20C)	N/A	-1.87	-2.39	-2.17		-2.68	2776404	-2.58			2776404
Langelier Index (@ 4C)	N/A	-2.12	-2.65	-2.43		-2.93	2776405	-2.83			2776405
Nitrate (N)	mg/L	ND	0.053	0.095	0.050	ND	2776403	ND		0.050	2776403
Saturation pH (@ 20C)	N/A	8.96	9.27	9.37		9.48	2776404	9.43			2776404
Saturation pH (@ 4C)	N/A	9.21	9.53	9.63		9.73	2776405	9.68			2776405
Inorganics											
Total Alkalinity (Total as CaCO3)	mg/L	26	18	15	5.0	13	2778692	14		5.0	2778692
Dissolved Chloride (Cl)	mg/L	4.9	4.2	3.3	1.0	2.8	2778695	2.9		1.0	2778695
Colour	TCU	37	42	29	5.0	54	2778700	65		25	2778700
Nitrate + Nitrite	mg/L	ND	0.053	0.095	0.050	ND	2778702	ND		0.050	2778702
Nitrite (N)	mg/L	ND	ND	ND	0.010	ND	2778703	ND		0.010	2778703
Nitrogen (Ammonia Nitrogen)	mg/L	0.052	ND	ND	0.050	ND	2777532	ND		0.050	2777532
Total Organic Carbon (C)	mg/L	6.4	6.5	4.7	0.50	6.3	2781756	6.8	7.0	0.50	2781763
Orthophosphate (P)	mg/L	ND	ND	ND	0.010	ND	2778701	ND		0.010	2778701
pH	pH	7.09	6.88	7.20	N/A	6.80	2777459	6.85	6.91	N/A	2777459
Reactive Silica (SiO2)	mg/L	2.1	2.0	3.3	0.50	2.1	2778699	2.3		0.50	2778699
Total Suspended Solids	mg/L	4.0	2.8	2.0	2.0	ND	2776763	ND		2.0	2776763
Dissolved Sulphate (SO4)	mg/L	ND	ND	ND	2.0	ND	2778697	ND		2.0	2778697
Turbidity	NTU	3.7	3.4	1.1	0.10	0.86	2778669	0.80		0.10	2778669
Conductivity	uS/cm	71	53	45	1.0	40	2777460	39	39	1.0	2777460

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B228623
Report Date: 2012/03/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		MR0510		MR0511		MR0512	MR0513	MR0514	MR0536	MR0537	MR0538		
Sampling Date		2012/02/25		2012/02/25		2012/02/25	2012/02/25	2012/02/25	2012/02/25	2012/02/25	2012/02/25		
	Units	**VL-01**	**RDL**	**RO-01**	**RDL**	**RO-02**	**RO-03**	**RO-04**	**RO-05**	**VE01**	**VE02**	**RDL**	**QC Batch**
Calculated Parameters													
Anion Sum	me/L	0.290	N/A	0.310	N/A	0.320	0.380	0.230	0.240	0.320	0.290	N/A	2776402
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	9.9	1.0	11.7	1.0	13.0	15.8	7.7	9.3	11.6	10.1	1.0	2776397
Calculated TDS	mg/L	19.0	1.0	21.0	1.0	20.0	25.0	17.0	14.0	23.0	20.0	1.0	2776406
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	ND	1.0	ND	ND	ND	ND	ND	ND	1.0	2776397
Cation Sum	me/L	0.320	N/A	0.340	N/A	0.350	0.430	0.260	0.260	0.400	0.320	N/A	2776402
Hardness (CaCO3)	mg/L	11	1.0	13	1.0	14	18	9.5	9.2	13	12	1.0	2776400
Ion Balance (% Difference)	%	4.92	N/A	4.62	N/A	4.48	6.17	6.12	4.00	11.1	4.92	N/A	2776401
Langelier Index (@ 20C)	N/A	-3.06		-2.45		-2.29	-2.19	-3.30	-2.82	-2.66	-2.70		2776404
Langelier Index (@ 4C)	N/A	-3.31		-2.71		-2.54	-2.44	-3.55	-3.08	-2.91	-2.95		2776405
Nitrate (N)	mg/L	0.12	0.050	ND	0.050	0.078	0.092	0.15	ND	0.092	0.11	0.050	2776403
Saturation pH (@ 20C)	N/A	9.74		9.57		9.49	9.32	9.90	9.83	9.61	9.71		2776404
Saturation pH (@ 4C)	N/A	9.99		9.83		9.74	9.57	10.1	10.1	9.86	9.96		2776405
Inorganics													
Total Alkalinity (Total as CaCO3)	mg/L	9.9	5.0	12	5.0	13	16	7.7	9.3	12	10	5.0	2778692
Dissolved Chloride (Cl)	mg/L	3.1	1.0	2.6	1.0	2.1	2.2	2.4	1.9	2.8	2.7	1.0	2778695
Colour	TCU	42	5.0	25	5.0	37	23	29	11	27	31	5.0	2778700
Nitrate + Nitrite	mg/L	0.12	0.050	ND	0.050	0.078	0.092	0.15	ND	0.092	0.11	0.050	2778702
Nitrite (N)	mg/L	ND	0.010	ND	0.010	ND	ND	ND	ND	ND	ND	0.010	2778703
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.050	ND	0.050	ND	ND	ND	ND	ND	ND	0.050	2777532
Total Organic Carbon (C)	mg/L	6.5	0.50	4.5	0.50	4.7	3.7	5.2	3.0	5.0	5.3	0.50	2781763
Orthophosphate (P)	mg/L	ND	0.010	ND	0.010	ND	ND	ND	ND	0.037	ND	0.010	2778701
pH	pH	6.68	N/A	7.12	N/A	7.20	7.13	6.60	7.01	6.95	7.01	N/A	2780204
Reactive Silica (SiO2)	mg/L	3.2	0.50	4.1	0.50	3.2	4.5	4.0	0.83	4.5	4.0	0.50	2778699
Total Suspended Solids	mg/L	ND	1.0	ND	2.0	ND	ND	3.2	ND	12	2.0	1.0	2777474
Dissolved Sulphate (SO4)	mg/L	ND	2.0	ND	2.0	ND	ND	ND	ND	ND	ND	2.0	2778697
Turbidity	NTU	0.45	0.10	0.46	0.10	0.39	0.16	0.30	0.66	0.47	0.22	0.10	2778669
Conductivity	uS/cm	32	1.0	35	1.0	35	43	27	26	38	32	1.0	2780205

N/A = Not Applicable
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QC Batch = Quality Control Batch

Maxxam Job #: B228623
Report Date: 2012/03/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		MR0539	MR0540	MR0541	MR0541		MR0542		
Sampling Date		2012/02/25	2012/02/25	2012/02/25	2012/02/25		2012/02/25		
	Units	**VE03**	**VE04**	**VE05**	**VE05 Lab-Dup**	**QC Batch**	**VE06**	**RDL**	**QC Batch**
Calculated Parameters									
Anion Sum	me/L	0.260	0.300	0.370		2776402	0.380	N/A	2776402
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	8.8	10.1	13.1		2776397	13.8	1.0	2776397
Calculated TDS	mg/L	18.0	20.0	25.0		2776406	26.0	1.0	2776406
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	ND	ND		2776397	ND	1.0	2776397
Cation Sum	me/L	0.310	0.320	0.370		2776402	0.400	N/A	2776402
Hardness (CaCO3)	mg/L	11	12	15		2776400	16	1.0	2776400
Ion Balance (% Difference)	%	8.77	3.23	0.00		2776401	2.56	N/A	2776401
Langelier Index (@ 20C)	N/A	-2.79	-2.75	-2.45		2776404	-2.42		2776404
Langelier Index (@ 4C)	N/A	-3.04	-3.00	-2.70		2776405	-2.67		2776405
Nitrate (N)	mg/L	0.098	0.13	0.30		2776403	0.29	0.050	2776403
Saturation pH (@ 20C)	N/A	9.80	9.70	9.52		2776404	9.46		2776404
Saturation pH (@ 4C)	N/A	10.0	9.95	9.77		2776405	9.71		2776405
Inorganics									
Total Alkalinity (Total as CaCO3)	mg/L	8.8	10	13		2778692	14	5.0	2778692
Dissolved Chloride (Cl)	mg/L	2.8	3.0	3.0		2778695	2.8	1.0	2778695
Colour	TCU	32	47	17		2778700	16	5.0	2778700
Nitrate + Nitrite	mg/L	0.098	0.13	0.30		2778702	0.29	0.050	2778702
Nitrite (N)	mg/L	ND	ND	ND		2778703	ND	0.010	2778703
Nitrogen (Ammonia Nitrogen)	mg/L	0.10	ND	ND		2777532	ND	0.050	2777548
Total Organic Carbon (C)	mg/L	5.7	6.8	5.0		2781763	5.0	0.50	2781763
Orthophosphate (P)	mg/L	ND	ND	ND		2778701	ND	0.010	2778701
pH	pH	7.01	6.95	7.07	7.08	2780204	7.04	N/A	2780206
Reactive Silica (SiO2)	mg/L	3.8	3.9	5.6		2778699	5.6	0.50	2778699
Total Suspended Solids	mg/L	ND	ND	ND		2777474	ND	1.0	2777474
Dissolved Sulphate (SO4)	mg/L	ND	ND	ND		2778697	ND	2.0	2778697
Turbidity	NTU	0.20	0.28	0.53		2778669	0.44	0.10	2778669
Conductivity	uS/cm	31	33	39	39	2780205	39	1.0	2780207

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Maxxam Job #: B228623
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Stantec Consulting Ltd
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Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		MR0542		MR0543	MR0543		MR0544		
Sampling Date		2012/02/25		2012/02/25	2012/02/25		2012/02/25		
	Units	**VE06 Lab-Dup**	**QC Batch**	**VE07**	**VE07 Lab-Dup**	**QC Batch**	**VE10**	**RDL**	**QC Batch**
Calculated Parameters									
Anion Sum	me/L		2776402	0.360		2776402	0.310	N/A	2776402
Bicarb. Alkalinity (calc. as CaCO3)	mg/L		2776397	12.8		2776397	11.4	1.0	2776397
Calculated TDS	mg/L		2776406	25.0		2776406	23.0	1.0	2776406
Carb. Alkalinity (calc. as CaCO3)	mg/L		2776397	ND		2776397	ND	1.0	2776397
Cation Sum	me/L		2776402	0.360		2776402	0.380	N/A	2776402
Hardness (CaCO3)	mg/L		2776400	14		2776400	13	1.0	2776400
Ion Balance (% Difference)	%		2776401	0.00		2776401	10.1	N/A	2776401
Langelier Index (@ 20C)	N/A		2776404	-2.47		2776404	-2.95		2776404
Langelier Index (@ 4C)	N/A		2776405	-2.73		2776405	-3.20		2776405
Nitrate (N)	mg/L		2776403	0.35		2776403	0.19	0.050	2776403
Saturation pH (@ 20C)	N/A		2776404	9.54		2776404	9.67		2776404
Saturation pH (@ 4C)	N/A		2776405	9.80		2776405	9.92		2776405
Inorganics									
Total Alkalinity (Total as CaCO3)	mg/L		2778692	13	13	2778692	11	5.0	2778706
Dissolved Chloride (Cl)	mg/L		2778695	2.7	2.7	2778695	2.5	1.0	2778712
Colour	TCU		2778700	17	16	2778700	22	5.0	2778722
Nitrate + Nitrite	mg/L		2778702	0.35	0.35	2778702	0.19	0.050	2778727
Nitrite (N)	mg/L		2778703	ND	ND	2778703	ND	0.010	2778729
Nitrogen (Ammonia Nitrogen)	mg/L	ND	2777548	ND	ND	2777532	ND	0.050	2777533
Total Organic Carbon (C)	mg/L		2781763	4.9		2781763	6.6	0.50	2781763
Orthophosphate (P)	mg/L		2778701	ND	ND	2778701	ND	0.010	2778723
pH	pH		2780206	7.07		2780206	6.72	N/A	2780206
Reactive Silica (SiO2)	mg/L		2778699	5.5	5.6	2778699	5.0	0.50	2778719
Total Suspended Solids	mg/L		2777474	ND		2777474	42	1.0	2777474
Dissolved Sulphate (SO4)	mg/L		2778697	ND	ND	2778697	ND	2.0	2778716
Turbidity	NTU		2778669	0.48	0.48	2778669	5.1	0.10	2778669
Conductivity	uS/cm		2780207	39		2780207	35	1.0	2780207

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Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B228623
Report Date: 2012/03/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
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Sampler Initials: SM

MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		MR0505	MR0505	MR0506	MR0507	MR0508	MR0509	MR0510	MR0511	MR0512	MR0513		
Sampling Date		2012/02/22	2012/02/22	2012/02/22	2012/02/22	2012/02/22	2012/02/22	2012/02/25	2012/02/25	2012/02/25	2012/02/25		
	Units	**LP01**	**LP01 Lab-Dup**	**LP02**	**LP03**	**LP04**	**LP05**	**VL-01**	**RO-01**	**RO-02**	**RO-03**	**RDL**	**QC Batch**
Metals													
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.013	2777553

Maxxam ID		MR0514	MR0536	MR0537	MR0538	MR0539	MR0540	MR0541	MR0542	MR0543	MR0544		
Sampling Date		2012/02/25	2012/02/25	2012/02/25	2012/02/25	2012/02/25	2012/02/25	2012/02/25	2012/02/25	2012/02/25	2012/02/25		
	Units	**RO-04**	**RO-05**	**VE01**	**VE02**	**VE03**	**VE04**	**VE05**	**VE06**	**VE07**	**VE10**	**RDL**	**QC Batch**
Metals													
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.013	2777553

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Maxxam Job #: B228623
Report Date: 2012/03/06

Stantec Consulting Ltd
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Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		MR0505	MR0505	MR0506	MR0507	MR0508	MR0509	MR0510	MR0511	MR0512		
Sampling Date		2012/02/22	2012/02/22	2012/02/22	2012/02/22	2012/02/22	2012/02/22	2012/02/25	2012/02/25	2012/02/25		
	Units	**LP01**	**LP01 Lab-Dup**	**LP02**	**LP03**	**LP04**	**LP05**	**VL-01**	**RO-01**	**RO-02**	**RDL**	**QC Batch**
Metals												
Total Aluminum (Al)	ug/L	208	205	204	86.5	121	118	73.3	37.1	39.4	5.0	2778804
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2778804
Total Arsenic (As)	ug/L	ND	ND	ND	1.4	ND	ND	1.5	2.8	2.5	1.0	2778804
Total Barium (Ba)	ug/L	6.4	6.3	5.7	1.8	1.8	1.6	2.2	1.5	ND	1.0	2778804
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2778804
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2778804
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	50	2778804
Total Cadmium (Cd)	ug/L	0.018	ND	ND	ND	ND	ND	ND	ND	ND	0.017	2778804
Total Calcium (Ca)	ug/L	8540	8490	5850	5380	4800	5030	3540	4320	4720	100	2778804
Total Chromium (Cr)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2778804
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.40	2778804
Total Copper (Cu)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2778804
Total Iron (Fe)	ug/L	258	254	266	156	219	209	136	180	173	50	2778804
Total Lead (Pb)	ug/L	2.16	ND	ND	ND	ND	ND	ND	ND	ND	0.50	2778804
Total Magnesium (Mg)	ug/L	1230	1150	849	817	814	742	598	602	571	100	2778804
Total Manganese (Mn)	ug/L	260	258	230	44.5	142	127	122	44.3	20.3	2.0	2778804
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2778804
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2778804
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	100	2778804
Total Potassium (K)	ug/L	850	832	620	273	176	182	133	ND	ND	100	2778804
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2778804
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2778804
Total Sodium (Na)	ug/L	3720	3620	2900	2180	1690	1690	1860	1660	1470	100	2778804
Total Strontium (Sr)	ug/L	52.8	52.5	36.0	19.5	8.1	11.2	8.3	9.1	8.2	2.0	2778804
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2778804
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2778804
Total Titanium (Ti)	ug/L	4.5	4.4	4.3	ND	2.7	2.6	2.8	ND	ND	2.0	2778804
Total Uranium (U)	ug/L	ND	ND	ND	ND	0.14	ND	ND	ND	ND	0.10	2778804
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2778804
Total Zinc (Zn)	ug/L	11.3	ND	ND	ND	ND	ND	ND	ND	ND	5.0	2778804

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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		MR0513	MR0514	MR0536	MR0537	MR0538	MR0539		
Sampling Date		2012/02/25	2012/02/25	2012/02/25	2012/02/25	2012/02/25	2012/02/25		
	Units	**RO-03**	**RO-04**	**RO-05**	**VE01**	**VE02**	**VE03**	**RDL**	**QC Batch**
Metals									
Total Aluminum (Al)	ug/L	40.3	84.0	55.2	63.9	46.4	50.1	5.0	2778804
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2778804
Total Arsenic (As)	ug/L	1.2	ND	ND	ND	ND	ND	1.0	2778804
Total Barium (Ba)	ug/L	1.1	1.7	7.7	1.5	1.0	ND	1.0	2778804
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2778804
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2778804
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	50	2778804
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	ND	ND	0.017	2778804
Total Calcium (Ca)	ug/L	5850	3080	2940	4020	3670	3440	100	2778804
Total Chromium (Cr)	ug/L	ND	ND	1.8	ND	ND	ND	1.0	2778804
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	ND	ND	0.40	2778804
Total Copper (Cu)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2778804
Total Iron (Fe)	ug/L	109	114	105	214	113	120	50	2778804
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	ND	0.50	2778804
Total Magnesium (Mg)	ug/L	725	449	450	779	595	568	100	2778804
Total Manganese (Mn)	ug/L	57.1	61.7	71.5	83.6	18.9	22.4	2.0	2778804
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2778804
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2778804
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	100	2778804
Total Potassium (K)	ug/L	ND	ND	127	160	117	122	100	2778804
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2778804
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	0.10	2778804
Total Sodium (Na)	ug/L	1670	1570	1670	2800	1760	1700	100	2778804
Total Strontium (Sr)	ug/L	9.6	4.8	7.4	10.3	9.1	9.4	2.0	2778804
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	0.10	2778804
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2778804
Total Titanium (Ti)	ug/L	ND	ND	2.9	ND	ND	ND	2.0	2778804
Total Uranium (U)	ug/L	ND	ND	ND	ND	ND	ND	0.10	2778804
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2778804
Total Zinc (Zn)	ug/L	ND	ND	ND	ND	ND	ND	5.0	2778804

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Maxxam Job #: B228623
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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		MR0540	MR0541		MR0542	MR0543	MR0544		
Sampling Date		2012/02/25	2012/02/25		2012/02/25	2012/02/25	2012/02/25		
	Units	**VE04**	**VE05**	**QC Batch**	**VE06**	**VE07**	**VE10**	**RDL**	**QC Batch**
Metals									
Total Aluminum (Al)	ug/L	73.5	79.5	2778804	78.9	75.9	181	5.0	2780297
Total Antimony (Sb)	ug/L	ND	ND	2778804	ND	ND	ND	1.0	2780297
Total Arsenic (As)	ug/L	ND	ND	2778804	ND	ND	ND	1.0	2780297
Total Barium (Ba)	ug/L	1.8	1.3	2778804	1.4	1.3	5.4	1.0	2780297
Total Beryllium (Be)	ug/L	ND	ND	2778804	ND	ND	ND	1.0	2780297
Total Bismuth (Bi)	ug/L	ND	ND	2778804	ND	ND	ND	2.0	2780297
Total Boron (B)	ug/L	ND	ND	2778804	ND	ND	ND	50	2780297
Total Cadmium (Cd)	ug/L	ND	ND	2778804	ND	ND	0.024	0.017	2780297
Total Calcium (Ca)	ug/L	3770	4490	2778804	4860	4300	3630	100	2780297
Total Chromium (Cr)	ug/L	ND	2.7	2778804	1.6	ND	ND	1.0	2780297
Total Cobalt (Co)	ug/L	ND	ND	2778804	ND	ND	0.75	0.40	2780297
Total Copper (Cu)	ug/L	ND	ND	2778804	ND	ND	ND	2.0	2780297
Total Iron (Fe)	ug/L	236	102	2778804	103	100	843	50	2780297
Total Lead (Pb)	ug/L	ND	ND	2778804	ND	ND	ND	0.50	2780297
Total Magnesium (Mg)	ug/L	579	830	2778804	884	791	958	100	2780297
Total Manganese (Mn)	ug/L	58.3	115	2778804	122	112	604	2.0	2780297
Total Molybdenum (Mo)	ug/L	ND	ND	2778804	ND	ND	ND	2.0	2780297
Total Nickel (Ni)	ug/L	ND	ND	2778804	ND	ND	ND	2.0	2780297
Total Phosphorus (P)	ug/L	ND	ND	2778804	ND	ND	120	100	2780297
Total Potassium (K)	ug/L	121	182	2778804	223	200	190	100	2780297
Total Selenium (Se)	ug/L	ND	ND	2778804	ND	ND	ND	1.0	2780297
Total Silver (Ag)	ug/L	ND	ND	2778804	ND	ND	ND	0.10	2780297
Total Sodium (Na)	ug/L	1690	1640	2778804	1750	1700	1840	100	2780297
Total Strontium (Sr)	ug/L	10.6	9.8	2778804	10.6	9.3	8.3	2.0	2780297
Total Thallium (Tl)	ug/L	ND	ND	2778804	ND	ND	ND	0.10	2780297
Total Tin (Sn)	ug/L	ND	ND	2778804	ND	ND	ND	2.0	2780297
Total Titanium (Ti)	ug/L	ND	2.2	2778804	2.7	2.6	6.6	2.0	2780297
Total Uranium (U)	ug/L	ND	ND	2778804	ND	ND	ND	0.10	2780297
Total Vanadium (V)	ug/L	ND	ND	2778804	ND	ND	ND	2.0	2780297
Total Zinc (Zn)	ug/L	ND	ND	2778804	ND	5.4	10.3	5.0	2780297

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B228623
Report Date: 2012/03/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

Package 1	2.3°C

Each temperature is the average of up to three cooler temperatures taken at receipt

GENERAL COMMENTS

Sample MR0505-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample MR0508-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample MR0511-01: Total Suspended Solids: Used all of the sample provided, DL raised.

Sample MR0513-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample MR0514-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample MR0537-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample MR0539-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample MR0544-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

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Maxxam Job #: B228623
Report Date: 2012/03/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2776763	Total Suspended Solids	2012/03/01					ND, RDL=1.0	mg/L	1.9	25	98	80 - 120
2777459	pH	2012/03/01							0.9	25	100	80 - 120
2777460	Conductivity	2012/03/01			100	80 - 120	1.1, RDL=1.0	uS/cm	0	25		
2777474	Total Suspended Solids	2012/03/01					ND, RDL=1.0	mg/L	5.5	25	99	80 - 120
2777532	Nitrogen (Ammonia Nitrogen)	2012/03/01	95	80 - 120	97	80 - 120	ND, RDL=0.050	mg/L	NC	25	100	80 - 120
2777533	Nitrogen (Ammonia Nitrogen)	2012/03/01	95	80 - 120	96	80 - 120	ND, RDL=0.050	mg/L	NC	25	98	80 - 120
2777548	Nitrogen (Ammonia Nitrogen)	2012/03/01	90	80 - 120	95	80 - 120	ND, RDL=0.050	mg/L	NC	25	98	80 - 120
2777553	Total Mercury (Hg)	2012/03/01	99	80 - 120	100	80 - 120	ND, RDL=0.013	ug/L	NC	25	99	80 - 120
2778669	Turbidity	2012/03/02					ND, RDL=0.10	NTU	NC	25	102	80 - 120
2778692	Total Alkalinity (Total as CaCO3)	2012/03/05	96	80 - 120	95	80 - 120	ND, RDL=5.0	mg/L	NC	25	104	80 - 120
2778695	Dissolved Chloride (Cl)	2012/03/05	100	80 - 120	99	80 - 120	ND, RDL=1.0	mg/L	NC	25	98	80 - 120
2778697	Dissolved Sulphate (SO4)	2012/03/05	113	80 - 120	103	80 - 120	ND, RDL=2.0	mg/L	NC	25	100	80 - 120
2778699	Reactive Silica (SiO2)	2012/03/05	NC	80 - 120	99	80 - 120	ND, RDL=0.50	mg/L	1.2	25	100	75 - 125
2778700	Colour	2012/03/05					ND, RDL=5.0	TCU	NC	25	101	80 - 120
2778701	Orthophosphate (P)	2012/03/06	91	80 - 120	102	80 - 120	ND, RDL=0.010	mg/L	NC	25	104	80 - 120
2778702	Nitrate + Nitrite	2012/03/06	98	80 - 120	98	80 - 120	ND, RDL=0.050	mg/L	1.4	25	101	80 - 120
2778703	Nitrite (N)	2012/03/05	90	80 - 120	101	80 - 120	ND, RDL=0.010	mg/L	NC	25	107	80 - 120
2778706	Total Alkalinity (Total as CaCO3)	2012/03/05	91	80 - 120	98	80 - 120	ND, RDL=5.0	mg/L	NC	25	102	80 - 120
2778712	Dissolved Chloride (Cl)	2012/03/05	NC	80 - 120	99	80 - 120	ND, RDL=1.0	mg/L	1.8	25	99	80 - 120
2778716	Dissolved Sulphate (SO4)	2012/03/05	113	80 - 120	104	80 - 120	ND, RDL=2.0	mg/L	NC	25	104	80 - 120
2778719	Reactive Silica (SiO2)	2012/03/05	99	80 - 120	100	80 - 120	ND, RDL=0.50	mg/L	NC	25	101	75 - 125
2778722	Colour	2012/03/05					ND, RDL=5.0	TCU	0.2	25	95	80 - 120
2778723	Orthophosphate (P)	2012/03/06	93	80 - 120	96	80 - 120	ND, RDL=0.010	mg/L	NC	25	101	80 - 120
2778727	Nitrate + Nitrite	2012/03/06	100	80 - 120	96	80 - 120	ND, RDL=0.050	mg/L	NC	25	100	80 - 120
2778729	Nitrite (N)	2012/03/05	85	80 - 120	97	80 - 120	ND, RDL=0.010	mg/L	NC	25	95	80 - 120
2778804	Total Aluminum (Al)	2012/03/02	95	80 - 120	99	80 - 120	ND, RDL=5.0	ug/L	1.4	25		
2778804	Total Antimony (Sb)	2012/03/02	115	80 - 120	113	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2778804	Total Arsenic (As)	2012/03/02	95	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2778804	Total Barium (Ba)	2012/03/02	93	80 - 120	94	80 - 120	ND, RDL=1.0	ug/L	2.5	25		
2778804	Total Beryllium (Be)	2012/03/02	98	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2778804	Total Bismuth (Bi)	2012/03/02	99	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2778804	Total Boron (B)	2012/03/02	99	80 - 120	100	80 - 120	ND, RDL=50	ug/L	NC	25		
2778804	Total Cadmium (Cd)	2012/03/02	98	80 - 120	99	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2778804	Total Calcium (Ca)	2012/03/02	95	80 - 120	96	80 - 120	ND, RDL=100	ug/L	0.6	25		
2778804	Total Chromium (Cr)	2012/03/02	94	80 - 120	96	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2778804	Total Cobalt (Co)	2012/03/02	99	80 - 120	100	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2778804	Total Copper (Cu)	2012/03/02	98	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2778804	Total Iron (Fe)	2012/03/02	99	80 - 120	101	80 - 120	ND, RDL=50	ug/L	1.6	25		
2778804	Total Lead (Pb)	2012/03/02	95	80 - 120	95	80 - 120	ND, RDL=0.50	ug/L	NC	25		

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Maxxam Job #: B228623
Report Date: 2012/03/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2778804	Total Magnesium (Mg)	2012/03/02	100	80 - 120	101	80 - 120	ND, RDL=100	ug/L	6.9	25		
2778804	Total Manganese (Mn)	2012/03/02	92	80 - 120	93	80 - 120	ND, RDL=2.0	ug/L	1.1	25		
2778804	Total Molybdenum (Mo)	2012/03/02	104	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2778804	Total Nickel (Ni)	2012/03/02	96	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2778804	Total Phosphorus (P)	2012/03/02	100	80 - 120	99	80 - 120	ND, RDL=100	ug/L	NC	25		
2778804	Total Potassium (K)	2012/03/02	97	80 - 120	97	80 - 120	ND, RDL=100	ug/L	2.1	25		
2778804	Total Selenium (Se)	2012/03/02	97	80 - 120	96	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2778804	Total Silver (Ag)	2012/03/02	101	80 - 120	101	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2778804	Total Sodium (Na)	2012/03/02	98	80 - 120	100	80 - 120	ND, RDL=100	ug/L	2.8	25		
2778804	Total Strontium (Sr)	2012/03/02	93	80 - 120	94	80 - 120	ND, RDL=2.0	ug/L	0.6	25		
2778804	Total Thallium (Tl)	2012/03/02	99	80 - 120	99	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2778804	Total Tin (Sn)	2012/03/02	102	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2778804	Total Titanium (Ti)	2012/03/02	98	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2778804	Total Uranium (U)	2012/03/02	104	80 - 120	106	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2778804	Total Vanadium (V)	2012/03/02	95	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2778804	Total Zinc (Zn)	2012/03/02	98	80 - 120	99	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2780204	pH	2012/03/05							0.1	25	100	80 - 120
2780205	Conductivity	2012/03/05			99	80 - 120	1.2, RDL=1.0	uS/cm	0.2	25		
2780206	pH	2012/03/05							0.6	25	100	80 - 120
2780207	Conductivity	2012/03/05			99	80 - 120	ND, RDL=1.0	uS/cm				
2780297	Total Aluminum (Al)	2012/03/05	99	80 - 120	102	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2780297	Total Antimony (Sb)	2012/03/05	115	80 - 120	116	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2780297	Total Arsenic (As)	2012/03/05	96	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2780297	Total Barium (Ba)	2012/03/05	95	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L	0.8	25		
2780297	Total Beryllium (Be)	2012/03/05	98	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2780297	Total Bismuth (Bi)	2012/03/05	102	80 - 120	106	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2780297	Total Boron (B)	2012/03/05	NC	80 - 120	103	80 - 120	ND, RDL=50	ug/L	NC	25		
2780297	Total Cadmium (Cd)	2012/03/05	99	80 - 120	100	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2780297	Total Calcium (Ca)	2012/03/05	NC	80 - 120	97	80 - 120	ND, RDL=100	ug/L	0.3	25		
2780297	Total Chromium (Cr)	2012/03/05	95	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2780297	Total Cobalt (Co)	2012/03/05	96	80 - 120	99	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2780297	Total Copper (Cu)	2012/03/05	94	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L	0.3	25		
2780297	Total Iron (Fe)	2012/03/05	100	80 - 120	104	80 - 120	ND, RDL=50	ug/L	NC	25		
2780297	Total Lead (Pb)	2012/03/05	96	80 - 120	99	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2780297	Total Magnesium (Mg)	2012/03/05	98	80 - 120	104	80 - 120	ND, RDL=100	ug/L	0.1	25		
2780297	Total Manganese (Mn)	2012/03/05	92	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2780297	Total Molybdenum (Mo)	2012/03/05	103	80 - 120	105	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2780297	Total Nickel (Ni)	2012/03/05	92	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2780297	Total Phosphorus (P)	2012/03/05	102	80 - 120	104	80 - 120	ND, RDL=100	ug/L	NC	25		

Maxxam Job #: B228623
Report Date: 2012/03/06

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2780297	Total Potassium (K)	2012/03/05	NC	80 - 120	102	80 - 120	ND, RDL=100	ug/L	1.1	25		
2780297	Total Selenium (Se)	2012/03/05	96	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2780297	Total Silver (Ag)	2012/03/05	98	80 - 120	99	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2780297	Total Sodium (Na)	2012/03/05	NC	80 - 120	102	80 - 120	ND, RDL=100	ug/L	0.5	25		
2780297	Total Strontium (Sr)	2012/03/05	NC	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	0.6	25		
2780297	Total Thallium (Tl)	2012/03/05	100	80 - 120	103	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2780297	Total Tin (Sn)	2012/03/05	103	80 - 120	104	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2780297	Total Titanium (Ti)	2012/03/05	99	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2780297	Total Uranium (U)	2012/03/05	107	80 - 120	108	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2780297	Total Vanadium (V)	2012/03/05	96	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2780297	Total Zinc (Zn)	2012/03/05	98	80 - 120	100	80 - 120	ND, RDL=5.0	ug/L	0.8	25		
2781756	Total Organic Carbon (C)	2012/03/06	104	80 - 120	106	80 - 120	ND, RDL=0.50	mg/L	4.7	25	104	80 - 120
2781763	Total Organic Carbon (C)	2012/03/06	NC	80 - 120	105	80 - 120	ND, RDL=0.50	mg/L	3.3	25	97	80 - 120

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

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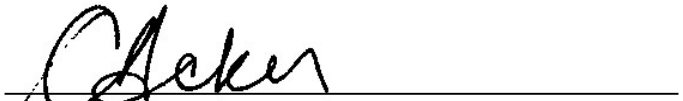
Validation Signature Page

Maxxam Job #: B228623

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



COLLEEN ACKER

KEVIN MACDONALD, Inorganics Supervisor

==========

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.

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Round 11

Your P.O. #: 16400NR
Your Project #: 121510621.100
Site Location: VALENTINE LAKE
Your C.O.C. #: N/A

Attention: Barry Wicks
Stantec Consulting Ltd
St. John's - Standing Offer
607 Torbay Rd
St. John's, NL
A1A 4Y6

Report Date: 2012/04/05

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B243968
Received: 2012/03/29, 10:14

Sample Matrix: Water
Samples Received: 21

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonate, Bicarbonate and Hydroxide	21	N/A	2012/04/03	CAM SOP-00102	APHA 4500-CO2 D
Alkalinity	21	N/A	2012/04/04	ATL SOP 00013	Based on EPA310.2
Chloride	21	N/A	2012/04/04	ATL SOP 00014	Based on SM4500-Cl-
Colour	21	N/A	2012/04/04	ATL SOP 00020	Based on SM2120C
Conductance - water	21	N/A	2012/04/02	ATL SOP 00004/00006	Based on SM2510B
Hardness (calculated as CaCO3)	18	N/A	2012/04/02	ATL SOP 00048	Based on SM2340B
Hardness (calculated as CaCO3)	3	N/A	2012/04/03	ATL SOP 00048	Based on SM2340B
Mercury - Total (CVAA,LL)	4	2012/03/29	2012/03/30	ATL SOP 00026	Based on EPA245.1
Mercury - Total (CVAA,LL)	16	2012/03/30	2012/04/02	ATL SOP 00026	Based on EPA245.1
Mercury - Total (CVAA,LL)	1	2012/04/02	2012/04/03	ATL SOP 00026	Based on EPA245.1
Metals Water Total MS	18	2012/03/30	2012/03/30	ATL SOP 00059	Based on EPA6020A
Metals Water Total MS	3	2012/04/02	2012/04/02	ATL SOP 00059	Based on EPA6020A
Ion Balance (% Difference)	21	N/A	2012/04/04		
Anion and Cation Sum	21	N/A	2012/04/03		
Nitrogen Ammonia - water	6	N/A	2012/04/02	ATL SOP 00015	Based on USEPA 350.1
Nitrogen Ammonia - water	15	N/A	2012/04/03	ATL SOP 00015	Based on USEPA 350.1
Nitrogen - Nitrate + Nitrite	21	N/A	2012/04/04	ATL SOP 00016	Based on USGS - Enz.
Nitrogen - Nitrite	21	N/A	2012/04/04	ATL SOP 00017	Based on SM4500-NO2B
Nitrogen - Nitrate (as N)	21	N/A	2012/04/04	ATL SOP 00018	Based on ASTMD3867
pH	21	N/A	2012/04/02	ATL SOP 00003	Based on SM4500H+B
Phosphorus - ortho	21	N/A	2012/04/04	ATL SOP 00021	Based on USEPA 365.1
Sat. pH and Langelier Index (@ 20C)	21	N/A	2012/04/04		
Sat. pH and Langelier Index (@ 4C)	21	N/A	2012/04/04		
Reactive Silica	20	N/A	2012/04/03	ATL SOP 00022	Based on EPA 366.0
Reactive Silica	1	N/A	2012/04/04	ATL SOP 00022	Based on EPA 366.0
Sulphate	21	N/A	2012/04/03	ATL SOP 00023	Based on EPA 375.4
Total Dissolved Solids (TDS calc)	21	N/A	2012/04/04		
Organic carbon - Total (TOC)	21	N/A	2012/04/05	ATL SOP 00037	Based on SM5310C
Total Suspended Solids	21	N/A	2012/03/30	ATL SOP 00007	based on EPA 160.2
Turbidity	14	N/A	2012/03/30	ATL SOP 00011	based on EPA 180.1
Turbidity	7	N/A	2012/04/02	ATL SOP 00011	based on EPA 180.1

Remarks:

Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

../2

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Maxxam Job #: B243968
Report Date: 2012/04/05

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16400NR
Sampler Initials: SM

Encryption Key

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

MICHELLE HILL, Project Manager
Email: MHill@maxxam.ca
Phone# (902) 420-0203

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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: 2

Maxxam Job #: B243968
Report Date: 2012/04/05

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16400NR
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		MY2441	MY2442		MY2443		MY2444			MY2445		MY2446		
Sampling Date		2012/03/17	2012/03/17		2012/03/17		2012/03/17			2012/03/17		2012/03/19		
	Units	**LP-01**	**LP-02**	**RDL**	**LP-03**	**RDL**	**LP-04**	**RDL**	**QC Batch**	**LP-05**	**RDL**	**VE-01**	**RDL**	**QC Batch**
Calculated Parameters														
Anion Sum	me/L	1.18	0.800	N/A	0.570	N/A	0.800	N/A	2805338	0.680	N/A	0.390	N/A	2805338
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	49	34	1.0	20	1.0	35	1.0	2805335	30	1.0	16	1.0	2805335
Calculated TDS	mg/L	63.0	44.0	1.0	32.0	1.0	45.0	1.0	2805341	37.0	1.0	24.0	1.0	2805341
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	ND	1.0	ND	1.0	ND	1.0	2805335	ND	1.0	ND	1.0	2805335
Cation Sum	me/L	1.10	0.810	N/A	0.500	N/A	0.790	N/A	2805338	0.680	N/A	0.370	N/A	2805338
Hardness (CaCO3)	mg/L	42	31	1.0	20	1.0	33	1.0	2805336	29	1.0	14	1.0	2805336
Ion Balance (% Difference)	%	3.51	0.620	N/A	6.54	N/A	0.630	N/A	2805337	0.00	N/A	2.63	N/A	2805337
Langelier Index (@ 20C)	N/A	-1.27	-1.73		-1.93		-1.68		2805339	-1.77		-2.42		2805339
Langelier Index (@ 4C)	N/A	-1.52	-1.98		-2.19		-1.93		2805340	-2.03		-2.67		2805340
Nitrate (N)	mg/L	ND	ND	0.050	0.24	0.050	ND	0.050	2805223	ND	0.050	0.13	0.050	2805223
Saturation pH (@ 20C)	N/A	8.49	8.76		9.18		8.74		2805339	8.83		9.42		2805339
Saturation pH (@ 4C)	N/A	8.74	9.01		9.44		8.99		2805340	9.09		9.67		2805340
Inorganics														
Total Alkalinity (Total as CaCO3)	mg/L	50	34	5.0	20	5.0	35	5.0	2808732	30	5.0	16	5.0	2808749
Dissolved Chloride (Cl)	mg/L	6.7	4.1	1.0	5.1	1.0	3.5	1.0	2808736	2.7	1.0	2.3	1.0	2808751
Colour	TCU	36	35	5.0	28	5.0	47	10	2808741	51	10	26	5.0	2808756
Nitrate + Nitrite	mg/L	ND	ND	0.050	0.24	0.050	ND	0.050	2808747	ND	0.050	0.13	0.050	2808768
Nitrite (N)	mg/L	ND	ND	0.010	ND	0.010	ND	0.010	2808748	ND	0.010	ND	0.010	2808769
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	0.050	ND	0.050	ND	0.050	2807906	ND	0.050	ND	0.050	2807906
Total Organic Carbon (C)	mg/L	6.8	6.2	0.50	4.5	0.50	5.1	0.50	2811690	5.9	0.50	4.1	0.50	2811690
Orthophosphate (P)	mg/L	ND	ND	0.010	ND	0.010	ND	0.010	2808743	ND	0.010	ND	0.010	2808757
pH	pH	7.22	7.03	N/A	7.25	N/A	7.06	N/A	2807572	7.06	N/A	7.00	N/A	2807572
Reactive Silica (SiO2)	mg/L	4.3	2.7	0.50	3.7	0.50	3.6	0.50	2808740	3.3	0.50	4.6	0.50	2808754
Total Suspended Solids	mg/L	5.2	3.2	2.0	ND	1.0	4.4	2.0	2799262	ND	1.0	1.4	1.0	2799262
Dissolved Sulphate (SO4)	mg/L	ND	ND	2.0	ND	2.0	ND	2.0	2808738	ND	2.0	ND	2.0	2808753
Turbidity	NTU	5.0	1.9	0.10	0.57	0.10	1.8	0.10	2806185	0.40	0.10	0.21	0.10	2806185
Conductivity	uS/cm	120	82	1.0	52	1.0	77	1.0	2807574	69	1.0	38	1.0	2807574

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B243968
Report Date: 2012/04/05

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16400NR
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		MY2447		MY2448	MY2449	MY2449			MY2450	MY2451		
Sampling Date		2012/03/19		2012/03/19	2012/03/19	2012/03/19			2012/03/19	2012/03/19		
	Units	**VE-02**	**RDL**	**VE-03**	**VE-04**	**VE-04 Lab-Dup**	**RDL**	**QC Batch**	**VE-05**	**VE-06**	**RDL**	**QC Batch**
Calculated Parameters												
Anion Sum	me/L	0.330	N/A	0.330	0.280		N/A	2805338	0.400	0.390	N/A	2805338
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	13	1.0	12	10		1.0	2805335	15	15	1.0	2805335
Calculated TDS	mg/L	21.0	1.0	21.0	20.0		1.0	2805341	27.0	26.0	1.0	2805341
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	1.0	ND	ND		1.0	2805335	ND	ND	1.0	2805335
Cation Sum	me/L	0.340	N/A	0.340	0.340		N/A	2805338	0.410	0.400	N/A	2805338
Hardness (CaCO3)	mg/L	13	1.0	13	12		1.0	2805336	16	16	1.0	2805336
Ion Balance (% Difference)	%	1.49	N/A	1.49	9.68		N/A	2805337	1.23	1.27	N/A	2805337
Langelier Index (@ 20C)	N/A	-2.54		-2.55	-2.73			2805339	-2.46	-2.47		2805339
Langelier Index (@ 4C)	N/A	-2.80		-2.80	-2.98			2805340	-2.71	-2.72		2805340
Nitrate (N)	mg/L	0.14	0.050	0.15	0.067		0.050	2805223	0.33	0.30	0.050	2805223
Saturation pH (@ 20C)	N/A	9.54		9.58	9.68			2805339	9.42	9.43		2805339
Saturation pH (@ 4C)	N/A	9.80		9.83	9.93			2805340	9.67	9.68		2805340
Inorganics												
Total Alkalinity (Total as CaCO3)	mg/L	13	5.0	12	10		5.0	2808749	15	15	5.0	2808749
Dissolved Chloride (Cl)	mg/L	2.1	1.0	2.6	2.7		1.0	2808751	2.6	2.5	1.0	2808751
Colour	TCU	28	5.0	28	46		5.0	2808756	18	19	5.0	2808756
Nitrate + Nitrite	mg/L	0.14	0.050	0.15	0.067		0.050	2808768	0.33	0.30	0.050	2808768
Nitrite (N)	mg/L	ND	0.010	ND	ND		0.010	2808769	ND	ND	0.010	2808769
Nitrogen (Ammonia Nitrogen)	mg/L	ND	0.050	ND	ND	ND	0.050	2807906	ND	ND	0.050	2807909
Total Organic Carbon (C)	mg/L	4.4	0.50	4.8	6.5		0.50	2811690	5.0	5.1	0.50	2811690
Orthophosphate (P)	mg/L	ND	0.010	ND	ND		0.010	2808757	ND	ND	0.010	2808757
pH	pH	7.00	N/A	7.03	6.95		N/A	2807572	6.96	6.96	N/A	2807572
Reactive Silica (SiO2)	mg/L	4.1	0.50	3.9	3.8		0.50	2808754	5.5	5.5	0.50	2808754
Total Suspended Solids	mg/L	4.8	2.0	23	12		5.0	2799262	2.8	4.8	1.0	2799262
Dissolved Sulphate (SO4)	mg/L	ND	2.0	ND	ND		2.0	2808753	ND	ND	2.0	2808753
Turbidity	NTU	0.20	0.10	0.20	0.72		0.10	2806185	4.0	4.1	0.10	2806185
Conductivity	uS/cm	35	1.0	34	33		1.0	2807574	40	40	1.0	2807574

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Maxxam Job #: B243968
Report Date: 2012/04/05

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16400NR
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		MY2452	MY2452	MY2453		MY2454		MY2455	MY2455	MY2456	MY2457		
Sampling Date		2012/03/19	2012/03/19	2012/03/19		2012/03/19		2012/03/19	2012/03/19	2012/03/19	2012/03/19		
	Units	**VE-07**	**VE-07 Lab-Dup**	**VE-08**	**RDL**	**VE-09**	**QC Batch**	**VE-10**	**VE-10 Lab-Dup**	**R01**	**R02**	**RDL**	**QC Batch**
Calculated Parameters													
Anion Sum	me/L	0.370		0.230	N/A	0.400	2805338	0.310		0.350	0.350	N/A	2805338
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	14		5.6	1.0	15	2805335	11		14	14	1.0	2805335
Calculated TDS	mg/L	31.0		19.0	1.0	26.0	2805341	21.0		22.0	21.0	1.0	2805341
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND		ND	1.0	ND	2805335	ND		ND	ND	1.0	2805335
Cation Sum	me/L	0.570		0.290	N/A	0.400	2805338	0.310		0.330	0.350	N/A	2805338
Hardness (CaCO3)	mg/L	19		9.2	1.0	15	2805336	11		13	14	1.0	2805336
Ion Balance (% Difference)	%	21.3		11.5	N/A	0.00	2805337	0.00		2.94	0.00	N/A	2805337
Langelier Index (@ 20C)	N/A	-2.51		-4.05		-2.59	2805339	-3.15		-2.59	-2.35		2805339
Langelier Index (@ 4C)	N/A	-2.76		-4.30		-2.84	2805340	-3.40		-2.84	-2.61		2805340
Nitrate (N)	mg/L	0.32		0.49	0.050	0.44	2805223	0.20		0.086	0.086	0.050	2805223
Saturation pH (@ 20C)	N/A	9.44		10.2		9.49	2805339	9.73		9.53	9.45		2805339
Saturation pH (@ 4C)	N/A	9.69		10.4		9.74	2805340	9.98		9.78	9.71		2805340
Inorganics													
Total Alkalinity (Total as CaCO3)	mg/L	14		5.6	5.0	15	2808749	11		14	14	5.0	2808749
Dissolved Chloride (Cl)	mg/L	2.6		2.9	1.0	2.5	2808751	2.5		2.5	2.2	1.0	2808751
Colour	TCU	20		23	5.0	21	2808756	33		26	36	5.0	2808756
Nitrate + Nitrite	mg/L	0.32		0.49	0.050	0.44	2808768	0.20		0.086	0.086	0.050	2808768
Nitrite (N)	mg/L	ND		ND	0.010	ND	2808769	ND		ND	ND	0.010	2808769
Nitrogen (Ammonia Nitrogen)	mg/L	ND		ND	0.050	ND	2807909	ND		ND	ND	0.050	2807909
Total Organic Carbon (C)	mg/L	5.1		5.1	0.50	5.4	2811690	6.2	5.9	4.7	4.0	0.50	2811692
Orthophosphate (P)	mg/L	ND		ND	0.010	ND	2808757	ND		ND	ND	0.010	2808757
pH	pH	6.93		6.14	N/A	6.90	2807572	6.58		6.94	7.10	N/A	2807572
Reactive Silica (SiO2)	mg/L	5.5		4.4	0.50	4.9	2808754	5.0		4.0	3.3	0.50	2808754
Total Suspended Solids	mg/L	39	39	60	2.0	2.2	2799262	2.2		ND	1.0	1.0	2799262
Dissolved Sulphate (SO4)	mg/L	ND		ND	2.0	ND	2808753	ND		ND	ND	2.0	2808753
Turbidity	NTU	10		8.4	0.10	0.32	2806185	ND		ND	0.13	0.10	2807581
Conductivity	uS/cm	40		26	1.0	41	2807574	32		35	36	1.0	2807574

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Maxxam Job #: B243968
Report Date: 2012/04/05

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16400NR
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		MY2457		MY2458	MY2459	MY2460	MY2461		
Sampling Date		2012/03/19		2012/03/19	2012/03/19	2012/03/19	2012/03/19		
	Units	**R02 Lab-Dup**	**QC Batch**	**R03**	**R04**	**R05**	**VL-01**	**RDL**	**QC Batch**
Calculated Parameters									
Anion Sum	me/L		2805338	0.370	0.230	0.240	0.350	N/A	2805338
Bicarb. Alkalinity (calc. as CaCO3)	mg/L		2805335	15	8.4	9.1	13	1.0	2805335
Calculated TDS	mg/L		2805341	23.0	16.0	13.0	22.0	1.0	2805341
Carb. Alkalinity (calc. as CaCO3)	mg/L		2805335	ND	ND	ND	ND	1.0	2805335
Cation Sum	me/L		2805338	0.360	0.250	0.250	0.380	N/A	2805338
Hardness (CaCO3)	mg/L		2805336	15	9.4	9.4	14	1.0	2805336
Ion Balance (% Difference)	%		2805337	1.37	4.17	2.04	4.11	N/A	2805337
Langelier Index (@ 20C)	N/A		2805339	-2.40	-3.26	-2.83	-2.67		2805339
Langelier Index (@ 4C)	N/A		2805340	-2.65	-3.51	-3.08	-2.92		2805340
Nitrate (N)	mg/L		2805223	ND	0.12	ND	0.094	0.050	2805223
Saturation pH (@ 20C)	N/A		2805339	9.40	9.86	9.82	9.50		2805339
Saturation pH (@ 4C)	N/A		2805340	9.65	10.1	10.1	9.75		2805340
Inorganics									
Total Alkalinity (Total as CaCO3)	mg/L		2808749	15	8.5	9.1	13	5.0	2808749
Dissolved Chloride (Cl)	mg/L		2808751	1.9	1.9	1.9	2.9	1.0	2808751
Colour	TCU		2808756	27	38	8.9	34	5.0	2808756
Nitrate + Nitrite	mg/L		2808768	0.10	0.17	ND	0.094	0.050	2808768
Nitrite (N)	mg/L		2808769	0.18	0.054	ND	ND	0.010	2808769
Nitrogen (Ammonia Nitrogen)	mg/L		2807909	ND	ND	ND	ND	0.050	2807909
Total Organic Carbon (C)	mg/L		2811692	3.7	5.0	3.0	5.4	0.50	2811692
Orthophosphate (P)	mg/L		2808757	ND	ND	ND	ND	0.010	2808757
pH	pH	7.16	2807572	7.00	6.60	6.99	6.83	N/A	2807575
Reactive Silica (SiO2)	mg/L		2808754	4.1	3.7	0.86	3.7	0.50	2808754
Total Suspended Solids	mg/L		2799262	1.6	1.8	1.8	ND	1.0	2799262
Dissolved Sulphate (SO4)	mg/L		2808753	ND	ND	ND	ND	2.0	2808753
Turbidity	NTU		2807581	ND	ND	ND	0.14	0.10	2807581
Conductivity	uS/cm	36	2807574	37	25	26	37	1.0	2807577

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Maxxam Job #: B243968
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Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16400NR
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MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		MY2441	MY2442	MY2443	MY2444		MY2445	MY2446	MY2447	MY2448	MY2449		
Sampling Date		2012/03/17	2012/03/17	2012/03/17	2012/03/17		2012/03/17	2012/03/19	2012/03/19	2012/03/19	2012/03/19		
	Units	**LP-01**	**LP-02**	**LP-03**	**LP-04**	**QC Batch**	**LP-05**	**VE-01**	**VE-02**	**VE-03**	**VE-04**	**RDL**	**QC Batch**
Metals													
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	2806096	ND	ND	ND	ND	ND	0.013	2807733

Maxxam ID		MY2450	MY2451	MY2452	MY2453	MY2454	MY2455	MY2456	MY2457		
Sampling Date		2012/03/19	2012/03/19	2012/03/19	2012/03/19	2012/03/19	2012/03/19	2012/03/19	2012/03/19		
	Units	**VE-05**	**VE-06**	**VE-07**	**VE-08**	**VE-09**	**VE-10**	**R01**	**R02**	**RDL**	**QC Batch**
Metals											
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	0.013	2807733

Maxxam ID		MY2458	MY2459	MY2460		MY2461	MY2461		
Sampling Date		2012/03/19	2012/03/19	2012/03/19		2012/03/19	2012/03/19		
	Units	**R03**	**R04**	**R05**	**QC Batch**	**VL-01**	**VL-01 Lab-Dup**	**RDL**	**QC Batch**
Metals									
Total Mercury (Hg)	ug/L	ND	ND	ND	2807733	ND	ND	0.013	2808802

ND = Not detected
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Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B243968
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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		MY2441	MY2442	MY2442	MY2443	MY2444	MY2445	MY2446	MY2447	MY2448	MY2449		
Sampling Date		2012/03/17	2012/03/17	2012/03/17	2012/03/17	2012/03/17	2012/03/17	2012/03/19	2012/03/19	2012/03/19	2012/03/19		
	Units	**LP-01**	**LP-02**	**LP-02 Lab-Dup**	**LP-03**	**LP-04**	**LP-05**	**VE-01**	**VE-02**	**VE-03**	**VE-04**	**RDL**	**QC Batch**
Metals													
Total Aluminum (Al)	ug/L	276	134	134	42.4	190	78.9	43.9	45.5	57.7	142	5.0	2806293
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2806293
Total Arsenic (As)	ug/L	ND	ND	ND	1.4	1.3	ND	ND	ND	ND	ND	1.0	2806293
Total Barium (Ba)	ug/L	9.4	6.0	6.0	1.5	3.9	1.7	1.2	1.5	1.1	2.2	1.0	2806293
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2806293
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2806293
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	50	2806293
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.017	2806293
Total Calcium (Ca)	ug/L	13800	10300	10300	6370	10500	9590	4560	4190	4050	3990	100	2806293
Total Chromium (Cr)	ug/L	ND	2.3	2.3	ND	3.3	ND	ND	1.8	ND	ND	1.0	2806293
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	0.64	ND	ND	ND	ND	ND	0.40	2806293
Total Copper (Cu)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2806293
Total Iron (Fe)	ug/L	360	219	213	113	853	247	118	108	131	468	50	2806293
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.50	2806293
Total Magnesium (Mg)	ug/L	1730	1370	1330	926	1540	1330	718	654	649	594	100	2806293
Total Manganese (Mn)	ug/L	599	537	517	41.0	733	174	25.8	30.7	49.1	234	2.0	2806293
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2806293
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2806293
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100	2806293
Total Potassium (K)	ug/L	979	696	694	280	256	181	149	143	141	134	100	2806293
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2806293
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2806293
Total Sodium (Na)	ug/L	5220	3490	3430	2250	2320	1860	1730	1650	1650	1610	100	2806293
Total Strontium (Sr)	ug/L	95.2	71.2	69.8	24.8	18.9	21.6	10.3	10.6	10.7	11.2	2.0	2806293
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2806293
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2806293
Total Titanium (Ti)	ug/L	3.5	2.8	2.9	ND	3.5	ND	ND	ND	ND	5.4	2.0	2806293
Total Uranium (U)	ug/L	0.24	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2806293
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2806293
Total Zinc (Zn)	ug/L	6.0	ND	ND	ND	ND	ND	7.6	ND	ND	ND	5.0	2806293

ND = Not detected
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QC Batch = Quality Control Batch

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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		MY2450	MY2451	MY2452	MY2453	MY2454	MY2455	MY2456		
Sampling Date		2012/03/19	2012/03/19	2012/03/19	2012/03/19	2012/03/19	2012/03/19	2012/03/19		
	Units	**VE-05**	**VE-06**	**VE-07**	**VE-08**	**VE-09**	**VE-10**	**R01**	**RDL**	**QC Batch**
Metals										
Total Aluminum (Al)	ug/L	167	173	1640	523	95.5	76.9	34.6	5.0	2806293
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	2806293
Total Arsenic (As)	ug/L	ND	ND	2.6	ND	ND	ND	2.7	1.0	2806293
Total Barium (Ba)	ug/L	2.2	2.1	12.0	3.3	1.7	1.8	1.4	1.0	2806293
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	2806293
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2806293
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	ND	50	2806293
Total Cadmium (Cd)	ug/L	ND	ND	0.129	ND	ND	ND	ND	0.017	2806293
Total Calcium (Ca)	ug/L	4920	4790	5150	2210	4250	3190	4160	100	2806293
Total Chromium (Cr)	ug/L	2.4	ND	3.3	3.3	1.1	ND	ND	1.0	2806293
Total Cobalt (Co)	ug/L	ND	ND	2.19	0.43	ND	ND	ND	0.40	2806293
Total Copper (Cu)	ug/L	ND	ND	4.3	ND	ND	ND	ND	2.0	2806293
Total Iron (Fe)	ug/L	265	243	3240	913	85	155	140	50	2806293
Total Lead (Pb)	ug/L	ND	ND	1.14	ND	ND	ND	ND	0.50	2806293
Total Magnesium (Mg)	ug/L	919	908	1460	888	1090	820	599	100	2806293
Total Manganese (Mn)	ug/L	122	130	1300	99.8	115	58.8	45.8	2.0	2806293
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2806293
Total Nickel (Ni)	ug/L	ND	ND	2.8	ND	ND	ND	ND	2.0	2806293
Total Phosphorus (P)	ug/L	ND	ND	104	ND	ND	ND	ND	100	2806293
Total Potassium (K)	ug/L	217	205	334	226	171	120	116	100	2806293
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	2806293
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.10	2806293
Total Sodium (Na)	ug/L	1620	1580	1600	1530	1990	1680	1580	100	2806293
Total Strontium (Sr)	ug/L	10.9	10.6	12.2	5.7	12.0	6.8	8.9	2.0	2806293
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.10	2806293
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2806293
Total Titanium (Ti)	ug/L	6.5	6.0	115	37.0	2.2	ND	ND	2.0	2806293
Total Uranium (U)	ug/L	ND	ND	0.22	ND	ND	ND	ND	0.10	2806293
Total Vanadium (V)	ug/L	ND	ND	6.0	ND	ND	ND	ND	2.0	2806293
Total Zinc (Zn)	ug/L	9.3	ND	12.1	6.9	ND	ND	ND	5.0	2806293

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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		MY2457	MY2458		MY2459	MY2460	MY2461		
Sampling Date		2012/03/19	2012/03/19		2012/03/19	2012/03/19	2012/03/19		
	Units	**R02**	**R03**	**QC Batch**	**R04**	**R05**	**VL-01**	**RDL**	**QC Batch**
Metals									
Total Aluminum (Al)	ug/L	34.7	39.6	2806293	71.5	21.8	70.1	5.0	2807911
Total Antimony (Sb)	ug/L	ND	ND	2806293	ND	ND	ND	1.0	2807911
Total Arsenic (As)	ug/L	2.5	ND	2806293	ND	ND	1.6	1.0	2807911
Total Barium (Ba)	ug/L	ND	ND	2806293	1.2	5.4	2.3	1.0	2807911
Total Beryllium (Be)	ug/L	ND	ND	2806293	ND	ND	ND	1.0	2807911
Total Bismuth (Bi)	ug/L	ND	ND	2806293	ND	ND	ND	2.0	2807911
Total Boron (B)	ug/L	ND	ND	2806293	ND	ND	ND	50	2807911
Total Cadmium (Cd)	ug/L	ND	ND	2806293	ND	ND	ND	0.017	2807911
Total Calcium (Ca)	ug/L	4780	4990	2806293	3090	3070	4570	100	2807911
Total Chromium (Cr)	ug/L	ND	ND	2806293	ND	ND	ND	1.0	2807911
Total Cobalt (Co)	ug/L	ND	ND	2806293	ND	ND	ND	0.40	2807911
Total Copper (Cu)	ug/L	ND	ND	2806293	ND	ND	ND	2.0	2807911
Total Iron (Fe)	ug/L	145	71	2806293	79	ND	103	50	2807911
Total Lead (Pb)	ug/L	ND	ND	2806293	ND	ND	ND	0.50	2807911
Total Magnesium (Mg)	ug/L	576	607	2806293	421	413	702	100	2807911
Total Manganese (Mn)	ug/L	18.2	31.7	2806293	19.6	17.9	113	2.0	2807911
Total Molybdenum (Mo)	ug/L	ND	ND	2806293	ND	ND	ND	2.0	2807911
Total Nickel (Ni)	ug/L	ND	ND	2806293	ND	ND	ND	2.0	2807911
Total Phosphorus (P)	ug/L	ND	ND	2806293	ND	ND	ND	100	2807911
Total Potassium (K)	ug/L	ND	ND	2806293	ND	127	149	100	2807911
Total Selenium (Se)	ug/L	ND	ND	2806293	ND	ND	ND	1.0	2807911
Total Silver (Ag)	ug/L	ND	ND	2806293	ND	ND	ND	0.10	2807911
Total Sodium (Na)	ug/L	1410	1440	2806293	1400	1320	1900	100	2807911
Total Strontium (Sr)	ug/L	8.2	8.0	2806293	4.5	7.5	11.1	2.0	2807911
Total Thallium (Tl)	ug/L	ND	ND	2806293	ND	ND	ND	0.10	2807911
Total Tin (Sn)	ug/L	ND	ND	2806293	ND	ND	ND	2.0	2807911
Total Titanium (Ti)	ug/L	ND	ND	2806293	ND	ND	ND	2.0	2807911
Total Uranium (U)	ug/L	ND	ND	2806293	ND	ND	ND	0.10	2807911
Total Vanadium (V)	ug/L	ND	ND	2806293	ND	ND	ND	2.0	2807911
Total Zinc (Zn)	ug/L	ND	ND	2806293	ND	ND	ND	5.0	2807911

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Package 1	3.4°C

Each temperature is the average of up to three cooler temperatures taken at receipt

GENERAL COMMENTS

Total Suspended Solids: Sample integrity may have been compromised, the samples exceeded their hold time prior to being analyzed.

Sample MY2443-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample MY2449-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample MY2452-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample MY2453-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2799262	Total Suspended Solids	2012/03/30					ND, RDL=1.0	mg/L	1.0	25	100	80 - 120
2806096	Total Mercury (Hg)	2012/03/30	98	80 - 120	95	80 - 120	ND, RDL=0.013	ug/L	NC	25	94	80 - 120
2806185	Turbidity	2012/03/30					ND, RDL=0.10	NTU	NC	25	101	80 - 120
2806293	Total Aluminum (Al)	2012/03/30	90	80 - 120	95	80 - 120	ND, RDL=5.0	ug/L	0.004	25		
2806293	Total Antimony (Sb)	2012/03/30	112	80 - 120	111	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2806293	Total Arsenic (As)	2012/03/30	96	80 - 120	95	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2806293	Total Barium (Ba)	2012/03/30	89	80 - 120	90	80 - 120	ND, RDL=1.0	ug/L	1.2	25		
2806293	Total Beryllium (Be)	2012/03/30	94	80 - 120	96	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2806293	Total Bismuth (Bi)	2012/03/30	97	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2806293	Total Boron (B)	2012/03/30	97	80 - 120	99	80 - 120	ND, RDL=50	ug/L	NC	25		
2806293	Total Cadmium (Cd)	2012/03/30	96	80 - 120	95	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2806293	Total Calcium (Ca)	2012/03/30	93	80 - 120	94	80 - 120	ND, RDL=100	ug/L	0.6	25		
2806293	Total Chromium (Cr)	2012/03/30	93	80 - 120	93	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2806293	Total Cobalt (Co)	2012/03/30	94	80 - 120	95	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2806293	Total Copper (Cu)	2012/03/30	94	80 - 120	94	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2806293	Total Iron (Fe)	2012/03/30	96	80 - 120	103	80 - 120	ND, RDL=50	ug/L	NC	25		
2806293	Total Lead (Pb)	2012/03/30	93	80 - 120	93	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2806293	Total Magnesium (Mg)	2012/03/30	96	80 - 120	97	80 - 120	ND, RDL=100	ug/L	3.3	25		
2806293	Total Manganese (Mn)	2012/03/30	NC	80 - 120	92	80 - 120	ND, RDL=2.0	ug/L	3.7	25		
2806293	Total Molybdenum (Mo)	2012/03/30	103	80 - 120	108	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2806293	Total Nickel (Ni)	2012/03/30	94	80 - 120	94	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2806293	Total Phosphorus (P)	2012/03/30	97	80 - 120	97	80 - 120	ND, RDL=100	ug/L	NC	25		
2806293	Total Potassium (K)	2012/03/30	94	80 - 120	95	80 - 120	ND, RDL=100	ug/L	0.3	25		
2806293	Total Selenium (Se)	2012/03/30	97	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2806293	Total Silver (Ag)	2012/03/30	101	80 - 120	101	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2806293	Total Sodium (Na)	2012/03/30	94	80 - 120	95	80 - 120	ND, RDL=100	ug/L	1.7	25		
2806293	Total Strontium (Sr)	2012/03/30	92	80 - 120	93	80 - 120	ND, RDL=2.0	ug/L	2.0	25		
2806293	Total Thallium (Tl)	2012/03/30	97	80 - 120	98	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2806293	Total Tin (Sn)	2012/03/30	101	80 - 120	101	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2806293	Total Titanium (Ti)	2012/03/30	99	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2806293	Total Uranium (U)	2012/03/30	104	80 - 120	104	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2806293	Total Vanadium (V)	2012/03/30	93	80 - 120	95	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2806293	Total Zinc (Zn)	2012/03/30	96	80 - 120	96	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2807572	pH	2012/04/02							0.8	25	99	80 - 120
2807574	Conductivity	2012/04/02			100	80 - 120	ND, RDL=1.0	uS/cm	0	25		
2807575	pH	2012/04/02							0	25	100	80 - 120
2807577	Conductivity	2012/04/02			100	80 - 120	ND, RDL=1.0	uS/cm	0.07	25		
2807581	Turbidity	2012/04/02					ND, RDL=0.10	NTU	6.5	25	104	80 - 120
2807733	Total Mercury (Hg)	2012/04/02	103	80 - 120	99	80 - 120	ND, RDL=0.013	ug/L	NC	25	103	80 - 120

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2807906	Nitrogen (Ammonia Nitrogen)	2012/04/03	94	80 - 120	100	80 - 120	ND, RDL=0.050	mg/L	NC	25	101	80 - 120
2807909	Nitrogen (Ammonia Nitrogen)	2012/04/03	97	80 - 120	96	80 - 120	ND, RDL=0.050	mg/L	NC	25	98	80 - 120
2807911	Total Aluminum (Al)	2012/04/02	99	80 - 120	99	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2807911	Total Antimony (Sb)	2012/04/02	114	80 - 120	114	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2807911	Total Arsenic (As)	2012/04/02	99	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2807911	Total Barium (Ba)	2012/04/02	99	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L	4.4	25		
2807911	Total Beryllium (Be)	2012/04/02	100	80 - 120	100	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2807911	Total Bismuth (Bi)	2012/04/02	104	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2807911	Total Boron (B)	2012/04/02	105	80 - 120	103	80 - 120	ND, RDL=50	ug/L	NC	25		
2807911	Total Cadmium (Cd)	2012/04/02	101	80 - 120	99	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2807911	Total Calcium (Ca)	2012/04/02	99	80 - 120	99	80 - 120	ND, RDL=100	ug/L	2.1	25		
2807911	Total Chromium (Cr)	2012/04/02	98	80 - 120	96	80 - 120	ND, RDL=1.0	ug/L	24.5	25		
2807911	Total Cobalt (Co)	2012/04/02	99	80 - 120	98	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2807911	Total Copper (Cu)	2012/04/02	98	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	1.2	25		
2807911	Total Iron (Fe)	2012/04/02	100	80 - 120	97	80 - 120	ND, RDL=50	ug/L	NC	25		
2807911	Total Lead (Pb)	2012/04/02	100	80 - 120	99	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2807911	Total Magnesium (Mg)	2012/04/02	101	80 - 120	99	80 - 120	ND, RDL=100	ug/L	2.4	25		
2807911	Total Manganese (Mn)	2012/04/02	96	80 - 120	94	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2807911	Total Molybdenum (Mo)	2012/04/02	105	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2807911	Total Nickel (Ni)	2012/04/02	97	80 - 120	95	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2807911	Total Phosphorus (P)	2012/04/02	101	80 - 120	100	80 - 120	ND, RDL=100	ug/L	NC	25		
2807911	Total Potassium (K)	2012/04/02	100	80 - 120	98	80 - 120	ND, RDL=100	ug/L	NC	25		
2807911	Total Selenium (Se)	2012/04/02	101	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2807911	Total Silver (Ag)	2012/04/02	99	80 - 120	99	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2807911	Total Sodium (Na)	2012/04/02	99	80 - 120	96	80 - 120	ND, RDL=100	ug/L	3.2	25		
2807911	Total Strontium (Sr)	2012/04/02	97	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2807911	Total Thallium (Tl)	2012/04/02	102	80 - 120	102	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2807911	Total Tin (Sn)	2012/04/02	104	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2807911	Total Titanium (Ti)	2012/04/02	102	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2807911	Total Uranium (U)	2012/04/02	110	80 - 120	109	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2807911	Total Vanadium (V)	2012/04/02	99	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2807911	Total Zinc (Zn)	2012/04/02	100	80 - 120	97	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2808732	Total Alkalinity (Total as CaCO3)	2012/04/04	100	80 - 120	106	80 - 120	ND, RDL=5.0	mg/L	NC	25	106	80 - 120
2808736	Dissolved Chloride (Cl)	2012/04/04	96	80 - 120	95	80 - 120	ND, RDL=1.0	mg/L	0.8	25	95	80 - 120
2808738	Dissolved Sulphate (SO4)	2012/04/03	113	80 - 120	104	80 - 120	ND, RDL=2.0	mg/L	NC	25	102	80 - 120
2808740	Reactive Silica (SiO2)	2012/04/03	97	80 - 120	101	80 - 120	ND, RDL=0.50	mg/L	NC	25	108	75 - 125
2808741	Colour	2012/04/04					ND, RDL=5.0	TCU	NC	25	97	80 - 120
2808743	Orthophosphate (P)	2012/04/04	97	80 - 120	106	80 - 120	ND, RDL=0.010	mg/L	NC	25	106	80 - 120
2808747	Nitrate + Nitrite	2012/04/04	101	80 - 120	101	80 - 120	ND, RDL=0.050	mg/L	NC	25	109	80 - 120

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2808748	Nitrite (N)	2012/04/04	96	80 - 120	105	80 - 120	ND, RDL=0.010	mg/L	NC	25	105	80 - 120
2808749	Total Alkalinity (Total as CaCO3)	2012/04/04	NC	80 - 120	104	80 - 120	ND, RDL=5.0	mg/L	3.5	25	103	80 - 120
2808751	Dissolved Chloride (Cl)	2012/04/04	95	80 - 120	96	80 - 120	ND, RDL=1.0	mg/L	2.7	25	96	80 - 120
2808753	Dissolved Sulphate (SO4)	2012/04/03	102	80 - 120	101	80 - 120	ND, RDL=2.0	mg/L	NC	25	100	80 - 120
2808754	Reactive Silica (SiO2)	2012/04/03	NC	80 - 120	99	80 - 120	ND, RDL=0.50	mg/L	0.8	25	109	75 - 125
2808756	Colour	2012/04/04					ND, RDL=5.0	TCU	NC	25	102	80 - 120
2808757	Orthophosphate (P)	2012/04/04	98	80 - 120	102	80 - 120	ND, RDL=0.010	mg/L	NC	25	108	80 - 120
2808768	Nitrate + Nitrite	2012/04/04	98	80 - 120	103	80 - 120	ND, RDL=0.050	mg/L	NC	25	108	80 - 120
2808769	Nitrite (N)	2012/04/04	100	80 - 120	106	80 - 120	ND, RDL=0.010	mg/L	NC	25	106	80 - 120
2808802	Total Mercury (Hg)	2012/04/03	102	80 - 120	98	80 - 120	ND, RDL=0.013	ug/L	NC	25	96	80 - 120
2811690	Total Organic Carbon (C)	2012/04/05	97	80 - 120	96	80 - 120	ND, RDL=0.50	mg/L	NC	25	100	80 - 120
2811692	Total Organic Carbon (C)	2012/04/05	99	80 - 120	102	80 - 120	ND, RDL=0.50	mg/L	5.0	25	101	80 - 120

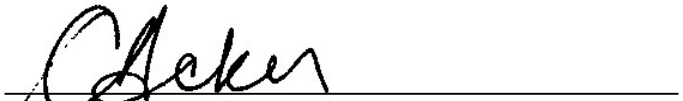
N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel:902-420-0203 Toll-free:800-565-7227 Fax:902-420-8612 www.maxxamanalytics.com

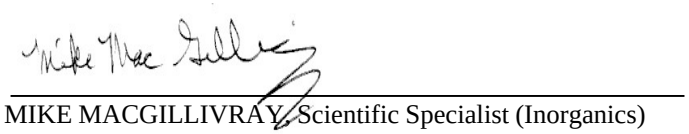
Validation Signature Page

Maxxam Job #: B243968

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



COLLEEN ACKER



MIKE MACGILLIVRAY, Scientific Specialist (Inorganics)

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Round 12

Your P.O. #: 16300R-40
Your Project #: 121510621.100
Site Location: VALENTINE LAKE
Your C.O.C. #: N/A

Attention: Barry Wicks
Stantec Consulting Ltd
St. John's - Standing Offer
607 Torbay Rd
St. John's, NL
A1A 4Y6

Report Date: 2012/05/31

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B274971
Received: 2012/05/24, 10:25

Sample Matrix: Water
Samples Received: 21

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonate, Bicarbonate and Hydroxide (1)	4	N/A	2012/05/25	CAM SOP-00102	APHA 4500-CO2 D
Carbonate, Bicarbonate and Hydroxide (1)	17	N/A	2012/05/28	CAM SOP-00102	APHA 4500-CO2 D
Alkalinity (1)	21	N/A	2012/05/30	ATL SOP 00013	Based on EPA310.2
Chloride (1)	21	N/A	2012/05/30	ATL SOP 00014	Based on SM4500-Cl-
Colour (1)	21	N/A	2012/05/30	ATL SOP 00020	Based on SM2120C
Conductance - water (1)	21	N/A	2012/05/25	ATL SOP 00004/00006	Based on SM2510B
Hardness (calculated as CaCO3) (1)	21	N/A	2012/05/28	ATL SOP 00048	Based on SM2340B
Mercury - Total (CVAA,LL) (1)	21	2012/05/25	2012/05/28	ATL SOP 00026	Based on EPA245.1
Metals Water Total MS (1)	21	2012/05/25	2012/05/25	ATL SOP 00059	Based on EPA6020A
Ion Balance (% Difference) (1)	21	N/A	2012/05/31		
Anion and Cation Sum (1)	21	N/A	2012/05/31		
Nitrogen Ammonia - water (1)	20	N/A	2012/05/30	ATL SOP 00015	Based on USEPA 350.1
Nitrogen Ammonia - water (1)	1	N/A	2012/05/31	ATL SOP 00015	Based on USEPA 350.1
Nitrogen - Nitrate + Nitrite (1)	21	N/A	2012/05/30	ATL SOP 00016	Based on USGS - Enz.
Nitrogen - Nitrite (1)	21	N/A	2012/05/29	ATL SOP 00017	Based on SM4500-NO2B
Nitrogen - Nitrate (as N) (1)	21	N/A	2012/05/30	ATL SOP 00018	Based on ASTMD3867
pH (1)	21	N/A	2012/05/25	ATL SOP 00003	Based on SM4500H+B
Phosphorus - ortho (1)	21	N/A	2012/05/30	ATL SOP 00021	Based on USEPA 365.1
Sat. pH and Langelier Index (@ 20C) (1)	21	N/A	2012/05/31		
Sat. pH and Langelier Index (@ 4C) (1)	21	N/A	2012/05/31		
Reactive Silica (1)	21	N/A	2012/05/29	ATL SOP 00022	Based on EPA 366.0
Sulphate (1)	21	N/A	2012/05/30	ATL SOP 00023	Based on EPA 375.4
Total Dissolved Solids (TDS calc) (1)	21	N/A	2012/05/31		
Organic carbon - Total (TOC) (1)	21	N/A	2012/05/28	ATL SOP 00037	Based on SM5310C
Total Suspended Solids (1)	16	N/A	2012/05/25	ATL SOP 00007	based on EPA 160.2
Total Suspended Solids (1)	5	N/A	2012/05/28	ATL SOP 00007	based on EPA 160.2
Turbidity (1)	21	N/A	2012/05/25	ATL SOP 00011	based on EPA 180.1

Remarks:

Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

(1) This test was performed by Bedford

../2

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Maxxam Job #: B274971
Report Date: 2012/05/31

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

Encryption Key

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

MICHELLE HILL, Project Manager
Email: MHill@maxxam.ca
Phone# (709) 754 0203

==========

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: 2

Maxxam Job #: B274971
Report Date: 2012/05/31

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		NN9369	NN9369	NN9370		NN9371	NN9372			NN9373		
Sampling Date		2012/05/15	2012/05/15	2012/05/15		2012/05/15	2012/05/15			2012/05/15		
	Units	**LP-01**	**LP-01 Lab-Dup**	**LP-02**	**QC Batch**	**LP-03**	**LP-04**	**RDL**	**QC Batch**	**LP-05**	**RDL**	**QC Batch**
Calculated Parameters												
Anion Sum	me/L	0.570		0.300	2858606	0.170	0.230	N/A	2858606	0.320	N/A	2858606
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	23		12	2858602	5.5	9.0	1.0	2858602	14	1.0	2858602
Calculated TDS	mg/L	32.0		16.0	2858611	11.0	12.0	1.0	2858611	18.0	1.0	2858611
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND		ND	2858602	ND	ND	1.0	2858602	ND	1.0	2858602
Cation Sum	me/L	0.670		0.340	2858606	0.200	0.270	N/A	2858606	0.370	N/A	2858606
Hardness (CaCO3)	mg/L	24		12	2858604	5.9	11	1.0	2858604	15	1.0	2858604
Ion Balance (% Difference)	%	8.06		6.25	2858605	8.11	8.00	N/A	2858605	7.25	N/A	2858605
Langelier Index (@ 20C)	N/A	-1.68		-2.60	2858609	-3.78	-2.94		2858609	-2.42		2858609
Langelier Index (@ 4C)	N/A	-1.94		-2.85	2858610	-4.03	-3.20		2858610	-2.68		2858610
Nitrate (N)	mg/L	ND		ND	2858607	0.052	ND	0.050	2859329	ND	0.050	2859329
Saturation pH (@ 20C)	N/A	9.04		9.64	2858609	10.3	9.79		2858609	9.43		2858609
Saturation pH (@ 4C)	N/A	9.30		9.89	2858610	10.5	10.0		2858610	9.69		2858610
Inorganics												
Total Alkalinity (Total as CaCO3)	mg/L	23	23	12	2863121	5.5	9.0	5.0	2863121	14	5.0	2863121
Dissolved Chloride (Cl)	mg/L	3.9	3.8	2.3	2863150	2.0	1.6	1.0	2863150	1.7	1.0	2863150
Colour	TCU	33	33	47	2863155	25	49	5.0	2863155	57	25	2863155
Nitrate + Nitrite	mg/L	ND	ND	ND	2863158	0.052	ND	0.050	2863158	ND	0.050	2863158
Nitrite (N)	mg/L	ND	ND	ND	2863162	ND	ND	0.010	2863162	ND	0.010	2863162
Nitrogen (Ammonia Nitrogen)	mg/L	ND		ND	2864498	ND	ND	0.050	2864498	ND	0.050	2864498
Total Organic Carbon (C)	mg/L	6.8		6.2	2862003	3.3	6.2	0.50	2862003	6.9	0.50	2862011
Orthophosphate (P)	mg/L	ND	ND	ND	2863156	ND	ND	0.010	2863156	ND	0.010	2863156
pH	pH	7.36	7.40	7.04	2859865	6.52	6.85	N/A	2859865	7.01	N/A	2860367
Reactive Silica (SiO2)	mg/L	ND	ND	ND	2863154	1.8	ND	0.50	2863154	0.67	0.50	2863154
Total Suspended Solids	mg/L	4.0		1.8	2859909	3.6	1.6	1.0	2859909	1.0	1.0	2859909
Dissolved Sulphate (SO4)	mg/L	ND	ND	ND	2863153	ND	ND	2.0	2863153	ND	2.0	2863153
Turbidity	NTU	6.0		1.3	2859881	0.53	0.31	0.10	2859881	0.41	0.10	2859882
Conductivity	uS/cm	58	59	31	2859866	21	24	1.0	2859866	35	1.0	2860368

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B274971
Report Date: 2012/05/31

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		NN9374		NN9375	NN9376	NN9376		NN9377		NN9378	NN9379		
Sampling Date		2012/05/15		2012/05/18	2012/05/18	2012/05/18		2012/05/18		2012/05/18	2012/05/18		
	Units	**VL01**	**QC Batch**	**R01**	**R02**	**R02 Lab-Dup**	**RDL**	**R03**	**RDL**	**R04**	**R05**	**RDL**	**QC Batch**
Calculated Parameters													
Anion Sum	me/L	0.210	2858606	0.250	0.240		N/A	0.260	N/A	0.200	0.220	N/A	2858606
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	8.1	2858602	10	9.8		1.0	11	1.0	7.7	8.4	1.0	2858602
Calculated TDS	mg/L	13.0	2858611	15.0	14.0		1.0	16.0	1.0	14.0	12.0	1.0	2858611
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	2858602	ND	ND		1.0	ND	1.0	ND	ND	1.0	2858602
Cation Sum	me/L	0.240	2858606	0.270	0.270		N/A	0.300	N/A	0.240	0.230	N/A	2858606
Hardness (CaCO3)	mg/L	8.5	2858604	10	10		1.0	12	1.0	8.8	8.4	1.0	2858604
Ion Balance (% Difference)	%	6.67	2858605	3.85	5.88		N/A	7.14	N/A	9.09	2.22	N/A	2858605
Langelier Index (@ 20C)	N/A	-3.19	2858609	-2.90	-2.81			-2.80		-3.37	-2.96		2858609
Langelier Index (@ 4C)	N/A	-3.45	2858610	-3.16	-3.07			-3.05		-3.62	-3.21		2858610
Nitrate (N)	mg/L	ND	2859329	ND	ND		0.050	ND	0.050	ND	ND	0.050	2859329
Saturation pH (@ 20C)	N/A	9.92	2858609	9.73	9.75			9.66		9.92	9.90		2858609
Saturation pH (@ 4C)	N/A	10.2	2858610	9.99	10.0			9.91		10.2	10.2		2858610
Inorganics													
Total Alkalinity (Total as CaCO3)	mg/L	8.1	2863121	10	9.8		5.0	11	5.0	7.7	8.4	5.0	2863121
Dissolved Chloride (Cl)	mg/L	1.9	2863150	1.5	1.7		1.0	1.4	1.0	1.7	1.7	1.0	2863150
Colour	TCU	31	2863155	42	49		5.0	53	10	48	10	5.0	2863155
Nitrate + Nitrite	mg/L	ND	2863158	ND	ND		0.050	ND	0.050	ND	ND	0.050	2863158
Nitrite (N)	mg/L	ND	2863162	ND	ND		0.010	ND	0.010	ND	ND	0.010	2863162
Nitrogen (Ammonia Nitrogen)	mg/L	ND	2864661	ND	ND		0.050	ND	0.050	ND	ND	0.050	2864499
Total Organic Carbon (C)	mg/L	5.9	2862011	7.0	7.2		0.50	7.5	0.50	7.6	3.2	0.50	2862011
Orthophosphate (P)	mg/L	ND	2863156	ND	ND		0.010	ND	0.010	ND	ND	0.010	2863156
pH	pH	6.73	2860367	6.83	6.94	6.94	N/A	6.86	N/A	6.55	6.94	N/A	2860367
Reactive Silica (SiO2)	mg/L	1.6	2863154	1.7	1.5		0.50	2.0	0.50	2.3	0.63	0.50	2863154
Total Suspended Solids	mg/L	1.2	2859909	2.0	ND		1.0	ND	1.0	ND	2.8	1.0	2859909
Dissolved Sulphate (SO4)	mg/L	ND	2863153	ND	ND		2.0	ND	2.0	ND	ND	2.0	2863153
Turbidity	NTU	0.71	2859882	ND	0.24		0.10	0.23	0.10	ND	0.18	0.10	2859882
Conductivity	uS/cm	23	2860368	25	25	25	1.0	26	1.0	22	23	1.0	2860368

N/A = Not Applicable
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QC Batch = Quality Control Batch

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Maxxam Job #: B274971
Report Date: 2012/05/31

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		NN9380	NN9381	NN9382		NN9383	NN9383			NN9384	NN9384		
Sampling Date		2012/05/18	2012/05/18	2012/05/18		2012/05/18	2012/05/18			2012/05/18	2012/05/18		
	Units	**VE1**	**VE2**	**VE3**	**RDL**	**VE4**	**VE4 Lab-Dup**	**RDL**	**QC Batch**	**VE5**	**VE5 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters													
Anion Sum	me/L	0.260	0.230	0.220	N/A	0.190		N/A	2858606	0.270		N/A	2858606
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	11	9.4	8.5	1.0	7.0		1.0	2858602	11		1.0	2858602
Calculated TDS	mg/L	16.0	16.0	13.0	1.0	10.0		1.0	2858611	18.0		1.0	2858611
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	ND	ND	1.0	ND		1.0	2858602	ND		1.0	2858602
Cation Sum	me/L	0.290	0.310	0.250	N/A	0.210		N/A	2858606	0.300		N/A	2858606
Hardness (CaCO3)	mg/L	11	10	8.8	1.0	6.9		1.0	2858604	11		1.0	2858604
Ion Balance (% Difference)	%	5.45	14.8	6.38	N/A	5.00		N/A	2858605	5.26		N/A	2858605
Langelier Index (@ 20C)	N/A	-2.88	-2.98	-3.08		-3.46			2858609	-2.94			2858609
Langelier Index (@ 4C)	N/A	-3.14	-3.23	-3.33		-3.72			2858610	-3.19			2858610
Nitrate (N)	mg/L	ND	ND	ND	0.050	ND		0.050	2859329	0.069		0.050	2859329
Saturation pH (@ 20C)	N/A	9.71	9.79	9.90		10.1			2858609	9.72			2858609
Saturation pH (@ 4C)	N/A	9.97	10.0	10.2		10.3			2858610	9.97			2858610
Inorganics													
Total Alkalinity (Total as CaCO3)	mg/L	11	9.4	8.5	5.0	7.0		5.0	2863121	11	12	5.0	2863164
Dissolved Chloride (Cl)	mg/L	1.6	1.6	1.6	1.0	1.6		1.0	2863150	1.6	1.8	1.0	2863167
Colour	TCU	37	35	37	5.0	49		10	2863155	35	35	5.0	2863175
Nitrate + Nitrite	mg/L	ND	ND	ND	0.050	ND		0.050	2863158	0.069	0.069	0.050	2863185
Nitrite (N)	mg/L	ND	ND	ND	0.010	ND		0.010	2863162	ND	ND	0.010	2863187
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	ND	0.050	ND		0.050	2864499	ND		0.050	2864499
Total Organic Carbon (C)	mg/L	6.4	6.6	6.7	0.50	7.6	7.7	0.50	2862011	7.4		0.50	2862011
Orthophosphate (P)	mg/L	ND	ND	ND	0.010	ND		0.010	2863156	ND	ND	0.010	2863180
pH	pH	6.83	6.81	6.82	N/A	6.60		N/A	2860367	6.78		N/A	2860367
Reactive Silica (SiO2)	mg/L	2.1	1.5	1.0	0.50	ND		0.50	2863154	3.3	3.3	0.50	2863173
Total Suspended Solids	mg/L	ND	2.0	ND	1.0	3.6		1.0	2859909	ND		1.0	2859909
Dissolved Sulphate (SO4)	mg/L	ND	ND	ND	2.0	ND		2.0	2863153	ND	ND	2.0	2863170
Turbidity	NTU	0.13	1.2	0.28	0.10	0.87		0.10	2859882	ND		0.10	2859882
Conductivity	uS/cm	26	24	22	1.0	19		1.0	2860368	28		1.0	2860368

