GOLDEN PREDATOR CORP.

Brewery Creek Mine

2013 ANNUAL WATER LICENSE REPORT

SUBMITTED TO THE YUKON WATER BOARD

WATER USE LICENSE QZ96-007

2013 ANNUAL QUARTZ MINING LICENSE REPORT

SUBMITTED TO YUKON GOVERNMENT, ENERGY MINES AND RESOURCES

YUKON QUARTZ MINING LICENSE A99-001

February 2014

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1 INTRODUCTION

The Brewery Creek Mine is currently owned and operated by Golden Predator Corp., who signed a purchase agreement with Alexco Resource Corp. in early 2012. The property is located in central Yukon approximately 55 km east of Dawson City and was operated as a conventional open pit heap leach continuously from 1996 through 2001; reclamation and closure began in 2002. With the exception of some remaining site facilities, the mine has been closed and reclaimed. The mine closure and reclamation objectives are outlined in the 2003 Decommissioning and Reclamation Plan (DRP) required under the Water Use License.

The mine was operated and closed under Type A Water Use License QZ96-007 (originally issued as QZ94-003 in August 1995) and Quartz Mining License A99-001 issued in June 1999. Both licenses expire in 2021. The Water Use License was most recently amended in March of 2012 (Amendment 8, QZ11-035), which addressed updated closure conditions and monitoring. Golden Predator also holds a Type B Water Use License MN12-038, which was issued in August 2012, and expires on July 5, 2022. Under this license Golden Predator has the right to obtain groundwater and upgrade the existing septic system on site for a larger camp.

Golden Predator holds a Class 4 Mining Land Use Approval for the Brewery Creek property (LQ00364), which was updated from a Class 3 approval on July 6, 2012. With this Class 4 approval, Golden Predator has been able to extend their exploration beyond the previous license boundaries.

This report summarizes the 2013 monitoring data and activities relevant to the Water Use License QZ96-007, and the Quartz Mining License A99-001. Many aspects of the required monitoring under QZ96-007 and A99-001 have now been completed; however Golden Predator continues to monitor baseline conditions in anticipation of future use of the site.

2 OVERVIEW OF ACTIVITIES

In anticipation of further development on the Brewery Creek property, Golden Predator has been conducting monthly baseline monitoring of surface water sites from August 2011 until August 2013, and on a quarterly basis from then on. A quarterly baseline groundwater monitoring program was also initiated in May 2013. Currently under QZ96-007, compliance monitoring of surface and groundwater need only be conducted semi-annually.

The following tasks and activities were completed in 2013:

January 2013

- Monthly site inspection
- Baseline surface water quality monitoring

February 2013

- Monthly site inspection
- Baseline surface water quality monitoring

March 2013

- Monthly site inspection
- Baseline surface water quality monitoring
- Snow survey

April 2013

- Monthly site inspection
- Baseline surface water quality monitoring
- Monitoring under the *Lower Laura Creek Impact Study Plan*

May 2013

- Monthly site inspection
- Baseline surface water quality and hydrology monitoring
- Baseline groundwater quality monitoring
- Compliance surface water and groundwater quality monitoring

June 2013

- Monthly site inspection
- Baseline surface water quality and hydrology monitoring

July 2013

- Monthly site inspection
- Baseline surface water quality and hydrology monitoring
- Removal of contractor equipment and tent camp

August 2013

- Monthly site inspection
- Baseline surface water quality and hydrology monitoring
- Removal of contractor equipment and tent camp

September 2013

- Monthly site inspection

October 2013

- Monthly site inspection
- Baseline surface water quality and hydrology monitoring
- Baseline groundwater quality monitoring
- Compliance surface water and groundwater quality monitoring

November 2013

- Monthly site inspection

December 2013

- Monthly site inspection

3 MONITORING PROGRAMS AND STUDIES

3.1 Water Use

No water was withdrawn from Laura Creek or BC-23 during 2013.