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B274971
Report Date: 2012/05/31

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		NN9385	NN9385		NN9386		NN9387	NN9388		NN9389	NN9389		
Sampling Date		2012/05/18	2012/05/18		2012/05/18		2012/05/18	2012/05/18		2012/05/18	2012/05/18		
	Units	**VE6**	**VE6 Lab-Dup**	**RDL**	**VE7**	**RDL**	**VE8**	**VE9**	**QC Batch**	**VE10**	**VE10 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters													
Anion Sum	me/L	0.280		N/A	0.290	N/A	0.160	0.270	2858606	0.260		N/A	2858606
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	12		1.0	12	1.0	5.6	11	2858602	11		1.0	2858602
Calculated TDS	mg/L	18.0		1.0	19.0	1.0	11.0	17.0	2858611	16.0		1.0	2858611
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND		1.0	ND	1.0	ND	ND	2858602	ND		1.0	2858602
Cation Sum	me/L	0.360		N/A	0.390	N/A	0.200	0.340	2858606	0.300		N/A	2858606
Hardness (CaCO3)	mg/L	14		1.0	15	1.0	6.4	12	2858604	11		1.0	2858604
Ion Balance (% Difference)	%	12.5		N/A	14.7	N/A	11.1	11.5	2858605	7.14		N/A	2858605
Langelier Index (@ 20C)	N/A	-2.69			-2.70		-4.22	-2.94	2858609	-3.18			2858609
Langelier Index (@ 4C)	N/A	-2.94			-2.96		-4.48	-3.20	2858610	-3.43			2858610
Nitrate (N)	mg/L	ND		0.050	ND	0.050	0.16	ND	2859329	ND		0.050	2859329
Saturation pH (@ 20C)	N/A	9.57			9.53		10.3	9.69	2858609	9.77			2858609
Saturation pH (@ 4C)	N/A	9.82			9.79		10.5	9.95	2858610	10.0			2858610
Inorganics													
Total Alkalinity (Total as CaCO3)	mg/L	12		5.0	12	5.0	5.6	11	2863164	11		5.0	2863164
Dissolved Chloride (Cl)	mg/L	1.8		1.0	1.7	1.0	1.2	1.4	2863167	1.7		1.0	2863167
Colour	TCU	57		25	56	10	41	45	2863175	40		5.0	2863175
Nitrate + Nitrite	mg/L	ND		0.050	ND	0.050	0.16	ND	2863185	ND		0.050	2863185
Nitrite (N)	mg/L	ND		0.010	ND	0.010	ND	ND	2863187	ND		0.010	2863187
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	0.050	ND	0.050	ND	ND	2864499	ND		0.050	2864499
Total Organic Carbon (C)	mg/L	9.3		0.50	8.8	0.50	10	9.1	2862011	8.8		0.50	2862011
Orthophosphate (P)	mg/L	ND		0.010	ND	0.010	ND	ND	2863180	ND		0.010	2863180
pH	pH	6.88		N/A	6.83	N/A	6.06	6.75	2860367	6.59	6.56	N/A	2860369
Reactive Silica (SiO2)	mg/L	2.4		0.50	2.6	0.50	1.9	1.9	2863173	2.2		0.50	2863173
Total Suspended Solids	mg/L	1.6		1.0	ND	1.0	ND	ND	2859905	2.4		1.0	2859905
Dissolved Sulphate (SO4)	mg/L	ND		2.0	ND	2.0	ND	ND	2863170	ND		2.0	2863170
Turbidity	NTU	0.60	0.51	0.10	0.33	0.10	ND	0.15	2859882	ND		0.10	2859882
Conductivity	uS/cm	32		1.0	32	1.0	19	27	2860368	26	26	1.0	2860380

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B274971
Report Date: 2012/05/31

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		NN9369	NN9370	NN9371	NN9372		NN9373	NN9373	NN9374	NN9375	NN9376		
Sampling Date		2012/05/15	2012/05/15	2012/05/15	2012/05/15		2012/05/15	2012/05/15	2012/05/15	2012/05/18	2012/05/18		
	Units	**LP-01**	**LP-02**	**LP-03**	**LP-04**	**QC Batch**	**LP-05**	**LP-05 Lab-Dup**	**VL01**	**R01**	**R02**	**RDL**	**QC Batch**
Metals													
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	2861904	ND	ND	ND	ND	ND	0.013	2861906

Maxxam ID		NN9377	NN9378	NN9379	NN9380	NN9381	NN9382	NN9383		
Sampling Date		2012/05/18	2012/05/18	2012/05/18	2012/05/18	2012/05/18	2012/05/18	2012/05/18		
	Units	**R03**	**R04**	**R05**	**VE1**	**VE2**	**VE3**	**VE4**	**RDL**	**QC Batch**
Metals										
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.013	2861906

Maxxam ID		NN9384	NN9385	NN9386	NN9387	NN9388	NN9389		
Sampling Date		2012/05/18	2012/05/18	2012/05/18	2012/05/18	2012/05/18	2012/05/18		
	Units	**VE5**	**VE6**	**VE7**	**VE8**	**VE9**	**VE10**	**RDL**	**QC Batch**
Metals									
Total Mercury (Hg)	ug/L	0.015	ND	ND	0.013	0.015	ND	0.013	2861906

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Stantec Consulting Ltd
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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		NN9369	NN9370	NN9371	NN9372		NN9373	NN9373	NN9374	NN9375	NN9376		
Sampling Date		2012/05/15	2012/05/15	2012/05/15	2012/05/15		2012/05/15	2012/05/15	2012/05/15	2012/05/18	2012/05/18		
	Units	**LP-01**	**LP-02**	**LP-03**	**LP-04**	**QC Batch**	**LP-05**	**LP-05 Lab-Dup**	**VL01**	**R01**	**R02**	**RDL**	**QC Batch**
Metals													
Total Aluminum (Al)	ug/L	504	156	101	126	2859927	95.3	92.8	119	64.8	63.0	5.0	2860105
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	2859927	ND	ND	ND	ND	ND	1.0	2860105
Total Arsenic (As)	ug/L	1.0	1.1	ND	ND	2859927	ND	ND	1.7	3.8	2.7	1.0	2860105
Total Barium (Ba)	ug/L	6.8	3.4	2.9	1.3	2859927	1.2	1.1	1.7	1.3	ND	1.0	2860105
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	2859927	ND	ND	ND	ND	ND	1.0	2860105
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	2859927	ND	ND	ND	ND	ND	2.0	2860105
Total Boron (B)	ug/L	ND	ND	ND	ND	2859927	ND	ND	ND	ND	ND	50	2860105
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	2859927	ND	ND	2.25	0.038	ND	0.017	2860105
Total Calcium (Ca)	ug/L	7720	3740	1710	3300	2859927	5020	4870	2740	3330	3350	100	2860105
Total Chromium (Cr)	ug/L	ND	ND	ND	1.8	2859927	ND	ND	ND	ND	ND	1.0	2860105
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	2859927	ND	ND	ND	ND	ND	0.40	2860105
Total Copper (Cu)	ug/L	ND	ND	ND	ND	2859927	ND	ND	ND	ND	ND	2.0	2860105
Total Iron (Fe)	ug/L	725	292	138	122	2859927	120	119	117	157	132	50	2860105
Total Lead (Pb)	ug/L	ND	ND	ND	ND	2859927	ND	ND	ND	ND	ND	0.50	2860105
Total Magnesium (Mg)	ug/L	1050	547	401	556	2859927	703	695	415	443	435	100	2860105
Total Manganese (Mn)	ug/L	79.9	17.4	15.4	24.9	2859927	17.2	17.0	36.3	44.7	22.9	2.0	2860105
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	2859927	ND	ND	ND	ND	ND	2.0	2860105
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	2859927	ND	ND	ND	ND	ND	2.0	2860105
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	2859927	ND	ND	ND	ND	ND	100	2860105
Total Potassium (K)	ug/L	817	385	221	192	2859927	158	155	157	121	ND	100	2860105
Total Selenium (Se)	ug/L	ND	ND	ND	ND	2859927	ND	ND	ND	ND	ND	1.0	2860105
Total Silver (Ag)	ug/L	ND	ND	ND	ND	2859927	ND	ND	ND	ND	ND	0.10	2860105
Total Sodium (Na)	ug/L	3560	2090	1720	1240	2859927	1330	1290	1330	1420	1330	100	2860105
Total Strontium (Sr)	ug/L	53.2	26.9	5.7	6.4	2859927	13.5	13.0	6.7	7.1	6.4	2.0	2860105
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	2859927	ND	ND	ND	ND	ND	0.10	2860105
Total Tin (Sn)	ug/L	ND	ND	ND	ND	2859927	ND	ND	ND	ND	ND	2.0	2860105
Total Titanium (Ti)	ug/L	13.5	2.3	11.9	ND	2859927	ND	ND	2.9	ND	ND	2.0	2860105
Total Uranium (U)	ug/L	0.10	ND	ND	ND	2859927	ND	ND	ND	ND	ND	0.10	2860105
Total Vanadium (V)	ug/L	ND	ND	ND	ND	2859927	ND	ND	ND	ND	ND	2.0	2860105
Total Zinc (Zn)	ug/L	ND	5.1	ND	ND	2859927	ND	ND	12.1	5.2	ND	5.0	2860105

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Maxxam Job #: B274971
Report Date: 2012/05/31

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		NN9377	NN9378	NN9379	NN9380	NN9381	NN9382	NN9383		
Sampling Date		2012/05/18	2012/05/18	2012/05/18	2012/05/18	2012/05/18	2012/05/18	2012/05/18		
	Units	**R03**	**R04**	**R05**	**VE1**	**VE2**	**VE3**	**VE4**	**RDL**	**QC Batch**
Metals										
Total Aluminum (Al)	ug/L	95.3	89.8	24.2	63.3	337	69.5	97.3	5.0	2860105
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	2860105
Total Arsenic (As)	ug/L	1.6	ND	ND	ND	1.3	ND	ND	1.0	2860105
Total Barium (Ba)	ug/L	1.3	1.3	5.5	1.2	8.4	1.0	1.5	1.0	2860105
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	2860105
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2860105
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	ND	50	2860105
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	0.049	ND	ND	0.017	2860105
Total Calcium (Ca)	ug/L	3800	2890	2760	3360	3240	2750	2250	100	2860105
Total Chromium (Cr)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	2860105
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	0.54	ND	ND	0.40	2860105
Total Copper (Cu)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2860105
Total Iron (Fe)	ug/L	144	71	ND	112	799	115	223	50	2860105
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.50	2860105
Total Magnesium (Mg)	ug/L	491	383	379	559	531	461	319	100	2860105
Total Manganese (Mn)	ug/L	37.7	14.9	18.7	20.8	996	37.5	109	2.0	2860105
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2860105
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2860105
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	ND	100	2860105
Total Potassium (K)	ug/L	102	134	139	166	246	194	166	100	2860105
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	ND	1.0	2860105
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.10	2860105
Total Sodium (Na)	ug/L	1510	1440	1290	1530	1540	1430	1270	100	2860105
Total Strontium (Sr)	ug/L	6.7	4.5	6.7	8.1	8.9	7.3	6.6	2.0	2860105
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.10	2860105
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2860105
Total Titanium (Ti)	ug/L	ND	ND	ND	ND	8.8	ND	ND	2.0	2860105
Total Uranium (U)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.10	2860105
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	ND	2.0	2860105
Total Zinc (Zn)	ug/L	ND	5.7	ND	ND	15.0	8.7	6.0	5.0	2860105

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Stantec Consulting Ltd
Client Project #: 121510621.100
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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		NN9384	NN9385	NN9386	NN9387	NN9388	NN9389		
Sampling Date		2012/05/18	2012/05/18	2012/05/18	2012/05/18	2012/05/18	2012/05/18		
	Units	**VE5**	**VE6**	**VE7**	**VE8**	**VE9**	**VE10**	**RDL**	**QC Batch**
Metals									
Total Aluminum (Al)	ug/L	91.5	127	134	125	157	105	5.0	2860105
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2860105
Total Arsenic (As)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2860105
Total Barium (Ba)	ug/L	1.5	1.4	1.6	ND	2.0	1.8	1.0	2860105
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2860105
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2860105
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	50	2860105
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	0.439	0.936	0.017	2860105
Total Calcium (Ca)	ug/L	3320	4390	4560	1720	3390	3060	100	2860105
Total Chromium (Cr)	ug/L	ND	ND	ND	ND	ND	1.3	1.0	2860105
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	ND	ND	0.40	2860105
Total Copper (Cu)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2860105
Total Iron (Fe)	ug/L	121	167	156	220	143	167	50	2860105
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	ND	0.50	2860105
Total Magnesium (Mg)	ug/L	695	693	769	504	910	762	100	2860105
Total Manganese (Mn)	ug/L	30.7	53.4	69.8	56.4	176	58.8	2.0	2860105
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2860105
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2860105
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	100	2860105
Total Potassium (K)	ug/L	193	226	242	259	179	124	100	2860105
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	1.0	2860105
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	0.10	2860105
Total Sodium (Na)	ug/L	1640	1620	1910	1420	1930	1740	100	2860105
Total Strontium (Sr)	ug/L	7.6	9.5	10.2	4.1	9.8	6.6	2.0	2860105
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	0.10	2860105
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2860105
Total Titanium (Ti)	ug/L	ND	2.6	2.7	2.1	2.5	ND	2.0	2860105
Total Uranium (U)	ug/L	ND	ND	ND	ND	ND	ND	0.10	2860105
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	2.0	2860105
Total Zinc (Zn)	ug/L	ND	6.9	5.0	ND	6.4	6.1	5.0	2860105

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GENERAL COMMENTS

Sample NN9369-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample NN9370-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample NN9371-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample NN9372-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample NN9373-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample NN9374-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample NN9376-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample NN9377-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample NN9378-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample NN9380-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample NN9381-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample NN9382-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample NN9384-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample NN9385-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample NN9386-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample NN9387-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample NN9388-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample NN9389-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2859865	pH	2012/05/25							0.5	25	100	80 - 120
2859866	Conductivity	2012/05/25			100	80 - 120	ND, RDL=1.0	uS/cm	0.3	25		
2859881	Turbidity	2012/05/25					ND, RDL=0.10	NTU	NC	25	104	80 - 120
2859882	Turbidity	2012/05/25					ND, RDL=0.10	NTU	16.2	25	103	80 - 120
2859905	Total Suspended Solids	2012/05/28					ND, RDL=1.0	mg/L	4.3	25	99	80 - 120
2859909	Total Suspended Solids	2012/05/25					ND, RDL=1.0	mg/L	1	25	102	80 - 120
2859927	Total Aluminum (Al)	2012/05/25	99	80 - 120	105	80 - 120	ND, RDL=5.0	ug/L				
2859927	Total Antimony (Sb)	2012/05/25	109	80 - 120	109	80 - 120	ND, RDL=1.0	ug/L				
2859927	Total Arsenic (As)	2012/05/25	104	80 - 120	105	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2859927	Total Barium (Ba)	2012/05/25	103	80 - 120	104	80 - 120	ND, RDL=1.0	ug/L				
2859927	Total Beryllium (Be)	2012/05/25	106	80 - 120	106	80 - 120	ND, RDL=1.0	ug/L				
2859927	Total Bismuth (Bi)	2012/05/25	108	80 - 120	108	80 - 120	ND, RDL=2.0	ug/L				
2859927	Total Boron (B)	2012/05/25	108	80 - 120	107	80 - 120	ND, RDL=50	ug/L				
2859927	Total Cadmium (Cd)	2012/05/25	107	80 - 120	106	80 - 120	ND, RDL=0.017	ug/L				
2859927	Total Calcium (Ca)	2012/05/25	105	80 - 120	105	80 - 120	ND, RDL=100	ug/L				
2859927	Total Chromium (Cr)	2012/05/25	104	80 - 120	106	80 - 120	ND, RDL=1.0	ug/L				
2859927	Total Cobalt (Co)	2012/05/25	106	80 - 120	108	80 - 120	ND, RDL=0.40	ug/L				
2859927	Total Copper (Cu)	2012/05/25	105	80 - 120	107	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2859927	Total Iron (Fe)	2012/05/25	105	80 - 120	114	80 - 120	ND, RDL=50	ug/L				
2859927	Total Lead (Pb)	2012/05/25	104	80 - 120	105	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2859927	Total Magnesium (Mg)	2012/05/25	104	80 - 120	108	80 - 120	ND, RDL=100	ug/L				
2859927	Total Manganese (Mn)	2012/05/25	NC	80 - 120	104	80 - 120	ND, RDL=2.0	ug/L	4.1	25		
2859927	Total Molybdenum (Mo)	2012/05/25	109	80 - 120	109	80 - 120	ND, RDL=2.0	ug/L				
2859927	Total Nickel (Ni)	2012/05/25	106	80 - 120	107	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2859927	Total Phosphorus (P)	2012/05/25	104	80 - 120	106	80 - 120	ND, RDL=100	ug/L				
2859927	Total Potassium (K)	2012/05/25	102	80 - 120	106	80 - 120	ND, RDL=100	ug/L				
2859927	Total Selenium (Se)	2012/05/25	106	80 - 120	105	80 - 120	ND, RDL=1.0	ug/L				
2859927	Total Silver (Ag)	2012/05/25	106	80 - 120	107	80 - 120	ND, RDL=0.10	ug/L				
2859927	Total Sodium (Na)	2012/05/25	103	80 - 120	107	80 - 120	ND, RDL=100	ug/L				
2859927	Total Strontium (Sr)	2012/05/25	104	80 - 120	105	80 - 120	ND, RDL=2.0	ug/L				
2859927	Total Thallium (Tl)	2012/05/25	107	80 - 120	107	80 - 120	ND, RDL=0.10	ug/L				
2859927	Total Tin (Sn)	2012/05/25	111	80 - 120	110	80 - 120	ND, RDL=2.0	ug/L				
2859927	Total Titanium (Ti)	2012/05/25	108	80 - 120	108	80 - 120	ND, RDL=2.0	ug/L				
2859927	Total Uranium (U)	2012/05/25	115	80 - 120	116	80 - 120	ND, RDL=0.10	ug/L				
2859927	Total Vanadium (V)	2012/05/25	104	80 - 120	106	80 - 120	ND, RDL=2.0	ug/L				
2859927	Total Zinc (Zn)	2012/05/25	108	80 - 120	109	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2860105	Total Aluminum (Al)	2012/05/25	103	80 - 120	103	80 - 120	ND, RDL=5.0	ug/L	2.6	25		
2860105	Total Antimony (Sb)	2012/05/25	104	80 - 120	103	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2860105	Total Arsenic (As)	2012/05/25	101	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	NC	25		

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Maxxam Job #: B274971
Report Date: 2012/05/31

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2860105	Total Barium (Ba)	2012/05/25	94	80 - 120	94	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2860105	Total Beryllium (Be)	2012/05/25	102	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2860105	Total Bismuth (Bi)	2012/05/25	103	80 - 120	101	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2860105	Total Boron (B)	2012/05/25	103	80 - 120	100	80 - 120	ND, RDL=50	ug/L	NC	25		
2860105	Total Cadmium (Cd)	2012/05/25	100	80 - 120	97	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2860105	Total Calcium (Ca)	2012/05/25	100	80 - 120	101	80 - 120	ND, RDL=100	ug/L	3.1	25		
2860105	Total Chromium (Cr)	2012/05/25	98	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2860105	Total Cobalt (Co)	2012/05/25	100	80 - 120	97	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2860105	Total Copper (Cu)	2012/05/25	97	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2860105	Total Iron (Fe)	2012/05/25	104	80 - 120	103	80 - 120	ND, RDL=50	ug/L	NC	25		
2860105	Total Lead (Pb)	2012/05/25	98	80 - 120	98	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2860105	Total Magnesium (Mg)	2012/05/25	105	80 - 120	103	80 - 120	ND, RDL=100	ug/L	1.2	25		
2860105	Total Manganese (Mn)	2012/05/25	94	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	1.3	25		
2860105	Total Molybdenum (Mo)	2012/05/25	103	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2860105	Total Nickel (Ni)	2012/05/25	103	80 - 120	101	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2860105	Total Phosphorus (P)	2012/05/25	105	80 - 120	104	80 - 120	ND, RDL=100	ug/L	NC	25		
2860105	Total Potassium (K)	2012/05/25	102	80 - 120	101	80 - 120	ND, RDL=100	ug/L	NC	25		
2860105	Total Selenium (Se)	2012/05/25	102	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2860105	Total Silver (Ag)	2012/05/25	102	80 - 120	100	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2860105	Total Sodium (Na)	2012/05/25	102	80 - 120	103	80 - 120	ND, RDL=100	ug/L	3.1	25		
2860105	Total Strontium (Sr)	2012/05/25	NC	80 - 120	95	80 - 120	ND, RDL=2.0	ug/L	3.7	25		
2860105	Total Thallium (Tl)	2012/05/25	102	80 - 120	101	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2860105	Total Tin (Sn)	2012/05/25	104	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2860105	Total Titanium (Ti)	2012/05/25	105	80 - 120	101	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2860105	Total Uranium (U)	2012/05/25	111	80 - 120	109	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2860105	Total Vanadium (V)	2012/05/25	102	80 - 120	100	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2860105	Total Zinc (Zn)	2012/05/25	100	80 - 120	100	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2860367	pH	2012/05/25							0	25	100	80 - 120
2860368	Conductivity	2012/05/25			102	80 - 120	ND, RDL=1.0	uS/cm	0.4	25		
2860369	pH	2012/05/25							0.5	25	100	80 - 120
2860380	Conductivity	2012/05/25			101	80 - 120	ND, RDL=1.0	uS/cm	0.4	25		
2861904	Total Mercury (Hg)	2012/05/28	90	80 - 120	99	80 - 120	ND, RDL=0.013	ug/L	NC	25	96	80 - 120
2861906	Total Mercury (Hg)	2012/05/28	103	80 - 120	102	80 - 120	ND, RDL=0.013	ug/L	NC	25	103	80 - 120
2862003	Total Organic Carbon (C)	2012/05/28	101	80 - 120	98	80 - 120	ND, RDL=0.50	mg/L	0.7	25	92	80 - 120
2862011	Total Organic Carbon (C)	2012/05/28	NC	80 - 120	103	80 - 120	ND, RDL=0.50	mg/L	0.7	25	92	80 - 120
2863121	Total Alkalinity (Total as CaCO3)	2012/05/30	NC	80 - 120	110	80 - 120	ND, RDL=5.0	mg/L	NC	25	102	80 - 120
2863150	Dissolved Chloride (Cl)	2012/05/30	101	80 - 120	105	80 - 120	ND, RDL=1.0	mg/L	NC	25	100	80 - 120
2863153	Dissolved Sulphate (SO4)	2012/05/30	115	80 - 120	110	80 - 120	ND, RDL=2.0	mg/L	NC	25	104	80 - 120
2863154	Reactive Silica (SiO2)	2012/05/29	111	80 - 120	113	80 - 120	ND, RDL=0.50	mg/L	NC	25	112	75 - 125

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Maxxam Job #: B274971
Report Date: 2012/05/31

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2863155	Colour	2012/05/30					ND, RDL=5.0	TCU	0.3	25	100	80 - 120
2863156	Orthophosphate (P)	2012/05/30	90	80 - 120	99	80 - 120	ND, RDL=0.010	mg/L	NC	25	101	80 - 120
2863158	Nitrate + Nitrite	2012/05/30	100	80 - 120	98	80 - 120	ND, RDL=0.050	mg/L	NC	25	100	80 - 120
2863162	Nitrite (N)	2012/05/29	99	80 - 120	105	80 - 120	ND, RDL=0.010	mg/L	NC	25	104	80 - 120
2863164	Total Alkalinity (Total as CaCO3)	2012/05/30	102	80 - 120	108	80 - 120	ND, RDL=5.0	mg/L	NC	25	105	80 - 120
2863167	Dissolved Chloride (Cl)	2012/05/30	101	80 - 120	102	80 - 120	ND, RDL=1.0	mg/L	NC	25	99	80 - 120
2863170	Dissolved Sulphate (SO4)	2012/05/30	114	80 - 120	108	80 - 120	ND, RDL=2.0	mg/L	NC	25	106	80 - 120
2863173	Reactive Silica (SiO2)	2012/05/29	112	80 - 120	113	80 - 120	ND, RDL=0.50	mg/L	0.3	25	113	75 - 125
2863175	Colour	2012/05/30					ND, RDL=5.0	TCU	0.03	25	98	80 - 120
2863180	Orthophosphate (P)	2012/05/30	94	80 - 120	96	80 - 120	ND, RDL=0.010	mg/L	NC	25	94	80 - 120
2863185	Nitrate + Nitrite	2012/05/30	99	80 - 120	97	80 - 120	ND, RDL=0.050	mg/L	NC	25	101	80 - 120
2863187	Nitrite (N)	2012/05/29	92	80 - 120	105	80 - 120	ND, RDL=0.010	mg/L	NC	25	104	80 - 120
2864498	Nitrogen (Ammonia Nitrogen)	2012/05/30	99	80 - 120	98	80 - 120	ND, RDL=0.050	mg/L	NC	25	106	80 - 120
2864499	Nitrogen (Ammonia Nitrogen)	2012/05/30	95	80 - 120	98	80 - 120	ND, RDL=0.050	mg/L	NC	25	102	80 - 120
2864661	Nitrogen (Ammonia Nitrogen)	2012/05/31	NC	80 - 120	98	80 - 120	ND, RDL=0.050	mg/L	0.9	25	105	80 - 120

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

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Validation Signature Page

Maxxam Job #: B274971

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

MIKE MACGILLIVRAY, Scientific Specialist (Inorganics)

KEVIN MACDONALD, Inorganics Supervisor

==========

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Round 13

Your P.O. #: 16300R-40
Your Project #: 121510621.100
Site Location: VALENTINE LAKE
Your C.O.C. #: N/A

Attention: Barry Wicks
Stantec Consulting Ltd
St. John's - Standing Offer
607 Torbay Rd
St. John's, NL
A1A 4Y6

Report Date: 2012/07/04

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B295466
Received: 2012/06/27, 09:32

Sample Matrix: Water
Samples Received: 20

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonate, Bicarbonate and Hydroxide (1)	18	N/A	2012/06/29	CAM SOP-00102	APHA 4500-CO2 D
Carbonate, Bicarbonate and Hydroxide (1)	2	N/A	2012/07/03	CAM SOP-00102	APHA 4500-CO2 D
Alkalinity (1)	20	N/A	2012/07/03	ATL SOP 00013	Based on EPA310.2
Chloride (1)	20	N/A	2012/07/03	ATL SOP 00014	Based on SM4500-Cl-
Colour (1)	20	N/A	2012/07/03	ATL SOP 00020	Based on SM2120C
Conductance - water (1)	20	N/A	2012/06/29	ATL SOP 00004/00006	Based on SM2510B
Hardness (calculated as CaCO3) (1)	4	N/A	2012/07/03	ATL SOP 00048	Based on SM2340B
Hardness (calculated as CaCO3) (1)	16	N/A	2012/07/04	ATL SOP 00048	Based on SM2340B
Mercury - Total (CVAA,LL) (1)	20	2012/07/02	2012/07/03	ATL SOP 00026	Based on EPA245.1
Metals Water Total MS (1)	20	2012/06/29	2012/06/29	ATL SOP 00059	Based on EPA6020A
Ion Balance (% Difference) (1)	20	N/A	2012/07/04		
Anion and Cation Sum (1)	4	N/A	2012/07/03		
Anion and Cation Sum (1)	16	N/A	2012/07/04		
Nitrogen Ammonia - water (1)	20	N/A	2012/06/28	ATL SOP 00015	Based on USEPA 350.1
Nitrogen - Nitrate + Nitrite (1)	20	N/A	2012/07/03	ATL SOP 00016	Based on USGS - Enz.
Nitrogen - Nitrite (1)	20	N/A	2012/07/03	ATL SOP 00017	Based on SM4500-NO2B
Nitrogen - Nitrate (as N) (1)	20	N/A	2012/07/04	ATL SOP 00018	Based on ASTMD3867
pH (1)	20	N/A	2012/06/29	ATL SOP 00003	Based on SM4500H+B
Phosphorus - ortho (1)	20	N/A	2012/07/03	ATL SOP 00021	Based on USEPA 365.1
Sat. pH and Langelier Index (@ 20C) (1)	20	N/A	2012/07/04		
Sat. pH and Langelier Index (@ 4C) (1)	20	N/A	2012/07/04		
Reactive Silica (1)	20	N/A	2012/07/04	ATL SOP 00022	Based on EPA 366.0
Sulphate (1)	20	N/A	2012/07/03	ATL SOP 00023	Based on EPA 375.4
Total Dissolved Solids (TDS calc) (1)	20	N/A	2012/07/04		
Organic carbon - Total (TOC) (1)	20	N/A	2012/07/03	ATL SOP 00037	Based on SM5310C
Total Suspended Solids (1)	20	N/A	2012/06/30	ATL SOP 00007	based on EPA 160.2
Turbidity (1)	20	N/A	2012/06/29	ATL SOP 00011	based on EPA 180.1

Remarks:

Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

(1) This test was performed by Bedford

../2

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Maxxam Job #: B295466
Report Date: 2012/07/04

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

Encryption Key

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

Michelle Hill, Project Manager
Email: MHill@maxxam.ca
Phone# (709) 754 0203

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Total cover pages: 2

Maxxam Job #: B295466
Report Date: 2012/07/04

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		NY1302	NY1303	NY1304	NY1305	NY1305	NY1306	NY1306	NY1307	NY1308		
Sampling Date		2012/06/21	2012/06/21	2012/06/21	2012/06/21	2012/06/21	2012/06/21	2012/06/21	2012/06/21	2012/06/21		
	Units	**LP01**	**LP02**	**LP03**	**LP04**	**LP04 Lab-Dup**	**LP05**	**LP05 Lab-Dup**	**VL01**	**R01**	**RDL**	**QC Batch**
Calculated Parameters												
Anion Sum	me/L	0.800	0.340	0.0700	0.600		0.780		0.230	0.420	N/A	2893650
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	33	13	ND	28		34		9.5	19	1.0	2893647
Calculated TDS	mg/L	42.0	21.0	8.0	31.0		42.0		13.0	24.0	1.0	2893656
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	ND	ND	ND		ND		ND	ND	1.0	2893647
Cation Sum	me/L	0.870	0.520	0.200	0.650		0.880		0.290	0.440	N/A	2893650
Hardness (CaCO3)	mg/L	33	19	5.8	28		39		11	18	1.0	2893648
Ion Balance (% Difference)	%	4.19	20.9	48.2	4.00		6.02		11.5	2.33	N/A	2893649
Langelier Index (@ 20C)	N/A	-1.19	-1.85	NC	-1.57		-0.981		-2.63	-1.77		2893653
Langelier Index (@ 4C)	N/A	-1.44	-2.11	NC	-1.82		-1.23		-2.88	-2.02		2893655
Nitrate (N)	mg/L	ND	ND	0.065	ND		ND		ND	0.058	0.050	2893651
Saturation pH (@ 20C)	N/A	8.75	9.38	NC	8.91		8.67		9.75	9.23		2893653
Saturation pH (@ 4C)	N/A	9.00	9.64	NC	9.16		8.92		10.0	9.48		2893655
Inorganics												
Total Alkalinity (Total as CaCO3)	mg/L	33	13	ND	28		34		9.5	19	5.0	2895060
Dissolved Chloride (Cl)	mg/L	4.6	2.9	2.2	1.8		1.8		1.6	1.3	1.0	2895062
Colour	TCU	18	13	22	28		25		23	17	5.0	2895065
Nitrate + Nitrite	mg/L	ND	ND	0.065	ND		ND		ND	0.058	0.050	2895067
Nitrite (N)	mg/L	ND	ND	ND	ND		ND		ND	ND	0.010	2895069
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	ND	ND		ND		ND	0.051	0.050	2894169
Total Organic Carbon (C)	mg/L	7.4	7.0	3.9	8.1		7.6		6.3	4.9	0.50	2896953
Orthophosphate (P)	mg/L	ND	ND	ND	ND		ND		ND	ND	0.010	2895066
pH	pH	7.56	7.53	6.72	7.34	7.34	7.69		7.12	7.46	N/A	2894898
Reactive Silica (SiO2)	mg/L	ND	ND	1.4	ND		ND		ND	1.9	0.50	2895064
Total Suspended Solids	mg/L	4.4	ND	2.6	2.0		ND		2.0	1.8	1.0	2894157
Dissolved Sulphate (SO4)	mg/L	ND	ND	ND	ND		2.4		ND	ND	2.0	2895063
Turbidity	NTU	1.1	0.50	1.9	0.60		0.40	0.43	0.82	0.21	0.10	2894904
Conductivity	uS/cm	78	48	19	59	60	74		26	39	1.0	2894900

N/A = Not Applicable
ND = Not detected
NC = Non-calculable
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B295466
Report Date: 2012/07/04

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		NY1308		NY1309	NY1309	NY1310	NY1311	NY1312		
Sampling Date		2012/06/21		2012/06/24	2012/06/24	2012/06/24	2012/06/24	2012/06/24		
	Units	**R01 Lab-Dup**	**QC Batch**	**R02**	**R02 Lab-Dup**	**R03**	**R04**	**R05**	**RDL**	**QC Batch**
Calculated Parameters										
Anion Sum	me/L		2893650	0.450		0.540	0.350	0.210	N/A	2893650
Bicarb. Alkalinity (calc. as CaCO3)	mg/L		2893647	20		24	14	8.0	1.0	2893647
Calculated TDS	mg/L		2893656	26.0		30.0	23.0	12.0	1.0	2893656
Carb. Alkalinity (calc. as CaCO3)	mg/L		2893647	ND		ND	ND	ND	1.0	2893647
Cation Sum	me/L		2893650	0.540		0.630	0.370	0.250	N/A	2893650
Hardness (CaCO3)	mg/L		2893648	23		26	14	9.5	1.0	2893648
Ion Balance (% Difference)	%		2893649	9.09		7.69	2.78	8.70	N/A	2893649
Langelier Index (@ 20C)	N/A		2893653	-1.51		-1.44	-2.47	-2.67		2893653
Langelier Index (@ 4C)	N/A		2893655	-1.76		-1.69	-2.72	-2.92		2893655
Nitrate (N)	mg/L		2893651	0.070		ND	0.14	ND	0.050	2893651
Saturation pH (@ 20C)	N/A		2893653	9.11		8.97	9.48	9.87		2893653
Saturation pH (@ 4C)	N/A		2893655	9.36		9.22	9.73	10.1		2893655
Inorganics										
Total Alkalinity (Total as CaCO3)	mg/L		2895060	20	22	24	14	8.0	5.0	2895060
Dissolved Chloride (Cl)	mg/L		2895062	1.8	1.8	2.0	2.1	1.8	1.0	2895062
Colour	TCU		2895065	17	14	21	13	7.1	5.0	2895065
Nitrate + Nitrite	mg/L		2895067	0.070	0.066	ND	0.14	ND	0.050	2895067
Nitrite (N)	mg/L		2895069	ND	ND	ND	ND	ND	0.010	2895069
Nitrogen (Ammonia Nitrogen)	mg/L		2894169	ND		ND	ND	ND	0.050	2894185
Total Organic Carbon (C)	mg/L	5.0	2896953	4.5		5.4	3.0	2.9	0.50	2896953
Orthophosphate (P)	mg/L		2895066	ND	ND	ND	ND	ND	0.010	2895066
pH	pH		2894898	7.60		7.53	7.01	7.20	N/A	2894898
Reactive Silica (SiO2)	mg/L		2895064	1.1	1.0	1.2	4.7	ND	0.50	2895064
Total Suspended Solids	mg/L		2894157	ND		1.0	2.0	ND	1.0	2894157
Dissolved Sulphate (SO4)	mg/L		2895063	ND	ND	ND	ND	ND	2.0	2895063
Turbidity	NTU		2894904	ND		0.55	0.19	ND	0.10	2894904
Conductivity	uS/cm		2894900	49		54	35	23	1.0	2894900

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Maxxam Job #: B295466
Report Date: 2012/07/04

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		NY1313	NY1314	NY1315	NY1316	NY1317	NY1318		
Sampling Date		2012/06/24	2012/06/24	2012/06/24	2012/06/24	2012/06/24	2012/06/24		
	Units	**VE01**	**VE02**	**VE03**	**VE04**	**VE05**	**VE06**	**RDL**	**QC Batch**
Calculated Parameters									
Anion Sum	me/L	0.560	0.500	0.460	0.360	0.840	0.740	N/A	2893650
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	25	22	17	14	34	31	1.0	2893647
Calculated TDS	mg/L	36.0	33.0	30.0	23.0	47.0	41.0	1.0	2893656
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	ND	ND	ND	ND	ND	1.0	2893647
Cation Sum	me/L	0.680	0.580	0.500	0.420	0.860	0.800	N/A	2893650
Hardness (CaCO3)	mg/L	28	24	20	16	37	34	1.0	2893648
Ion Balance (% Difference)	%	9.68	7.41	4.17	7.69	1.18	3.90	N/A	2893649
Langelier Index (@ 20C)	N/A	-1.40	-1.68	-1.75	-2.20	-1.32	-1.48		2893653
Langelier Index (@ 4C)	N/A	-1.65	-1.93	-2.00	-2.46	-1.57	-1.73		2893655
Nitrate (N)	mg/L	0.12	0.12	0.20	0.36	0.053	ND	0.050	2893651
Saturation pH (@ 20C)	N/A	8.95	9.07	9.25	9.44	8.69	8.77		2893653
Saturation pH (@ 4C)	N/A	9.20	9.32	9.50	9.70	8.94	9.02		2893655
Inorganics									
Total Alkalinity (Total as CaCO3)	mg/L	25	22	17	14	34	31	5.0	2895060
Dissolved Chloride (Cl)	mg/L	2.0	2.0	1.9	1.6	2.0	2.1	1.0	2895062
Colour	TCU	19	16	9.6	31	22	28	5.0	2895065
Nitrate + Nitrite	mg/L	0.12	0.12	0.20	0.37	0.053	ND	0.050	2895067
Nitrite (N)	mg/L	ND	ND	ND	0.010	ND	ND	0.010	2895069
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	ND	ND	ND	ND	0.050	2894185
Total Organic Carbon (C)	mg/L	3.8	2.8	2.1	7.5	6.5	8.3	0.50	2896953
Orthophosphate (P)	mg/L	ND	ND	ND	ND	ND	ND	0.010	2895066
pH	pH	7.55	7.39	7.50	7.24	7.37	7.29	N/A	2894898
Reactive Silica (SiO2)	mg/L	5.0	5.5	4.3	2.1	2.3	0.89	0.50	2895064
Total Suspended Solids	mg/L	2.4	1.0	ND	9.8	4.0	4.6	1.0	2894157
Dissolved Sulphate (SO4)	mg/L	ND	ND	2.6	ND	4.2	3.1	2.0	2895063
Turbidity	NTU	0.34	0.16	ND	1.3	0.70	0.99	0.10	2894904
Conductivity	uS/cm	56	51	48	37	79	70	1.0	2894900

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Stantec Consulting Ltd
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Site Location: VALENTINE LAKE
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Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		NY1319		NY1320		NY1321	NY1321		
Sampling Date		2012/06/24		2012/06/24		2012/06/24	2012/06/24		
	Units	**VE07**	**QC Batch**	**VE09**	**QC Batch**	**VE10**	**VE10 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters									
Anion Sum	me/L	0.880	2893650	0.910	2893650	0.530		N/A	2893650
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	37	2893647	44	2893647	27		1.0	2893647
Calculated TDS	mg/L	48.0	2893656	49.0	2893656	27.0		1.0	2893656
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	2893647	ND	2893647	ND		1.0	2893647
Cation Sum	me/L	0.870	2893650	0.820	2893650	0.570		N/A	2893650
Hardness (CaCO3)	mg/L	38	2893648	34	2893648	23		1.0	2893648
Ion Balance (% Difference)	%	0.570	2893649	5.20	2893649	3.64		N/A	2893649
Langelier Index (@ 20C)	N/A	-1.24	2893653	-1.48	2893653	-1.74			2893653
Langelier Index (@ 4C)	N/A	-1.49	2893655	-1.74	2893655	-1.99			2893655
Nitrate (N)	mg/L	0.060	2893651	ND	2893651	ND		0.050	2893651
Saturation pH (@ 20C)	N/A	8.64	2893653	8.68	2893653	9.04			2893653
Saturation pH (@ 4C)	N/A	8.89	2893655	8.94	2893655	9.29			2893655
Inorganics									
Total Alkalinity (Total as CaCO3)	mg/L	37	2895060	44	2895060	27		5.0	2895060
Dissolved Chloride (Cl)	mg/L	1.7	2895062	1.4	2895062	ND		1.0	2895062
Colour	TCU	19	2895065	23	2895065	22		5.0	2895065
Nitrate + Nitrite	mg/L	0.060	2895067	ND	2895067	ND		0.050	2895067
Nitrite (N)	mg/L	ND	2895069	ND	2895069	ND		0.010	2895069
Nitrogen (Ammonia Nitrogen)	mg/L	0.052	2894185	ND	2894185	ND	ND	0.050	2894185
Total Organic Carbon (C)	mg/L	5.7	2896953	7.2	2896953	8.5		0.50	2896953
Orthophosphate (P)	mg/L	0.015	2895066	ND	2895066	ND		0.010	2895066
pH	pH	7.40	2894898	7.20	2894901	7.30		N/A	2894901
Reactive Silica (SiO2)	mg/L	2.5	2895064	3.2	2895064	0.67		0.50	2895064
Total Suspended Solids	mg/L	ND	2894157	1.0	2894938	ND		1.0	2894938
Dissolved Sulphate (SO4)	mg/L	4.3	2895063	ND	2895063	ND		2.0	2895063
Turbidity	NTU	0.36	2894904	0.91	2894904	0.32		0.10	2894905
Conductivity	uS/cm	82	2894900	78	2894902	50		1.0	2894902

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MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		NY1302	NY1303		NY1304	NY1304	NY1305	NY1306	NY1307	NY1308	NY1309		
Sampling Date		2012/06/21	2012/06/21		2012/06/21	2012/06/21	2012/06/21	2012/06/21	2012/06/21	2012/06/21	2012/06/24		
	Units	**LP01**	**LP02**	**QC Batch**	**LP03**	**LP03 Lab-Dup**	**LP04**	**LP05**	**VL01**	**R01**	**R02**	**RDL**	**QC Batch**
Metals													
Total Mercury (Hg)	ug/L	ND	0.015	2896900	ND	ND	ND	ND	ND	ND	ND	0.013	2896903

Maxxam ID		NY1310	NY1311	NY1312	NY1313	NY1314	NY1315		
Sampling Date		2012/06/24	2012/06/24	2012/06/24	2012/06/24	2012/06/24	2012/06/24		
	Units	**R03**	**R04**	**R05**	**VE01**	**VE02**	**VE03**	**RDL**	**QC Batch**
Metals									
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	0.013	2896903

Maxxam ID		NY1316	NY1317	NY1318	NY1319	NY1320	NY1321		
Sampling Date		2012/06/24	2012/06/24	2012/06/24	2012/06/24	2012/06/24	2012/06/24		
	Units	**VE04**	**VE05**	**VE06**	**VE07**	**VE09**	**VE10**	**RDL**	**QC Batch**
Metals									
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	0.013	2896903

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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		NY1302	NY1303	NY1304	NY1305	NY1306	NY1307	NY1308	NY1309	NY1310	NY1311		
Sampling Date		2012/06/21	2012/06/21	2012/06/21	2012/06/21	2012/06/21	2012/06/21	2012/06/21	2012/06/24	2012/06/24	2012/06/24		
	Units	**LP01**	**LP02**	**LP03**	**LP04**	**LP05**	**VL01**	**R01**	**R02**	**R03**	**R04**	**RDL**	**QC Batch**
Metals													
Total Aluminum (Al)	ug/L	32.1	52.4	84.1	35.4	47.9	107	38.4	21.8	42.5	36.4	5.0	2894916
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2894916
Total Arsenic (As)	ug/L	ND	1.4	ND	ND	ND	2.4	4.6	2.6	3.5	ND	1.0	2894916
Total Barium (Ba)	ug/L	3.3	2.3	2.6	1.3	1.1	3.1	1.3	ND	1.4	2.5	1.0	2894916
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2894916
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2894916
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	50	2894916
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.017	2894916
Total Calcium (Ca)	ug/L	10800	6050	1710	8800	12600	3510	5980	7660	8710	4500	100	2894916
Total Chromium (Cr)	ug/L	ND	ND	ND	ND	2.8	ND	1.0	ND	ND	ND	1.0	2894916
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.40	2894916
Total Copper (Cu)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2894916
Total Iron (Fe)	ug/L	333	61	104	191	172	81	139	ND	225	60	50	2894916
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.50	2894916
Total Magnesium (Mg)	ug/L	1410	879	380	1490	1780	524	681	907	1000	622	100	2894916
Total Manganese (Mn)	ug/L	229	17.8	12.7	45.6	32.2	143	73.6	18.7	152	72.3	2.0	2894916
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2894916
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2894916
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100	2894916
Total Potassium (K)	ug/L	1040	564	221	217	158	207	185	152	182	169	100	2894916
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	2894916
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2894916
Total Sodium (Na)	ug/L	4060	2860	1800	1860	2180	1540	1660	1770	2220	1950	100	2894916
Total Strontium (Sr)	ug/L	76.3	44.4	5.7	16.0	38.8	9.9	13.3	15.4	15.7	7.8	2.0	2894916
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10	2894916
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2894916
Total Titanium (Ti)	ug/L	2.4	ND	3.1	ND	ND	2.5	ND	ND	4.2	ND	2.0	2894916
Total Uranium (U)	ug/L	ND	ND	ND	ND	0.12	ND	ND	ND	ND	ND	0.10	2894916
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	2894916
Total Zinc (Zn)	ug/L	ND	ND	ND	ND	7.7	ND	5.1	ND	ND	ND	5.0	2894916

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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		NY1312	NY1313		NY1314	NY1315	NY1316		NY1317		
Sampling Date		2012/06/24	2012/06/24		2012/06/24	2012/06/24	2012/06/24		2012/06/24		
	Units	**R05**	**VE01**	**QC Batch**	**VE02**	**VE03**	**VE04**	**QC Batch**	**VE05**	**RDL**	**QC Batch**
Metals											
Total Aluminum (Al)	ug/L	15.1	47.1	2894914	102	37.4	90.0	2894916	66.5	5.0	2894914
Total Antimony (Sb)	ug/L	ND	ND	2894914	ND	ND	ND	2894916	ND	1.0	2894914
Total Arsenic (As)	ug/L	ND	ND	2894914	ND	ND	ND	2894916	ND	1.0	2894914
Total Barium (Ba)	ug/L	5.7	1.6	2894914	3.8	1.7	2.3	2894916	2.7	1.0	2894914
Total Beryllium (Be)	ug/L	ND	ND	2894914	ND	ND	ND	2894916	ND	1.0	2894914
Total Bismuth (Bi)	ug/L	ND	ND	2894914	ND	ND	ND	2894916	ND	2.0	2894914
Total Boron (B)	ug/L	ND	ND	2894914	ND	ND	ND	2894916	ND	50	2894914
Total Cadmium (Cd)	ug/L	ND	ND	2894914	ND	ND	ND	2894916	ND	0.017	2894914
Total Calcium (Ca)	ug/L	3110	9090	2894914	7630	6470	4780	2894916	12200	100	2894914
Total Chromium (Cr)	ug/L	ND	ND	2894914	ND	ND	ND	2894916	6.3	1.0	2894914
Total Cobalt (Co)	ug/L	ND	ND	2894914	ND	ND	ND	2894916	ND	0.40	2894914
Total Copper (Cu)	ug/L	ND	ND	2894914	ND	ND	ND	2894916	ND	2.0	2894914
Total Iron (Fe)	ug/L	ND	228	2894914	274	60	536	2894916	446	50	2894914
Total Lead (Pb)	ug/L	ND	ND	2894914	ND	ND	ND	2894916	ND	0.50	2894914
Total Magnesium (Mg)	ug/L	418	1340	2894914	1070	959	998	2894916	1520	100	2894914
Total Manganese (Mn)	ug/L	16.3	122	2894914	277	106	264	2894916	501	2.0	2894914
Total Molybdenum (Mo)	ug/L	ND	ND	2894914	ND	ND	ND	2894916	ND	2.0	2894914
Total Nickel (Ni)	ug/L	ND	ND	2894914	ND	ND	ND	2894916	ND	2.0	2894914
Total Phosphorus (P)	ug/L	ND	ND	2894914	ND	ND	ND	2894916	ND	100	2894914
Total Potassium (K)	ug/L	134	198	2894914	224	245	208	2894916	316	100	2894914
Total Selenium (Se)	ug/L	ND	ND	2894914	ND	ND	ND	2894916	ND	1.0	2894914
Total Silver (Ag)	ug/L	ND	ND	2894914	ND	ND	ND	2894916	ND	0.10	2894914
Total Sodium (Na)	ug/L	1380	2370	2894914	2170	2040	1800	2894916	2270	100	2894914
Total Strontium (Sr)	ug/L	8.0	22.7	2894914	17.8	17.7	13.0	2894916	28.8	2.0	2894914
Total Thallium (Tl)	ug/L	ND	ND	2894914	ND	ND	ND	2894916	ND	0.10	2894914
Total Tin (Sn)	ug/L	ND	ND	2894914	ND	ND	ND	2894916	ND	2.0	2894914
Total Titanium (Ti)	ug/L	2.1	2.4	2894914	3.6	ND	4.9	2894916	3.4	2.0	2894914
Total Uranium (U)	ug/L	ND	ND	2894914	ND	ND	ND	2894916	ND	0.10	2894914
Total Vanadium (V)	ug/L	ND	ND	2894914	ND	ND	ND	2894916	ND	2.0	2894914
Total Zinc (Zn)	ug/L	ND	ND	2894914	6.1	ND	5.2	2894916	10.4	5.0	2894914

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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		NY1318		NY1319		NY1320	NY1321		
Sampling Date		2012/06/24		2012/06/24		2012/06/24	2012/06/24		
	Units	**VE06**	**QC Batch**	**VE07**	**QC Batch**	**VE09**	**VE10**	**RDL**	**QC Batch**
Metals									
Total Aluminum (Al)	ug/L	61.1	2894916	19.9	2894914	75.5	31.1	5.0	2894916
Total Antimony (Sb)	ug/L	ND	2894916	ND	2894914	ND	ND	1.0	2894916
Total Arsenic (As)	ug/L	ND	2894916	ND	2894914	1.0	ND	1.0	2894916
Total Barium (Ba)	ug/L	2.4	2894916	1.6	2894914	7.5	1.6	1.0	2894916
Total Beryllium (Be)	ug/L	ND	2894916	ND	2894914	ND	ND	1.0	2894916
Total Bismuth (Bi)	ug/L	ND	2894916	ND	2894914	ND	ND	2.0	2894916
Total Boron (B)	ug/L	ND	2894916	ND	2894914	ND	ND	50	2894916
Total Cadmium (Cd)	ug/L	ND	2894916	ND	2894914	0.069	ND	0.017	2894916
Total Calcium (Ca)	ug/L	11100	2894916	12600	2894914	9660	6620	100	2894916
Total Chromium (Cr)	ug/L	ND	2894916	ND	2894914	ND	ND	1.0	2894916
Total Cobalt (Co)	ug/L	ND	2894916	ND	2894914	0.75	ND	0.40	2894916
Total Copper (Cu)	ug/L	ND	2894916	ND	2894914	ND	ND	2.0	2894916
Total Iron (Fe)	ug/L	431	2894916	162	2894914	476	53	50	2894916
Total Lead (Pb)	ug/L	ND	2894916	ND	2894914	ND	ND	0.50	2894916
Total Magnesium (Mg)	ug/L	1490	2894916	1580	2894914	2320	1650	100	2894916
Total Manganese (Mn)	ug/L	675	2894916	463	2894914	3150	153	2.0	2894916
Total Molybdenum (Mo)	ug/L	ND	2894916	ND	2894914	ND	ND	2.0	2894916
Total Nickel (Ni)	ug/L	ND	2894916	ND	2894914	ND	ND	2.0	2894916
Total Phosphorus (P)	ug/L	ND	2894916	ND	2894914	ND	ND	100	2894916
Total Potassium (K)	ug/L	314	2894916	251	2894914	212	174	100	2894916
Total Selenium (Se)	ug/L	ND	2894916	ND	2894914	ND	ND	1.0	2894916
Total Silver (Ag)	ug/L	ND	2894916	ND	2894914	ND	ND	0.10	2894916
Total Sodium (Na)	ug/L	2320	2894916	2250	2894914	2750	2140	100	2894916
Total Strontium (Sr)	ug/L	25.1	2894916	30.3	2894914	29.3	16.6	2.0	2894916
Total Thallium (Tl)	ug/L	ND	2894916	ND	2894914	ND	ND	0.10	2894916
Total Tin (Sn)	ug/L	ND	2894916	ND	2894914	ND	ND	2.0	2894916
Total Titanium (Ti)	ug/L	3.1	2894916	ND	2894914	2.4	ND	2.0	2894916
Total Uranium (U)	ug/L	ND	2894916	ND	2894914	ND	ND	0.10	2894916
Total Vanadium (V)	ug/L	ND	2894916	ND	2894914	ND	ND	2.0	2894916
Total Zinc (Zn)	ug/L	15.2	2894916	ND	2894914	7.5	ND	5.0	2894916

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B295466
Report Date: 2012/07/04

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

GENERAL COMMENTS

Sample	NY1303-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.
Sample	NY1304-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.
Sample	NY1306-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.
Sample	NY1307-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.
Sample	NY1309-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.
Sample	NY1310-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.
Sample	NY1312-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.
Sample	NY1313-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.
Sample	NY1314-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.
Sample	NY1316-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.
Sample	NY1320-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

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Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2894157	Total Suspended Solids	2012/06/30					ND, RDL=1.0	mg/L	5.5	25	103	80 - 120
2894169	Nitrogen (Ammonia Nitrogen)	2012/06/29	NC	80 - 120	97	80 - 120	ND, RDL=0.050	mg/L	2.8	25	100	80 - 120
2894185	Nitrogen (Ammonia Nitrogen)	2012/06/28	92	80 - 120	97	80 - 120	ND, RDL=0.050	mg/L	NC	25	96	80 - 120
2894898	pH	2012/06/29							0	25	100	80 - 120
2894900	Conductivity	2012/06/29			98	80 - 120	ND, RDL=1.0	uS/cm	0.3	25		
2894901	pH	2012/06/29							2.8	25	100	80 - 120
2894902	Conductivity	2012/06/29			98	80 - 120	ND, RDL=1.0	uS/cm	NC	25		
2894904	Turbidity	2012/06/29					ND, RDL=0.10	NTU	NC	25	102	80 - 120
2894905	Turbidity	2012/06/29					ND, RDL=0.10	NTU	0.6	25	101	80 - 120
2894914	Total Aluminum (Al)	2012/06/29	101	80 - 120	109	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2894914	Total Antimony (Sb)	2012/06/29	102	80 - 120	113	80 - 120	ND, RDL=1.0	ug/L				
2894914	Total Arsenic (As)	2012/06/29	98	80 - 120	106	80 - 120	ND, RDL=1.0	ug/L				
2894914	Total Barium (Ba)	2012/06/29	96	80 - 120	107	80 - 120	ND, RDL=1.0	ug/L				
2894914	Total Beryllium (Be)	2012/06/29	93	80 - 120	102	80 - 120	ND, RDL=1.0	ug/L				
2894914	Total Bismuth (Bi)	2012/06/29	99	80 - 120	108	80 - 120	ND, RDL=2.0	ug/L				
2894914	Total Boron (B)	2012/06/29	92	80 - 120	102	80 - 120	ND, RDL=50	ug/L				
2894914	Total Cadmium (Cd)	2012/06/29	102	80 - 120	109	80 - 120	ND, RDL=0.017	ug/L				
2894914	Total Calcium (Ca)	2012/06/29	93	80 - 120	102	80 - 120	ND, RDL=100	ug/L				
2894914	Total Chromium (Cr)	2012/06/29	96	80 - 120	105	80 - 120	ND, RDL=1.0	ug/L				
2894914	Total Cobalt (Co)	2012/06/29	104	80 - 120	110	80 - 120	ND, RDL=0.40	ug/L				
2894914	Total Copper (Cu)	2012/06/29	96	80 - 120	106	80 - 120	ND, RDL=2.0	ug/L				
2894914	Total Iron (Fe)	2012/06/29	99	80 - 120	107	80 - 120	ND, RDL=50	ug/L				
2894914	Total Lead (Pb)	2012/06/29	99	80 - 120	109	80 - 120	ND, RDL=0.50	ug/L				
2894914	Total Magnesium (Mg)	2012/06/29	98	80 - 120	108	80 - 120	ND, RDL=100	ug/L				
2894914	Total Manganese (Mn)	2012/06/29	95	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L				
2894914	Total Molybdenum (Mo)	2012/06/29	99	80 - 120	112	80 - 120	ND, RDL=2.0	ug/L				
2894914	Total Nickel (Ni)	2012/06/29	96	80 - 120	104	80 - 120	ND, RDL=2.0	ug/L				
2894914	Total Phosphorus (P)	2012/06/29	98	80 - 120	107	80 - 120	ND, RDL=100	ug/L				
2894914	Total Potassium (K)	2012/06/29	98	80 - 120	107	80 - 120	ND, RDL=100	ug/L				
2894914	Total Selenium (Se)	2012/06/29	100	80 - 120	107	80 - 120	ND, RDL=1.0	ug/L				
2894914	Total Silver (Ag)	2012/06/29	97	80 - 120	108	80 - 120	ND, RDL=0.10	ug/L				
2894914	Total Sodium (Na)	2012/06/29	99	80 - 120	107	80 - 120	ND, RDL=100	ug/L				
2894914	Total Strontium (Sr)	2012/06/29	97	80 - 120	106	80 - 120	ND, RDL=2.0	ug/L				
2894914	Total Thallium (Tl)	2012/06/29	98	80 - 120	108	80 - 120	ND, RDL=0.10	ug/L				
2894914	Total Tin (Sn)	2012/06/29	101	80 - 120	112	80 - 120	ND, RDL=2.0	ug/L				
2894914	Total Titanium (Ti)	2012/06/29	99	80 - 120	109	80 - 120	ND, RDL=2.0	ug/L				
2894914	Total Uranium (U)	2012/06/29	103	80 - 120	113	80 - 120	ND, RDL=0.10	ug/L				
2894914	Total Vanadium (V)	2012/06/29	98	80 - 120	106	80 - 120	ND, RDL=2.0	ug/L				
2894914	Total Zinc (Zn)	2012/06/29	98	80 - 120	108	80 - 120	ND, RDL=5.0	ug/L				

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Maxxam Job #: B295466
Report Date: 2012/07/04

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2894916	Total Aluminum (Al)	2012/06/29	102	80 - 120	108	80 - 120	5.2, RDL=5.0	ug/L				
2894916	Total Antimony (Sb)	2012/06/29	104	80 - 120	112	80 - 120	ND, RDL=1.0	ug/L				
2894916	Total Arsenic (As)	2012/06/29	100	80 - 120	105	80 - 120	ND, RDL=1.0	ug/L				
2894916	Total Barium (Ba)	2012/06/29	97	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L				
2894916	Total Beryllium (Be)	2012/06/29	101	80 - 120	105	80 - 120	ND, RDL=1.0	ug/L				
2894916	Total Bismuth (Bi)	2012/06/29	104	80 - 120	110	80 - 120	ND, RDL=2.0	ug/L				
2894916	Total Boron (B)	2012/06/29	102	80 - 120	112	80 - 120	ND, RDL=50	ug/L				
2894916	Total Cadmium (Cd)	2012/06/29	98	80 - 120	104	80 - 120	ND, RDL=0.017	ug/L				
2894916	Total Calcium (Ca)	2012/06/29	NC	80 - 120	101	80 - 120	ND, RDL=100	ug/L	1.1	25		
2894916	Total Chromium (Cr)	2012/06/29	98	80 - 120	105	80 - 120	ND, RDL=1.0	ug/L				
2894916	Total Cobalt (Co)	2012/06/29	100	80 - 120	106	80 - 120	ND, RDL=0.40	ug/L				
2894916	Total Copper (Cu)	2012/06/29	100	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L	0.6	25		
2894916	Total Iron (Fe)	2012/06/29	104	80 - 120	109	80 - 120	ND, RDL=50	ug/L	NC	25		
2894916	Total Lead (Pb)	2012/06/29	98	80 - 120	106	80 - 120	ND, RDL=0.50	ug/L				
2894916	Total Magnesium (Mg)	2012/06/29	103	80 - 120	110	80 - 120	ND, RDL=100	ug/L	1.1	25		
2894916	Total Manganese (Mn)	2012/06/29	98	80 - 120	101	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2894916	Total Molybdenum (Mo)	2012/06/29	102	80 - 120	108	80 - 120	ND, RDL=2.0	ug/L				
2894916	Total Nickel (Ni)	2012/06/29	99	80 - 120	105	80 - 120	ND, RDL=2.0	ug/L				
2894916	Total Phosphorus (P)	2012/06/29	104	80 - 120	109	80 - 120	ND, RDL=100	ug/L				
2894916	Total Potassium (K)	2012/06/29	102	80 - 120	106	80 - 120	ND, RDL=100	ug/L	NC	25		
2894916	Total Selenium (Se)	2012/06/29	99	80 - 120	103	80 - 120	ND, RDL=1.0	ug/L				
2894916	Total Silver (Ag)	2012/06/29	100	80 - 120	106	80 - 120	ND, RDL=0.10	ug/L				
2894916	Total Sodium (Na)	2012/06/29	103	80 - 120	107	80 - 120	ND, RDL=100	ug/L	1.1	25		
2894916	Total Strontium (Sr)	2012/06/29	99	80 - 120	104	80 - 120	ND, RDL=2.0	ug/L				
2894916	Total Thallium (Tl)	2012/06/29	101	80 - 120	108	80 - 120	ND, RDL=0.10	ug/L				
2894916	Total Tin (Sn)	2012/06/29	102	80 - 120	108	80 - 120	ND, RDL=2.0	ug/L				
2894916	Total Titanium (Ti)	2012/06/29	108	80 - 120	110	80 - 120	2.3, RDL=2.0	ug/L				
2894916	Total Uranium (U)	2012/06/29	109	80 - 120	116	80 - 120	ND, RDL=0.10	ug/L				
2894916	Total Vanadium (V)	2012/06/29	100	80 - 120	108	80 - 120	ND, RDL=2.0	ug/L				
2894916	Total Zinc (Zn)	2012/06/29	NC	80 - 120	103	80 - 120	ND, RDL=5.0	ug/L	1.7	25		
2894938	Total Suspended Solids	2012/06/30					ND, RDL=1.0	mg/L	1.9	25	99	80 - 120
2895060	Total Alkalinity (Total as CaCO3)	2012/07/03	91	80 - 120	93	80 - 120	ND, RDL=5.0	mg/L	NC	25	99	80 - 120
2895062	Dissolved Chloride (Cl)	2012/07/03	101	80 - 120	100	80 - 120	ND, RDL=1.0	mg/L	NC	25	99	80 - 120
2895063	Dissolved Sulphate (SO4)	2012/07/03	98	80 - 120	91	80 - 120	ND, RDL=2.0	mg/L	NC	25	100	80 - 120
2895064	Reactive Silica (SiO2)	2012/07/04	101	80 - 120	101	80 - 120	ND, RDL=0.50	mg/L	NC	25	105	75 - 125
2895065	Colour	2012/07/03					ND, RDL=5.0	TCU	NC	25	97	80 - 120
2895066	Orthophosphate (P)	2012/07/03	89	80 - 120	94	80 - 120	ND, RDL=0.010	mg/L	NC	25	98	80 - 120
2895067	Nitrate + Nitrite	2012/07/03	98	80 - 120	101	80 - 120	ND, RDL=0.050	mg/L	NC	25	102	80 - 120
2895069	Nitrite (N)	2012/07/03	98	80 - 120	109	80 - 120	ND, RDL=0.010	mg/L	NC	25	103	80 - 120

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Maxxam Job #: B295466
Report Date: 2012/07/04

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2896900	Total Mercury (Hg)	2012/07/03	102	80 - 120	105	80 - 120	ND, RDL=0.013	ug/L	NC	25	102	80 - 120
2896903	Total Mercury (Hg)	2012/07/03	100	80 - 120	106	80 - 120	ND, RDL=0.013	ug/L	NC	25	107	80 - 120
2896953	Total Organic Carbon (C)	2012/07/03	92	80 - 120	93	80 - 120	ND, RDL=0.50	mg/L	0.8	25		

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

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Validation Signature Page

Maxxam Job #: B295466

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

Colleen Acker

Mike Macgillivray, Scientific Specialist (Inorganics)

==========

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.

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Round 14

Your P.O. #: 16300R-40
Your Project #: 121510621.100
Site Location: VALENTINE LAKE
Your C.O.C. #: N/A

Attention: Barry Wicks
Stantec Consulting Ltd
St. John's - Standing Offer
607 Torbay Rd
St. John's, NL
A1A 4Y6

Report Date: 2012/08/16

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B2C0158
Received: 2012/08/09, 09:49

Sample Matrix: Water
Samples Received: 20

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonate, Bicarbonate and Hydroxide (1)	20	N/A	2012/08/10	CAM SOP-00102	APHA 4500-CO2 D
Alkalinity (1)	20	N/A	2012/08/10	ATL SOP 00013	Based on EPA310.2
Chloride (1)	20	N/A	2012/08/10	ATL SOP 00014	Based on SM4500-Cl-
Colour (1)	20	N/A	2012/08/10	ATL SOP 00020	Based on SM2120C
Conductance - water (1)	20	N/A	2012/08/10	ATL SOP 00004/00006	Based on SM2510B
Hardness (calculated as CaCO3) (1)	20	N/A	2012/08/14	ATL SOP 00048	Based on SM2340B
Mercury - Total (CVAA,LL) (1)	20	2012/08/10	2012/08/13	ATL SOP 00026	Based on EPA245.1
Metals Water Total MS (1)	20	2012/08/10	2012/08/13	ATL SOP 00059	Based on EPA6020A
Ion Balance (% Difference) (1)	20	N/A	2012/08/15		
Anion and Cation Sum (1)	20	N/A	2012/08/15		
Nitrogen Ammonia - water (1)	19	N/A	2012/08/13	ATL SOP 00015	Based on USEPA 350.1
Nitrogen Ammonia - water (1)	1	N/A	2012/08/14	ATL SOP 00015	Based on USEPA 350.1
Nitrogen - Nitrate + Nitrite (1)	20	N/A	2012/08/13	ATL SOP 00016	Based on USGS - Enz.
Nitrogen - Nitrite (1)	20	N/A	2012/08/13	ATL SOP 00017	Based on SM4500-NO2B
Nitrogen - Nitrate (as N) (1)	20	N/A	2012/08/13	ATL SOP 00018	Based on ASTMD3867
pH (1)	20	N/A	2012/08/10	ATL SOP 00003	Based on SM4500H+B
Phosphorus - ortho (1)	20	N/A	2012/08/10	ATL SOP 00021	Based on USEPA 365.1
Sat. pH and Langelier Index (@ 20C) (1)	20	N/A	2012/08/15		
Sat. pH and Langelier Index (@ 4C) (1)	20	N/A	2012/08/15		
Reactive Silica (1)	20	N/A	2012/08/10	ATL SOP 00022	Based on EPA 366.0
Sulphate (1)	20	N/A	2012/08/13	ATL SOP 00023	Based on EPA 375.4
Total Dissolved Solids (TDS calc) (1)	20	N/A	2012/08/15		
Organic carbon - Total (TOC) (1)	20	N/A	2012/08/13	ATL SOP 00037	Based on SM5310C
Total Suspended Solids (1)	15	N/A	2012/08/13	ATL SOP 00007	based on EPA 160.2
Total Suspended Solids (1)	5	N/A	2012/08/14	ATL SOP 00007	based on EPA 160.2
Turbidity (1)	20	N/A	2012/08/10	ATL SOP 00011	based on EPA 180.1

Remarks:

Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

(1) This test was performed by Bedford

../2

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Maxxam Job #: B2C0158
Report Date: 2012/08/16

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

Encryption Key

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

Michelle Hill, Project Manager
Email: MHill@maxxam.ca
Phone# (902) 420-0203 Ext:289

==========

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Total cover pages: 2

Maxxam Job #: B2C0158
Report Date: 2012/08/16

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		OK8095	OK8096	OK8097	OK8098		OK8099	OK8099		OK8100		
Sampling Date		2012/08/03	2012/08/03	2012/08/03	2012/08/03		2012/08/03	2012/08/03		2012/08/04		
	Units	**LP-01**	**LP-02**	**LP-04**	**LP-05**	**QC Batch**	**VL-01**	**VL-01 Lab-Dup**	**QC Batch**	**LP-03**	**RDL**	**QC Batch**
Calculated Parameters												
Anion Sum	me/L	0.710	0.490	0.390	0.370	2932704	0.290		2932704	0.180	N/A	2932704
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	30	20	17	16	2932700	12		2932700	5.3	1.0	2932700
Calculated TDS	mg/L	40.0	28.0	23.0	21.0	2932709	17.0		2932709	11.0	1.0	2932709
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	ND	ND	ND	2932700	ND		2932700	ND	1.0	2932700
Cation Sum	me/L	0.860	0.590	0.540	0.500	2932704	0.370		2932704	0.210	N/A	2932704
Hardness (CaCO3)	mg/L	32	22	22	21	2932702	14		2932702	5.9	1.0	2932702
Ion Balance (% Difference)	%	9.55	9.26	16.1	14.9	2932703	12.1		2932703	7.69	N/A	2932703
Langelier Index (@ 20C)	N/A	-1.29	-1.74	-2.24	-2.03	2932707	-2.43		2932707	-3.66		2932707
Langelier Index (@ 4C)	N/A	-1.54	-1.99	-2.49	-2.28	2932708	-2.69		2932708	-3.91		2932708
Nitrate (N)	mg/L	ND	ND	ND	ND	2932705	ND		2932705	0.065	0.050	2932705
Saturation pH (@ 20C)	N/A	8.81	9.14	9.24	9.27	2932707	9.55		2932707	10.3		2932707
Saturation pH (@ 4C)	N/A	9.06	9.39	9.49	9.52	2932708	9.81		2932708	10.6		2932708
Inorganics												
Total Alkalinity (Total as CaCO3)	mg/L	30	20	17	16	2934214	12		2934214	5.3	5.0	2934214
Dissolved Chloride (Cl)	mg/L	3.7	3.0	2.0	1.9	2934215	2.0		2934215	2.4	1.0	2934215
Colour	TCU	24	21	42	37	2934221	23		2934221	22	5.0	2934221
Nitrate + Nitrite	mg/L	ND	ND	ND	ND	2934224	ND		2934224	0.065	0.050	2934224
Nitrite (N)	mg/L	ND	ND	ND	ND	2934225	ND		2934225	ND	0.010	2934225
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	ND	ND	2934587	ND	ND	2934589	ND	0.050	2934587
Total Organic Carbon (C)	mg/L	7.6	7.9	11	9.7	2936529	7.0		2936529	4.0	0.50	2936529
Orthophosphate (P)	mg/L	ND	ND	ND	ND	2934223	ND		2934223	ND	0.010	2934223
pH	pH	7.52	7.40	7.00	7.24	2934134	7.12		2934134	6.66	N/A	2934134
Reactive Silica (SiO2)	mg/L	0.67	0.61	0.61	ND	2934219	0.98		2934219	1.3	0.50	2934219
Total Suspended Solids	mg/L	ND	ND	ND	1.0	2934320	1.2		2934320	1.2	1.0	2934320
Dissolved Sulphate (SO4)	mg/L	ND	ND	ND	ND	2934216	ND		2934216	ND	2.0	2934216
Turbidity	NTU	0.99	0.71	0.76	0.70	2934141	0.91		2934141	0.44	0.10	2934141
Conductivity	uS/cm	74	51	45	40	2934135	31		2934135	20	1.0	2934135

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Maxxam Job #: B2C0158
Report Date: 2012/08/16

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		OK8100	OK8101	OK8101	OK8102	OK8103	OK8103		OK8104		
Sampling Date		2012/08/04	2012/08/04	2012/08/04	2012/08/04	2012/08/04	2012/08/04		2012/08/04		
	Units	**LP-03 Lab-Dup**	**R01**	**R01 Lab-Dup**	**R02**	**R03**	**R03 Lab-Dup**	**QC Batch**	**R04**	**RDL**	**QC Batch**
Calculated Parameters											
Anion Sum	me/L		0.510		0.430	0.450		2932704	0.360	N/A	2932704
Bicarb. Alkalinity (calc. as CaCO3)	mg/L		23		19	20		2932700	15	1.0	2932700
Calculated TDS	mg/L		30.0		25.0	28.0		2932709	24.0	1.0	2932709
Carb. Alkalinity (calc. as CaCO3)	mg/L		ND		ND	ND		2932700	ND	1.0	2932700
Cation Sum	me/L		0.580		0.500	0.570		2932704	0.440	N/A	2932704
Hardness (CaCO3)	mg/L		25		21	24		2932702	17	1.0	2932702
Ion Balance (% Difference)	%		6.42		7.53	11.8		2932703	10.0	N/A	2932703
Langelier Index (@ 20C)	N/A		-1.51		-1.74	-1.68		2932707	-2.30		2932707
Langelier Index (@ 4C)	N/A		-1.77		-2.00	-1.94		2932708	-2.56		2932708
Nitrate (N)	mg/L		ND		ND	ND		2932705	0.12	0.050	2932974
Saturation pH (@ 20C)	N/A		9.00		9.16	9.09		2932707	9.35		2932707
Saturation pH (@ 4C)	N/A		9.26		9.42	9.35		2932708	9.61		2932708
Inorganics											
Total Alkalinity (Total as CaCO3)	mg/L		23		19	20	22	2934214	15	5.0	2934214
Dissolved Chloride (Cl)	mg/L		1.4		1.7	1.6	1.5	2934215	1.7	1.0	2934215
Colour	TCU		28		30	36	36	2934221	18	5.0	2934221
Nitrate + Nitrite	mg/L		ND		ND	ND	ND	2934224	0.12	0.050	2934224
Nitrite (N)	mg/L		ND		ND	ND	ND	2934225	ND	0.010	2934225
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND		ND	ND		2934587	ND	0.050	2934587
Total Organic Carbon (C)	mg/L		6.4	6.5	7.1	6.9		2936529	5.2	0.50	2936529
Orthophosphate (P)	mg/L		ND		ND	ND	ND	2934223	ND	0.010	2934223
pH	pH		7.49		7.42	7.41		2934134	7.05	N/A	2934134
Reactive Silica (SiO2)	mg/L		3.0		1.8	2.4	2.4	2934219	3.7	0.50	2934219
Total Suspended Solids	mg/L		ND		ND	9.0		2934320	ND	1.0	2934320
Dissolved Sulphate (SO4)	mg/L		ND		ND	ND	ND	2934216	ND	2.0	2934216
Turbidity	NTU		0.63		0.36	0.70		2934141	0.91	0.10	2934141
Conductivity	uS/cm		49		43	47		2934135	36	1.0	2934135

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Maxxam Job #: B2C0158
Report Date: 2012/08/16

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		OK8105	OK8106		OK8107	OK8107		OK8108	OK8109		
Sampling Date		2012/08/05	2012/08/05		2012/08/05	2012/08/05		2012/08/05	2012/08/05		
	Units	**R05**	**VE01**	**QC Batch**	**VE02**	**VE02 Lab-Dup**	**QC Batch**	**VE03**	**VE04**	**RDL**	**QC Batch**
Calculated Parameters											
Anion Sum	me/L	0.230	0.370	2932704	0.340		2932704	0.330	0.290	N/A	2932704
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	9.2	16	2932700	14		2932700	14	12	1.0	2932700
Calculated TDS	mg/L	13.0	23.0	2932709	21.0		2932709	20.0	17.0	1.0	2932709
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	ND	2932700	ND		2932700	ND	ND	1.0	2932700
Cation Sum	me/L	0.270	0.450	2932704	0.400		2932704	0.380	0.350	N/A	2932704
Hardness (CaCO3)	mg/L	10	18	2932702	15		2932702	15	13	1.0	2932702
Ion Balance (% Difference)	%	8.00	9.76	2932703	8.11		2932703	7.04	9.38	N/A	2932703
Langelier Index (@ 20C)	N/A	-2.68	-2.02	2932707	-2.19		2932707	-2.22	-2.49		2932707
Langelier Index (@ 4C)	N/A	-2.94	-2.27	2932708	-2.44		2932708	-2.47	-2.74		2932708
Nitrate (N)	mg/L	ND	0.093	2932974	0.088		2932974	0.088	0.069	0.050	2932974
Saturation pH (@ 20C)	N/A	9.78	9.32	2932707	9.44		2932707	9.47	9.59		2932707
Saturation pH (@ 4C)	N/A	10.0	9.57	2932708	9.69		2932708	9.72	9.84		2932708
Inorganics											
Total Alkalinity (Total as CaCO3)	mg/L	9.2	16	2934214	14		2934229	14	12	5.0	2934229
Dissolved Chloride (Cl)	mg/L	1.6	1.4	2934215	1.8		2934231	1.8	1.8	1.0	2934231
Colour	TCU	10	24	2934221	19		2934236	22	35	5.0	2934236
Nitrate + Nitrite	mg/L	ND	0.093	2934224	0.088		2934238	0.088	0.069	0.050	2934238
Nitrite (N)	mg/L	ND	ND	2934225	ND		2934239	ND	ND	0.010	2934239
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	2934589	ND		2934589	ND	ND	0.050	2934589
Total Organic Carbon (C)	mg/L	3.0	5.8	2936529	5.4		2936543	6.3	9.6	0.50	2936543
Orthophosphate (P)	mg/L	ND	ND	2934223	ND		2934237	ND	ND	0.010	2934237
pH	pH	7.10	7.30	2934136	7.25	7.27	2934134	7.25	7.10	N/A	2934136
Reactive Silica (SiO2)	mg/L	0.50	2.5	2934219	2.2		2934233	1.9	1.0	0.50	2934233
Total Suspended Solids	mg/L	1.0	1.4	2934320	ND		2934320	ND	4.6	1.0	2934320
Dissolved Sulphate (SO4)	mg/L	ND	ND	2934216	ND		2934232	ND	ND	2.0	2934232
Turbidity	NTU	0.35	0.50	2934141	0.25		2934141	0.33	0.56	0.10	2934141
Conductivity	uS/cm	24	39	2934139	34	34	2934135	33	29	1.0	2934139

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Maxxam Job #: B2C0158
Report Date: 2012/08/16

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
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RESULTS OF ANALYSES OF WATER

Maxxam ID		OK8110	OK8111		OK8112			OK8113	OK8114	OK8114		
Sampling Date		2012/08/05	2012/08/05		2012/08/05			2012/08/05	2012/08/05	2012/08/05		
	Units	**VE05**	**VE06**	**RDL**	**VE07**	**RDL**	**QC Batch**	**VE09**	**VE10**	**VE10 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters												
Anion Sum	me/L	0.500	0.530	N/A	0.470	N/A	2932704	0.660	0.550		N/A	2932973
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	22	24	1.0	21	1.0	2932700	31	26		1.0	2932970
Calculated TDS	mg/L	31.0	33.0	1.0	29.0	1.0	2932709	40.0	33.0		1.0	2932977
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	ND	1.0	ND	1.0	2932700	ND	ND		1.0	2932970
Cation Sum	me/L	0.610	0.630	N/A	0.580	N/A	2932704	0.660	0.630		N/A	2932973
Hardness (CaCO3)	mg/L	26	26	1.0	24	1.0	2932702	26	26		1.0	2932971
Ion Balance (% Difference)	%	9.91	8.62	N/A	10.5	N/A	2932703	0.00	6.78		N/A	2932972
Langelier Index (@ 20C)	N/A	-1.86	-1.81		-1.91		2932707	-1.86	-1.87			2932975
Langelier Index (@ 4C)	N/A	-2.11	-2.07		-2.16		2932708	-2.11	-2.13			2932976
Nitrate (N)	mg/L	ND	0.053	0.050	ND	0.050	2932974	ND	ND		0.050	2932974
Saturation pH (@ 20C)	N/A	9.03	8.99		9.09		2932707	8.93	9.00			2932975
Saturation pH (@ 4C)	N/A	9.28	9.25		9.34		2932708	9.18	9.26			2932976
Inorganics												
Total Alkalinity (Total as CaCO3)	mg/L	22	24	5.0	21	5.0	2934229	31	26		5.0	2934229
Dissolved Chloride (Cl)	mg/L	1.9	2.0	1.0	1.9	1.0	2934231	1.2	1.2		1.0	2934231
Colour	TCU	43	39	5.0	54	25	2934236	28	31		5.0	2934236
Nitrate + Nitrite	mg/L	ND	0.053	0.050	ND	0.050	2934238	ND	ND		0.050	2934238
Nitrite (N)	mg/L	ND	ND	0.010	ND	0.010	2934239	ND	ND		0.010	2934239
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	0.050	ND	0.050	2934589	ND	ND		0.050	2934589
Total Organic Carbon (C)	mg/L	9.4	9.1	0.50	12	0.50	2936543	8.1	9.5		0.50	2936543
Orthophosphate (P)	mg/L	ND	ND	0.010	ND	0.010	2934237	ND	ND		0.010	2934237
pH	pH	7.17	7.18	N/A	7.18	N/A	2934136	7.07	7.13	7.15	N/A	2934136
Reactive Silica (SiO2)	mg/L	3.3	3.4	0.50	2.7	0.50	2934233	3.0	3.1		0.50	2934233
Total Suspended Solids	mg/L	1.4	ND	1.0	ND	1.0	2934304	1.0	1.2		1.0	2934304
Dissolved Sulphate (SO4)	mg/L	ND	ND	2.0	ND	2.0	2934232	ND	ND		2.0	2934232
Turbidity	NTU	0.40	0.48	0.10	0.63	0.10	2934142	1.2	0.79		0.10	2934142
Conductivity	uS/cm	54	55	1.0	48	1.0	2934139	61	52	52	1.0	2934139

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Maxxam Job #: B2C0158
Report Date: 2012/08/16

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		OK8095	OK8096	OK8097	OK8098	OK8099	OK8100	OK8101	OK8102	OK8103	OK8104		
Sampling Date		2012/08/03	2012/08/03	2012/08/03	2012/08/03	2012/08/03	2012/08/04	2012/08/04	2012/08/04	2012/08/04	2012/08/04		
	Units	**LP-01**	**LP-02**	**LP-04**	**LP-05**	**VL-01**	**LP-03**	**R01**	**R02**	**R03**	**R04**	**RDL**	**QC Batch**
Metals													
Total Mercury (Hg)	ug/L	ND	0.013	0.013	ND	ND	ND	ND	ND	ND	ND	0.013	2936199

Maxxam ID		OK8105	OK8106	OK8107	OK8108	OK8109	OK8110		
Sampling Date		2012/08/05	2012/08/05	2012/08/05	2012/08/05	2012/08/05	2012/08/05		
	Units	**R05**	**VE01**	**VE02**	**VE03**	**VE04**	**VE05**	**RDL**	**QC Batch**
Metals									
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	0.013	0.013	2936199

Maxxam ID		OK8111	OK8112		OK8113	OK8113	OK8114		
Sampling Date		2012/08/05	2012/08/05		2012/08/05	2012/08/05	2012/08/05		
	Units	**VE06**	**VE07**	**QC Batch**	**VE09**	**VE09 Lab-Dup**	**VE10**	**RDL**	**QC Batch**
Metals									
Total Mercury (Hg)	ug/L	0.013	ND	2936199	0.013	ND	ND	0.013	2936202

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Client Project #: 121510621.100
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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		OK8095	OK8096		OK8097	OK8098	OK8099		OK8100	OK8101	OK8102		
Sampling Date		2012/08/03	2012/08/03		2012/08/03	2012/08/03	2012/08/03		2012/08/04	2012/08/04	2012/08/04		
	Units	**LP-01**	**LP-02**	**QC Batch**	**LP-04**	**LP-05**	**VL-01**	**QC Batch**	**LP-03**	**R01**	**R02**	**RDL**	**QC Batch**
Metals													
Total Aluminum (Al)	ug/L	65.0	70.4	2934174	85.4	68.4	70.6	2934443	67.2	26.5	28.2	5.0	2934174
Total Antimony (Sb)	ug/L	ND	ND	2934174	ND	ND	ND	2934443	ND	ND	ND	1.0	2934174
Total Arsenic (As)	ug/L	1.2	1.2	2934174	1.2	1.1	3.7	2934443	ND	9.0	5.6	1.0	2934174
Total Barium (Ba)	ug/L	4.2	2.4	2934174	1.7	1.5	1.8	2934443	2.3	1.7	ND	1.0	2934174
Total Beryllium (Be)	ug/L	ND	ND	2934174	ND	ND	ND	2934443	ND	ND	ND	1.0	2934174
Total Bismuth (Bi)	ug/L	ND	ND	2934174	ND	ND	ND	2934443	ND	ND	ND	2.0	2934174
Total Boron (B)	ug/L	ND	ND	2934174	ND	ND	ND	2934443	ND	ND	ND	50	2934174
Total Cadmium (Cd)	ug/L	ND	ND	2934174	ND	ND	ND	2934443	ND	ND	ND	0.017	2934174
Total Calcium (Ca)	ug/L	10400	6890	2934174	6650	6470	4470	2934443	1690	8300	7000	100	2934174
Total Chromium (Cr)	ug/L	ND	ND	2934174	ND	ND	ND	2934443	ND	ND	ND	1.0	2934174
Total Cobalt (Co)	ug/L	ND	ND	2934174	ND	ND	ND	2934443	ND	ND	ND	0.40	2934174
Total Copper (Cu)	ug/L	ND	ND	2934174	ND	ND	ND	2934443	ND	ND	ND	2.0	2934174
Total Iron (Fe)	ug/L	308	68	2934174	325	104	132	2934443	62	361	142	50	2934174
Total Lead (Pb)	ug/L	ND	ND	2934174	ND	ND	ND	2934443	ND	ND	ND	0.50	2934174
Total Magnesium (Mg)	ug/L	1420	1040	2934174	1250	1070	689	2934443	396	951	789	100	2934174
Total Manganese (Mn)	ug/L	217	19.7	2934174	102	35.6	110	2934443	11.0	139	27.4	2.0	2934174
Total Molybdenum (Mo)	ug/L	ND	ND	2934174	ND	ND	ND	2934443	ND	ND	ND	2.0	2934174
Total Nickel (Ni)	ug/L	ND	ND	2934174	ND	ND	ND	2934443	ND	ND	ND	2.0	2934174
Total Phosphorus (P)	ug/L	ND	ND	2934174	ND	ND	ND	2934443	ND	ND	ND	100	2934174
Total Potassium (K)	ug/L	844	498	2934174	155	108	135	2934443	180	ND	ND	100	2934174
Total Selenium (Se)	ug/L	ND	ND	2934174	ND	ND	ND	2934443	ND	ND	ND	1.0	2934174
Total Silver (Ag)	ug/L	ND	ND	2934174	ND	ND	ND	2934443	ND	ND	ND	0.10	2934174
Total Sodium (Na)	ug/L	4370	3290	2934174	1950	1900	1910	2934443	1920	1740	1790	100	2934174
Total Strontium (Sr)	ug/L	73.4	53.8	2934174	13.8	15.6	13.2	2934443	5.7	18.7	14.2	2.0	2934174
Total Thallium (Tl)	ug/L	ND	ND	2934174	ND	ND	ND	2934443	ND	ND	ND	0.10	2934174
Total Tin (Sn)	ug/L	ND	ND	2934174	ND	ND	ND	2934443	ND	ND	ND	2.0	2934174
Total Titanium (Ti)	ug/L	2.7	ND	2934174	2.2	ND	2.9	2934443	2.7	ND	ND	2.0	2934174
Total Uranium (U)	ug/L	ND	ND	2934174	ND	ND	ND	2934443	ND	ND	ND	0.10	2934174
Total Vanadium (V)	ug/L	ND	ND	2934174	ND	ND	ND	2934443	ND	ND	ND	2.0	2934174
Total Zinc (Zn)	ug/L	ND	ND	2934174	8.3	ND	ND	2934443	ND	ND	ND	5.0	2934174

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: B2C0158
Report Date: 2012/08/16

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		OK8103	OK8104	OK8105		OK8106		OK8107	OK8108	OK8109		
Sampling Date		2012/08/04	2012/08/04	2012/08/05		2012/08/05		2012/08/05	2012/08/05	2012/08/05		
	Units	**R03**	**R04**	**R05**	**QC Batch**	**VE01**	**QC Batch**	**VE02**	**VE03**	**VE04**	**RDL**	**QC Batch**
Metals												
Total Aluminum (Al)	ug/L	77.2	68.9	47.7	2934443	32.2	2934174	25.0	43.1	61.0	5.0	2934443
Total Antimony (Sb)	ug/L	ND	ND	ND	2934443	ND	2934174	ND	ND	ND	1.0	2934443
Total Arsenic (As)	ug/L	5.1	1.6	ND	2934443	ND	2934174	ND	ND	1.0	1.0	2934443
Total Barium (Ba)	ug/L	2.4	3.0	7.4	2934443	1.2	2934174	ND	1.5	1.7	1.0	2934443
Total Beryllium (Be)	ug/L	ND	ND	ND	2934443	ND	2934174	ND	ND	ND	1.0	2934443
Total Bismuth (Bi)	ug/L	ND	ND	ND	2934443	ND	2934174	ND	ND	ND	2.0	2934443
Total Boron (B)	ug/L	ND	ND	ND	2934443	ND	2934174	ND	ND	ND	50	2934443
Total Cadmium (Cd)	ug/L	ND	ND	ND	2934443	ND	2934174	ND	ND	ND	0.017	2934443
Total Calcium (Ca)	ug/L	7890	5600	3320	2934443	5640	2934174	4900	4660	4180	100	2934443
Total Chromium (Cr)	ug/L	ND	ND	ND	2934443	ND	2934174	ND	ND	ND	1.0	2934443
Total Cobalt (Co)	ug/L	ND	ND	ND	2934443	ND	2934174	ND	ND	ND	0.40	2934443
Total Copper (Cu)	ug/L	ND	ND	ND	2934443	ND	2934174	ND	ND	ND	2.0	2934443
Total Iron (Fe)	ug/L	374	153	69	2934443	136	2934174	69	94	176	50	2934443
Total Lead (Pb)	ug/L	ND	ND	ND	2934443	ND	2934174	ND	ND	ND	0.50	2934443
Total Magnesium (Mg)	ug/L	931	746	448	2934443	848	2934174	742	707	613	100	2934443
Total Manganese (Mn)	ug/L	323	223	83.9	2934443	88.9	2934174	41.7	99.0	73.5	2.0	2934443
Total Molybdenum (Mo)	ug/L	ND	ND	ND	2934443	ND	2934174	ND	ND	ND	2.0	2934443
Total Nickel (Ni)	ug/L	ND	ND	ND	2934443	ND	2934174	ND	ND	ND	2.0	2934443
Total Phosphorus (P)	ug/L	ND	ND	ND	2934443	ND	2934174	ND	ND	ND	100	2934443
Total Potassium (K)	ug/L	102	124	120	2934443	119	2934174	122	116	107	100	2934443
Total Selenium (Se)	ug/L	ND	ND	ND	2934443	ND	2934174	ND	ND	ND	1.0	2934443
Total Silver (Ag)	ug/L	ND	ND	ND	2934443	ND	2934174	ND	ND	ND	0.10	2934443
Total Sodium (Na)	ug/L	1930	2120	1400	2934443	2020	2934174	1990	1960	1780	100	2934443
Total Strontium (Sr)	ug/L	15.3	9.5	8.3	2934443	14.7	2934174	14.3	14.0	13.4	2.0	2934443
Total Thallium (Tl)	ug/L	ND	ND	ND	2934443	ND	2934174	ND	ND	ND	0.10	2934443
Total Tin (Sn)	ug/L	ND	ND	ND	2934443	ND	2934174	ND	ND	ND	2.0	2934443
Total Titanium (Ti)	ug/L	3.2	2.7	2.6	2934443	ND	2934174	ND	2.1	4.5	2.0	2934443
Total Uranium (U)	ug/L	ND	ND	ND	2934443	ND	2934174	ND	ND	ND	0.10	2934443
Total Vanadium (V)	ug/L	ND	ND	ND	2934443	ND	2934174	ND	ND	ND	2.0	2934443
Total Zinc (Zn)	ug/L	ND	ND	ND	2934443	ND	2934174	ND	ND	ND	5.0	2934443

ND = Not detected
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Maxxam Job #: B2C0158
Report Date: 2012/08/16

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

ELEMENTS BY ICP/MS (WATER)

Maxxam ID		OK8110		OK8111		OK8112	OK8113		OK8114		
Sampling Date		2012/08/05		2012/08/05		2012/08/05	2012/08/05		2012/08/05		
	Units	**VE05**	**QC Batch**	**VE06**	**QC Batch**	**VE07**	**VE09**	**QC Batch**	**VE10**	**RDL**	**QC Batch**
Metals											
Total Aluminum (Al)	ug/L	49.2	2934174	52.3	2934443	69.6	85.2	2934174	51.4	5.0	2934443
Total Antimony (Sb)	ug/L	ND	2934174	ND	2934443	ND	ND	2934174	ND	1.0	2934443
Total Arsenic (As)	ug/L	ND	2934174	ND	2934443	ND	1.3	2934174	ND	1.0	2934443
Total Barium (Ba)	ug/L	1.4	2934174	2.4	2934443	1.4	14.1	2934174	3.0	1.0	2934443
Total Beryllium (Be)	ug/L	ND	2934174	ND	2934443	ND	ND	2934174	ND	1.0	2934443
Total Bismuth (Bi)	ug/L	ND	2934174	ND	2934443	ND	ND	2934174	ND	2.0	2934443
Total Boron (B)	ug/L	ND	2934174	ND	2934443	ND	ND	2934174	ND	50	2934443
Total Cadmium (Cd)	ug/L	ND	2934174	ND	2934443	ND	0.055	2934174	ND	0.017	2934443
Total Calcium (Ca)	ug/L	8230	2934174	8470	2934443	7630	7490	2934174	7520	100	2934443
Total Chromium (Cr)	ug/L	ND	2934174	ND	2934443	ND	ND	2934174	ND	1.0	2934443
Total Cobalt (Co)	ug/L	ND	2934174	ND	2934443	ND	1.50	2934174	0.41	0.40	2934443
Total Copper (Cu)	ug/L	ND	2934174	ND	2934443	ND	ND	2934174	ND	2.0	2934443
Total Iron (Fe)	ug/L	265	2934174	357	2934443	423	1170	2934174	429	50	2934443
Total Lead (Pb)	ug/L	ND	2934174	ND	2934443	ND	ND	2934174	ND	0.50	2934443
Total Magnesium (Mg)	ug/L	1190	2934174	1220	2934443	1120	1680	2934174	1670	100	2934443
Total Manganese (Mn)	ug/L	236	2934174	583	2934443	390	4530	2934174	738	2.0	2934443
Total Molybdenum (Mo)	ug/L	ND	2934174	ND	2934443	ND	ND	2934174	ND	2.0	2934443
Total Nickel (Ni)	ug/L	ND	2934174	ND	2934443	ND	ND	2934174	ND	2.0	2934443
Total Phosphorus (P)	ug/L	ND	2934174	ND	2934443	ND	ND	2934174	ND	100	2934443
Total Potassium (K)	ug/L	144	2934174	170	2934443	135	ND	2934174	ND	100	2934443
Total Selenium (Se)	ug/L	ND	2934174	ND	2934443	ND	ND	2934174	ND	1.0	2934443
Total Silver (Ag)	ug/L	ND	2934174	ND	2934443	ND	ND	2934174	ND	0.10	2934443
Total Sodium (Na)	ug/L	2110	2934174	2170	2934443	2020	2520	2934174	2310	100	2934443
Total Strontium (Sr)	ug/L	19.8	2934174	20.6	2934443	18.0	23.0	2934174	18.5	2.0	2934443
Total Thallium (Tl)	ug/L	ND	2934174	ND	2934443	ND	ND	2934174	ND	0.10	2934443
Total Tin (Sn)	ug/L	ND	2934174	ND	2934443	ND	ND	2934174	ND	2.0	2934443
Total Titanium (Ti)	ug/L	2.1	2934174	2.3	2934443	3.6	2.4	2934174	ND	2.0	2934443
Total Uranium (U)	ug/L	ND	2934174	ND	2934443	ND	ND	2934174	ND	0.10	2934443
Total Vanadium (V)	ug/L	ND	2934174	ND	2934443	ND	ND	2934174	ND	2.0	2934443
Total Zinc (Zn)	ug/L	ND	2934174	5.9	2934443	ND	5.1	2934174	ND	5.0	2934443

ND = Not detected
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Maxxam Job #: B2C0158
Report Date: 2012/08/16

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

GENERAL COMMENTS

Sample OK8095-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OK8096-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OK8097-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OK8098-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OK8099-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OK8100-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OK8101-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OK8102-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OK8103-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OK8104-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OK8105-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OK8106-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OK8107-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OK8108-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OK8109-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OK8110-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OK8111-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OK8112-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OK8114-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2934134	pH	2012/08/10							0.3	25	100	80 - 120
2934135	Conductivity	2012/08/10			101	80 - 120	ND, RDL=1.0	uS/cm	0	25		
2934136	pH	2012/08/10							0.3	25	100	80 - 120
2934139	Conductivity	2012/08/10			101	80 - 120	ND, RDL=1.0	uS/cm	0.2	25		
2934141	Turbidity	2012/08/10					ND, RDL=0.10	NTU	10.9	25	100	80 - 120
2934142	Turbidity	2012/08/10					ND, RDL=0.10	NTU	0.5	25	99	80 - 120
2934174	Total Aluminum (Al)	2012/08/13	109	80 - 120	111	80 - 120	6.9, RDL=5.0	ug/L	NC	25		
2934174	Total Antimony (Sb)	2012/08/13	107	80 - 120	113	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2934174	Total Arsenic (As)	2012/08/13	107	80 - 120	105	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2934174	Total Barium (Ba)	2012/08/13	94	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L	2.1	25		
2934174	Total Beryllium (Be)	2012/08/13	104	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2934174	Total Bismuth (Bi)	2012/08/13	110	80 - 120	113	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2934174	Total Boron (B)	2012/08/13	114	80 - 120	110	80 - 120	ND, RDL=50	ug/L	NC	25		
2934174	Total Cadmium (Cd)	2012/08/13	100	80 - 120	98	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2934174	Total Calcium (Ca)	2012/08/13	NC	80 - 120	107	80 - 120	ND, RDL=100	ug/L	0.3	25		
2934174	Total Chromium (Cr)	2012/08/13	106	80 - 120	105	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2934174	Total Cobalt (Co)	2012/08/13	105	80 - 120	106	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2934174	Total Copper (Cu)	2012/08/13	103	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L	5.1	25		
2934174	Total Iron (Fe)	2012/08/13	121(1, 2)	80 - 120	119	80 - 120	ND, RDL=50	ug/L	NC	25		
2934174	Total Lead (Pb)	2012/08/13	103	80 - 120	104	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2934174	Total Magnesium (Mg)	2012/08/13	NC	80 - 120	119	80 - 120	ND, RDL=100	ug/L	1	25		
2934174	Total Manganese (Mn)	2012/08/13	105	80 - 120	105	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2934174	Total Molybdenum (Mo)	2012/08/13	108	80 - 120	112	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2934174	Total Nickel (Ni)	2012/08/13	105	80 - 120	106	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2934174	Total Phosphorus (P)	2012/08/13	109	80 - 120	110	80 - 120	ND, RDL=100	ug/L	NC	25		
2934174	Total Potassium (K)	2012/08/13	106	80 - 120	109	80 - 120	ND, RDL=100	ug/L	2.5	25		
2934174	Total Selenium (Se)	2012/08/13	107	80 - 120	105	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2934174	Total Silver (Ag)	2012/08/13	102	80 - 120	109	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2934174	Total Sodium (Na)	2012/08/13	NC	80 - 120	117	80 - 120	ND, RDL=100	ug/L	1.7	25		
2934174	Total Strontium (Sr)	2012/08/13	NC	80 - 120	107	80 - 120	ND, RDL=2.0	ug/L	1.5	25		
2934174	Total Thallium (Tl)	2012/08/13	109	80 - 120	110	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2934174	Total Tin (Sn)	2012/08/13	106	80 - 120	113	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2934174	Total Titanium (Ti)	2012/08/13	111	80 - 120	112	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2934174	Total Uranium (U)	2012/08/13	124(1, 2)	80 - 120	125(1, 2)	80 - 120	ND, RDL=0.10	ug/L	0.9	25		
2934174	Total Vanadium (V)	2012/08/13	110	80 - 120	108	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2934174	Total Zinc (Zn)	2012/08/13	105	80 - 120	106	80 - 120	ND, RDL=5.0	ug/L	0.5	25		
2934214	Total Alkalinity (Total as CaCO3)	2012/08/10	92	80 - 120	98	80 - 120	ND, RDL=5.0	mg/L	NC	25	107	80 - 120
2934215	Dissolved Chloride (Cl)	2012/08/10	99	80 - 120	100	80 - 120	ND, RDL=1.0	mg/L	NC	25	103	80 - 120
2934216	Dissolved Sulphate (SO4)	2012/08/13	103	80 - 120	101	80 - 120	ND, RDL=2.0	mg/L	NC	25	102	80 - 120

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2934219	Reactive Silica (SiO2)	2012/08/10	100	80 - 120	101	80 - 120	ND, RDL=0.50	mg/L	NC	25	103	75 - 125
2934221	Colour	2012/08/10					ND, RDL=5.0	TCU	0.7	25	96	80 - 120
2934223	Orthophosphate (P)	2012/08/10	87	80 - 120	94	80 - 120	ND, RDL=0.010	mg/L	NC	25	97	80 - 120
2934224	Nitrate + Nitrite	2012/08/13	99	80 - 120	101	80 - 120	ND, RDL=0.050	mg/L	NC	25	102	80 - 120
2934225	Nitrite (N)	2012/08/13	92	80 - 120	100	80 - 120	ND, RDL=0.010	mg/L	NC	25	101	80 - 120
2934229	Total Alkalinity (Total as CaCO3)	2012/08/10	NC	80 - 120	92	80 - 120	ND, RDL=5.0	mg/L	NC	25	106	80 - 120
2934231	Dissolved Chloride (Cl)	2012/08/10	99	80 - 120	100	80 - 120	ND, RDL=1.0	mg/L	0.9	25	98	80 - 120
2934232	Dissolved Sulphate (SO4)	2012/08/13	NC	80 - 120	98	80 - 120	ND, RDL=2.0	mg/L	1.5	25	100	80 - 120
2934233	Reactive Silica (SiO2)	2012/08/10	NC	80 - 120	102	80 - 120	ND, RDL=0.50	mg/L	0.9	25	104	75 - 125
2934236	Colour	2012/08/10					ND, RDL=5.0	TCU	NC	25	96	80 - 120
2934237	Orthophosphate (P)	2012/08/10	91	80 - 120	102	80 - 120	ND, RDL=0.010	mg/L	NC	25	95	80 - 120
2934238	Nitrate + Nitrite	2012/08/13	98	80 - 120	101	80 - 120	ND, RDL=0.050	mg/L	NC	25	102	80 - 120
2934239	Nitrite (N)	2012/08/13	96	80 - 120	101	80 - 120	ND, RDL=0.010	mg/L	NC	25	99	80 - 120
2934304	Total Suspended Solids	2012/08/14					ND, RDL=1.0	mg/L	NC	25	99	80 - 120
2934320	Total Suspended Solids	2012/08/13					ND, RDL=1.0	mg/L	17.5	25	98	80 - 120
2934443	Total Aluminum (Al)	2012/08/13	108	80 - 120	114	80 - 120	7.0, RDL=5.0	ug/L	NC	25		
2934443	Total Antimony (Sb)	2012/08/13	119	80 - 120	109	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2934443	Total Arsenic (As)	2012/08/13	110	80 - 120	111	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2934443	Total Barium (Ba)	2012/08/13	NC	80 - 120	101	80 - 120	ND, RDL=1.0	ug/L	0.4	25		
2934443	Total Beryllium (Be)	2012/08/13	105	80 - 120	107	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2934443	Total Bismuth (Bi)	2012/08/13	114	80 - 120	118	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2934443	Total Boron (B)	2012/08/13	115	80 - 120	120	80 - 120	ND, RDL=50	ug/L	2.8	25		
2934443	Total Cadmium (Cd)	2012/08/13	102	80 - 120	103	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2934443	Total Calcium (Ca)	2012/08/13	NC	80 - 120	112	80 - 120	ND, RDL=100	ug/L	0.6	25		
2934443	Total Chromium (Cr)	2012/08/13	110	80 - 120	112	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2934443	Total Cobalt (Co)	2012/08/13	110	80 - 120	113	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2934443	Total Copper (Cu)	2012/08/13	105	80 - 120	110	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2934443	Total Iron (Fe)	2012/08/13	120	80 - 120	108	80 - 120	ND, RDL=50	ug/L	NC	25		
2934443	Total Lead (Pb)	2012/08/13	107	80 - 120	110	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2934443	Total Magnesium (Mg)	2012/08/13	NC	80 - 120	104	80 - 120	ND, RDL=100	ug/L	1.3	25		
2934443	Total Manganese (Mn)	2012/08/13	109	80 - 120	111	80 - 120	ND, RDL=2.0	ug/L	0.6	25		
2934443	Total Molybdenum (Mo)	2012/08/13	120	80 - 120	108	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2934443	Total Nickel (Ni)	2012/08/13	109	80 - 120	112	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2934443	Total Phosphorus (P)	2012/08/13	110	80 - 120	113	80 - 120	ND, RDL=100	ug/L	NC	25		
2934443	Total Potassium (K)	2012/08/13	110	80 - 120	114	80 - 120	ND, RDL=100	ug/L	0.3	25		
2934443	Total Selenium (Se)	2012/08/13	108	80 - 120	109	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2934443	Total Silver (Ag)	2012/08/13	114	80 - 120	106	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2934443	Total Sodium (Na)	2012/08/13	NC	80 - 120	106	80 - 120	ND, RDL=100	ug/L	1.5	25		
2934443	Total Strontium (Sr)	2012/08/13	NC	80 - 120	112	80 - 120	ND, RDL=2.0	ug/L	0.6	25		

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Maxxam Job #: B2C0158
Report Date: 2012/08/16

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2934443	Total Thallium (Tl)	2012/08/13	113	80 - 120	116	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2934443	Total Tin (Sn)	2012/08/13	118	80 - 120	108	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2934443	Total Titanium (Ti)	2012/08/13	114	80 - 120	117	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2934443	Total Uranium (U)	2012/08/13	130(1, 2)	80 - 120	106	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2934443	Total Vanadium (V)	2012/08/13	112	80 - 120	114	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2934443	Total Zinc (Zn)	2012/08/13	109	80 - 120	112	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2934587	Nitrogen (Ammonia Nitrogen)	2012/08/13	100	80 - 120	103	80 - 120	ND, RDL=0.050	mg/L	NC	25	100	80 - 120
2934589	Nitrogen (Ammonia Nitrogen)	2012/08/14	101	80 - 120	103	80 - 120	ND, RDL=0.050	mg/L	NC	25	99	80 - 120
2936199	Total Mercury (Hg)	2012/08/13	101	80 - 120	109	80 - 120	ND, RDL=0.013	ug/L	NC	25	94	80 - 120
2936202	Total Mercury (Hg)	2012/08/13	104	80 - 120	111	80 - 120	ND, RDL=0.013	ug/L	NC	25	111	80 - 120
2936529	Total Organic Carbon (C)	2012/08/13	NC	80 - 120	96	80 - 120	ND, RDL=0.50	mg/L	2.1	25		
2936543	Total Organic Carbon (C)	2012/08/13	85	80 - 120	91	80 - 120	ND, RDL=0.50	mg/L	NC	25		

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.
(1) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.
(2) - Recovery is within QC acceptance limits. < 10 % of compounds in multi-component analysis in violation.

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Validation Signature Page

Maxxam Job #: B2C0158

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

Colleen Acker

Kevin Macdonald, Inorganics Supervisor

==========

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Round 15

Your P.O. #: 16300R-40
Your Project #: 121510621.100
Site Location: VALENTINE LAKE
Your C.O.C. #: N/A

Attention: Barry Wicks
Stantec Consulting Ltd
St. John's - Standing Offer
607 Torbay Rd
St. John's, NL
A1A 4Y6

Report Date: 2012/10/03

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B2E7715
Received: 2012/09/25, 09:58

Sample Matrix: Water
Samples Received: 21

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Carbonate, Bicarbonate and Hydroxide (1)	1	N/A	2012/09/26	CAM SOP-00102	APHA 4500-CO2 D
Carbonate, Bicarbonate and Hydroxide (1)	20	N/A	2012/09/27	CAM SOP-00102	APHA 4500-CO2 D
Alkalinity (1)	21	N/A	2012/10/01	ATL SOP 00013	Based on EPA310.2
Chloride (1)	21	N/A	2012/10/01	ATL SOP 00014	Based on SM4500-Cl-
Colour (1)	21	N/A	2012/10/02	ATL SOP 00020	Based on SM2120C
Conductance - water (1)	2	N/A	2012/09/26	ATL SOP 00004/00006	Based on SM2510B
Conductance - water (1)	19	N/A	2012/09/27	ATL SOP 00004/00006	Based on SM2510B
Hardness (calculated as CaCO3) (1)	4	N/A	2012/09/28	ATL SOP 00048	Based on SM2340B
Hardness (calculated as CaCO3) (1)	17	N/A	2012/10/01	ATL SOP 00048	Based on SM2340B
Mercury - Total (CVAA,LL) (1)	4	2012/09/27	2012/09/27	ATL SOP 00026	Based on EPA245.1
Mercury - Total (CVAA,LL) (1)	17	2012/10/01	2012/10/01	ATL SOP 00026	Based on EPA245.1
Metals Water Total MS (1)	4	2012/09/26	2012/09/27	ATL SOP 00059	Based on EPA6020A
Metals Water Total MS (1)	1	2012/09/27	2012/09/28	ATL SOP 00059	Based on EPA6020A
Metals Water Total MS (1)	16	2012/09/27	2012/09/29	ATL SOP 00059	Based on EPA6020A
Ion Balance (% Difference) (1)	21	N/A	2012/10/02		
Anion and Cation Sum (1)	4	N/A	2012/09/29		
Anion and Cation Sum (1)	17	N/A	2012/10/01		
Nitrogen Ammonia - water (1)	17	N/A	2012/09/28	ATL SOP 00015	Based on USEPA 350.1
Nitrogen Ammonia - water (1)	4	N/A	2012/09/29	ATL SOP 00015	Based on USEPA 350.1
Nitrogen - Nitrate + Nitrite (1)	21	N/A	2012/10/01	ATL SOP 00016	Based on USGS - Enz.
Nitrogen - Nitrite (1)	21	N/A	2012/10/02	ATL SOP 00017	Based on SM4500-NO2B
Nitrogen - Nitrate (as N) (1)	21	N/A	2012/10/02	ATL SOP 00018	Based on ASTMD3867
pH (1)	2	N/A	2012/09/26	ATL SOP 00003	Based on SM4500H+B
pH (1)	19	N/A	2012/09/27	ATL SOP 00003	Based on SM4500H+B
Phosphorus - ortho (1)	21	N/A	2012/10/02	ATL SOP 00021	Based on USEPA 365.1
Sat. pH and Langelier Index (@ 20C) (1)	21	N/A	2012/10/02		
Sat. pH and Langelier Index (@ 4C) (1)	21	N/A	2012/10/02		
Reactive Silica (1)	21	N/A	2012/10/02	ATL SOP 00022	Based on EPA 366.0
Sulphate (1)	21	N/A	2012/10/01	ATL SOP 00023	Based on EPA 375.4
Total Dissolved Solids (TDS calc) (1)	21	N/A	2012/10/02		
Organic carbon - Total (TOC) (1)	21	N/A	2012/10/03	ATL SOP 00037	Based on SM5310C
Total Suspended Solids (1)	21	N/A	2012/09/26	ATL SOP 00007	based on EPA 160.2
Turbidity (1)	1	N/A	2012/09/27	ATL SOP 00011	based on EPA 180.1
Turbidity (1)	20	N/A	2012/09/28	ATL SOP 00011	based on EPA 180.1

Remarks:

Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

../2

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Maxxam Job #: B2E7715
Report Date: 2012/10/03

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
* Results relate only to the items tested.

(1) This test was performed by Bedford

Encryption Key

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

Michelle Hill, Project Manager
Email: MHill@maxxam.ca
Phone# (902) 420-0203 Ext:289

==========

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Total cover pages: 2

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Maxxam Job #: B2E7715
Report Date: 2012/10/03

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		OY5998	OY5999	OY6000			OY6001	OY6001		OY6002		
Sampling Date		2012/09/16	2012/09/16	2012/09/16			2012/09/16	2012/09/16		2012/09/16		
	Units	**LP-01**	**LP-02**	**LP-03**	**RDL**	**QC Batch**	**LP-04**	**LP-04 Lab-Dup**	**QC Batch**	**LP-05**	**RDL**	**QC Batch**
Calculated Parameters												
Anion Sum	me/L	0.570	0.550	0.0700	N/A	2980732	0.470		2980732	0.430	N/A	2980732
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	23	22	ND	1.0	2980728	20		2980728	19	1.0	2980728
Calculated TDS	mg/L	33.0	31.0	8.0	1.0	2980737	27.0		2980737	26.0	1.0	2980737
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	ND	ND	1.0	2980728	ND		2980728	ND	1.0	2980728
Cation Sum	me/L	0.690	0.660	0.190	N/A	2980732	0.570		2980732	0.570	N/A	2980732
Hardness (CaCO3)	mg/L	26	25	5.7	1.0	2980730	24		2980730	25	1.0	2980730
Ion Balance (% Difference)	%	9.52	9.09	46.2	N/A	2980731	9.62		2980731	14.0	N/A	2980731
Langelier Index (@ 20C)	N/A	-1.38	-1.39	NC		2980735	-1.70		2980735	-1.83		2980735
Langelier Index (@ 4C)	N/A	-1.63	-1.64	NC		2980736	-1.95		2980736	-2.08		2980736
Nitrate (N)	mg/L	ND	ND	0.077	0.050	2980733	ND		2980733	ND	0.050	2980733
Saturation pH (@ 20C)	N/A	8.99	9.03	NC		2980735	9.09		2980735	9.12		2980735
Saturation pH (@ 4C)	N/A	9.24	9.28	NC		2980736	9.34		2980736	9.37		2980736
Inorganics												
Total Alkalinity (Total as CaCO3)	mg/L	24	22	ND	5.0	2986593	20		2986593	19	5.0	2986593
Dissolved Chloride (Cl)	mg/L	3.5	3.5	2.4	1.0	2986595	2.1		2986595	2.1	1.0	2986595
Colour	TCU	35	35	20	5.0	2986598	72		2986598	69	25	2986598
Nitrate + Nitrite	mg/L	ND	ND	0.077	0.050	2986601	ND		2986601	ND	0.050	2986601
Nitrite (N)	mg/L	ND	ND	ND	0.010	2986602	ND		2986602	ND	0.010	2986602
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	ND	0.050	2985729	ND	ND	2985729	ND	0.050	2985729
Total Organic Carbon (C)	mg/L	8.9	8.8	4.0	0.50	2989992	12		2989992	13	0.50	2989985
Orthophosphate (P)	mg/L	ND	ND	ND	0.010	2986600	ND		2986600	ND	0.010	2986600
pH	pH	7.61	7.64	6.79	N/A	2983537	7.39		2983537	7.29	N/A	2983537
Reactive Silica (SiO2)	mg/L	0.93	0.84	1.3	0.50	2986597	1.9		2986597	1.7	0.50	2986597
Total Suspended Solids	mg/L	1.4	2.2	ND	1.0	2982164	1.4		2982164	ND	1.0	2982164
Dissolved Sulphate (SO4)	mg/L	ND	ND	ND	2.0	2986596	ND		2986596	ND	2.0	2986596
Turbidity	NTU	1.4	1.1	0.20	0.10	2985420	0.48	0.38	2983561	0.66	0.10	2985420
Conductivity	uS/cm	62	59	19	1.0	2983538	50		2983538	48	1.0	2983538

N/A = Not Applicable
ND = Not detected
NC = Non-calculable
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B2E7715
Report Date: 2012/10/03

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		OY6003	OY6004			OY6005	OY6005	OY6006	OY6006		
Sampling Date		2012/09/16	2012/09/16			2012/09/17	2012/09/17	2012/09/17	2012/09/17		
	Units	**VL-01**	**R01**	**RDL**	**QC Batch**	**R02**	**R02 Lab-Dup**	**R03**	**R03 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters											
Anion Sum	me/L	0.160	0.360	N/A	2980732	0.290		0.310		N/A	2980732
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	6.4	15	1.0	2980728	12		12		1.0	2980728
Calculated TDS	mg/L	11.0	22.0	1.0	2980737	19.0		20.0		1.0	2980737
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	ND	1.0	2980728	ND		ND		1.0	2980728
Cation Sum	me/L	0.200	0.410	N/A	2980732	0.390		0.390		N/A	2980732
Hardness (CaCO3)	mg/L	6.5	17	1.0	2980730	15		16		1.0	2980730
Ion Balance (% Difference)	%	11.1	6.49	N/A	2980731	14.7		11.4		N/A	2980731
Langelier Index (@ 20C)	N/A	-3.40	-2.00		2980735	-2.23		-2.27			2980735
Langelier Index (@ 4C)	N/A	-3.65	-2.26		2980736	-2.49		-2.52			2980736
Nitrate (N)	mg/L	ND	ND	0.050	2980733	ND		ND		0.050	2980733
Saturation pH (@ 20C)	N/A	10.2	9.36		2980735	9.49		9.47			2980735
Saturation pH (@ 4C)	N/A	10.4	9.62		2980736	9.75		9.72			2980736
Inorganics											
Total Alkalinity (Total as CaCO3)	mg/L	6.4	15	5.0	2986593	12		12		5.0	2986593
Dissolved Chloride (Cl)	mg/L	1.2	2.1	1.0	2986595	2.1		2.2		1.0	2986595
Colour	TCU	16	34	5.0	2986598	71		69		25	2986598
Nitrate + Nitrite	mg/L	ND	ND	0.050	2986601	ND		ND		0.050	2986601
Nitrite (N)	mg/L	ND	ND	0.010	2986602	ND		ND		0.010	2986602
Nitrogen (Ammonia Nitrogen)	mg/L	ND	ND	0.050	2985729	ND		ND		0.050	2985729
Total Organic Carbon (C)	mg/L	5.5	7.5	0.50	2989985	10	11	11		0.50	2989985
Orthophosphate (P)	mg/L	ND	ND	0.010	2986600	ND		ND		0.010	2986600
pH	pH	6.76	7.36	N/A	2983537	7.26		7.20	7.18	N/A	2983537
Reactive Silica (SiO2)	mg/L	1.7	2.6	0.50	2986597	1.8		2.6		0.50	2986597
Total Suspended Solids	mg/L	4.4	ND	1.0	2982164	ND		ND		1.0	2982164
Dissolved Sulphate (SO4)	mg/L	ND	ND	2.0	2986596	ND		ND		2.0	2986596
Turbidity	NTU	1.2	0.60	0.10	2985420	0.64		0.46		0.10	2985426
Conductivity	uS/cm	18	36	1.0	2983538	31		33	33	1.0	2983538

N/A = Not Applicable
ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B2E7715
Report Date: 2012/10/03

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		OY6007	OY6007		OY6008	OY6009	OY6010	OY6011		OY6012		
Sampling Date		2012/09/17	2012/09/17		2012/09/17	2012/09/17	2012/09/17	2012/09/17		2012/09/17		
	Units	**R04**	**R04 Lab-Dup**	**QC Batch**	**R05**	**VE01**	**VE02**	**VE03**	**RDL**	**VE04**	**RDL**	**QC Batch**
Calculated Parameters												
Anion Sum	me/L	0.280		2980732	0.220	0.260	0.270	0.250	N/A	0.240	N/A	2980732
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	11		2980728	8.0	9.9	10	9.1	1.0	8.5	1.0	2980728
Calculated TDS	mg/L	19.0		2980737	12.0	17.0	17.0	16.0	1.0	15.0	1.0	2980737
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND		2980728	ND	ND	ND	ND	1.0	ND	1.0	2980728
Cation Sum	me/L	0.350		2980732	0.250	0.330	0.320	0.320	N/A	0.310	N/A	2980732
Hardness (CaCO3)	mg/L	14		2980730	9.5	12	12	12	1.0	12	1.0	2980730
Ion Balance (% Difference)	%	11.1		2980731	6.38	11.9	8.47	12.3	N/A	12.7	N/A	2980731
Langelier Index (@ 20C)	N/A	-2.54		2980735	-2.71	-2.56	-2.54	-2.63		-2.80		2980735
Langelier Index (@ 4C)	N/A	-2.79		2980736	-2.96	-2.81	-2.80	-2.88		-3.06		2980736
Nitrate (N)	mg/L	0.053		2980733	ND	ND	ND	0.051	0.050	ND	0.050	2980733
Saturation pH (@ 20C)	N/A	9.58		2980735	9.87	9.69	9.68	9.74		9.76		2980735
Saturation pH (@ 4C)	N/A	9.83		2980736	10.1	9.94	9.94	9.99		10.0		2980736
Inorganics												
Total Alkalinity (Total as CaCO3)	mg/L	11		2986593	8.1	9.9	10	9.1	5.0	8.5	5.0	2986593
Dissolved Chloride (Cl)	mg/L	2.2		2986595	1.9	2.2	2.2	2.3	1.0	2.4	1.0	2986595
Colour	TCU	43		2986598	12	40	40	40	5.0	75	25	2986598
Nitrate + Nitrite	mg/L	0.053		2986601	ND	ND	ND	0.051	0.050	ND	0.050	2986601
Nitrite (N)	mg/L	ND		2986602	ND	ND	ND	ND	0.010	ND	0.010	2986602
Nitrogen (Ammonia Nitrogen)	mg/L	ND		2985729	ND	ND	ND	ND	0.050	ND	0.050	2985729
Total Organic Carbon (C)	mg/L	9.6		2989985	4.0	8.9	8.8	9.3	0.50	13(1)	1.0	2989985
Orthophosphate (P)	mg/L	ND		2986600	ND	ND	ND	ND	0.010	ND	0.010	2986600
pH	pH	7.04	7.00	2982112	7.16	7.13	7.14	7.11	N/A	6.96	N/A	2983540
Reactive Silica (SiO2)	mg/L	2.8		2986597	0.71	2.3	2.3	2.0	0.50	1.5	0.50	2986597
Total Suspended Solids	mg/L	1.0		2982164	2.0	1.0	ND	2.2	1.0	ND	2.0	2982164
Dissolved Sulphate (SO4)	mg/L	ND		2986596	ND	ND	ND	ND	2.0	ND	2.0	2986596
Turbidity	NTU	0.20		2985426	2.0	0.25	0.27	0.30	0.10	1.8	0.10	2985426
Conductivity	uS/cm	32	30	2982113	24	28	28	27	1.0	26	1.0	2983542

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(1) - Elevated reporting limit due to sample matrix.

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Maxxam Job #: B2E7715
Report Date: 2012/10/03

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		OY6012		OY6013	OY6014		OY6015	OY6015		
Sampling Date		2012/09/17		2012/09/17	2012/09/17		2012/09/17	2012/09/17		
	Units	**VE04 Lab-Dup**	**RDL**	**VE05**	**VE06**	**QC Batch**	**VE07**	**VE07 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters										
Anion Sum	me/L		N/A	0.350	0.280	2980732	0.290		N/A	2980732
Bicarb. Alkalinity (calc. as CaCO3)	mg/L		1.0	14	11	2980728	11		1.0	2980728
Calculated TDS	mg/L		1.0	22.0	21.0	2980737	21.0		1.0	2980737
Carb. Alkalinity (calc. as CaCO3)	mg/L		1.0	ND	ND	2980728	ND		1.0	2980728
Cation Sum	me/L		N/A	0.360	0.340	2980732	0.350		N/A	2980732
Hardness (CaCO3)	mg/L		1.0	14	13	2980730	13		1.0	2980730
Ion Balance (% Difference)	%		N/A	1.41	9.68	2980731	9.38		N/A	2980731
Langelier Index (@ 20C)	N/A			-2.25	-2.51	2980735	-2.53			2980735
Langelier Index (@ 4C)	N/A			-2.51	-2.76	2980736	-2.78			2980736
Nitrate (N)	mg/L		0.050	0.058	0.072	2980733	0.074		0.050	2980733
Saturation pH (@ 20C)	N/A			9.53	9.65	2980735	9.64			2980735
Saturation pH (@ 4C)	N/A			9.79	9.90	2980736	9.89			2980736
Inorganics										
Total Alkalinity (Total as CaCO3)	mg/L	8.6	5.0	14	11	2986593	11		5.0	2986593
Dissolved Chloride (Cl)	mg/L	2.2	1.0	2.4	2.1	2986595	2.2		1.0	2986595
Colour	TCU	73	25	23	37	2986598	40		5.0	2986598
Nitrate + Nitrite	mg/L	ND	0.050	0.058	0.072	2986601	0.074		0.050	2986601
Nitrite (N)	mg/L	ND	0.010	ND	ND	2986602	ND		0.010	2986602
Nitrogen (Ammonia Nitrogen)	mg/L		0.050	ND	ND	2985729	ND		0.050	2985738
Total Organic Carbon (C)	mg/L		1.0	8.1	10	2989985	11		0.50	2989985
Orthophosphate (P)	mg/L	ND	0.010	ND	ND	2986600	ND		0.010	2986600
pH	pH		N/A	7.28	7.14	2983540	7.11	7.12	N/A	2982521
Reactive Silica (SiO2)	mg/L	1.5	0.50	2.6	4.6	2986597	4.8		0.50	2986597
Total Suspended Solids	mg/L	ND	2.0	ND	ND	2982164	ND		1.0	2982164
Dissolved Sulphate (SO4)	mg/L	ND	2.0	ND	ND	2986596	ND		2.0	2986596
Turbidity	NTU		0.10	1.3	0.43	2985426	0.65		0.10	2985426
Conductivity	uS/cm		1.0	36	30	2983542	31	31	1.0	2982523

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Maxxam Job #: B2E7715
Report Date: 2012/10/03

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
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Sampler Initials: SM

RESULTS OF ANALYSES OF WATER

Maxxam ID		OY6016		OY6017		OY6018	OY6018		
Sampling Date		2012/09/17		2012/09/17		2012/09/17	2012/09/17		
	Units	**VE08**	**QC Batch**	**VE09**	**QC Batch**	**VE10**	**VE10 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters									
Anion Sum	me/L	0.170	2980732	0.270	2980732	0.290		N/A	2980732
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	5.1	2980728	11	2980728	12		1.0	2980728
Calculated TDS	mg/L	14.0	2980737	19.0	2980737	20.0		1.0	2980737
Carb. Alkalinity (calc. as CaCO3)	mg/L	ND	2980728	ND	2980728	ND		1.0	2980728
Cation Sum	me/L	0.220	2980732	0.350	2980732	0.380		N/A	2980732
Hardness (CaCO3)	mg/L	7.5	2980730	13	2980730	15		1.0	2980730
Ion Balance (% Difference)	%	12.8	2980731	12.9	2980731	13.4		N/A	2980731
Langelier Index (@ 20C)	N/A	-3.93	2980735	-2.65	2980735	-2.61			2980735
Langelier Index (@ 4C)	N/A	-4.18	2980736	-2.90	2980736	-2.87			2980736
Nitrate (N)	mg/L	0.18	2980733	0.054	2980733	ND		0.050	2980733
Saturation pH (@ 20C)	N/A	10.2	2980735	9.66	2980735	9.58			2980735
Saturation pH (@ 4C)	N/A	10.5	2980736	9.91	2980736	9.84			2980736
Inorganics									
Total Alkalinity (Total as CaCO3)	mg/L	5.1	2986593	11	2986604	12	13	5.0	2986604
Dissolved Chloride (Cl)	mg/L	1.9	2986595	1.6	2986605	1.8	2.1	1.0	2986605
Colour	TCU	37	2986598	41	2986609	42	44	5.0	2986609
Nitrate + Nitrite	mg/L	0.18	2986601	0.054	2986612	ND	ND	0.050	2986612
Nitrite (N)	mg/L	ND	2986602	ND	2986698	ND	ND	0.010	2986698
Nitrogen (Ammonia Nitrogen)	mg/L	ND	2985738	ND	2985738	ND		0.050	2985738
Total Organic Carbon (C)	mg/L	11	2989985	11	2989985	11		0.50	2989985
Orthophosphate (P)	mg/L	ND	2986600	ND	2986611	ND	ND	0.010	2986611
pH	pH	6.31	2983540	7.01	2983540	6.97		N/A	2983540
Reactive Silica (SiO2)	mg/L	4.0	2986597	3.4	2986608	3.9	4.0	0.50	2986608
Total Suspended Solids	mg/L	ND	2982164	ND	2982164	ND		1.0	2982173
Dissolved Sulphate (SO4)	mg/L	ND	2986596	ND	2986607	ND	ND	2.0	2986607
Turbidity	NTU	0.25	2985426	0.37	2985426	0.50		0.10	2985426
Conductivity	uS/cm	20	2983542	29	2983542	32		1.0	2983542

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MERCURY BY COLD VAPOUR AA (WATER)

Maxxam ID		OY5998	OY5999	OY6000	OY6001		OY6002	OY6002	OY6003	OY6004	OY6005		
Sampling Date		2012/09/16	2012/09/16	2012/09/16	2012/09/16		2012/09/16	2012/09/16	2012/09/16	2012/09/16	2012/09/17		
	Units	**LP-01**	**LP-02**	**LP-03**	**LP-04**	**QC Batch**	**LP-05**	**LP-05 Lab-Dup**	**VL-01**	**R01**	**R02**	**RDL**	**QC Batch**
Metals													
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	2983923	ND	ND	ND	ND	ND	0.013	2987323

Maxxam ID		OY6006	OY6007	OY6008	OY6009	OY6010	OY6011	OY6012		
Sampling Date		2012/09/17	2012/09/17	2012/09/17	2012/09/17	2012/09/17	2012/09/17	2012/09/17		
	Units	**R03**	**R04**	**R05**	**VE01**	**VE02**	**VE03**	**VE04**	**RDL**	**QC Batch**
Metals										
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	ND	0.013	2987323

Maxxam ID		OY6013	OY6014	OY6015	OY6016	OY6017	OY6018		
Sampling Date		2012/09/17	2012/09/17	2012/09/17	2012/09/17	2012/09/17	2012/09/17		
	Units	**VE05**	**VE06**	**VE07**	**VE08**	**VE09**	**VE10**	**RDL**	**QC Batch**
Metals									
Total Mercury (Hg)	ug/L	ND	ND	ND	ND	ND	ND	0.013	2987323

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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		OY5998	OY5999	OY6000	OY6001	OY6002	OY6003	OY6004		OY6005		
Sampling Date		2012/09/16	2012/09/16	2012/09/16	2012/09/16	2012/09/16	2012/09/16	2012/09/16		2012/09/17		
	Units	**LP-01**	**LP-02**	**LP-03**	**LP-04**	**LP-05**	**VL-01**	**R01**	**QC Batch**	**R02**	**RDL**	**QC Batch**
Metals												
Total Aluminum (Al)	ug/L	108	76.2	52.4	122	115	91.3	32.5	2983703	67.2	5.0	2984592
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	ND	2983703	ND	1.0	2984592
Total Arsenic (As)	ug/L	ND	ND	ND	1.4	1.2	1.5	7.6	2983703	6.4	1.0	2984592
Total Barium (Ba)	ug/L	3.6	3.4	2.6	1.9	1.8	1.2	1.7	2983703	1.0	1.0	2984592
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	ND	2983703	ND	1.0	2984592
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	ND	2983703	ND	2.0	2984592
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	ND	2983703	ND	50	2984592
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	ND	ND	ND	2983703	ND	0.017	2984592
Total Calcium (Ca)	ug/L	8560	8150	1680	7740	7880	2010	5590	2983703	5160	100	2984592
Total Chromium (Cr)	ug/L	ND	ND	ND	ND	ND	ND	ND	2983703	ND	1.0	2984592
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	ND	ND	ND	2983703	ND	0.40	2984592
Total Copper (Cu)	ug/L	ND	ND	ND	ND	ND	ND	ND	2983703	ND	2.0	2984592
Total Iron (Fe)	ug/L	205	340	70	273	245	247	291	2983703	256	50	2984592
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	ND	ND	2983703	ND	0.50	2984592
Total Magnesium (Mg)	ug/L	1150	1110	375	1160	1170	366	669	2983703	614	100	2984592
Total Manganese (Mn)	ug/L	76.8	36.0	13.8	55.9	56.2	365	153	2983703	25.6	2.0	2984592
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	ND	2983703	ND	2.0	2984592
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	ND	2983703	ND	2.0	2984592
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	ND	2983703	ND	100	2984592
Total Potassium (K)	ug/L	766	661	196	146	152	ND	103	2983703	134	100	2984592
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	ND	2983703	ND	1.0	2984592
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	ND	2983703	ND	0.10	2984592
Total Sodium (Na)	ug/L	3240	3130	1660	1630	1670	1310	1460	2983703	1510	100	2984592
Total Strontium (Sr)	ug/L	59.7	55.6	5.7	14.6	14.7	4.5	12.8	2983703	10.8	2.0	2984592
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	ND	2983703	ND	0.10	2984592
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	ND	2983703	ND	2.0	2984592
Total Titanium (Ti)	ug/L	3.5	2.4	ND	ND	ND	2.9	ND	2983703	ND	2.0	2984592
Total Uranium (U)	ug/L	ND	ND	ND	ND	ND	ND	ND	2983703	ND	0.10	2984592
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	ND	2983703	ND	2.0	2984592
Total Zinc (Zn)	ug/L	ND	ND	ND	6.9	5.3	ND	5.2	2983703	8.1	5.0	2984592

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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		OY6006	OY6007	OY6008	OY6009	OY6010	OY6011		OY6012		OY6013		
Sampling Date		2012/09/17	2012/09/17	2012/09/17	2012/09/17	2012/09/17	2012/09/17		2012/09/17		2012/09/17		
	Units	**R03**	**R04**	**R05**	**VE01**	**VE02**	**VE03**	**QC Batch**	**VE04**	**QC Batch**	**VE05**	**RDL**	**QC Batch**
Metals													
Total Aluminum (Al)	ug/L	87.8	87.8	23.6	62.6	57.6	68.9	2983703	114	2982476	72.9	5.0	2983703
Total Antimony (Sb)	ug/L	ND	ND	ND	ND	ND	ND	2983703	ND	2982476	ND	1.0	2983703
Total Arsenic (As)	ug/L	3.1	1.2	ND	ND	ND	ND	2983703	1.2	2982476	ND	1.0	2983703
Total Barium (Ba)	ug/L	1.6	1.9	5.6	1.4	1.2	1.5	2983703	2.4	2982476	4.7	1.0	2983703
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	2983703	ND	2982476	ND	1.0	2983703
Total Bismuth (Bi)	ug/L	ND	ND	ND	ND	ND	ND	2983703	ND	2982476	ND	2.0	2983703
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	2983703	ND	2982476	ND	50	2983703
Total Cadmium (Cd)	ug/L	ND	ND	ND	ND	ND	ND	2983703	ND	2982476	0.018	0.017	2983703
Total Calcium (Ca)	ug/L	5300	4570	3120	3910	3800	3780	2983703	3780	2982476	4050	100	2983703
Total Chromium (Cr)	ug/L	ND	ND	ND	ND	ND	ND	2983703	ND	2982476	ND	1.0	2983703
Total Cobalt (Co)	ug/L	ND	ND	ND	ND	ND	ND	2983703	ND	2982476	0.54	0.40	2983703
Total Copper (Cu)	ug/L	ND	ND	ND	ND	ND	ND	2983703	ND	2982476	ND	2.0	2983703
Total Iron (Fe)	ug/L	240	91	ND	145	124	139	2983703	299	2982476	284	50	2983703
Total Lead (Pb)	ug/L	ND	ND	ND	ND	ND	ND	2983703	ND	2982476	ND	0.50	2983703
Total Magnesium (Mg)	ug/L	648	597	417	629	600	606	2983703	547	2982476	831	100	2983703
Total Manganese (Mn)	ug/L	82.4	49.0	19.2	63.2	42.7	60.2	2983703	123	2982476	1600	2.0	2983703
Total Molybdenum (Mo)	ug/L	ND	ND	ND	ND	ND	ND	2983703	ND	2982476	ND	2.0	2983703
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	2983703	ND	2982476	ND	2.0	2983703
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	2983703	ND	2982476	ND	100	2983703
Total Potassium (K)	ug/L	ND	ND	118	108	108	116	2983703	203	2982476	116	100	2983703
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	2983703	ND	2982476	ND	1.0	2983703
Total Silver (Ag)	ug/L	ND	ND	ND	ND	ND	ND	2983703	ND	2982476	ND	0.10	2983703
Total Sodium (Na)	ug/L	1500	1650	1250	1630	1590	1670	2983703	1450	2982476	1860	100	2983703
Total Strontium (Sr)	ug/L	10.0	7.7	8.1	11.2	11.1	11.7	2983703	12.3	2982476	9.2	2.0	2983703
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	2983703	ND	2982476	ND	0.10	2983703
Total Tin (Sn)	ug/L	ND	ND	ND	ND	ND	ND	2983703	ND	2982476	ND	2.0	2983703
Total Titanium (Ti)	ug/L	ND	ND	ND	ND	ND	ND	2983703	3.8	2982476	ND	2.0	2983703
Total Uranium (U)	ug/L	ND	ND	ND	ND	ND	ND	2983703	ND	2982476	ND	0.10	2983703
Total Vanadium (V)	ug/L	ND	ND	ND	ND	ND	ND	2983703	ND	2982476	ND	2.0	2983703
Total Zinc (Zn)	ug/L	ND	5.1	5.4	5.0	ND	6.3	2983703	ND	2982476	ND	5.0	2983703

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ELEMENTS BY ICP/MS (WATER)

Maxxam ID		OY6014	OY6015		OY6016	OY6017	OY6018		
Sampling Date		2012/09/17	2012/09/17		2012/09/17	2012/09/17	2012/09/17		
	Units	**VE06**	**VE07**	**QC Batch**	**VE08**	**VE09**	**VE10**	**RDL**	**QC Batch**
Metals									
Total Aluminum (Al)	ug/L	143	129	2983703	139	138	93.0	5.0	2982476
Total Antimony (Sb)	ug/L	ND	ND	2983703	ND	ND	ND	1.0	2982476
Total Arsenic (As)	ug/L	ND	ND	2983703	ND	ND	ND	1.0	2982476
Total Barium (Ba)	ug/L	2.1	2.0	2983703	ND	2.7	2.8	1.0	2982476
Total Beryllium (Be)	ug/L	ND	ND	2983703	ND	ND	ND	1.0	2982476
Total Bismuth (Bi)	ug/L	ND	ND	2983703	ND	ND	ND	2.0	2982476
Total Boron (B)	ug/L	ND	ND	2983703	ND	ND	ND	50	2982476
Total Cadmium (Cd)	ug/L	ND	ND	2983703	ND	0.018	ND	0.017	2982476
Total Calcium (Ca)	ug/L	3960	4030	2983703	2090	3880	4240	100	2982476
Total Chromium (Cr)	ug/L	ND	ND	2983703	ND	ND	ND	1.0	2982476
Total Cobalt (Co)	ug/L	ND	ND	2983703	ND	ND	ND	0.40	2982476
Total Copper (Cu)	ug/L	ND	ND	2983703	ND	ND	ND	2.0	2982476
Total Iron (Fe)	ug/L	186	197	2983703	195	184	303	50	2982476
Total Lead (Pb)	ug/L	ND	ND	2983703	ND	ND	ND	0.50	2982476
Total Magnesium (Mg)	ug/L	766	789	2983703	562	910	979	100	2982476
Total Manganese (Mn)	ug/L	410	398	2983703	83.9	391	130	2.0	2982476
Total Molybdenum (Mo)	ug/L	ND	ND	2983703	ND	ND	ND	2.0	2982476
Total Nickel (Ni)	ug/L	ND	ND	2983703	ND	ND	ND	2.0	2982476
Total Phosphorus (P)	ug/L	ND	ND	2983703	ND	ND	ND	100	2982476
Total Potassium (K)	ug/L	108	106	2983703	ND	ND	ND	100	2982476
Total Selenium (Se)	ug/L	ND	ND	2983703	ND	ND	ND	1.0	2982476
Total Silver (Ag)	ug/L	ND	ND	2983703	ND	ND	ND	0.10	2982476
Total Sodium (Na)	ug/L	1670	1700	2983703	1520	1610	1770	100	2982476
Total Strontium (Sr)	ug/L	9.8	9.8	2983703	5.2	10.6	9.7	2.0	2982476
Total Thallium (Tl)	ug/L	ND	ND	2983703	ND	ND	ND	0.10	2982476
Total Tin (Sn)	ug/L	ND	ND	2983703	ND	ND	ND	2.0	2982476
Total Titanium (Ti)	ug/L	3.2	4.5	2983703	4.4	2.6	3.1	2.0	2982476
Total Uranium (U)	ug/L	ND	ND	2983703	ND	ND	ND	0.10	2982476
Total Vanadium (V)	ug/L	ND	ND	2983703	ND	ND	ND	2.0	2982476
Total Zinc (Zn)	ug/L	ND	5.8	2983703	5.4	ND	ND	5.0	2982476

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B2E7715
Report Date: 2012/10/03

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

GENERAL COMMENTS

TSS samples received past the recommeneded 7 day holding time.

Sample OY5998-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OY5999-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OY6000-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OY6001-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OY6002-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OY6003-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OY6004-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OY6005-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OY6006-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OY6007-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OY6008-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OY6009-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OY6010-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OY6011-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OY6012-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OY6014-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OY6015-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OY6016-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

Sample OY6017-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

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Sample OY6018-01: RCAp Ion Balance acceptable. Anion/cation agreement within 0.2 meq/L.

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2982112	pH	2012/09/26							0.6	25	100	80 - 120
2982113	Conductivity	2012/09/26			99	80 - 120	ND, RDL=1.0	uS/cm	6.5	25		
2982164	Total Suspended Solids	2012/09/26					ND, RDL=1.0	mg/L	NC	25	97	80 - 120
2982173	Total Suspended Solids	2012/09/26					ND, RDL=1.0	mg/L	1.5	25	97	80 - 120
2982476	Total Aluminum (Al)	2012/09/27	99	80 - 120	97	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2982476	Total Antimony (Sb)	2012/09/27	113	80 - 120	114	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2982476	Total Arsenic (As)	2012/09/27	97	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2982476	Total Barium (Ba)	2012/09/27	103	80 - 120	105	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2982476	Total Beryllium (Be)	2012/09/27	106	80 - 120	109	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2982476	Total Bismuth (Bi)	2012/09/27	103	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2982476	Total Boron (B)	2012/09/27	101	80 - 120	103	80 - 120	ND, RDL=50	ug/L	5.5	25		
2982476	Total Cadmium (Cd)	2012/09/27	104	80 - 120	103	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2982476	Total Calcium (Ca)	2012/09/27	NC	80 - 120	97	80 - 120	ND, RDL=100	ug/L	2.9	25		
2982476	Total Chromium (Cr)	2012/09/27	96	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2982476	Total Cobalt (Co)	2012/09/27	94	80 - 120	95	80 - 120	ND, RDL=0.40	ug/L	NC	25		
2982476	Total Copper (Cu)	2012/09/27	94	80 - 120	96	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2982476	Total Iron (Fe)	2012/09/27	95	80 - 120	95	80 - 120	ND, RDL=50	ug/L	NC	25		
2982476	Total Lead (Pb)	2012/09/27	98	80 - 120	98	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2982476	Total Magnesium (Mg)	2012/09/27	92	80 - 120	92	80 - 120	ND, RDL=100	ug/L	NC	25		
2982476	Total Manganese (Mn)	2012/09/27	95	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2982476	Total Molybdenum (Mo)	2012/09/27	107	80 - 120	108	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2982476	Total Nickel (Ni)	2012/09/27	93	80 - 120	95	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2982476	Total Phosphorus (P)	2012/09/27	106	80 - 120	105	80 - 120	ND, RDL=100	ug/L	NC	25		
2982476	Total Potassium (K)	2012/09/27	97	80 - 120	97	80 - 120	ND, RDL=100	ug/L	1.6	25		
2982476	Total Selenium (Se)	2012/09/27	95	80 - 120	90	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2982476	Total Silver (Ag)	2012/09/27	107	80 - 120	109	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2982476	Total Sodium (Na)	2012/09/27	NC	80 - 120	90	80 - 120	ND, RDL=100	ug/L	0.04	25		
2982476	Total Strontium (Sr)	2012/09/27	NC	80 - 120	98	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2982476	Total Thallium (Tl)	2012/09/27	100	80 - 120	99	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2982476	Total Tin (Sn)	2012/09/27	109	80 - 120	109	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2982476	Total Titanium (Ti)	2012/09/27	101	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2982476	Total Uranium (U)	2012/09/27	98	80 - 120	96	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2982476	Total Vanadium (V)	2012/09/27	98	80 - 120	99	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2982476	Total Zinc (Zn)	2012/09/27	97	80 - 120	98	80 - 120	ND, RDL=5.0	ug/L	NC	25		
2982521	pH	2012/09/26							0.1	25	100	80 - 120
2982523	Conductivity	2012/09/26			101	80 - 120	ND, RDL=1.0	uS/cm	1.6	25		
2983537	pH	2012/09/27							0.3	25	100	80 - 120
2983538	Conductivity	2012/09/27			100	80 - 120	ND, RDL=1.0	uS/cm	0	25		
2983540	pH	2012/09/27							0.5	25	100	80 - 120

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Maxxam Job #: B2E7715
Report Date: 2012/10/03

Stantec Consulting Ltd
Client Project #: 121510621.100
Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
Sampler Initials: SM

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2983542	Conductivity	2012/09/27			99	80 - 120	ND, RDL=1.0	uS/cm	0.7	25		
2983561	Turbidity	2012/09/27					ND, RDL=0.10	NTU	NC	25	99	80 - 120
2983703	Total Aluminum (Al)	2012/09/29	105	80 - 120	106	80 - 120	6.5, RDL=5.0	ug/L	2.7	25		
2983703	Total Antimony (Sb)	2012/09/29	112	80 - 120	109	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2983703	Total Arsenic (As)	2012/09/29	100	80 - 120	100	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2983703	Total Barium (Ba)	2012/09/29	NC	80 - 120	105	80 - 120	ND, RDL=1.0	ug/L	4.0	25		
2983703	Total Beryllium (Be)	2012/09/29	101	80 - 120	102	80 - 120	ND, RDL=1.0	ug/L				
2983703	Total Bismuth (Bi)	2012/09/29	102	80 - 120	107	80 - 120	ND, RDL=2.0	ug/L				
2983703	Total Boron (B)	2012/09/29	106	80 - 120	106	80 - 120	ND, RDL=50	ug/L	NC	25		
2983703	Total Cadmium (Cd)	2012/09/29	104	80 - 120	103	80 - 120	ND, RDL=0.017	ug/L	NC	25		
2983703	Total Calcium (Ca)	2012/09/29	NC	80 - 120	99	80 - 120	ND, RDL=100	ug/L				
2983703	Total Chromium (Cr)	2012/09/29	101	80 - 120	103	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2983703	Total Cobalt (Co)	2012/09/29	105	80 - 120	108	80 - 120	ND, RDL=0.40	ug/L				
2983703	Total Copper (Cu)	2012/09/29	99	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2983703	Total Iron (Fe)	2012/09/29	104	80 - 120	107	80 - 120	ND, RDL=50	ug/L	NC	25		
2983703	Total Lead (Pb)	2012/09/29	104	80 - 120	108	80 - 120	ND, RDL=0.50	ug/L	NC	25		
2983703	Total Magnesium (Mg)	2012/09/29	NC	80 - 120	106	80 - 120	ND, RDL=100	ug/L				
2983703	Total Manganese (Mn)	2012/09/29	98	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2983703	Total Molybdenum (Mo)	2012/09/29	107	80 - 120	107	80 - 120	ND, RDL=2.0	ug/L				
2983703	Total Nickel (Ni)	2012/09/29	99	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L				
2983703	Total Phosphorus (P)	2012/09/29	104	80 - 120	105	80 - 120	ND, RDL=100	ug/L				
2983703	Total Potassium (K)	2012/09/29	99	80 - 120	104	80 - 120	ND, RDL=100	ug/L				
2983703	Total Selenium (Se)	2012/09/29	104	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2983703	Total Silver (Ag)	2012/09/29	109	80 - 120	107	80 - 120	ND, RDL=0.10	ug/L				
2983703	Total Sodium (Na)	2012/09/29	NC	80 - 120	106	80 - 120	ND, RDL=100	ug/L	3.6	25		
2983703	Total Strontium (Sr)	2012/09/29	NC	80 - 120	105	80 - 120	ND, RDL=2.0	ug/L				
2983703	Total Thallium (Tl)	2012/09/29	103	80 - 120	106	80 - 120	ND, RDL=0.10	ug/L				
2983703	Total Tin (Sn)	2012/09/29	108	80 - 120	106	80 - 120	ND, RDL=2.0	ug/L				
2983703	Total Titanium (Ti)	2012/09/29	103	80 - 120	106	80 - 120	ND, RDL=2.0	ug/L				
2983703	Total Uranium (U)	2012/09/29	106	80 - 120	109	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2983703	Total Vanadium (V)	2012/09/29	104	80 - 120	105	80 - 120	ND, RDL=2.0	ug/L				
2983703	Total Zinc (Zn)	2012/09/29	99	80 - 120	103	80 - 120	8.1, RDL=5.0	ug/L	9.2	25		
2983923	Total Mercury (Hg)	2012/09/27	100	80 - 120	100	80 - 120	ND, RDL=0.013	ug/L	2.6	25	99	80 - 120
2984592	Total Aluminum (Al)	2012/09/28	NC	80 - 120	110	80 - 120	ND, RDL=5.0	ug/L	4.2	25		
2984592	Total Antimony (Sb)	2012/09/28	108	80 - 120	107	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2984592	Total Arsenic (As)	2012/09/28	102	80 - 120	99	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2984592	Total Barium (Ba)	2012/09/28	111	80 - 120	108	80 - 120	ND, RDL=1.0	ug/L	0.2	25		
2984592	Total Beryllium (Be)	2012/09/28	101	80 - 120	101	80 - 120	ND, RDL=1.0	ug/L	4.3	25		
2984592	Total Bismuth (Bi)	2012/09/28	103	80 - 120	104	80 - 120	ND, RDL=2.0	ug/L	NC	25		

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Stantec Consulting Ltd
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Site Location: VALENTINE LAKE
Your P.O. #: 16300R-40
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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2984592	Total Boron (B)	2012/09/28	102	80 - 120	102	80 - 120	ND, RDL=50	ug/L	NC	25		
2984592	Total Cadmium (Cd)	2012/09/28	103	80 - 120	102	80 - 120	ND, RDL=0.017	ug/L	2.6	25		
2984592	Total Calcium (Ca)	2012/09/28	NC	80 - 120	101	80 - 120	ND, RDL=100	ug/L	1.3	25		
2984592	Total Chromium (Cr)	2012/09/28	110	80 - 120	108	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2984592	Total Cobalt (Co)	2012/09/28	109	80 - 120	110	80 - 120	ND, RDL=0.40	ug/L	0.5	25		
2984592	Total Copper (Cu)	2012/09/28	106	80 - 120	105	80 - 120	ND, RDL=2.0	ug/L	2.9	25		
2984592	Total Iron (Fe)	2012/09/28	109	80 - 120	108	80 - 120	ND, RDL=50	ug/L	1	25		
2984592	Total Lead (Pb)	2012/09/28	107	80 - 120	105	80 - 120	ND, RDL=0.50	ug/L	1.8	25		
2984592	Total Magnesium (Mg)	2012/09/28	112	80 - 120	111	80 - 120	ND, RDL=100	ug/L	0.2	25		
2984592	Total Manganese (Mn)	2012/09/28	NC	80 - 120	105	80 - 120	ND, RDL=2.0	ug/L	0.4	25		
2984592	Total Molybdenum (Mo)	2012/09/28	107	80 - 120	105	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2984592	Total Nickel (Ni)	2012/09/28	102	80 - 120	103	80 - 120	ND, RDL=2.0	ug/L	1.1	25		
2984592	Total Phosphorus (P)	2012/09/28	107	80 - 120	105	80 - 120	ND, RDL=100	ug/L	NC	25		
2984592	Total Potassium (K)	2012/09/28	103	80 - 120	103	80 - 120	ND, RDL=100	ug/L	1.7	25		
2984592	Total Selenium (Se)	2012/09/28	103	80 - 120	102	80 - 120	ND, RDL=1.0	ug/L	NC	25		
2984592	Total Silver (Ag)	2012/09/28	105	80 - 120	105	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2984592	Total Sodium (Na)	2012/09/28	115	80 - 120	113	80 - 120	ND, RDL=100	ug/L	1.4	25		
2984592	Total Strontium (Sr)	2012/09/28	NC	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L	0.3	25		
2984592	Total Thallium (Tl)	2012/09/28	104	80 - 120	102	80 - 120	ND, RDL=0.10	ug/L	NC	25		
2984592	Total Tin (Sn)	2012/09/28	106	80 - 120	105	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2984592	Total Titanium (Ti)	2012/09/28	109	80 - 120	109	80 - 120	2.6, RDL=2.0	ug/L	NC	25		
2984592	Total Uranium (U)	2012/09/28	111	80 - 120	108	80 - 120	ND, RDL=0.10	ug/L	1.6	25		
2984592	Total Vanadium (V)	2012/09/28	111	80 - 120	110	80 - 120	ND, RDL=2.0	ug/L	NC	25		
2984592	Total Zinc (Zn)	2012/09/28	100	80 - 120	101	80 - 120	ND, RDL=5.0	ug/L	0.2	25		
2985420	Turbidity	2012/09/28					ND, RDL=0.10	NTU	NC	25	102	80 - 120
2985426	Turbidity	2012/09/28					ND, RDL=0.10	NTU	6.3	25	102	80 - 120
2985729	Nitrogen (Ammonia Nitrogen)	2012/09/29	86	80 - 120	90	80 - 120	ND, RDL=0.050	mg/L	NC	25	100	80 - 120
2985738	Nitrogen (Ammonia Nitrogen)	2012/09/29	87	80 - 120	90	80 - 120	ND, RDL=0.050	mg/L	NC	25	104	80 - 120
2986593	Total Alkalinity (Total as CaCO3)	2012/10/01	105	80 - 120	110	80 - 120	ND, RDL=5.0	mg/L	NC	25	106	80 - 120
2986595	Dissolved Chloride (Cl)	2012/10/01	100	80 - 120	97	80 - 120	ND, RDL=1.0	mg/L	NC	25	101	80 - 120
2986596	Dissolved Sulphate (SO4)	2012/10/01	98	80 - 120	101	80 - 120	ND, RDL=2.0	mg/L	NC	25	103	80 - 120
2986597	Reactive Silica (SiO2)	2012/10/02	100	80 - 120	97	80 - 120	ND, RDL=0.50	mg/L	NC	25		
2986598	Colour	2012/10/02					ND, RDL=5.0	TCU	NC	25	106	80 - 120
2986600	Orthophosphate (P)	2012/10/02	90	80 - 120	89	80 - 120	ND, RDL=0.010	mg/L	NC	25	92	80 - 120
2986601	Nitrate + Nitrite	2012/10/01	95	80 - 120	95	80 - 120	ND, RDL=0.050	mg/L	NC	25	97	80 - 120
2986602	Nitrite (N)	2012/10/02	81	80 - 120	96	80 - 120	ND, RDL=0.010	mg/L	NC	25	94	80 - 120
2986604	Total Alkalinity (Total as CaCO3)	2012/10/01	108	80 - 120	106	80 - 120	ND, RDL=5.0	mg/L	NC	25	102	80 - 120
2986605	Dissolved Chloride (Cl)	2012/10/01	100	80 - 120	99	80 - 120	ND, RDL=1.0	mg/L	NC	25	103	80 - 120
2986607	Dissolved Sulphate (SO4)	2012/10/01	103	80 - 120	96	80 - 120	ND, RDL=2.0	mg/L	NC	25	102	80 - 120

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Client Project #: 121510621.100
Site Location: VALENTINE LAKE
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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2986608	Reactive Silica (SiO2)	2012/10/02	98	80 - 120	99	80 - 120	ND, RDL=0.50	mg/L	0.8	25		
2986609	Colour	2012/10/02					ND, RDL=5.0	TCU	4.1	25	104	80 - 120
2986611	Orthophosphate (P)	2012/10/02	89	80 - 120	90	80 - 120	ND, RDL=0.010	mg/L	NC	25	94	80 - 120
2986612	Nitrate + Nitrite	2012/10/01	94	80 - 120	93	80 - 120	ND, RDL=0.050	mg/L	NC	25	96	80 - 120
2986698	Nitrite (N)	2012/10/02	84	80 - 120	96	80 - 120	ND, RDL=0.010	mg/L	NC	25	91	80 - 120
2987323	Total Mercury (Hg)	2012/10/01	101	80 - 120	97	80 - 120	ND, RDL=0.013	ug/L	NC	25	99	80 - 120
2989985	Total Organic Carbon (C)	2012/10/03	NC	80 - 120	94	80 - 120	ND, RDL=0.50	mg/L	4.5	25		
2989992	Total Organic Carbon (C)	2012/10/03	91	80 - 120	94	80 - 120	ND, RDL=0.50	mg/L	NC	25		

N/A = Not Applicable
RDL = Reportable Detection Limit
RPD = Relative Percent Difference
Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

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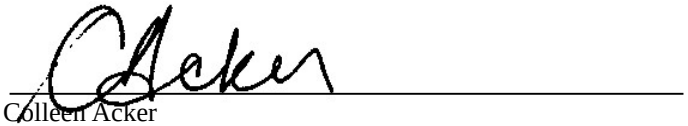

Colleen Acker

Kevin Macdonald, Inorganics Supervisor

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Maxxam Analytics International Corporation o/a Maxxam Analytics 49-55 Elizabeth Ave, Suite 101A, St.John's, NL, Canada A1A 1W9 Tel: 709-754-0203 Toll Free: 888-492-7227 Fax:709-754-8612 www.maxxam.ca

2012 Hydrology Monitoring Program
Valentine Lake Prospect

Stantec Consulting Ltd.
607 Torbay Road
St. John's, NL A1A 4Y6
Tel: (709) 576-1458
Fax: (709) 576-2126

Prepared for

Marathon Gold Corp.
36 Birchview Drive
Pasadena, NL A0L 1K0

Interim Report

File No. 121511074

Date: February 15, 2013

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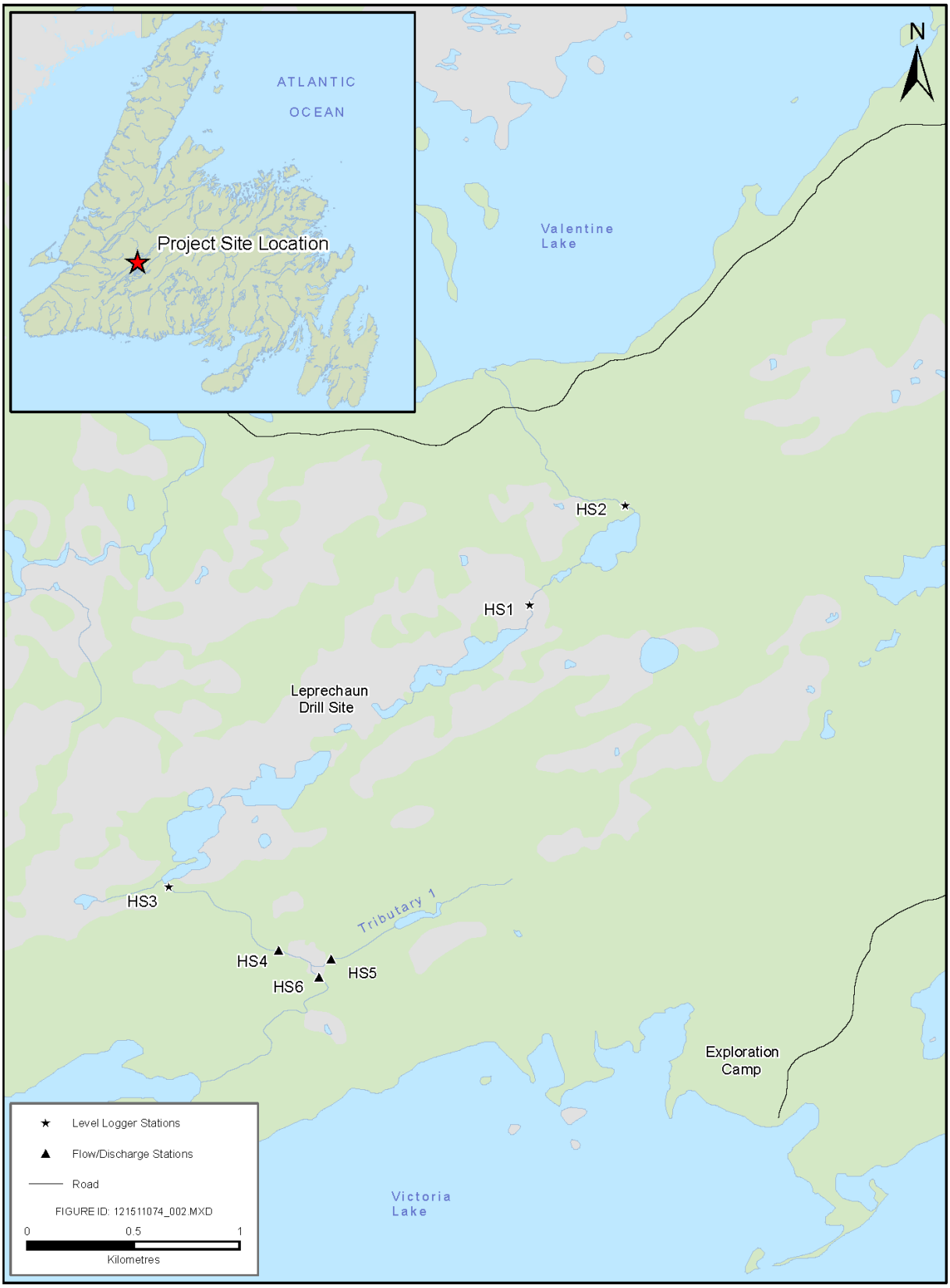
1.0 INTRODUCTION

At the request of Marathon Gold Corp. (Marathon), Stantec Consulting Ltd. (Stantec) was engaged to design and implement a preliminary hydrology monitoring program at the Valentine Lake prospect. The purpose of the program was to establish a series of water flow monitoring stations that could be used to characterize baseline surface water hydrology at the site. This information will be used to support future mine planning and satisfy potential future regulatory requirements.

1.1 Overview

The focus of the hydrology program was the Leprechaun Pond site, which is comprised of two small watersheds, one flowing north to Valentine Lake and the other flowing south to Victoria Lake (Figure 1-1). Both watersheds contain two small ponds that may be impacted (lost) during future mine development. The hydrology program was instituted to describe the potential downstream hydrological impacts that future pond loss could have on the streams flowing to Valentine Lake and Victoria Lake. This report documents the works carried out by Stantec and includes hydrologic logger and assessment station locations, channel characteristics and profiles, preliminary hydrologic ratings curves, and anticipated future works.

Figure 1-1 Sampling Locations for the Hydrological Monitoring Program



2.0 METHODOLOGY

A suite of three level logging stations and three flow sampling stations where established within the two watersheds at the Leprechaun site. Two level logger stations were placed within the north flowing watershed, just downstream of the outlet of the first pond (HS1) and one downstream of the outlet of the Second pond (HS2) that drains to Valentine Lake (Figure 3-1). A single level logger station was established just downstream of the outlet of the second pond (HS3) within the south draining watershed. Three additional flow monitoring stations were established approximately 800 m downstream of the HS3 station. Water from the upper ponds combines with water from Tributary 1 within the eastern portion of this watershed. To assess the contribution of Tributary 1 to the main stream flowing to Victoria Lake, sample sites were established on Tributary 1 (HS5) as well as upstream (HS4) and downstream (HS6) of the confluence with the mainstream (Figure 3-1).

Each of the level logger monitoring stations was equipped with a Solinst Levellogger Edge (M5/F-15), with one station (HS1) also getting a Solinst Barologger Edge (M1.5/F5). Prior to field station setup, all level loggers and the barologger were hooked up to a computer to ensure operation and communications, and to initialize the system and record appropriate serial numbers.

Each of the station locations was documented through photographs and GPS location (Table 2.1). For stations with level loggers, sampling apparatus was brightly painted and flagged with tape for easy identification. At each of the sites flow measurements were taken using a SonTek FlowTracker meter, with values recorded and discharges calculated. Additional site characteristics recorded at each station included riparian vegetation, channel width and shape, water depths, water temperature and substrate composition.

Following completion of the field component, all pertinent field data was transferred to appropriate software programs and checked for consistency and quality. Profiles were developed for each station that included location, general site characteristics, channel profile, and flow ratings curves. Station profiles are provided within the results section. Flow ratings curves were developed as follows.

To interpolate flow (discharge) between manual flow measurements, it is necessary to relate water column heights (stream stage) to flow by developing a stage discharge relationship, also known as a rating curve. Sampling locations selected for stream flow monitoring contain level loggers which were installed in stilling wells to measure water temperature and total pressure at pre-programmed time intervals. The total pressure is equal to the sum of the water pressure (as caused by water depth above the logger) plus the atmospheric pressure. To determine the pressure caused by water depth only, the atmospheric pressure (which was obtained from barometric pressure data loggers) was simply subtracted from the total pressure.

The stage data were then transformed into flow rates using the corresponding rating curve for each site. There are two steps involved in the rating curve development. First, a theoretical rating curve for each site was developed using the software WinXSPRO which requires channel cross-sectional area, energy slope, and Manning's roughness coefficient. The channel cross sectional area was determined based on field measurements. Manning's roughness coefficient

was estimated according to bank and channel bottom conditions. Second, the theoretical rating curve was then calibrated with instantaneous flow rates measured in the field, along with their corresponding stream stages for the best fit function. The rating curves are expected to remain valid for as long as the area and slope of the channel at the measurement point remain the same.

Table 2.1 Hydrologic Station Coordinates Lat/Long (NAD27 Canada)

Sample Station ID	Latitude	Longitude
HS1	N48.36450	W57.16728
HS2	N48.36875	W57.16113
HS3	N48.35251	W57.19011
HS4	N48.34990	W57.18308
HS5	N48.34935	W57.17975
HS6	N48.34867	W57.18059

3.0 RESULTS

Provided below are station descriptions, channel profiles, and ratings curves for the hydrologic monitoring stations.

Station HS1

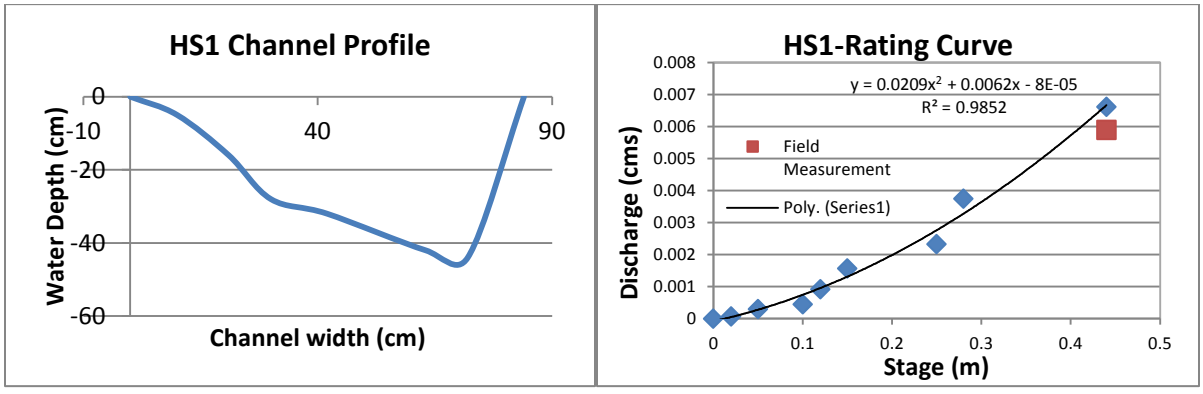
Surface Water Station HS1 is located approximately 115 m downstream of the outflow from the upper pond within the north flowing watershed. The site GPS location is N48.36875, W57.16113. Instrumentation at this location includes a water level logger (SN 2014121) and barometric pressure logger (SN 2014647). The station was installed on October 16, 2012.

Access to the site is via quads from the Marathon prospect camp site to the Leprechaun drill site and then north east along a trail that runs along the northern shore of the upper pond. The site is located approximately 25 m south of this trail.

Photo 1 Station HS1

The site was characterized as an open grassy meadow dominated by grasses and shrubs. Channel wetted width was 0.831m, and water depth ranged from 16 to 44 cm, with near vertical banks of 20 and 21 cm. Substrate was a mixture of gravel with some fines and cobble, and instream vegetation. Measured velocities ranged from 0.000 to 0.085 m/s with a discharge of 0.0059 m^3/s. A cross-sectional view of the stream channel and the rating curve is provided in Figure 3-1.

Figure 3-1 Channel Profile and Rating Curve for Station HS1



Station HS2

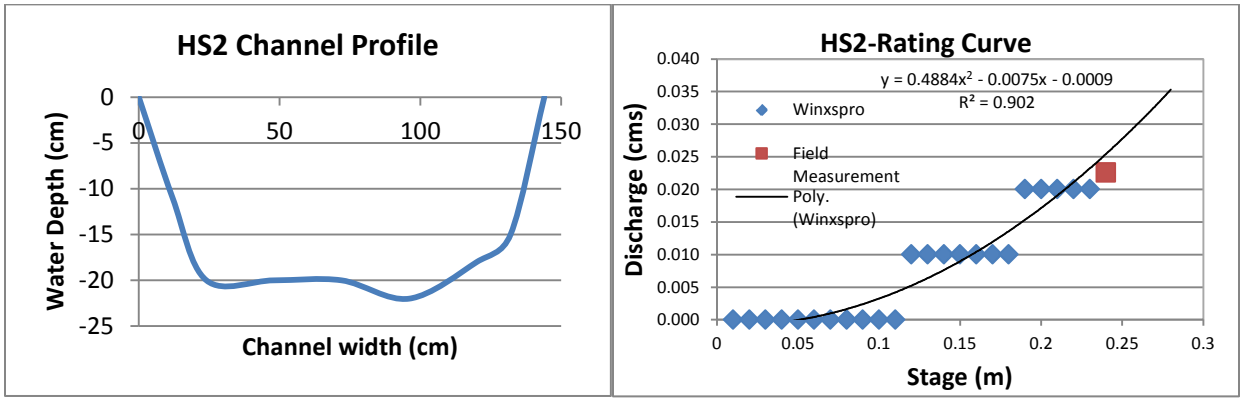
Surface water station HS2 is located approximately 60 m downstream of the outflow from the lower pond within the north flowing watershed. The site GPS location is N48.36875 W57.16113. Instrumentation at this location includes a water level logger (SN 2014183) installed on October 16, 2012.

Photo 2 Station HS2

Access to the site is via quads from the Marathon prospect camp site to the Leprechaun drill site and then north east along a trail that runs along the northern shore of the upper pond. This trail ends approximately half way along the northern shore of the second pond. A hike of approximately 200 m along the northshore of the pond and then down the outflow channel, is required to reach the site.

The site was characterized as mainly shrubs with some grasses, fringed by forest. Channel wetted width was 1.45 m, water depth ranged from 11 to 22 cm, with near vertical banks of 22 and 14 cm. Substrate was a mixture of cobble and boulder, with some gravel. No instream vegetation was noted. Measured velocities ranged from 0.00 to 0.383 m/s with a discharge of 0.0226 m^3/s. A cross-sectional view of the stream channel at the sampling location and the rating curve is provided in Figure 3-2.