3.2 Climate

Requirements under QZ96-007 for the climatic monitoring is described in the *Solutions Management Plan*, as well as the *Blue Zone Monitoring and Assessment Program*, and the *Heap Leach Pad Cover and Facilities Monitoring Program.* As per these programs, climatic monitoring was discontinued in 2010 under QZ96-007 as the heap was deemed detoxified according to specific monitoring requirements *("detoxification of the heap shall be deemed to have occurred when the concentration of Total Cyanide measured at monitoring station BC-28a in accordance with Schedules A and B is equal to or lower than 2.0 mg/l for five consecutive years of monitoring").* However, Golden Predator continues to perform baseline climatic monitoring even though requirements under QZ96-007 have been fulfilled.

A Campbell Scientific weather station is installed on site and collects weather data continuously. The data are downloaded in conjunction with the baseline water quality and hydrology monitoring program, at which point the station is also inspected to ensure it is functioning properly and any necessary maintenance is performed.

The meteorological station was down for a period of 21 days in January and February 2013, due to a low battery voltage, and it was last visited and downloaded in October 2013. A meteorological data summary memorandum is presented in Appendix A and includes a tabular summary of the 2013 data available.

3.2.1 Snow Survey

A snow survey is performed annually under the requirements of the Blue Pit and Blue WRSA snow monitoring survey. This year's snow survey occurred on March 27th and 28th, and the results are included in Appendix A.