Figure 3-2 Channel Profile and Rating Curve for Station HS2



Station HS3

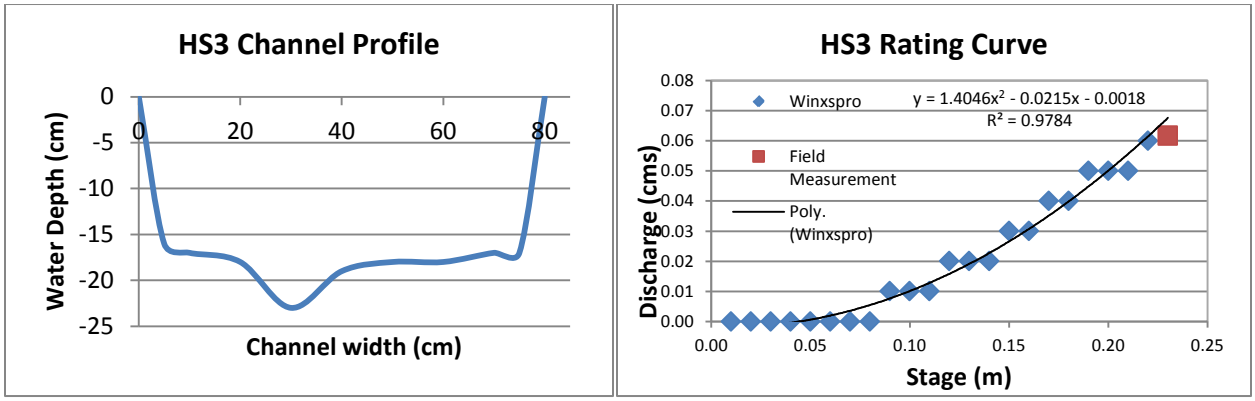
Surface Water Station HS3 is located approximately 20 m downstream of the outflow from the lower pond within the south flowing watershed. The site GPS location is N48.35251 W57.19011. Instrumentation at this location included a water level logger (SN 2014117) installed on October 16, 2012.

Access to the site is via quads from the Marathon prospect camp site to the Leprechaun drill site and then west along a trail that runs along the northern shore of the upper ponds. This trail ends approximately 125 m north of the sampling station. Access is then via foot down to the second pond and along the northern shore until reaching the outlet.

Photo 3 Station HS3

The site was characterized as an open grassy meadow dominated by grasses and shrubs, fringed by forest. Channel wetted width was 0.80 m, water depth ranged from 17 to 21 cm, with near vertical banks of 17 and 19 cm. Substrate was a mixture of cobble and gravel with some instream vegetation noted. Measured velocities ranged from 0.100 to 1.260 m/s with a discharge of 0.0616 m^3/s. A cross-sectional view of the stream channel at the sampling location and the rating curve is provided in Figure 3-3.

Figure 3-3 Channel Profile and Rating Curve for Station HS3



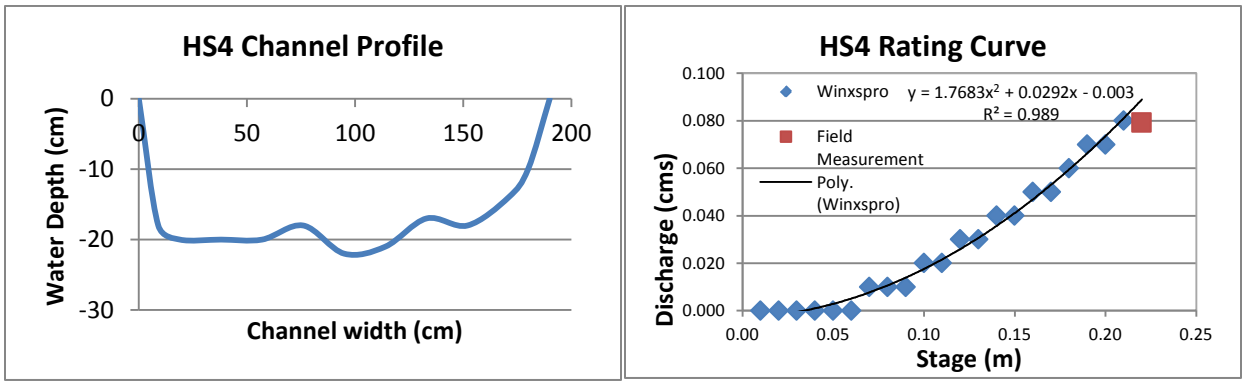
Sampling Stations HS4, HS5, and HS6

Three flow and discharge measurement stations (HS4, HS5 and HS6) were established approximately 800 m downstream of the HS3 site to assess the flow contribution of Tributary 1 to the mainstream flowing to Victoria Lake.

Access to the sites was along the mainstream channel downstream from station HS3. Deviations from the stream were frequent due to traversing a large falls area and several sections of heavy brush. Once down the steeper grade area, the stream channel entered an open meadow and bog like area. Due to several challenging terrain areas, future access along the stream channel from HS3 is not recommended. Upon returning from the initial monitoring survey the hydrology team found an old soils tag line just north of HS4. This line ran all the way back up to the pond shoreline east of the HS3 site. This route is recommended for future surveys.

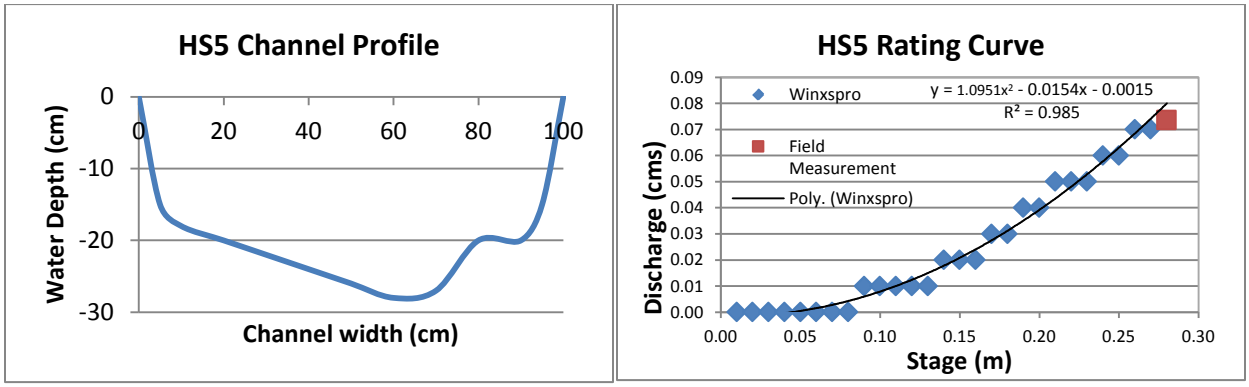
The HS4 site (GPS: N48.34990 W57.18308) was dominated by shrubs and trees, with some grasses and dense overhanging vegetation. Channel wetted width was 1.90 m, water depth ranged from 14 to 22 cm, with near vertical banks of 29 and 14 cms. Substrate was a mixture of cobble and gravel with some areas of fines. Measured velocities ranged from 0.000 to 0.3890 m/s with a discharge of 0.0792 m^3/s. A cross-sectional view of the stream channel and a ratings curve for HS4 is provided in Figure 3-4.

Figure 3-4 Channel Profile and Rating Curve for Station HS4



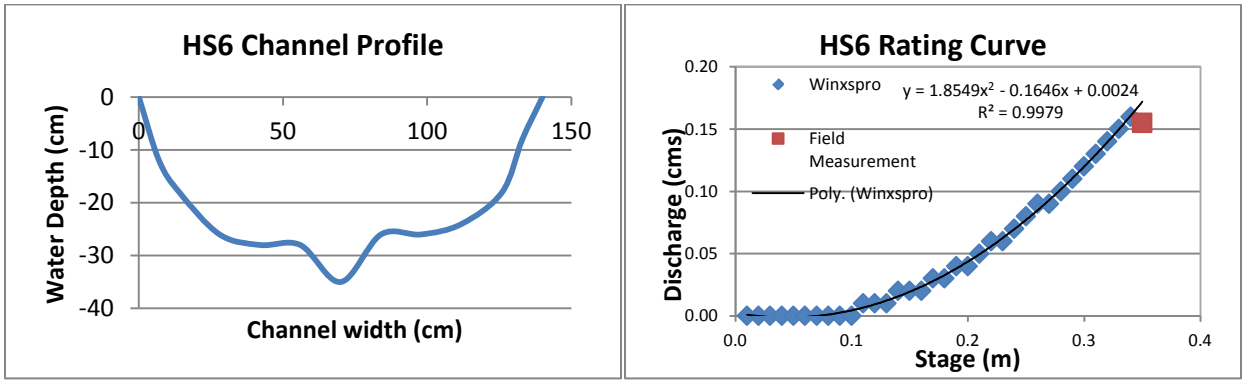
The HS5 site (GPS: N48.34935 W57.17975) was dominated by shrubs and trees, with some grasses and overhanging vegetation. Channel wetted width was 1.05 m, water depth ranged from 17 to 28 cm, with near vertical banks of 37 and 47 cms. Substrate was a mixture of cobble and gravel with some boulders. Measured velocities ranged from 0.100 to 0.564 m/s with a discharge of 0.0736 m^3/s. A cross-sectional view of the stream channel and a ratings curve for HS5 is provided in Figure 3-5.

Figure 3-5 Channel Profile and Rating Curve for Station HS5



The HS6 site (GPS: N48.34867 W57.18059) was dominated by grasses and shrubs, fringed by trees. Channel wetted width was 1.40 m, water depth ranged from 12 to 35 cm, with near vertical banks of 35 and 24 cm. Substrate was a mixture of gravel, fines, and woody debris as the area was impacted by beaver activity. Measured velocities ranged from 0.027 to 0.615 m/s with a discharge of 0.1551 m^3/s. A cross-sectional view of the stream channel and a ratings curve for HS6 is provided in Figure 3-6.

Figure 3-6 Channel Profile and Rating Curve for Station HS6



4.0 FUTURE WORKS

The installed water and barometric pressure loggers will need to have data downloaded in early spring of 2013, as they will likely be reaching their storage capacity near the end of June. Stantec will provide a field technician to assist with downloading the data from each station, and will provide onsite technical advice regarding downloading procedures, trouble shooting, data storage, data quality management, data transfer, and appropriate scheduling of station checks and data downloading.

Data acquired from this spring session will be used to verify established ratings curves and provide detailed hydrologic information for each of the stations across the fall of 2012 to spring 2013 season. Stantec will provide this information along with subsequent ongoing analysis of the hydrologic field data in a final hydrological report.

Winter Wildlife Survey

Prepared for:
Marathon Gold Corporation
District Office
P.O. Box 160
Pasadena, NL A0L 1K0

Prepared by:
Stantec Consulting Ltd.
141 Kelsey Drive
St. John's, NL A1B 0L2
Tel: (709) 576-1458
Fax: (709) 576-2126

File No:121511074

Final Report

May 22, 2014

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1.0 INTRODUCTION

1.1 Project Description

Marathon Gold Corporation (Marathon) is conducting a drilling program at its Valentine Lake prospect in Central Newfoundland. Drilling activities have targeted the Valentine East site and the Leprechaun Pond site (Figure 1-1). Pending final analysis of the drilling program, the project would involve the exploration, construction and operation of mining infrastructure in Central Newfoundland. Should Marathon wish to develop the mineral deposit, an Environmental Assessment (EA) would be required.

Baseline work to support the anticipated EA has been ongoing for anticipated valued ecosystem components (*e.g.*, landbirds, waterfowl, and freshwater fish) during spring and summer. This study aims to gather information to complement other baseline work with the identification of mammal species occurring within Marathon's mineral claim area. Winter track surveys (aerial and ground) are an effective approach to document wildlife species as several species would be easier to detect when there is snow cover. Of particular interest is whether Newfoundland Marten (*Martes americana atrata*) are present. The Newfoundland marten is a threatened species (2007) at both the provincial (NLESA) and federal (SARA) levels (The Newfoundland Marten Recovery Team 2010). The Newfoundland Marten Recovery Team (2010) identified breeding individuals in the Red Indian Lake Area. Some of Marathon's mineral claim area is located within the Red Indian Lake Subregion, however, no marten have been confirmed within the claim area.

Winter tracking surveys are useful to estimate species diversity, richness (number of individuals observed), and relative abundance among habitat types. These surveys can be designed to collect baseline data or to monitor wildlife throughout various stages of project development. Target species during winter tracking surveys are mid-large mammals that are active during winter. Limited information can be collected for small mammals (such as mouse, voles, and shrews) they are highly active in subnivean tunnels and upland game birds (ptarmigan *and* grouse) who do not always travel via ground routes.

1.2 Study Objectives

The study's two main objectives include: 1) To examine the presence and distribution of winter mammal wildlife within the study area via aerial and ground winter track surveys and 2) To determine the presence of Newfoundland marten in the study area.

Although Marathon is in the exploratory stage in this mineral claim area, it was deemed prudent to understand the ecological setting and potential mitigating factors as the planning process continues.

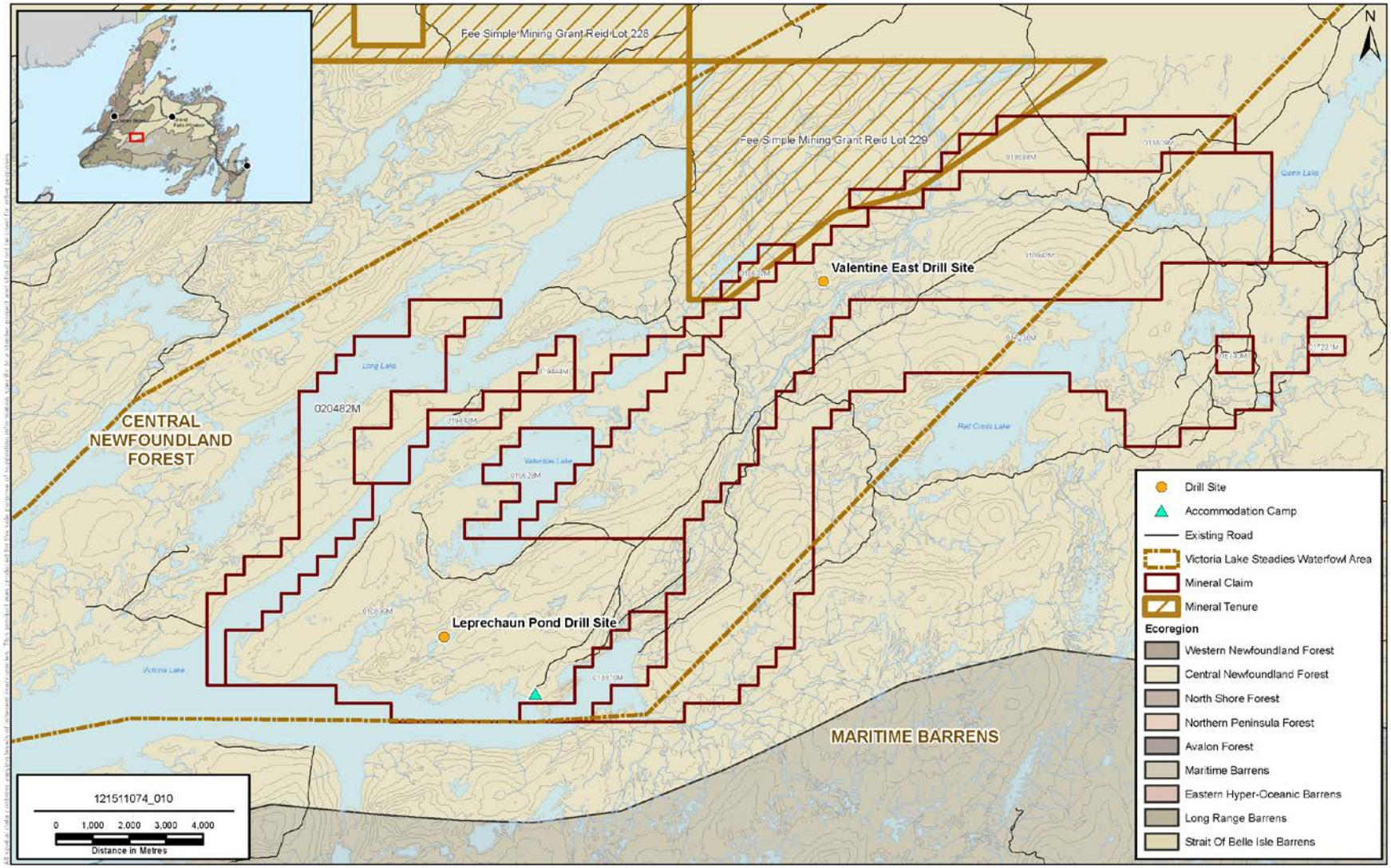

Figure 1-1 Study Area

1.3 Study Area

Marathon's mineral claim area is composed of the Central Newfoundland Forest Ecoregion and the Red Indian Lake Subregion (Damman 1983, NLDEC 2008; Figure 1-1). The landscape is characterized by remote upland forests interspersed by wetlands (bogs/fens), krummholtz, barrens and waterbodies. The dense forests are composed of balsam fir (*Abies balsamea*) and black spruce (*Picea mariana*), common to Central Newfoundland Forests. Stands of pure hardwood and mixedwood are also present, with the dominant species being white birch (*Betula papyrifera*) and trembling aspen (*Populus tremuloides*). While the majority area is in a relatively natural state, timber harvesting and mining activity have occurred.

There are a variety of Newfoundland mammal species, small mammals (mice, voles, and shrews) and upland game birds that would be expected to be detected during winter within the Study Area including (NLDEC 2012):

- Large Ungulates:
  - Moose (*Alces americanus*)
  - Woodland Caribou (*Rangifer tarandus*)
- Carnivores:
  - American Mink (*Neovison vison*)
  - Canadian Lynx (*Lynx canadensis*)
  - Eastern Coyote (*Canis latrans*)
  - Ermine (Weasel) (*Mustela erminea*)
  - Newfoundland Marten (*Martes americana atrata*; Species at Risk)
  - Red Fox (*Vulpes vulpes*)
  - River Otter (*Lontra canadensis*)
- Rodents:
  - Red Squirrel (*Tamiasciurus hudsonicus*)
- Lagomorphs:
  - Arctic Hare (*Lepus arcticus*)
  - nowshoe Hare (*Lepus americanus*)
  - Upland Game Birds:
  - Ruffed Grouse (*Bonasa umbellus*)
  - Spruce Grouse (*Falcipennis Canadensis*)
  - Willow Ptarmigan (*Lagopus lagopus*)

1.4 Study Team

A team of five Stantec members, a helicopter pilot, and one Marathon Gold Corporation employee carried out the field component of the winter wildlife survey. The complete project team, their affiliation and project role is included in Table 1.1.

Table 1.1 Personnel, Affiliation and Roles for Winter Wildlife Survey

Personnel	Affiliation	Role(s)
Barry Wicks	Stantec	Project Manager
Perry Trimper	Stantec	Technical Lead and Senior Review
Tina Newbury	Stantec	Field Lead; aerial survey (observer/data recorder), ground track survey; data entry and report preparation
Stacey Camus	Stantec	Ground track survey; data entry and report preparation
Tony Parr	Stantec	Aerial survey (navigator/observer); ground track survey; placement of marten hair snag traps
Karen Rashleigh	Stantec	Aerial survey (observer/data recorder); ground transect survey
Wayne Tucker	Stantec	Ground transect survey and report preparation
Peter Jefford	Universal Helicopters Newfoundland and Labrador	Pilot
Scott McCrindle	Marathon Gold Corporation	Checking of marten hair snag traps

2.0 METHODS

Prior to commencing the winter survey two permits were obtained from the Newfoundland and Labrador Wildlife Division (NLWD), Newfoundland and Labrador Department of Environment and Conservation (NLDEC):

- A permit to conduct research and possess specimens of a threatened species under the Newfoundland and Labrador Endangered Species Act (Appendix A-1); and
- A scientific research permit to undertake one day aerial and ground based winter reconnaissance surveys to examine the presence and distribution of wildlife within the study area (Appendix A-2).

A review of Stantec's health, safety, and environment safe work practices (SWP) (*e.g.*, Working in Remote Areas, Helicopter Safety) by members of the Study Team was undertaken prior to the start of the field program.

To meet the two objectives of the study, three methods were used: 1) Aerial Surveys; 2) Ground Track Surveys; and 3) Newfoundland Marten Hair Snag.

2.1 Aerial Survey

The aerial survey was designed to assess the species diversity, richness, and relative abundance of larger mammals, more specifically ungulate species (*e.g.*, moose and caribou). Further, all

observations and signs of species were recorded. During the aerial survey, a 151 km^2 polygon covering 65 % of the mineral claim area was flown (Figure 2-1). The aerial survey was conducted in a L4 helicopter under good flying conditions (-5ºC, light eastern winds) on February 28, 2013. The aerial survey crew consisted of the pilot, a navigator, and two observers.

An assessment of the landscape composition and configuration of the study area was conducted to maximize the efficiency of the aerial survey. Through discussions with the pilot, a series of parallel transect lines, at 800 m spacing, were oriented with the topography (i.e., southwest-northeast). Prior to the flight, these predetermined transects were uploaded onto both the pilot's and navigator's GPS units for navigation. The grid pattern was flown at a speed of approximately 125 km/hr and height of 100 m above ground level. Observers scanned an area of 200 m either side of the helicopter. Disturbance to wildlife was minimized by maintaining the flight altitude and minimizing hovering and circling unless required to confirm a specific track. All wildlife and tracks observed were recorded with locational data. Other parameters such as: snow and ice cover, start and end times of each transect, and habitat descriptions were also recorded. The flight track file and digital photos were stored for future reference if necessary.

Track densities were calculated for each species using the following formula:

$$\text{track density} = \frac{\text{\# tracks per species}}{\text{transect length (20km) x field of view (400m) x \# transects (13)}}$$

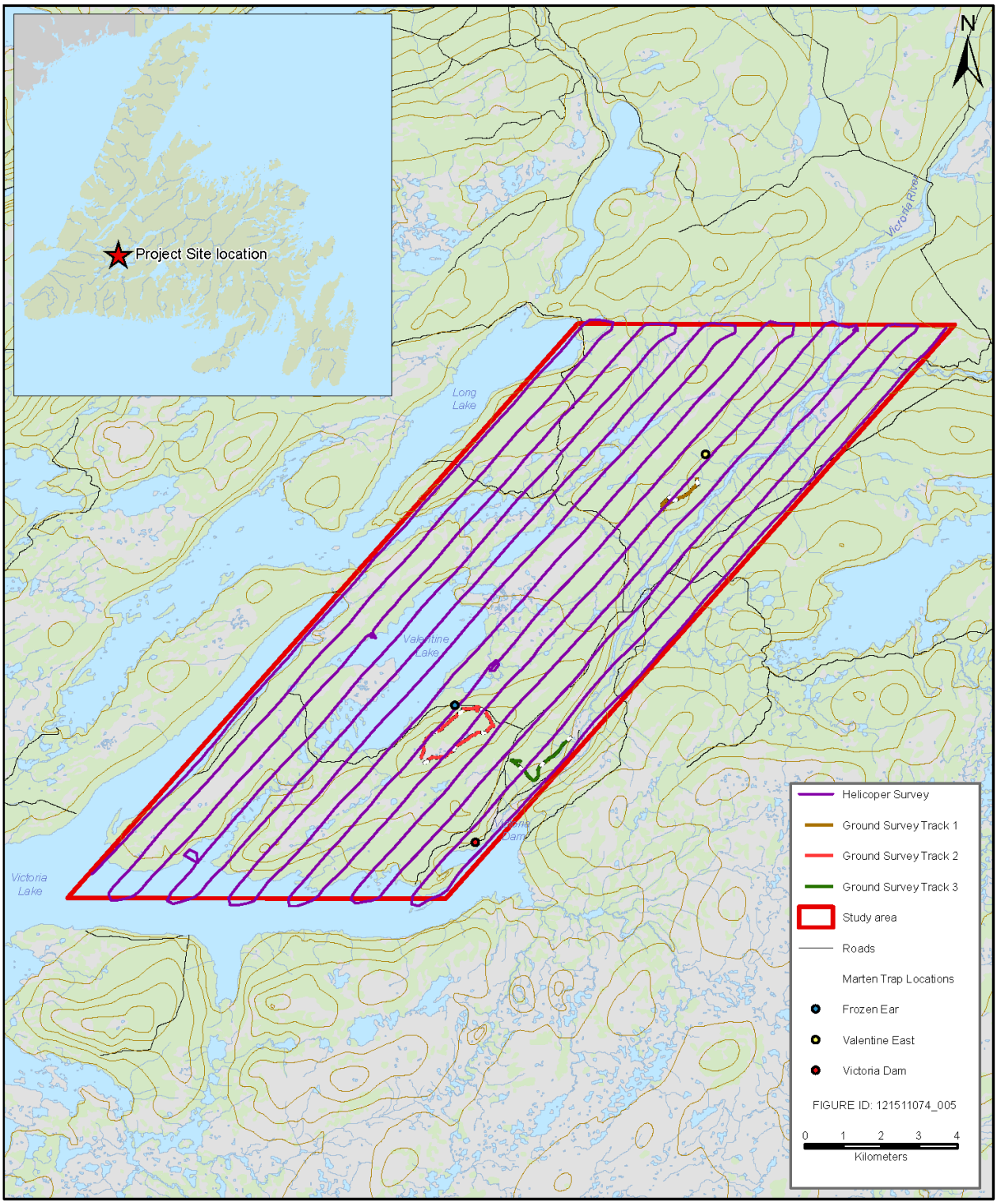

Figure 2-1 2013 Winter Wildlife Surveys

2.2 Ground Track Survey

Winter ground track surveys were designed to observe species diversity, richness, and relative abundance. Based on an assessment of the various habitat types in the study area, three transects were predetermined prior to the survey based on the following factors:

- start points were selected near accessible locations to enhance survey efficiency;
- transects were >1 km in length to account for species (e.g. caribou) that avoid access features;
- transects were oriented perpendicular to existing environmental gradients (such as topography), to examine a variety of adjacent habitats; and
- transects were oriented in a variety of directions to examine greater ecological variability.

Two teams of two observers on snowshoes, followed the predetermined transects (Figure 2-1) using a handheld GPS. Weather and snow condition, dominant tree and shrub vegetation and all tracks encountered were recorded on data sheets. Track files from each GPS and digital photos were stored for future reference.

Track densities were calculated for each species using the following formula:

$$\text{track density} = \frac{\Sigma \text{ tracks observed}}{\Sigma \text{ transect length surveyed by transect and habitat (km)x } \Sigma \text{ track period (days)}}$$

2.3 Newfoundland Marten Hair Snag

Newfoundland marten hair snag traps were constructed and deployed according to guidelines provided by the NLWD (Herdman 2012). A triangular shaped trap was constructed from three boards that were wired together. Suitable Newfoundland marten habitat was selected using mapping provided by the NLWD and was verified during the aerial survey before deployment. The three trap sites were accessed via helicopter and snowshoe on February 28, 2013. Each hair snag trap was mounted horizontally (with screws) to a large living coniferous tree. Four sticky pads and one can of sardines were placed in each trap. A GPS waypoint and digital photo was taken at each trap placement site (Figure 2-1). Marten hair snag traps remained in place for one month. Each of the traps were checked and re-baited if necessary on three occasions, approximately once per week (Table 2.1).

Table 2.1 Marten Hair Snag Locations

Trap	Location	Date Set	Dates Checked
Victoria Dam	N48.35260 W-57.12880	March 8	March 13, 21, 29
Frozen Ear Pond	N48.38508 W-57.13621	February 28	March 8, 13, 21, 29
Valentine Lake northeast	N48.44458 W-57.04724	February 28	March 8, 13, 21, 29

When traps were successful in obtaining hair samples, the sticky pads were collected and placed in labeled envelopes. Sticky pads were replaced and bait was recharged on subsequent visits. Hair snag samples were forwarded to the MUN CREAIT laboratory for analyses.

3.0 RESULTS

3.1 Aerial Survey

A total transect distance of 274 km was flown during the aerial survey. The survey lasted 2 hours and 13 minutes, including ferry time between transects (<30 seconds each turnaround).

Sign of seven mammal species (Canadian lynx, eastern coyote, moose, red fox, river otter, snowshoe hare, and woodland caribou) two upland game birds (grouse and ptarmigan) and an unidentified ungulate and canid were observed (Table 3.1). The highest track densities observed were snowshoe hare, eastern coyote, and moose. Coniferous stands had Canadian lynx and snowshoe hare tracks. Hardwood stands had tracks from Canadian lynx, moose, and snowshoe hare. Edge habitats had red fox, river otter, and snowshoe hare tracks. Open barrens and bogs contained tracks from woodland caribou, eastern coyote, and upland game birds.

Incidental wildlife observations during the aerial track survey included an unidentified passerine species and Common Raven (*Corvus corax*).

Table 3.1 Aerial Track Density by Wildlife Species

Wildlife Groupings	Species	Total number of tracks	Survey area (km²)	Track density (total number of tracks/survey area (km²)
Large Ungulates	Moose	106	104	1.01
	Woodland caribou	29	104	0.27
	Unidentified ungulate[1]	3	104	0.028
Carnivores	Canadian lynx	21	104	0.20
	Eastern coyote	140	104	1.34
	Red fox	65	104	0.62
	River otter	8	104	0.076
	Unidentified canid[2]	1	104	0.0096
Lagomorphs	Snowshoe hare	535	104	5.14
Upland game birds	Grouse or Ptarmigan	4	104	0.038

[1] moose or caribou
[2] fox or coyote

3.2 Ground Track Survey

The ground survey covered 10.4 km over 7 hours and 6 minutes of person effort. Snow conditions varied from site to site. The last recorded snowfall for the area was on February 25, 2013, three days prior to the surveys. There was 100 % snow cover throughout the area. Higher elevation transects (Ground Track 2 – Figure 2-1) were windblown with a snow hardness of approximately 40 g/cm^3. Snow conditions at lower elevations transects (Ground Track 1 and 3 – Figure 2-1) were ideal for tracks with a firm layer covered by 5 cm of uncompacted snow. Snow hardness was less at lower elevations with values of approximately 25 g/cm^3.

Canadian lynx, eastern coyote, ermine, Newfoundland martin, moose, red fox, red squirrel, small mammals, snowshoe hare and upland game birds were recorded (Table 3.2). Overall, snowshoe hare, small mammals, ermine, and red squirrel had the highest track densities amongst the species observed. In coniferous stands, all 10 of the observed species were recorded, while there were 9 species in hardwood and 6 species in bogs and barrens. Snowshoe hare, Newfoundland marten, eastern coyote, and moose were the most common in coniferous stands based on track density. Track densities were highest in hardwood stands for all species except eastern coyote, which had highest track density in bog/barren habitat. The fact that Newfoundland marten exhibited highest track density in hardwood habitat was unexpected, as marten are generally associated with mature coniferous forests.

Incidental wildlife observations outside of the track surveys included: Boreal Chickadee (*Poecile hudsonicus*), Gray Jay (*Perisoreus canadensis*), and Red-breasted Nuthatch (*Sitta canadensis*).

Table 3.2 Ground Track Density by Stand Type

Stand Type	Track Density (tracks/km*day)											Total Species Observed	Total Kilometers Sampled
	Moose [1]	Canadian Lynx [2]	Eastern Coyote [2]	Ermine [2]	Newfoundland Martin [2]	Red Fox [2]	Red Squirrel [3]	Snowshoe Hare [4]	Small Mammals	Upland Game Birds	Unidentified Tracks		
Conifer-ous	0.25	0.10	0.29	0.18	0.47	0.25	0.18	3.88	0.21	0.03	0.07	10	9.1
Hard-wood	0	3.33	3.33	20	3.33	6.66	16.66	120	50	6.66	3.33	9	0.1
Bogs/ Barrens	0	0.81	5.73	0	0.81	0.81	0	0.81	4.09	0.81	0	6	1.2
Totals	0.25	4.24	9.35	20.18	4.61	7.72	16.84	124.69	54.30	7.50	3.40	10	10.4
[1]Large Ungulates; [2]Carnivores; [3]Rodents; and [4]Lagomorphs.													

3.3 Newfoundland Marten Hair Snag

The total trapping effort for the program was 22 trap-nights at the Victoria Dame Site and 30 trap-nights at both the Frozen Ear Pond and Valentine Lake northeast Site (Figure 2-1). One hair snag trap deployed at the Frozen Ear Pond site was successful in obtaining a Newfoundland marten hair sample. The Marten visited the Frozen Ear Pond site between February 29 and March 8, 2013.

A complete microsatellite haplotype was identified for this individual marten as it did not match any of the 172 Newfoundland marten that were currently in the provincial database. Further analyses were conducted and determined that this individual was female. This information was included as a new addition to the provincial database.

4.0 DISCUSSION

The three types of survey techniques provided different perspectives as to the presence and distribution of wildlife within the Valentine Lake area during winter. The wildlife (mammal and upland game bird species) species identified during the survey were consistent with those expected in the area based on the habitats surveyed (Banfield 1984, NLDEC 2012). Coniferous habitats were the most species diverse with a total of ten wildlife species documented. The high utilization of coniferous forest was expected as this habit provides essential cover which offers protection from both weather and predators. Newfoundland marten was confirmed in both coniferous and hardwood stands within the Study Area.

Large Ungulates

Evidence of woodland caribou presence was predominantly in two locations: 1) hummocks at higher elevations and 2) areas adjacent to and on a frozen lake. At the frozen lake, many coyote tracks were present and an individual coyote was observed feeding on a recent caribou kill. Woodland caribou occur in higher elevation areas as these windblown areas typically have less snow cover, providing easier travel and therefore reduced energetic output. During winter caribou are known to select feeding areas with extensive ground lichen cover and the amount of snow cover in an area affects caribou distribution (Pruitt 1959; Brown and Theberge 1990). Caribou can forage through up to 1 meter or more of snow through cratering, an activity where they use their hooves to dig through snow and ice to forage (Brown and Theberge 1990). In addition to ease of travel and increased forage availability in higher elevation areas the vantage provided on the higher, open barren ground may be advantageous to caribou wary of predators.

Moose tracks were in coniferous stands, valley bottoms and mixedwood stands. These are typical areas for moose to overwinter as they are relatively protected from wind and their food sources are more readily accessible (Parker and Morton 1978; S. Fudge and Associates 1989). Coniferous stands also provide thermal cover (Renecker and Hudson 1986).

Carnivores

Eastern coyotes, Canadian lynx, ermine, red fox, and river otter were documented. Eastern coyote tracks were frequently observed around open forest edges, a commonly used area by predators to avoid detection. Canadian lynx tracks were noted in conjunction with snowshoe hare, in coniferous and hardwood stands as is usually the case in this close predator-prey relationship (O'Donoghue et al. 1998). Ermine were found in coniferous and hardwood stands as documented elsewhere (Banfield 1984). Red fox tracks were observed in hardwood habitat, bog/barren habitat and coniferous habitat (edge habitat). Red foxes are generally found in open areas which include shores, river valleys, and natural clearings in forests (Banfield 1984). River otter tracks were observed as expected proximate to frozen water bodies and near areas of open water. River otter are known to prefer lakes, ponds, stream and riverine edge habitats due to their piscivorous diets and amphibious behaviour (Banfield 1984).

Rodents, Lagomorphs, Small Mammals, and Upland Game Birds

In the Study Area, there were tracks of red squirrel, snowshoe hare, small mammals and upland game birds. Red squirrels were found in hardwood and coniferous stands as documented elsewhere (Banfield 1984). Snowshoe hare tracks were common throughout the study area in most habitat types. Tracks were most prevalent in hardwood forest habitat. Association of hares with white birch as forage has been documented (Newbury and Simon 2005, MacCracken et al. 1988). Small mammal signs were evident throughout the Study Area. Subnivean activity was documented in hardwood and coniferous forests, as well as open edges around bog areas, where the windblown snow did not obscure identification of activity. Upland game bird tracks were in coniferous, hardwood habitats as well as open areas. Ruffed grouse is primarily associated hardwood stands of trembling aspen and white birch stands but is also found in young mixedwood stands (Rusch et al. 2000). Spruce grouse are found in dense coniferous stands (Boag and Schroeder 1992). Willow Ptarmigan in Newfoundland occupies barrens and coniferous krummholtz (Hannon et al. 1998).

Species at Risk

Newfoundland marten presence in the study area was confirmed through the observation of tracks and analyses of collected hair samples. This species was expected but unconfirmed in the Valentine Lake area, based on the habitat available and proximity to identified core and critical habitat ranges (The Newfoundland Marten Recovery Team 2010). The detection of a new individual female marten through the genetic analysis of the hair sample was included in the Newfoundland database and may be used by the NLWD to monitor Newfoundland marten abundance throughout its range in the province.

There were Newfoundland marten tracks within both coniferous and hardwood stands. Structure and other habitat features such as canopy cover provided by coniferous forests are well-documented as important characteristics for Newfoundland marten (Gosse et al. 2005; Buskirk et al. 1989). Use of hardwood forests is not well-documented in Newfoundland. Hardwood stands may be included in their home range as a response to prey availability (Gosse et al. 2005). Marten may be responding to prey fluctuations that in turn are resulting from high seed crops in

hardwood stands (Jensen et al. 2012). Prior to this study, Newfoundland marten were recorded in areas just west of the study area in older growth coniferous forests. Their documented presence within the Study Area and in particular in relatively undocumented habitats is important as it may reflect on both the quality of habitat (such as structure, food sources) as well as expansion of the species in the area.

Limitations

While all efforts were made to ensure a successful survey, there are always limitations that must be acknowledged. Particular limitations to this study were:

- The last recorded snowfall in the areas was three days prior to survey date. Some literature recommends that track surveys be conducted within twelve hours of the last snowfall (RIC 1998) while others reference three days (AMBI 2010). Based on the existing weather patterns and forecast at the time of the study, it was felt that the window of opportunity was limited and there was risk in delaying for ideal snow conditions.
- Snow conditions varied over the sites surveyed. Transects located at higher elevations were somewhat windblown in open areas, which may have made detection of tracks from species such as small mammals and upland game birds difficult to distinguish. A decision to consolidate small mammals and upland game birds was made as a result.

The results of this type of study are often used in baseline reporting, ecological model verification in Environmental Impact Assessments, and as a monitoring tool. Because three different survey techniques were used for the study, the results are more comprehensive than any single technique. The breadth and depth of knowledge gained can assist Marathon with future planning and permitting related to the Project.

5.0 CONCLUSION

All species and/or species sign documented were expected in the Study Area. There were ten wildlife (*i.e.*, mammal and upland game bird species) species observed based on tracks during the ground surveys and eight wildlife (*i.e.*, mammal and upland game bird species) species during the aerial surveys. The presence of Newfoundland marten was confirmed by the observation of tracks, as well as the analyses of the hair sample, which identified a new individual to the NL database.

No significant environmental effects are expected as a result of this survey. The Study Team acted to minimize all disturbances associated with helicopter use so no wildlife was unnecessarily disturbed as part of the survey. Surveys of this nature have been completed in the past (in Newfoundland and Labrador, as well as other areas) without the detection of any significant effects on behavior.

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APPENDIX A-1

A permit to conduct research on, and possess specimens of a threatened species under the Newfoundland and Labrador Endangered Species Act

Newfoundland Labrador

GOVERNMENT OF
NEWFOUNDLAND AND LABRADOR

Department of
Environment and Conservation
Wildlife Division

A PERMIT TO CONDUCT RESEARCH ON, AND POSSESS SPECIMENS OF A THREATENED SPECIES UNDER THE *ENDANGERED SPECIES ACT* OF NEWFOUNDLAND AND LABRADOR

Date: February 25, 2013

Endangered Species Permit Number: **2012/13-24**

Issued To: Tina Newbury, Stantec Consulting Ltd., 19 Union St. Corner Brook, NL A2H 6G7

Permit To: Collect and possess hair specimens from American marten (*Martes americana atrata*)

Expiry Date: May 1, 2013

CONDITIONS:

1. The permit holder may designate other individuals to collect and possess hair specimens on his/her behalf. The permit holder is responsible for the training of any designated individuals and must ensure designated individuals follow all regulations related to this permit.

2. Nominees under this permit include: Scott McCrindle, Tony Parr, Stacey Camus

3. Information about the location of collection and any other relevant information must be transferred to the Wildlife Division, Department of Environment and Conservation as soon as possible following hair collection.

4. All marten hair samples are to be transferred to the Wildlife Division, Department of Environment and Conservation or to the CREAIT Laboratory at Memorial University of Newfoundland. Any remaining hair samples after analysis are to be transferred to the Wildlife Division, Department of Environment and Conservation.

5. A final report including the methods and results of the study and including full genetic results must be provided to the Wildlife Division, Department of Environment and Conservation by May 1, 2013.

6. Names and contact information for all individuals participating in hair snagging activities must be provided to the Wildlife Division, Department of Environment and Conservation once activities are completed for the year.

The permit holder may at any time request the permit be amended to allow for the loan, exchange or donation of specimens covered under this permit to other institutions or individuals for the purposes of, conservation, identification or study.

JOHN BLAKE
Director

APPENDIX A-2

Scientific research permit: to undertake one day aerial and ground based winter reconnaissance surveys to examine the presence of and distribution of wildlife within the study area during winter

Newfoundland Labrador

GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
Dept of Environment & Conservation

Scientific Research Permit

(as under Section 86 of the Wildlife Regulations, Consolidated Newfoundland and Labrador Regulation 1156/96)

Project Title: *Marathon Gold – 2013 Winter Wildlife Reconnaissance Surveys*

Issued to:

Tina Newbury
Stantec Consulting Ltd.
19 Union Street
Corner Brook, NL CA A2H 6G7
Tel: (709) 639-9712

Permit to: Undertake one-day aerial and ground based winter reconnaissance surveys to examine the presence of and distribution of wildlife within and the study area during winter.

Dates:
1-Day survey that will be undertaken between February 26 & March 8, 2013
Permit expires April 1, 2013

Location: The study area consists of approximately 172 km2 within the Marathon Gold Corp. Valentine Lake Property claim area. This claim area falls within the area of Victoria Lake and Valentine Lake (NTS 12A/06 &12A/07).

Conditions:

1) Prior to initiation of surveys, a digital copy of the shapefiles of all survey routes must be provided to the Wildlife Division, Senior Wildlife Biologist, Habitat Management Program, Kirsten Miller at: kirstenmiller@gov.nl.ca

2) The Wildlife Division advises applicants to operate under established regulations and guidelines with respect to wildlife and wildlife habitat to minimize adverse impacts (Section 106 of the *Wild Life Regulations* under the *Wild Life Act* (O.C. 96-809)).

3) The Project will be conducted using accepted wildlife research techniques and target species will be disturbed as little as possible.

4) Upon completion of the report writing, a copy of the final reports will be remitted to the Wildlife Division, Senior Wildlife Biologist, Habitat Management Program, Kirsten Miller at: kirstenmiller@gov.nl.ca by May 15, 2013. In addition, a list of all wildlife sightings and sign with their coordinates will be forwarded to the Wildlife Division after each survey.

5) Any unusual wildlife observations or any adverse effects observed during this survey are

to be reported immediately to the Wildlife Division – Corner Brook.

6) The methods and survey dates described in the application will be followed as closely as possible. Any changes to the survey design or methodology outlined in the initial permit request will require prior approval before implementation.

7) All conditions of this permit must be adhered to and data and results from previous projects submitted to the Wildlife Division prior to another permit being issued.

26 Feb 2012
Date

Senior Manager – Habitat, Game and Fur

Wildlife Division
PO Box 2007
Corner Brook, NL A2H 7S1
Ph (709) 637-2383
Fax (709) 637-2004

Ecosystem Classification and Mapping of the Marathon Gold Corporation Valentine Lake Project, Central Newfoundland

Prepared for:
Marathon Gold Corporation
District Office
P.O. Box 160
Pasadena, NL A0L 1K0

Prepared by:
Stantec Consulting Ltd.
141 Kelsey Drive
St. John's, NL A1B 0L2
Tel: (709) 576-1458
Fax: (709) 576-2126

Final Report

File No. 121511074.600

November 23, 2015

Stantec

Document Status Tracking Table

Report Title	File Number

Date mm/dd/yr	Author/Reviewer's Name and Role (e.g., Senior Reviewer. Technical Reviewer, Independent Senior Reviewer, Author, Formatter, etc.)	Action Performed (Tech review of draft for Sr. review, Sr. review of final to client, formatting of 1st draft, etc.)	Status and Comments (e.g., ready for release with minor edits noted in document, do not need to see again; or my review required of revisions per comments inserted in text, sent to NAME)	Sign-off ISR or Technical (Please insert initials to confirm review actions as indicated)
01/06/2015	S. Bennett	Initiate reporting - template		
01/29/2015	R. LaPaix	Integration of vegetation text, appendices, general review of vegetation-related text	Document in working condition; RL comments and edits in tracked changes and need to be reviewed by SB for acceptance	RL
02/05/2015	S. Bennett	Review of recent edits by RL and application of required updates to final Draft Report doc		SMB
02/19/2015	Lois Strangemore	Format check;		
02/19/2015	Michael Crowell	Senior review	Edits recorded as track changes	MJC
02/24/2015	Lois Strangemore	Insert figures, format; PDF		LMS
04/11/2015	Tina Newbury	Review of wildlife text		TN
06/11/2015	S. Bennett	Review of edits to document		SMB
18/11/2015	S. Bennett	Updates to report based on Accuracy Assessment		SMB
21/11/2015	Ellen Tracy	Independent Review		et
18/11/2015	S. Bennett	Final report assembly		SMB

	Signature of Final Reviewer is Required	Date
Approval to Release to Client		

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Executive Summary

This report presents a description of efforts to develop an Ecological Land Classification (ELC) for an area encompassing the proposed Marathon Gold Corporation (Marathon) Valentine Lake Gold Mine Project (the Project). An ELC was undertaken for the Project to describe the local ecological context of the mineral claims area and expanded regional area (herein refered to as the "Study Area"), such that interactions between biota, the physical environment and the Project can be assessed within the context of the specific ecology of the area.

Baseline information was compiled using the results of field sampling programs conducted by Stantec Consulting Ltd. (Stantec), literature reviews, interpretation of aerial photography and existing mapping information, as well as other Project-specific information. This baseline compilation and review also considered the applicable methods for interpretation of terrain, soil, vegetation and wildlife resources, including mapping conventions previously used for projects in Newfoundland and Labrador. Details of the methods applied to this baseline are provided.

Stantec conducted a field program in the Study Area in August 2014 and September 2015, during which 136 field plots were inspected (Original ELC Survey[2014]: 74 points; Accuracy Assessment [2015]: 62). The distribution of the sites was planned in order to sample within the mineral claims areas for the Valentine East and Leprechaun Pond deposits, in addition to any of those habitat types deemed of interest.

Medium textured, morainal till surface materials are the most commonly observed parent material within the Study Area. This material is variable in thickness ranging from a few centimetres (cm) to over 1 metre (m). Other common soil parent material types were organic (fen), colluvium, bedrock and fluvial. In poorly drained soils, the presence of the bedrock and other shallow unconsolidated material contributed substantially to the extent of organic soils in the Study Area. Colluvium, in varying forms, occurring primarily on steep slopes often in complexes with both till and exposed bedrock, was observed infrequently. Lacustrine deposits were found in association with a narrower band of habitat surrounding Red Indian Lake and Victoria Lake (Reservoir). Bedrock, till and colluvium-derived soils were common at mid to high elevations. Fluvial deposits, though infrequent, originated from glaciofluvial sands and silts, and were found along the shoreline of the Victoria River and on small islands associated with large river systems in the area.

The soil orders present on these parent materials included Podzolic, Gleysolic, Regosolic and Organic. Soil map units were mostly complexes of organic and mineral soils, reflecting the varied topography of the underlying till. The most abundant mineral soil unit on well to imperfectly drained soils was the Red Indian soil unit. Gleysols, which are poorly drained transitional soils between organic and upland soils, were less extensive and included mainly Silver Mountain soil units. Soils developed on fen peat parent materials occupied the Deadwolf Pond and

Ebbegunbaeg soil units. Anthropogenic or disturbed land was primarily associated with historic mineral exploration and forest management activities in the area. Water occupied a substantial portion of the Study Area.

There are 12 ecosystem units (or land cover classes) within the Study Area: Balsam Fir Forest, Black Spruce Forest, Kalmia-Black Spruce Woodland, Mixedwood Forest, Regenerating Forest, Alder Thicket, Riparian Thicket, Wet Coniferous Forest, Open Wetlands, Open Water, Exposed Sand / Gravel Shoreline and Anthropogenic. Of these, nine are vegetated and three are sparsely vegetated, naturally non-vegetated and/or anthropogenic ecosystem units. Approximately 56% of the Study Area is occupied by upland environments, 22% by lowlands (i.e., wetlands) and 22% by open water. Upland areas are dominated by softwood forests (i.e., the Balsam Fir - Black Spruce Forest Ecosystem Unit), alder thickets and mixedwood forests, whereas lowland sites are comprised of open peatlands and treed wetlands. Fourteen ecotypes have been identified within the mapped ecosystem units. Most mapped ecosystem units are direct correlates with ecotypes, but multiple ecotypes have been identified for the Kalmia- Black Spruce Woodland (Kalmia-Black Spruce Forest and Kalmia Heath) and Open Wetlands (Shrub / Graminoid Fen and Shrub Bog) units based on field data collected within the 136 field plots (ground and visual). Ecotypes vary considerably in their vegetative structure and composition.

A total of 224 plant taxa were recorded during surveys conducted in support of the ELC. Of these, 198 were vascular plants, 19 were mosses / liverworts, and seven were lichens. The population statuses of all plant species encountered during the ELC surveys were determined through a review of the species status reports prepared by Newfoundland and Labrador Department of Environment and Conservation (NLDEC 2014), Atlantic Canada Conservation Data Centre (AC CDC 2010), the Committee on the Status of Endangered Wildlife in Canada Wildlife Species Assessment (COSEWIC 2015) and the Newfoundland and Labrador *Endangered Species Act* (NL *ESA* 2007). No federally or provincially designated "at risk" species were found, but several regionally uncommon graminoids were encountered, including: short-scale sedge (*Carex deweyana*), perennial bentgrass (*Agrostis perennans*), forest bluegrass (*Poa saltuensis*) and cottongrass bulrush (*Scirpus cyperinus*).

Accuracy assessment is an integral component of any mapping project based on remote sensing. As the land-cover map for the Study Area was completed, thematic accuracy was assessed to measure general and categorical qualities of the data. Assessing accuracy for this regional mapping project was a complex task, largely owing to the size of the Study Area relative to the spatial resolution of the RapidEye Thematic Map data used. The accuracy assessment results were derived from analysis of the error matrix summarization of the reference data. The accuracy assessment for the Project ELC was completed using 162 reference points obtained through ground truthing of the Study area in September 2015. The estimated overall accuracy for the habitat classification was 83%.

Abbreviations

AC CDC	Atlantic Canada Conservation Data Centre
CanSIS	Canadian Soil Information System
CEAA, 2012	*Canadian Environmental Assessment Act, 2012*
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ELC	Ecological Land Classification
EIS	environmental impact statement
GIS	geographic information system
GIF	ground inspection plot
GPS	global positioning system
LFH	Litter, fibric and humic layer; organic layer
MoELP-MoF	British Columbia Ministry of Environment, Lands and Parks and British Columbia Ministry of Forestry
NLDEC	Newfoundland and Labrador Department of Environment and Conservation
NL ESA	Newfoundland and Labrador *Endangered Species Act*
NL EPA	Newfoundland and Labrador *Environmental Protection Act*
NS	Nova Scotia
The Project	Valentine Lake Gold Mine Project
QMS	Quality Management System
RIC	Resources Inventory Committee
SARA	*Species at Risk Act*
SMR	soil moisture regime
SNR	soil nutrient regime
SOCC	species of conservation concern

Glossary

Anthropogenic	Caused by human activity.
Biogeoclimatic ecosystem classification	A classification system incorporating soils and or geology, climate and vegetation into defined regional units (zones, subzones and variants) with recognized and characteristic ecosystems. An ecosystem is manifested as the interactions between climate and soil to determine vegetation potential on any site.
Bog	Nutrient-poor, acidic and peat-forming wetlands that receive water only from precipitation.
Classification	A taxonomic activity involving the aggregation of samples into a logical framework.
Clay	(i) As a particle size term: a size fraction less than 0.002 mm equivalent diameter, or some other limit (geology or engineering). (ii) As a rock term: a natural, earthy, fine grained material that develops plasticity with a small amount of water. (iii) As a soil term: a textural class. See also soil. (iv) As a soil separate: a material usually consisting largely of clay minerals but commonly also of amorphous free oxides (sesquioxides) and primary minerals.
Ecodistrict	A broad subdivision of the landscape based on differences in landscape pattern, topography and dominant soils.
Ecosystem Mapping	An approach where site, soil and vegetation information are used to delineate map units that are internally consistent and sufficiently different from adjacent areas to enable separation of a landscape continuum into ecologically meaningful units. It involves a collaborative interdisciplinary process involving clear timely communication within and between offices (and scientists) and the application of consistent mapping approaches to the integration of site, soil and vegetation information, using the best available technology and appropriately trained staff.

Ecological Land Classification (ecosystem classification)	The process of subdividing landscapes using ecological criteria (climate, terrain, biota) into units that is internally consistent and distinguished from their neighbors.
Ecotone	An ecotone is a transitional area between two different ecosystems, such as a forest and a wetland. In landscape ecology, an ecotone is the border area where two patches meet that have different ecological composition. The ecotone contains elements of both bordering communities, as well as species that are characteristic and restricted to the ecotone.
Ecotype	A classification unit applied to mapping where an abstract vegetation community developed from synthesis of ground plot information is related to a set of soil moisture and soil nutrient conditions under which it occurs within a Natural Subregion or combination of Subregions. Site, generalized soil and vegetation composition and cover information are used to determine the closest fit to one of many described ecotypes.
Ecosystem	An integrated and stable association of living and non-living resources functioning within a defined physical location. A community of organisms and its environment functioning as an ecological unit. For the purposes of assessment, the ecosystem must be defined according to a particular unit and scale.
Edatopic grid	A two-dimensional representation of moisture and nutrient classes, generally with moisture on the y-axis (wettest to driest bottom to top) and nutrients on the x-axis (nutrient poor to the left, nutrient rich to the right). Under a given regional climate, ecotypes or vegetation types occupy various positions on the grid according to the moisture and nutrient conditions under which plant communities with recognizable species compositions generally recur.
Eutrophic	High fertility conditions, rich in nutrients.
Fen	Sedge peat materials derived primarily from sedges with inclusions of partially decayed stems of shrubs formed in a eutrophic environment due to the close association of the material with mineral rich waters. Minerotropic peat-forming wetlands that receive surface moisture from precipitation and groundwater. Fens are less acidic than bogs, deriving most of their water from groundwater rich in calcium and magnesium.

Fibric	Organic materials containing large amounts of weakly decomposed fibres whose botanical origins are readily identifiable; fibric material has 40% or more of rubbed fibre by volume (or weight of rubbed fibre retained on a 100 mm mesh sieve) and is classified in the von Post scale of decomposition as class 1 to class 4. See also horizon, soil.
Forest Peat	Peat materials derived mainly from trees such as black spruce, from ericaceous shrubs, and from feather mosses.
Gleysolic Soil	An order of soils that have properties indicating prolonged, intermittent or continuous saturation with water during soil development. Diagnostic horizon is either Bg or Cg.
Gleying	Gleying is a reduction process that takes place in soils that are saturated with water for long periods of time. The horizon of most intense reduction is characterised by a gray, commonly mottled appearance, which on drying shows numerous rusty brown iron stains or streaks.
Horizon	A layer of soil or soil material approximately parallel to the land surface; it differs from adjacent genetically related layers in properties such as colour, structure, texture, consistence and chemical, biological and mineralogical composition. More detailed definitions of some horizons and layers may be found in the "Soil Survey Handbook" (Agriculture Canada 1987).
Humic	Organic material that is at an advanced stage of decomposition. It has the lowest amount of fibre, the highest bulk density, and the lowest saturated water-holding capacity of the organic materials; it is physically and chemically stable over time, unless it is drained; the rubbed fibre content is <10% by volume and the material usually is classified in the von Post scale of decomposition as class 7 or higher. See also horizon, soil.

LFH	an organic horizon containing > 17% organic C (approximately ≥ 30% organic matter) by weight. It is developed primarily from the accumulation of leaves, twigs, and woody materials with or without a minor component of mosses. It is also normally associated with upland forested soils with imperfect drainage or drier. • L: this organic horizon is characterized by an accumulation of organic matter in which the original structures are easily discernible. • F: this organic horizon is characterized by an accumulation of partly decomposed organic matter. Some of the original structures are difficult to recognize. The material may be partly comminuted (pulverized) by soil fauna as in moder (a non-matted forest humus), or it may be a partly decomposed mat permeated by fungal hyphae as in mor. • H: this organic horizon is characterized by an accumulation of decomposed organic matter in which the original structures are indiscernible. This horizon differs from the F by having greater humification due chiefly to the action of organisms. It is frequently intermixed with mineral grains, especially near the junction with mineral horizons.
Lowlands	Areas with ground slopes of less than 0.5% and typically poorly drained.
Mapping	The division and description of a landscape into units that are distinct from neighboring map units. Map units may be simple (one element) or complex (two or more elements expressed as proportions of a polygon.
Mesic	A moderate soil moisture regime value whereby water is removed somewhat slowly in relation to supply; neither wet nor dry. Available soil water reflects climatic inputs.
Mesotrophic	Moderately fertile conditions.

Mineral Soil	Soils containing low levels of organic matter. Soils that have evolved on morainal, fluvial, glaciofluvial and lacustrine parent material. The A, B and C horizons and underlying parent material.
Morainal	Unsorted and heterogeneous drift (morainal "till" material), consisting of clay, silt, sand, gravel and boulders intermingled in any proportion, deposited by and underneath a glacier without subsequent reworking by glacial meltwater.
Moisture Regime	The relative moisture supply at a site available for plant growth.
Nutrient Regime	The relative supply of nutrients available for plant growth at a given site.
Oligotrophic	Surface fed directly and exclusively by precipitation.
Ombrogenous, Bog	A peat-forming vegetation community lying above groundwater level, it is separated from the ground flora and the mineral soil, and thus dependent on rainwater for mineral nutrients. The resulting lack of dissolved bases gives strongly acidic conditions and only specialized vegetation, predominantly Sphagnum species (bog mosses), will grow. Two types of ombrogenous bogs are commonly distinguished: raised bogs; and blanket bogs.
Ombrotrophic	Water derived from precipitation, not groundwater.
Order, Soil	A category in the Canadian system of soil classification. All the soils within an order have one or more characteristics in common.
Organic Soil	A soil order that have developed primarily on organic deposits. Soils containing high percentages of organic matter (fibric and humic inclusions).
Paludification	a natural process involving the gradual accumulation of a thick layer of organic matter.
Parent Material	The unconsolidated and more or less chemically weathered mineral or organic matter from which the solum of a soil has developed by pedogenic processes.

Peat	Material constituting peatlands, exclusive of live plant cover, consisting largely of organic residues accumulated as a result of incomplete decomposition of dead plant constituents under conditions of excessive moisture.
Peatland	Areas where there is an accumulation of peat material at least 40 cm thick. These are represented by bog and fen wetlands types.
Poor Fens	Poor fen is a sedge-dominated wetland found on very strongly to strongly acid, saturated peat that is moderately influenced by acidic groundwater. Fens which tend to support a less diverse flora and fauna than fens fed by more alkaline water.
Regosolic Soil	The only great group in the Regosolic order. The soils in the group have insufficient horizon development to meet the requirements of the other orders.
Sand	(i) As a particle size term: a size fraction between 0.05 and 2.0 mm equivalent diameter, or some other limit (geology or engineering). (ii) As a soil term: a textural class with abundant sand sized particles.
Silt	(i) As a particle size term: a size fraction between 0.002 and 0.05 mm equivalent diameter, or some other limit (geology or engineering). (ii) As a soil term: a textural class with abundant silt sized particles.
Site series	Describes all land areas (within a defined biogeoclimatic unit [subzone or variant] capable of producing the same late seral or climax plant community.
Soil	The naturally occurring, unconsolidated mineral or organic material at least 10 cm thick that occurs at the Earth's surface and is capable of supporting plant growth. Soil extends from the Earth's surface through the genetic horizons, if present, into the underlying material to the depth of the control section (normally approximately 1 to 2 m). Soil development involves climatic factors and organisms, conditioned by relief and water regime, acting through time on geological materials, and thus modifying the properties of the parent material (Agriculture Canada 1987).

Soil Classification	The systematic arrangement of soils into categories based on their characteristics. Broad groupings are made on the basis of general characteristics and subdivisions on the basis of more detailed differences in specific properties.
Soil Horizon	A layer of mineral or organic soil material approximately parallel to the land surface that has characteristics altered by processes of soil formation. A soil mineral horizon is a horizon with 17% or less total organic carbon by weight. A soil organic horizon is a horizon with more than 17% organic carbon by weight.
Soligenous	Wetness induced by lateral water movement (i.e. sideways through the soil or rock, as on seepage slopes).
Study Area	Marathon's Valentine Lake mineral claims area, plus an expanded regional area
Subgroup	A category in the Canadian system of soil classification. These soils are subdivisions of the great groups, and therefore are defined more specifically.
Terrestrial ecosystem map	An ecosystem map based on field data collection and aerial photo interpretation of terrain and vegetation into ecosystem units that incorporate ecological features, including climate, physiography, surficial material, bedrock geology, soil and vegetation.
Uplands	Areas where the soil is not saturated for extended periods as indicated by vegetation and soils.
Unsupervised Satelite Classification	An ecosystem map that is produced through a computer modelling process incorporating all available information including vegetation cover mapping, soil or terrain mapping, topography, and field data (predictive ecosystem map).
Veneer	Unconsolidated materials too thin to mask the minor irregularities of the underlying unit surface. A veneer ranges from 10 cm to 1 m in thickness and possesses no form typical of the materials' genesis.
Water Table	The shallowest saturated ground below ground level - technically, that surface of a body of unconfined groundwater in which the pressure is equal to atmospheric pressure.

Wetland	Wetlands are land where the water table is at, near or above the surface or which is saturated for a long enough period to promote such features as wet-altered soils and water tolerant vegetation. Wetlands include organic wetlands or "peatlands" and mineral wetlands or mineral soil areas that are influenced by excess water but produce little or no peat.

1.0 INTRODUCTION

1.1 Project Description

Marathon Gold Corporation (Marathon) is conducting a drilling program at its Valentine Lake prospect in Central Newfoundland. Drilling activities have targeted the Valentine East and the Leprechaun Pond sites (Figure 1-1). Pending final analysis of the drilling program, the Valentine Lake Gold Mine Project ("the Project") would involve the construction and operation, and rehabilitation and closure of mining infrastructure in Central Newfoundland.

Should Marathon wish to develop the mineral deposit, the Project will require approval from the Government of Newfoundland and Labrador and is subject to environmental assessment under the Newfoundland and Labrador *Environmental Protection Act* (NL EPA) and associated *Environmental Assessment Regulations*. Under the *Canadian Environmental Assessment Act, 2012* (CEAA, 2012). The Project is a Designated Project pursuant to Section 15(a) *Regulations Designating Physical Activities* and will require federal environmental assessment. This environmental study was conducted in support of the environmental assessment process for the Project.

Baseline work to support the anticipated environmental assessment has been ongoing for anticipated valued components (*e.g.*, landbirds, waterfowl, freshwater fish and winter wildlife). This Ecological Land Classification (ELC) Study was conducted to gather information to complement other baseline work with the identification of primary information on the biological and physical characteristics of habitat types occurring within Marathon's Valentine Lake mineral claims area, in addition to that of the expanded regional area (herein refered to as the "Study Area"). ELC is perhaps the most appropriate tool used to classify and integrate a broad range of physical and biotic characteristics into discrete and ecologically unique units, providing an understanding of ecosystem form and function by linking abiotic and biotic components of each system. Classification is contained within a nested, hierarchical framework that allows for different levels of generalization (and scale) when describing ELC units. In this framework, the ELC provides a description of the physical and biological environment affecting the ecological structures and processes and the biodiversity of ecosystems.

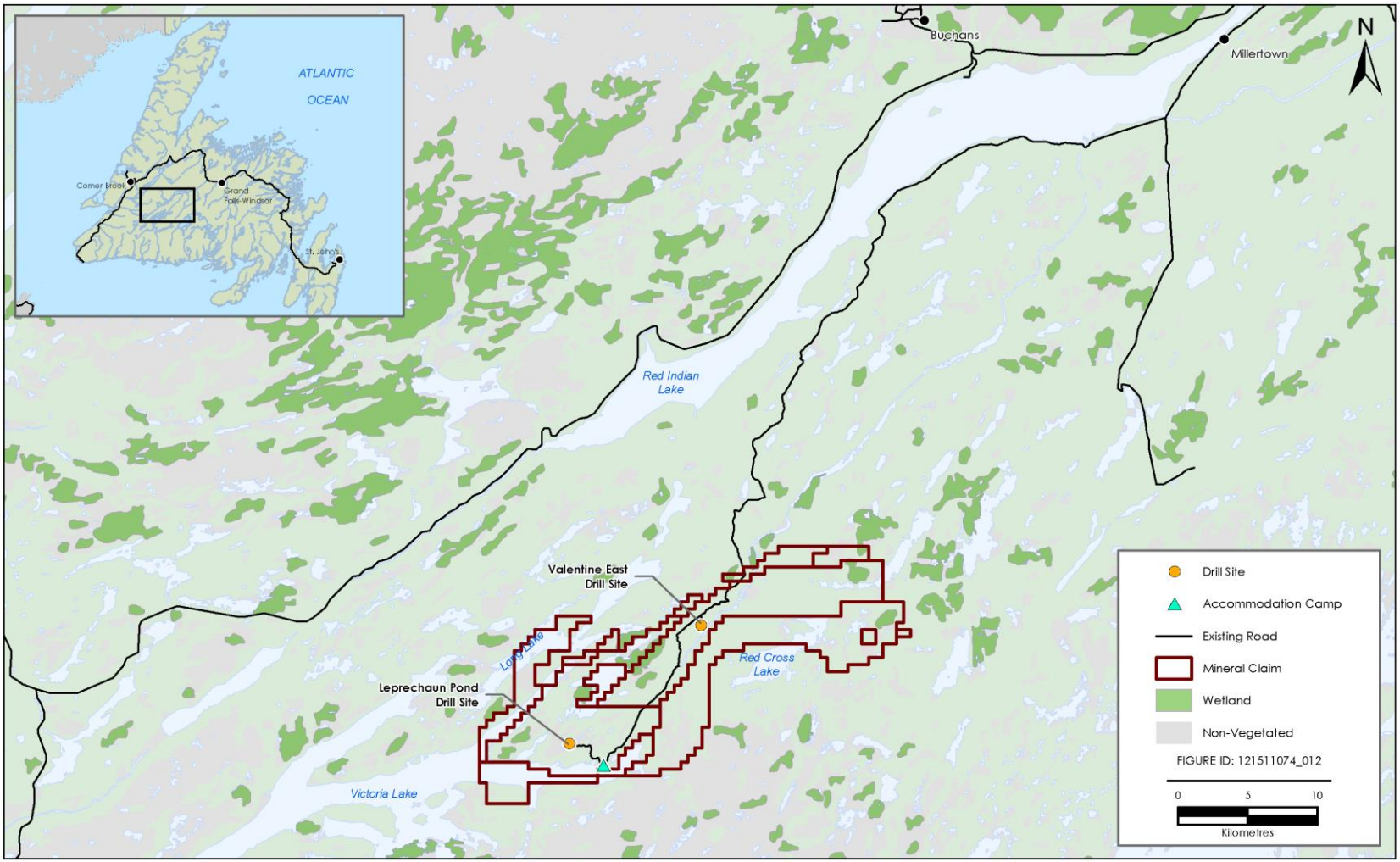


Figure 1-1 Project Location for the Marathon Valentine Lake Gold Mine Project

1.2 Ecological Land Classification Overview

The ELC is an important tool for examining the interactions between the Project and the surrounding physical environment by interpreting key issues that may result from the Project in the context of the ecosystem properties identified in the ELC. While ELC describes the ecological mosaic of the Project, it is also important in the understanding of other components of the existing environment, such as the identification and evaluation of existing wildlife habitat, and provides a basis for understanding the potential effects of the Project in relation to the surrounding environment.

The ELC was completed in order to identify, compile, summarize and present information on vegetation and vegetation communities and wildlife habitat near the proposed Project, and which may interact with it. The description of vegetation communities found within the Study Area aims to document the presence of sensitive habitats, including wetlands and/or other potentially rare or uncommon habitats. Such habitats may contain species at risk, of conservation concern or uncommon plant species. In addition, these communities provide a wide variety of habitats that are essential to wildlife by offering areas for foraging, feeding, calving, etc. Key species for habitat consideration included major ungulates such as: caribou (*Rangifer tarandus*) and moose (*Alces alces*); key predators such as lynx (*Lynx canadensis*) and raptors; economically important species such as furbearers; migratory species; songbirds and songbird guilds; and species of conservation concern such as the Newfoundland marten (*Martes americana atrata*) and Harlequin Duck (*Histrionicus histrionicus*).

The ELC provides a useful estimate of species diversity, richness (number of species observed) and relative abundance among habitat types. Surveys were designed to collect baseline data or to aid in the monitoring of wildlife throughout various stages of project development. Therefore, the ELC is complementary to the Avifauna, Waterfowl, and Large and Small Mammal studies conducted between 2010 and 2013. This information will be used as supporting information in the Environmental Impact Statement (EIS).

1.3 Study Team

The ELC was conducted by Stantec Consulting Ltd. (Stantec). The Study Team included a Project Manager / Lead Project Scientist, Senior Reviewer, Project Scientists and Information Management / Geographic Information System (GIS) Specialists (Table 1.1). All team members have in-depth knowledge and experience in their fields of expertise and a broad general knowledge of the work conducted by other experts in related fields. Brief biographical statements, highlighting project roles and responsibilities and relevant education and employment experience, are provided below.

Table 1.1 Study Team – Ecological Land Classification Study

Plant Species Classification	Probability of Occurring in Wetland
Project Manager / Lead Project Scientist	Sean Bennett
Senior Review	Michael Crowell
	Ellen Tracy
Project Scientist	Sean Bennett
	Rich LaPaix
Data Analysis and Report Preparation	Sean Bennett
	Rich LaPaix
Information Management / GIS	Heather Ward
	Ryan Melanson

Sean Bennett, P.Biol., R.P.F. | Ecologist | Project Manager & Lead Project Scientist

Sean is a terrestrial ecologist and Lead Project Scientist with Stantec's Biophysical and Ecological Services team in St. John's, NL. His responsibilities include performing ecological and botanical assessments and characterizations; natural resource inventories including rare, endangered, threatened and vulnerable species surveys; wetland delineations and function and value assessments; wildlife surveys; soil surveys; and long-term biological monitoring. He has also explored the interactions among various components of terrestrial ecosystems while developing a strong, interdisciplinary background in the areas of soils / terrain science, vegetation ecology and wildlife biology. Sean has demonstrated experience and extensive training that includes project, discipline and team management with emphasis on the planning, design, execution and management of field programs with diverse ecological objectives. Working with the Project team, Sean will be responsible for overall management of the Project; as well as acting as Lead Project Scientist, having been involved in similar projects throughout Canada.

Rich LaPaix, M.Sc. | Ecologist | Technical Lead

Rich is a terrestrial ecologist for Stantec's office in Dartmouth, NS, and is primarily involved with environmental assessment and monitoring initiatives that address the effects of various anthropogenic activities on rare or sensitive species and habitats. He is an experienced botanist and vegetation ecologist, having conducted numerous botanical surveys and plant community studies in a wide range of habitat types throughout Atlantic Canada. Rich also has expertise as a wildlife biologist, particularly in performing surveys of songbirds within Atlantic Canada, and as a wetland ecologist, having extensive experience in the delineation, classification and functional assessment of wetlands within the Acadian and Boreal Forest Regions. He has been involved in several of the baseline environmental studies for the Kami Mine Project, including the rare plant surveys. Rich was a field researcher and technical Lead for this Project and has been

involved in similar projects within Newfoundland and Labrador, including development of an ELC for the Labrador-Island Transmission Link project.

Michael Crowell, M.Sc. | Ecologist | Senior Review

Michael is a terrestrial ecologist in Stantec's Dartmouth, NS, office, with over 30 years' experience in plant taxonomy, plant ecology, wetland ecology and wildlife ecology. He has also conducted a number of vascular plant and ELC studies in Newfoundland and Labrador, including work in the Lower Churchill Hydroelectric Generation Project, Voisey's Bay, Labrador City, the DND practice bombing range in southern Labrador and the Trans Labrador Highway. Michael served in the capacity of Senior Reviewer for the Project.

Heather Ward, M.Sc. |GIS Analyst | Remote Sensing

Heather is a GIS Coordinator with the Information Management team in Stantec's St. John's, NL, office. Heather completed her Masters in Geography at Memorial University with a focus in Remote Sensing. Her experience comes from a combination of private sector work in Remote Sensing and GIS, and work related to her Master of Science program. She has considerable experience with Remote Sensing, geo-statistical and spatial analysis as well as cartography. Heather also teaches GIS sciences at Memorial University.

Ryan Melanson, B.Sc. |GIS Analyst | GIS

Ryan is a GIS Analyst with the Information Management team in Stantec's St. John's, NL, office. His background is in GIS and environmental monitoring. Ryan has five years of experience between creating geospatial solutions and sampling freshwater, marine and terrestrial environments. He has contributed to projects through data collection, analysis and reporting.

2.0 RATIONALE AND OBJECTIVES

This ELC Study forms one aspect of Marathon's environmental baseline programs for the Project. The purpose of this and other such environmental studies has been to gather and present information on key aspects of the environment, providing an appropriate level of understanding of the existing environmental conditions within and near the Study Area for use in the EIS. Although Marathon is in the exploratory stage in this mineral claim area, it was deemed prudent to understand the ecological setting and potential mitigating factors as the planning process continues.

To achieve this objective, Stantec defined and delineated ecological units within the Study Area at varying organizational scales based on climate, physiography, bedrock, surficial geology, soils and corresponding vegetation. The system is primarily vegetation-driven as plants best integrate the combined influence of numerous environmental factors. Specifically, the Project ELC investigated the distribution and grouping of plant species according to ecosystem patterns and processes. ELC is widely considered a useful tool in the inventory and evaluation of wildlife habitat.

Information presented herein will provide valuable information about the distribution of ecosystem units (or land cover classes) across the land base and is intended to support and/or supplement that contained in associated environmental studies prepared for the Project. These studies will be used collectively to guide ongoing Project planning, as well as to support and inform the environmental assessment for the Project.

The objectives for the Project ELC and wildlife habitat studies were to:

- provide descriptions of vegetation at various levels of generality using a complete taxonomic vegetation hierarchy (e.g., Ecozones, Ecoregions, Ecodistricts and Ecotypes) and using standardized criteria and nomenclature. Classification is based on floristic, ecological and physiognomic criteria, with Ecotype used as the basic unit of classification;
- establish a field sampling program that effectively examines and evaluates ecotypes on the basis of vegetation characteristics that can be objectively measured and delineated in the field using consistent sampling methods and ecosystem mapping standards;
- collect high-quality, ground-verified plot data used to support satellite-based ecosystem mapping (e.g., a combination of ground verification and remote-sensing industry analytical tools to identify and delineate similar areas of ground vegetation cover) of ecotypes;
- compile ecological data for use in the preparation and development of a comprehensive GIS database and thematic mapping products. These database and map products serve as the basis for understanding ecological relationships at a variety of scales and will enable the analysis of the effects of the Project on the natural environment; and

- identify and evaluate the occurrence of environmentally sensitive areas or feature, as well as supporting future habitat suitability modelling for key wildlife species in the Study Area, as required.

In summary, the application of an ecosysytem-specific approach will see the Study Area stratified into ecologically uniform segments. A consistent and ecologically meaningful stratification, in turn, requires an appropriate ecosystem classification system. The ELC serves as an essential and integral component of the environmental assessment, and provides key and core information that will be used in assessing and quantifying the Project's potential interactions with aspects of the terrestrial environment (soil, vegetation, wildlife and wildlife habitat). Information provided through this and other associated supporting studies prepared for the Project is considered appropriate and adequate for these purposes.

3.0 STUDY AREA OVERVIEW

3.1 Project Location and Surrounding Land Use

The boundaries of the Project ELC are shown in Figure 3-1. Boundaries of the ELC Study Area are similar to that used for other environmental baseline studies relating to the Project (e.g., Songbird and Waterfowl Survey, Winter Wildlife Survey) and were selected to encompass the Valentine Lake mineral claim area, including any proposed developments associated with the Project.

Boundaries for the ELC analysis were selected using the following criteria:

- all features and infrastructure associated with the proposed Valentine Lake Gold Mine site will be within the ELC Study Area;
- the ELC Study Area will include representative habitats for key wildlife species that could potentially interact with the proposed Project;
- accommodate habitat and potential migrations routes for key species within and/or in the vicinity of the Project; and
- the ELC Study Area encompasses key areas of resource harvesting, recreation and cultural activities.

The ELC Study Area comprises an area of 1,831 km^2 and fully encompasses the proposed mine site, access road, and transportation components, and therefore the "zone of influence", which is anticipated to be directly affected by construction, operation and maintenance, and rehabilitation and closure of the Project (Figure 3-1). Ecosystem mapping at this scale is considered appropriate and will provide very detailed information on ecosystem composition and structure, which can in turn be used to assess potential effects of the Project in the EIS.

The Project occupies the Central Newfoundland Forest Ecoregion and the Red Indian Lake Subregion (Damman 1983; Newfoundland and Labrador Department of Environment and Conservation (NLDEC 2008); Figure 3-1). The landscape is characterized by remote upland forests interspersed by wetlands (bogs/fens), krummholtz, barrens and waterbodies. The dense forests are composed of balsam fir (*Abies balsamea*) and black spruce (*Picea mariana*), common to Central Newfoundland Forests. Stands of pure hardwood and mixedwood are also present, with the dominant species being white birch (*Betula papyrifera*) and trembling aspen (*Populus tremuloides*). While the majority area is in a relatively natural state, road construction, timber harvesting, mineral exploration, mining, recreational use, and various other ground-disturbing activities have occurred.

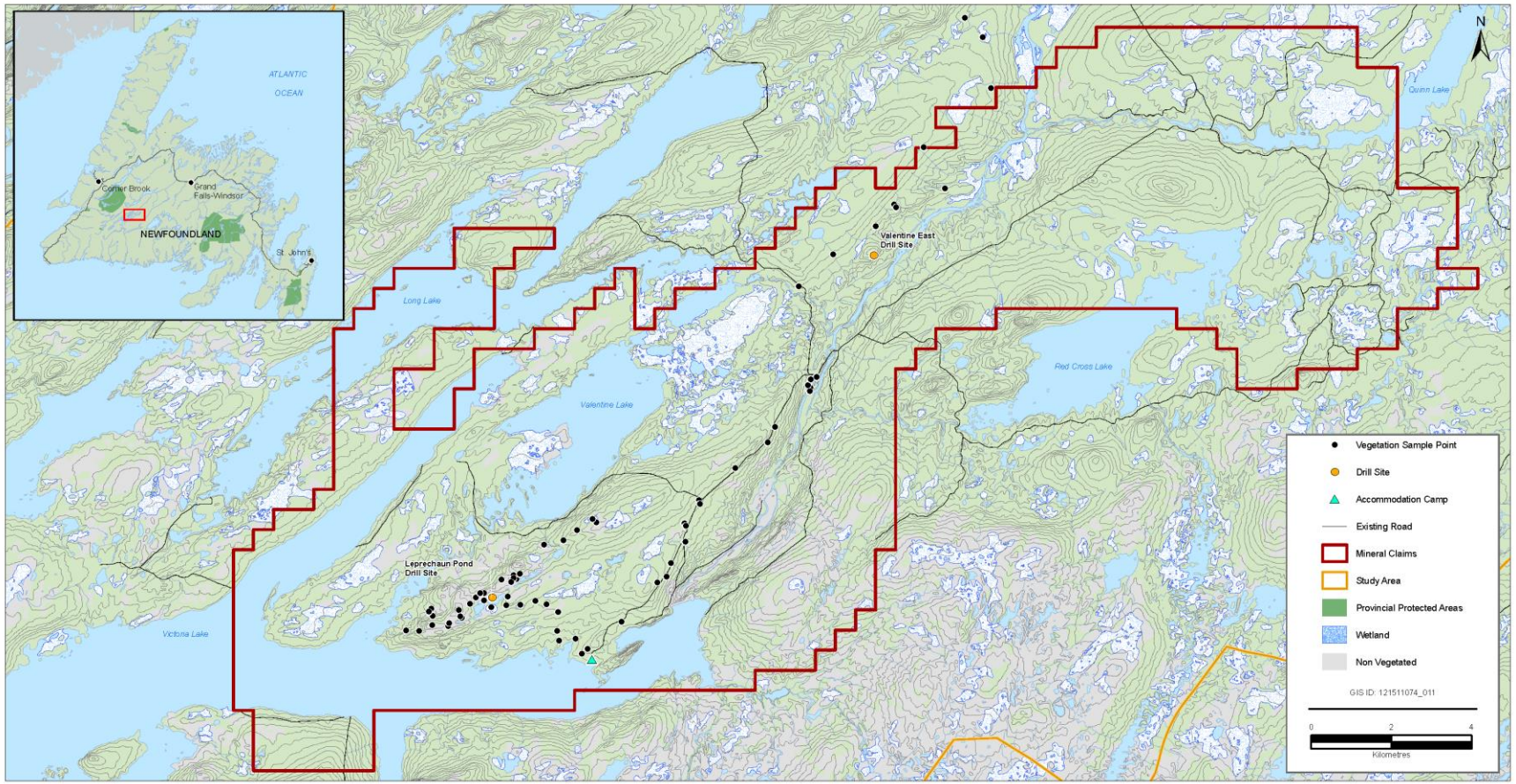


Figure 3-1 Project Location for the Marathon Gold Project

4.0 ECOLOGICAL LAND CLASSIFICATION

4.1 Ecological Land Classification in Canada

ELC uses climate, physical land features and vegetation to identify and classify regional terrestrial ecosystems into a hierarchy of nested units at progressively smaller scales.

Marshall and Schut (1999) describe a hierarchical framework for ELC in Canada that forms the basis of this ELC. This framework provides a consistent, national spatial context within which ecosystems, at various levels of generalization, can be described, classified and monitored. Using this framework, the Project ELC incorporates a standard and well-validated methodology for describing ecological units, thereby facilitating comparisons of ELCs undertaken in other jurisdictions, including those undertaken in Newfoundland and Labrador.

ELC is hierarchical (or nested) in its organization and describes regional ecological units at multiple scales, in which broad scale ecological units (i.e., *zones*) encompass successively smaller ones (i.e., finer scale *districts*).

4.1.1 Ecozones

At the top of the hierarchy, Ecozones are defined on the basis of generalized characteristics and global and continental climate. There are 15 Ecozones delineated for Canada (Natural Resources Canada 2007), of which one overlaps with insular Newfoundland: the Boreal Shield Ecozone. Ecozones typically differ from one another on the basis of climate, geomorphology, terrain, soils and vegetation species composition and growth pattern.

The ELC Study Area is located entirely within the Boreal Shield Ecozone, Canada's largest ecozone. This ecozone stretches in a broad, u-shape pattern from northeastern Alberta to the eastern tip of Newfoundland covering an area of more than 1.8 million km^2, or approximately 20% of Canada's land mass and 10% of its fresh water (Environment Canada 2005). The Boreal Shield Ecozone in Newfoundland and Labrador encompasses the island of Newfoundland and southeastern Labrador, where it is primarily coastal extending north to Hamilton Inlet and the Lake Melville area. A massive rolling plain of ancient bedrock blanketed with gravel, sand and other glacial deposits, its topography is comprised of broadly rolling uplands that form poorly drained depressions covered by lakes, ponds and wetlands. The climate of the Boreal Shield Ecozone is generally continental, with long, cold winters, short, warm summers and abundant precipitation. Although the moderating effect of the Atlantic Ocean produces warmer winters and cooler summers for insular Newfoundland, the central region has the most continental climate found on the island. Cool temperatures and a short growing season, along with acidic soils, reduces productivity, although most of the area is forested, primarily coniferous species, intermixed with hardwoods, mixed with bogs and other wetlands. Lichens and shrubs are common on areas of exposed rock (Wilkin 1986).

4.1.2 Ecoregions and Ecodistricts

This Ecozone is further divided into a number of Ecoregions. Ecoregions are smaller land units within Ecozones that have distinctive, recurring patterns of vegetation and soil that are determined and controlled by local climate and geology (Stantec 2010). Ecoregions also differ from each other in their combinations of plant communities, landscapes, geology and other features (Marshall and Schut 1999; Parks and Natural Areas Division 2008). For practical purposes, they are effectively mapped at a scale of 1:750,000 or less. Ecoregions identify areas of the landscape with characteristic regional climate and landform, as expressed in typical vegetation physiognomy and composition, landforms, soils and topography. The Study Area occupies two ecoregions: Central Newfoundland and the Maritime Barrens (Figure 4-1).

Central Newfoundland Forest

> *This maritime-influenced ecoregion covers the north-central part of Newfoundland. The ecoregion is marked by cool summers and short, cold winters. It is the most continental part of the island. This ecoregion is classified as having a maritime mid-boreal ecoclimate. Its forests are dominated by closed, intermediate to low stands of balsam fir and black spruce on steep, moist, upland slopes. Paper birch, aspen, and black spruce are typical of disturbed sites. Drier sites are characterized by woodlands of black spruce, kalmia heath, and lichens. Dwarf, open stands of black spruce and tamarack with ericaceous shrubs are found on raised domed bogs. Where forest growth is poor, exposure to winds and wet, cold soils are the main causes. Where stream erosion has cut deeply, the uplands are rugged and rocky, but elsewhere they present a rolling terrain of low relief. The surface of the uplands is dominated by hummocky to ridged, sandy morainal deposits with slopes that range from 5-30% and are associated predominantly with Humo-Ferric Podzols. (From Agriculture and Agri-Food Canada's National Ecological Framework 2013).*

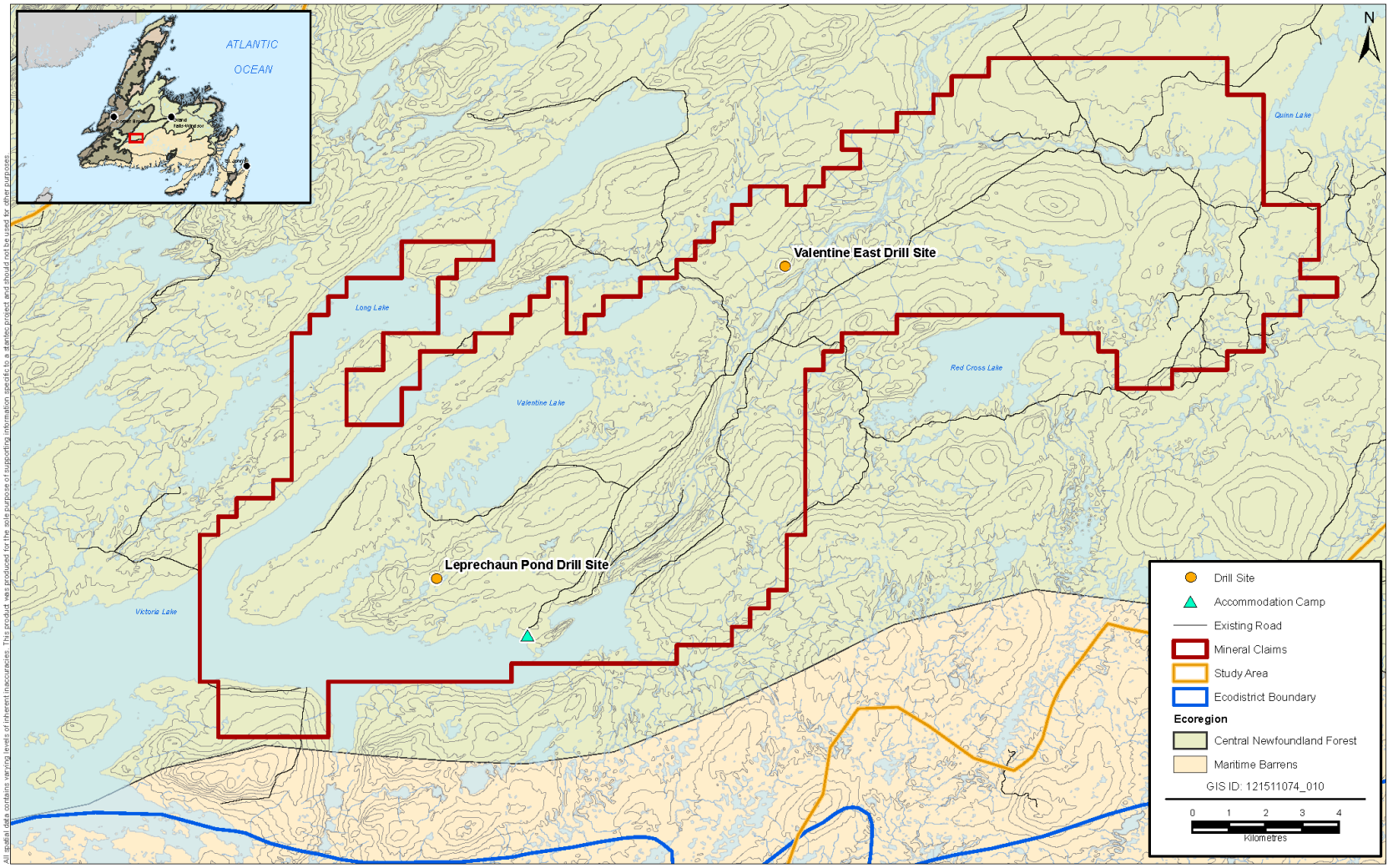


Figure 4-1 Ecoregions of the Marathon Gold Study Area

Maritime Barrens

> *This Atlantic Ocean-influenced boreal ecoregion extends westward across the southern half of the uplands of Newfoundland to the Long Range Mountains. The ecoregion is marked by foggy, cool summers and short; relatively moderate winters along the coast and colder inland. This ecoregion is classified as having an oceanic mid-boreal ecoclimate. It is dominated by nearly pure, closed, intermediate stands of balsam fir. Fires have caused widespread destruction of the forests and the subsequent replacement of fir by stands of sparse black spruce, balsam fir, tamarack, and mixed ericaceous shrubs, along with mosses and lichen. Kalmia and sphagnum moss occur on large tracts of blanket and flat bogs. The ecoregion ranges from sea level to about 250 m asl in elevation and is composed predominantly of a mixture of late Precambrian and Palaeozoic sedimentary rocks and granites. Where stream erosion has cut deeply, the uplands are rugged and rocky, but elsewhere they present a rolling terrain of low relief. The surface of the uplands is dominated by rolling to hummocky; sandy morainal deposits and is associated predominantly with Humo-Ferric Podzolic soils* (*From Agriculture and Agri-Food Canada's National Ecological Framework 2013*).

Ecodistricts are the next level of division in the ELC framework. Ecodistricts are sub-units of the ecoregions, and are characterized by distinctive assemblages of topography, landform, geology, soil, vegetation, water bodies and fauna. This unit is best mapped at a scale of 1:500,000 or less. The Study Area is located almost entirely within the Red Indian Subregion (Ecodistrict ED467) and extends only slightly into the Central Barrens Subregion (Ecodistrict ED472) at its southeastern periphery. No general descriptions of these Ecodistricts have been published (Marshall and Schut 1999).

4.1.3 Ecosections and Ecotypes

The national ELC system described by Marshall and Schut (1999) does not map units smaller than Ecodistricts. However, ELC systems often include smaller units such as Ecosections, with scales generally between 1:50,000 to 1:100,000, and Ecotypes, with approximate scales of 1:10,000 to 1:50,000. At fine spatial scales (1:10,000 to 1:50,000), the system is extended through the use of the ecotype unit, which is defined as a landscape area consisting of typical, recurring associations of vegetation and substrate types.

The most detailed level of classification used in the development of the Project ELC was that of the Ecotype, mapped at scales of 1:30,000. Focusing at this scale was a practical decision based on the scale of mapping and imagery, the local area focus of a project of this size, and cost for value considerations. Ecotypes are generally defined by their relative soil nutrient and soil moisture regimes influenced by local climate, surficial geology and topography. These soil nutrient and moisture regime combinations often dictate the type of vegetation community that can be expected to naturally develop under these conditions. Therefore, an ecotype is generally a group of related ecosystems physically and biologically similar enough that they

have or would have similar vegetation at maturity. Once a site has been classified, site quality can be described in terms of the ecological drivers associated with each ecotype.

To determine ecotypes, homogeneous vegetation (e.g., upland, lowland, aquatic) polygons are classified based on stable features such as substrate depth, soil texture and landform. These features are considered ecological drivers that influence vegetation community structure and function. Once they have been identified, the polygon boundaries are delineated to reflect current vegetation character of the area. The process is achieved through a combination of expert knowledge of plant communities and substrates, ground-based validation of these factors and remotely sensed data.

It is important to recognize that ecotypes or vegetation associations are not always clearly defined entities with abrupt boundaries, and that a given plant species may well inhabit two or more different such communities. Ecotypes and/or vegetation associations are typically dependent on or affected by a variety of factors; including geographic location, elevation, precipitation, microclimates, orientation of slopes, soil types and successional considerations. Therefore, it would not be uncommon to find a particular plant or grouping of plants growing outside what would be thought of as its customary habitat if some of the above factors are advantageous to that growth.

4.2 Wildlife and Wildlife Habitat

In this report, wildlife is defined as mammals, avifauna (birds) and amphibians. Fieldwork for wildlife and wildlife habitat was completed in the Study Area in conjunction with the ELC, to inform future habitat suitability modelling and document occurrences of some species groups, while for other species groups a literature review (including review of previous studies) and habitat ratings were used in assessing their occurrence in the Study Area. The following sections provide incidental observations of wildlife noted through the delivery of ELC field surveys completed in 2014 and guidance for future wildlife species habitat models.

4.2.1 Incidental Wildlife Observations

Incidental observations (observations made without specifically surveying) of wildlife species of interest (e.g., mammals, birds, and previously undocumented, uncommon species occurrences) are useful to document important wildlife features (e.g., dens, raptor nests, roost trees, drumming sites), presence of species of management concern, and to provide additional information on presence and distribution of wildlife outside of formal survey periods and protocols. Systematically recording wildlife observations in this manner is an inexpensive method of collecting information about wildlife populations associated with an area or habitat type.

4.2.2 Wildlife Habitat Assessments (Future Studies)

Habitat models provide information about wildlife habitat that can be used during various components of project planning, including a description of the environmental setting and the assessment of potential environmental effects of the Project.

Wildlife habitat mapping is a relatively recent development for identifying and quantifying areas of importance to wildlife. As defined by RIC (1999), suitability models and maps identify areas which, in their current condition, provide functioning (i.e., suitable) habitat for a particular species. Suitable habitat generally means that the physical attributes (e.g., elevation, slope, aspect and geographical location) and the biological components (e.g., vegetation species composition, structure and age) of an area are likely appropriate for the species in question. The creation of a habitat map identifies areas of suitable habitat for wildlife species, provides a basis to evaluate the effects of development on wildlife habitat, and allows for the potential loss or alteration of these habitats to be placed into a local and regional context. Data derived from ecosystem maps and other biophysical information are used to develop spatial inventories of wildlife habitat that can then be used for land management planning.

Ecosystem mapping, as described herein, represents the stratification of the landscape into similar units based upon ecological features such as terrain, soil, and vegetation communities. It provides information on the type and distribution of ecological units and can be used in creating a broad-scale representation of suitable habitat for selected species and particular seasons of use. In addition, documenting wildlife habitat features or important wildlife habitat at a finer scale is integral in understanding the quality of habitat for any one species. Examples of these fine-scale features are migration routes, mineral licks, nest sites and bear dens. Such features may be essential for the subsistence of a wildlife population.

Field studies to identify wildlife species that inhabit the area of the Marathon Project, including those of species at risk and/or species of conservation concern (SOCC), have been conducted intermittently (2011 to 2014) for the Project. Breeding songbird point count surveys were conducted in June 2011, and dedicated winter wildlife surveys were conducted in March of 2013.

5.0 METHODS

5.1 Pre-Survey Planning

Project planning and initial data compilation included defining the objectives and the purpose of the work; conducting a review of prior vegetation and ecosystem classification studies performed within the Study Area and/or the region; and developing a field sampling plan and appropriate survey intensity. Additional details are provided in Sections 5.2 to 5.6.

5.2 Information Review

Information used in support of the ELC was derived from reviews of both historical and existing data sources, including:

- a review of existing literature information pertaining to the distribution and character of vegetation communities within the region, including peer-reviewed academic journals, research project reports, and government publications;
- recent aerial photographs and topographical maps that could indicate the abundance and distribution of ecotype's in the Study Area; and
- data collected (2011 to 2014) as a part of baseline data collection programs for the Project.

Prior to field surveys, a search of existing information was completed with focus on potential vegetation type's occurring within the Study Area. This was achieved using existing 1:50,000 topographical maps, 1:10,000 aerial photography, and Google Earth Pro Imagery. Additional information was gained through topographic maps, bedrock and surficial geology maps, recent digital aerial photography and land use maps.

In addition, relevant data from provincial and federal government databases, such as the *Species at Risk Act* (*SARA*) Public Registry, Newfoundland and Labrador General Status of Wild Species and the Atlantic Canada Conservation Data Centre (AC CDC), as well as other non-governmental and provincial conservation programs, were also used to determine the potential for wildlife species (flora / fauna) at risk, of conservation concern or those considered uncommon in Newfoundland and Labrador and with potential to occur in / near the Study Area.

The majority of data was collected through on-site surveys, as completed during the 2013-2014 field seasons (Stantec 2014). The field surveys included detailed vegetation surveys, soil surveys and incidental wildlife observations, where possible.

5.3 Field Sampling

5.3.1 Terrain and Soils

Soils were classified within the Study Area as part of the ELC for the Project. Field methodologies followed The Manual for Describing Soils in the Field (Agriculture Canada Expert Committee on Soil Survey 1983) and the Field Manual for Describing Terrestrial Ecosystems (British Columbia Ministry of Environment, Lands and Parks and British Columbia Ministry of Forestry (MoELP-MoF) 1998). Soils were classified according to the Canadian Soil Information System (CanSIS) (Agriculture Canada Expert Committee on Soil Survey 1983), the Canadian System of Soil Classification (Soil Classification Working Group 1998), and the classification of humus forms described by Green et al. (1993). Ground plot descriptions were based on those found in the Field Manual for Describing Terrestrial Ecosystems (MoELP-MoF 1998).

Sites chosen for soil description and classification were based primarily on assessments of landform and vegetation units to provide descriptions of the range of soil and humus conditions within the Study Area. Where necessary, unique sites identified through aerial reconnaissance were also targeted for sampling.

To characterize soils, soil pits were excavated to a minimum depth of approximately 60 cm or to the C-horizon, unless potential restrictions (e.g., bedrock, stony soils) were encountered. Soil profiles were photographed as well as described. All soil and humus form classifications were based on field assessments only.

5.3.2 Vegetation

In 2014, an ELC of the area in the vicinity of the proposed Project was completed by Stantec. This survey collected information to assess the baseline conditions of terrain, soils, vegetation and wildlife habitat.

To support satellite-based land cover classification and development of mapping products, a field program was completed by Stantec on August 25 and 30, 2014. A total of 74 sites were surveyed, with detailed vegetation surveys performed at approximately 30 of those. Between August 2014 and September 2015 (accuracy assessment), 106 sites were visually inspected and as such, a formal plot was not created, but rather, emphasis was placed on characterization of the site and completion of a site description.

Detailed survey plots were sampled to collect information to confirm the ELC mapping and to characterize the vegetation composition of the Study Area, including species composition, and presence of rare plant species or communities. Detailed sample plots were established in representative vegetation types to: characterize site and terrain conditions (moisture and nutrient conditions, slope, aspect and location); describe the overstorey species and characteristics (composition, cover, height, density); obtain information on forest seral stage; and identify and assign cover values to all vascular plant species. Common non-vascular plants

were also recorded at the species or genus taxonomic level. Sampling plot locations were selected to encounter the broadest range of ecotypes within the Study Area. Plot locations were also selected from those vegetation types (e.g., early successional vegetation types - scrub / shrub lands and barren areas) deemed potentially difficult to classify through the remote sensing process alone. Wherever possible, a minimum of five sample plots per ecotype / land cover unit were targeted to support the classification. Ecotypes / land cover units that occupied a large proportion of the Study Area (e.g., wetlands) were sampled at a greater density than ecotype / land cover units with less areal coverage. Detailed plots were placed a minimum of 50 m from the stand edge to minimize edge effects. Overstorey data were collected in a 400 m^2 quadrat, with shrubs and vascular / nonvascular ground cover from within a 100 m^2 quadrat.

Surveys were conducted by two-person field crews comprised of a vegetation ecologist / wildlife biologist and soil specialist. Detailed sampling of dominant vegetation communities was performed at representative sites throughout the Study Area. Data collected in the field provided information on local species distributions and occurrence patterns as required to: (1) characterize ecosystem units; (2) refine the classification of ecotypes; (3) verify ecotype map unit designations; and (4) confirm accuracy of preliminary vegetation mapping. Sampling effort was directed at inspecting as many biotic habitats, plant communities and biophysical features as possible. Consequently, ground-truthing or verification of satellite-based land cover classification was achieved at two levels: ground plots (GIFs) and visual inspections. Each sample plot was located with a global positioning system (GPS). Plot boundaries encompassed a homogeneous vegetation community and varied in shape to ensure homogeneity.

Ground inspections are abbreviated plots that provide basic ecological data and confirm the identified ecosystem unit, as well as provide some data for characterizing ecosystem attributes. GIFs recorded site, soil and vegetation information. A list of minimum data collected for GIF plots is provided in Standard for Terrestrial Ecosystem Mapping in British Columbia (RIC 1998). Notes describing the plot, in context and variability within the polygon, were recorded and photographs were taken at each plot.

Visual inspections are the least detailed type of field data collection. Visual checks involved recording brief point or area characteristics made from the air (helicopter) or ground, and were used to note the basic ecosystem unit, vegetation and other key features. The primary function of visual plots was to aid in the delineation of mapping labels and to confirm the placement of mapping boundaries used in the photo interpretation and mapping phases

5.4 Ecosystem Classification

All naturally vegetated lands in the Study Area were summarized according to the forest types presented in the *Forest Site Classification Manual: A Field Guide to the Damman Forest Types of Newfoundland* (Meades and Moores 1994 Second Edition. This field guide was used to identify mappable ecological (ecosystem) units that are relatively uniform in terms of biophysical characteristics. Ecotypes are functional units that develop under specific environmental

conditions reflecting the local climate, moisture regime, and nutrient regime. Moisture and nutrient regimes form the edatope, upon which ecotypes are 'mapped' (Section 6.2). Each sampled vegetation plot was assigned to an ecotype based on its characteristics. Anthropogenic lands, non-vegetated lands (e.g., lands cleared for exploration activity), water bodies and watercourses were assigned a classification according to their land cover class. Clear cuts, cutlines, and other clearings were considered as vegetated disturbances because natural regeneration was either already occurring or was anticipated to occur on these areas.

ELC classes are described in terms of terrain, soils, moisture and nutrient regime (Appendix C), and plant species richness. Measures of species richness include percent cover and frequency of occurrence by species, dominant species (≥5% cover and occurring in ≥50% of sample plots), and unique species. Dominant species are the typical vegetation species in each ELC type and may be used to help determine the species that should be present following successful reclamation.

Summary data for each ELC ecosystem unit (ecotype) are presented that compare the mean regional vegetation characteristics to the characteristics of vegetation observed during the Project baseline surveys. Data comparison summaries include:

- composition and mean percent cover of vascular and non-vascular plant species;
- forest structure (number of snags, downed logs and mean stand ages);
- site characteristics (soils, moisture, nutrients, slope);
- species richness (total and mean richness of vascular and nonvascular plants); and
- representative site photos.

Mapping of the Study Area for the Project ELC is presented at a scale of 1:30,000.

5.5 Map Platform Selection / Ecosystem Mapping

An effective and efficient process for integrating terrain, soils, vegetation and wildlife information means the practitioners involved in the process agree upon mapping procedures, data handling and reporting. GIS experts occupy a central position in the approach and as Stantec's project experience has shown, their ability to control and manage data and workflow processes is invaluable to ensure consistency and efficiency.

Ecosystem mapping, as defined here, involves the integration of site, soil, terrain and vegetation information to delineate map units that are internally consistent and sufficiently different from adjacent units to enable separation of a landscape continuum into ecologically meaningful parts.

An iterative approach using a variety of data formats including satellite imagery (RapidEye 5m multispectral), aerial ortho-photos, elevation and field survey data served as the foundation for the ELC. This combination of data formats resulted in a field survey program (Section 5.3) designed to support a systematic remote sensing-based mapping program. The combination of

these two separate but interrelated programs provided the best combination for the acquisition of ecological information relevant to the Project and mapping accuracy over the geographic area involved. This approach to the regional satellite-based land cover classification is consistent with typical remote sensing-based vegetation classification practice and is closely aligned with recently completed projects in Newfoundland and Labrador, including Alderon's Kami Mine Site and Nalcor Energy's Labrador-Island Transmission Link.

Satellite imagery data served as the foundation for the selection of survey site locations. Field surveys were designed to provide information on vegetation abundance and community composition, which was used to assess overall plant species distribution and wildlife habitat ratings. Surveyed sites were also used to identify specific locations and the distribution of defined Ecotype units.

Field surveys are a key requirement in the development and validation of a remote sensing-based, unsupervised classification algorithm, which is a procedure or formula for effectively solving a problem using a sequence of instructions. The degree of coverage chosen for the field survey (136 plots in total) was to allow for adequate representation of the land class types found regionally in the Study Area, and the accurate application of their descriptions to the algorithm output. Ultimately, this insures the production of a high quality ELC product. The ground-verified plot locations are presented in Figure 5-1.

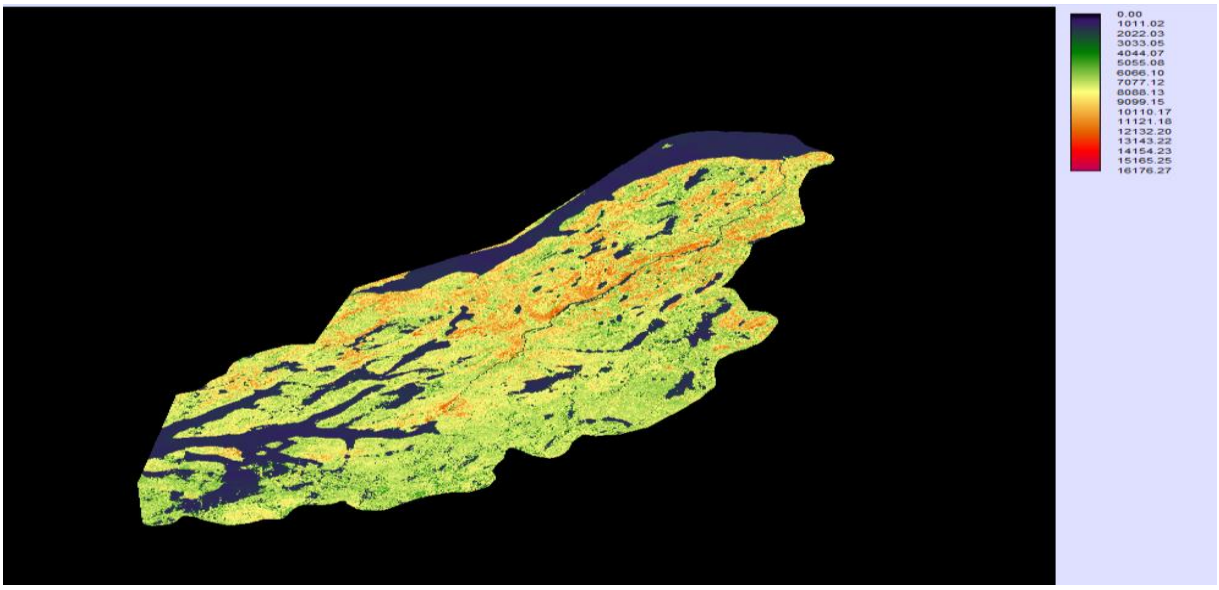


Figure 5-1 Near Infrared Band for Marathon Gold Project Regional Area. Note the reflectance contrast between water (dark blue) and land cover.

A computer-based algorithm was developed using satellite images to delineate the habitats identified in the field program for the entire Study Area. The use of satellite images and remote sensing technologies allowed for a systematic and consistent identification and delineation of large-scale vegetation patterns throughout the geographic extent of the Study Area. Therefore,

the use of remote sensing technologies and satellite images was preferred over manual interpretation due to the large geographic extent of the Study Area. The output of the computer-based algorithm is a raw classification grid that is further processed to identify areas / classes of confusion and then generalized for mapping presentation.

The resultant maps were not designed to provide detailed site-specific information, but rather, an appropriate representation of the regional landscape. A similar approach to ELC mapping has been used for other projects and in support of environmental assessments, including the Alderon Kami Mine Project (Stassinu Stantec 2012) and the Labrador-Island Transmission Link (Stantec 2010).

5.5.1 Satellite-based Land Cover Classification

The focus of the ELC study is to use remote sensing software along with vegetation training areas derived from desktop research and field verification of model land cover classes from across the Study Area, and regionally. The resulting preliminary land cover classification is then verified through the field program, in addition to that of an accuracy (error) assessment process used to confirm the validity of the modelling exercise. The final classification is then used in the environmental assessment to complement other baseline studies (i.e., wildlife habitat modelling) and for regional comparisons required as part of the Project EIS.

Satellite-based ELC programs use a combination of ground-verified areas and remote sensing industry analytical tools to identify and delineate areas of similar ground vegetation cover. Individual satellite images often differ from each other due to the difference in environmental conditions at the time of acquisition (e.g., differences in time of year, time of day, or amount of cloud cover). Because of these differences, each image used in a mapping program requires specific processing and analysis. Additionally, satellite images are rich in information that must be summarized prior to final use.

The Study Area was covered by RapidEye's 5-band, 5 m, multispectral imaging platform. The analysis required 11 separate RapidEye images to cover the entire Study Area. Although RapidEye imagery was used as the primary mapping platform, high-resolution ortho-corrected air photos (captured during the summer of 2012) were also acquired and used to verify and adjust the algorithm for areas of specific interest.

5.5.1.1 Background and Technical Information

Image-based classifications are used to automatically aggregate pixel values within an image into predefined land cover classes of statistically similar spectral reflectance values. Pixels are placed into classes based on their spectral signature / reflectance pattern across all multispectral bands used in the analysis of the image. The available multispectral bands vary depending on the remote sensing platform used to capture the imagery. Classes (ELC ecotypes) are defined differently between a supervised classification, and the unsupervised classification process employed in this study.

A supervised classification relies on user-delineated "training" areas to define example reflectance patterns and spectral characteristics of each ELC ecotype desired in the final output. Training areas are collected with the aid of existing reference data, such as field surveys and regional vector data. The classification algorithm then analyzes the reflectance value for each pixel analyzed across all spectral bands input by the analyst and places it into the class, as defined by the training areas, to which it is most similar.

An unsupervised classification process was used in this ELC. This was supported by an algorithm that looks at each pixel (analyzed across all spectral bands input by the analyst) and places them into clusters / natural collections called spectral classes. These classes are based on similarities in reflectance patterns. This works on the assumption that values belonging to the same class will be similar or close in proximity in the measurement space, and pixels that do not belong together will not. The analyst then compares the spectral classes to reference data and assigns each an appropriate ELC ecotype. This type of classification is preferred when working with a large number of classes, which renders a supervised classification and adequate training impossible.

5.5.1.2 Data Specifications and Sources

Satellite-based multispectral imagery was used for this classification. The imagery was captured by RapidEye's constellation of five Earth observation satellites. This unique "constellation" of satellites allows RapidEye to provide complete coverage of current data over any location in a very short period. Each identical satellite is equipped with a five band, multi-spectral "push broom" imaging platform. This platform collects high-resolution imagery with a pixel resolution of 5 m from an orbit 630 km above the earth. Each satellite provides image data in the Blue, Green, Red, Red Edge and Near Infra- Red portions of the electromagnetic spectrum. All five bands were used during image classification to provide unique information about the land cover.

5.5.1.3 Extent of Satellite Imagery

Eleven images provided by RapidEye's satellite constellation required to cover the Study Area with seamless, multi-spectral imagery. The RapidEye imagery was captured between July and August, 2012. Images were selected on the basis of a qualitative assessment (i.e., they were acquired during snow-free conditions during a period in the growing season where vegetation differentiation could be maximized and the extent of cloud cover reduced (less than 10%)).

5.5.1.4 Image Processing

Specialized imaging processing techniques are required to convert the apparent surface reflectance before analysis can take place. Each of the 11 scenes required a considerable amount of pre-processing before any classifications were run. Each scene's spectral bands (five in total) were imported and combined into one, multi-band image file. The 11 scenes were then mosaiced into one seamless image of the entire Study Area. A "Normalized Difference Vegetation Index" analysis was performed to assist technicians and vegetation specialists in the

classification process. The following five channels were used to build the foundation of the classification:

- RapidEye Multi-Spectral Band 1 (Blue);
- RapidEye Multi-Spectral Band 2 (Green);
- RapidEye Multi-Spectral Band 3 (Red);
- RapidEye Multi-Spectral Band 4 (Red Edge); and
- RapidEye Multi-Spectral Band 5 (Near-Infrared).

5.5.1.5 Preliminary Image Classification

To complete the image classification, unsupervised classification techniques were used. This involved running an iterative self-organizing (ISOCLUST) classifier in Idrisi GIS on all five bands. With ISOCLUST, the user simply identifies which bands Idrisi should use to create the classifications, and into how many classes to categorize the land cover features. The ISOCLUST algorithm first determines how many classes can be extracted by using the spectral signature within the five bands and then statistically classifies each pixel in the image based on the probability that it belong to one of the classes. The classification is known as an unsupervised classification because it does not indicate which land cover/ land use type is represented by each class. The classification simply indicates the classes that are statistically different from one another. Decisions were then made concerning which land cover types each category falls within. Ground-truthing what was seen in the digital image with that actually present at the time the image was recorded makes this task more efficient and more accurate. Field data were used after the fact in order to inform the user as to which class represents which land cover/land use type.

5.5.1.6 Classification of Open Water

Open water was classified using the Near Infrared (NIR) band only. NIR wavelengths (0.76 to 0.88 µm) are largely absorbed by water and thus there is very little reflectance signature for the satellite to pick up. The results are "dark" areas of open water that appear in heavy contrast to the surrounding land cover, which reflects NIR wavelengths (see Figure 5-1).

A threshold reflectance value was determined in review of the histogram for open water areas in the NIR band. Pixels below this threshold were isolated and classified as open water. Pixels with a reflectance value above the threshold were left to be analyzed as part of the preliminary, unsupervised classification and ultimately assigned a land cover type description (see figure 5-2).

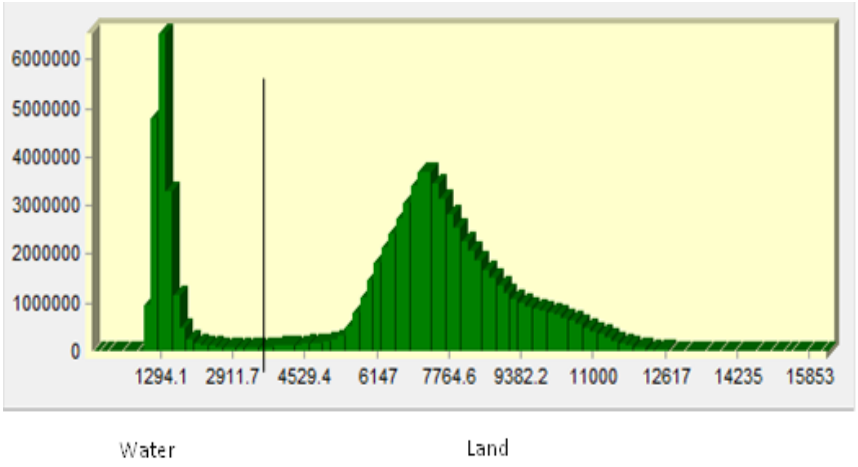


Figure 5-2 Near Infrared Band Histogram – Water vs. Land Post-Processing / Accuracy Assessment (x-axis is the range of the available digital numbers and y-axis is the number of pixels in the image having a given digital number)

As with all classification, some degree of post-processing is required. Post-processing is required to correct errors / confusions in the output of the classification such that the classification was reviewed and any error / confusion isolated and corrected.

The majority of the post-processing involved the visual identification of errors / confusions, masking and then re-classing them manually. A common example of this occurred when the algorithm mistakenly grouped the highly reflective understory of Exposed Earth / Anthropogenic class with Wetlands. These two classes were spectrally similar enough that it was common for areas of Exposed Earth / Anthropogenic to be misclassified as Wetlands, particularly when tree cover associated with the wetland was sparse and the ground vegetation dominated by graminoids, a predominant factor in its spectral signature. These types of issues were identified and corrected manually.

5.5.1.7 Final Classification

To complete the classification, grids (land cover types and open water) were combined into one continuous, raster dataset. This ensured there were no "No-Data" areas and gaps in the data.

5.6 Taxonomic Nomenclature and Ranking

Taxonomical nomenclature for all plants collected during in-field surveys in 2014 subscribes to that identified by the AC CDC (2010). The plants listed in this report are generally referred to

using their accepted common names but their scientific name is also provided the first time they are referenced in the text. Some plants have no common names, in which case only the scientific name is used. Where there is a list of several species in the same genus, this report follows the commonly used procedure of using the genus name first, and only the initial for that genus in the rest of the text (e.g., "*Carex lasiocarpa, C. livida,* and *C. exillis*").

All species of vascular plant encountered during the surveys were identified and their population status in Newfoundland and Labrador were determined through a review of the species rankings provided by NLDEC (NLDEC 2010), AC CDC (AC CDC 2010), Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2010) and those listed under SARA and the Newfoundland and Labrador *Endangered Species Act* (NL ESA). Although not a focused objective of the ELC, the identification of potentially rare plant species observed through detailed vegetation surveys at ground-truthing locations was recorded during field surveys.

5.7 ArcGIS

ArcGIS software was used to manage all spatial data collected for the Project ELC. All data were stored in personal geodatabase format in accordance with the established Project information management standards. Data were stored in a Geographic NAD 83 system, while mapping was created using UTM NAD 83. Sampling location databases, ELC polygons, and associated base map information and imagery were all managed in ArcGIS. ArcGIS was also used for all data analysis and cartographic output.

5.8 Quality Assurance / Quality Control Procedures

To ensure consistent delivery of high quality products and services, Stantec has developed and implemented a Quality Management System (QMS) within its operations. The QMS is registered to ISO 9001:2008 (QMS - Requirements) by QMI Management Systems Registration (CERT-0011312:026332).

A quality assurance / quality control review of the mapping was performed by comparing a number of ground-truthed sampling locations with that of the mapped vegetation types. Accuracy assessments determine the quality of the information derived from remotely sensed data. The assessment assigns a measure of validity to the map product and allows users to understand the reliability with which the mapped vegetation classes capture conditions on the ground. Knowing the accuracy of the map enables potential users to determine the suitability of the map for any particular application (Environmental Systems Research Institute et al. 1994).

Map accuracy was assessed by comparing the mapped vegetation type to the field verified vegetation type at various evaluation points (i.e., training sites). Accuracy was calculated for each individual map class, as well as for all map classes combined.

5.9 Incidental Wildlife Observations

Incidental observations were recorded throughout the Study Area. Incidental observations of wildlife and wildlife sign detected outside of standardized survey protocols were recorded. Surveyors recorded evidence of direct and indirect wildlife use, including direct (visual) observations and vocalizations (auditory), as well as indirect (sign) tracks, game trails, scat, feeding activities (e.g., browsed or grazed vegetation), mineral licks, residences [e.g., upland bird nests, nest cavities woodpecker holes and burrows), feathers, skeletal remains or kill sites. Use of forest types and special habitat features by wildlife was deduced from an analysis of habitat features, and observations and evidence of use noted at the time of ELC survey.

Incidental wildlife observations were recorded throughout the survey by recording the UTM coordinates a description of the observation (e.g., species, sex, and number) and where possible, the habitat in which the observation occurred.

6.0 RESULTS

6.1 Overview of Study Area

6.1.1 General Description of Terrain Units

The types of terrain units observed in the Study Area are described below. Terrain units were identified on the basis of the parent materials associated with the formation of the landform and/or the steepness of the representative slopes (e.g., upland soils formed on terrain with noticeable relief that is a result of morainal till material).

Terrain units observed within the Study Area include:

- Morainal (M) - Material deposited directly by glacier ice without modification by any other agent of transportation. Gentle slopes (slopes from 0.5% to 5%) and blankets were the most commonly observed surface expression. Gully erosion was the most common geomorphological process, and morainal materials were typically well to moderately-well drained. During the field program, it was noted that while present over much of the area, the local till is not uniformly distributed over the landscape; rather, it occurs discontinuously in association with local bedrock outcropping. Till thickness generally increases with lower slope positions, as a direct result of the predominantly bedrock controlled landscape.
- Glaciofluvial (GF) - Materials that exhibit clear evidence of being deposited by glacial meltwater streams either directly in front of or in contact with glacier ice. Slopes ranged from 0.5% to 30%, surface expressions range from undulating to hummocky to hummocky ridged. Gullying and meltwater channeling were the most common geomorphological processes and drainage was generally moderate to well.
- Fluvial (F) - Fluvial materials are associated with deposition of sediments along modern stream floodplains, and in some cases are synonymous with alluvial. Typically this parent material contains stratified sediments comprising silt, sand and gravel. Finer textured sediments may also occur when flooding events occur. In general, the topographic form of the fluvial sediments is a floodplain with level to terraced topography. These deposits may also be expressed as low slope gradient fans and were primarily observed in association with the Victoria River and its tributary streams, in addition to that of other riverine systems in the Study Area.
- Colluvium (C) - Materials that have reached their present positions as a result of direct, gravity-induced movement not involving an agent of transportation such as water or ice, although the moving material may have contained water or ice. Colluvium was observed infrequently and typically in association with steep valley sides. Moderate slopes and hummocks were the most frequently mapped surface expressions. Slow mass movement was the most common geomorphological process and drainage was usually rapid to well.
- Organic (O) – Sediments composed largely of organic materials resulting from the accumulation of vegetative matter. They contain at least 30% organic matter by weight-

17% or more organic carbon. Organic accumulations are generally found in topographic depressions, within former shallow pond basins, along the margins of active low-gradient watercourses, and within areas where shallow seepage is forced to the surface. Two major organic deposits, bogs and fens, are found within the Study Area. Bogs are ombrotrophic, wet, poorly drained peatlands occupying level or depressional areas in the landscape. Ombrotrophic is defined as all water being derived from precipitation and not groundwater. Accumulation of slightly to moderately decomposed organic material, mainly Sphagnum mosses, results in these deposits being acidic in nature. In addition, there is generally a stagnant water regime and low nutrient availability. The depth of organics over the underlying mineral contact varies considerably from <50 cm to over 2 m. Fens are peat-covered or peat-filled wetlands characterized by high water tables (i.e., water table is at or near the surface for at least part of the year). As opposed to the stagnant conditions of the bog units, fens have varying degrees of surface or subsurface lateral flow that produce a nutrient-medium to -rich, oxygenated environment (minerotrophic) originating from mineral soils via overland or subsurface flow. Fens develop on accumulations of slightly to moderately decomposed organic material, made up primarily of mosses and sedges.

- Weathered Bedrock (D) – Weathered bedrock has been modified in situ by mechanical and chemical weathering. Weathered bedrock is found as a discontinuous very thin veneer (Dx) overlying gently sloping or undulating bedrock outcrops. It typically contains a high proportion of angular coarse fragments with varying amounts of interstitial silty sand. It is non-cohesive and rapidly to very rapidly drained.
- Rock (R) – A considerable percentage of exposed bedrock outcrops and/or rock covered by a thin mantle (up to 10 cm thick) of unconsolidated or organic materials was also observed throughout the Study Area.
- Anthropogenic (A) - Anthropogenic materials are human-modified sediments or geological materials so modified by human activity that their original physical properties (e.g., structure, cohesion, consolidation) have been drastically altered. Anthropogenic materials were observed in association with historic mining and forest management activities in the area.

In the Study Area, medium-textured, morainal (till) surface materials were the most commonly observed parent material. This material was often of variable thickness, ranging from a few centimetres to >1 m. Other common soil parent material types were organic (bog and fen), colluvium, bedrock, lacustrine and fluvial. In poorly drained soils, the presence of near-surface bedrock and other shallow unconsolidated material contributed substantially to the extent of organic soils. Colluvium, in varying forms was observed infrequently, primarily on steep slopes often in complexes with both till and exposed bedrock. Bedrock, till and colluvium-derived soils were common at mid to high elevations. Lacustrine deposits were found primarily in association with a narrow band of riparian vegetation surrounding Red Indian Lake and Victoria Lake (Reservoir). Fluvial deposits, though infrequent, originated from glaciofluvial sands and silts, and were found along the shoreline of the Victoria River and on small islands associated with this and other medium to large river systems in the region.

6.1.2 General Description of Soil Units

Soils mapping for the Study Area is based primarily on existing information (i.e., CanSIS data). The map polygons described in this report are based on diagnostic properties of the principal soil series after which they have been named (i.e., Red Indian, Silver Mountain, The Topsails). Thus, once assigned a series name, a map polygon is called a soil unit. Although a soil unit is named after a particular soil series, it is not meant to imply that all soils within the boundaries of that particular map unit will conform to the description of a typical profile of that soil series. Instead, the predominant soil series within a specified polygon falls within the range of natural variability determined for that soil series. Other series can occur within that polygon as minor components or inclusions. Soil inspections in the field are classified at the sub-group level according to "The Canadian System of Soil Classification" (Soil Classification Working Group 1998).

Orthic Humo-Ferric and Orthic Ferro-Humic Podzols are the dominant soils in upland areas. Gleyed Podzols (Gleyed Humo-Ferric Podzol) are found where drainage is imperfect. Soils are dominantly acidic throughout (pH 4 to 5 or less), but values can be higher (pH 5 to 6) where seepage inputs (subsurface flow or groundwater flow, or both, in addition to precipitation) are the main water sources. Orthic Gleysols, Orthic Regosols, Gleyed Regosols and Organic soils (Mesisols) predominate in poorly drained areas (fens and bogs). Drainage is restricted in these areas due to bedrock (or basal till) and a lack of slope. Folisols (upland organic soils) can also be found where bedrock is close to the surface. Humus forms are dominated by hemimors.

Drainage associated with bedrock and moraine derived soils range from poor to well, depending on slope position and soil depth. In upland areas drainage is mainly well to moderately-well; however, in some cases, in particular Humo-Ferric and Ferro-Humic Podzols associated with the Red Indian and The Topsails soil units, drainage may be slowed by cemented (Ortstein) variants of these soils and/or sub-surface horizons of massive structure. Where this occurs, drainage may be moderately well, imperfect, or even poor. Colluvium derived soils are generally associated with steeper slopes where drainage is mainly well to imperfect, depending on slope position and seepage inputs. Alternatively, at lower slope positions drainage may be moderately well to imperfect due to seepage inputs from above. Drainage on level areas is often bedrock-controlled, with only minor elevation differences between poorly drained wetlands and associated uplands. Drainage associated with fluvial deposits is mainly rapid to well, but can also be moderately-well to imperfect at lower slope positions.

Within the Study Area, soil map units were mostly complexes of organic and mineral soils, reflecting the varied topography of the underlying till. The most abundant mineral soil unit on well to imperfectly drained soils is that of the Red Indian soil unit (described below). Gleysols, which are poorly drained transitional soils between organic and upland soils, are less extensive and include mainly Silver Mountain soil units. Soils developed on fen peat parent materials occupy the Deadwolf Pond and Ebbegunbaeg soil units. Anthropogenic or disturbed land is

primarily associated with historic mineral exploration and forest management activities in the area. Water occupies a substantial portion of the Study Area.

Red Indian and Gleyed Red Indian Soil Units

As a group, the Red Indian soils are primarily Orthic Humo-Ferric Podzol developed on moist, moderately-coarse textured, morainal (till) parent materials. They occur in upland positions on slopes of 10% to 15%.

Red Indian soils are typically labelled with an xt modifier that indicates the presence of moraine within 1 m of the surface (lithic contact 50 to 100 cm from the mineral surface). Gleyed Red Indian soils have a subhygric moisture regime with a steady supply of water. There is distinctive mottling within the soil profile, and gley colours are typically observed below 50 cm.

Based on site inspection and existing mapping (Woodrow 1988), subgroup composition for the Red Indian soil units include:

- Orthic Humo-Ferric Podzols;
- Gleyed Humo-Ferric Podzols;
- Orthic Gleysols;
- Humic Gleysols and
- Other inclusions.

Mapped soil units encompassing the Study Area were primarily comprised of the Orthic Gleysols subgroup, developed on predominantly medium to moderately fine textured (i.e., sandy clay loam), wet morainal deposits. These soils typically occur in depressional and lower slope positions, on less than 2.5% of slopes, and with poor drainage.

Silver Mountain Soil Unit

Silver Mountain soils are mapped (Woodrow 1988) primarily in the southern portion of the Study Area. The Silver Mountain soil unit is characterized by Gleyed Humo-Ferric Podzol soils occurring on morainal veneer deposits overlying hummocky to rolling bedrock. They occur in upland positions on slopes of 16% to 30%. Large areas of rock outcroppings are associated with these soils. As such, Silver Mountain is commonly very shallow and has a subhygric moisture regime with a steady supply of water. There is distinctive mottling within the soil profile and gley colours (Gleyed Red Indian) are typically observed below 50 cm. Silver Mountain soils are typically labelled with an xt modifier that indicates the presence of moraine within 1 m of the surface (lithic contact 50 to 100 cm from the mineral surface).

Based on site inspections, the subgroup composition for Silver Mountain soil units include:

- Gleyed Humo-Ferric Podzols;
- Ortstein Humo-Ferric Podzols;

- Orthic Humo-Ferric Podzols (lithic phase); and
- Other inclusions.

The Topsails Soil Unit

The Topsails soils are mapped (Woodrow 1988) in the north central portion of the Study Area. The Topsails soil unit is characterized by Gleyed Ortstein Ferro-Humic Podzol (lithic phase) soils developed on washed, partially sorted, coarse textured morainal till. They occur in upland positions on undulating (slopes 2% to 5%) to hummocky moraine (slopes 6% to 9%). Drainage is imperfect and the soils are exceedingly stony and slightly rocky.

Based on existing mapping of the Study Area, the subgroup composition for The Topsails soil unit include:

- Gleyed Ortstein Ferro-Humic Podzol (lithic phase);
- Gleyed Regosols; and
- Rock Outcrops.

Organic Soil Units

Deadwolf Pond soils typically occur as subdominants within the Red Indian and Gander soils. These organic soils are developed on domed bogs, several of which occur in the Study Area. The mineral soils in depressions between the domes may contain Red Indian soils. When Deadwolf Pond soils occur as subdominant they are mapped as sloping and domed bogs. Deadwolf Pond soils are mainly Terric Fibrisols. The mainly fibric peat material is derived mostly from sphagnum moss, and is underlain by unconsolidated material or bedrock.

Ebbegunbaeg soil units are characterized by organic soils developed in fens, with peat depths ranging from 40 to more than 160 cm. These soils developed on sloping bogs are classified mainly as Typic Mesisols. They consist of moderately decomposed sphagnum peat underlain by moderately coarse textured glacial till or bedrock.

These soils developed on sloping bogs and are classified mainly as Typic Mesisols. They consist of moderately decomposed sphagnum peat underlain by compacted till deposits. The Ebbegunbaeg soil units occur in the areas of very poorly drained, low-lying depressions between mineral soils, knobs or hummocks with slopes that are <0.5%, grading up to 2.5% at the upper margins.

Based on site inspections, subgroup composition for the Ebbegunbaeg soil units includes:

- Terric Mesisols (40 to 100 cm, average 70 cm)
- Typic Mesisols (101 to 200 cm, average 140 cm)
- Terric Humisols (40 to 100 cm, average 70 cm)
- Typic Humisols (40 to 100 cm, average 70 cm)

The mineral material found beneath the peat ranges from clay to sand, but is predominantly of moderately fine texture (i.e., clay loam, sandy clay loam and silty clay loam).

Peat depths range from 25 cm to greater than 110 cm. Common soil types include: Terric Fibrisols and Mesisols. These sites tolerate variable hydrology.

6.1.3 General Description of Dominant Vegetation

The Study Area is within the Central Newfoundland Ecoregion, as identified by the *Forest Site Classification Manual: A Field Guide to the Damman Forest Types of Newfoundland* (Meades and Moores 1994, Second Edition). The main characteristics of this ecoregion are a gently rolling to hilly topography with thin discontinuous till veneers, underlain by acidic bedrock. Vegetation within this ecoregion reflects its continental climate, which are attributed the highest summer and lowest winter temperatures of insular Newfoundland (Meades and Moores 1994).

Like the majority of insular Newfoundland, softwood forests predominate throughout the ecoregion. Balsam fir forests with dense carpets of stairstep moss *(Hylocomium splendens*) occupy the zonal or reference site for the region (Meades and Moores 1994), occurring in those areas not having been disturbed by fire in the last century (South 1983). Black spruce - sheep laurel (*Kalmia angustifolia*) and balsam fir - Schreber's feathermoss (*Pleurozium schreberi)* forest types are also very common. Forest fires have played a more important role in the Central Newfoundland Ecoregion compared to others and have resulted in much of the balsam fir-dominated forest types being converted to black spruce stands, and some of the richer types to hardwood forests dominated by paper birch (*Betula papyrifera*) and trembling aspen. Aspen has been noted as being more pronounced in this ecoregion than others and yellow birch (*Betula alleghaniensis*) is absent from the ecoregion because of the short frost-free period (Meades and Moores 1994). Alders (*Alnus* spp.) are common on wet seepage slopes and represent a siliviculural problem following tree harvesting initiatives.

Like much of insular Newfoundland, peatlands are a prominent feature on the landscape with both fen and bog classes being represented. Ombrogenous and soligenous peatlands are common; the latter being medsotrophic or oligotrophic. Eutrophic fens are rare.

Edaphic vegetation types are found in association with exposed hills where shallow and nutrient poor soils result in shrub-dominated communities largely comprised of stunted coniferous trees and ericaceous plants. In particular, dwarf shrub heath-dominated communities dominated by sheep laurel have been reported to occur with regularity throughout the region, occupying local areas with nutrient poor parent materials (South 1983).

The Red Indian Lake Subregion encompasses the southwest end of the Study Area. The rolling to undulating topography of this subregion is similar to much of the rest of the Central Newfoundland Ecoregion, but it is described as colder and receiving more precipitation (Meades and Moores 1994). Balsam fir forest types predominate throughout this subregion, and unlike much of the ecoregion, paper birch is more common than black spruce (Meades and

Moores 1994). The Rubus-Balsam Fir and Dryopteris-Lycopodium- Balsam Fir Damman forest types have been noted to dominate the subregion, both of which regularly contain occurrences of paper birch. The forests of the subregion are amongst the most productive forest types in central Newfoundland but succession to alder thickets following cutting and fire is described as an important silivicultural issue (Meades and Moores 1994).

6.1.4 Ecosystem Units and Ecotypes

A total of 12 ecosystem units were mapped within the Study Area (Table 6.1). Of these, nine are vegetated and three are sparsely vegetated, naturally non-vegetated and/or anthropogenic ecosystem units. The Study Area covers a total area of 1,831 km^2 (Table 6.1), approximately 56% of which is occupied by upland environments, 22% by lowlands (i.e., wetlands), and 22% by open water. Upland areas are dominated by softwood forests (i.e., the Balsam Fir Forest, Black Spruce Forest Ecotypes), Alder Thickets and Mixedwood Forests; whereas lowland sites are comprised of open peatlands (i.e., Shrub / Graminoid Fen and Shrub Bog Ecotypes) and treed wetlands (i.e., Wet Coniferous Forest Ecotype). The relative frequency of ecotypes or ecosystem units found in the Study Area is presented in Figure 6-1.

Table 6.1 Ecosystem Units and Ecotypes within the Study Area

Ecosystem Units	Ecotypes	Description	Map Unit	Area (km^2) in Study Area	Percentage of Study Area
Balsam Fir Forest	Balsam Fir Forest	Dry to moist and sometimes wet conifer dominated forests	BF	126.9	6.9
Black Spruce Forest	Black Spruce Forest	Dry to moist and sometimes wet conifer dominated forests	BS	233.1	12.7
Kalmia- Black Spruce Woodland	Kalmia-Black Spruce Forest	Dry to moist and sometimes wet stunted tree and shrub/heath dominated communities	KB	208.8	11.4
	Kalmia Heath		KH		
Mixedwood Forest	Mixedwood Forest	Mesic to moist forests with high hardwood component	MF	179.3	9.8
Regenerating Forest	Regenerating Forest	Forests regenerating as a result of harvesting, fire, windthrow, etc.	RF	139.5	7.6
Alder Thicket	Alder Thicket	Alder-dominated communities on moist seepage slopes and riparian areas	AT	97.4	5.3
Riparian Thicket	Riparian Thicket	Shrub thickets located in transitional areas and subject to periodic flooding	RT	15.1	0.8
Wet Coniferous Forest	Wet Coniferous Forest	Very moist to wet conifer forests	WC	130.7	7.1
Open Wetlands	Shrub /	Very moist to wet shrub/herb	SF	280.3	15.3

Ecosystem Units	Ecotypes	Description	Map Unit	Area (km^2) in Study Area	Percentage of Study Area
	Graminoid Fen	dominated peatlands			
	Shrub Bog		SB		
Open Water	Open Water	Waterbodies (lakes, ponds, rivers and streams)	OW	408.5	22.3
Exposed Sand / Gravel Shoreline	Exposed Sand / Gravel Shoreline	Sparsely vegetated and/or un-vegetated shorelines	ES	2.8	0.2
Anthropogenic	Anthropogenic	Areas currently or historically subject to intense levels of human disturbance and use (does not include areas regenerating from forest management)	ANTH	8.2	0.5
Total				1,830.6	100.0

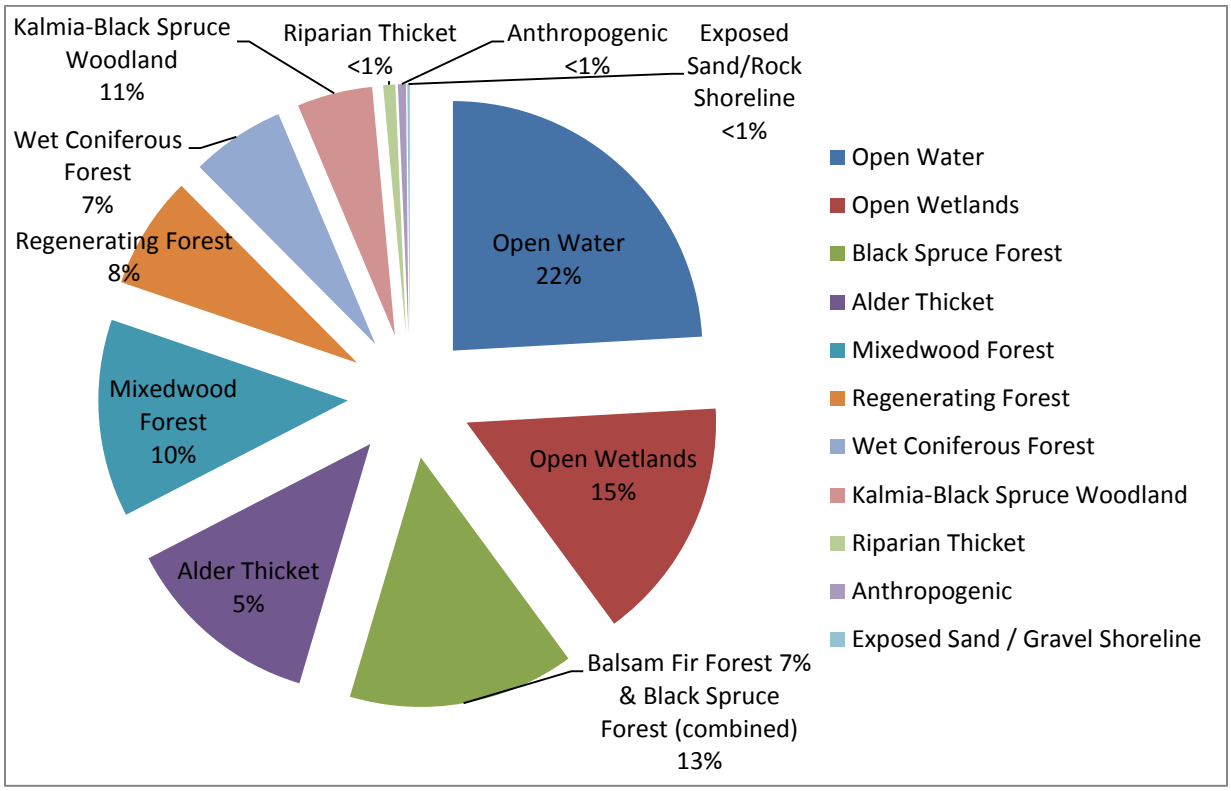


Figure 6-1 Relative Frequency of Ecotypes and Ecosystem Units Found in the Study Area

Fourteen ecotypes have been identified within the mapped ecosystem units (Table 6.1). Whereas most mapped ecosystem units are direct correlates with ecotypes, multiple ecotypes have been identified for Kalmia-Black Spruce Woodland and Open Wetlands units based on field data collected within the 136 field plots (ground and visual). Riparian Transition, Anthropogenic, and Exposed Sand / Gravel Shoreline ecotypes and ecosystem units represent <1% of the Study Area and may therefore be considered relatively rare within the region. Mapping of the distribution of each ecosystem unit within the Study Area is available in Appendix A; detailed descriptions of each of the ecotypes is provided in Section 6.2.

Vegetated upland ecosystems within the Study Area are represented by both forested and shrub-dominated communities. Upland ecotypes that are characterized by a well-established overstory tree canopy include the Balsam Fir Forest, Black Spruce Forest, and Mixedwood Forest ecotypes, which together account for over 29% of the Study Area. Upland forested ecosystem units are generally characterized by mesic to subhygric moisture regimes with well to imperfectly drained soils, typically not saturated with water for extended periods of time. Shrub-dominated communities are represented within the Kalmia-Black Spruce Woodland unit (i.e., Kalmia-Black Spruce Forest and Kalmia Heath), Regenerating Forest, Alder Thicket, and Riparian Thicket

ecotypes and cumulatively comprise approximately 25% of the Study Area. Although shrub-dominated, many of these ecotypes also have a diffuse tree layer. The Kalmia-Black Spruce Forest and Kalmia Heath ecotypes exist as edaphic climax units maintained by exposed, dry and nutrient-poor soil conditions, whereas the Riparian Thicket ecotype reflects the influence of periodic flooding from adjacent waterways. The Regenerating Forest ecotype is a temporal phase that will convert to forest with succession. The Alder Thicket ecotype occurs both as a temporal seral stage following poor tree regeneration after forest management activities and as an edaphic community on moist seepage slopes and in association with riparian areas. Wetlands are represented by the Wet Coniferous Forest, Shrub / Graminoid Fen and Shrub Bog ecotypes. Wetland ecosystem units have soils that are saturated for all or part of the year, characterized by hygric to hydric moisture regimes and poor to very poor drainage. As a result of similarities in their vegetative structure and composition, the Shrub / Graminoid Fen and Shrub Bog ecotypes are jointly represented by the Open Wetland ecosystem unit. Open wetlands comprise a dominant component of the landscape within the Study Area and data indicate that they are of much greater prominence than forested wetlands, which are encompassed by the Wet Coniferous Forest ecotype. Although data on the relative abundance of open fens and bogs is not available, field observations indicate that the Shrub / Graminoid Fen ecotype is more common than Shrub Bog in the vicinity of the Project.

Sparsely vegetated, naturally non-vegetated, and/or anthropogenic ecosystem units include Open Water (i.e., lakes, ponds, rivers), Exposed Sand / Gravel Shoreline and Anthropogenic (Table 6.1). Open water is the most prominent of these ecosystem units or ecotype types, covering 22% of the Study Area. Existing disturbances, including access roads and trails, clearings, exploration drill sites, and recreational properties cover <1% of the Study Area. Similarly, the Exposed Sand / Gravel Shoreline ecotype is a minor component of the Study Area, accounting for much less than 1% of its area.

Although ecotypes and ecosystem units were defined on the basis of site (orientation of the slope, form of the site and topography), soil (drainage, humus form, texture, soil depth and coarse fragment content) and vegetation characteristics, there is considerable natural variability in the landscape with ecotones being common. Plant species abundance, organic matter thickness and soil moisture vary across the landscape as one ecological unit grades into another. As a result, not every site encountered is easily classified into the ecological units described herein.

6.1.5 How to Read and Interpret the Ecosystem Factsheets

The site, soil and vegetation ecological descriptors that describe each ecotype are summarized using a factsheet format that is designed to provide a concise synopsis of the important ecological characteristics of each ecotype. A sufficient number of sample plots (minimum three, where possible) were targeted within these ecosystem units (ecotypes) to capture enough variation to be described for the Study Area as a whole. As such, each fact sheet represents a

composite or average representation of ecotypes determined by averaging all plot data for a particular ecotype. A brief explanation of each fact sheet component is provided below.

- **Ecotype Heading**: Ecotypes are named using the potential dominant one or two "near-climax species" followed by the indicative subordinate species of a different growth form (e.g., tree / shrub / moss) for the plant community or association on which they are based. An example is Black Spruce-Labrador Tea-Feathermoss. The growth forms of different "layers" are separated by a dash (-). When more than one plant species is used to name a vegetation type from the same layer and growth form, a slash (/) is used. An example is Balsam Fir - Black Spruce Forest.
  - The names of the vegetation (plant community) types are provided in three formats:
    - By common names (Balsam Fir / Black Spruce –Feathermoss Forest);
    - By scientific names (*Abies balsamea / Picea mariana -Pleurozium schreberi*); and
    - By ecotype codes (BF).
- **General Ecotype Description**: A general description of the ecotype, including the geographic location, elevational range, slope percentage, aspect, micro topography and slope orientation from sampled plots.
- **Edatopic Grid**: The edatopic grid arranges all ecotypes that occur within an area into a two-way matrix of estimated soil moisture regime (SMR), and soil nutrient regime (SNR) status and communicates information on the plant communities typically associated with combinations of these grid classes, including the proportion of sampling sites within each of these classes. SMR and SNR in the edatopic grids are estimated from site and soil properties such as vegetation community and indicator plant species, as well as site (slope position, site shape and topography), and soil (drainage, humus form, texture, depth and coarse fragment content) characteristics. The grid class occupied by each ecotype represents the approximate distribution of plots belonging to each specific ecotype.
- **Photos**: Representative images (aerial, ground, detailed vegetation cover and soil profile) of the various plant associations / plant communities were selected from photographs taken at the Project site by Stantec Field Team members for most major ecotypes.
- **Summary of Ecological Condition**: A summary table of key environmental information (site and soil characteristics and vegetation structure and composition), as well as other important environmental / physical parameters associated with a site that may assist in the preliminary identification of each described ecotype is provided. An example of a summary table for ccological conditions is provided in Table 6.2.

Table 6.2 Example Summary for Ecological Condition

Ecotype Name	
Site Information	
Ecoregion:	1
Ecotype:	2
General Location:	3

Ecotype Name	
Inventory Numbers	4
Number of Sample Plots (n):	5
Site Characteristics	
Surface Expression	6
Slope Position	7
Slope	8
Aspect	9
Soil Nutrient Regime	10
Soil Moisture Regime	11
Successional Status	12
Structural Stage	13
Soil Characteristics	
Organic Thickness / LFH Thickness (cm)	14
Humus Form	15
Surface (Topsoil) Texture	16
Average Topsoil Thickness (cm)	17
Seepage	18
Drainage	19
Depth to Water Table	20
Depth to Mottles / Gleying	21
Effective Rooting Depth (cm)	22
Coarse Fragment Percent / Type	23
Depth to Bedrock	24
Parent Material	25
Soil Classification (CSSC)	26
Vegetation	
Dominant Tree Species	27
Dominant Shrub Species	28
Dominant Herb Species	29
Dominant Mosses, Liverwort, Lichen Species	30
Dominant Aquatic / Wetland Species	31
Plant Indicator Species	32
Plant Species Richness (Avg. Vascular / Avg. Non-Vascular	33

Ecotype Name	
Species At Risk / Species of Conservation Concern	34

Site Information

1. **Ecoregion:** ecoregion in which the ecotype is located.

2. **Ecotype:** ecotype name.

3. **General Location:** an overview of the geographical location of the ecotype within the Study Area.

4. **Inventory Numbers:** present all plot numbers associated with specific field sampling sites.

5. **Number of Sample Plots (n):** the total number of field sampling sites (detailed, ground and visual) for the ecotype.

Site Characteristics

6. **Surface Expression:** refers to the shape and form of the land surface (e.g., level, inclined, rolling, undulating, hummocky, ridged, steep) associated with the ecotype. Varying terrain will often have gradients of ecological condition.

7. **Slope Position:** presents the position of the site relative to the localized catchment area (i.e., crest, upper slope, middle slope, lower slope, toe, depression, or level). Indirectly relates to several other ecological factors, including wind exposure, depth of unconsolidated surficial materials, degree of soil development, erosion potential and moisture status.

8. **Slope:** approximation of the percent slope associated with the site.

9. **Aspect:** approximation the orientation of the slope associated with the site. Aspect differences can influence site temperatures and soil moisture regime. Northern aspects are generally cooler, while south and southwesterly aspects warmer and drier.

10. **Soil Moisture Regime:** presents the soil moisture regime (a synopsis of site and soil characteristics that effect soil hydrology) range encompassed by the ecotype (Appendix C).

11. **Soil Nutrient Regime:** presents the soil nutrient regime (a synopsis of site, soil and soil humus characteristics that determine soil nutrient availability) range encompassed by the ecotype (Appendix C).

12. **Successional Status:** presents the successional status (i.e., non-vegetated, pioneer seral, young seral, mature seral, overmature seral, young climax, young climatic climax, young edaphic climax, maturing climax, maturing climatic climax, maturing edaphic climax and disclimax) for the ecotype. Generally applies to ecotypes where forest succession is expected to occur.

13. **Structural Stage:** presents the structural development (sparse / bryoid, herb, shrub / herb, pole / sapling, young forest, mature forest or old forest) for the ecotype.

Soil Characteristics

14. **Organic Thickness / LFH Thickness:** is the depth of organic layer overlying the mineral substrate. It is considered an important source of macronutrients and water for plant growth.

15. **Soil Humus Form:** presents the typical soil humus forms for the ecotype forest floor. Sites with high quality litter and a rapid turnover of nutrients are potentially more productive for plant growth than sites with acidic litter.

16. **Surface Texture:** is the proportion of different-sized mineral particles contained within a soil (sand, silt and clay). Soil texture influences plant community development by effecting water- and nutrient-holding capacity, and root penetration.

17. **Average Topsoil Thickness:** is the depth of uppermost layer of soil (Ah, Ae, Ahe, or Ap horizons) and contains the highest concentration of organic matter, microorganisms and nutrients.

18. **Seepage:** groundwater seepage represents an enhanced and stable supply of soil moisture than associated upland sites, often resulting in more productive plant growth.

19. **Drainage:** describes the speed and extent to which water is removed from a mineral soil in relation to inputs and indicates the general availability of moisture. Drainage class codes follow MoELP-MoF (1998): very rapidly drained; rapidly drained; well drained; moderately-well drained; imperfectly drained; poorly drained; and very poorly drained.

20. **Depth to Water Table:** indicates where the groundwater table currently occurs. The occurrence of water at or near the ground surface is indicative of imperfectly to very poorly drained soils.

21. **Depth to Mottles / Gleying:** depth and degree of mottle development indicates how wet a soil may be at varying times during the year even in absence of water at the time of assessment. Where gleying occurs, it indicates that soil is saturated with moisture for most of the year.

22. **Effective Rooting Depth:** the volume of soil that a plant community can exploit, measured as the rooting depth range and average in centimetres. A deep, effective rooting zone can allow plants to exploit a broader range of moisture and nutrient resources.

23. **Coarse Fragment (percent cover):** gives the average in percent for the coarse fragments (gravel to boulders) in a soil. Coarse fragments reduce the volume of sand, silt and clay in the soil, which can reduce water- and nutrient-holding capacity, and effective rooting depth.

24. **Depth to Bedrock:** indicates how much unconsolidated material occurs over bedrock. Sites with less than 25 cm of unconsolidated material over bedrock represent severe limitations to plant growth.

25. **Parent Material:** presents surficial geology deposits associated with the ecotype. Provides a general indication of the physical characteristics and variability of substrates on which vegetation will grow.

26. **Soil Classification:** presents the various soil subgroups (follows the Soil Classification Working Group 1998) associated with the ecotype.

Vegetation Characteristics

27. **Dominant Tree Species:** identifies the general tree composition of the forest overstorey associated with the ecotype.

28. **Dominant Shrub Species:** identifies the dominant vegetation associated with the ecotype. Abundant species are potentially more reliable indicators of site conditions than those with low abundance.

29. **Dominant Herb Species:** identifies the dominant herbaceous vegetation associated with the ecotype. Abundant species are potentially more reliable indicators of site conditions than those with low abundance.

30. **Dominant Mosses, Liverwort, Lichen Species:** identifies the dominant non-vascular vegetation associated with the ecotype. Abundant species are potentially more reliable indicators of site conditions than those with low abundance.

31. **Dominant Aquatic / Wetland Species:** identifies the dominant vegetation associated with the ecotype. Abundant species are potentially more reliable indicators of site conditions than those with low abundance.

32. **Plant Indicator Species:** reflects the interpretive value of some plant species as "good" indicators of a particular site condition.

33. **Plant Species Richness:** the number of species recorded within ground plots with separate average values provided for vascular and non-vascular plants. Only dominant non-vascular plants, to genus or their species epithet, were recorded.

34. **Species at Risk / Species of Conservation Concern:** identifies occurrences of provincially or federally listed species at risk (i.e., designated under the federal SARA or the NL ESA), or species of conservation concern (i.e., those that are not considered species at risk but are ranked SH, S1, or S2 by the AC CDC).

- **Plant Community Diversity:** A table used to depict characteristic plant species, including scientific and common names (grouped into tree, shrub, forb, graminoid and moss / lichen layers), from the complete list of plant species found at the site. Minimum maximum, and average coverage values are provided for each species encountered within the ecotypes. Constancy refers to the frequency of occurrence of a species in the total number of ground plots used for describing the ecotype. These tables are intended as general guides to the identification of the dominant and indicator plant species used to characterize each described ecotype and are provided in Appendix B. An example is provided as Table 6.3.

Table 6.3 Ecotype Plant Species Description

Ecotype						
Scientific Name 1	Common Name 2	Growth Form 3	Minimum Cover (%) 4	Maximum Cover (%) 5	Average Cover (%) 6	Constancy (%) 7

1. **Scientific name:** the scientific binomial of each plant species recorded in the ecotype, as identified by the AC CDC (2010).
2. **Common name:** the common plant name for each species recorded in the ecotype, as identified by the AC CDC (2010).
3. **Growth form:** the following designations have been assigned to plants based on their physiognomy: tree; tall shrub; low shrub; dwarf shrub; forb; graminoid; moss; and lichen. Species may occupy one or more of the tree, tall shrub, low shrub and dwarf shrub designations depending on their height.
4. **Minimum cover (%):** the minimum percent cover for each plant species recorded in the ecotype. Percent cover is estimated as the percentage of the ground surface covered when the crowns are projected vertically. The minimum value recorded to note the presence of a species at a given site was 0.5%.
5. **Maximum cover (%):** the maximum percent cover for each plant species recorded in the ecotype.
6. **Average cover (%):** the average percent cover for each plant species recorded in the ecotype.
7. **Constancy:** the frequency of occurrence within ground plots (i.e., plant was present in x plots/total number of plots in the ecotype).

- **Rarity:** Rare elements under the protection of SARA or the NL ESA (i.e., listed as "Special Concern" in Schedule 1 of SARA; listed in Schedule 2 or 3 of SARA); or ranked as SH, S1, or S2 by the AC CDC have been identified from vascular plant species found within each ecotype.
- **Succession / Disturbance Ecology:** A brief narrative of the successional dynamics of key ecotypes and their environmental requirements. The response to disturbance by plants and the community. The principal natural and anthropogenic disturbances influencing the vegetation in the Study Area have been fire, insects and disease, and human activity.
- **Wildlife and Wildlife Habitat:** Provides a brief overview of area wildlife and their relationship to habitat components comprising each of the identified ecotypes.

Mapping of ecotypes and ecosystem units within the Study Area is provided in Appendix A.

6.2 Ecotypes and Ecosystem Units

The following are descriptions of the regional ecosystem mapping categories and ecotypes that outline the main vegetation and site characteristics found in the Central Newfoundland Forest Ecoregion that includes the Marathon Gold Study Area. These descriptions are based on field data collected during the summer of 2014.

6.2.1 Forested Ecosystem Units

6.2.1.1 CNF Ecotype 01: Balsam Fir Forest

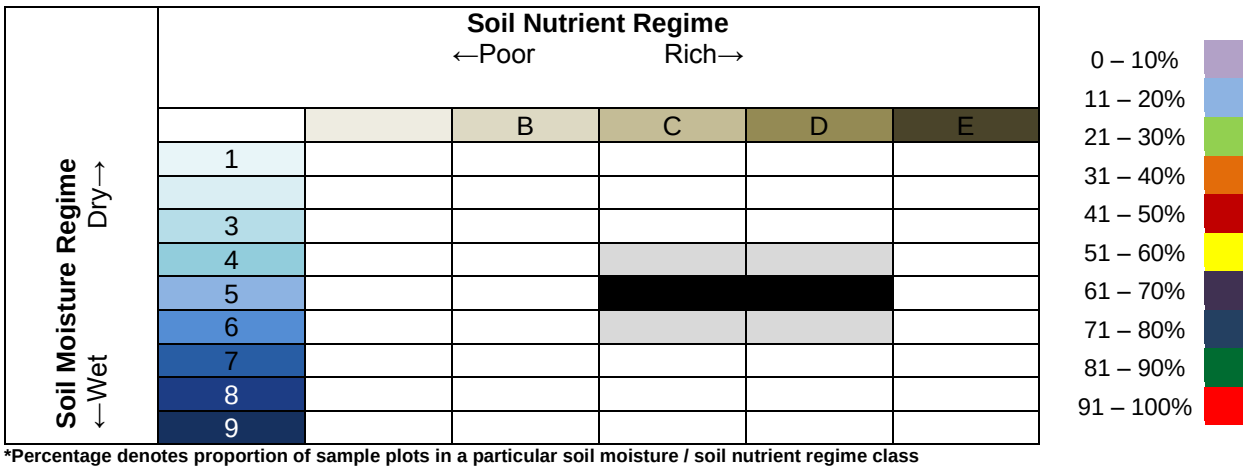
General Site Description

The Balsam Fir Forest (BF) ecotype tends to occur on level ground and in a variety of slope positions and is dominated by balsam fir. Although balsam fir forest types are generally described as being closed-canopy softwood stands that have a high component of balsam fir, other species may often provide an important component of the overstory (Meades and Moores 1994). Black spruce was an important component of the majority of field sites visited and although paper birch typically comprised a minor component of the tree canopy, it was frequently encountered within sites prescribed to this forest type. Additionally, white spruce (*Picea glauca*) was occasionally present in the overstory of the Balsam Fir Forest ecotype. The understory vegetation within this ecotype is typically comprised of minor vascular plant growth and a well-developed moss layer. Shrub cover was characteristically dominated by an understory of balsam fir, lesser amounts of black spruce and scattered occurrences of other regenerating tree species, ericaceous shrubs and deciduous shrubs. Dwarf shrubs such as creeping snowberry (*Gaultheria hispidula*) and twinflower (*Linnaea borealis*) are often common but typically of low abundance along with scattered herbaceous plants, most notably bunchberry (*Cornus canadensis*) and mountain wood-fern (*Dryopteris campyloptera*). A variety of other forbs and graminoids may also be present depending on the local moisture regime, including stiff clubmoss (*Lycopodium annotinum*), one-sided wintergreen (*Orthilia secunda*), dewberry (*Rubus pubescens*), northern oak fern (*Gymnocarpium dryopteris*), threefruit sedge

(*Carex trisperma*) and hoary sedge (*Carex canescens*). This ecotype is characterized by an almost continuous layer of moss on the forest floor, the majority of which is stairstep moss and/or Schreber's feathermoss, with lesser amounts of plume moss (*Ptilium crista-castrensis*), common broom moss (*Dicranum scoparium*), wavy-leaved broom moss (*Dicranum polysetum*), and three-lobed whipwort (*Bazzania trilobata*) being present. Peatmoss (*Sphagnum* spp.) may also be abundant in localized areas with imperfect drainage, but does not typically comprise an important component of this ecotype's understory vegetation.

Field data indicate that the Balsam Fir Forest Ecotype may comprise multiple Damman Forest Types described for the region. Alhough a majority of sites visited during the field program are best characterized as *Hylocomium-Balsam Fir (Fh) #9* or *Pleurozium-Balsam Fir (Fp) #11* forest types. The *Hylocomium-Balsam Fir* forest type, as described by Meades and Moores (1989), is considered the zonal forest type in those areas of the Central Newfoundland Ecoregion not affected by stand-replacing disturbance regimes. It is also one of the more common types in the Study Area, and is often associated with fresh to moist, nutrient-poor to medium soils with morainal (till) parent materials overlying bedrock. Soils of this ecotype are generally medium to coarse textured and often stony.

Soils associated with this ecotype are primarily Orthic Humo-Ferric Podzols, Orthic Humic Podzols and Orthic Humic Regosols derived from morainal (till) or colluvial deposits. Gravel and cobble content is generally low to moderate in surface horizons. Stone and boulder content is low to moderate, but was observed as high in soils derived from colluvial deposits. These are typically fresh, fine to medium textured soils, with soil texture varying greatly by site, but with near-surface, horizons dominated loam, clay loam, and silt loam soil textures. Profiles generally contain a well-developed Ae horizon, and may contain partially or fully cemented B-horizons (Bfc, Bhfc). Partially or fully cemented B-horizons were not encountered although Ortstein horizons that form in acid soils with high iron and organic matter are relatively common throughout the region. Lower slope seepage potential may be high for soils with restricted vertical drainage with occasional distinct mottling noted within the top 50 cm of the mineral soil surface. Gleyed Humo-Ferric Podzols, occupy mid to lower slopes with restricted vertical drainage, with Orthic and Rego Gleysols in depressional areas. Alternatively, in areas of shallow, weathered bedrock, coarser sandy loam textures may also occur. Drainage ranges from moderately well to imperfectly drained, depending on slope position, slope percent, soil depth and the occurrence of vertical drainage restrictions. This forested ecotype is generally nutrient-poor to medium, and soil moisture regime is mesic to subhygric (Figure 6-2). Humus forms are dominated by Hemimors. Organic / LFH layer thicknesses are usually in the 8 to 13 cm range. Topsoil thickness ranges from 21 to 38 cm. Site productivity is typically moderate.



*Percentage denotes proportion of sample plots in a particular soil moisture / soil nutrient regime class

Figure 6-2 Edatopic Grid for Balsam Fir Forest Ecotype

The BF map unit occupies approximately 7% (126.9 km^2) of the Study Area (Table 6.1).

Environmental Information

A summary of the environmental information is provided in Table 6.4.

Table 6.4 Summary of Ecological Condition for Balsam Fir Forest Ecotype

Balsam Fir Forest Ecotype	
Site Information	
Ecoregion	Central Newfoundland
Ecotype	Balsam Fir-Feathermoss
Model Classification	Black Spruce / Balsam Fir Forest
Map Unit	BF
Damman Forest Site Classification Equivalent	*Hylocomium-Balsam Fir (Fh) #9 or Pleurozium-Balsam Fir (Fp) #11*
General Location	Widespread across insular Newfoundland and especially common in the Central Newfoundland Ecoregion and Red Indian Lake Subregion. One of the more common sites in the Study Area, often occupying coarse textured morainal deposits.
Number of Sample Plots (n)	n=11
Inventory Numbers	G1, G13, G17, G23, G24, V7, V10, V14, V16, V20, V33
Total Area (km^2)	126.9
Percentage of Study Area (%)	7
Site Characteristics	
Surface Expression	Gently sloping; Flat (Level)
Slope Position	Range of slope positions - Upper Slope, Mid Slope; Lower

Balsam Fir Forest Ecotype	
	Slope; Level
Slope	Variable
Aspect	North, South, West and East (Variable)
Soil Nutrient Regime	Poor (B) to Medium (C), with the majority of sites classed as medium
Soil Moisture Regime	Submesic (3) to subhygric (5)
Successional Status	Typically as stable forest communities in the maturing seral stage, although extensive areas of burned forest are present where pioneer and young seral communities of the CNF01 ecotype may exist
Structural Stage	Pole Sapling; Young Forest; Mature Forest; Old Forest
Soil Characteristics	
Organic Thickness / LFH Thickness (cm)	8-13
Humus Form	Hemimors
Surface (Topsoil) Texture	Loam; Clay loam; Silt loam
Average Topsoil Thickness (cm)	23
Seepage	Yes
Drainage	Moderately-well to Imperfectly Drained
Depth to Water Table (cm)	>50 cm
Depth to Mottles / Gleying (cm)	>50 cm
Effective Texture	Clay Loam
Effective Rooting Depth (cm)	20-30
Coarse Fragment Percent (%) and Type	<30 gravels and cobbles
Depth to Bedrock (cm)	50-100
Parent Material	Morainal (till); Colluvium
Soil Classification (CSSC):	Orthic Humo-Ferric Podzols; Gleyed Ferro-Humic Podzols; Orthic Gleysols; Rego Gleysols;
Vegetation	
Dominant Tree Species	*Abies balsamea, Picea mariana*
Dominant Shrub Species	*Abies balsamea, Picea mariana*
Dominant Herb Species	*Cornus canadensis, Dryopteris campyloptera*
Dominant Mosses, Liverwort, Lichen Species	*Hylocomium splendens, Pleurozium schreberi*
Dominant Aquatic / Wetland Species	N/A
Plant Indicator Species	-
Plant Species Richness (Avg. Vascular / Avg. Non-Vascular)	15.6 / 7.6
Species At Risk / Species of Conservation	*Scirpus cyperinus*

Balsam Fir Forest Ecotype	
Concern	

Photo 1 Balsam Fir Forest Ecotype – Overview

Photo 2 Balsam Fir Forest Ecotype –Vegetation

Photo 3 Balsam Fir Forest Ecotype –Soil Profile

Rarity

No plants under the protection of SARA or the NL ESA have been identified from surveys of the Balsam Fir Forest ecotype. However, one regionally uncommon graminoid species, cottongrass bulrush (*Scirpus cyperinus*), and ranked as *S2S3* by the AC CDC, was recorded from this ecotype.

Disturbance and Succession Ecology

The natural disturbance regime of Balsam Fir Forest ecotype is characterized by frequent, small and intermediate-scale wind events and infrequent, medium to high-severity fire regimes, with estimated return intervals ranging from 10 to 80 years. Insect epidemics and early growing-season snow press are also important disturbance factors.

Black spruce ultimately achieves dominance after stand-replacing disturbance events lead to the recruitment of pioneering hardwood species. The black spruce and balsam fir component initiates in the latter part of the early seral stage and achieves dominance in late seral stage of stand development.

6.2.1.2 CNF Ecotype 02: Black Spruce Forest

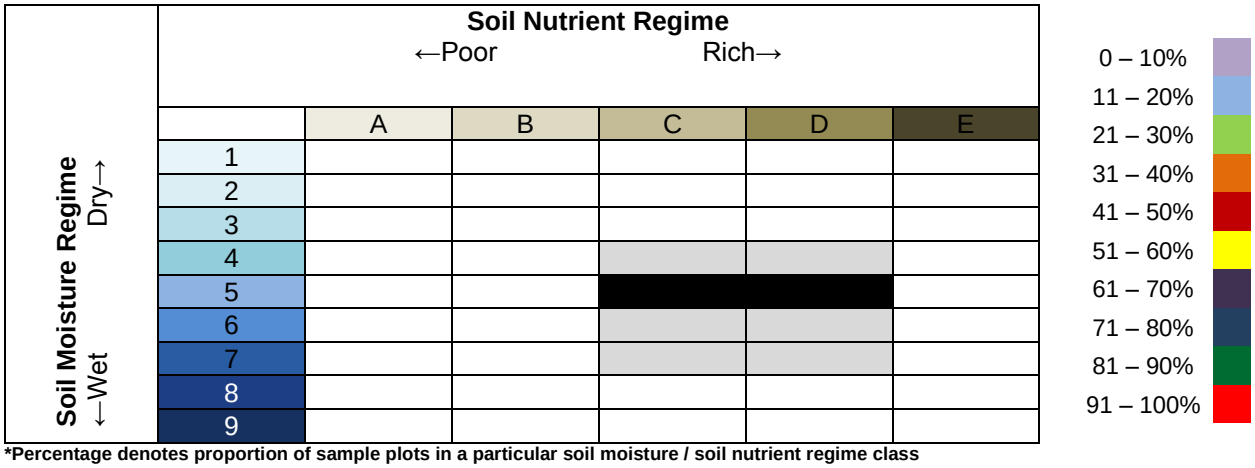
General Site Description

The Black Spruce Forest (BS) ecotype is widespread across insular Newfoundland, often associated with morainal parent materials overlying bedrock. The BS ecotype tends to occur on gently sloping (in a variety of slope positions) to level ground and is mainly associated with fresh to moist, nutrient poor soils.

Black Spruce Forest types are characterized by a moderately dense overstory of softwood cover that contains a high abundance of black spruce (Meades and Moores 1994). Balsam fir and paper birch are also typically present within the overstory, although the later may comprise a relatively minor component of the canopy. This ecotype is typically characterized by a moderately to well-developed shrub layer (e.g., tall shrubs, low shrubs, ground shrubs). Black spruce is typically the most dominant component of the shrub layer, but sheep-laurel is also often abundant and a variety of other shrubs may be common including rhodora (*Rhododendron canadense*), balsam fir and the dwarf shrubs creeping snowberry and trailing arbutus (*Epigaea repens*). A moderate to well-developed understory of herbaceous plants is typically present. Herbaceous species composition varies depending on localized moisture availability but bunchberry is typically a dominant component. Other species that are typically present or may be abundant depending on local moisture conditions include threefruit sedge, dewberry, little prickly sedge (*Carex echinata*), northern oak fern, goldthread (*Coptis trifolia*) and yellow clintonia (*Clintonia borealis*). Stairstep moss and Schreber's feathermoss provide a prominent moss carpet on well-drained sites, but are also abundant at imperfectly drained sites within this ecotype.

The majority of field sites that fall within the Black Spruce Forest ecotype most closely reflect the *Black Spruce-Feathermoss/Dry (SM/D) #15*, *Black Spruce-Feathermoss/Moist (SM/M) #17,* and *Sphagnum-Black Spruce (Ss) #12* Damman forest types (Meades and Moores 1994).

The Black Spruce Forest ecotype encompasses forests that vary considerably in their soil conditions and moisture regimes. As above, soils associated with this ecotype include Orthic Humo-Ferric Podzols, Orthic Humic Podzols and Orthic Humic Regosols derived from morainal (till) or colluvial deposits; however, the prevelance of Gleyed Ferro-Humic Podzols, Orthic Humic Podzols, Orthic Gleysols and Rego Gleysols is a reflection of the varied moisture regimes in which this ecotype may occur. Gravel and cobble content is generally low to moderate in surface horizons. Stone and boulder content is low to moderate, but was observed as high in soils derived from colluvial deposits. Soils are typically somewhat moist and moist to somewhat wet, and fine to medium textured, with soil texture varying by site. Near-surface horizons (topsoils) are dominated by loam, clay loam, and silt loam soil textures. Profiles generally contain a well-developed Ae horizon, with BC and C-horizons often mottled because of restricted drainage and/or poor aeration of subsoil and shallow bedrock. These soils may also contain partially or fully cemented B-horizons (Bfc, Bhfc). Lower slope seepage potential may be high for soils with restricted vertical drainage (cemented hardpans - Ortstein horizons) with occasional distinct mottling noted within the top 50 cm of the mineral soil surface. In areas of shallow, near surface, weathered bedrock, coarser sandy loam textures may also occur. Drainage ranges from moderately well to imperfect depending on slope position, slope percent, soil depth and the occurrence of vertical drainage restrictions. This forested ecotype is generally nutrient-poor to medium, and soil moisture regime is mesic to subhygric (Figure 6-3). Humus forms are dominated by Hemimors. Organic / LFH layer thicknesses are usually in the 8 to 13 cm range. Site productivity is typically moderate.



***Percentage denotes proportion of sample plots in a particular soil moisture / soil nutrient regime class**

Figure 6-3 Edatopic Grid for Black Spruce-Feathermoss Ecotype

The BS map unit occupies approximately 13% (233.1 km^2) of the Study Area (Table 6.1).

Environmental Information

A summary of the environmental information is provided in Table 6.5.

Table 6.5 Summary of Ecological Condition for Black Spruce Forest (BS) Ecotype

Black Spruce Forest Ecotype	
Site Information	
Ecoregion	Central Newfoundland
Ecotype	Black Spruce Forest
Model Classification	Black Spruce / Balsam Fir Forest
Map Unit	BS
Damman Forest Site Classification Equivalent	*Black Spruce-Feathermoss/Dry (SM/D) #15, Black Spruce-Feathermoss/Moist (SM/M) #17, and Sphagnum-Black Spruce (Ss) #12*
General Location	Widespread across insular Newfoundland, and especially common in the Central Newfoundland Ecoregion and Red Indian Lake Subregion. One of the more common sites in the Study Area, often-occupying coarse-textured morainal deposits.
Number of Sample Plots (n)	n=5
Inventory Numbers	G1, V23, V27, V37, V39
Total Area (km^2)	233.1
Percentage of Study Area (%)	13
Site Characteristics	
Surface Expression	Gently sloping; flat
Slope Position	Range of slope positions - Upper Slope, Mid Slope; Lower Slope; Level
Slope	Variable
Aspect	North, South, East, and West (Variable)
Soil Nutrient Regime	Poor (B) to medium (C), with the majority of sites classed as medium
Soil Moisture Regime	Submesic (3) to subhygric (5)
Successional Status	Typically as stable forest communities in the maturing seral stage, although extensive areas of burned forest are present where pioneer and young seral communities of the CNF03 ecotype exist
Structural Stage	Pole Sapling; Young Forest; Mature Forest
Soil Characteristics	
Organic Thickness / LFH Thickness (cm)	13
Humus Form	Hemimors
Surface (Topsoil) Texture	Loam; Clay loam; Silt loam

Black Spruce Forest Ecotype	
Average Topsoil Thickness (cm)	21
Seepage	Yes
Drainage	Moderately-well to Imperfectly Drained
Depth to Water Table (cm)	>50
Depth to Mottles / Gleying (cm)	>50
Effective Texture	Clay Loam
Effective Rooting Depth (cm)	20-30
Coarse Fragment Percent (%) and Type:	<30 gravels and cobbles
Depth to Bedrock (cm) (cm)	50-100
Parent Material	Morainal (till); Colluvium
Soil Classification (CSSC)	Orthic Humo-Ferric Podzols; Gleyed Ferro-Humic Podzols; Orthic Gleysols; Rego Gleysols
Vegetation	
Dominant Tree Species	*Picea mariana*
Dominant Shrub Species	*Picea mariana, Gaultheria hispidula, Kalmia angustifolia*
Dominant Herb Species	*Cornus canadensis, Carex trisperma*
Dominant Mosses, Liverwort, Lichen Species	Hylocomium splendens, Pleurozium schreberi
Dominant Aquatic / Wetland Species	N/A
Plant Indicator Species	-
Plant Species Richness (Avg. Vascular / Avg. Non-Vascular)	35.0 / 7.0
Species At Risk / Species of Conservation Concern	None encountered

Photo 4 Black Spruce Forest Ecotype – Overview

Photo 5 Black Spruce Forest Ecotype – Typical Vegetation

Photo 6 Black Spruce Forest Ecotype – Typical Soil Profile

Rarity

No plants under the protection of SARA or the NL ESA; or ranked as SH, S1, or S2 by the AC CDC have been identified from this ecotype.