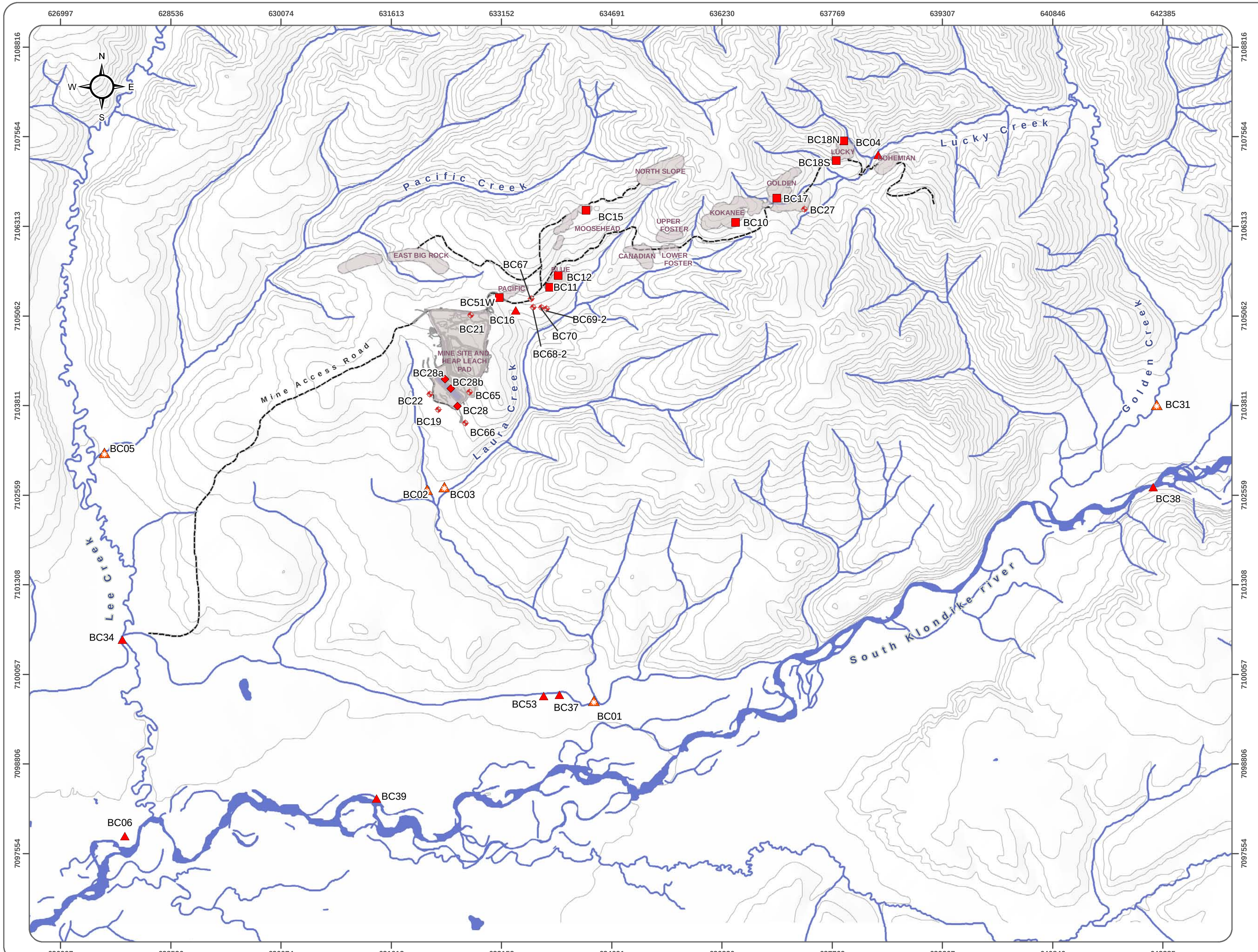
3.3 Water Quality and Hydrology

3.3.1 Water Quality Monitoring

Water quality sampling was performed as required by Schedule B of Water License QZ96-007. Sample stations locations are presented in Figure 3-1.

Environmental monitoring at Brewery Creek has transitioned to the post-closure phase, which involves twice-annual monitoring of water quality surveillance sites where conditions require. These events were conducted during freshet in May, and again in October during low-flow conditions. The amount of environmental monitoring has declined since closure of the heap has been accomplished and the drain down solutions treated. Environmental monitoring during the post-closure period have been reduced commiserate with the amount of site activity.

The following sections provide a summary of the key results, while a detailed analysis, including tabular results for 2013, in presented in Appendix B.



GOLDEN PREDATOR TSX: GPD

BREWERY CREEK MINE

FIGURE 3-1
WATER QUALITY STATIONS

Monitoring Stations

- Groundwater
- Heap Effluent
- Surface Water Quality and Hydrometric
- Surface Pit/Dump Discharge
- Surface
- Mine Area
- Watercourse
- Waterbody

NAD 83 UTM Zone 7N

0 0.5 1 2 Kilometers

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ACCESS

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3.3.2 Surface Water Quality

3.3.2.1 Methods

Monitoring and sampling was carried out in accordance with the procedures and standards described in the Guidance Document for the Sampling and Analysis of Metal Mining Effluents (April 2001, EPS2/MM/5, Minerals and Metals Division, Environment Canada). All samples were preserved and filtered on the day of collection, where applicable, and were kept cool until shipment to Maxxam Analytics Inc. Samples were analyzed for the following parameters:

- Routine parameters (conductivity, pH, alkalinity, hardness, hydroxide, carbonate);
- Total suspended and dissolved solids (TSS/TDS);
- Ammonia;
- Anions (nitrite, nitrate, fluoride, sulphate, cholride, bromide, ortho-phosphate);
- Dissolved organic carbon (DOC);
- Cyanide (Weak Acid Dissociable and Total); and
- Total and dissolved metals (suite of 33 metals, including all parameters found in the CCME and MMER guidelines).

QA/QC samples were collected as part of each sampling event.

3.3.2.2 Water Quality Guidelines

Clause 46 of Water Licence QZ96-007 states that:

"Water quality at monitoring stations BC-31, BC-34 and BC-39 shall not exceed the water quality guidelines specified for the protection of aquatic life contained in the Canadian Environmental Quality Guidelines prepared by the Canadian Council of Ministers of Environment, as amended from time to time."

As such, for the receiving water quality data assessment, water quality parameters were screened against Canadian Water Quality Guidelines for Protection of Aquatic Life (CWQG; CCME 2012); however for antimony, the Provincial Water Quality Objective for Ontario (PWQO; OMOE 1994) was chosen as no CWQG exists. Relevant guidelines are presented in Table 3-1.