Disturbance and Succession Ecology

Nutrient poor to medium soils of the Black Spruce Forest ecotype typically give rise to an edaphic climax community with an overstory dominated by black spruce and balsam fir. The natural disturbance regime is characterized by infrequent, medium to high-severity fire regimes, with even aged forests typically following these stand-replacing disturbances. The estimated return interval ranges from 10 to 80 years. In the absence of stand-level disturbance, it is likely that black spruce will maintain itself as the dominant canopy species.

6.2.1.3 CNF Ecotype 03: Kalmia-Black Spruce Forest

General Site Description

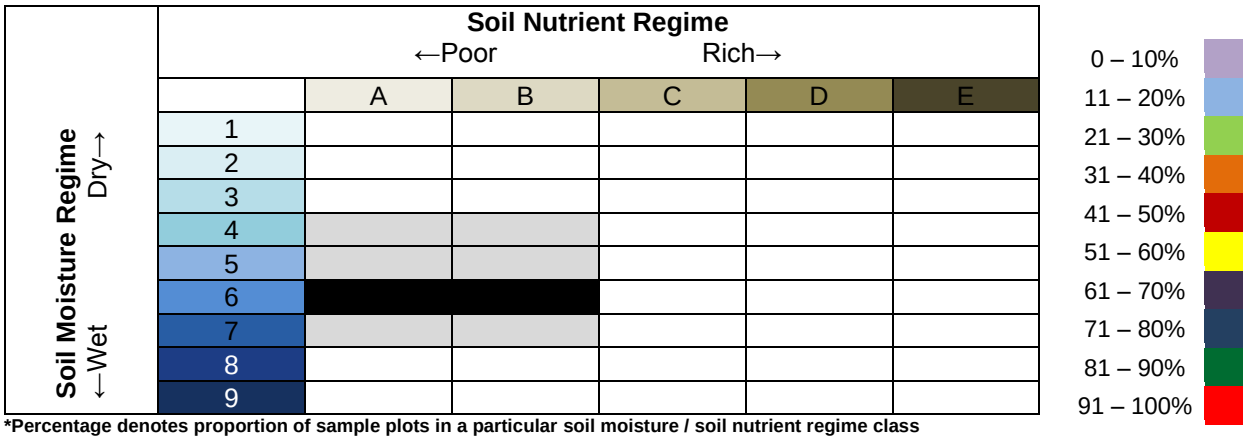
The Kalmia-Black Spruce Forest (KB) ecotype occurs on ridges and upper slope positions where soil depths are typically shallow and/or stony, and exposed bedrock may be present. These sites are typically nutrient poor, dry to moist and exposed to desiccating winds, which also remove protective snow cover during winter. Soil moisture increases with organic accumulation, particularly areas where shallow, near-surface bedrock restricts soil drainage. As such, these sites are typically harsh environments for plant growth. This ecotype typically occurs in association with Kalmia Heath but is differentiated based on a patchy, stunted tree layer with many areas having intermediate characteristics.

Kalmia-Black Spruce Forest ecotype's represent open black spruce forests with an understory dominated by numerous black spruce layers, ericaceous shrubs and lichens and a sparse cover of herbaceous vegetation (Meades and Moores 1994). Balsam fir and tamarack (*Larix laricina*) may also contribute to the tree layer. Scrubby black spruce and sheep-laurel are the dominant components of the shrub layer, with other prominent species including rhodora, late lowbush blueberry (*Vaccinium angustifolium*) and creeping snowberry. Bunchberry is typically the most abundant component of the limited herbaceous layer, with other relatively common species including goldthread and threefruit sedge. Schreber's feathermoss dominates a well-developed moss layer, with peatmoss present in localized depressions with imperfect drainage and wavy-leaved broom moss and three-lobed whipwort scattered throughout the more prevalent upland conditions that characterize the ecotype. Reindeer lichens (*Cladina* spp.) are typically common in patches throughout this ecotype with gray reindeer lichen (*C. rangiferina*) being most abundant, followed by lesser amounts of green reindeer lichen (*C. mitis*), reindeer lichen (*C. arbuscula*), star-tipped reindeer lichen (*C. stellaris*) and various species of cladonia lichen (*Cladonia* spp.).

This ecotype is consistent with the *Kalmia-Black Spruce Forest* group described by Meades and Moores (1989), which occurs in association with nutrient-poor soils over a range of moisture conditions. Although sites are typically dry, proximity of bedrock to the surface results in localized areas of imperfect drainage and associated vegetation. Field sites within this ecotype most typically approximate the *Kalmia-Black Spruce (SK) #20* type described by Meades and Moores (1989). They may also strongly reflect the *Sphagnum-Kalmia-Black Spruce (SKs) #23* and *Cladonia-Kalmia-Black Spruce (SKc) #21* types and may verge towards *Kalmia Heath (K) #33* where tree cover is particularly limited.

Soils associated with this ecotype are typically derived from morainal (till) deposits. Shallow soils and near surface, weathered bedrock are prevalent resulting in moderate to high gravel and cobble content in surface horizons. Stone and boulder content is moderate, increasing in crest and upper slope positions. Moist, medium to coarse-textured soils, with near surface textures dominated by sandy loams. Drainage ranges from rapidly drained upland organic Folisols to moderately well drained Orthic Humo-Ferric and Ferro-Humic Podzols. Fragmental colluvial

deposits supporting upland organic Folisols are also associated with this ecotype. Profiles generally contain interrupted Ae horizons. The ecotype is nutrient-poor, and soil moisture regime is submesic to mesic (Figure 6-4). Humus forms are dominated by Hemimors. Organic / LFH layer thicknesses are usually in the 8-20 cm range. Site productivity is typically low.



***Percentage denotes proportion of sample plots in a particular soil moisture / soil nutrient regime class**

Figure 6-4 Edatopic Grid for Kalmia-Black Spruce Forest Ecotype

The combined KF and KH map unit occupies approximately 11% (208.8 km^2) of the Study Area (Table 6.1).

Environmental Information

A summary of the environmental information is provided in Table 6.64.

Table 6.6 Summary of Ecological Condition for Kalmia-Black Spruce Forest Ecotype

Kalmia-Black Spruce Forest Ecotype	
Site Information	
Ecoregion	Central Newfoundland
Ecotype	Kalmia-Black Spruce Forest
Model Classification	Kalmia-Black Spruce Forest
Map Unit	KB
Damman Forest Site Classification Equivalent	*Kalmia-Black Spruce (SK) #20; Sphagnum-Kalmia-Black Spruce (SKs) #23; and Cladonia-Kalmia-Black Spruce (SKc) #21*
General Location	Ecotype is widespread and floristically consistent across the boreal range, often associated with shallow soils on bedrock ridges and outcrops
Number of Sample Plots (n)	n=5
Inventory Numbers	G3, G11, G28, V4, V31
Total Area (km^2)	208.8
Percentage of Study Area (%)	11

Kalmia-Black Spruce Forest Ecotype	
Site Characteristics	
Surface Expression	Ridge; Gently Sloping
Slope Position	Range of slope positions - Upper Slope, Mid Slope; Lower Slope; Level
Slope	Variable
Aspect	Variable
Soil Nutrient Regime	Poor (B) to Medium (C), with the majority of sites classed as Poor
Soil Moisture Regime	Submesic (4) to Subhygric (6)
Successional Status	Edaphic Climax
Structural Stage	Most stands are mid-successional but this ecotype can be expressed at a variety (early to late) of successional stages.
Soil Characteristics	
Organic Thickness / LFH Thickness (cm)	8-20
Humus Form	Hemimor; Humimor
Surface (Topsoil) Texture	Sandy Loam; Loam
Average Topsoil Thickness (cm)	22
Seepage	Yes
Drainage	Moderately-well to imperfectly drained
Depth to Water Table (cm)	<50
Depth to Mottles / Gleying (cm)	None
Effective Texture	Loam
Effective Rooting Depth (cm)	0-30
Coarse Fragment Percent (%) and Type	<30 gravels and cobbles
Depth to Bedrock (cm)	<100
Parent Material	Morainal (till); Colluvium
Soil Classification (CSSC)	Orthic Humo-Ferric Podzols, Organic Folisols
Vegetation	
Dominant Tree Species	*Picea mariana, Abies balsamea*
Dominant Shrub Species	*Kalmia angustifolia, Picea mariana, Rhododendron canadense, Vaccinium angustifolium*
Dominant Herb Species	*Cornus canadensis, Carex trisperma*
Dominant Mosses, Liverwort, Lichen Species	*Pleurozium schreberi, Cladina rangiferina, Sphagnum spp.*
Dominant Aquatic / Wetland Species	N/A
Plant Indicator Species	-

Kalmia-Black Spruce Forest Ecotype	
Plant Species Richness (Avg. Vascular / Avg. Non-Vascular)	20.7 / 9.3
Species At Risk / Species of Conservation Concern	None encountered

Photo 7 Kalmia-Black Spruce Forest Ecotype – Ground View (mesic site)

Photo 8 Kalmia-Black Spruce Forest Ecotype – Typical Vegetation

Photo 9 Kalmia-Black Spruce Forest Ecotype – Typical Soil Profile

Rarity

No plants under the protection of SARA or the NL ESA; or ranked as SH, S1, or S2 by the AC CDC have been identified from this ecotype.

Disturbance and Succession Ecology

Kalmia-Black Spruce Forest sites are relatively stable and less prone to natural disturbance regimes. Fire frequency is low, and fire severity is also low owing to a lack of flash fuels (woody debris) and sometimes rocky, gravelly nature of the sites. The KF ecotype is largely maintained by exposure, limiting soil conditions sites and early growing-season snow press.

Early seral stages are represented by a dominance of ericaceous shrubs where stand-replacing fires have occurred; and a mix of patchily distributed black spruce, ericaceous and deciduous shrubs where mixed-severity burns have occurred. In stand-replacement burns, black spruce is often slow to re-establish. Ericaceous shrubs, including common Labrador tea (*Rhododendron groenlandicum*), late lowbush blueberry, bog bilberry (*Vaccinium uliginosum*) and partridgeberry (*Vaccinium vitis-idaea*), usually precedes the establishment of canopy-forming trees following stand replacement burns until the site has regained warmer, moister conditions and less exposure to frost. Succession advances very slowly owing to the short growing season, deep lingering snows and low soil temperatures. As these sites are not expected to succeed to later successional stages, it is often considered a type of edaphic climax.

6.2.1.4 CNF Ecotype 04: Kalmia Heath

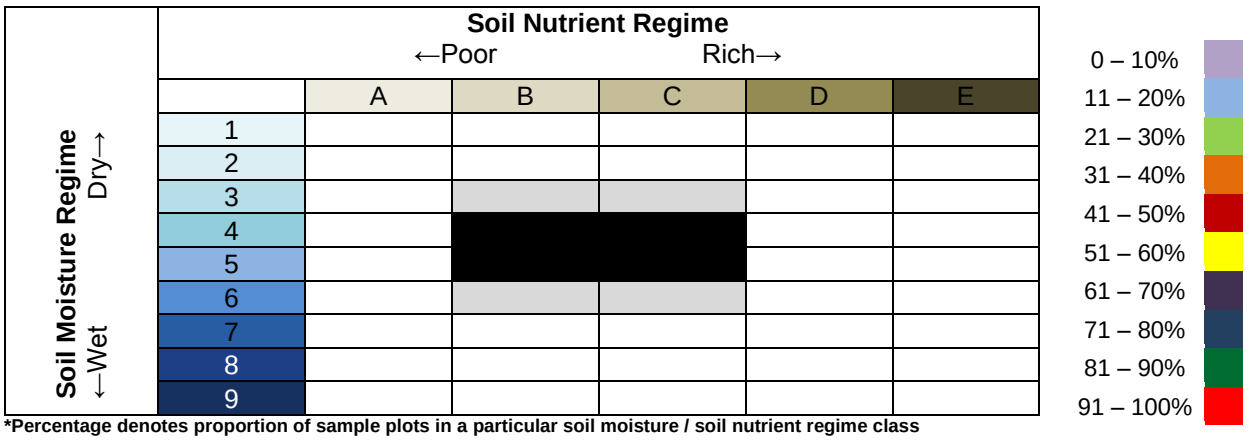
General Site Description

The Kalmia Heath (KH) Ecotype occurs on the crests of hills and ridges where bedrock is exposed or near surface. Drainage was predominantly rapid, with moisture regimes of xeric to submesic. Nutrient regime typically ranged from very poor to poor. The dominant soil subgroup within this ecosystem unit was that of Orthic Regosol, with the majority of soil inspection sites exhibiting almost no soil development. These sites are typically infertile, very dry and exposed to desiccating winds, which also remove protective snow cover during winter. As such, these areas are harsh environments for plants. This ecotype typically occurs in association with the Kalmia-Black Spruce Forest ecotype and has been primarily differentiated by the absence of a tree layer, but many areas have intermediate characteristics. In areas of open heath, climatic exposure, in particular winter snow depth, is an important determining factor in overall vegetation species composition and structure. Soil fertility is typically masked by a deep organic layer characteristic of most heath types (Meades and Moore 1999).

The Kalmia Heath ecotype closely approximates the *Kalmia Heath (K) #33* type described by Meades and Moores (1989) and is characterized by an absence of tree cover and abundant cover of shrubs. This ecotype occurs on the crest of exposed hills and grades into the Kalmia-Black Spruce Forest ecotype, often resembling the *Cladonia-Kalmia-Black Spruce (SKc) #21* Damman type represented therein. The prominent cover of low and ground shrubs that characterize this ecotype is primarily comprised of stunted black spruce along with sheep-laurel and rhodora. Other low-lying shrubs are also commonly present but are typically much less abundant, including late lowbush blueberry, black crowberry (*Empetrum nigrum*), leatherleaf (*Chamaedaphne calyculata*), balsam fir and creeping snowberry. Although of minor abundance, scattered forbs and graminoids are present and reflect both very dry and

imperfectly drained soil conditions as a result of the shallow soils that characterize the ecotype. Although of intermittent occurrence, the following herbaceous species were most commonly encountered within the Kalmia Heath ecotype during field surveys: bunchberry, northern pitcher-plant (*Sarracenia purpurea*), goldthread, cloudberry (*Rubus chamaemorus*), stiff clubmoss, northern starflower (*Trientalis borealis*), deergrass (*Trichophorum caespitosum*), threefruit sedge, few-flowered sedge (*Carex pauciflora*) and few-seeded sedge (*Carex oligosperma*). A moderate cover of both mosses and lichens is present within this ecotype. Moss coverage is primarily comprised of Schreber's feathermoss and other feathermosses in dry areas and by peatmoss in localized depressions. The prominent cover of lichens is provided by gray reindeer lichen, reindeer lichen, and star-tipped reindeer lichen, with lesser amounts of other species (including *Cladonia* spp. and *Cetraria* spp.).

Soils associated with this ecotype are typically derived from morainal (till) deposits. Shallow soils and near-surface, weathered bedrock is prevalent resulting in moderate to high gravel and cobble content in surface horizons. Stone and boulder content is moderate, increasing in crest and upper slope positions. Moist, medium to coarse-textured soils, with near surface textures dominated by sandy loams. Drainage ranges from rapidly drained upland organic Folisols to moderately well drained Orthic Humo-Ferric and Ferro-Humic Podzols. Fragmental colluvial deposits supporting upland organic Folisols are also associated with this ecotype. The ecotype is nutrient-poor, and soil moisture regime is submesic to mesic (Figure 6-5). Organic / LFH layer thicknesses are usually in the 4 to 14 cm range. Site productivity is typically low.



***Percentage denotes proportion of sample plots in a particular soil moisture / soil nutrient regime class**

Figure 6-5 Edatopic Grid for Kalmia Heath Ecotype

The combined KF and KH map unit occupies approximately 11% (208.8 km^2) of the Study Area (Table 6.1).

Environmental Information

A summary of the environmental information is provided in Table 6.7.

Table 6.7 Summary of Ecological Condition for Kalmia Heath Ecotype

Kalmia Heath Ecotype	
Site Information	
Ecoregion	Central Newfoundland Forest
Ecotype	Kalmia Heath
Model Classification	Kalmia-Black Spruce Woodland
Map Unit	KH
Damman Forest Site Classification Equivalent	*Kalmia Heath (K) #33*
General Location	Ecotype is widespread and floristically consistent across the boreal range, often associated with shallow soils on bedrock ridges and outcrops
Number of Sample Plots (n)	n=6
Inventory Numbers	G4, G6, G9, V2, V21, V28
Total Area (km^2)	208.8
Percentage of Study Area (%)	11
Site Characteristics	
Surface Expression	Ridge; Hummock; Undulating; Gently Sloping
Slope Position	Crest; Upper Slope
Slope	Variable
Aspect	Variable
Soil Nutrient Regime	Poor (B) to Medium (C), with the majority of sites classed as Poor
Soil Moisture Regime	Submesic (3) to mesic (4)
Successional Status	Edaphic Climax
Structural Stage	Most stands are mid-successional but this ecotype may be expressed at a variety of successional stages - early to late.
Soil Characteristics	
Organic Thickness / LFH Thickness (cm)	6-14
Humus Form	Hemimors; Humimors
Surface (Topsoil) Texture	Sandy Loam to Loam
Average Topsoil Thickness (cm)	5
Seepage	
Drainage	Well to moderately-well drained
Depth to Water Table (cm):	<100
Depth to Mottles / Gleying (cm)	None
Effective Texture	Loam

Kalmia Heath Ecotype	
Effective Rooting Depth (cm)	0-30
Coarse Fragment Percent (%) and Type	30-50 gravels and cobbles
Depth to Bedrock (cm)	<100
Parent Material	Morainal (till); Colluvium
Soil Classification (CSSC)	Organic Folisols, Orthic Humo-Ferric Podzols
Vegetation	
Dominant Tree Species	-
Dominant Shrub Species	*Picea mariana, Kalmia angustifolia, Rhododendron canadense, Empetrum nigrum, Vaccinium angustifolium*
Dominant Herb Species	*Cornus canadensis, Trichophorum caespitosum, Sarracenia purpurea*
Dominant Mosses, Liverwort, Lichen Species	*Pleurozium schreberi ,Cladina rangiferina, Cladina arbuscula, Cladina stellaris*
Dominant Aquatic / Wetland Species	N/A
Plant Indicator Species	-
Plant Species Richness (Avg. Vascular / Avg. Non-Vascular)	20.3 / 10.7
Species At Risk / Species of Conservation Concern	None encountered

Photo 10 Kalmia Heath Ecotype –Ground View

Photo 11 Kalmia Heath Ecotype – Vegetation

Photo 12 Kalmia Heath – Typical Soil Profile

Rarity

No plants under the protection of SARA or the NL ESA; or ranked as SH, S1, or S2 by the AC CDC have been identified from this ecotype.

Disturbance and Succession Ecology

Similar to the Kalmia-Black Spruce Forest ecotypes described above, the Kalmia Heath ecotypes are relatively stable and less prone to natural disturbance regimes (e.g., fire, wind). As previously discussed, the Kalmia Heath ecotype is maintained primarily by exposure, and limiting soil conditions.

Early seral stages are represented by a dominance of ericaceous shrubs; and may include a mix of patchily distributed black spruce, ericaceous shrubs where mixed-severity burns have occurred. As these sites are not expected to succeed to later successional stages, the Kalmia Heath ecotype is often considered a type of edaphic climax.

6.2.1.5 CNF Ecotype 05: Mixedwood Forest

General Site Description

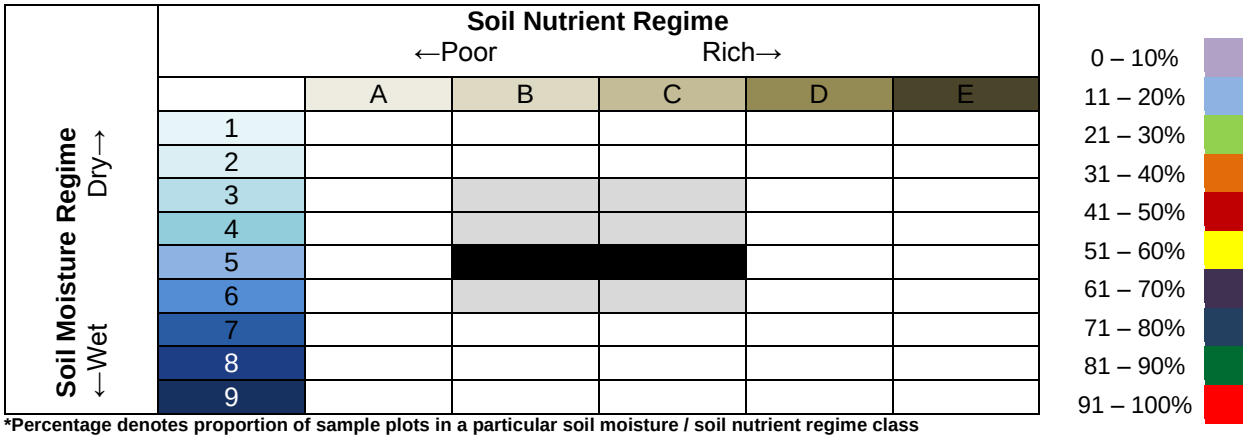
The Mixedwood Forest (MW) Ecotype represents an early mid-successional stage ecotype and is intended to characterize stands with an overstory dominated by balsam fir, often with a substantial component of white birch. Openings in the forest canopy often give way to extensive conifer regeneration. It is typical of a range of slope positions, but generally observed on moderately well to well drained, mid to upper slopes. Soils are often fresh to moist, nutrient medium and of variable texture, often on substrates derived from morainal (till) and colluvial deposits. The current extent of this ecotype in the Study Area is moderate.

The Mixedwood Forest Ecotype is characterized by a well-developed overstory dominated by balsam fir and white birch. Other tree species may be present in lesser amounts, including white spruce. The structure and species composition of the understory is largely shaped by canopy structure and soil attributes. Stands with an open tree canopy often have a well-developed cover of red raspberry in the understory whereas regenerating tree species provide a diffuse shrub layer within more closed-canopy stands. A variety of other shrubs may occur in the understory including scattered Canada yew (*Taxus canadensis*), mountain maple (*Acer spicatum*) and the dwarf shrubs twinflower (*Linnaea borealis*) and creeping snowberry. The character of the herbaceous layer varies considerably with the density of the tree canopy but pteridophytes are typically dominant, particularly mountain wood-fern (*Dryopteris campyloptera*) and lesser amounts of evergreen woodfern (*Dryopteris intermedia*). Bunchberry is also a typical dominant on the forest floor with a variety of other forbs and graminoids also being present depending on local site conditions, including wood reedgrass (*Cinna latifolia*), northern starflower, dewberry, northern oak fern and small enchanter's nightshade (*Circaea alpina*). Moss cover varies with canopy structure, the abundance of hardwood species, and related amounts of leaf litter on the forest floor but is typically patchy. Stairstep moss and wavy-leaved broom moss are typically dominant, with lesser amounts of Schreber's feathermoss, common broom moss, and other species (e.g., *Rhytidiadelphus* sp.) being present. Lichens are generally absent from the forest floor.

Mixedwood stands encountered during field surveys fall within various Damman Balsam Fir Forest types, particularly *Dryopteris-Hylocomium-Balsam Fir (Fdh) #5, Equisetum-Rubus-Balsam Fir (Fre) #1, Pleurozium-Balsam Fir (Fp) #11,* and *Rubus-Balsam Fir (Fr) #2*. Although not encountered at any of the survey site, trembling aspen is known to be more prominent in the Central Newfoundland Ecoregion than in other parts of the province (Meades and Moores 1994) and occurrences of this species were observed during field surveys. Some of the richer sites within the region have been described as being dominated by trembling aspen and paper birch (Meades and Moores 1994) and such hardwood-dominated stands have potential to occur within the Study Area for the Project.

Soils associated with this ecotype are primarily Orthic Humo-Ferric Podzols and Ferro-Humic Podzols along with their Gleyed variants., Orthic Humic Podzols and Orthic Humic Regosols

derived from morainal (till) or colluvial deposits are also common. Gravel and cobble content is generally low to moderate in surface horizons. Stone and boulder content is low to moderate, and high in soils derived from colluvial deposits. These are typically fresh, fine to medium textured soils, with soil texture varying greatly by site, but with near-surface horizons dominated by loam, clay loam and silt loam soil textures. Profiles generally contain a well-developed Ae horizon, and may contain partially or fully cemented B-horizons (Bfc, Bhfc). Partially or fully cemented B-horizons were not encountered, although Ortstein horizons that form in acid soils with high iron and organic matter are relatively common throughout the region. Lower slope seepage potential may be high for soils with restricted vertical drainage, with occasional distinct mottling noted within the top 50 cm of the mineral soil surface. Gleyed Humo-Ferric Podzols, occupy mid to lower slopes with restricted vertical drainage, with Orthic and Rego Gleysols in depressional areas. Drainage is variable and can range from imperfect to well-drained depending on slope position, slope percent, soil depth and the occurrence of vertical drainage restrictions. Soils may possess a range of soil nutrient conditions but is frequently in areas with medium soil fertility. Moisture and nutrient levels are often enhanced in these soils as a result of seepage inputs or perched water, occasionally promoting development of thin Ahe or Ah horizons. An edaphic grid for this ecotype is presented in Figure 6.6. Humus forms are dominated by Hemimors and Humimors, but Mormoders can also occur as a result of hardwood litter inputs.



***Percentage denotes proportion of sample plots in a particular soil moisture / soil nutrient regime class**

Figure 6-6 Edatopic Grid for Mixedwood Forest Ecotype

The Mixedwood Forest map unit occupies approximately 10% (179.3 km^2) of the Study Area (Table 6.1).

Environmental Information

A summary of the environmental information is provided in Table 6.8.

Table 6.8 Summary of Ecological Condition for Mixedwood Forest Ecotype

Mixedwood Forest Ecotype	
Site Information	
Ecoregion	Central Newfoundland Forest (CNF)
Ecotype	Mixedwood Forest
Model Classification	Mixedwood Forest
Map Unit	MW
Damman Forest Site Classification Equivalent	*Dryopteris-Hylocomium-Balsam Fir (Fdh) #5; Equisetum-Rubus-Balsam Fir (Fre) #1; Pleurozium-Balsam Fir (Fp) #11; and Rubus-Balsam Fir (Fr) #2*
General Location	Mainly on slopes, associated with fresh, nutrient medium soils of glacial origin (morainal) and/or colluvial deposits; predominantly as inclusions within the broader coniferous forest.
Number of Sample Plots (n)	n=7
Inventory Numbers	G2, G15, G18, V3, V15, V17, V43
Total Area (km^2)	179.3
Percentage of Study Area (%)	9.8
Site Characteristics	
Surface Expression	Undulating, Rolling, Hummocky
Slope Position	Range of slope positions - Upper Slope, Mid Slope; Lower Slope; Level
Slope	Variable
Aspect	East, West
Soil Nutrient Regime	Medium
Soil Moisture Regime	Submesic to subhygric
Successional Status	Early to mid-successional
Structural Stage	Young to mature forest
Soil Characteristics	
Organic Thickness / LFH Thickness (cm)	6-12
Humus Form	Hemimors, humimors and mormoders
Surface (Topsoil) Texture	Sandy Loam to loam
Average Topsoil Thickness (cm)	19
Seepage	Possible
Drainage	Well to imperfect
Depth to Water Table (cm)	50-100
Depth to Mottles / Gleying (cm)	None
Effective Texture	Loam
Effective Rooting Depth (cm)	25-50
Coarse Fragment Percent (%) and Type	<50 gravels and cobbles

Mixedwood Forest Ecotype	
Depth to Bedrock (cm)	>100
Parent Material:	Morainal (till), Colluvium, Fluvial
Soil Classification (CSSC):	Orthic Humo-Ferric and Ferro-Humic Podzols;
Vegetation	
Dominant Tree Species	*Abies balsamea, Betula papyrifera, Picea glauca*
Dominant Shrub Species	*Rubus idaeus, Abies balsamea*
Dominant Herb Species	*Dryopteris campyloptera, Cornus canadensis*
Dominant Mosses, Liverwort, Lichen Species	*Hylocomium splendens, Dicranum polysetum, Pleurozium schreberi, Dicranum scoparium*
Dominant Aquatic / Wetland Species	N/A
Plant Indicator Species	-
Plant Species Richness (Avg. Vascular / Avg. Non-Vascular)	20.0 / 7.7
Species At Risk / Species of Conservation Concern	*Poa saltuensis*

Photo 13 Mixedwood Forest Ecotype – Ground View

Photo 14 Mixedwood Forest Ecotype –Vegetation

Photo 15 Mixedwood Forest Ecotype – Typical Soil

Rarity

No plants under the protection of SARA or the NL ESA have been identified from this ecotype, but one regionally uncommon graminoid, forest bluegrass (*Poa saltuensis*), and ranked as *S2S3* by the AC CDC, was recorded within the Mixedwood Forest ecotype.

Disturbance and Succession Ecology

Stand-replacing disturbances such as fire, windthrow, insect epidemics and harvesting are the primary disturbances that affect these communities.

The MW ecotype is considered a mid-seral plant community for the CNF ecoregion and usually precedes the establishment of canopy forming trees – balsam fir; following die-off or senescence of the short-lived and shade-intolerant white birch. Given enough time between

disturbances, sites characterized by the MW ecotype could be expected to succeed to mature and overmature CNF 02 sites.

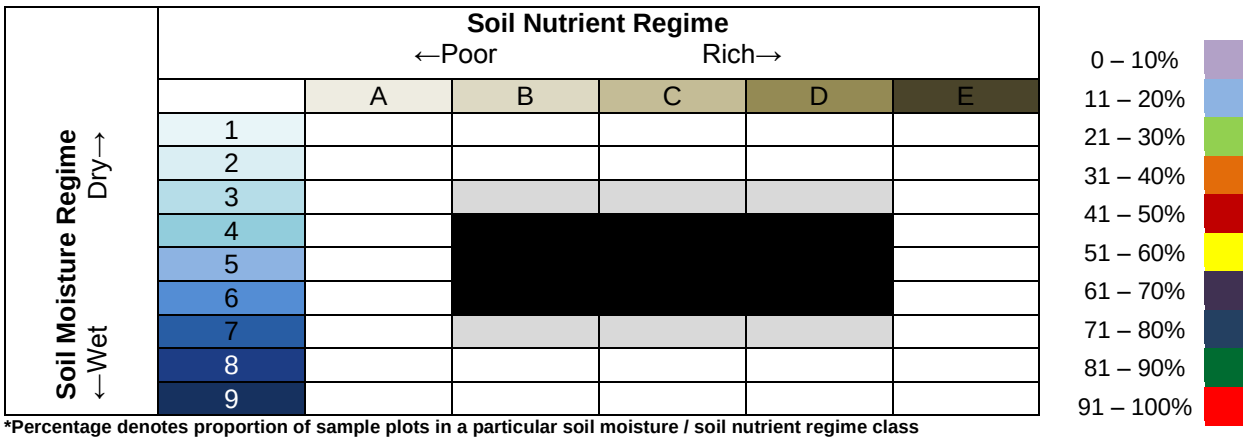
6.2.1.6 CNF Ecotype 05: Regenerating Forest

General Site Description

As the name implies, the Regenerating Forest (RF) ecotype represents post-disturbance sites in which tree cover has been greatly reduced or eliminated due to varied stand-replacing disturbances, including fire, windthrow, insect epidemics and timber harvesting. Historical activities, including timber harvesting, and to a lesser extent mineral exploration and extraction, are important factors determining the abundance of the Regenerating Forest ecotype in the Study Area. Numerous stand-replacing fires have occurred in northern sections of the Central Newfoundland Forest ecoregion (South 1983), which includes upland sites throughout the Study Area. Such mixed- and high-severity fire regimes are usually wind-driven, with large, high-severity fires capable of creating medium to large burned over patches on the landscape. Black spruce is typically slow to establish after fire and is replaced by post-fire tree and shrub species that have evolved mechanisms for rapid regeneration within these burn patches. Depending on site conditions and the severity of the disturbance regime, sites may succeed to Black Spruce or Mixedwood ecotypes before returning to mature conifer cover, presumably Balsam Fir Forest.

At this stage, tree cover generally consists of isolated patches of regenerating trees, particularly black spruce and balsam fir, with scattered paper birch. These trees and ericaceous species typically form a prominent shrub layer. Sheep laurel is often abundant, as is late lowbush blueberry. Additional ericaceous dwarf shrubs are also often abundant, including partridgeberry (*Vaccinium vitis-idaea*) and creeping snowberry, along with scattered hardwood shrubs, particularly speckled alder (*Alnus incana*) and fire cherry (*Prunus pensylvanica*). A moderately developed herbaceous layer is typically present, with bunchberry being a common dominant and other species being occasionally abundant, including stiff clubmoss, bristly sarsaparilla (*Aralia hispida*) and yellow clintonia. Non-vascular plant cover is comprised of a moderately well-developed moss layer dominated by feathermosses, with crustose lichens also being prevalent at the drier sites.

For the most part, soils are the same as those that existed prior to the stand-replacing disturbance event and described for mesic Balsam Fir Forest or Black Spruce Forest sites, except that forest floor horizons are thinner on burned sites. An edaphic grid for this ecotype is presented in Figure 6.7.



***Percentage denotes proportion of sample plots in a particular soil moisture / soil nutrient regime class**

Figure 6-7 Edatopic Grid for Regenerating Forest Ecotype

The Regenerating Forest (RF) ecotype occupies approximately 8% (139.5 km^2) of the Study Area (Table 6.1).

Environmental Information

A summary of the environmental information is provided in Table 6.9.

Table 6.9 Summary of Ecological Condition for Regenerating Forest Ecotype

Regenerating Forest Ecotype	
Site Information	
Ecoregion	Central Newfoundland Forest (CNF)
Ecotype	Regenerating Forest
Model Classification	Regenerating Forest
Map Unit	RF
Damman Forest Site Classification Equivalent	n/a
General Location	Variable
Number of Sample Plots (n)	n=4
Inventory Numbers	-
Total Area (km^2)	139.5
Percentage of Study Area (%)	7.6
Site Characteristics	
Surface Expression	Undulating, Rolling, Hummocky
Slope Position	Range of slope positions - Upper Slope, Mid Slope; Lower Slope; Level
Slope	Variable

Regenerating Forest Ecotype	
Aspect	North, South, West and East (Variable)
Soil Nutrient Regime	Poor to Medium
Soil Moisture Regime	Submesic to subhygric
Successional Status	Early seral
Structural Stage	Young Forest
Soil Characteristics	
Organic Thickness / LFH Thickness (cm)	-
Humus Form	Hemimors and humimors
Surface (Topsoil) Texture	Silt Loam to loam
Average Topsoil Thickness (cm)	19
Seepage	Possible
Drainage	Well to imperfect
Depth to Water Table (cm)	50 to 100
Depth to Mottles / Gleying (cm)	None
Effective Texture	Loam
Effective Rooting Depth (cm)	25-50
Coarse Fragment Percent (%) and Type	<30 gravels and cobbles
Depth to Bedrock (cm)	>100
Parent Material:	Morainal (till), Colluvium
Soil Classification (CSSC):	Orthic and Orstein Humo-Ferric and Ferro-Humic Podzols
Vegetation	
Dominant Tree Species	*Picea mariana, Abies balsamea, Betula papyifera*
Dominant Shrub Species	*Kalmia angustifolia, Vaccinium angustifolium*
Dominant Herb Species	*Cornus canadensis*
Dominant Mosses, Liverwort, Lichen Species	*Pleurozium schreberi, Hylocomium splendens*
Dominant Aquatic / Wetland Species	N/A
Plant Indicator Species	-
Plant Species Richness (Avg. Vascular / Avg. Non-Vascular)	N/A
Species At Risk / Species of Conservation Concern	*Scirpus cyperinus*

Rarity

No plants under the protection of SARA or the NL ESA have been identified from this ecotype, but one regionally common graminoid, cottongrass bulrush, and ranked as *S2S3* by the AC CDC, was recorded within the Regenerating Forest ecotype.

Disturbance and Succession Ecology

The Regenerating ecotype is considered an early-seral plant community for the CNF ecoregion. Stand-replacing disturbances such as fire, windthrow, insect epidemics and harvesting are the primary disturbances that affect these communities. Early seral stages are represented by an abundance of ericaceous shrubs where stand-replacing fires have occurred, and a mix of patchily distributed black spruce, ericaceous and deciduous shrubs where mixed-severity burns have occurred. In stand-replacement burns, black spruce is often slow to re-establish. Ericaceous shrubs, including sheep-laurel, common Labrador tea, late lowbush blueberry and partridgeberry, usually precedes the establishment of canopy forming trees following stand-replacement burns until the site has regained warmer, moister conditions and less exposure to frost. Succession advances very slowly owing to the short growing season, deep lingering snows and cold temperatures.

6.2.1.7 CNF Ecotype 06: Alder Thicket

General Site Description

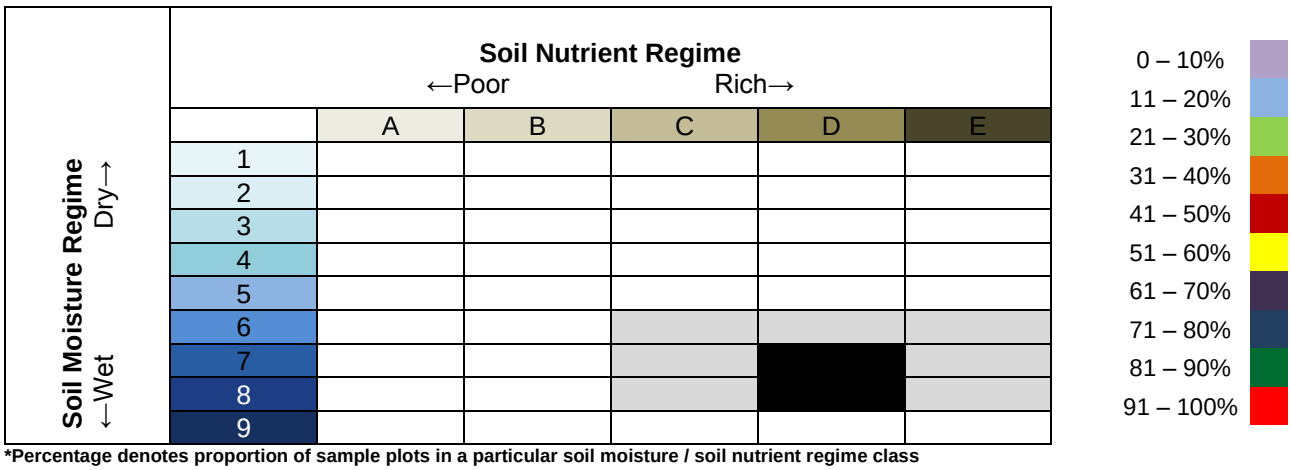
The Alder Thicket (AT) ecotype is most often associated with morainal (till) parent materials occupying depressions, but may also occupy sloping terrain in areas of concentrated lateral flow (seepage) or groundwater discharge. Groundwater seepage is an important attribute of the Alder Thicket ecotype, and such areas are typically associated with increased soil moisture and nutrient regimes as compared to adjacent sites, with concomitant changes in vegetation. The rolling to undulating topography is characterized by deep, nutrient-enriched sites with a soil texture ranging from silt loam to loam, usually with a fragipan that promotes seepage in the rooting zone. Midslopes are dominated by the Balsam Fir Forest ecotype in level to gently sloping terrain, with the Black Spruce Forest ecotype occupying seepage slopes. Succession to alder thickets after commercial harvest and fire is considered a serious silvicultural problem (Newfoundland and Labrador Department of Natural Resources 2014). Stands of alder that originated following logging and/or wildfire will usually revert to forest, although on heavy, poorly drained soils, forest re-growth can be problematic owing to raised water tables resulting in a "swamping" effect. These thickets may eventually develop into coniferous or mixedwood forest types.

The majority of Alder Thicket Ecotypes are characterized by the *Alder Swamps (Aa)* or *Lycopodium-Alder Swamp (AL) #31* Damman types, with many showing intermediate characteristics. The *Lycopodium-Alder Swamp (AL) #31* type is described by Meades and Moores (1989) as being dense alder thickets with scattered balsam fir and/or white spruce showing good growth and an understory dominated by leaves and scattered patches of sedges and forbs. The *Alder Swamps (Aa)* type is differentiated by the typical presence of stunted softwood trees, is moist to somewhat wet, periodically inundated and often associated with floodplains. These thickets often have an understory dominated by sedges and forbs (Meades and Moores 1994). The successional history of these alder thickets is unclear, but their occurrence is undoubtedly indicative of nutrient-enriched settings on slopes and within

depressions fed by groundwater seepage. Alders are known to be common on wet seepage slopes within the ecoregion (Meades and Moores 1994). Once established, alder thickets can persist over the long-term, particularly where disturbance factors prevent tree establishment and growth.

Speckled alder was the dominant species within the majority of sites, but green alder (*A. viridis*) was dominant at several sites. The composition of the diffuse tree canopy varied and included both hardwood and softwood species, with scattered occurrences of balsam fir, paper birch, white spruce and black spruce being observed within this unit. Although of limited abundance, trees sometimes exhibited good growth. Other species found to contribute to the prominent shrub layer, include red raspberry, currant (*Ribes* sp.), balsam fir and sweet gale (*Myrica gale*). Herbaceous vegetation was varied and ranged from moderately to well-developed. Ferns were typically the most prominent component of the herbaceous vegetation, particularly evergreen woodfern and mountain wood-fern, but a variety of other forbs and graminoids were also often common, including dewberry, bluejoint reedgrass (*Calamagrostis canadensis*), purplestem aster (*Symphyotrichum puniceum*) and hoary sedge. A thick, nutrient-rich layer of fallen leaves (litter) largely precludes the occurrence of mosses, which were typically scattered in small patches. However, peatmoss was observed to provide a prominent cover at several wetter sites, often in association with riparian features.

Soils associated with this ecotype are mainly Orthic Gleysols, Orthic Humic Gleysols, and Rego Gleysols. Orthic and Gleyed Humic Regosols are also common. Orthic Humic Podzols are also possible on older sites that are no longer subject to saturated conditions. In depression areas, soils can also have surface O-horizons, which (when thick enough) move them into the Organic soil order. Soils tend to be moist to wet, nutrient-rich, mineral soils, or occasionally well-decomposed sapric peat. Mineral soil texture can be fine to coarse, ranging from silt loam to sandy loam depending on parent material type, and usually with a fragipan that promotes seepage in the rooting zone. Soils range from poorly drained to well drained, with the majority of sites remaining wetted throughout the growing season. Potential rooting depth is variable, but tends to be less than 50 cm due to high water levels and potential root restricting layers (i.e., fragipans). Humus forms vary depending on drainage conditions and vegetation sources, with mulls dominant. Moder humus forms are also possible on drier sites. This ecotype is generally nutrient-medium to rich, with a mesic to subhygric soil moisture regime (Figure 6.8). Site productivity is typically medium-rich.



***Percentage denotes proportion of sample plots in a particular soil moisture / soil nutrient regime class**

Figure 6-8 Edatopic Grid for Alder Thicket Ecotype

This ecotype is limited in its extent and currently occupies approximately 5% (97.4 km^2) of the Study Area (Table 6.1).

Environmental Information

A summary of the environmental information is provided in Table 6.10.

Table 6.10 Summary of Ecological Condition for Alder Thicket Ecotype

Alder Thicket Ecotype	
Site Information	
Ecoregion	Central Newfoundland Forest (CNF)
Ecotype	Alder Thicket Ecotype
Model Classification	Alder Thicket Ecotype
Map Unit	AT
Damman Forest Site Classification Equivalent	*Lycopodium-Alder Swamp (AL) #31*
General Location	Semi-stable thickets form on gently sloping, level to lightly depressed areas on seepage slopes derived from morainal (till) deposits
Number of Sample Plots (n)	n=9
Inventory Numbers	G22, G25, G26, G27, V8, V9, V19, V38, V40,
Total Area (km^2)	97.4
Percentage of Study Area (%)	5.3
Site Characteristics	
Surface Expression	Gently sloping; Level
Slope Position	Level (slopes <2%); Depression
Slope	<2%

Alder Thicket Ecotype	
Aspect	Variable
Soil Nutrient Regime	Medium (C) to rich (D) nutrient status
Soil Moisture Regime	Subhygric (6) to Subhydric (8)
Successional Status	Early to mid-seral
Structural Stage	Shrub
Soil Characteristics	
Organic Thickness / LFH Thickness (cm)	8-40
Humus Form	Mull
Surface (Topsoil) Texture	Silt Loam, Loam, Loamy Sand, Silty Clay
Average Topsoil Thickness (cm)	31
Seepage	Yes
Drainage	Imperfect to Poor
Depth to Water Table (cm)	0 to 20
Depth to Mottles / Gleying (cm)	10+
Effective Texture	Loam
Effective Rooting Depth (cm)	20 - 40
Coarse Fragment Percent (%) and Type	<5
Depth to Bedrock (cm)	50-100
Parent Material	Morainal (till), Fluvial
Soil Classification (CSSC):	Orthic Gleysol; Rego Gleysol; Orthic Humic Gleysol; Orthic Regosol; Gleyed Regosol
Vegetation	
Dominant Tree Species	*Abies balsamea, Betula papyrifera*
Dominant Shrub Species	*Alnus incana, Alnus viridis, Myrica gale*
Dominant Herb Species	*Dryopteris intermedia, Dryopteris campyloptera*
Dominant Mosses, Liverwort, Lichen Species	*Sphagnum sp.*
Dominant Aquatic / Wetland Species	N/A
Plant Indicator Species	-
Plant Species Richness (Avg. Vascular / Avg. Non-Vascular)	26.3 / 3.5
Species At Risk / Species of Conservation Concern	*Agrostis perennans, Carex deweyana, Scirpus cyperinus*

Photo 16 Alder Thicket Ecotype – Ground View

Photo 17 Alder Thicket – Typical Vegetation

Photo 18 Alder Thicket Ecotype – Typical Soil Profile

Rarity

No plants under the protection of SARA or the NL ESA have been identified from this ecotype, but three regionally uncommon graminoids were recorded within the Alder Thicket ecotype: short-scale sedge (*Carex deweyana*), ranked *S1S2* by the AC CDC; perennial bentgrass (*Agrostis perennans*), ranked *S2*; and cottongrass bulrush; *S2S3*.

Disturbance and Succession Ecology

The Alder Thicket ecotype can be expressed at a variety of successional stages. Moister occurrences are expected to persist as an edaphic climax, while stands on better drained sites are relatively stable but expected to transition to a later successional stage defined by the Balsam Fir Forest, Black Spruce Forest or Mixedwood Forest ecotypes. Successional history of the Alder Thicket ecotype is otherwise not fully understood.

6.2.2 Riparian Ecosystem Units

The Marathon Gold Study Area encompasses both the eastern shoreline of Red Indian Lake, Victoria Lake (reservoir) and the Victoria River drainage basin. Riparian areas buffered along the streams and rivers account for 15.1 km^2 (<1%) of the Study Area (Appendix A). Riparian ecosystems were determined based on a 20 m buffer width assigned to all rivers and streams classified as permanent within the Study Area. In a majority of instances, the presence or absence of these features has not been confirmed on the ground; the results are therefore considered approximate.

6.2.2.1 CNF Ecotype 07: Riparian Thicket

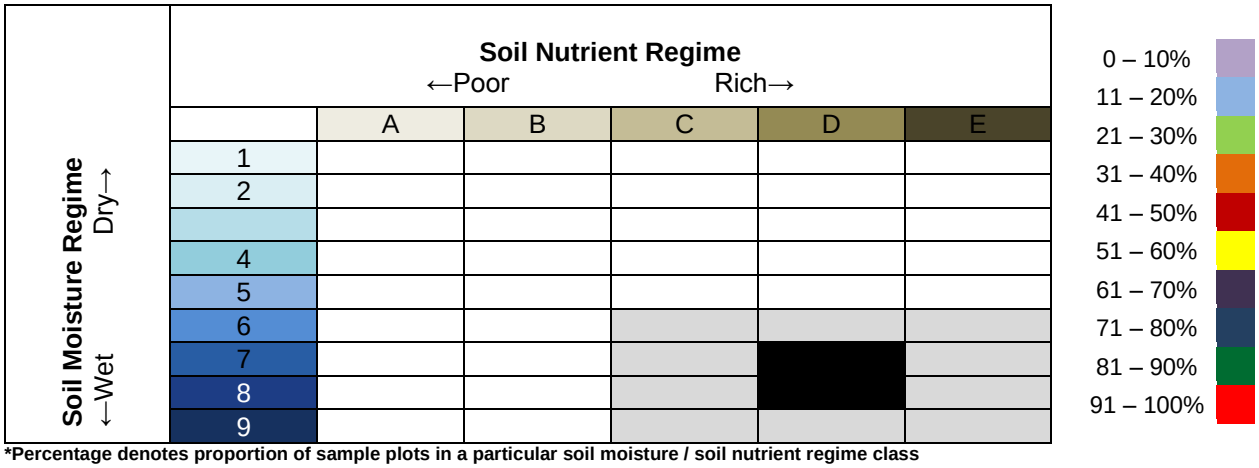
General Site Description

The Riparian Thicket (RT) ecotype is most often associated with fluvial (alluvial) and lacustrine deposits. These non-forested ecosystem units are typically associated with active floodplains that are annually or periodically flooded and enriched by sediments. Within the Study Area, these ecotypes occupy the shores of larger rivers and lakes, including the eastern shoreline of Red Indian Lake, Victoria Lake (reservoir) and the Victoria River drainage basin; below the annual high-water line, and in areas somewhat protected from the extremes of ice scour and flooding. Substrates are generally fresh to moist, mineral, peaty-phase mineral or organic, moderately deep and with variable texture.

The vegetation of the Riparian Thicket ecotype is characterized by a dense shrub thicket, composed largely of low shrub species. They are rich, diverse sites typically lacking an overstory. The tree layer, if present, is composed of scattered coniferous and deciduous species. Sweet gale is typically the dominant shrub but other common species include narrow-leaved meadow-sweet (*Spiraea alba*), leatherleaf and green alder. A well-developed herbaceous layer is dominated by a mixture of graminoids, particularly cottongrass bulrush, inflated sedge (*Carex vesicaria*), little prickly sedge, red-tinged bulrush (*Scirpus microcarpus*) and slender sedge (*C. lasiocarpa*). However, a variety of forbs are also present, including water horsetail (*Equisetum fluviatile*), blueflag (*Iris versicolor*), marsh St. John's-wort (*Triadenum fraseri*), sensitive fern (*Onoclea sensibilis*) and white turtlehead (*Chelone glabra*). Vegetation composition, particularly the herbaceous element, varies with proximity to the water's edge.

Soils associated with this ecotype are mainly Orthic, Gleyed, or Cumulic Regosols. Orthic Humic Podzols and Dystric Brunisols are also possible on older sites that are no longer subject to flooding and sedimentation. Mineral soil texture can be fine to coarse, depending on parent material type and/or deposition event. Sandy textures predominate, although silt loam textures are also possible. Drainage is generally moderately well to imperfect; however, sandy and gravelly sites located far from current shorelines or river channels may be well to rapidly drained. Potential rooting depth is variable, but tends to be less than 50 cm due to high water levels. Humus forms vary depending on drainage conditions and vegetation sources, with mulls dominant. Moder humus forms are also possible on sites with intermittent flooding. This ecotype is generally

nutrient-medium to rich, with a subhygric to subhydric soil moisture regime (Figure 6.9). Site productivity is typically medium-rich.



*Percentage denotes proportion of sample plots in a particular soil moisture / soil nutrient regime class

Figure 6-9 Edatopic Grid for Riparian Thicket Ecotype

Free-flowing stream systems, in conjunction with beaver activity (e.g., dams, impoundments) are considered important to the development and persistence of these non-forested riparian ecosystem.

The Riparian Thicket (Alluvial) ecotype is limited in its extent and distribution and currently occupies <1% (15.1 km^2) of the Study Area (Table 6.1).

Environmental Information

A summary of the environmental information is provided in Table 6.11.

Table 6.11 Summary of Ecological Condition for Riparian Thicket Ecotype

Riparian Thicket Ecotype	
Site Information	
Ecoregion:	Central Newfoundland Forest (CNF)
Ecotype:	Riparian Thicket Ecotype
Model Classification	Riparian Thicket Ecotype
Map Unit	RT
Damman Forest Site Classification Equivalent	*Alder Swamps (Aa)*
General Location	These vegetation types are found on active floodplain sites and occasionally on infrequently flooded terraces and gentle riparian slopes associated with (alluvial) fluvial deposits.
Number of Sample Plots (n)	n=1
Inventory Numbers	G21
Total Area (km^2)	15.1

Riparian Thicket Ecotype	
Percentage of Study Area (%)	0.8
Site Characteristics	
Surface Expression	Gently sloping; Level
Slope Position	Level (slopes <2%); Depression
Slope	<2%
Aspect	Variable
Soil Nutrient Regime	Medium (C) to Rich (D)
Soil Moisture Regime	Hygric (6) to Hydric (8)
Successional Status	Late sere in vegetation succession on fluvial deposits
Structural Stage	Shrub / Herb
Soil Characteristics	
Organic Thickness / LFH Thickness (cm):	10
Humus Form:	Mull
Surface (Topsoil) Texture	Sandy Loam to Clay Loam
Average Topsoil Thickness (cm)	10
Seepage	No
Drainage	Imperfect to Poor
Depth to Water Table (cm)	0 to 30
Depth to Mottles / Gleying (cm)	10+
Effective Texture	Clay Loam
Effective Rooting Depth (cm)	0 to 50
Coarse Fragment Percent (%) and Type	<5
Depth to Bedrock (cm)	Variable
Parent Material	Fluvial, Lacustrine, Morainal (till)
Soil Classification (CSSC):	Orthic Gleysol; Rego Gleysol; Orthic Humic Gleysol; Orthic Regosol; Gleyed Regosol;
Vegetation	
Dominant Tree Species	N/A
Dominant Shrub Species	*Myrica gale*
Dominant Herb Species	*Calamagrostis canadensis, Equisetum fluviatile*
Dominant Mosses, Liverwort, Lichen Species	N/A
Dominant Aquatic / Wetland Species	*Myrica gale, Equisetum fluviatile*
Plant Indicator Species	-
Plant Species Richness (Avg. Vascular / Avg. Non-Vascular)	31.0 / 0.0
Species At Risk / Species of Conservation Concern	*Scirpus cyperinus; S2S3*

Photo 19 Riparian Thicket Ecotype – Ground View

Photo 20 Riparian Thicket– Typical Vegetation

Photo 21 Riparian Thicket Ecotype – Typical Soil Profile

Rarity

No plants under the protection of SARA or the NL ESA have been identified from this ecotype, but one regionally uncommon graminoid, cottongrass bulrush; *S2S3*, did form an important component of the herbaceous layer for the Riparian Thicket ecotype.

Disturbance and Succession Ecology

The Riparian Thicket ecotype occurs predominantly along watercourses (large and small rivers, and streams), where a range of communities dominated by shrubs and small trees of the Salicaceae family, typically willow (*Salix* spp.) tend to occur. These sites are often prone to severe flooding and scour by ice during spring break-up. Other disturbances include damage because of over-browsing, especially in areas where larger animals (i.e., moose) tend to frequent these sites in high numbers due to the availability of food, water and shade and level terrain.

Although some of these vegetation communities may be disclimaxes induced through disturbance, most are undisturbed, natural (climax) vegetation for which hardwood thickets (of various forms) appears to be the riparian climax on developing fluvial/lacustrine deposits. As the thickness of these deposits increases, the frequency and severity of flood events and scouring by ice decreases, allowing shrubs and some trees to become established. Over time, a dense shrub thicket establishes to form the Riparian Thicket ecotype. Although these sites are considered productive due to an abundance of moisture and rich, fluvial / lacustrine soils, the rate and course of succession in this ecotype is dictated by the frequency, timing and severity of seasonal flooding and ice scour events.

6.2.3 Wetland Ecosystem Units

Wetland ecosystems occupy 410 km^2 (22 %) of the Study Area. Two general wetland types were identified – bogs and fens. These "peatland" ecosystems form in wetland conditions when production rates of plant biomass exceed its decomposition, resulting in a net accumulation of organic substrate materials. This accumulation of peat is generally the result of low decomposition rates caused by lack of oxygen, high acidity and nutrient availability. Bogs and fens occur along a gradient of these substrate conditions, from very acidic and nutrient-poor (bogs) to nutrient-medium, pH neutral or slightly alkaline (fens).

They typically occur on exposed sites, in level to depressional topography, with soils derived from organic parent materials (i.e., peatlands). Within the Study Area, peatlands support somewhat differing vegetation communities (i.e., wetland cover types) tolerant of wet, generally acidic, nutrient-poor soils. They include a mosaic of wet herbaceous (e.g., wet herb), scrub-shrub wetlands (e.g., wet heath) and forested communities along a gradient of decreasing water availability. Although wetlands may be represented by several vegetation communities, the overall site was deemed to support two somewhat topographically confined wetland types. Apart from the grouping of unclassified wetlands as required to produce the unsupervised classification, three main wetland types, identified using designations provided by the Canadian Wetland Classification System (1997), were encountered, including fens, bogs and shallow open water. Fens are the most common wetland type, with poor shrub fen (weakly minerotrophic) and graminoid basin fen (weakly minerotrophic) accounting for a majority of the peat dominated wetlands. Detailed descriptions of wetland ecotype units comprising the Project are provided in the following sections.

6.2.3.1 CNF Ecotype 08: Wet Coniferous Forest

General Site Description

The Wet Coniferous Forest (WC) ecotype primarily represents treed wetlands that may occur as extensive areas or in the transitional zone of more open peatland communituies (i.e., bogs and fens). This ecotype often occurs in association with other adjacent wetland types as part of larger wetland complexes. They are found in lower slope and toe positions of gentle slopes, shallow depressions and along drainage channels. Soils are generally derived form morainal (till)

and/or organic deposits. Soil nutrient regime is low except where nutrient availability is enhanced by groundwater or seepage inputs.

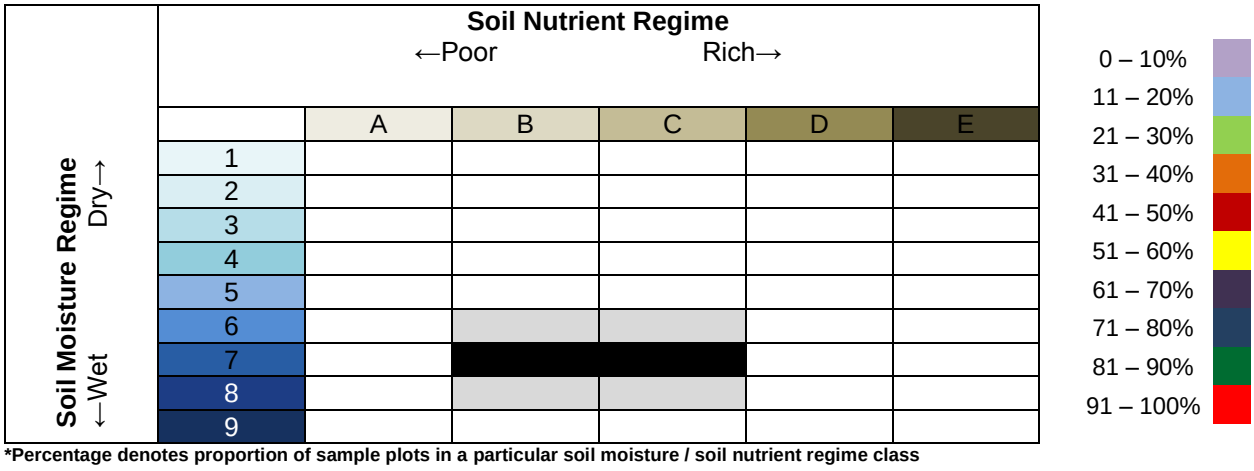
Coniferous treed fens are common in the Study Area and are often associated with or adjacent to other types of wetlands. The overall topography of these ecotypes is flat to gently undulating with micro-topography characterized by hummocks and hollows. Soils are typically poorly drained, peaty mineral to organic, and enriched by minerals seeping through the morainal (till) parent materials. As with coniferous treed fens, coniferous treed bogs may also be present in the Study Area; in association with or adjacent to other types of wetlands. Treed bogs are often transitional to fens (i.e., slightly more acidic – pH <4.6) and tend to be comprised of higher percentages of glow moss (*Aulacomnium palustre*), golden fuzzy fen moss (*Tomenthypnum nitens*) and a greater proportion of graminoids (especially, sedges (*Carex* spp.)). In the boreal zone, transitional bogs often contain a component of tamarack.

The Wet Coniferous Forest ecotype is characterized by a unique and diverse flora with a rich herbaceous layer and well-developed moss carpet. Black spruce is the dominant tree within this ecotype, but scattered balsam fir and tamarack are common. Because of their imperfect to poor drainage, trees are typically stunted and the aforementioned tree species are typically dominant components within the tall and low shrub strata, along with alder, sweet gale and leatherleaf. Ground vegetation is dominated by herbaceous species, but dwarf shrubs such as creeping snowberry, twinflower and late lowbush blueberry are common occurrences. Herbaceous vegetation is comprised of a mixture of forbs and graminoids, including a relatively high diversity of sedges. Commonly encountered and/or often abundant herbs within the understory include three-leaf Solomon's-plume (*Maianthemum trifolium*), bunchberry, dewberry, threefruit sedge, little prickly sedge, Atlantic sedge (*Carex atlantica*), Buxbaum's sedge (*C. buxbaumii*) and bristlestalk sedge (*C. leptalea*). Peatmoss is the dominant component of the moss carpet, but feathermosses and other species more typical of upland conditions may be prevalent on hummocks.

Field sites of the Wet Coniferous Forest ecosystem unit most closely reflect the Black Spruce Fen types as described by Meades and Moores (1989). In particular, the vegetation structure and composition of field sites typically reflected the *Carex-Black Spruce (Sc) #18* and/or *Osmunda-Black Spruce (SO) #19* types (their understory often contained indicators of both types), with elements of *Sphagnum-Black Spruce (Ss) #12* also encountered. Forested fens are described by Meades and Moores (1989) as being poorly-drained open black spruce stands with a lush understory of forbs and sedges, a number of which are considered indicative of relatively fertile conditions.

Soils associated with Wet Coniferous Forest ecotypes include Terric Fibrisols and Terric Mesisols, usually originating from organic parent material in early to moderate stages of decomposition (Of and Om horizons). Typic Fibrisols and Typic Mesisols may also be present in areas where peat depth exceeds 160 cm. In a majority of cases, poorly drained soils have surface horizons derived from peat (sphagnum) mosses. Organic soils often grade into mineral soils (i.e., Rego Gleysols,

Gleyed Regosols) at the periphery of these sites. Wet Coniferous Forest ecotypes are characterized by poorly drained soils with near-surface mottles (prominent) and/or gley conditions and above-average clay content. Wet medium to coarse-textured Gleyed Humo-Ferric and Ferro-Humic Podzols are also possible. They are described as loamy mineral soils, with thin Ae or Ahe horizons, imperfect drainage and mottling at depth. In a majority of areas gravel / cobble content can vary from low to high. The water table is generally near surface, and sites are nutrient-poor to medium, with subhygric to subhydric soil moisture regimes. Drainage is often imperfect to poor due to slope position (lower slope, level, depressional) and/or restricted vertical drainage in areas of gentle slope. Rooting depths are typically shallow due to high water levels. Site productivity is typically low to moderate in relation to the surrounding landscapes. An edaphic grid for this ecotype is presented in Figure 6.10.



*Percentage denotes proportion of sample plots in a particular soil moisture / soil nutrient regime class

Figure 6-10 Edatopic Grid for Wet Coniferous Forest Ecotype

The Wet Coniferous Forest ecotype occupies approximately 7% (130.7 km^2) of the Study Area (Table 6.1).

Environmental Information

A summary of the environmental information is provided in Table 6.12.

Table 6.12 Summary of Ecological Condition for Wet Coniferous Forest Ecotype

Wet Coniferous Forest Ecotype	
Site Information	
Ecoregion	Central Newfoundland
Ecotype	Wet Coniferous Forest
Model Classification	Treed Wetland - Treed Bogs & Treed Fens
Map Unit	WC
Damman Forest Site Classification Equivalent	*Carex-Black Spruce (Sc) #18; Osmunda-Black Spruce (SO) #19;* elements of *Sphagnum-Black Spruce (Ss) #12*

Wet Coniferous Forest Ecotype	
General Location	Widespread across the boreal range and often associated with poorly drained, wetted depressions, underlain by peat and/or coarse textured morainal parent materials.
Number of Sample Plots (n)	n=5
Inventory Numbers	G12, G16, G20, V13, V26
Total Area (km^2)	130.7
Percentage of Study Area (%)	7.1
Site Characteristics	
Surface Expression	Flat (level); Depressional
Slope Position	Level, Depression
Slope	<2%
Aspect	None
Soil Nutrient Regime	Poor (B) to Medium (C)
Soil Moisture Regime	Hygric (6) to Hydric (8)
Successional Status	Edaphic Climax
Structural Stage	Most stands are mid-successional but this ecotype is expressed in a variety of successional stages (early to late).
Soil Characteristics	
Organic Thickness / LFH Thickness (cm)	40-160
Humus Form	Fibrimors; Mesimors
Surface (Topsoil) Texture	Fibric; Mesic
Average Topsoil Thickness (cm)	N/A
Seepage	N/A
Drainage	Poor
Depth to Water Table (cm)	Near surface
Depth to Mottles / Gleying (cm)	Yes
Effective Texture	N/A
Effective Rooting Depth (cm)	0 to 20
Coarse Fragment Percent (%) and Type	N/A
Depth to Bedrock (cm)	40-160
Parent Material	Organic, Morainal (Till)
Soil Classification (CSSC)	Terric Fibrisol; Terric Mesisol; extending to Typic Fibrisols and Typic Mesisols where topography has led to the development of thick organics deposits.
Vegetation	
Dominant Tree Species	*Picea mariana*
Dominant Shrub Species	*Picea mariana, Abies balsamea, Myrica gale*

Wet Coniferous Forest Ecotype	
Dominant Herb Species	*Maianthemum trifolium, Sanguisorba canadensis, Carex buxbaumii, Trichophorum caespitosum, Cornus canadensis, Rubus pubescens*
Dominant Mosses, Liverwort, Lichen Species	*Sphagnum spp.*
Dominant Aquatic / Wetland Species	-
Plant Indicator Species	-
Plant Species Richness (Avg. Vascular / Avg. Non-Vascular)	43.7 / 5.3
Species At Risk / Species of Conservation Concern	*Poa saltuensis; S2S3 and Scirpus cyperinus; S2S3*

Photo 22 Wet Coniferous Forest Ecotype – OverView

Photo 23 Wet Coniferous Forest Ecotype – Vegetation

Photo 24 Wet Coniferous Forest Ecotype –Soil Profile

Rarity

No plants under the protection of SARA or the NL ESA have been identified from this ecotype; however, two regionally uncommon graminoids, cottongrass bulrush; ranked *S2S3* by the AC CDC and forest bluegrass; ranked *S2S3* were recorded within the Wet Coniferous Forest ecotype.

Disturbance and Succession Ecology

These sites are relatively stable. Fire frequency is low, and fire severity is low owing to their position in moist areas of low relief. As a result, the dominant natural disturbance associated with Coniferous Treed Wetland ecotypes are seasonal and yearly water level fluctuations, the quality and quantity of which is crucial to the maintenance of the wetland. Seasonally, water levels tend to be highest during the winter and spring and lowest in late summer and early fall.

Wet Coniferous Forest ecotypes are considered edaphic climax communities limited by excessive soil moisture and low soil fertility. Disturbance regimes, including fluctuating water tables, fire, insects and disease, can result in a range of successional stages depending on frequency and intensity.

6.2.3.2 CNF Ecotype 09: Shrub / Graminoid Fen

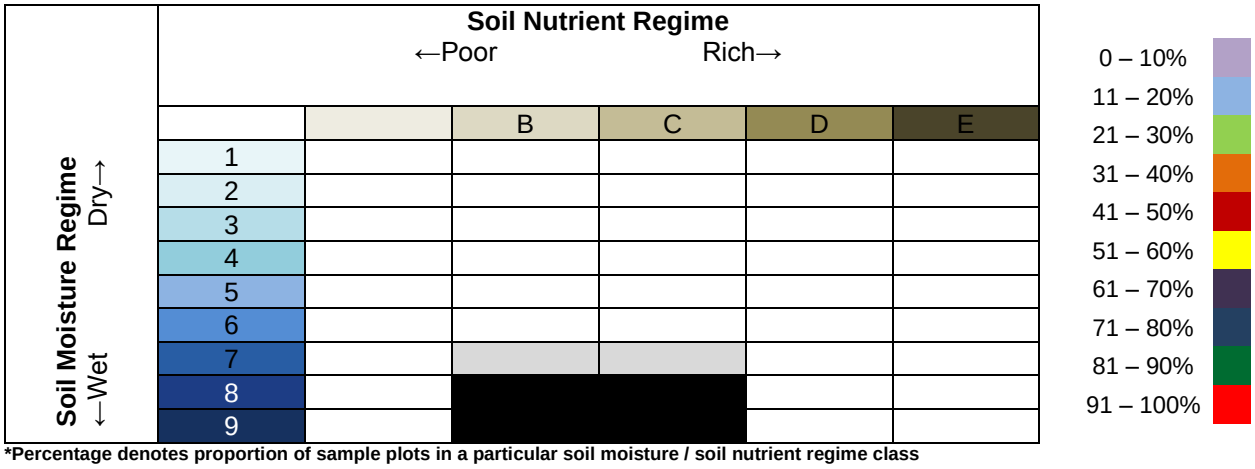
General Site Description

Shrub / Graminoid Fen (SF) ecotypes typically occur on flat areas or poorly-drained, peat-filled depressions (basins), on neutral to moderately alkaline substrates classed as organic (either as well-decomposed organic material or as floating mats of organic material held together by live plant roots and rhizomes), overlying bedrock and morainal (till) deposits. The overall topography is flat to gently undulating with micro-topography characterized by hummocks and hollows. This ecotype tends to be more common of the wetlands (peatlands) observed in the Study Area, often occurring in association with other adjacent wetland types as a gradient between fresh to moist bedrock-controlled uplands and wetted lowland areas.

The open fens of the Study Area are characterized by a lack of tree cover, a diffuse tall shrub strata (if present) and a prominent cover of low-lying shrubs, herbs and mosses. Sweet gale is typically the most abundant shrub within these fens, but Michaux's dwarf birch (*Betula michauxii*) and shrubby cinquefoil (*Dasiphora fruticosa*) are also prominent, along with lesser amounts of tamarack, black spruce and purple chokeberry (*Photinia* spp.). Scattered tamarack often characterizes a very diffuse tall shrub stratum. Graminoids dominating the herbaceous layer include deergrass, white beakrush (*Rhynchospora alba*), few-seeded sedge and Pickering's reedgrass (*Calamagrostis pickeringii*) considered common. Other typical components of the herbaceous layer for the Shrub / Graminoid Fen ecotype include bottlebrush (*Sanguisorba canadensis*), coast sedge (*Carex exilis*) and bog goldenrod (*Solidago uliginosa*). Peatmoss provides the dominant bryophyte coverage within this ecotype, but more upland associated species are present in association with hummocks and scattered occurrences of other species are also present. The fens within the Study Area are typically nutrient-poor and their vegetation

closely resembles that present within the Shrub Bog ecotype. However, the fens are distinguished based on the presence and abundance of species that are indicative of nutrient enrichment, including both shrubs and herbs such as Michaux's dwarf birch, shrubby cinquefoil, bottlebrush, balsam groundsel (*Packera paupercula*) and Michaux's sedge (*Carex michauxiana*).

Organic soils associated with this ecotype are mainly Mesisols, dominated by organic layers in a moderate stage of decomposition (Om horizons). Organic soils may grade into mineral Gleysols at the edges of these wetlands. Drainage is usually poor to very poor, but is imperfect on transitional sites. Potential rooting depth is usually shallow due to high water levels. Humus forms are dominated by Fibrimors and Mesimors on wet sites and by Hemimors on imperfectly drained sites. The water table is usually at or near the surface, particularly in hollows / pools between peat ridges. The ecotype is generally nutrient-poor to -medium, with a hygric to hydric soil moisture regime (Figure 6.11). Site productivity is typically poor.



***Percentage denotes proportion of sample plots in a particular soil moisture / soil nutrient regime class**

Figure 6-11 Edatopic Grid for Shrub / Graminoid Fen Ecotype

The combined Shrub / Graminoid Fen and Shrub Bog wetland map units occupy approximately 15% (280.3 km^2) of the Study Area (Table 6.1).

Environmental Information

A summary of the environmental information is provided in Table 6.13.

Table 6.13 Summary of Ecological Condition for Shrub / Graminoid Fen Ecotype

Shrub / Graminoid Fen Ecotype	
Site Information	
Ecoregion	Central Newfoundland
Ecotype	Shrub / Graminoid Fen Ecotype
Model Classification	Non-Treed Wetland
Map Unit	SF
Damman Forest Site Classification Equivalent	N/A
General Location	Ecotype is widespread and floristically consistent across the boreal range, often occupying poorly drained, wetted depressions, underlain by peat and/or coarse textured morainal parent materials.
Number of Sample Plots (n)	n=14
Inventory Numbers	G5, G7, G8, G19, G29, G30, V1, V5, V12, V22, V25, V30, V32, V36
Total Area (km^2)	280.3
Percentage of Study Area (%)	15.3
Site Characteristics	
Surface Expression	Flat (level); Depressional
Slope Position	Level, Depression
Slope	<2%
Aspect	None
Soil Nutrient Regime	Typically classed as having Poor (B) or Poor (B) to Medium (C) nutrient status.
Soil Moisture Regime	Hygric (6) to Hydric (8)
Successional Status	Edaphic Climax
Structural Stage	Shrub/Herb (SH)
Soil Characteristics	
Organic Thickness / LFH Thickness (cm)	40-160+
Humus Form	Fibrimors; Mesimors
Surface (Topsoil) Texture	Fibric; Mesic
Average Topsoil Thickness (cm)	N/A
Seepage	N/A
Drainage	Poor to Very Poor
Depth to Water Table (cm)	0-20
Depth to Mottles / Gleying (cm)	Variable
Effective Texture	N/A

Shrub / Graminoid Fen Ecotype	
Effective Rooting Depth (cm)	0 to 20
Coarse Fragment Percent (%) and Type	N/A
Depth to Bedrock (cm)	40-160
Parent Material	Organic, Morainal (Till)
Soil Classification (CSSC)	Terric Fibrisol; Terric Mesisol; extending to Typic Fibrisols and Typic Mesisols where topography has led to the development of thick organics deposits.
Vegetation	
Dominant Tree Species	N/A
Dominant Shrub Species	*Myrica gale, Betula michauxii, Dasiphora fruticosa*
Dominant Herb Species	*Trichophorum caespitosum, Rhynchospora alba, Carex oligosperma*
Dominant Mosses, Liverwort, Lichen Species	*Sphagnum* spp.
Dominant Aquatic / Wetland Species	*Myrica gale, Betula michauxii, Dasiphora fruticosa*
Plant Indicator Species	*Dasiphora fruticosa, Betula michauxii, Sanguisorba canadensis*
Plant Species Richness (Avg. Vascular / Avg. Non-Vascular)	34.3 / 5.0
Species At Risk / Species of Conservation Concern	None encountered

Photo 25 Shrub / Graminoid Fen Ecotype – Ground View

Photo 26 Shrub / Graminoid Fen Ecotype – Typical Vegetation

Photo 27 Shrub / Graminoid Fen Ecotype – Typical Soil Profile

Rarity

No plants under the protection of SARA or the NL ESA or ranked as SH, S1, or S2 by the AC CDC have been identified from this ecotype.

Disturbance and Succession Ecology

These sites are relatively stable. Fire frequency is low, and fire severity is low owing to their position in moist areas of low relief. As a result, the dominant natural disturbance associated with Shrub / Graminoid Fen ecotypes are seasonal and yearly water level fluctuations, the quality and quantity of which is crucial to the maintenance of the fen. Seasonally, water levels tend to be highest during the winter and spring and lowest in late summer and early fall.

The Shrub / Graminoid Fen ecotypes are considered to be primarily edaphic climax communities limited by excessive soil moisture and low soil fertility. Repeated disturbances, including fluctuating water tables, fire, insects and disease, though uncommon, could maintain these ecotypes in this early successional state, provided the regenerative capacity of the shrub layer was maintained. In the absence of disturbance, paludification may convert some fen types to that of bog communities over time. Sphagnum patches and associated bog vegetation in the fens may be early signs of paludification.

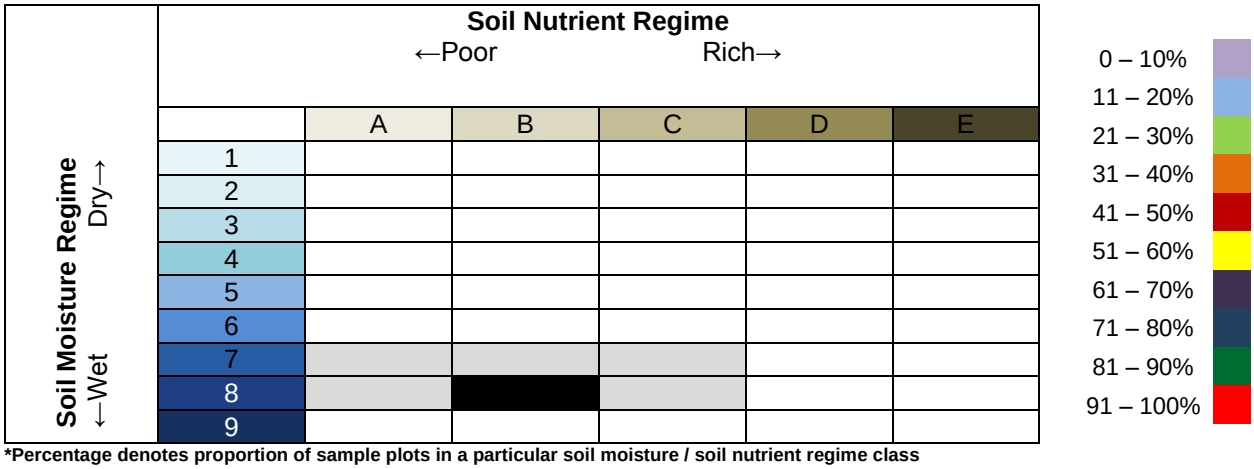
6.2.3.3 CNF Ecotype 11: Shrub Bog

General Site Description

Shrub Bog (SB) ecotypes typically occur on flat areas or poorly drained, peat-filled depressions (basins), on neutral to moderately acidic substrates classed as organic (either as well-decomposed organic material or as floating mats of organic material held together by live plant roots and rhizomes), overlying bedrock and morainal (till) deposits. The overall topography is flat to gently undulating, with micro-topography characterized by hummocks and hollows. This ecotype often occurs in association with other adjacent wetland types as a gradient between fresh to moist bedrock-controlled uplands and wetted lowland areas.

Open shrub bogs of the Study Area are characterized by a lack of tree and tall shrub strata, but well-developed low and dwarf shrub layer intermixed with herbaceous species. This is considered indicative of acidic wetland conditions. A prominent cover of peatmoss and lichens also occurs here. Low shrub cover is primarily provided by sheep-laurel and leatherleaf, with other common species including black spruce, bog rosemary (*Andromeda polifolia*), rhodora, black chokeberry (*Photinia melanocarpa*), black crowberry, northern blueberry (*Vaccinium boreale*), common Labrador tea, and Bog Laurel (*Kalmia polifolia*). Herbaceous cover is mostly provided by graminoids, with deergrass being particularly abundant and coast sedge and white beakrush also being important components. Although of minor abundance, other commonly occurring herbaceous plants include northern pitcher-plant and roundleaf sundew (*Drosera rotundifolia*). Peatmoss forms a prominent carpet throughout much of the extent of this ecotype and feathermosses occupy the drier hummocks. Reindeer lichens are a distinct component of this wetland type, with gray reindeer lichen and green reindeer lichen being particularly abundant. Other species of lichen are scattered throughout and may be dominant in discrete patches, including *Cladonia* lichens and species belonging to the genus *Cetraria*. Although the Shrub Bog ecotype is of similar vegetation structure and composition to that of open fens of the Study Area, bogs are differentiated by the lack or low abundance of species that are indicative of nutrient enrichment and a higher occurrence of those associated with acidic wetland conditions, such as sheep-laurel, leatherleaf, black spruce, and blueberry (*Vaccinium* spp.). Furthermore, the Shrub Bog ecotype has a high prominence of vegetation that reflects the drier surface conditions (e.g., such as the prominence of ground lichens) that are typically associated with this wetland class compared to fens.

Organic soils associated with this ecotype are mainly Mesisols, dominated by organic layers in a moderate stage of decomposition (Om horizons). Organic soils may grade into mineral Gleysols at the edges of these wetlands. Drainage is usually poor to very poor, but is imperfect on transitional sites. Potential rooting depth is usually shallow due to high water levels. Humus forms are dominated by Fibrimors and Mesimors on wet sites and by Hemimors on imperfectly drained sites. The water table is usually at or near the surface, particularly in hollows / pools between peat ridges. The ecotype is generally nutrient-poor to -medium, with a hygric to hydric soil moisture regime (Figure 6.12). Site productivity is typically poor.



***Percentage denotes proportion of sample plots in a particular soil moisture / soil nutrient regime class**

Figure 6-12 Edatopic Grid for Shrub Bog Ecotype

The combined Shrub / Graminoid Fen and Shrub Bog wetland map units occupy approximately 15% (280.3 km^2) of the Study Area (Table 6.1).

Environmental Information

A summary of the environmental information is provided in Table 6.14.

Table 6.14 Summary of Ecological Condition for Shrub Bog Ecotype

Shrub Bog Ecotype	
Site Information	
Ecoregion	Central Newfoundland
Ecotype	Shrub Bog Ecotype
Model Classification	Non-Treed Wetland
Map Unit	SB
Damman Forest Site Classification Equivalent	N/A

Shrub Bog Ecotype	
General Location	Ecotype is widespread and floristically consistent across the boreal range, often occupying poorly drained, wetted depressions, underlain by peat and/or coarse textured morainal parent materials.
Number of Sample Plots (n)	n=14 (combined with Shrub / Graminoid Fen)
Inventory Numbers	G5, G7, G8, G19, G29, G30, V1, V5, V12, V22, V25, V30, V32, V36
Total Area (km^2)	280.3
Percentage of Study Area (%)	15.3
Site Characteristics	
Surface Expression	Flat (level); Depressional
Slope Position	Level, Depression
Slope	<2%
Aspect	None
Soil Nutrient Regime	Typically classed as having Poor (B) to Medium (C)
Soil Moisture Regime	Hygric (6) to Hydric (8)
Successional Status	Edaphic Climax
Structural Stage	Shrub / Herb (SH)
Soil Characteristics	
Organic Thickness / LFH Thickness (cm)	40-160+
Humus Form	Fibrimors; Mesimors
Surface (Topsoil) Texture	Fibric; Mesic
Average Topsoil Thickness (cm)	N/A
Seepage	N/A
Drainage	Poor to Very Poor
Depth to Water Table (cm)	Near surface
Depth to Mottles / Gleying (cm)	Yes
Effective Texture	N/A
Effective Rooting Depth (cm)	0 to 20
Coarse Fragment Percent (%) and Type	N/A
Depth to Bedrock (cm)	40-160
Parent Material	Organic, Morainal (Till)
Soil Classification (CSSC)	Terric Fibrisol; Terric Mesisol; extending to Typic Fibrisols and Typic Mesisols where topography has led to the development of thick organics deposits.
Vegetation	
Dominant Tree Species	N/A

Shrub Bog Ecotype	
Dominant Shrub Species	*Kalmia angustifolia, Chamaedaphne calyculata*
Dominant Herb Species	*Trichophorum caespitosum, Carex exilis, Rhynchospora alba*
Dominant Mosses, Liverwort, Lichen Species	*Sphagnum spp., Cladina rangiferina, Cladina mitis*
Dominant Aquatic / Wetland Species	*Chamaedaphne calyculata, Andromeda polifolia, Trichophorum caespitosum, Sphagnum spp.*
Plant Indicator Species	*Chamaedaphne calyculata, Carex exilis, Rhynchospora alba*
Plant Species Richness (Avg. Vascular / Avg. Non-Vascular)	31.0 / 7.0
Species At Risk / Species of Conservation Concern	None encountered.

Photo 28 Shrub Bog Ecotype – Ground View

Photo 29 Shrub Bog Ecotype – Typical Vegetation

Photo 30 Shrub Bog Ecotype – Typical Soil Profile

Rarity

No plants under the protection of SARA or the NL ESA or ranked as SH, S1, or S2 by the AC CDC have been identified from this ecotype.

Disturbance and Succession Ecology

These sites are relatively stable. Fire frequency is low, and fire severity is low owing to their position in moist areas of low relief. The Shrub Bog ecotypes are considered to be primarily edaphic climax communities limited by excessive soil moisture and low soil fertility.

6.2.4 Sparsely Vegetated, Naturally Non-Vegetated and Anthropogenically Altered / Disturbed Ecosystem Units

A number of sparsely vegetated, naturally non-vegetated and/or anthropogenic ecosystem units were also mapped.

6.2.4.1 CNF 12 Ecosystem Unit: Exposed Sand / Gravel Shoreline (ES)

The Exposed Sand / Gravel Shoreline ecosystem unit occupies <1% (2.8 km^2) of the Study Area.

The ES ecotype is characterized by natural areas with less than 20% vegetative cover, mostly elongated landforms generated by waves and currents and usually running parallel to the shore. It is composed of unconsolidated small, rounded cobbles, pebbles, stones and sand. This unit was primarily associated with distinct shorelines of Red Indian and Victoria Lakes, where the artificial basin created by the impoundment of water behind a human-made structure such as a dam, berm, dyke or wall and control of water within this impoundment has exposed the sandy or gravelly shoreline. Occurring in very specific geographies with limited extent throughout the Study Area, these units are typically small in scale. Where sediments occur close to the modern shoreline of the aforementioned systems, there is little or no vegetation due to the erosive action of the river and/or waves. Walking inland reveals evidence of early plant succession. Gradually, dwarf ericaceous shrubs, lichens and mosses become established. Dust, sand and plant material including seeds and spores collects, and eventually a soil sufficient to support a more consistent cover of rooted plants begins to develop. They tend to support a very sparse cover of willows, grasses, sedges and horsetails, as well as a small assortment of forbs.

6.2.4.2 CNF 13 Ecosystem Unit: Open Water (OW)

The Open Water Ecosystem Unit includes lakes, ponds and rivers across the Study Area. Lakes are defined as naturally occurring static bodies of water, greater than 2 m deep in some portion. The boundary for the lake is the natural high water mark. A pond is a small body of water greater than 2 m deep, but not large enough to be classified as a lake (e.g., less than 50 ha). Rivers include any watercourse formed when water flows between continuous, definable banks. The

flow may be intermittent or perennial. An area that has an ephemeral flow and no channel with definable banks is not considered a river.

The Open Water Ecosystem Unit occupies approximately 22% (408.5 km^2) of the Study Area, the largest areal extent covered by any ecosystem unit.

6.2.4.3 CNF 14 Ecosystem Unit: Anthropogenic (AN)

This ecosystem unit includes any area of exposed soil that is not included in any of the other definitions. It includes areas of recent disturbance, such as slumping, mass wasting, flooding and anthropogenic disturbances (e.g., access roads used for exploration drilling, borrow pits), where vegetation cover is <5% or absent entirely. This ecosystem unit occupies <1% (8.2 km^2) of the Study Area.

Vegetation cover within the Anthropogenic ecosystem unit is typically limited as much of these areas are subject to frequent disturbance. Where the frequency and intensity of disturbances allow (e.g., along the margins or roads), native and exotic ruderal herbs provide some ground cover, with commonly occurring species including rough bentgrass (*Agrostis scabra*), poverty Oatgrass (*Danthonia spicata*), pearly everlasting (*Anaphalis margaritacea*), flat-top fragrant-golden-rod (*Euthamia graminifolia*) and low hop clover (*Trifolium campestre*). Although dominated by exposed substrates, minor amounts of remnant vegetation are sometimes present within sites recently disturbed by human activities (e.g., mining scrapes). Conversely, areas that once supported intense anthropogenic land uses that have ceased may support a well-developed regenerating plant community. For example, green alder may form a dense shrub layer on previously disturbed sites and facilitate succession to more mature plant communities. Habitats that are at more advanced stages of successional development following cessation of human activities may support a variety of shrubs, herbs and non-vascular species that are indicative of the soil conditions in less altered environments.

6.2.5 Accuracy Assessment

An accuracy assessment was performed as part of the quality assurance / quality control review of vegetation mapping for the Project ELC. The map accuracy was assessed by comparing the mapped vegetation type to the field-verified vegetation type at various points (chosen prior to field work) to represent the full range of map classes in the Study Area in a statistically valid manner. Accuracy was calculated for each individual map unit as well as for all map units combined.

The accuracy assessment quantifies data quality so that map users may evaluate the utility of a thematic map for its intended applications. The thematic accuracy of the Project ELC was assessed by comparing the vegetation type (ecotype / subtype) shown on the map to that identified on the ground for a representative sample (totaling 162) of evaluation points. When polygons representing vegetation types are mapped and labelled with the correct community types, then the map has "high" thematic accuracy.

The accuracy assessment for the Project ELC was completed using 162 reference points. A total of 136 reference points were in situ field samples collected in the field (Original ELC Survey[2014]: 74 points; Accuracy Assessment [2015]: 62) as a result of ground-truthing (points accurate to +/- 10 m using Garmin GPS Map 76CSx technology). Twenty-six points were identified from an independent assessment (desktop) of existing aerial imagery in an effort to account for those classes (i.e., Open Water, Exposed Sand / Gravel Shoreline, Riparian Thicket) not sampled in the field. The accuracy estimates using only high confidence sites are reported in Table 6.15. Over the entire Study Area, high confidence sites represent 83% of all sample sites, and the proportion of high confidence sites is approximately the same for all classes.

The output classification was analyzed and an accuracy assessment performed. Classification error matrices were generated to quantify the results of the assessment and to provide overall accuracy for the classification. Table 6.15 depicts the confusion matrix prepared based on observations and ground-truthing information gathered in September 2014.

Table 6.15 Confusion (Error) Matrix for Data Accuracy

Land Cover Class	Reference Data												Total	User's Accuracy (%)
	Shrub Fen / Shrub Bog	Regenerating Forest	Mixedwood Forest	Alder Thicket	Balsam Fir Forest	Black Spruce Forest	Kalmia-Black Spruce Woodland	Wet Coniferous	Riparian Thicket	Exposed Sand / Gravel Shoreline	Anthropogenic	Water		
Shrub Fen / Shrub Bog	29		1	1		2	1						**34**	**85**
Regenerating Forest	1	5											**6**	**83**
Mixedwood Forest		1	15	1	2								**19**	**79**
Alder Thicket				16									**16**	**100**
Balsam Fir Forest					15	4							**19**	**79**
Black Spruce Forest			2	1	2	14	1						**20**	**70**
Kalmia-Black Spruce Woodland	1			1		1	6				1		**10**	**60**
Wet Coniferous								12					**12**	**100**
Riparian Thicket								2	5				**7**	**71**
Exposed Sand / Gravel Shoreline	1									4			**5**	**80**
Anthropogenic											9		**9**	**100**
Water												5	**5**	**100**
Total Points Per Class	**32**	**6**	**18**	**20**	**19**	**21**	**8**	**14**	**5**	**4**	**10**	**5**	**135**	
Producer's Accuracy (%)	**91**	**83**	**83**	**80**	**79**	**67**	**75**	**86**	**100**	**100**	**90**	**100**		
Overall Accuracy (% Correct)														**83**

Overall or total classification accuracy is typically computed by dividing the total number of correctly classified pixels (i.e., the sum of the elements along the major diagonal) by the total number of reference pixels. When completed for the Project ELC, the Overall Accuracy for the habitat classification is 83%. Ultimately, this means that if 100 reference points were evaluated, 83 would be classified correctly through the classification procedure, and thus, if a pixel is selected at random, there is a 83% chance that that pixel is classified correctly.

Accuracy estimates may vary greatly among the 12 individual classes. When either user's or producer's accuracy is considered, results are low or moderately low for two identified classes; Black Spruce Forest and Kalmia-Black Spruce Woodland have the lowest class accuracy with 70% and 60% user's accuracy, respectively. It is important to understand what factors may have contributed to the low results. These factors may be attributed to variation in tree height, density and growth stage, resulting in a similar spectral response and thus misclassification of the ecotype class. Additionally, depending on the dates of the image data, the presence and optical properties of groundwater can affect whether the land cover is classified as woody wetland or forest, as suggested by confusions in Table 6.15.

The Project ELC mapping is conducted over a very large area with a relatively large number of land cover / vegetation type classes. Some of the land cover classes (such as the Black Spruce Forest and Kalmia-Black Spruce Woodland classes) are very similar spectrally, posing a challenge to both the mapping and photointerpretation during accuracy assessment. Given these conditions, the overall and class-specific accuracy estimates for the Project ELC are generally satisfactory. Most misclassification errors occur along edges of heterogeneous land-cover a majority of the confusion is between related land-cover classes.

6.2.6 Summary

6.2.6.1 Plant Species Richness

A total of 224 plant taxa were recorded during surveys conducted in support of the ELC. Of these, 198 were vascular plants, 19 were mosses / liverworts and seven were lichens. The most prevalent tree species were balsam fir, black spruce and paper birch, with small amounts of red maple (*Acer rubrum*), tamarack and white spruce also recorded. Although not recorded within survey plots, trembling aspen was also observed in small patches of the Study Area. A complete list of the flora identified during surveys is provided in Appendix C.

Ecotype units varied considerably with respect to their species richness. The highest vascular plant species richness was associated with the Wet Coniferous Forests, with an average of approximately 44 species / plot. The Black Spruce Forest and Graminoid / Shrub Fen ecotype units also had relatively high vascular plant diversity, with 35 and 34 species / plot, respectively. The Balsam Fir Forest ecotype obtained the lowest measure of species richness, with <16 species / plot. The average richness amongst the ecotypes was 29 species / plot. In general, data indicate that wetland and poorly drained ecotype units had a higher richness of vascular plants than did sites with more mature forest cover or ecotypes associated with dry soil conditions. Due

to difficulties inherent in non-vascular plant identification, only the most dominant mosses and lichens were identified to species or genus level. As such, calculated values for average non-vascular species richness are not reliable indicators of the diversity of bryophyte of lichen communities within ecotypes.

6.2.6.2 Species at Risk / Species of Conservation Concern

The population statuses of all species of flora and fauna encountered during the ELC surveys were determined through a review of the species status reports prepared by NLDEC (2014), AC CDC (2010), COSEWIC (2014) and NL ESA (2007). No federally or provincially designated "at risk" flora species were found to be present in the Study Area; several SOCC were present, all of which are graminoids. These include short-scale sedge, perennial bentgrass, forest bluegrass and cottongrass bulrush. Two federally and provincially listed (*threatened*) faunal species were detected during the breeding songbird point count survey in June 2011: Olive-sided Flycatcher (*Contopus cooperi*) (COSEWIC 2007; and Common Nighthawk (*Chordeiles minor*) (COSEWIC 2007) (Stantec 2014).

The population of short-scale sedge within Newfoundland is ranked as *S1S2* by the AC CDC and has a general status rank of *may be at risk* (AC CDC 2010). Although these designations indicate that it is considered rare within the province, its population at the national and global level is secure, being identified as *N5* and *G5T5*, respectively. Short-scale sedge was observed at two locations within the Alder Thicket ecotype, where it was present in trace amounts. This species is generally observed from forested settings (Gleason and Cronquist 1991) and historical records indicate that it is known to occur in Central Newfoundland (Flora of North America Association 2008).

Perennial bentgrass is ranked as *S2* by the AC CDC and its population on the Island of Newfoundland is considered *may be at risk* (AC CDC 2010). It is widespread and common in eastern North America. At the global and national level, it is considered common, widespread and abundant and has been assigned statuses of *G5* and *N5*, respectively. Records for this species are available throughout western, northern and eastern Newfoundland, but are relatively absent from more central parts of the Island's interior (Flora of North America Association 2008). Perennial bentgrass is known to grow in association with a variety of habitats, including roadsides, fields, fens, woodlands and periodically inundated stream banks (Flora of North America Association 2008). It was observed at one site within the Alder Thicket ecotype, located within the riparian zone of Victoria River.

The Newfoundland population of forest bluegrass is ranked *S2S3* by the AC CDC and is considered *sensitive* (AC CDC 2010). Its global population is considered secure (*G5*) and its national population as apparently secure (*N4?*). This species has been recorded throughout much of the western portion of Newfoundland and is generally described as being found in association with woodlands (Flora of North America Association 2008). Forest bluegrass was

recorded at three sites during field surveys, two of which have been classified as the Wet Coniferous Forest ecotype and one Mixedwood Forest.

Cottongrass bulrush is ranked *S2S3* by the AC CDC and sensitive on the Island of Newfoundland (AC CDC 2010), but is considered to have a secure population at the national and global scale (i.e., ranked *G5* and *N5*, respectively). This species is noted as being extremely variable throughout its range, where it is frequently found growing in association with a variety of disturbed areas, marshes, moist meadows, ditches and shallow ponds (Flora of North America Association 2008). Data indicate that it is known to occur in Central Newfoundland (Flora of North America Association 2008). Cottongrass bulrush was recorded at seven locations; including within the Wet Coniferous Forest (one), Riparian Thicket (one), Regenerating Forest (two), Balsam Fir Forest (one), and Alder Thicket (two) ecotypes during field surveys in support of the ELC. This species was also observed at several other locations within the Study Area, primarily in imperfectly drained portions of regenerating cut blocks, where it often formed relatively large swards.

6.3 Wildlife & Wildlife Habitat

6.3.1 Incidental Wildlife Observations

A total of seven mammal species were observed during delivery of the ELC survey. Visually recorded species included moose, woodland caribou), Canada lynx, eastern coyote (*Canis latrans*), red fox (*Vulpes vulpes*), snowshoe hare (*Lepus americanus*) and American red squirrel (*Tamiasciurus hudsonicus*). Species most frequently encountered were moose, woodland caribou, snowshoe hare and American red squirrel. In addition, there were indications (i.e., wildlife sign, including but not limited to, tracks, scat, markings, feeding activity, kill sites, bedding and nests and lodges and dams) of several more species, including, muskrat (*Ondatra zibethicus*), river otter (*Lontra canadensis*), red-backed vole (*Myodes* rutilus) and meadow vole (*Microtus pennsylvanicus*). Black bear (*Ursus americanus*) and two other predator species - ermine (*Mustela erminea*) and mink (*Neovison vison*), as well as Newfoundland marten, are known to occur in the Study Area, but were not confirmed during 2014 ELC field survey. Newfoundland marten, Newfoundland population, is protected under SARA; designated Threatened in April 2007, and listed as Threatened under the NL ESA. Evidence of beaver (*Castor canadensis*) activity including dams, lodges, stumps and cutting, as expected, were recorded along some small rivers and streams, and while no individual animals were observed, this species is believed to occur throughout the Study Area, where suitable habitat exists (i.e., habitat with a permanent water supply). No other mammal species listed under SARA or the NL ESA were encountered.

The number and composition of avifauna encountered was typical of what may be expected, based on the experience of the field team, the seasonal timing and available habitat in the region of the Study Area. There were 21 species observed during the survey. The list includes raptors, passerines, waterfowl / waterbirds and upland game birds.

Observations of raptors in the Study Area consisted mainly of Bald Eagle (*Haliaeetus leucocephalus*), Osprey (*Pandion haliaetus*) and Boreal Owl (*Aegolius funereus*). Other species previously observed (Stantec 2011) or likely to occur in the Study Area include Merlin (*Falco columbarius*), Northern Harrier (*Circus cyaneus*), Northern Goshawk (*Accipiter gentilis*), Sharp-shinned Hawk (*Accipiter striatus*), American Kestrel (*Falco tinnunculus*), Great-horned Owl (*Bubo virginianus*) and Short-eared Owl (*Asio flammeus*), where suitable habitats occur (Gosse and Montevecchi 2000).

Twelve forest songbird (passerines) species were detected during the 2014 ELC survey. Songbird species recorded during and in the course of delivering the ELC survey include: American Robin (*Turdus migratorius*), Black-capped Chickadee (*Poecile atricapillus*), Boreal Chickadee (*Poecile hudsonicus*), Black-and-white Warbler (*Mniotilta varia*), Black-throated Green Warbler (*Setophaga virens*), Common Yellowthroat (*Geothlypis trichas*), Dark-eyed Junco (*Junco hyemalis*), Red-breasted Nuthatch (*Sitta canadensis*), Lincoln's Sparrow (*Melospiza lincolnii*), Ovenbird (*Seiurus aurocapilla*), Song Sparrow (*Melospiza melodia*), and White-crowned Sparrow (*Zonotrichia leucophrys*). Thirty-eight avian species were identified during the breeding songbird point count survey in June 2011. The most common species recorded were White-throated Sparrow (*Zonotrichia albicollis*), Ruby-crowned Kinglet (*Regulus calendula*), Swainson's Thrush (*Catharus ustulatus*) and Yellow-bellied Flycatcher (*Empidonax flaviventris*) (Stantec 2014).

Other songbird species that could occur in the Study Area include: Alder Flycatcher (*Empidonax alnorum*), American Goldfinch, (*Spinus tristis*), American Redstart (*Setophaga ruticilla*), Blackpoll Warbler (*Dendroica striata*), Fox Sparrow (*Passerella iliaca*), Golden-crowned Kinglet (*Regulus satrapa*), Gray-cheeked Thrush (*Catharus minimus*), Hermit Thrush (*Catharus guttatus*), Least Flycatcher (*Empidonax minimus*), Mourning Warbler (*Oporornis philadelphia*), Nashville Warbler (*Vermivora ruficapilla*), Olive-sided Flycatcher, Palm Warbler (*Dendroica palmarum*), Pine Grosbeak (*Pinacola enucleator*), Pine Sisken (*Spinus pinus*), Ruby-crowned Kinglet, Rusty Blackbird (*Euphagus carolinus*), Red Crossbill (*Loxia curvirostra*), Swamp Sparrow (*Melospiza georgiana*), Swainson's Thrush, Tree Swallow (*Tachycineta bicolor*), White-throated Sparrow, Yellow-rumped Warbler (*Dendroica coronata*), and Yellow-bellied Flycatcher (Stantec 2014).

Several woodpecker species were also recorded, including Northern Flicker (*Colaptes auratus*), Yellow-shafted Flicker (*Colaptes auratus*) and Black-backed Woodpecker (*Picoides arcticus*). Those species with potential to occur include Downy Woodpecker (*Picoides pubescens*), Pileated Woodpecker (*Dryocopus pile*atus), and Yellow-bellied Sapsucker (*Sphyrapicus varius*).

Additional avifauna species such as American Crow (*Corvus brachyrhynchos*), Gray Jay (*Perisoreus canadensis*) and Belted Kingfisher (*Megaceryle alcyon*) were also detected but not included above as they are not forest songbirds (i.e., family Corvidae).

Upland game bird species Ruffed Grouse (*Bonasa umbellus*) and Spruce Grouse (*Falcipennis canadensis*) were distributed throughout the Study Area, while Willow Ptarmigan (*Lagopus*

lagopus) (also known as "partridge") were restricted to barren areas in open habitats characterized by low conifers and dwarf shrubs (e.g., blueberries and crowberries).

A small number of waterfowl / waterbirds were also recorded, including American Black Duck (*Anas rubripes*) and Common Loon (*Gavia immer*). Common Merganser (*Mergus merganser*), Common Goldeneye (*Bucephala clangula*), Green-winged Teal (*Anas carolinensis*) and Common Eider (*Somateria mollissima*) are also possible in open water habitats. An abundance of Canada Goose (*Branta canadensis*)during the Fall season (coinciding with fall migration for many species) would not be unexpected, given the many shrub wetlands, bogs, fens, smaller waterbodies and large lakes that provide favourable nesting habitat for geese (Mowbray et al. 2002). Shorebirds including sandpipers, phalaropes and snipe may occupy lowland habitats throughout the Study Area. Observations of Killdeer (*Charadrius vociferus*), Wilson's Snipe (*Gallinago delicata*) and Greater Yellowlegs (*Tringa melanoleuca*) were noted from within the Study Area.

A complete list of wildlife species identified during the surveys is provided in Appendix F.

6.3.1.1 Wildlife Species at Risk and/or Species of Conservation Concern

Species at Risk (i.e., listed under Schedule 1 of SARA or listed under the NL ESA and/or SOCC (i.e., listed as S1, S2 or S3 by AC CDC; listed as At Risk, May be at Risk, or Sensitive by NLDEC or by COSEWIC, but not listed under Schedule 1, have potential to occur in the region. Mammals species at risk with potential to occur in the Study Area include the Newfoundland population of American marten). Newfoundland marten are listed as *Threatened* and are protected both federally under SARA (COSEWIC 2007) and the NL ESA (Government of Newfoundland and Labrador 2004). Avifauna species at risk with potential to occur in the Study Area include Olive-sided Flycatcher, Gray-cheeked Thrush, Rusty Blackbird, Red Crossbill, Common Nighthawk, Short-eared Owl and Bank Swallow (*Riparia riparia*). Olive-sided Flycatcher is listed as "*Threatened*" under SARA, while Rusty Blackbird is listed as a "*Special Concern*" under SARA. Gray-cheeked Thrush is listed as "*Vulnerable*" under the NL ESA, but it has a recommended status of "*Threatened*" (Island of Newfoundland), due to population declines (SSAC 2010; Endangered Species and Advisory Committee Section 2010). Bank Swallow has been identified as a "species of interest" by provincial regulators. Potential habitat for Olive-sided Flycatcher included forested areas with tall, prominent snags. Potential habitat for Rusty Blackbird, and similarly that of Short-eared Owl, included relatively large, open fens with surrounding coniferous forest. Potential habitat for Red Crossbill included mature coniferous forest. Potential habitat for Common Nighthawk include logged or burned forest, woodland clearings, open forests and rock outcrops. Burrows associated with near-vertical, sandy embankments along large river systems may provide habitat for Bank Swallows.

Two federally and provincially listed (*threatened*) species were detected during earlier baseline studies conducted in the Study Area (Stantec 2013), including Olive-sided Flycatcher (COSEWIC 2007; SSAC 2009) and Common Nighthawk (COSEWIC 2007). The Olive-sided Flycatcher is listed

federally and provincially as "*threatened*" (COSEWIC 2007; SSAC 2009) and individuals were previously detected during point count surveys performed in the Study Area (Stantec 2014). These individuals were observed in habitat typically associated with this species (i.e., Wet Coniferous Forest (wetland edge), and in Balsam Fir - Black Spruce Forest. Olive-sided Flycatcher is found throughout the Island and southern Labrador. Common Nighthawk (*Chordeiles minor*) is listed both provincial and federally and provincially as "*threatened*" (COSEWIC 2007), with a single individual having been incidentally observed in roadside habitat during songbird surveys conducted in 2011. Within the province, this species is known to breed in southern Labrador, but is considered a rarity on the Island of Newfoundland.

Both the Olive-sided Flycatcher and Common Nighthawk are boreal forest birds. The provincial and federal listings for these two species result from habitat decline throughout their range. Most avifauna. particularly those associated with federal and/or provincial endangered species lists, will require a management plan to reduce and possibly eliminate potential disturbance to nest sites. Management plans for these two species in Newfoundland and Labrador are pending. Note that the inadvertent disturbance or loss of nest sites is referred to as incidental take, and requires discussion with Environment Canada before this can occur. Unique mitigation measures to avoid or minimize disturbance may also be required.

6.3.2 Wildlife Habitat Assessment

6.3.2.1 Habitat Availability

Eleven ecosystem units representing 14 ecotypes (13 natural and 1 anthropogenic) were identified within the Study Area (Table 6.1). A majority of the Study Area is characterized by lowland ecotypes comprised of the Open Wetland (15%) and Wet Coniferous Forest (7%), followed by upland ecotypes, Balsam Fir Forest (7) and Black Spruce Forest (13), and mixed coniferous types or Mixedwood Forest ecotypes (10%). Only a small proportion of the Study Area (<1.0%) was characterized by anthropogenic disturbances comprised of existing and historic mineral exploration and forestry activities. On a landscape level, upland communities (Balsam Fir Forest, Black Spruce Forest, Mixedwood Forest, Kalmia-Black Spruce Forest, Kalmia Heath, Regenerating Forest, Alder Thicket and Riparian Thicket ecotypes) occupy 56% of the Study Area; lowland communities (Wet Coniferous Forest, Shrub / Graminoid Fen and Shrub Bog ecotypes) occupy 22.0% and open water, 22%.

Lowland treed and shrub habitats were the most abundant habitat types in the Study Area. Treed bogs and fens, although generally known to support lower bird and mammal density and diversity compared to upland habitats, provide important habitat for woodland caribou (Stuart-Smith et al. 1997). Treed lowlands also provide habitat for Olive-sided Flycatcher. Lowland shrub habitats are also used by various large mammal species (e.g., moose, woodland caribou and black bear), and support many bird species including Rusty Blackbird, Short-eared Owl and Common Yellowthroat. Graminoid dominated fen habitat may contain several wetland bird

species of interest including Rusty Blackbird and Common Nighthawk. These areas often have standing water, and can be important habitat for water birds and amphibians alike.

Coniferous / Mixed coniferous and Mixedwood habitat were the second and third most abundant types, occupying 19.6% (385.1 ha) and 9.8% (179.3 ha) of the Study Area, respectively (Table 6.1). Mustelids such as marten and ermine may use the Coniferous / Mixed Coniferous habitat, particularly in areas of old growth. Although these sites do not support much songbird diversity, Olive-sided Flycatcher, Grey-cheeked Thrush and Black-throated Green Warbler may use stands comprised of mature balsam fir and black and white spruce. Mature mixed coniferous stands with reindeer lichen may also be used by woodland caribou, particularly those comprised of black spruce and balsam fir.

The majority of the Mixedwood habitat type is comprised of balsam fir-dominated white birch stands, although some spruce-dominated white birch stands. Species of interest include, but are not limited to, Northern Goshawk, Ruffed Grouse and Black-throated Green Warbler. Important mammalian species such as moose and black bear also use this habitat, as do marten, weasel and red squirrel during the denning season, in addition to many other small mammals. Bats, including the northern myotis (*Myotis septentrionalis*) and little brown myotis (*Myotis lucifugus*) (recently listed as *Endangered* under SARA; COSEWIC 2013), are also expected to roost in mature mixedwood forest

The remaining habitat types of Kalmia-Black Spruce Forest and Kalmia Heath, comprising approximately 11.4% (208.8 ha) of the Study Area combined (Table 6.1), may provide important winter forage for woodland caribou because of the presence of arboreal and ground lichens.

Existing anthropogenic disturbances accounted for less than 1% (8.2 ha) of the Study Area (Table 6.1).

6.3.2.2 Wildlife Habitat Assessment (Future Studies)

The following provides context to future studies, as required, in particular the assignment of wildlife habitat ratings for wildlife (i.e., mammals, birds, amphibians) in relation to the availability of ELC land cover classes found in the Study Area. Habitat ratings are selected due to the importance of identifying the current potential of each land cover class (i.e., ecotype or ecosystem unit) to provide the necessary life requisites (e.g., food, cover) or habitat attributes to support each species for a specified season. A combination of field sampling and cross-referencing to ecotype / ecosystem unit data may be used to derive the wildlife species and habitat ratings. This can be achieved for all ecosystem units and ecotypes in the Study Area.

Ranking the suitability of available habitat for each wildlife species involves the use of standard ecosystem mapping products that identify and spatially define habitat across an area of interest (RIC 1999). Because the land cover classes identified through ecosystem mapping for the Project represent relatively broad habitat types (i.e., coarse scale), a habitat association approach will likely be used to estimate habitat availability within the Study Area. Specifically,

each land cover class will be evaluated to determine whether it could provide suitable habitat using knowledge of seasonal habitat requirements for a select list of species. Ratings are assigned for each species based on assumptions made about the habitat requirements of these species. For mammals, year-round habitat requirements are typically considered to account for breeding habitat during the summer (includingdenning and foraging habitat) and overwintering habitat requirements (*e.g.*, denning sites). For migratory birds and raptors, the land cover classes are evaluated for suitable breeding habitat only (including nesting and foraging); migratory and winter habitat is not assessed. Habitat associations may be not assigned for some species, depending on their degree of association with specific habitat features and/or restrictions to their distribution within the province. Ratings of high, moderate and low value habitats for a select list of species are assigned.

High value habitat is defined as habitat that provides foraging, protection, nesting and resting habitat; Moderate habitat provides an abundance of one or more (or marginal amounts of all) of the critical elements; Low value habitat provides marginal foraging, protection or resting opportunities or may be used only during transit; and lastly Nil for those habitats possessing limited value to a species.

6.3.2.3 Key or Representative Wildlife Species Selected for Habitat Suitability

Habitat suitability models are developed for wildlife species selected because they represent at risk species (species at risk or SOCC in Newfoundland and Labrador), and/or of cultural, economic (e.g., furbearers, game species), and/or species of biological importance (e.g., possible indicators of ecosystem health). Habitat suitability models for the following species and seasonal attributes are anticipated: beaver; American marten - winter habitat; black bear - natal denning / hibernating habitat; moose - both spring / summer and early / late winter habitat; Canada lynx - both spring / summer and early / late winter habitat and woodland caribou - growing season (combined spring, summer, and fall) habitat.

American Beaver

Beaver select habitat with availability of preferred forage, which consists of aquatic vegetation and ericaceous shrubs in summer and alder (*Alnus* spp.) and birch (*Betula* spp.), aspen and other hardwoods in winter (Northcott 1971). Beavers are closely associated with streams, ponds and lakes that provide escape cover and den sites such as lodges or bank burrows (Allen 1983). High quality habitat for beaver in the Study Area includes Open Water, Open Wetlands (i.e., shrub bog ecotype), Wet Coniferous Forest and Riparian Thicket. Habitats for beaver in the Study Area deemed of Moderate quality include Wet Coniferous Forest, Regenerating Forests, Alder Thickets and Open Wetlands (i.e., shrub / graminoid fen ecotype). Low quality habitats include Balsam Fir-Black Spruce Forest and Kalmia- Black Spruce Woodland. Disturbed habitats characterized as Anthropogenic are typically avoided, providing no (NIL) habitat for beaver.

American Marten

Marten, on the Island of Newfoundland are a genetically and geographically distinct population of the American marten, and are restricted to three core habitats in Newfoundland. Five subpopulations are distributed among three core areas (near Main River, Terra Nova and west-central Newfoundland). The west-central Newfoundland population overlaps with or are adjacent to the Study Area.

The Little Grand Lake / Red Indian Lake Marten population encompasses a large area in west-central Newfoundland (6,232 km^2). Also included in this core area is a smaller core area just south of Sandy Lake with four adult marten locations documented between 1990 and 2007. To the south of the Little Grand Lake / Red Indian Lake core area is another small core area near Crabbes River. This core area contains an estimated 14 to 16 marten (Schmelzer 2008). The marten population in the Little Grand Lake / Red Indian Lake core area is estimated to be between 237 and 481 individuals (Schmelzer 2008). Critical habitat for the Newfoundland marten identified in the western portion of the island overlaps the Valentine Lake Study Area (The Newfoundland Marten Recovery Team 2010).

American marten require structural complexity of multistory mature coniferous forest (Smith and Schaefer 2002; Payer and Harrison 2003; Goose et al. 2005; Hearn et al. 2010). Forest structure complexity provides prey (such as red-backed voles (s.n.)) habitats, denning sites, thermoregulation, subnivean habitats and protection from predators (Andruskiw et al. 2008; Godbout and Ouellet 2010; McLaren et al. 2013). Marten in Newfoundland have a generalist foraging strategy; their diet varies seasonally with the availability of prey and berries. Habitat selection by marten generally depends on the availability of dense canopy forest patches within a matrix of bogs and scrub (Smith and Schaefer 2002). High quality habitat for American marten in the Study Area therefore includes mature to overmature Balsam Fir - Black Spruce Forest. Moderate quality habitats Black Spruce and Lichen Forest, Wet Conifer Forest, Kalmia- Black Spruce Woodland and Mixedwood Forest habitat types. The remaining habitat types are classified as low quality, based on the provision of limited foraging, protection and resting opportunities.

Black Bear

Black bear forage in various habitat types such as meadows, berry-dominated fields and bogs depending on the time of year (Pelton 1999). Dens are often constructed using existing blowdown or other coarse woody debris as the main structure, but crevices in rock formations are also used (Dennis et al. 1996). Black bear prefer areas with dense understory vegetation and spend the majority of their time in coniferous and deciduous forests, wetlands and areas remote from humans (Pelton 1999).

Spring / Summer

High quality habitat for black bear in the Study Area during the spring / early summer seasons includes Balsam Fir - Black Spruce Forest, Mixedwood Forest, Regenerating Forest, Open Wetland

(shrub bog ecotype), Wet Coniferous Forest, Riparian Thicket and Exposed Sand / Gravel Shoreline. Modertate quality habitats include Open Wetland (Shrub / Graminoid Fen ecotype), Regeneration, Open Water and Anthropogenic. These same habitats are preferred during late summer / fall.

Given that black bear are omnivorous and have opportunistic feeding behaviours, all habitats in the Study Area may be considered either high or moderate quality.

Canada Lynx

During winter, lynx select complex multistory mature coniferous stands providing prey (i.e., snowshoe hare) and cover, while summer and denning habitat selection also include some younger forests with complex multistory (Moen et al. 2008; Squires et al. 2010; Simons-Legaard et al. 2013). High quality habitat for lynx in the Study Area includes Balsam Fir - Black Spruce Forest (e.g., open spruce moss forest, closed spruce moss forest), Open Wetlands – Shrub Bog ecotype, Wet Coniferous Forest, Alder Thicket, Riparian Thicket, and Exposed Sand / Gravel Shoreline. Moderate quality habitats are Kalmia- Black Spruce Woodland, Mixedwood Forest, and Regenerating Forest. Low quality habitats for lynx are Open Water, Open Wetlands – Shrub / Graminoid Fen ecotype, Open Water, and Anthropogenic.

Moose

Moose are found in relatively high densities in Newfoundland, with an estimated population of 125,000 (McLaren et al. 2004). Quotas within Big Game Management Areas in the central Newfoundland region of the Study Area are generally higher than elsewhere in the Province (NLDEC 2012), and may reflect higher densities in this region. Moose are generally associated with mixedwood or coniferous habitats (i.e., Balsam Fir - Black Spruce Forest, Mixedwood Forest). Conifers are sometimes used as a supplementary food source (Bowyer et al. 2003), although the use of conifer dominated forests by moose is likely dependent on the amount of balsam fir (important for browse and cover) present.

Spring / Summer

During the spring / summer, Mixedwood / Hardwood Forests, Regenerating Forest and Open Wetlands (particularly those that support aquatic plants) provide particularly important (High quality) moose habitat. Mixedwood Forests provide high quality habitat because of the food, protection and shelter it provides. Similarly, Open Wetlands provide primary habitat due to the presence of high quality forage (aquatic vegetation) typically important at this time.

Coniferous habitats, including Balsam Fir - Black Spruce Forest and Kalmia- Black Spruce Woodland have a moderate importance in the spring / summer.

Fall / Winter

In the fall / winter season, three habitat types provide high quality habitat. Coniferous forests (Balsam Fir - Black Spruce Forest and Wet Coniferous Forest) are of primary importance in the fall

/ winter because they provide forage and cover. Regenerating Forest is also of some importance in the fall / winter (secondary in the spring / summer), as young balsam fir and birch may occur here and is an important food source. The fourth habitat type with primary importance in the fall / winter is Mixedwood Forest; this high quality habitat provides shelter, and the deciduous portion may be an important food source at this time.

Kalmia - Black Spruce Woodland and Open Wetlands are both of moderate importance to moose year round, providing some foraging opportunities, with Kalmia - Black Spruce Woodland used in the winter when snow depth is low. Mixedwood Forests and Open Wetland habitats are of moderate and low importance in the fall / winter. Mixedwood Forests do not offer much cover, and Open Wetlands are likely frozen, thus preventing access to vegetation.

All other habitat types were considered low quality, based on limited protection, resting or foraging opportunities.

Woodland Caribou

Woodland caribou are an important cultural, economic, and ecosystem component in Newfoundland and Labrador, supplying a hunting resource for residents and prey for wildlife. Woodland caribou within Newfoundland and Labrador are classified as one of three ecotypes: (i) sedentary; (ii) migratory; or (iii) montane (Thomas and Gray 2002; Boulet et al. 2007; Bergerud et al. 2008). Currently, the province recognizes the sedentary caribou are the forest dwelling ecotype that undergoes a seasonal dispersion (rather than migration) during calving (Bergerud et al. 2008).

Woodland caribou regularly occur in the Study Area, with many caribou moving south following the calving period. Woodland caribou were generally associated with dry, mesic coniferous scrub (Kalmia - Black Spruce Woodland and Kalmia Heath ecotypes) and wetland habitat types (including Wet Coniferous Forest and Open Wetland). With the exception of habitat classified as Open Water, these habitats have been identified as primary habitat for caribou during calving and post calving. In particular, deciduous shrubs, sedges, reindeer moss or lichen (*Cladina* spp.), and fungi are important to caribou in Newfoundland during summer (Bergerud 1972), and evidence suggests that barrens and Wetlands are preferred calving habitats (McCarthy et al. 2011). Hardwood and softwood scrub are also used during calving, as well as post-calving and fall (Mahoney and Virgil 2003). Open water can also be important to caribou, as it offers escape from predators (Bergerud et al. 2008).

Both bear and coyote are predator species in insular Newfoundland, and known predators of Woodland caribou, and are known to occur in Study Area.

Additionally, the province has eight species with NL ESA designations that are known, or potentially present within the Study Area (Table 6.17).

Table 6.16 Key or Representative Wildlife Species Selected for Habitat Suitability

Species	NLESA Designation
Common Nighthawk	Threatened
Gray-cheeked Thrush	Endangered
Harlequin Duck	Vulnerable
Olive-sided Flycatcher	Threatened
Red Knot	Endangered
Red Crossbill	Endangered
Rusty Blackbird	Endangered
Short-eared Owl	Vulnerable

7.0 ELC REPORT AND MAP USE

This ELC report and the cover classes described within are intended to be reflective of ecological conditions within the Study Area; however, variability is the norm within ecosystems and no classification can be expected to capture all this variation. In addition, the ELC map produced for this Project reflects dominant current conditions within each polygon, which are subject to change over time. In particular, burned ecotypes will change considerably as they move through successional stages. In addition, mapped polygons will usually contain inclusions of ecotypes too small to be reflected in the supervised classification and represented in polygon labels. Therefore, this ELC report and map should be used as a guide to ecotypes within the Study Area. Users should verify conditions on the ground before proceeding with any ELC-associated site-specific activity.

8.0 CLOSURE

This report has been prepared for the benefit of Marathon Gold Corporation. The report may not be used by any other person or entity without the express written consent of Stantec and Marathon Gold Corporation.

Any use that a third party makes of this report, or any reliance on decisions made based on it, is the responsibility of such third parties. Stantec accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made, or actions taken, based on this report.

The information presented in this report represents the best technical judgment of Stantec based on the data obtained from the work. The conclusions are based on the site conditions observed by Stantec at the time the work was performed at the specific testing and/or sampling locations, and can only be extrapolated to another time and location without further analysis.

This assessment was prepared by Sean Bennett and Rich LaPaix and has been reviewed for technical quality by Mike Crowell. We trust that the above meets your requirements at this time. Please contact Sean Bennett at (709) 576-1458 if there are any questions respecting this report.

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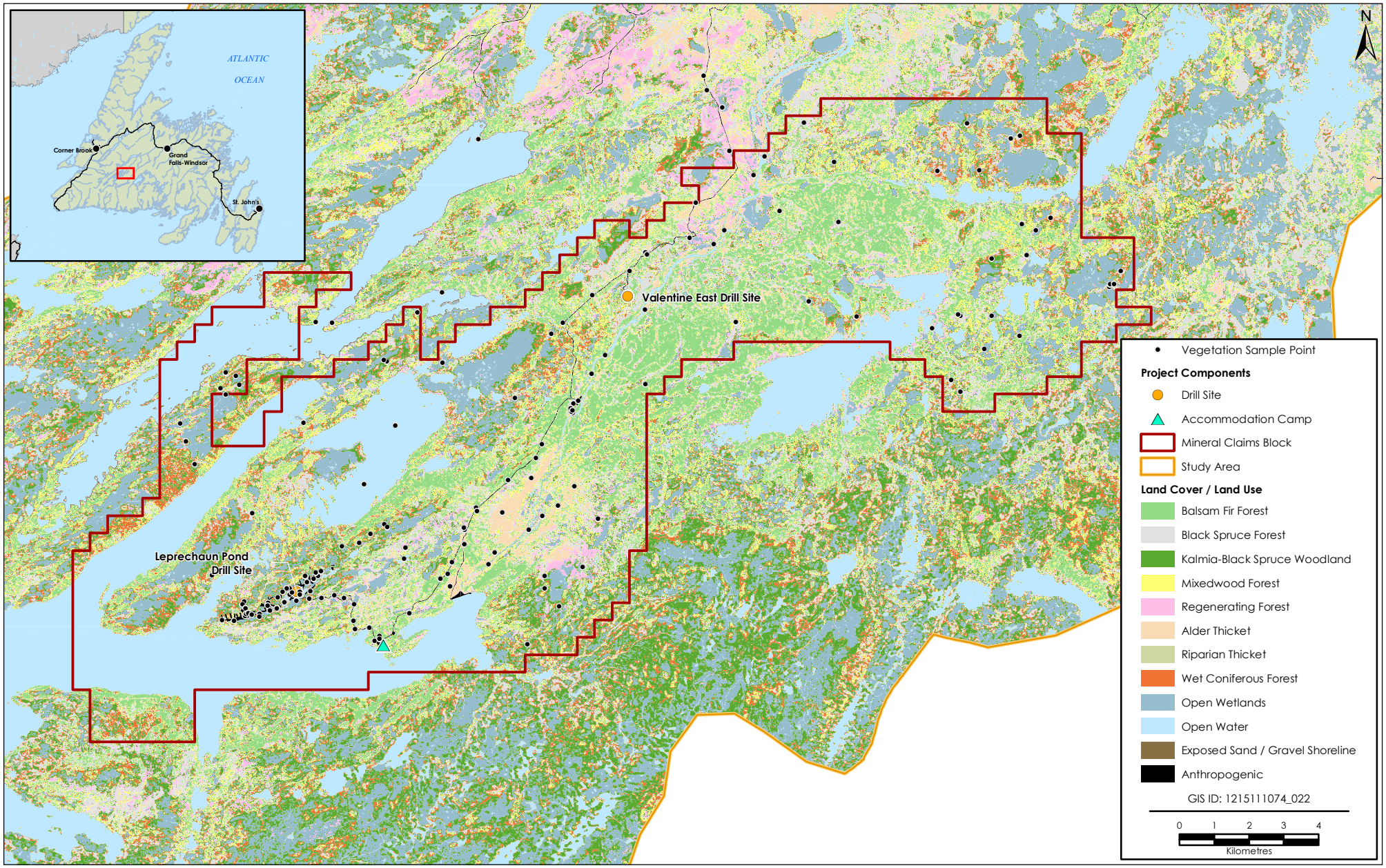
APPENDIX A

Ecosystem Mapping of the Study Area



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REVIEWED BY: C. SHUPE		DATE: Nov 19, 2015
CLIENT: Marathon Gold	**Ecological Land Classification - Local Study Area and Regional Study Area**	Stantec

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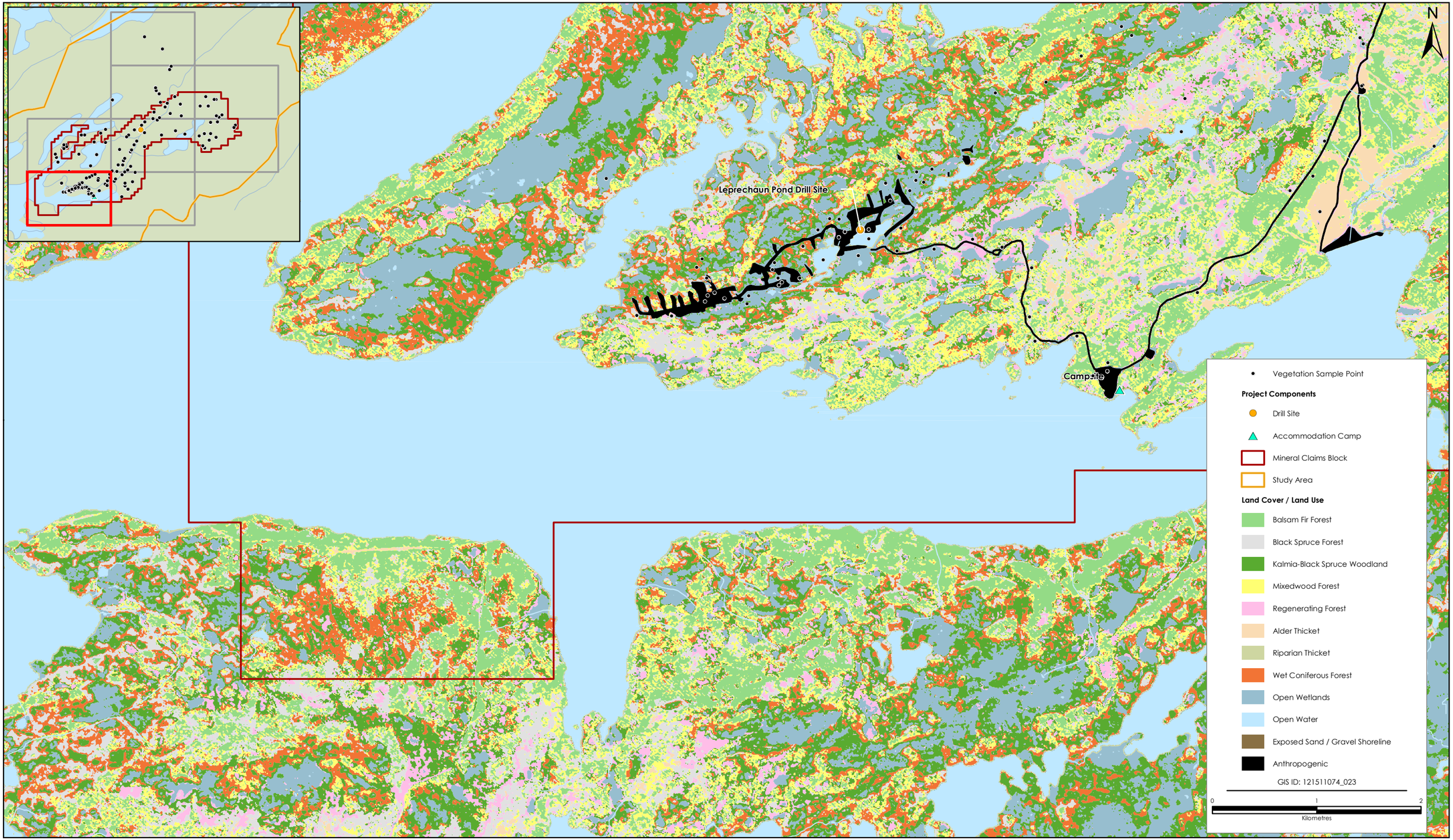

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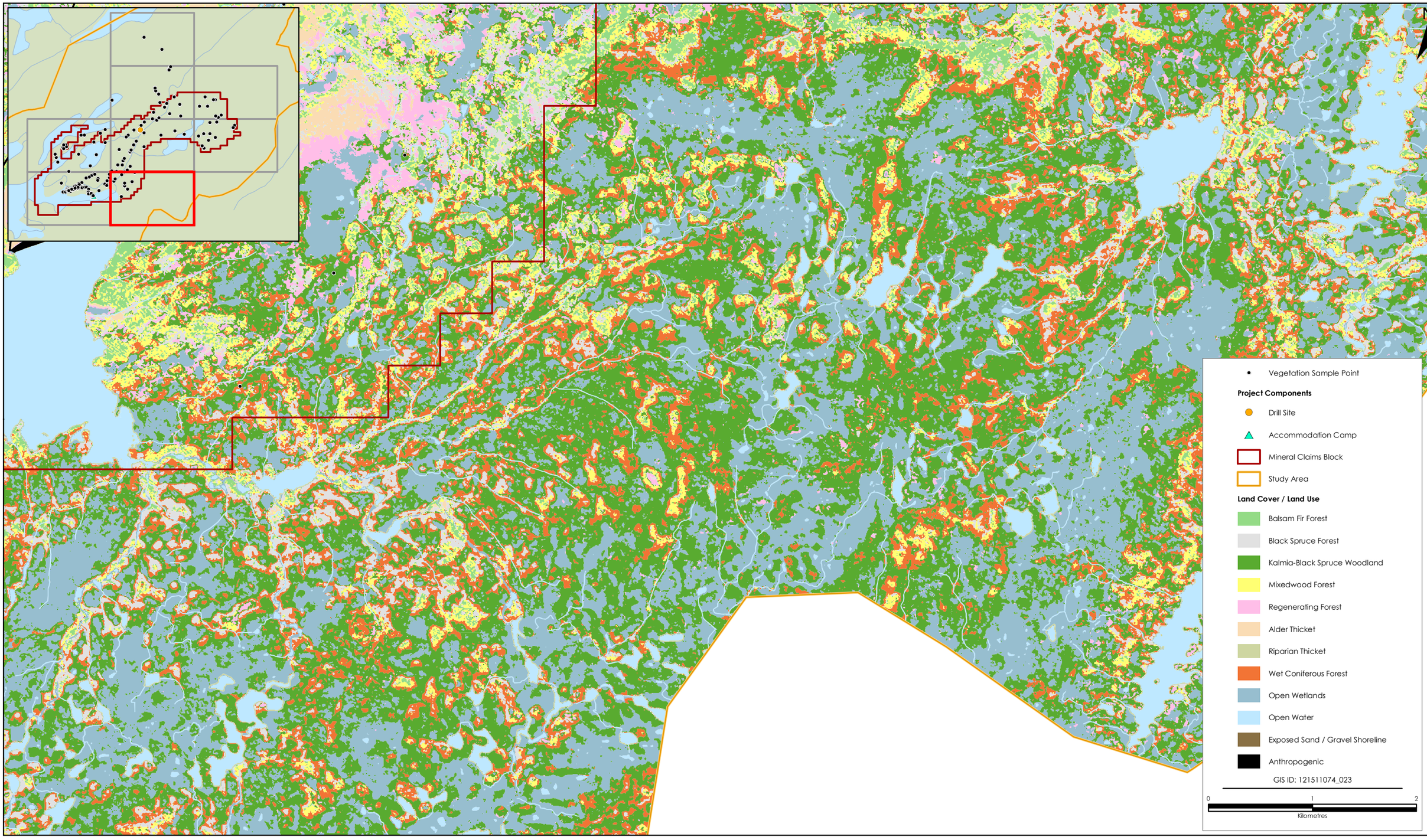

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REVIEWED BY: C. SHUPE	Victoria Lake Region, Newfoundland and Labrador
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	FIGURE NO.: X.X
	DATE: Nov 20, 2015
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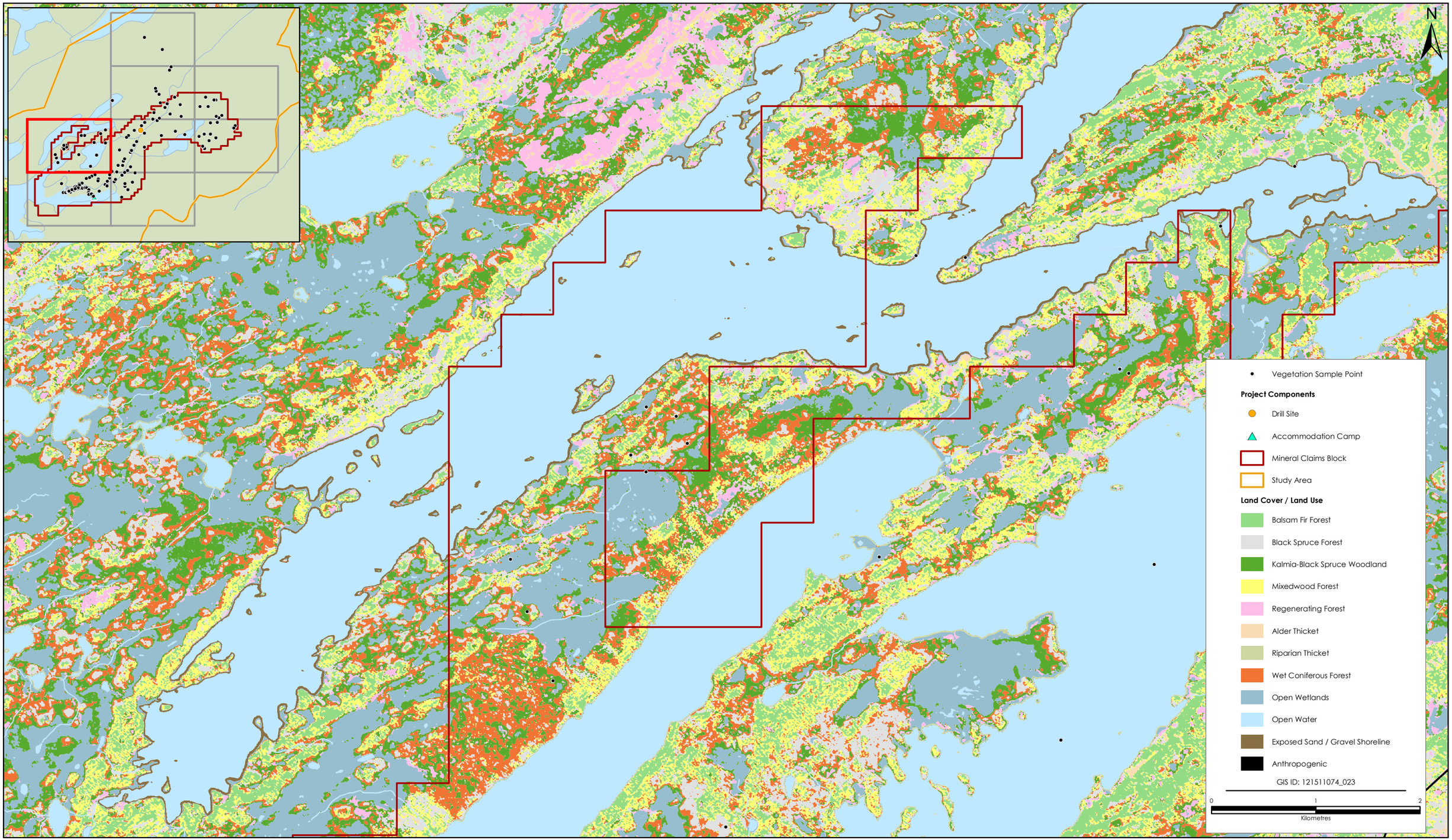

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REVIEWED BY: C. SHUPE	
CLIENT: Marathon Gold	

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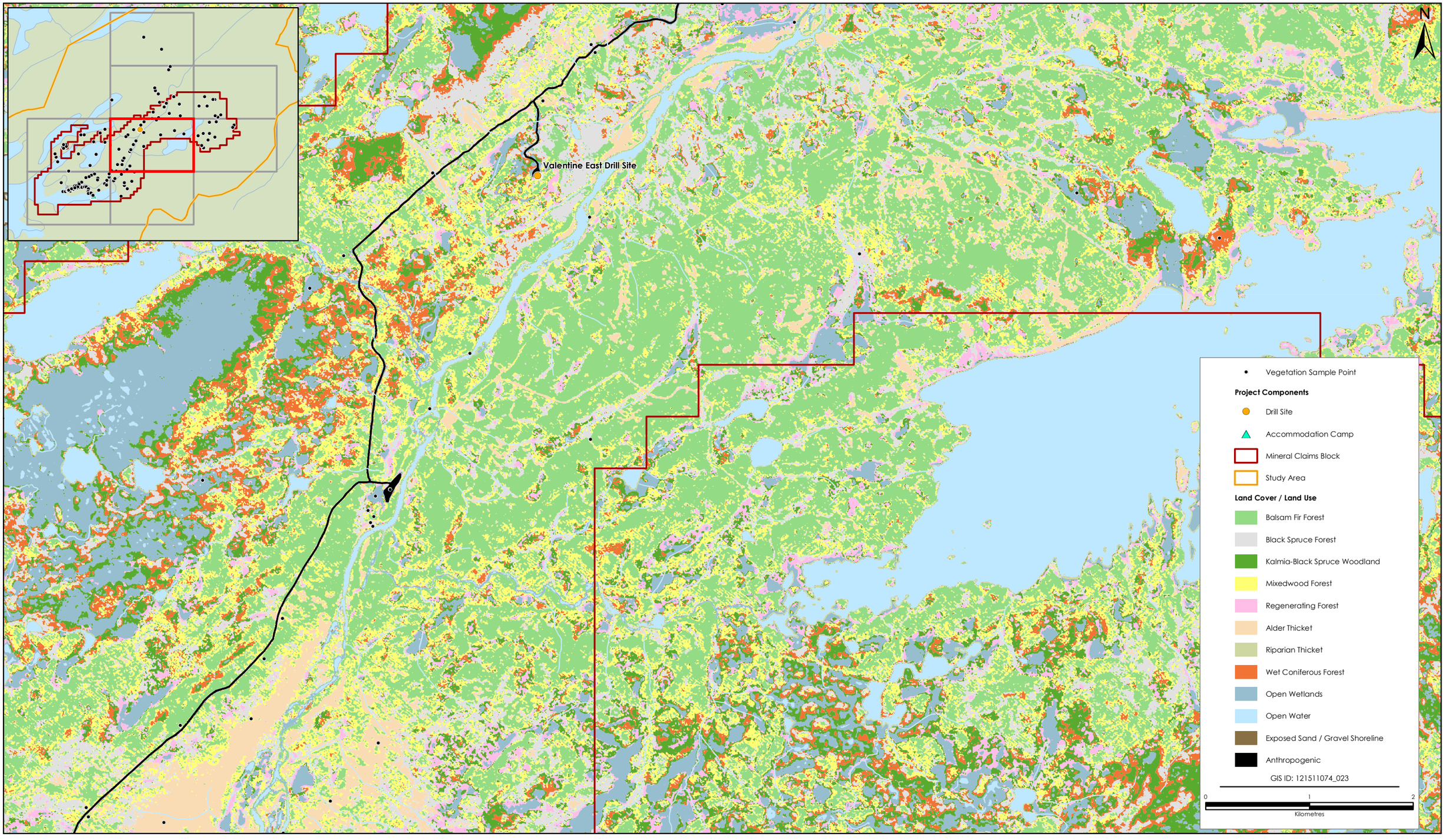

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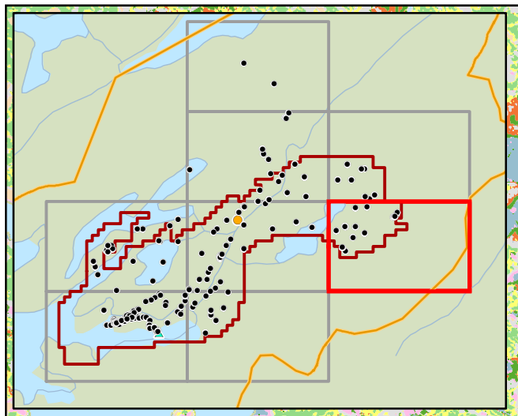

N

- Vegetation Sample Point

Project Components

- Drill Site
- Accommodation Camp
- Mineral Claims Block
- Study Area

Land Cover / Land Use

- Balsam Fir Forest
- Black Spruce Forest
- Kalmia-Black Spruce Woodland
- Mixedwood Forest
- Regenerating Forest
- Alder Thicket
- Riparian Thicket
- Wet Coniferous Forest
- Open Wetlands
- Open Water
- Exposed Sand / Gravel Shoreline
- Anthropogenic

GIS ID: 121511074_023

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Kilometres

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	Ecological Land Classificaiton -Mineral Claims Block - Page 5 of 8
	FIGURE NO.: X.X
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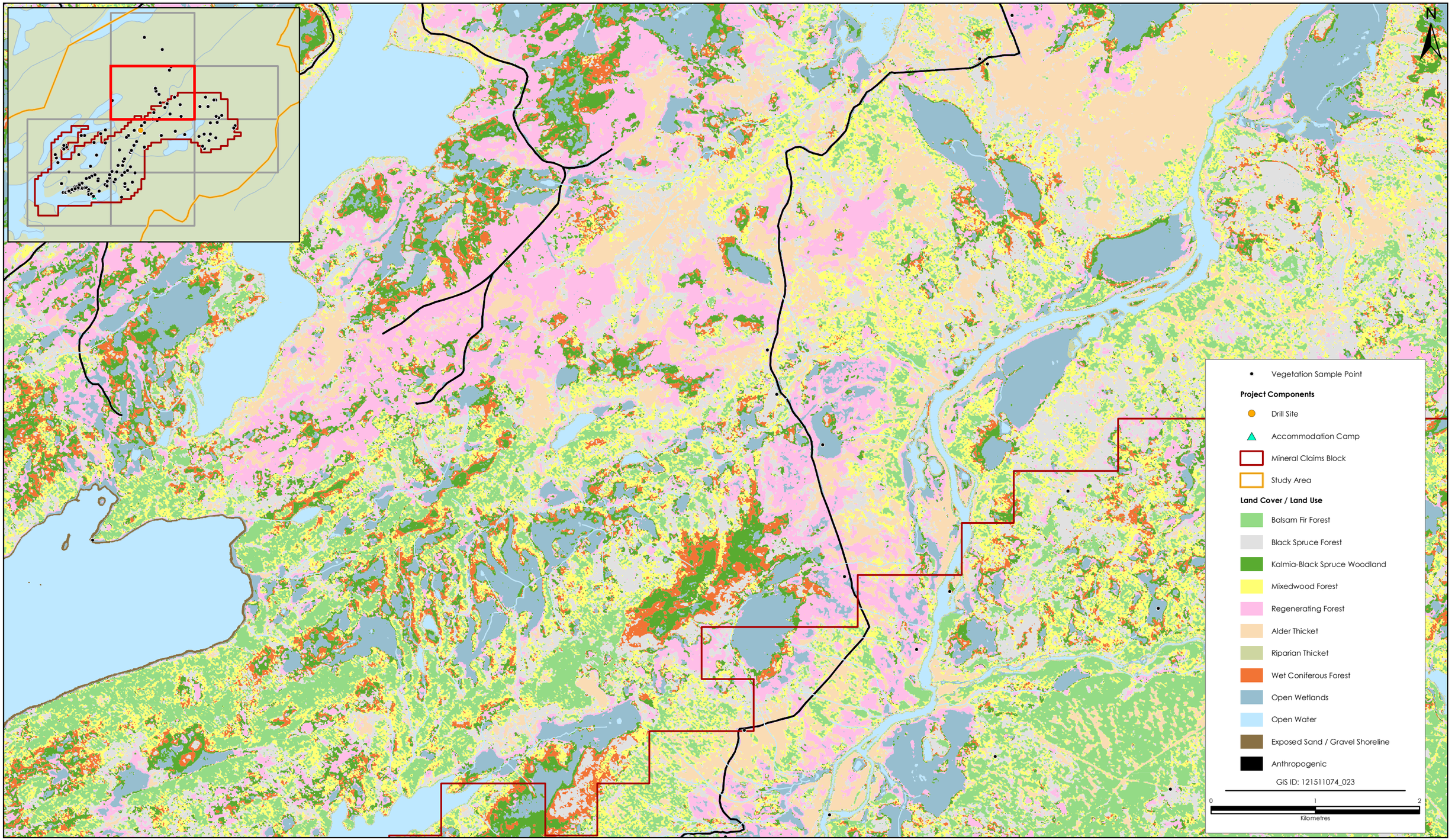

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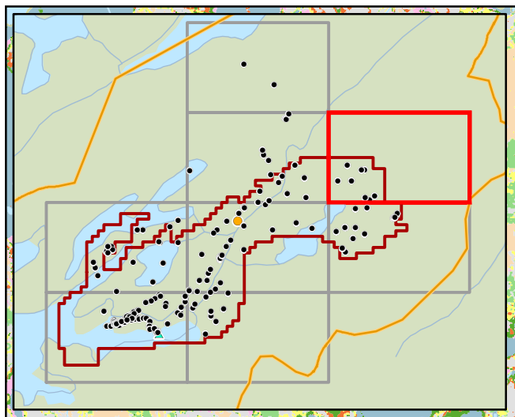

N

- Vegetation Sample Point

Project Components

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- Mineral Claims Block
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- Balsam Fir Forest
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- Open Wetlands
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Kilometres

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CLIENT: Marathon Gold	

Victoria Lake Region, Newfoundland and Labrador

Ecological Land Classificaiton -Mineral Claims Block - Page 7 of 8

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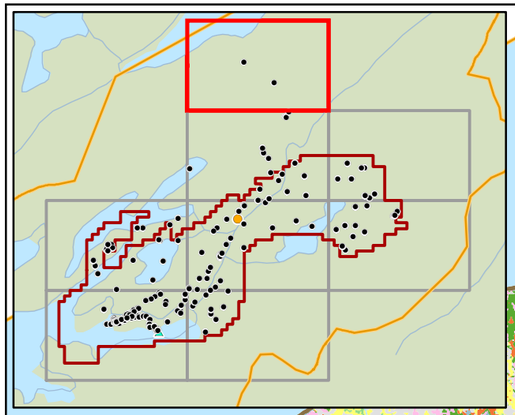

N

- Vegetation Sample Point

Project Components

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GIS ID: 121511074_023

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Kilometres

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CLIENT: Marathon Gold	**Ecological Land Classificaiton -Mineral Claims Block - Page 8 of 8**
	FIGURE NO.: X.X
	DATE: Nov 20, 2015
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APPENDIX B

Plant Species Observed within Field Sites

Table B1 Vascular and Non-vascular Plant Species Observed within ELC Field Sites in the Marathon Valentine Lake Gold Mine Study Area

Family	Scientific Name	Common Name	G Rank	N Rank	S Rank	General Status Rank
Trees / Shrubs						
Aceraceae	*Acer rubrum*	Red Maple	G5	N5	S5	Secure
Betulaceae	*Betula papyrifera*	Paper Birch	G5	N5	S5	Secure
Pinaceae	*Abies balsamea*	Balsam Fir	G5	N5	S5	Secure
Pinaceae	*Larix laricina*	Tamarack	G5	N5	S5	Secure
Pinaceae	*Picea glauca*	White Spruce	G5	N5	S5	Secure
Pinaceae	*Picea mariana*	Black Spruce	G5	N5	S5	Secure
Shrubs						
Aquifoliaceae	*Ilex mucronatus*	Mountain Holly	G5	N5	S5	Secure
Adoxaceae	*Viburnum nudum*	Northern Wild Raisin	G5	NNR	S5	Secure
Adoxaceae	*Viburnum trilobum*	Highbush Cranberry	G5	N5	S5	Secure
Adoxaceae	*Sambucus racemosa*	Red Elderberry	G5	N5	S4	Secure
Adoxaceae	*Sambucus sp.*	Elderberry				
Betulaceae	*Alnus incana*	Speckled Alder	G5	N5	S4S5	Secure
Betulaceae	*Alnus viridis* subsp. *crispa*	Mountain Alder	G5	N5	S5	Secure
Betulaceae	*Betula michauxii*	Michaux's Dwarf Birch	G3G4	N2N4	S3	Secure
Betulaceae	*Betula pumila*	Bog Birch	G5	N5	S5	Secure
Caprifoliaceae	*Linnaea borealis*	Twinflower	G5	NNR	S5	Secure
Caprifoliaceae	*Lonicera villosa*	Mountain Fly-Honeysuckle	G5	NNR	S5	Secure
Cornaceae	*Cornus sericea*	Silky Dogwood	G5	NNR	S5	Secure
Cupressaceae	*Juniperus communis var. depressa*	Ground Juniper	G5	N5	S4S5	
Cupressaceae	*Juniperus horizontalis*	Creeping Juniper	G5	N5	S5	Secure
Empetraceae	*Empetrum eamesii*	Rock Crowberry	G5	NNR	S4	Secure
Empetraceae	*Empetrum nigrum*	Black Crowberry	G5	NNR	S5	Secure
Ericaceae	*Andromeda polifolia*	Glaucousleaf Bog Rosemary	G5	NNR	S5	Secure
Ericaceae	*Chamaedaphne calyculata*	Leatherleaf	G5	N5	S5	Secure
Ericaceae	*Epigaea repens*	Trailing Arbutus	G5	NNR	S3	Sensitive
Ericaceae	*Gaultheria hispidula*	Creeping Snowberry	G5	NNR	S5	Secure

Family	Scientific Name	Common Name	G Rank	N Rank	S Rank	General Status Rank
Ericaceae	*Kalmia angustifolia*	Sheep-Laurel	G5	NNR	S5	Secure
Ericaceae	*Kalmia polifolia*	Bog Laurel	G5	NNR	S5	Secure
Ericaceae	*Rhododendron groenlandicum*	Labrador Tea	G5	N5	S5	Secure
Ericaceae	*Rhododendron canadense*	Rhodora	G5	NNR	S5	Secure
Ericaceae	*Vaccinium angustifolium*	Late Lowbush Blueberry	G5	N5	S5	Secure
Ericaceae	*Vaccinium boreale*	Northern Blueberry	G4	N4	S4S5	Secure
Ericaceae	*Vaccinium macrocarpon*	Large Cranberry	G4	N4?	S5	Secure
Ericaceae	*Vaccinium oxycoccos*	Small Cranberry	G5	N5	S5	Secure
Ericaceae	*Vaccinium uliginosum*	Bog Bilberry	G5	NNR	S5	Secure
Ericaceae	*Vaccinium vitis-idaea*	Partridgeberry	G5	NNR	S5	Secure
Grossulariaceae	*Ribes glandulosum*	Skunk Currant	G5	N5	S5	Secure
Grossulariaceae	*Ribes lacustre*	Bristly Black Currant	G5	NNR	S3S4	Secure
Grossulariaceae	*Ribes sp.*	a Currant				
Rhamnaceae	*Rhamnus alnifolia*	Alderleaf Buckthorn	G5	NNR	S5	Secure
Rosaceae	*Amelanchier bartramiana*	Bartram's Chuckleypear	G5	NNR	S5	Secure
Rosaceae	*Dasiphora fruticosa*	Shrubby Cinquefoil	G5	NNR	S3S5	Secure
Rosaceae	*Photinia melanocarpa*	Black Chokeberry	G5	NNR	SNR	Undetermined
Rosaceae	*Photinia sp.*	Chokeberry	G5	NNR		
Rosaceae	*Prunus pensylvanica*	Fire Cherry	G5	NNR	S4S5	Secure
Rosaceae	*Rosa nitida*	Shining Rose	G5	N4N5	S4S5	Secure
Rosaceae	*Rubus idaeus*	Red Raspberry	G5	N5	S5	Secure
Rosaceae	*Sorbus americana*	American Mountain-Ash	G5	NNR	S3S5	Secure
Rosaceae	*Sorbus decora*	Showy Mountain-Ash	G4G5	NNR	S3S5	Secure
Rosaceae	*Spiraea alba*	Narrow-Leaved Meadow-Sweet	G5	N5	S3S5	-
Sapindaceae	*Acer spicatum*	Mountain Maple	G5	N5	S5	Secure
Taxaceae	*Taxus canadensis*	Canada Yew	G5	N5	S3	Sensitive
Graminoids						
Cyperaceae	*Carex atlantica*	Atlantic Sedge	G5	NNR		-
Cyperaceae	*Carex brunnescens*	Brownish Sedge	G5	N5	S3S5	Secure
Cyperaceae	*Carex buxbaumii*	Buxbaum's Sedge	G5	N5	S3S5	Secure

Family	Scientific Name	Common Name	G Rank	N Rank	S Rank	General Status Rank
Cyperaceae	*Carex canescens*	Hoary Sedge	G5	N5	S3S5	Secure
Cyperaceae	*Carex debilis*	White-Edge Sedge	G5T5	N5	S3S5	Secure
Cyperaceae	*Carex deweyana*	Short-Scale Sedge	G5T5	N5	S1S2	May be at risk
Cyperaceae	*Carex disperma*	Softleaf Sedge	G5	N5	S3S5	Secure
Cyperaceae	*Carex echinata*	Little Prickly Sedge	G5T5	N5	S3S5	Secure
Cyperaceae	*Carex exilis*	Coast Sedge	G5	N5	S3S5	Secure
Cyperaceae	*Carex flava*	Yellow Sedge	G5	N5	S3S5	Secure
Cyperaceae	*Carex interior*	Inland Sedge	G5	N5	S3S5	Secure
Cyperaceae	*Carex intumescens*	Bladder Sedge	G5	N5	S3S5	Secure
Cyperaceae	*Carex lasiocarpa*	Slender Sedge	G5	N5	S3S5	Secure
Cyperaceae	*Carex leptalea*	BristlestalkSedge	G5	N5	S3S5	Secure
Cyperaceae	*Carex limosa*	Mud Sedge	G5	N5	S3S5	Secure
Cyperaceae	*Carex magellanica*	Boreal Bog Sedge	G5T5	N5	S3S5	Secure
Cyperaceae	*Carex michauxiana*	Michaux Sedge	G5	N5	S3S5	Secure
Cyperaceae	*Carex oligosperma*	Few-Seeded Sedge	G5	N5	S5	Secure
Cyperaceae	*Carex pauciflora*	Few-Flowered Sedge	G5	N5	S3S5	Secure
Cyperaceae	*Carex sp.*	a sedge				
Cyperaceae	*Carex stipata*	Stalk-Grain Sedge	G5T5	N5	S3S5	Secure
Cyperaceae	*Carex tenuiflora*	Sparse-Flowered Sedge	G5	N5	S3S5	Secure
Cyperaceae	*Carex trisperma*	Threefruit sedge	G5	N5	S5	Secure
Cyperaceae	*Carex utriculata*	Bear Sedge	G5	N5	S4S5	Secure
Cyperaceae	*Carex vesicaria*	Inflated Sedge	G5	N5	S3S5	Secure
Cyperaceae	*Carex wiegandii*	Wiegand's Sedge	G4	N3N4	S3	Secure
Cyperaceae	*Eriophorum angustifolium*	No Common Name In Tracker	G5T5	NNR	S3S5	Secure
Cyperaceae	*Eriophorum vaginatum*	Tussock Cotton-Grass	G5	N5	S3S5	Secure
Cyperaceae	*Eriophorum virginicum*	Tawny Cotton-Grass	G5	N5	S3S5	Secure
Cyperaceae	*Eriophorum viridicarinatum*	Green-Keel Cottongrass	G5	N5	S3S5	Secure
Cyperaceae	*Rhynchospora alba*	White Beakrush	G5	N5	S3S5	Secure
Cyperaceae	*Schoenoplectus subterminalis*	Water Bulrush	G4G5	NNR	S3S5	Secure
Cyperaceae	*Scirpus atrocinctus*	Black-Girdle Bulrush	G5	N5	S3S5	Secure
Cyperaceae	*Scirpus cyperinus*	Cottongrass Bulrush	G5	N5	S2S3	Sensitive
Cyperaceae	*Scirpus microcarpus*	Red-Tinged Bulrush	G5	N5	S3S5	Secure
Cyperaceae	*Trichophorum alpinum*	Alpine Cotton-Grass	G5	N5	S3S5	Secure
Cyperaceae	*Trichophorum*	Deergrass	G5	NNR	S3S5	Secure

Family	Scientific Name	Common Name	G Rank	N Rank	S Rank	General Status Rank
	caespitosum					
Juncaceae	*Juncus brevicaudatus*	Short-tail Rush	G5	N5	S5	Secure
Juncaceae	*Juncus canadensis*	Canada Rush	G5	N5	S4	Secure
Juncaceae	*Juncus effusus*	Soft Rush	G5	N5	S5	Secure
Juncaceae	*Juncus pelocarpus*	Brown-Fruited Rush	G5	N5	S4	Secure
Juncaceae	*Juncus stygius*	Moor Rush	G5	NNR		
Poaceae	*Agrostis capillaris*	Colonial Bentgrass	GNR	NNA	SE	Exotic/Alien
Poaceae	*Agrostis gigantea*	Black Bentgrass	G4G5	NNA	SE	Exotic/Alien
Poaceae	*Agrostis perennans*	Perennial Bentgrass	G5	N5	S2	May be at risk
Poaceae	*Agrostis scabra*	Rough Bentgrass	G5	N5	S3S5	Secure
Poaceae	*Bromus ciliatus*	Fringed Brome	G5T5	N5	S3S5	Secure
Poaceae	*Calamagrostis canadensis*	Bluejoint Reedgrass	G5	N5	S5	Secure
Poaceae	*Calamagrostis pickeringii*	Pickering's Reedgrass	G4	NNR	S3S5	Secure
Poaceae	*Cinna latifolia*	Wood Reedgrass	G5	N5	S3S5	Secure
Poaceae	*Danthonia spicata*	Poverty Oatgrass	G5	N5	S3S5	Secure
Poaceae	*Glyceria canadensis*	Canada Manna-Grass	G5	N4N5	S3S5	Secure
Poaceae	*Glyceria striata*	Fowl Manna-Grass	G5	N5	S3S5	Secure
Poaceae	*Muhlenbergia glomerata*	Marsh Muhly	G5	N5	S3S5	Secure
Poaceae	*Muhlenbergia uniflora*	Fall Dropseed Muhly	G5	NNR	S3S5	Secure
Poaceae	*Poa palustris*	Fowl Bluegrass	G5	N5	SNA	Exotic/Alien
Poaceae	*Poa saltuensis*	Forest Bluegrass	G5	N4?	S2S3	Sensitive
Poaceae	*Schizachne purpurascens*	Purple False Melic	G5	N5	S3	Sensitive
Scheuchzeriaceae	*Scheuchzeria palustris*	Pod Grass	G5	NNR	S3	Sensitive
Forbs						
Apiaceae	*Heracleum maximum*	Cow Parsnip	G5	N5	S5	Secure
Araliaceae	*Aralia hispida*	Bristly Sarsaparilla	G5	N5	S4S5	Secure
Araliaceae	*Aralia nudicaulis*	Wild Sarsaparilla	G5	N5	S5	Secure
Asteraceae	*Anaphalis margaritacea*	Pearly Everlasting	G5	N5	S5	Secure
Asteraceae	*Aster sp.*	unknown aster				
Asteraceae	*Cirsium muticum*	Swamp Thistle	G5	N5?	S5	Secure
Asteraceae	*Doellingeria umbellata*	Parasol White-Top	G5	N5	S5	Secure

Family	Scientific Name	Common Name	G Rank	N Rank	S Rank	General Status Rank
Asteraceae	*Erigeron sp.*	Fleabane				
Asteraceae	*Eurybia radula*	Rough-Leaved Aster	G5	NNR	S5	Secure
Asteraceae	*Euthamia graminifolia*	Flat-Top Fragrant-Golden-Rod	G5	N5	S5	Secure
Asteraceae	*Eutrochium maculatum*	Spotted Joe-Pye Weed	G5	N5	S4S5	Secure
Asteraceae	*Oclemena nemoralis*	Bog Aster	G5	N5	S5	Secure
Asteraceae	*Packera aurea*	Golden Ragwort	G5	N5	S4S5	Secure
Asteraceae	*Packera paupercula*	Balsam Groundsel	G5	N5	S4	Secure
Asteraceae	*Prenanthes trifoliolata*	Three-Leaved Rattlesnake-root	G5	NNR	S5	Secure
Asteraceae	*Solidago rugosa*	Rough-Leaf Goldenrod	G5	N5	S5	Secure
Asteraceae	*Solidago uliginosa*	Bog Goldenrod	G4G5	N5	S5	Secure
Asteraceae	*Symphyotrichum puniceum*	Purplestem aster	G5	N5	S5	Secure
Asteraceae	*Taraxacum officinale*	Common Dandelion	G5	N5	SNA	Exotic/Alien
Boraginaceae	*Myosotis laxa*	Small Forget-Me-Not	G5	N5	SU	Undetermined
Clusiaceae	*Hypericum sp.*	St John's-Wort				
Clusiaceae	*Triadenum fraseri*	Marsh St. John's-Wort	G5	N5	S4	Secure
Cornaceae	*Cornus canadensis*	Bunchberry	G5	N5	S5	Secure
Droseraceae	*Drosera intermedia*	Spoon-Leaved Sundew	G5	NNR	S4S5	Secure
Droseraceae	*Drosera rotundifolia*	Roundleaf Sundew	G5	N5	S5	Secure
Dryopteridaceae	*Athyrium filix-femina*	Lady Fern	G5T5	N5	S5	Secure
Dryopteridaceae	*Dryopteris campyloptera*	Mountain Wood-Fern	G5	NNR	S5	Secure
Dryopteridaceae	*Dryopteris intermedia*	Evergreen woodfern	G5	N5	S5	Secure
Dryopteridaceae	*Gymnocarpium dryopteris*	Northern Oak Fern	G5	N5	S5	Secure
Dryopteridaceae	*Matteucia struthiopteris*	Ostrich Fern			S3S4	Secure
Dryopteridaceae	*Onoclea sensibilis*	Sensitive Fern	G5	N5	S4	Secure
Equisetaceae	*Equisetum arvense*	Field Horsetail	G5	N5	S5	Secure
Equisetaceae	*Equisetum fluviatile*	Water Horsetail	G5	N5	S4	Secure
Equisetaceae	*Equisetum sylvaticum*	Woodland Horsetail	G5	N5	S5	Secure
Eriocaulaceae	*Eriocaulon aquaticum*	Seven-Angled Pipewort	G5	N5	S5	Secure

Family	Scientific Name	Common Name	G Rank	N Rank	S Rank	General Status Rank
Fabaceae	*Trifolium campestre*	Low Hop Clover	GNR	NNA	SNA	Exotic/Alien
Iridaceae	*Iris versicolor*	Blueflag	G5	N5	S5	Secure
Lamiaceae	*Galeopsis tetrahit*	Brittle-Stem Hempnettle	GNR	NNA	SNA	Exotic/Alien
Lamiaceae	*Lycopus uniflorus*	Northern Bugleweed	G5	NNR	S5	Secure
Lamiaceae	*Mentha arvensis*	Corn Mint	G5	N5	S5	Secure
Lamiaceae	*Prunella vulgaris*	Self-Heal	G5	N5	S3S4	Secure
Lentibulariaceae	*Utricularia cornuta*	Horned Bladderwort	G5	NNR	S5	Secure
Lentibulariaceae	*Utricularia intermedia*	Flatleaf Bladderwort	G5	NNR	S5	Secure
Liliaceae	*Clintonia borealis*	Yellow clintonia	G5	N5	S5	Secure
Liliaceae	*Maianthemum trifolium*	Three-Leaf Solomon's-Plume	G5	N5	S5	Secure
Liliaceae	*Tofieldia pusilla*	Scotch False-Asphodel	G5	N5	S4	Secure
Lycopodiaceae	*Lycopodiella inundata*	Bog Clubmoss	G5	N5	S5	Secure
Lycopodiaceae	*Lycopodium annotinum*	Stiff Clubmoss	G5	N5	S5	Secure
Lycopodiaceae	*Lycopodium dendroideum*	Treelike Clubmoss	G5	N5	S3S4	Secure
Menyanthaceae	*Menyanthes trifoliata*	Bog Buckbean	G5	NNR	S5	Secure
Monotropaceae	*Monotropa uniflora*	Indian-Pipe	G5	N5	S5	Secure
Myricaceae	*Myrica gale*	Sweet Gale	G5	NNR	S5	Secure
Nymphaeaceae	*Nuphar lutea*	Yellow Cowlily	G5T5	N5		Secure
Onagraceae	*Chamerion angustifolium*	Fireweed	G5	NNR	S5	Secure
Onagraceae	*Circaea alpina*	Small Enchanter's Nightshade	G5	NNR	S5	Secure
Onagraceae	*Epilobium ciliatum*	Hairy Willow-Herb	G5	NNR	S5	Secure
Onagraceae	*Epilobium palustre*	Marsh Willow-Herb	G5	NNR	S5	Secure
Orchidaceae	*Malaxis unifolia*	Green Adder's-Mouth	G5	NNR	S3	Sensitive
Orchidaceae	*Platanthera clavellata*	Club-Spur Orchid	G5	NNR	S5	Secure
Orchidaceae	*Platanthera dilatata*	Leafy White Orchis	G5T5	N5	S5	Secure
Orchidaceae	*Pogonia ophioglossoides*	Snakemouth	G5	NNR	S4	Secure
Orchidaceae	*Spiranthes romanzoffiana*	Hooded Ladies'-Tresses	G5	N5	S4S5	Secure
Osmundaceae	*Osmunda cinnamomea*	Cinnamon Fern	G5	N5	S5	Secure
Osmundaceae	*Osmunda regalis*	Royal Fern	G5T5	N5	S4	Secure

Family	Scientific Name	Common Name	G Rank	N Rank	S Rank	General Status Rank
Polygonaceae	*Polygonum hydropiper*	Marshpepper Smartweed	GNR	NNR	SNA	Exotic/Alien
Primulaceae	*Trientalis borealis*	Northern Starflower	G5	NNR	S5	Secure
Pyrolaceae	*Orthilia secunda*	One-Side Wintergreen	G5	NNR	S5	Secure
Ranunculaceae	*Coptis trifolia*	Goldthread	G5	N5	S5	Secure
Ranunculaceae	*Ranunculus acris*	Tall Butter-Cup	G5	NNA	SNA	Exotic/Alien
Ranunculaceae	*Ranunculus repens*	Creeping Butter-Cup	GNR	NNA	SNA	Exotic/Alien
Ranunculaceae	*Thalictrum alpinum*	Alpine Meadow-Rue	G5	NNR	S5	Secure
Ranunculaceae	*Thalictrum pubescens*	Tall Meadow-Rue	G5	NNR	S5	Secure
Rosaceae	*Fragaria virginiana*	Virginia Strawberry	G5	NNR	S4S5	Secure
Rosaceae	*Geum macrophyllum*	Large-Leaved Avens	G5	N5	S4S5	Secure
Rosaceae	*Geum sp.*	Avens				
Rosaceae	*Rubus arcticus*	Northern Blackberry	G5	NNR	S3	Sensitive
Rosaceae	*Rubus chamaemorus*	Cloudberry	G5	NNR	S5	Secure
Rosaceae	*Rubus pubescens*	Dewberry	G5	NNR	S5	Secure
Rosaceae	*Sanguisorba canadensis*	Bottlebrush	G5	NNR	S3S5	Secure
Rubiaceae	*Galium sp.*	Bedstraw				
Sarraceniaceae	*Sarracenia purpurea*	Northern Pitcher-Plant	G5	N5	S5	Secure
Saxifragaceae	*Mitella nuda*	Naked Bishop's-Cap	G5	NNR	S5	Secure
Scrophulariaceae	*Chelone glabra*	White Turtlehead	G5	NNR	S4	Secure
Scrophulariaceae	*Veronica americana*	American Speedwell	G5	NNR	S4	Secure
Selaginellaceae	*Selaginella selaginoides*	Low Spike-Moss	G5	NNR	S4S5	Secure
Thelypteridaceae	*Phegopteris connectilis*	Northern Beech Fern	G5	N5	S5	Secure
Violaceae	*Viola sp.*	Violet				
Mosses						
Aulacomniaceae	*Aulacomnium palustre*	Glow Moss	G5	NNR		
Dicranaceae	*Dicranum polysetum*	Wavy-leaved Broom Moss	G5	NNR		
Dicranaceae	*Dicranum scoparium*	Common Broom Moss	G5	NNR		
Dicranaceae	*Dicranum sp.*	Broom Moss				
Grimmiaceae	*Racomitrium sp.*	a Moss				
Hylocomiaceae	*Hylocomium splendens*	Stairstep Moss	G5	NNR		

Family	Scientific Name	Common Name	G Rank	N Rank	S Rank	General Status Rank
Hylocomiaceae	*Rhytidiadelphus sp.*	a Mosss				
Hylocomiaceae	*Feathermoss*	Feathermoss				
Hylocomiaceae	*Pleurozium schreberi*	Schreber's feathermoss	G5	NNR		
Hypnaceae	*Ptilium crista-castrensis*	Plume moss	G5	NNR		
Lepidoziaceae	*Bazzania trilobata*	Three-lobed Whipwort	G5	NNR		
Mniaceae	*Plagiomnium sp.*	Leafy Moss				
na	*na*	Unidentified liverwort				
na	*na*	Unidentified moss				
Polytrichaceae	*Polytrichum sp.*	Haircap Moss				
Ptilidiaceae	*Ptilidium sp.*	Fringewort	G5	NNR		
Sphagnaceae	*Sphagnum rubellum*	Red Peat Moss	G5	NNR		
Sphagnaceae	*Sphagnum sp.*	Peatmoss				
Thuidiaceae	*Thuidium recognitum*	Hook-leaved Fern Moss	G5	NNR		
Lichens						
Cladoniaceae	*Cladina arbuscula*	Reindeer Lichen	G5			
Cladoniaceae	*Cladina mitis*	Green Reindeer Lichen	G5			
Cladoniaceae	*Cladina rangiferina*	Gray Reindeer Lichen	G5			
Cladoniaceae	*Cladina sp.*	Reindeer Lichen				
Cladoniaceae	*Cladina stellaris*	Star-tipped Reindeer Lichen	G5			
Cladoniaceae	*Cladonia sp.*	Cladonia Lichen				
Parmeliaceae	*Cetraria sp.*	a lichen				