Table 3-1 Canadian Water Quality Guidelines and Provincial Water Quality Objectives (Ontario)

Parameter	Units	Guideline	
		Source	Value
Aluminum*	µg/L	CWQG	100
Antimony	µg/L	PWQO	20
Arsenic	µg/L	CWQG	5
Cadmium**	µg/L	CWQG	$10^{0.83[\log10(hardness)]-2.46}$
Chromium	µg/L	CWQG	1
Copper	µg/L	CWQG	$e^{0.8545[\ln(hardness)]-1.465} * 0.2$
Cyanide - WAD	µg/L	CWQG	5
Iron	µg/L	CWQG	300
Lead	µg/L	CWQG	$e^{1.273[\ln(hardness)]-4.705}$
Mercury	µg/L	CWQG	0.026
Molybdenum	µg/L	CWQG	73
Nickel	µg/L	CWQG	$e^{0.76[\ln(hardness)]+1.06}$
Nitrate Nitrogen	µg/L	CWQG	3000
Selenium	µg/L	CWQG/SSWQS	1/3.8
Silver	µg/L	CWQG	0.1
Thallium	µg/L	CWQG	0.8
Zinc	µg/L	CWQG	30
pH	pH units	CWQG	6.5 - 9.0

**If pH ≥ 6.5*
***Cadmium has two guidelines: one for short term exposure and one for long term exposure. Only the long term guideline is presented here as it is the most conservative.*

3.3.2.3 Results

At station BC-31, exceedences of the CCME guidelines in 2013 occurred for aluminum (40% of samples), cadmium (20% of samples), copper (20% of samples), iron (40% of samples) and selenium (80% of sample). Table 3-2 presents the results with exceedences shown in red.

Table 3-2 Surface Water Quality Results for BC-31

Parameter	Unit	24-May-13	26-Jun-13	23-Jul-13	13-Aug-13	10-Oct-13
pH (field)	pH units	8.03	8.4	8.95	8.29	8.58
pH (lab)	pH units	7.63	8.23	8.28	8.37	8.11
Specific Conductivity (field)	µS/cm	163	453	571	635	480.9
Conductivity (lab)	µS/cm	162	475	573	627	495
Temperature (field)	C	0.69	6.15	6.24	6.69	0.8
Hardness (from dissolved)	mg/L	84.7	232	296	350	254