APPENDIX C

Soil Nutrient and Moisture Regime Classes and Relationship to Site Properties

Table C1 Soil Nutrient Regime Classes

Parameter	Oligotrophic	Submesotrophic	Mesotrophic	Permesotrophic	Eutrophic
	Very Poor (A)	Poor (B)	Medium (C)	Rich (D)	Very Rich (E)
Available nutrients	very low	low	moderate	abundant	very abundant
Humus form	**mor**				
			moder		
					mull
A horizon	**Ae horizon present**				
			A horizon absent		
					Ah horizon present
Organic matter content	**low (light coloured)**				
		medium (intermediate in colour)			
					high (dark coloured)
Growth rate	**slow**				
		moderate			
				rapid	
Soil depth	**extremely superficial**				
		very superficial to deep			
Soil texture	**coarse texture**				
			medium to fine texture		
% Coarse fragment	**high**				
			moderate to low		
Parent material mineralogy	**low base (low Ca content)**				
		medium base (medium Ca content)			
				strong base (high Ca content)	
Soil pH	**extremely-moderately acidic**				
		moderately acidic-neutral			
				slightly acidic-mildly alkaline	
Water pH (wetlands)	**<4-5**	**4.5-5.5**	**5.5-6.5**	**6.5-7.4**	**7.4+**
Seepage			**temporary**	→→→→	**permanent**

Table C2 Soil Moisture Regime Classes

Moisture Regime	Description	Primary Water Source	Idealized Slope Position	Surface Organic Thickness (cm)	Common Soil Texture	Water Table Depth (cm)	Soil Drainage Class	Common Ecotypes
Very xeric (0)	Water is removed extremely rapidly in relation to supply; soil remains moist for a negligible amount of time following precipitation.	Precipitation	Crest-Upper Slope	<3	Very coarse (gravel to coarse sand); shallow soils	>100	Very rapid	ES
Xeric (1)	Water is removed from the soil very rapidly in relation to supply; soil remains moist for brief period s following precipitation.	Precipitation	Crest-Upper Slope	<3	Coarse (sand)	>100	Very rapid to rapid	ES
Subxeric (2)	Water is removed from the soil rapidly in relation to supply; the soil remains wet for short periods of time following precipitations. Linked to a rapid drainage, depending on the amount of precipitation.	Precipitation	Upper Slope-Mid Slope to Variable	<3	Coarse to moderately coarse (loamy sand-sandy loam)	>100	Rapid	BF, RT
Submesic (3)	Water is removed from the soil rapidly in relation to supply; water is available for moderately short periods following precipitation.	Precipitation	Upper Slope-Mid Slope to Variable	3-5	Moderately coarse (sandy loam)	>100	Rapid to well	BF, BS, RT
Mesic (4)	Water is removed from the soil rather slowly in relation to supply; soil may remain moist for a significant, but sometimes for short period of the year. Available soil moisture reflects climatic input.	Precipitation in moderate to fine-textured soil and limited seepage in coarse-textured soils	Mid Slope-Lower Slope to Variable	6-9	Medium (L) to fine (SCL); few coarse fragments	>100	Well to moderately well	BF, BS, MF, KB, KH
Subhygric (5)	Water is removed slowly enough in relation to supply to keep the soil wet for a significant part of the growing season; some temporary seepage and possibly mottling below 20 cm.	Precipitation and seepage	Lower Slope to Variable	10-40	Variable	<100	Imperfect	BF, BS, MF, KB, KH
Hygric (6)	Water is removed slowly enough in relation to supply to keep the soil wet for most of the growing season; permanent seepage and mottling (hygric aerated); gleyed colours common (hygric reduced).	Permanent seepage; water table fluctuates often <100 cm	Toe Slope-Depression-Level to Variable	10-40	Variable	30-100	Poor	BF, BS, KB, KH, RT, TF
Subhydric (7)	Water is removed so slowly that the water table remains at or near the soil surface for most of the year; gleyed mineral or organic soils; permanent seepage <30 cm below surface.	Seepage or permanent water table <30 cm	Depression-Level to Variable	>40	Variable; predominantly organics	0-30	Very poor	BS, RT, AT, WC, SF, SB, ES
Hydric (8)	Water is removed so slowly that the water table remains at or above the soil surface all year; gleyed mineral or organic soils	Permanent surface water table	Depression-Level to Variable	>40	Variable; predominantly organics	0	Very poor	RT, SF, SB

APPENDIX D

Ecotype Plant Occurrence Summaries (Gound Plot Data)

Table D1 Balsam Fir Forest - Plant Occurrence Summary (Ground Plot data)

Scientific Name	Common Name	Growth Form	Balsam Fir Forest (n=5)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
Tree Layer						
Abies balsamea	Balsam Fir	Tree	30.0	60.0	47.0	1.00
Betula papyrifera	Paper Birch	Tree	0.0	15.0	4.4	0.60
Picea glauca	White Spruce	Tree	0.0	15.0	4.0	0.40
Picea mariana	Black Spruce	Tree	0.0	35.0	17.0	0.80
Shrub Layer						
Abies balsamea	Balsam Fir	Tall Shrub	1.0	30.0	10.2	1.00
Alnus viridis	Green Alder	Tall Shrub	0.0	3.0	0.6	0.20
Picea glauca	White Spruce	Tall Shrub	0.0	1.0	0.2	0.20
Picea mariana	Black Spruce	Tall Shrub	0.0	5.0	2.5	0.80
Abies balsamea	Balsam Fir	Low Shrub	0.0	5.0	1.1	0.40
Alnus viridis	Green Alder	Low Shrub	0.0	1.0	0.2	0.20
Amelanchier bartramiana	Bartram's Chuckleypear	Low Shrub	0.0	0.5	0.1	0.20
Betula papyrifera	Paper Birch	Low Shrub	0.0	1.0	0.3	0.40
Kalmia angustifolia	Sheep-Laurel	Low Shrub	0.0	0.5	0.1	0.20
Picea mariana	Black Spruce	Low Shrub	0.0	3.0	0.8	0.40
Ribes lacustre	Bristly Black Currant	Low Shrub	0.0	0.5	0.1	0.20
Rubus idaeus	Red Raspberry	Low Shrub	0.0	1.0	0.2	0.20
Sambucus sp.	Elderberry	Low Shrub	0.0	0.5	0.1	0.20
Viburnum opulus	Guelder-Rose Viburnum	Low Shrub	0.0	1.0	0.2	0.20
Abies balsamea	Balsam Fir	Dwarf Shrub	0.5	3.0	1.0	1.00
Epigaea repens	Trailing Arbutus	Dwarf Shrub	0.0	3.0	0.6	0.20
Gaultheria hispidula	Creeping Snowberry	Dwarf Shrub	0.0	3.0	0.9	0.60
Linnaea borealis	Twinflower	Dwarf Shrub	0.0	2.0	0.8	0.40
Picea mariana	Black Spruce	Dwarf Shrub	0.0	0.5	0.1	0.20
Vaccinium angustifolium	Late Lowbush Blueberry	Dwarf Shrub	0.0	0.5	0.2	0.40
Forb Layer						
Anaphalis margaritacea	Pearly Everlasting	Forb	0.0	0.5	0.1	0.20
Aster sp.	unknown aster	Forb	0.0	0.5	0.1	0.20
Athyrium filix-femina	Lady Fern	Forb	0.0	0.5	0.2	0.40
Chamerion angustifolium	Fireweed	Forb	0.0	0.5	0.1	0.20
Coptis trifolia	Goldthread	Forb	0.0	0.5	0.1	0.20

Scientific Name	Common Name	Growth Form	Balsam Fir Forest (n=5)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
Cornus canadensis	Bunchberry	Forb	0.5	15.0	3.8	1.00
Dryopteris campyloptera	Mountain Wood-Fern	Forb	0.0	10.0	3.0	0.80
Dryopteris intermedia	Evergreen woodfern	Forb	0.0	0.5	0.2	0.40
Epilobium palustre	Marsh Willow-Herb	Forb	0.0	0.5	0.1	0.20
Equisetum sylvaticum	Woodland Horsetail	Forb	0.0	1.0	0.2	0.20
Fragaria virginiana	Virginia Strawberry	Forb	0.0	0.5	0.1	0.20
Galium sp.	Bedstraw	Forb	0.0	0.5	0.1	0.20
Gymnocarpium dryopteris	Northern Oak Fern	Forb	0.0	1.0	0.3	0.40
Lycopodium annotinum	Stiff Clubmoss	Forb	0.0	0.5	0.3	0.60
Lycopodium dendroideum	Treelike Clubmoss	Forb	0.0	0.5	0.1	0.20
Maianthemum trifolium	Three-Leaf Solomon's-Plume	Forb	0.0	1.0	0.2	0.20
Mitella nuda	Naked Bishop's-Cap	Forb	0.0	0.5	0.1	0.20
Monotropa uniflora	Indian-Pipe	Forb	0.0	0.5	0.1	0.20
Orthilia secunda	One-Side Wintergreen	Forb	0.0	0.5	0.3	0.60
Rubus pubescens	Dewberry	Forb	0.0	2.0	0.5	0.40
Trientalis borealis	Northern Starflower	Forb	0.0	0.5	0.2	0.40
Graminoid Layer						
Agrostis scabra	Rough Bentgrass	Graminoid	0.0	0.5	0.1	0.20
Calamagrostis canadensis	Bluejoint Reedgrass	Graminoid	0.0	0.5	0.1	0.20
Carex canescens	Hoary Sedge	Graminoid	0.0	5.0	1.1	0.40
Carex echinata	Little Prickly Sedge	Graminoid	0.0	1.0	0.2	0.20
Carex trisperma	Threefruit sedge	Graminoid	0.0	5.0	1.2	0.40
Carex vesicaria	Inflated Sedge	Graminoid	0.0	2.0	0.4	0.20
Cinna latifolia	Wood Reedgrass	Graminoid	0.0	0.5	0.1	0.20
Glyceria canadensis	Canada Manna-Grass	Graminoid	0.0	2.0	0.4	0.20
Glyceria striata	Fowl Manna-Grass	Graminoid	0.0	0.5	0.1	0.20
Scirpus cyperinus	Cottongrass Bulrush	Graminoid	0.0	1.0	0.2	0.20
Moss / Lichen Layer						
Cladina rangiferina	Gray Reindeer Lichen	Lichen	0.0	0.5	0.1	0.20
Cladonia sp.	Cladonia Lichen	Lichen	0.0	0.5	0.2	0.40
Bazzania trilobata	Three-lobed Whipwort	Moss	0.0	13.0	3.1	0.60
Dicranum polysetum	Wavy-leaved Broom Moss	Moss	0.0	10.0	4.8	0.80
Dicranum scoparium	Common Broom	Moss	0.0	15.0	5.5	0.80

Scientific Name	Common Name	Growth Form	Balsam Fir Forest (n=5)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
	Moss					
Dicranum sp.	Broom Moss	Moss	0.0	1.0	0.2	0.20
Hylocomium splendens	Stairstep Moss	Moss	15.0	60.0	37.0	1.00
na	Unidentified moss	Moss	0.0	1.0	0.4	0.40
Pleurozium schreberi	Schreber's feathermoss	Moss	25.0	50.0	33.0	1.00
Polytrichum sp.	Haircap Moss	Moss	0.0	1.0	0.4	0.40
Ptilidium sp.	Fringewort	Moss	0.0	5.0	1.0	0.20
Ptilium crista-castrensis	Plume moss	Moss	5.0	15.0	9.0	1.00
Rhytidiadelphus sp.	a Mosss	Moss	0.0	5.0	1.0	0.20
Sphagnum sp.	Peatmoss	Moss	0.0	25.0	5.4	0.40

Table D2 Black Spruce Forest - Plant Occurrence Summary (Ground Plot Data)

Scientific Name	Common Name	Growth Form	Black Spruce Forest (n=1)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
Tree Layer						
Abies balsamea	Balsam Fir	Tree	3.0	3.0	3.0	1.00
Betula papyrifera	Paper Birch	Tree	3.0	3.0	3.0	1.00
Picea mariana	Black Spruce	Tree	30.0	30.0	30.0	1.00
Shrub Layer						
Abies balsamea	Balsam Fir	Tall Shrub	2.0	2.0	2.0	1.00
Picea mariana	Black Spruce	Tall Shrub	10.0	10.0	10.0	1.00
Abies balsamea	Balsam Fir	Low Shrub	3.0	3.0	3.0	1.00
Acer rubrum	Red Maple	Low Shrub	0.5	0.5	0.5	1.00
Amelanchier bartramiana	Bartram's Chuckleypear	Low Shrub	0.5	0.5	0.5	1.00
Kalmia angustifolia	Sheep-Laurel	Low Shrub	8.0	8.0	8.0	1.00
Lonicera villosa	Mountain Fly-Honeysuckle	Low Shrub	0.5	0.5	0.5	1.00
Ilex mucronatus	Mountain Holly	Low Shrub	0.5	0.5	0.5	1.00
Picea mariana	Black Spruce	Low Shrub	25.0	25.0	25.0	1.00
Sorbus decora	S Mountain-Ash	Low Shrub	0.5	0.5	0.5	1.00
Taxus canadensis	Canada Yew	Low Shrub	0.5	0.5	0.5	1.00
Vaccinium angustifolium	Late Lowbush Blueberry	Low Shrub	3.0	3.0	3.0	1.00
Viburnum nudum	Possum-Haw Viburnum	Low Shrub	0.5	0.5	0.5	1.00
Empetrum nigrum	Black Crowberry	Dwarf Shrub	0.5	0.5	0.5	1.00
Epigaea repens	Trailing Arbutus	Dwarf Shrub	5.0	5.0	5.0	1.00
Gaultheria hispidula	Creeping Snowberry	Dwarf Shrub	15.0	15.0	15.0	1.00
Linnaea borealis	Twinflower	Dwarf Shrub	3.0	3.0	3.0	1.00
Vaccinium angustifolium	Late Lowbush Blueberry	Dwarf Shrub	2.0	2.0	2.0	1.00
Vaccinium vitis-idaea	Partridgeberry	Dwarf Shrub	2.0	2.0	2.0	1.00
Forb Layer						
Clintonia borealis	Yellow clintonia	Forb	2.0	2.0	2.0	1.00
Coptis trifolia	Goldthread	Forb	3.0	3.0	3.0	1.00
Cornus canadensis	Bunchberry	Forb	20.0	20.0	20.0	1.00
Epilobium palustre	Marsh Willow-Herb	Forb	0.5	0.5	0.5	1.00
Equisetum sylvaticum	Woodland Horsetail	Forb	1.0	1.0	1.0	1.00
Galium sp.	Bedstraw	Forb	0.5	0.5	0.5	1.00

Scientific Name	Common Name	Growth Form	Black Spruce Forest (n=1)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
Gymnocarpium dryopteris	Northern Oak Fern	Forb	3.0	3.0	3.0	1.00
Lycopodium annotinum	Stiff Clubmoss	Forb	0.5	0.5	0.5	1.00
Orthilia secunda	One-Side Wintergreen	Forb	0.5	0.5	0.5	1.00
Platanthera dilatata	Leafy White Orchis	Forb	0.5	0.5	0.5	1.00
Rubus pubescens	Dewberry	Forb	5.0	5.0	5.0	1.00
Symphyotrichum puniceum	Purplestem aster	Forb	1.0	1.0	1.0	1.00
Graminoid Layer						
Carex echinata	Little Prickly Sedge	Graminoid	3.0	3.0	3.0	1.00
Carex leptalea	Bristlestalk Sedge	Graminoid	1.0	1.0	1.0	1.00
Carex sp.	a sedge	Graminoid	2.0	2.0	2.0	1.00
Carex trisperma	Threefruit sedge	Graminoid	10.0	10.0	10.0	1.00
Cinna latifolia	Wood Reedgrass	Graminoid	0.5	0.5	0.5	1.00
Glyceria striata	Fowl Manna-Grass	Graminoid	1.0	1.0	1.0	1.00
Moss / Lichen Layer						
Cladina sp.	Reindeer Lichen	Lichen	0.5	0.5	0.5	1.00
Cladonia sp.	Cladonia Lichen	Lichen	0.5	0.5	0.5	1.00
Dicranum sp.	Broom Moss	Moss	0.5	0.5	0.5	1.00
Hylocomium splendens	Stairstep Moss	Moss	45.0	45.0	45.0	1.00
Pleurozium schreberi	Schreber's feathermoss	Moss	30.0	30.0	30.0	1.00
Ptilium crista-castrensis	Plume moss	Moss	0.5	0.5	0.5	1.00
Sphagnum sp.	Peatmoss	Moss	2.0	2.0	2.0	1.00

Table D3 Kalmia - Black Spruce Forest - Plant Occurrence Summary (Ground Plot Data)

Scientific Name	Common Name	Growth Form	Kalmia - Black Spruce Forest (n=3)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
Tree Layer						
Abies balsamea	Balsam Fir	Tree	0.0	5.0	1.7	0.33
Larix laricina	Tamarack	Tree	0.0	1.0	0.3	0.33
Picea mariana	Black Spruce	Tree	0.0	10.0	3.5	0.67
Shrub Layer						
Abies balsamea	Balsam Fir	Tall Shrub	0.0	4.0	1.7	0.67
Larix laricina	Tamarack	Tall Shrub	0.0	1.0	0.7	0.67
Picea mariana	Black Spruce	Tall Shrub	15.0	25.0	20.0	1.00
Abies balsamea	Balsam Fir	Low Shrub	0.5	1.0	0.8	1.00
Amelanchier bartramiana	Bartram's Chuckleypear	Low Shrub	0.5	1.0	0.7	1.00
Kalmia angustifolia	Sheep-Laurel	Low Shrub	30.0	35.0	31.7	1.00
Kalmia polifolia	Bog Laurel	Low Shrub	0.0	1.0	0.3	0.33
Rhododendron groenlandicum	Common Labrador Tea	Low Shrub	0.5	1.0	0.8	1.00
Ilex mucronatus	Mountain Holly	Low Shrub	0.0	1.0	0.7	0.67
Picea mariana	Black Spruce	Low Shrub	5.0	35.0	21.7	1.00
Rhododendron canadense	Rhodora	Low Shrub	4.0	20.0	11.3	1.00
Vaccinium angustifolium	Late Lowbush Blueberry	Low Shrub	0.0	0.5	0.2	0.33
Viburnum nudum	Possum-Haw Viburnum	Low Shrub	0.0	0.5	0.2	0.33
Amelanchier bartramiana	Bartram's chuckleypear	Dwarf Shrub	0.0	0.5	0.2	0.33
Empetrum nigrum	Black Crowberry	Dwarf Shrub	0.5	3.0	1.3	1.00
Epigaea repens	Trailing Arbutus	Dwarf Shrub	0.0	1.0	0.5	0.67
Gaultheria hispidula	Creeping Snowberry	Dwarf Shrub	1.0	2.0	1.7	1.00
Kalmia angustifolia	Sheep-Laurel	Dwarf Shrub	4.0	5.0	4.7	1.00
Kalmia polifolia	Bog Laurel	Dwarf Shrub	0.0	0.5	0.3	0.67
Rhododendron groenlandicum	Common Labrador Tea	Dwarf Shrub	0.0	1.0	0.3	0.33
Ilex mucronatus	Mountain Holly	Dwarf Shrub	0.0	0.5	0.2	0.33
Rhododendron canadense	Rhodora	Dwarf Shrub	0.0	1.0	0.3	0.33
Vaccinium	Late Lowbush	Dwarf	2.0	15.0	6.7	1.00

Scientific Name	Common Name	Growth Form	Kalmia - Black Spruce Forest (n=3)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
angustifolium	Blueberry	Shrub				
Vaccinium boreale	Northern Blueberry	Dwarf Shrub	0.0	1.0	0.3	0.33
Vaccinium oxycoccos	Small Cranberry	Dwarf Shrub	0.5	0.5	0.5	1.00
Vaccinium vitis-idaea	Partridgeberry	Dwarf Shrub	0.0	0.5	0.3	0.67
Forb Layer						
Clintonia borealis	Yellow clintonia	Forb	0.0	0.5	0.2	0.33
Coptis trifolia	Goldthread	Forb	0.5	1.0	0.7	1.00
Cornus canadensis	Bunchberry	Forb	2.0	4.0	2.7	1.00
Maianthemum trifolium	Three-Leaf Solomon's-Plume	Forb	0.0	0.5	0.2	0.33
Orthilia secunda	One-Side Wintergreen	Forb	0.0	0.5	0.3	0.67
Rubus chamaemorus	Cloudberry	Forb	0.0	0.5	0.2	0.33
Graminoid Layer						
Carex echinata	Little Prickly Sedge	Graminoid	0.5	1.0	0.7	1.00
Carex pauciflora	Few-Flowered Sedge	Graminoid	0.0	2.0	0.7	0.33
Carex trisperma	Threefruit sedge	Graminoid	0.5	2.0	1.0	1.00
Trichophorum caespitosum	Deergrass	Graminoid	0.0	0.5	0.2	0.33
Moss / Lichen Layer						
Cladina arbuscula	Reindeer Lichen	Lichen	0.0	5.0	2.3	0.67
Cladina mitis	Green Reindeer Lichen	Lichen	0.0	5.0	3.3	0.67
Cladina rangiferina	Gray Reindeer Lichen	Lichen	10.0	15.0	13.3	1.00
Cladina stellaris	Star-tipped Reindeer Lichen	Lichen	0.0	3.0	1.7	0.67
Cladonia sp.	Cladonia Lichen	Lichen	0.0	1.0	0.5	0.67
Bazzania trilobata	Three-lobed Whipwort	Moss	0.5	5.0	2.2	1.00
Dicranum polysetum	Wavy-leaved Broom Moss	Moss	0.5	10.0	5.2	1.00
Hylocomium splendens	Stairstep Moss	Moss	0.0	5.0	2.0	0.67
Pleurozium schreberi	Schreber's feathermoss	Moss	35.0	65.0	53.3	1.00
Polytrichum sp.	Haircap Moss	Moss	0.0	2.0	0.7	0.33
Ptilidium sp.	Fringewort	Moss	0.0	0.5	0.2	0.33
Ptilium crista-castrensis	Plume moss	Moss	0.0	5.0	1.7	0.33
Sphagnum sp.	Peatmoss	Moss	5.0	25.0	12.3	1.00

Table D4 Kalmia Heath - Plant Occurrence Summary (Ground Plot Data)

Scientific Name	Common Name	Growth Form	Kalmia Heath (n=3)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
Shrub Layer						
Abies balsamea	Balsam Fir	Tall Shrub	0.0	0.5	0.2	0.33
Larix laricina	Tamarack	Tall Shrub	0.5	2.0	1.0	1.00
Picea mariana	Black Spruce	Tall Shrub	0.0	0.5	0.2	0.33
Abies balsamea	Balsam Fir	Low Shrub	0.5	1.0	0.8	1.00
Amelanchier bartramiana	Bartram's Chuckleypear	Low Shrub	0.0	1.0	0.3	0.33
Andromeda polifolia	Bog Rosemary	Low Shrub	0.0	1.0	0.3	0.33
Betula papyrifera	Paper Birch	Low Shrub	0.0	0.5	0.3	0.67
Chamaedaphne calyculata	Leatherleaf	Low Shrub	1.0	3.0	1.7	1.00
Juniperus communis var. depressa	Ground Juniper	Low Shrub	0.0	0.5	0.2	0.33
Kalmia angustifolia	Sheep-Laurel	Low Shrub	0.0	35.0	21.7	0.67
Larix laricina	Tamarack	Low Shrub	0.0	0.5	0.3	0.67
Rhododendron groenlandicum	Common Labrador Tea	Low Shrub	0.0	0.5	0.2	0.33
Ilex mucronatus	Mountain Holly	Low Shrub	0.0	0.5	0.3	0.67
Picea mariana	Black Spruce	Low Shrub	30.0	40.0	35.0	1.00
Rhododendron canadense	Rhodora	Low Shrub	10.0	15.0	11.7	1.00
Vaccinium angustifolium	Late Lowbush Blueberry	Low Shrub	2.0	5.0	3.0	1.00
Chamaedaphne calyculata	Leatherleaf	Dwarf Shrub	0.0	2.0	0.8	0.67
Empetrum eamesii	Rock Crowberry	Dwarf Shrub	0.0	0.5	0.3	0.67
Empetrum nigrum	Black Crowberry	Dwarf Shrub	2.0	10.0	5.7	1.00
Gaultheria hispidula	Creeping Snowberry	Dwarf Shrub	0.5	2.0	1.2	1.00
Kalmia angustifolia	Sheep-Laurel	Dwarf Shrub	0.0	5.0	2.7	0.67
Kalmia polifolia	Bog Laurel	Dwarf Shrub	0.0	0.5	0.3	0.67
Rhododendron groenlandicum	Common Labrador Tea	Dwarf Shrub	0.0	1.0	0.3	0.33
Rhododendron canadense	Rhodora	Dwarf Shrub	0.0	2.0	1.0	0.67
Vaccinium angustifolium	Late Lowbush Blueberry	Dwarf Shrub	2.0	10.0	5.0	1.00
Vaccinium boreale	Northern Blueberry	Dwarf Shrub	0.5	1.0	0.8	1.00
Vaccinium oxycoccos	Small Cranberry	Dwarf	0.0	0.5	0.2	0.33

Scientific Name	Common Name	Growth Form	Kalmia Heath (n=3)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
		Shrub				
Vaccinium uliginosum	Bog Bilberry	Dwarf Shrub	0.0	1.0	0.5	0.67
Vaccinium vitis-idaea	Partridgeberry	Dwarf Shrub	0.0	1.0	0.5	0.67
Forb Layer						
Coptis trifolia	Goldthread	Forb	0.0	0.5	0.2	0.33
Cornus canadensis	Bunchberry	Forb	0.0	0.5	0.3	0.67
Drosera rotundifolia	Roundleaf Sundew	Forb	0.0	0.5	0.2	0.33
Lycopodium annotinum	Stiff Clubmoss	Forb	0.0	0.5	0.2	0.33
Rubus chamaemorus	Cloudberry	Forb	0.0	0.5	0.2	0.33
Sarracenia purpurea	Northern Pitcher-Plant	Forb	0.0	0.5	0.3	0.67
Trientalis borealis	Northern Starflower	Forb	0.0	0.5	0.2	0.33
Graminoid Layer						
Carex oligosperma	Few-Seeded Sedge	Graminoid	0.0	0.5	0.2	0.33
Carex pauciflora	Few-Flowered Sedge	Graminoid	0.0	0.5	0.2	0.33
Carex trisperma	Threefruit sedge	Graminoid	0.0	0.5	0.2	0.33
Trichophorum caespitosum	Deergrass	Graminoid	0.0	0.5	0.3	0.67
Moss / Lichen Layer						
Cetraria sp.	a lichen	Lichen	0.0	0.5	0.2	0.33
Cladina arbuscula	Reindeer Lichen	Lichen	1.0	25.0	17.0	1.00
Cladina mitis	Green Reindeer Lichen	Lichen	0.0	0.5	0.2	0.33
Cladina rangiferina	Gray Reindeer Lichen	Lichen	25.0	35.0	28.3	1.00
Cladina stellaris	Star-tipped Reindeer Lichen	Lichen	5.0	20.0	11.7	1.00
Cladonia sp.	Cladonia Lichen	Lichen	1.0	5.0	2.7	1.00
Aulacomnium palustre	Glow Moss	Moss	0.0	0.5	0.2	0.33
Dicranum sp.	Broom Moss	Moss	0.0	1.0	0.5	0.67
Hylocomium splendens	Stairstep Moss	Moss	0.5	10.0	4.2	1.00
Pleurozium schreberi	Schreber's feathermoss	Moss	20.0	50.0	31.7	1.00
Ptilidium sp.	Fringewort	Moss	0.5	5.0	2.0	1.00
Racomitrium sp.	a Moss	Moss	0.5	1.0	0.8	1.00
Sphagnum rubellum	Red Peat Moss	Moss	0.0	1.0	0.3	0.33
Sphagnum sp.	Peatmoss	Moss	0.0	25.0	8.7	0.67

Table D5 Mixedwood Forest - Plant Occurrence Summary (Ground Plot Data)

Scientific Name	Common Name	Growth Form	Mixedwood Forest (n=3)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
Tree Layer						
Abies balsamea	Balsam Fir	Tree	20.0	65.0	45.0	1.00
Betula papyrifera	Paper Birch	Tree	20.0	25.0	21.7	1.00
Picea glauca	White Spruce	Tree	0.0	20.0	9.0	0.67
Shrub Layer						
Abies balsamea	Balsam Fir	Tall Shrub	0.0	10.0	3.7	0.67
Picea glauca	White Spruce	Tall Shrub	0.0	2.0	0.7	0.33
Abies balsamea	Balsam Fir	Low Shrub	0.0	5.0	2.7	0.67
Acer spicatum	Mountain Maple	Low Shrub	0.0	2.0	0.7	0.33
Betula papyrifera	Paper Birch	Low Shrub	0.5	2.0	1.2	1.00
Picea glauca	White Spruce	Low Shrub	0.0	1.0	0.3	0.33
Ribes lacustre	Bristly Black Currant	Low Shrub	0.0	0.5	0.2	0.33
Rubus idaeus	Red Raspberry	Low Shrub	0.0	25.0	8.3	0.33
Sambucus racemosa	Red Elderberry	Low Shrub	0.0	2.0	0.7	0.33
Sambucus sp.	Elderberry	Low Shrub	0.0	1.0	0.3	0.33
Sorbus americana	American Mountain-Ash	Low Shrub	0.0	0.5	0.2	0.33
Sorbus decora	Showy Mountain-Ash	Low Shrub	0.0	1.0	0.3	0.33
Taxus canadensis	Canada Yew	Low Shrub	0.0	0.5	0.3	0.67
Vaccinium angustifolium	Late Lowbush Blueberry	Low Shrub	0.0	1.0	0.3	0.33
Viburnum opulus	Guelder-Rose Viburnum	Low Shrub	0.0	0.5	0.2	0.33
Abies balsamea	Balsam Fir	Dwarf Shrub	0.0	1.0	0.7	0.67
Gaultheria hispidula	Creeping Snowberry	Dwarf Shrub	0.0	4.0	1.3	0.33
Linnaea borealis	Twinflower	Dwarf Shrub	0.0	3.0	1.2	0.67
Viburnum opulus	Guelder-Rose Viburnum	Dwarf Shrub	0.0	0.5	0.2	0.33
Forb Layer						
Anaphalis margaritacea	Pearly Everlasting	Forb	0.0	1.0	0.3	0.33
Circaea alpina	Small Enchanter's Nightshade	Forb	0.0	0.5	0.3	0.67
Cornus canadensis	Bunchberry	Forb	1.0	35.0	13.7	1.00
Dryopteris campyloptera	Mountain Wood-Fern	Forb	5.0	35.0	18.3	1.00
Dryopteris intermedia	Evergreen woodfern	Forb	0.5	2.0	1.2	1.00
Epilobium ciliatum	Hairy Willow-Herb	Forb	0.0	0.5	0.2	0.33
Equisetum sylvaticum	Woodland Horsetail	Forb	0.0	0.5	0.2	0.33

Scientific Name	Common Name	Growth Form	Mixedwood Forest (n=3)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
Gymnocarpium dryopteris	Northern Oak Fern	Forb	0.0	1.0	0.5	0.67
Lycopodium dendroideum	Treelike Clubmoss	Forb	0.0	0.5	0.2	0.33
Monotropa uniflora	Indian-Pipe	Forb	0.0	0.5	0.2	0.33
Orthilia secunda	One-Side Wintergreen	Forb	0.0	0.5	0.2	0.33
Osmunda cinnamomea	Cinnamon Fern	Forb	0.0	0.5	0.2	0.33
Rubus pubescens	Dewberry	Forb	0.0	2.0	1.0	0.67
Trientalis borealis	Northern Starflower	Forb	0.5	0.5	0.5	1.00
Graminoid Layer						
Agrostis scabra	Rough Bentgrass	Graminoid	0.0	1.0	0.3	0.33
Calamagrostis canadensis	Bluejoint Reedgrass	Graminoid	0.0	0.5	0.2	0.33
Carex canescens	Hoary Sedge	Graminoid	0.0	1.0	0.3	0.33
Carex echinata	Little Prickly Sedge	Graminoid	0.0	1.0	0.3	0.33
Carex leptalea	Bristlestalk Sedge	Graminoid	0.0	0.5	0.2	0.33
Carex magellanica	Boreal Bog Sedge	Graminoid	0.0	1.0	0.3	0.33
Carex trisperma	Threefruit sedge	Graminoid	0.0	1.0	0.3	0.33
Cinna latifolia	Wood Reedgrass	Graminoid	0.0	2.0	0.7	0.33
Glyceria striata	Fowl Manna-Grass	Graminoid	0.0	1.0	0.3	0.33
Juncus effusus	Soft Rush	Graminoid	0.0	0.5	0.2	0.33
Poa saltuensis	Forest Bluegrass	Graminoid	0.0	0.5	0.2	0.33
Moss / Lichen Layer						
Bazzania trilobata	Three-lobed Whipwort	Moss	0.0	3.0	2.0	0.67
Dicranum polysetum	Wavy-leaved Broom Moss	Moss	0.0	20.0	11.7	0.67
Dicranum scoparium	Common Broom Moss	Moss	0.0	10.0	5.0	0.67
Dicranum sp.	Broom Moss	Moss	1.0	5.0	3.7	1.00
Hylocomium splendens	Stairstep Moss	Moss	0.5	20.0	13.5	1.00
na	Unidentified moss	Moss	0.0	2.0	0.7	0.33
Pleurozium schreberi	Schreber's feathermoss	Moss	5.0	10.0	6.7	1.00
Polytrichum sp.	Haircap Moss	Moss	0.0	2.0	0.7	0.33
Ptilium crista-castrensis	Plume moss	Moss	0.5	5.0	2.2	1.00
Rhytidiadelphus sp.	a Mosss	Moss	0.0	10.0	4.3	0.67
Sphagnum sp.	Peatmoss	Moss	0.0	0.5	0.2	0.33

Table D6 Alder Thicket - Plant Occurrence Summary (Ground Plot data)

Scientific Name	Common Name	Growth Form	Alder Thicket (n=4)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
Tree Layer						
Abies balsamea	Balsam Fir	Tree	0.0	10.0	4.3	0.75
Betula papyrifera	Paper Birch	Tree	0.0	5.0	2.3	0.50
Picea glauca	White Spruce	Tree	0.0	5.0	1.3	0.25
Picea mariana	Black Spruce	Tree	0.0	1.0	0.3	0.25
Shrub Layer						
Abies balsamea	Balsam Fir	Tall Shrub	0.0	1.0	0.3	0.25
Alnus incana	Speckled Alder	Tall Shrub	0.0	70.0	52.5	0.75
Alnus viridis	Green Alder	Tall Shrub	0.0	60.0	15.0	0.25
Abies balsamea	Balsam Fir	Low Shrub	0.0	0.5	0.3	0.50
Alnus incana	Speckled Alder	Low Shrub	0.0	25.0	15.0	0.75
Alnus viridis	Green Alder	Low Shrub	0.0	10.0	2.5	0.25
Chamaedaphne calyculata	Leatherleaf	Low Shrub	0.0	1.0	0.3	0.25
Myrica gale	Sweet Gale	Low Shrub	0.0	40.0	10.0	0.25
Ribes sp.	a Currant	Low Shrub	0.0	0.5	0.4	0.75
Rubus idaeus	Red Raspberry	Low Shrub	1.0	5.0	3.0	1.00
Sambucus sp.	Elderberry	Low Shrub	0.0	0.5	0.1	0.25
Spiraea alba	Narrow-Leaved Meadow-Sweet	Low Shrub	0.0	5.0	1.3	0.25
Taxus canadensis	Canada Yew	Low Shrub	0.0	0.5	0.1	0.25
Abies balsamea	Balsam Fir	Dwarf Shrub	0.0	0.5	0.3	0.50
Forb Layer						
Athyrium filix-femina	Lady Fern	Forb	0.0	0.5	0.1	0.25
Chelone glabra	White Turtlehead	Forb	0.0	10.0	2.5	0.25
Circaea alpina	Small Enchanter's Nightshade	Forb	0.0	1.0	0.4	0.50
Cornus canadensis	Bunchberry	Forb	0.0	1.0	0.4	0.50
Doellingeria umbellata	Parasol White-Top	Forb	0.0	1.0	0.3	0.25
Dryopteris campyloptera	Mountain Wood-Fern	Forb	0.0	50.0	15.5	0.75
Dryopteris intermedia	Evergreen woodfern	Forb	0.0	60.0	22.5	0.75
Epilobium ciliatum	Hairy Willow-Herb	Forb	0.0	0.5	0.1	0.25
Equisetum fluviatile	Water Horsetail	Forb	0.0	5.0	1.3	0.25
Equisetum sylvaticum	Woodland Horsetail	Forb	0.0	3.0	1.0	0.50
Eurybia radula	Rough-Leaved Aster	Forb	0.0	0.5	0.1	0.25
Eutrochium	Spotted Joe-Pye	Forb	0.0	2.0	0.5	0.25

Scientific Name	Common Name	Growth Form	Alder Thicket (n=4)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
maculatum	Weed					
Galium sp.	Bedstraw	Forb	0.0	1.0	0.4	0.50
Gymnocarpium dryopteris	Northern Oak Fern	Forb	0.0	1.0	0.3	0.25
Iris versicolor	Blueflag	Forb	0.0	10.0	2.5	0.25
Lycopodium annotinum	Stiff Clubmoss	Forb	0.0	4.0	1.3	0.50
Lycopus uniflorus	Northern Bugleweed	Forb	0.0	0.5	0.1	0.25
Mentha arvensis	Corn Mint	Forb	0.0	2.0	0.5	0.25
Mitella nuda	Naked Bishop's-Cap	Forb	0.0	2.0	0.5	0.25
Osmunda regalis	Royal Fern	Forb	0.0	1.0	0.3	0.25
Phegopteris connectilis	Northern Beech Fern	Forb	0.0	0.5	0.1	0.25
Ranunculus repens	Creeping Butter-Cup	Forb	0.0	3.0	1.0	0.50
Rubus pubescens	Dewberry	Forb	2.0	10.0	5.5	1.00
Sanguisorba canadensis	Bottlebrush	Forb	0.0	2.0	0.5	0.25
Solidago rugosa	Rough-Leaf Goldenrod	Forb	0.0	1.0	0.3	0.25
Symphyotrichum puniceum	Purplestem aster	Forb	0.0	10.0	3.0	0.75
Thalictrum pubescens	Tall Meadow-Rue	Forb	0.0	2.0	1.0	0.50
Triadenum fraseri	Marsh St. John's-Wort	Forb	0.0	0.5	0.1	0.25
Trientalis borealis	Northern Starflower	Forb	0.5	1.0	0.6	1.00
Graminoid Layer						
Agrostis capillaris	Colonial Bentgrass	Graminoid	0.0	1.0	0.3	0.25
Agrostis perennans	Perennial Bentgrass	Graminoid	0.0	2.0	0.5	0.25
Calamagrostis canadensis	Bluejoint Reedgrass	Graminoid	0.0	10.0	5.3	0.75
Carex brunnescens	Brownish Sedge	Graminoid	0.0	5.0	1.6	0.75
Carex canescens	Hoary Sedge	Graminoid	0.0	5.0	3.0	0.75
Carex debilis	White-Edge Sedge	Graminoid	0.0	0.5	0.1	0.25
Carex deweyana	Short-Scale Sedge	Graminoid	0.0	0.5	0.3	0.50
Carex echinata	Little Prickly Sedge	Graminoid	0.0	5.0	1.3	0.25
Carex flava	Yellow Sedge	Graminoid	0.0	0.5	0.1	0.25
Carex intumescens	Bladder Sedge	Graminoid	0.0	2.0	0.5	0.25
Carex leptalea	Bristlestalk Sedge	Graminoid	0.0	3.0	1.3	0.75
Carex stipata	Stalk-Grain Sedge	Graminoid	0.0	2.0	0.8	0.50
Carex trisperma	Threefruit sedge	Graminoid	0.0	7.0	1.8	0.25
Carex utriculata	Bear Sedge	Graminoid	0.0	4.0	1.0	0.25

Scientific Name	Common Name	Growth Form	Alder Thicket (n=4)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
Cinna latifolia	Wood Reedgrass	Graminoid	0.0	1.0	0.5	0.50
Glyceria canadensis	Canada Manna-Grass	Graminoid	0.0	5.0	2.3	0.50
Glyceria striata	Fowl Manna-Grass	Graminoid	0.5	2.0	1.1	1.00
Poa palustris	Fowl Bluegrass	Graminoid	0.0	2.0	0.5	0.25
Scirpus cyperinus	Cottongrass Bulrush	Graminoid	0.0	1.0	0.5	0.50
Moss / Lichen Layer						
Dicranum scoparium	Common Broom Moss	Moss	0.0	0.5	0.1	0.25
Dicranum sp.	Broom Moss	Moss	0.0	0.5	0.3	0.50
Hylocomium splendens	Stairstep Moss	Moss	0.0	0.5	0.1	0.25
na	Unidentified moss	Moss	0.0	1.0	0.2	0.25
Plagiomnium sp.	Leafy Moss	Moss	0.0	0.5	0.1	0.25
Pleurozium schreberi	Schreber's feathermoss	Moss	0.0	0.5	0.3	0.50
Polytrichum sp.	Haircap Moss	Moss	0.0	0.5	0.1	0.25
Ptilium crista-castrensis	Plume moss	Moss	0.0	0.5	0.1	0.25
Rhytidiadelphus sp.	a Mosss	Moss	0.0	1.0	0.3	0.25
Sphagnum sp.	Peatmoss	Moss	0.0	50.0	12.6	0.50
Thuidium recognitum	Hook-leaved Fern Moss	Moss	0.0	0.5	0.1	0.25

Table D7 Riparian Thicket - Plant Occurrence Summary (Ground Plot Data)

Scientific Name	Common Name	Growth Form	Riparian Thicket (n=1)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
Shrub Layer						
Alnus viridis	Green Alder	Tall Shrub	5.0	5.0	5.0	1.00
Alnus viridis	Green Alder	Low Shrub	1.0	1.0	1.0	1.00
Chamaedaphne calyculata	Leatherleaf	Low Shrub	1.0	1.0	1.0	1.00
Myrica gale	Sweet Gale	Low Shrub	70.0	70.0	70.0	1.00
Spiraea alba	Narrow-Leaved Meadow-Sweet	Low Shrub	2.0	2.0	2.0	1.00
Forb Layer						
Chelone glabra	White Turtlehead	Forb	1.0	1.0	1.0	1.00
Equisetum fluviatile	Water Horsetail	Forb	10.0	10.0	10.0	1.00
Eurybia radula	Rough-Leaved Aster	Forb	0.5	0.5	0.5	1.00
Eutrochium maculatum	Spotted Joe-Pye Weed	Forb	0.5	0.5	0.5	1.00
Galium sp.	Bedstraw	Forb	0.5	0.5	0.5	1.00
Hypericum sp.	St John's-Wort	Forb	0.5	0.5	0.5	1.00
Iris versicolor	Blueflag	Forb	5.0	5.0	5.0	1.00
Onoclea sensibilis	Sensitive Fern	Forb	1.0	1.0	1.0	1.00
Sanguisorba canadensis	Bottlebrush	Forb	2.0	2.0	2.0	1.00
Thalictrum pubescens	Tall Meadow-Rue	Forb	0.5	0.5	0.5	1.00
Triadenum fraseri	Marsh St. John's-Wort	Forb	1.0	1.0	1.0	1.00
Viola sp.	Violet	Forb	0.5	0.5	0.5	1.00
Graminoid Layer						
Calamagrostis canadensis	Bluejoint Reedgrass	Graminoid	15.0	15.0	15.0	1.00
Carex atlantica	Atlantic Sedge	Graminoid	1.0	1.0	1.0	1.00
Carex buxbaumii	Buxbaum's Sedge	Graminoid	1.0	1.0	1.0	1.00
Carex canescens	Hoary Sedge	Graminoid	1.0	1.0	1.0	1.00
Carex echinata	Little Prickly Sedge	Graminoid	5.0	5.0	5.0	1.00
Carex intumescens	Bladder Sedge	Graminoid	1.0	1.0	1.0	1.00
Carex lasiocarpa	Slender Sedge	Graminoid	5.0	5.0	5.0	1.00
Carex stipata	Stalk-Grain Sedge	Graminoid	1.0	1.0	1.0	1.00
Carex utriculata	Bear Sedge	Graminoid	1.0	1.0	1.0	1.00
Carex vesicaria	Inflated Sedge	Graminoid	5.0	5.0	5.0	1.00
Glyceria canadensis	Canada Manna-Grass	Graminoid	1.0	1.0	1.0	1.00
Juncus brevicaudatus	Short-tail Rush	Graminoid	0.5	0.5	0.5	1.00
Juncus canadensis	Canada Rush	Graminoid	2.0	2.0	2.0	1.00
Scirpus cyperinus	Cottongrass Bulrush	Graminoid	5.0	5.0	5.0	1.00
Scirpus microcarpus	Red-tinged bulrush	Graminoid	5.0	5.0	5.0	1.00

Table D8 Wet Coniferous Forest - Plant Occurrence Summary (Ground Plot Data)

Scientific Name	Common Name	Growth Form	Wet Coniferous Forest (n=3)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
Tree Layer						
Abies balsamea	Balsam Fir	Tree	0.0	20.0	6.7	0.33
Betula papyrifera	Paper Birch	Tree	0.0	0.5	0.2	0.33
Larix laricina	Tamarack	Tree	0.0	5.0	3.0	0.67
Picea mariana	Black Spruce	Tree	5.0	25.0	16.7	1.00
Shrub Layer						
Abies balsamea	Balsam Fir	Tall Shrub	0.0	25.0	9.0	0.67
Alnus viridis	Green Alder	Tall Shrub	0.0	3.0	1.7	0.67
Larix laricina	Tamarack	Tall Shrub	0.0	4.0	1.7	0.67
Picea mariana	Black Spruce	Tall Shrub	3.0	20.0	14.3	1.00
Abies balsamea	Balsam Fir	Low Shrub	0.0	5.0	2.7	0.67
Alnus viridis	Green Alder	Low Shrub	0.5	5.0	2.0	1.00
Amelanchier bartramiana	Bartram's Chuckleypear	Low Shrub	0.0	1.0	0.3	0.33
Chamaedaphne calyculata	Leatherleaf	Low Shrub	0.0	10.0	3.3	0.33
Cornus sericea	Silky Dogwood	Low Shrub	0.0	1.0	0.3	0.33
Dasiphora fruticosa	Shrubby Cinquefoil	Low Shrub	0.0	1.0	0.3	0.33
Kalmia angustifolia	Sheep-Laurel	Low Shrub	0.0	4.0	1.3	0.33
Kalmia polifolia	Bog Laurel	Low Shrub	0.0	0.5	0.2	0.33
Rhododendron groenlandicum	Common Labrador Tea	Low Shrub	0.0	3.0	1.2	0.67
Lonicera villosa	Mountain Fly-Honeysuckle	Low Shrub	0.0	1.0	0.3	0.33
Myrica gale	Sweet Gale	Low Shrub	0.0	15.0	5.3	0.67
Picea mariana	Black Spruce	Low Shrub	0.5	20.0	11.8	1.00
Rhamnus alnifolia	Alderleaf Buckthorn	Low Shrub	0.0	1.0	0.3	0.33
Taxus canadensis	Canada Yew	Low Shrub	0.0	0.5	0.2	0.33
Viburnum nudum	Possum-Haw Viburnum	Low Shrub	0.0	0.5	0.2	0.33
Viburnum opulus	Guelder-Rose Viburnum	Low Shrub	0.0	0.5	0.2	0.33
Epigaea repens	Trailing Arbutus	Dwarf Shrub	0.0	0.5	0.2	0.33
Gaultheria hispidula	Creeping Snowberry	Dwarf Shrub	0.5	2.0	1.2	1.00
Kalmia angustifolia	Sheep-Laurel	Dwarf Shrub	0.0	1.0	0.3	0.33
Kalmia polifolia	Bog Laurel	Dwarf Shrub	0.0	0.5	0.2	0.33
Rhododendron groenlandicum	Common Labrador Tea	Dwarf Shrub	0.0	1.0	0.3	0.33

Scientific Name	Common Name	Growth Form	Wet Coniferous Forest (n=3)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
Linnaea borealis	Twinflower	Dwarf Shrub	0.5	2.0	1.2	1.00
Lonicera villosa	Mountain Fly-Honeysuckle	Dwarf Shrub	0.0	0.5	0.2	0.33
Taxus canadensis	Canada Yew	Dwarf Shrub	0.0	0.5	0.2	0.33
Vaccinium angustifolium	Late Lowbush Blueberry	Dwarf Shrub	0.0	2.0	0.8	0.67
Vaccinium macrocarpon	Large Cranberry	Dwarf Shrub	0.0	0.5	0.2	0.33
Vaccinium oxycoccos	Small Cranberry	Dwarf Shrub	0.0	0.5	0.2	0.33
Forb Layer						
Anaphalis margaritacea	Pearly Everlasting	Forb	0.0	0.5	0.2	0.33
Athyrium filix-femina	Lady Fern	Forb	0.0	1.0	0.3	0.33
Cirsium muticum	Swamp Thistle	Forb	0.0	0.5	0.2	0.33
Clintonia borealis	Yellow clintonia	Forb	0.0	3.0	1.7	0.67
Coptis trifolia	Goldthread	Forb	0.0	0.5	0.2	0.33
Cornus canadensis	Bunchberry	Forb	2.0	15.0	6.3	1.00
Drosera rotundifolia	Roundleaf Sundew	Forb	0.0	0.5	0.2	0.33
Dryopteris campyloptera	Mountain Wood-Fern	Forb	0.0	1.0	0.3	0.33
Epilobium ciliatum	Hairy Willow-Herb	Forb	0.0	0.5	0.2	0.33
Epilobium palustre	Marsh Willow-Herb	Forb	0.0	0.5	0.2	0.33
Equisetum arvense	Field Horsetail	Forb	0.0	5.0	1.8	0.67
Equisetum sylvaticum	Woodland Horsetail	Forb	0.0	5.0	2.7	0.67
Eurybia radula	Rough-Leaved Aster	Forb	0.0	0.5	0.2	0.33
Fragaria virginiana	Virginia Strawberry	Forb	0.0	0.5	0.2	0.33
Galium sp.	Bedstraw	Forb	0.0	0.5	0.2	0.33
Geum macrophyllum	Large-Leaved Avens	Forb	0.0	2.0	0.7	0.33
Geum sp.	Avens	Forb	0.0	0.5	0.2	0.33
Gymnocarpium dryopteris	Northern Oak Fern	Forb	0.0	1.0	0.5	0.67
Maianthemum trifolium	Three-Leaf Solomon's-Plume	Forb	0.5	15.0	6.8	1.00
Mitella nuda	Naked Bishop's-Cap	Forb	0.0	0.5	0.3	0.67
Orthilia secunda	One-Side Wintergreen	Forb	0.0	0.5	0.2	0.33
Osmunda cinnamomea	Cinnamon Fern	Forb	0.0	1.0	0.7	0.67
Packera aurea	Golden Groundsel	Forb	0.0	0.5	0.2	0.33
Platanthera dilatata	Leafy White Orchis	Forb	0.0	0.5	0.2	0.33
Prenanthes trifoliolata	Three-Leaved Rattlesnake-root	Forb	0.0	0.5	0.2	0.33

Scientific Name	Common Name	Growth Form	Wet Coniferous Forest (n=3)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
Prunella vulgaris	Self-Heal	Forb	0.0	0.5	0.2	0.33
Ranunculus acris	Tall Butter-Cup	Forb	0.0	0.5	0.2	0.33
Ranunculus repens	Creeping Butter-Cup	Forb	0.0	1.0	0.3	0.33
Rubus arcticus	Northern Blackberry	Forb	0.0	0.5	0.3	0.67
Rubus pubescens	Dewberry	Forb	0.0	15.0	6.0	0.67
Sanguisorba canadensis	Bottlebrush	Forb	0.0	20.0	6.7	0.33
Solidago uliginosa	Bog Goldenrod	Forb	0.0	0.5	0.2	0.33
Spiranthes romanzoffiana	Hooded Ladies'-Tresses	Forb	0.0	0.5	0.2	0.33
Symphyotrichum puniceum	Purplestem aster	Forb	0.0	2.0	0.8	0.67
Thalictrum alpinum	Alpine Meadow-Rue	Forb	0.0	1.0	0.3	0.33
Thalictrum pubescens	Tall Meadow-Rue	Forb	0.0	5.0	1.7	0.33
Viola sp.	Violet	Forb	0.0	0.5	0.2	0.33
Graminoid Layer						
Agrostis gigantea	Black Bentgrass	Graminoid	0.0	0.5	0.2	0.33
Agrostis scabra	Rough Bentgrass	Graminoid	0.0	1.0	0.5	0.67
Bromus ciliatus	Fringed Brome	Graminoid	0.0	0.5	0.2	0.33
Calamagrostis canadensis	Bluejoint Reedgrass	Graminoid	0.0	1.0	0.3	0.33
Calamagrostis pickeringii	Pickering's Reedgrass	Graminoid	0.0	2.0	0.7	0.33
Carex atlantica	Atlantic Sedge	Graminoid	2.0	5.0	3.3	1.00
Carex brunnescens	Brownish Sedge	Graminoid	0.0	0.5	0.2	0.33
Carex buxbaumii	Buxbaum's Sedge	Graminoid	0.0	10.0	6.7	0.67
Carex canescens	Hoary Sedge	Graminoid	0.0	1.0	0.7	0.67
Carex disperma	Softleaf Sedge	Graminoid	0.0	0.5	0.2	0.33
Carex echinata	Little Prickly Sedge	Graminoid	4.0	5.0	4.7	1.00
Carex flava	Yellow Sedge	Graminoid	0.0	5.0	1.8	0.67
Carex interior	Inland Sedge	Graminoid	0.0	0.5	0.2	0.33
Carex leptalea	Bristlestalk Sedge	Graminoid	0.0	10.0	3.5	0.67
Carex magellanica	Boreal Bog Sedge	Graminoid	0.0	2.0	0.7	0.33
Carex oligosperma	Few-Seeded Sedge	Graminoid	0.0	2.0	0.7	0.33
Carex pauciflora	Few-Flowered Sedge	Graminoid	0.0	2.0	0.7	0.33
Carex tenuiflora	Sparse-Flowered Sedge	Graminoid	0.0	1.0	0.3	0.33
Carex trisperma	Threefruit sedge	Graminoid	5.0	5.0	5.0	1.00
Carex utriculata	Bear Sedge	Graminoid	0.0	3.0	1.0	0.33
Carex wiegandii	Wiegand's Sedge	Graminoid	0.0	0.5	0.2	0.33
Eriophorum angustifolium	No Common Name In Tracker	Graminoid	0.0	1.0	0.3	0.33
Eriophorum viridicarinatum	Green-Keel Cottongrass	Graminoid	0.0	0.5	0.2	0.33

Scientific Name	Common Name	Growth Form	Wet Coniferous Forest (n=3)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
Glyceria striata	Fowl Manna-Grass	Graminoid	0.0	3.0	1.3	0.67
Juncus brevicaudatus	Short-tail Rush	Graminoid	0.0	0.5	0.2	0.33
Poa saltuensis	Forest Bluegrass	Graminoid	0.0	0.5	0.3	0.67
Schizachne purpurascens	Purple Oat	Graminoid	0.0	0.5	0.2	0.33
Scirpus atrocinctus	Black-Girdle Bulrush	Graminoid	0.0	1.0	0.3	0.33
Scirpus cyperinus	Cottongrass Bulrush	Graminoid	0.0	1.0	0.3	0.33
Trichophorum caespitosum	Deergrass	Graminoid	0.0	20.0	6.7	0.33
Moss / Lichen Layer						
Cladina rangiferina	Gray Reindeer Lichen	Lichen	0.0	1.0	0.3	0.33
Dicranum polysetum	Wavy-leaved Broom Moss	Moss	0.0	3.0	1.0	0.33
Dicranum sp.	Broom Moss	Moss	0.0	3.0	1.0	0.33
Hylocomium splendens	Stairstep Moss	Moss	0.0	15.0	6.7	0.67
na	Unidentified moss	Moss	0.0	3.0	1.3	0.67
na	Unidentified liverwort	Moss	0.0	15.0	5.0	0.33
Ptilidium sp.	Fringewort	Moss	0.0	0.5	0.2	0.33
Ptilium crista-castrensis	Plume moss	Moss	0.0	4.0	1.3	0.33
Rhytidiadelphus sp.	a Mosss	Moss	0.0	5.0	1.7	0.33
Pleurozium schreberi	Schreber's feathermoss	Moss	2.0	10.0	4.7	1.00
Sphagnum sp.	Peatmoss	Moss	60.0	65.0	63.3	1.00

Table D9 Shrub / Graminoid Fen - Plant Occurrence Summary (Ground Plot Data)

Scientific Name	Common Name	Growth Form	Shrub / Graminoid Fen (n=3)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
Shrub Layer						
Larix laricina	Tamarack	Tall Shrub	0.0	0.5	0.3	0.67
Andromeda polifolia	Bog Rosemary	Low Shrub	0.0	1.0	0.3	0.33
Betula michauxii	Michaux's Dwarf Birch	Low Shrub	0.0	8.0	4.3	0.67
Chamaedaphne calyculata	Leatherleaf	Low Shrub	0.0	0.5	0.2	0.33
Dasiphora fruticosa	Shrubby Cinquefoil	Low Shrub	0.0	10.0	4.0	0.67
Juniperus communis var. depressa	Ground Juniper	Low Shrub	0.0	1.0	0.3	0.33
Juniperus horizontalis	Creeping Juniper	Low Shrub	0.0	0.5	0.2	0.33
Larix laricina	Tamarack	Low Shrub	1.0	2.0	1.7	1.00
Rhododendron groenlandicum	Common Labrador Tea	Low Shrub	0.0	0.5	0.2	0.33
Lonicera villosa	Mountain Fly-Honeysuckle	Low Shrub	0.0	1.0	0.5	0.67
Myrica gale	Sweet Gale	Low Shrub	2.0	25.0	9.7	1.00
Photinia melanocarpa	Black Chokeberry	Low Shrub	0.0	3.0	1.3	0.67
Photinia sp.	Chokeberry	Low Shrub	0.0	1.0	0.3	0.33
Picea mariana	Black Spruce	Low Shrub	0.0	4.0	1.5	0.67
Andromeda polifolia	Bog Rosemary	Dwarf Shrub	0.0	2.0	1.0	0.67
Betula michauxii	Michaux's Dwarf Birch	Dwarf Shrub	0.0	4.0	2.0	0.67
Chamaedaphne calyculata	Leatherleaf	Dwarf Shrub	0.5	2.0	1.0	1.00
Dasiphora fruticosa	Shrubby Cinquefoil	Dwarf Shrub	0.0	1.0	0.3	0.33
Empetrum nigrum	Black Crowberry	Dwarf Shrub	0.0	0.5	0.2	0.33
Juniperus communis var. depressa	Ground Juniper	Dwarf Shrub	0.0	0.5	0.2	0.33
Juniperus horizontalis	Creeping Juniper	Dwarf Shrub	0.0	0.5	0.2	0.33
Kalmia angustifolia	Sheep-Laurel	Dwarf Shrub	0.0	1.0	0.3	0.33
Kalmia polifolia	Bog Laurel	Dwarf Shrub	0.5	1.0	0.7	1.00
Rhododendron groenlandicum	Common Labrador Tea	Dwarf Shrub	0.0	0.5	0.2	0.33
Lonicera villosa	Mountain Fly-Honeysuckle	Dwarf Shrub	0.0	1.0	0.5	0.67
Myrica gale	Sweet Gale	Dwarf Shrub	0.0	1.0	0.3	0.33

Scientific Name	Common Name	Growth Form	Shrub / Graminoid Fen (n=3)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
Photinia melanocarpa	Black Chokeberry	Dwarf Shrub	0.0	4.0	1.3	0.33
Photinia sp.	Chokeberry	Dwarf Shrub	0.0	4.0	1.3	0.33
Rosa nitida	Shining Rose	Dwarf Shrub	0.0	0.5	0.2	0.33
Vaccinium oxycoccos	Small Cranberry	Dwarf Shrub	0.5	0.5	0.5	1.00
Forb Layer						
Drosera intermedia	Spoon-Leaved Sundew	Forb	0.0	0.5	0.2	0.33
Drosera rotundifolia	Roundleaf Sundew	Forb	0.5	0.5	0.5	1.00
Eurybia radula	Rough-Leaved Aster	Forb	0.5	2.0	1.0	1.00
Lycopodium annotinum	Stiff Clubmoss	Forb	0.0	0.5	0.2	0.33
Maianthemum trifolium	Three-Leaf Solomon's-Plume	Forb	0.0	0.5	0.2	0.33
Malaxis unifolia	Green Adder's-Mouth	Forb	0.0	0.5	0.2	0.33
Oclemena nemoralis	Bog Aster	Forb	0.0	1.0	0.7	0.67
Packera paupercula	Balsam Groundsel	Forb	0.0	5.0	1.7	0.33
Platanthera clavellata	Club-Spur Orchid	Forb	0.0	0.5	0.2	0.33
Platanthera dilatata	Leafy White Orchis	Forb	0.0	0.5	0.2	0.33
Pogonia ophioglossoides	Snakemouth	Forb	0.0	0.5	0.2	0.33
Rubus arcticus	Northern Blackberry	Forb	0.0	0.5	0.3	0.67
Sanguisorba canadensis	Bottlebrush	Forb	1.0	5.0	2.3	1.00
Sarracenia purpurea	Northern Pitcher-Plant	Forb	0.5	1.0	0.7	1.00
Selaginella selaginoides	Low Spike-Moss	Forb	0.0	0.5	0.3	0.67
Solidago uliginosa	Bog Goldenrod	Forb	1.0	4.0	2.0	1.00
Thalictrum alpinum	Alpine Meadow-Rue	Forb	0.0	1.0	0.5	0.67
Thalictrum pubescens	Tall Meadow-Rue	Forb	0.0	0.5	0.2	0.33
Tofieldia pusilla	Scotch False-Asphodel	Forb	0.0	0.5	0.2	0.33
Utricularia cornuta	Horned Bladderwort	Forb	0.0	0.5	0.2	0.33
Utricularia intermedia	Flatleaf Bladderwort	Forb	0.0	0.5	0.2	0.33
Viola sp.	Violet	Forb	0.0	0.5	0.2	0.33

Scientific Name	Common Name	Growth Form	Shrub / Graminoid Fen (n=3)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
Graminoid Layer						
Calamagrostis pickeringii	Pickering's Reedgrass	Graminoid	0.0	10.0	3.7	0.67
Carex buxbaumii	Buxbaum's Sedge	Graminoid	0.0	0.5	0.2	0.33
Carex exilis	Coast Sedge	Graminoid	0.5	5.0	2.0	1.00
Carex limosa	Mud Sedge	Graminoid	0.0	5.0	1.7	0.33
Carex michauxiana	Michaux Sedge	Graminoid	0.0	4.0	1.5	0.67
Carex oligosperma	Few-Seeded Sedge	Graminoid	2.0	20.0	8.0	1.00
Carex pauciflora	Few-Flowered Sedge	Graminoid	0.0	0.5	0.2	0.33
Eriophorum virginicum	Tawny Cotton-Grass	Graminoid	0.0	0.5	0.3	0.67
Eriophorum viridicarinatum	Green-Keel Cottongrass	Graminoid	0.0	0.5	0.2	0.33
Juncus canadensis	Canada Rush	Graminoid	0.0	1.0	0.3	0.33
Juncus pelocarpus	Brown-Fruited Rush	Graminoid	0.0	3.0	1.0	0.33
Juncus stygius	Moor Rush	Graminoid	0.0	1.0	0.3	0.33
Muhlenbergia glomerata	Marsh Muhly	Graminoid	0.0	0.5	0.2	0.33
Muhlenbergia uniflora	Fall Dropseed Muhly	Graminoid	0.0	0.5	0.2	0.33
Rhynchospora alba	White Beakrush	Graminoid	4.0	15.0	9.7	1.00
Trichophorum alpinum	Alpine Cotton-Grass	Graminoid	0.0	2.0	1.0	0.67
Trichophorum caespitosum	Deergrass	Graminoid	5.0	30.0	18.3	1.00
Moss / Lichen Layer						
Cladina mitis	Green Reindeer Lichen	Lichen	0.0	2.0	0.7	0.33
Cladina rangiferina	Gray Reindeer Lichen	Lichen	0.5	4.0	2.2	1.00
Dicranum sp.	Broom Moss	Moss	0.0	2.0	1.0	0.67
na	Unidentified moss	Moss	0.0	30.0	10.0	0.33
Pleurozium schreberi	Schreber's feathermoss	Moss	0.5	3.0	1.8	1.00
Polytrichum sp.	Haircap Moss	Moss	0.0	1.0	0.3	0.33
Ptilidium sp.	Fringewort	Moss	0.0	1.0	0.3	0.33
Sphagnum sp.	Peatmoss	Moss	20.0	75.0	40.0	1.00

Table D10 Shrub Bog - Plant Occurrence Summary (Ground Plot Data)

Scientific Name	Common Name	Growth Form	Shrub Bog (n=3)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
Shrub Layer						
Abies balsamea	Balsam Fir	Low Shrub	0.0	0.5	0.2	0.33
Betula michauxii	Michaux's Dwarf Birch	Low Shrub	0.0	1.0	0.3	0.33
Betula pumila	Bog Birch	Low Shrub	0.0	0.5	0.2	0.33
Chamaedaphne calyculata	Leatherleaf	Low Shrub	0.0	8.0	2.7	0.33
Kalmia angustifolia	Sheep-Laurel	Low Shrub	0.0	10.0	3.3	0.33
Kalmia polifolia	Bog Laurel	Low Shrub	0.0	0.5	0.2	0.33
Larix laricina	Tamarack	Low Shrub	0.0	2.0	0.8	0.67
Myrica gale	Sweet Gale	Low Shrub	0.0	0.5	0.2	0.33
Ilex mucronatus	Mountain Holly	Low Shrub	0.0	0.5	0.2	0.33
Picea mariana	Black Spruce	Low Shrub	0.5	2.0	1.0	1.00
Rhododendron canadense	Rhodora	Low Shrub	0.0	1.0	0.7	0.67
Viburnum nudum	Possum-Haw Viburnum	Low Shrub	0.0	0.5	0.2	0.33
Andromeda polifolia	Bog Rosemary	Dwarf Shrub	2.0	2.0	2.0	1.00
Betula michauxii	Michaux's Dwarf Birch	Dwarf Shrub	0.0	2.0	0.7	0.33
Chamaedaphne calyculata	Leatherleaf	Dwarf Shrub	1.0	10.0	6.3	1.00
Empetrum eamesii	Rock Crowberry	Dwarf Shrub	0.0	0.5	0.2	0.33
Empetrum nigrum	Black Crowberry	Dwarf Shrub	1.0	3.0	1.7	1.00
Juniperus communis var. depressa	Ground Juniper	Dwarf Shrub	0.0	0.5	0.2	0.33
Kalmia angustifolia	Sheep-Laurel	Dwarf Shrub	2.0	15.0	7.3	1.00
Kalmia polifolia	Bog Laurel	Dwarf Shrub	0.5	1.0	0.8	1.00
Larix laricina	Tamarack	Dwarf Shrub	0.0	0.5	0.2	0.33
Rhododendron groenlandicum	Common Labrador Tea	Dwarf Shrub	1.0	2.0	1.3	1.00
Lonicera villosa	Mountain Fly-Honeysuckle	Dwarf Shrub	0.0	1.0	0.3	0.33
Photinia melanocarpa	Black Chokeberry	Dwarf Shrub	0.0	4.0	1.7	0.67
Photinia sp.	Chokeberry	Dwarf Shrub	0.0	1.0	0.3	0.33
Picea mariana	Black Spruce	Dwarf Shrub	0.0	7.0	2.3	0.33

Scientific Name	Common Name	Growth Form	Shrub Bog (n=3)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
Rhododendron canadense	Rhodora	Dwarf Shrub	0.0	5.0	2.0	0.67
Vaccinium angustifolium	Late Lowbush Blueberry	Dwarf Shrub	0.0	2.0	0.7	0.33
Vaccinium boreale	Northern Blueberry	Dwarf Shrub	0.0	5.0	1.7	0.33
Vaccinium macrocarpon	Large Cranberry	Dwarf Shrub	0.0	0.5	0.2	0.33
Vaccinium oxycoccos	Small Cranberry	Dwarf Shrub	0.5	1.0	0.7	1.00
Forb Layer						
Coptis trifolia	Goldthread	Forb	0.0	1.0	0.3	0.33
Cornus canadensis	Bunchberry	Forb	0.0	1.0	0.5	0.67
Drosera intermedia	Spoon-Leaved Sundew	Forb	0.0	0.5	0.2	0.33
Drosera rotundifolia	Roundleaf Sundew	Forb	0.5	1.0	0.7	1.00
Equisetum fluviatile	Water Horsetail	Forb	0.0	1.0	0.3	0.33
Eriocaulon aquaticum	Seven-Angled Pipewort	Forb	0.0	0.5	0.2	0.33
Lycopodiella inundata	Bog Clubmoss	Forb	0.0	1.0	0.3	0.33
Lycopodium annotinum	Stiff Clubmoss	Forb	0.0	3.0	1.3	0.67
Maianthemum trifolium	Three-Leaf Solomon's-Plume	Forb	0.0	1.0	0.7	0.67
Menyanthes trifoliata	Bog Buckbean	Forb	0.0	0.5	0.2	0.33
Nuphar lutea	Yellow Cowlily	Forb	0.0	1.0	0.3	0.33
Oclemena nemoralis	Bog Aster	Forb	0.0	1.0	0.5	0.67
Pogonia ophioglossoides	Snakemouth	Forb	0.0	0.5	0.2	0.33
Rubus chamaemorus	Cloudberry	Forb	0.0	1.0	0.7	0.67
Sanguisorba canadensis	Bottlebrush	Forb	0.0	0.5	0.2	0.33
Sarracenia purpurea	Northern Pitcher-Plant	Forb	0.5	1.0	0.7	1.00
Schoenoplectus subterminalis	Water Bulrush	Forb	0.0	1.0	0.3	0.33
Solidago uliginosa	Bog Goldenrod	Forb	0.0	1.0	0.5	0.67
Utricularia cornuta	Horned Bladderwort	Forb	0.0	0.5	0.3	0.67
Graminoid Layer						
Calamagrostis pickeringii	Pickering's Reedgrass	Graminoid	0.0	3.0	1.2	0.67

Scientific Name	Common Name	Growth Form	Shrub Bog (n=3)			
			Minimum Cover (%)	Maximum Cover (%)	Average Cover (%)	Constancy
Carex exilis	Coast Sedge	Graminoid	2.0	10.0	5.7	1.00
Carex limosa	Mud Sedge	Graminoid	0.0	1.0	0.3	0.33
Carex oligosperma	Few-Seeded Sedge	Graminoid	0.0	3.0	1.0	0.33
Carex pauciflora	Few-Flowered Sedge	Graminoid	0.0	0.5	0.2	0.33
Carex utriculata	Bear Sedge	Graminoid	0.0	1.0	0.3	0.33
Eriophorum vaginatum	Tussock Cotton-Grass	Graminoid	0.0	1.0	0.3	0.33
Eriophorum virginicum	Tawny Cotton-Grass	Graminoid	0.0	0.5	0.2	0.33
Rhynchospora alba	White Beakrush	Graminoid	0.0	10.0	3.7	0.67
Scheuchzeria palustris	Pod Grass	Graminoid	0.0	1.0	0.5	0.67
Trichophorum alpinum	Alpine Cotton-Grass	Graminoid	0.0	0.5	0.2	0.33
Trichophorum caespitosum	Deergrass	Graminoid	10.0	15.0	13.3	1.00
Moss / Lichen Layer						
Aulacomnium palustre	Glow Moss	Moss	0.0	5.0	1.7	0.33
Cetraria sp.	a lichen	Lichen	0.0	2.0	1.0	0.67
Cladina arbuscula	Reindeer Lichen	Lichen	0.0	5.0	1.7	0.33
Cladina mitis	Green Reindeer Lichen	Lichen	2.0	15.0	7.0	1.00
Cladina rangiferina	Gray Reindeer Lichen	Lichen	5.0	35.0	16.7	1.00
Cladina stellaris	Star-tipped Reindeer Lichen	Lichen	0.0	1.0	0.3	0.33
Cladonia sp.	Cladonia Lichen	Lichen	0.0	5.0	2.3	0.67
Dicranum polysetum	Wavy-leaved Broom Moss	Moss	0.0	1.0	0.3	0.33
Pleurozium schreberi	Schreber's feathermoss	Moss	0.0	2.0	1.0	0.67
Polytrichum sp.	Haircap Moss	Moss	0.0	3.0	1.0	0.33
Racomitrium sp.	a Moss	Moss	0.0	1.0	0.3	0.33
Sphagnum sp.	Peatmoss	Moss	30.0	65.0	53.3	1.00

APPENDIX E

Incidental Wildlife Sightings Observed Within the Study Area

Table E1 Incidental Wildlife Sightings Observed Within the Study Area

Species		Observation				Associated Breeding Habitat[2]
Common Name	Scientific Name	Visual	Audio	Other[1]	Total	
MAMMALS						
Ungulates						
Caribou	*Rangifer tarandus*	1		6		
Moose	*Alces alces*	1		18		
Small Mammals / Carnivores						
Black bear	*Ursus americanus*					
Canada lynx	*Lynx canadensis*	1*		1**		
Eastern coyote	*Canis latrans*	1*		1		
Red fox	*Vulpes vulpes*	1*		1		
Newfoundland marten	*Martes americana*			1**		
River otter	*Lontra canadensis*	1*		1		
Ermine	*Mustela erminea*			1**		
Mink	*Neovison vison*					
Rodents						
American red squirrel	*Tamiasciurus hudsonicus*	3	3	1		
Beaver	*Castor canadensis*			1		
Meadow vole	*Microtus pennsylvanicus*					
Muskrat	*Ondatra zibethicus*					
Red-backed vole	*Myodes rutilus*			3		
Lagomorphs						
Snowshoe hare	*Lepus americanus*	1		9		
AVIFAUNA						
Raptors						
American Kestrel	*Falco tinnunculus*					
Bald Eagle	*Haliaeetus leucocephalus*	1				
Boreal Owl	*Aegolius funereus*	1				
Great Horned Owl	*Bubo virginianus*					Open Mixed Forests and Wetlands (Houston et al. 1998)
Merlin	*Falco columbarius*					
Osprey	*Pandion haliaetus*					
Red-tailed Hawk	*Buteo jamaicensis*					
Rough-legged	*Buteo lagopus*					

Species		Observation				Associated Breeding Habitat[2]
Common Name	Scientific Name	Visual	Audio	Other[1]	Total	
Hawk						
Sharp-shinned Hawk	*Accipiter striatus*					
Short-eared Owl	*Asio flammeus*					
Great Horned Owl	*Bubo virginianus*	1				
Waterfowl and Waterbirds						
American Black Duck	*Anas rubripes*					Wetlands (Longcore et al. 2000)
Canada Goose	*Branta Canadensis*					Wetlands near treeless and forested areas (Mowbray et al. 2002)
Common Goldeneye	*Bucephala clangula*					Wetlands and Riparian near Mature Forests (Eadie et al. 1995)
Common Loon	*Gavia immer*	2				Wetlands (Evers et al. 2010)
Common Merganser	*Mergus merganser*					Riparian near Coniferous and Mixed Forests (Malory and Metz 1999)
Green-winged Teal	*Anas crecca*					Wetlands (Johnson 1995)
Lesser Scaup	*Aythya affinis*					Wetlands (Austin et al. 1998)
Northern Shoveler	*Anas clypeata*					Wetlands (Dubowy 1996)
Red-breasted Merganser	*Mergus serrator*					Wetlands (Titman 1999)
Wood Duck	*Aix sponsa*					Riparian and Wetlands (Hepp and Bellrose 1995)
Shorebirds						
Common Tern	*Sterna hirundo*					Sandy, Gravel, Shell, or Cobble Areas on Islands (Nisbet 2002)
Greater Yellowlegs	*Tringa melanoleuca*	1				Wetlands with wooded islands and Coniferous Forests (Elphick and Tibbitts 1998)
Herring Gull	*Larus argentatus*					Rock or Sandy Areas on Islands (Pierotti and Good 1994)
Semipalmated Plover	*Charadrius semipalmatus*					Beaches and Grassy Borders In Riparian Areas (Nol and Blanken 1999)
Short-billed Dowitcher	*Limnodromus griseus*					Wetlands interspersed with coniferous stands (Jehl et al. 2001)
Sora	*Porzana carolina*					Wetlands (Melvin and Gibbs 2012)
Solitary Sandpiper	*Tringa solitaria*					Wetlands in mainly Coniferous Forests (Moskoff 2011)
Spotted Sandpiper	*Actitis macularius*					Riparian Areas (Reed et al. 2013)
Least Sandpiper	*Calidris minutilla*					Wetlands (Nebel and Cooper 2008)

Species		Observation				Associated Breeding Habitat[2]
Common Name	Scientific Name	Visual	Audio	Other[1]	Total	
Wilson's Snipe	*Gallinago delicata*		1			Wetlands (Mueller 1999)
Woodpeckers and Flycatchers						
Black-backed Woodpecker	*Picoides arcticus*	1				Coniferous Forests (Dixon and Saab 2000)
American Three-toed Woodpecker	*Picoides doStudy Arealis*					Coniferous Forests (Leonard Jr. 2001)
Downy Woodpecker	*Picoides pubescens*					Open Deciduous Forests near Riparian Areas (Jackson and Ouellet 2002)
Hairy Woodpecker	*Picoides villosus*					Mixed, Coniferous, and Deciduous Forests (Jackson et al. 2002)
Yellow-bellied Sapsucker	*Sphyrapicus varius*					Deciduous and Mixed Forests usually near Riparian Areas (Walters et al. 2002)
Northern Flicker	*Colaptes auratus*					Open Coniferous, Deciduous, and Mixed Forests, Snags in Disturbed Areas (burns and cutovers) and wetlands (Wiebe and Moore 2008)
Least Flycatcher	*Empidonax minimus*					Deciduous and Mixed Forests, may occasionally occur in disturbed areas (burns), wetlands, and shrubby fields (Tarof and Briskie 2008)
Alder Flycatcher	*Empidonax alnorum*					Shrubby Wetlands (Lowther 1999)
Yellow-bellied Flycatcher	*Empidonax flaviventris*					Coniferous and Mixed Forests as well as Wetlands (Gross and Lowther 2011)
Olive-sided Flycatcher	*Contopus cooperi*					Open Coniferous Forests and near forests openings or disturbed areas (anthropogenic and natural) (Altman and Sallabanks 2012)
Songbirds						
Tree Swallow	*Tachycineta bicolor*					Wetlands and Riparian Areas with standing dead trees (Winkler et al. 2011)
Bank Swallow	*Riparia riparia*					Vertical banks along Riparian Areas and Wetlands as well as artificial structures such as sand and gravel quarries, and road cuts (Garrison 1999)

Species		Observation				Associated Breeding Habitat[2]
Common Name	Scientific Name	Visual	Audio	Other[1]	Total	
Red-eyed Vireo	*Vireo olivaceus*					Deciduous and Mixed Forests (Cimprich et al. 2000)
Philadelphia Vireo	*Vireo philadelphicus*					Deciduous and Mixed Forests as well as Forest Edges with shrubby understory (Moskoff and Robinson 2011)
Northern Shrike	*Lanius excubitor*					Riparian Areas in open areas and forest edges (Cade and Atkinson 2002)
Black-capped Chickadee	*Poecile atricapillus*	2				Mixed and Deciduous Forests, Riparian, and disturbed areas with some residual forest (Foote et al. 2010)
Boreal Chickadee	*Poecile hudsonicus*	1				Coniferous Forests (Ficken et al. 1996)
Red-breasted Nuthatch	*Sitta canadensis*		1			Coniferous Forests or Mixed Forests with slightly more coniferous than deciduous species (Ghalambor and Martin 1999)
Brown Creeper	*Certhia americana*					Coniferous and Mixed Forests (Hejl et al. 2002)
Winter Wren	*Troglodytes hiemalis*					Coniferous, Deciduous, and Mixed Forests, and Riparian (Hejl et al. 2002)
Ruby-crowned Kinglet	*Regulus calendula*					Coniferous and Mixed Forests (Swanson et al. 2008)
Golden-crowned Kinglet	*Regulus satrapa*					Coniferous, Mixed, and Deciduous Forests with possibility of breeding in open or closed, edges, or near water (Swanson et al. 2012)
Grey-cheeked Thrush	*Catharus minimus*					Coniferous Forests (Lowther et al. 2001)
Swainson's Thrush	*Catharus ustulatus*					Coniferous Forests (Mack and Yong 2000)
Hermit Thrush	*Catharus guttatus*					Coniferous, Deciduous and Mixed Forests (Dellinger et al. 2012)
American Robin	*Turdus migratorius*					Open Mixed Forests and Disturbed Areas (Sallabanks and James 1999)
Bohemian Waxwing	*Bombycilla garrulus*					Open Coniferous, Mixed Forests, Disturbed areas (burns) and near Riparian Areas and Wetlands (Witmer 2002)

Species		Observation				Associated Breeding Habitat[2]
Common Name	Scientific Name	Visual	Audio	Other[1]	Total	
Cedar Waxwing	*Bombycilla cedrorum*					Riparian Areas and Open Coniferous, Deciduous, and Mixed Forests (Witmer et al. 1997)
American Pipit	*Anthus rubescens*					Wetlands and Riparian (Hendricks and Verbeek 2012)
Black-and-white Warbler	*Mniotilta varia*	2	2			Mixed and Deciduous Forests (Kricher 1995)
Tennessee Warbler	*Oreothlypis peregrina*					Deciduous, Mixed, and Coniferous Forests (Rimmer and Mcfarland 2012)
Orange-crowned Warbler	*Oreothlypis celata*					Open Deciduous Forests, Mixed and Coniferous Forest Edges (Gilbert et al. 2010)
Nashville Warbler	*Oreothlypis ruficapilla*					Open Deciduous and Mixed Forests (Lowther and Williams 2011)
Yellow Warbler	*Setophaga petechial*					Wet Deciduous Riparian Areas and Disturbed Areas (Lowther et al. 1999)
Palm Warbler	*Setophaga palmarum*					Wetlands and Open Coniferous Forests (Wilson 1996)
Magnolia Warbler	*Setophaga magnolia*					Coniferous and Mixed Forests (Dunn and Hall 2010)
Yellow-rumped Warbler	*Setophaga coronate*					Mature Coniferous and Mixed Forests (Hunt and Flaspohler 1998)
Blackpoll Warbler	*Setophaga striata*					Coniferous and Mixed Forests (DeLuca et al. 2013)
Cape May Warbler	*Setophaga tigrina*					Coniferous Forests (Baltz and Latta 1998)
Black-throated Green Warbler	*Setophaga virens*					Coniferous, Mixed, and Deciduous Forests (Morse and Poole 2005).
Wilson's Warbler	*Cardellina pusilla*					Riparian (Ammon and Gilbert 1999)
Warbler (unidentified)		3				
American Redstart	*Setophaga ruticilla*					Riparian and Mixed Forests (Sherry and Holmes 1997)
Northern Waterthrush	*Parkesia noveboracensis*					Riparian (Eaton 1995)
Common Yellowthroat	*Geothlypis trichas*					Wetlands and Riparian Areas (Guzy and Ritchison 1999)

Species		Observation				Associated Breeding Habitat[2]
Common Name	Scientific Name	Visual	Audio	Other[1]	Total	
Rusty Blackbird	*Euphagus carolinus*			1		Wet Coniferous and Mixed Forests, Riparian and Wetlands (Avery 2013)
Savannah Sparrow	*Passerculus sandwichensis*					Wetlands and Riparian Areas (Wheelwright and Rising 2008)
Song Sparrow	*Melospiza melodia*			3		Coniferous, Mixed, and Deciduous Forests and Riparian Areas (Arcese et al. 2002)
Lincoln's Sparrow	*Melospiza lincolnii*			1		Wetlands and Riparian (Ammon 1995)
Swamp Sparrow	*Melospiza georgiana*					Wetlands and Riparian (Mowbray 1997)
White-throated Sparrow	*Zonotrichia albicollis*					Open Coniferous and Mixed Forests (Falls and Kopachena 2010)
White-crowned Sparrow	*Zonotrichia leucophrys*					Coniferous Forests and Riparian Areas (Chilton et al. 1995)
Fox Sparrow	*Passerella iliaca*					Coniferous and Mixed Forests (Weckstein et al. 2002)
Sparrow (unidentified)		2	1			
Dark-eyed Junco	*Junco hyemalis*		1			Coniferous Forests (Nolan et al. 2002)
Pine Siskin	*Spinus pinus*					Coniferous Forests (Dawson 1997)
Common Redpoll	*Acanthis flammea*					Coniferous Forests (Knox and Lowther 2000)
Purple Finch	*Haemorhous purpureus*					Coniferous Forests, Mixed Forests, and Riparian Areas (Wootton 1996)
Red Crossbill	*Loxia curvirostra*					Coniferous Forests (Benkman 2012)
White-winged Crossbill	*Loxia leucoptera*					Coniferous Forests (Benkman 2012)
Pine Grosbeak	*Pinacola enucleator*					Coniferous Forests (Adkisson 1999)
Gray Jay	*Perisoreus canadensis*	7				Coniferous and Mixed Forests (Strickland and Ouellet 2011)
American Crow	*Corvus brachyrhynchos*	1				Open Areas in Edge Habitats such as Riparian Areas and anthropogenic structures (Verbeek and Caffrey 2002)
Common Raven	*Corvus corax*					Mixed, Coniferous, and Deciduous Forests (Boarman and Heinrich 1999)

Species		Observation				Associated Breeding Habitat[2]
Common Name	Scientific Name	Visual	Audio	Other[1]	Total	
Belted Kingfisher	*Megaceryle alcyon*					Near waterbodies with vertical nest exposures for nest burrows (Kelly and Bridge 2009)
Common Nighthawk	*Chordeiles minor*					Open areas such as disturbed areas, open forests, rock outcrops, and flat gravel areas (Brigham et al. 2011)
Mourning Dove	*Zenaida macroura*					Open Forest and Edges as well as Riparian Areas (Otis et al. 2008)
Passerine (unidentified)		1				
Upland Game Birds						
Ruffed Grouse	*Bonasa umbellus*	1				Deciduous and Mixed Forests (Rusch et al. 2000)
Spruce Grouse	*Falcipennis canadensis*	1		1		Coniferous Forests (Boag and Schroeder 1992)
Willow Ptarmigan	*Lagopus lagopus*					Barrens
AMPHIBIANS						
American Toad	*Bufo americanus*	2				Wetlands
Green Frog	*Rana clamitans*	2				Wetlands

1 "Other" refers to wildlife sign, including but not limited to, tracks, scat, markings, feeding activity, bedding and nests, lodges, dams and kill sites.

2 Sources: Birds of North America Online

* "Observed during 2013 Marathon Winter Wildlife Surveys - aerial surveys.

** "Observed during 2013 Marathon Winter Wildlife Surveys -snow-tracking surveys.