Parameter	Unit	24-May-13	26-Jun-13	23-Jul-13	13-Aug-13	10-Oct-13
Alkalinity, Total	mg/L	43	137	165	185	142
Total Dissolved Solids	mg/L	130	314	386	448	314
Total Suspended Solids	mg/L	36.3	13.1	3	<1.0	3.4
Chloride	mg/L	1.5	0.83	<0.50	0.54	0.62
Sulphate, Dissolved	mg/L	32.8	106	150	159	125
Ion Balance	N/A					0.95
Ammonia Total	mg/L	0.022	0.022	0.033	0.019	0.029
Nitrate, as N	mg/L	0.068	0.312	0.219	0.143	<1.0
Cyanide, Total	mg/L					0.00085
Cyanide, Weak Acid Dissociable	mg/L	0.00082	<0.00050	0.00067	0.0014	0.00106
Silver (Ag), Total	mg/L	0.000016	<0.0000050	<0.0000050	<0.000020	<0.0000050
Aluminum (Al), Total	mg/L	0.318	0.16	0.0289	0.0249	0.0336
Arsenic (As), Total	mg/L	0.00143	0.0012	0.000712	0.00073	0.0006
Barium (Ba), Total	mg/L	0.0546	0.0692	0.063	0.0701	0.0555
Beryllium (Be), Total	mg/L	0.000043	0.000012	<0.000010	<0.00010	0.000011
Bismuth (Bi), Total	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0010	<0.0000050
Boron (B), Total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.050
Calcium (Ca), Total	mg/L	20.2	58.2	66	81.2	63.8
Cadmium (Cd), Total	mg/L	0.000189	0.000075	0.000079	0.000046	0.000057
Cobalt (Co), Total	mg/L	0.000626	0.000256	0.000084	<0.00050	0.000103
Chromium (Cr), Total	mg/L	0.00051	0.00035	0.00045	<0.0010	0.00015
Copper (Cu), Total	mg/L	0.00398	0.00224	0.00153	0.0012	0.00162
Iron (Fe), Total	mg/L	0.772	0.364	0.0831	0.0626	0.112
Mercury (Hg), Total	mg/L		<0.000010		<0.000010	<0.000010
Potassium (K), Total	mg/L	1.26	0.883	1.04	1.05	0.835
Lithium (Li), Total	mg/L	0.00182	0.00445	0.00541	0.0065	0.00515
Magnesium (Mg), Total	mg/L	7.69	23.2	27.3	37.5	25.6
Manganese (Mn), Total	mg/L	0.108	0.0272	0.0131	0.0117	0.0164
Molybdenum (Mo), Total	mg/L	0.000516	0.00144	0.00166	0.0019	0.00133
Sodium (Na), Total	mg/L	0.596	1.75	2.1	2.38	1.85
Nickel (Ni), Total	mg/L	0.00455	0.00274	0.00195	0.002	0.00242
Lead (Pb), Total	mg/L	0.000614	0.00033	0.000164	<0.00020	0.000061
Antimony (Sb), Total	mg/L	0.000456	0.000708	0.000731	0.00082	0.000643
Selenium (Se), Total	mg/L	0.000647	0.00211	0.00204	0.00202	0.0018
Silicon (Si), Total	mg/L	1.93	3.59	3.68	3.71	3.86
Tin (Sn), Total	mg/L	<0.00020	0.00181	0.00022	<0.0050	<0.00020
Strontium (Sr), Total	mg/L	0.0952	0.291	0.346	0.428	0.294
Sulphur (S), Total	mg/L	11.8	37.4	50.4	58.7	40.4

Parameter	Unit	24-May-13	26-Jun-13	23-Jul-13	13-Aug-13	10-Oct-13
Titanium (Ti), Total	mg/L	0.00692	0.00396	0.00072	<0.0050	0.00093
Thallium (Tl), Total	mg/L	0.000007	0.000002	0.000003	<0.000050	0.000002
Uranium (U), Total	mg/L	0.000686	0.00248	0.00326	0.00348	0.00225
Vanadium (V), Total	mg/L	0.00318	0.0013	0.00066	<0.0050	0.00071
Zinc (Zn), Total	mg/L	0.0183	0.00599	0.02	<0.0050	0.0047
Zirconium (Zr), Total	mg/L	0.00038	0.00016	0.00014	<0.00050	0.00018

At station BC-34, exceedences were observed for the same parameters as for BC-31 but generally slightly less frequently: aluminum (~17% of samples), cadmium (~17% of samples), copper (~17% of samples), iron (~17% of samples) and selenium (~83% of samples). Table 3-3 presents the results, exceedences are shown in red.

Table 3-3 Surface Water Quality Results for BC-34

Parameter	Unit	23-Jan-13	26-May-13	28-Jun-13	24-Jul-13	13-Aug-13	11-Oct-13
pH (field)	pH units	7.93	7.97	8.11	7.99	8.34	8.4
pH (lab)	pH units	8.07	7.63	8.15	8.2	8.24	8.14
Specific Conductivity (field)	µS/cm	655	159	374	241	265	455
Conductivity (lab)	µS/cm	656	161	428	480	521	488
Temperature (field)	C	0.47	0.99	6.58	6.74	7.54	0.6
Hardness (from dissolved)	mg/L	351	81.3	214	234	275	242
Alkalinity, Total	mg/L	169	42	120	130	142	129
Total Dissolved Solids	mg/L	384	134	278	330	368	322
Total Suspended Solids	mg/L	1.2	45.3	10.3	2.4	4.7	2.7
Chloride	mg/L	0.78	1.5	0.67	<0.50	<0.50	<0.50
Sulphate, Dissolved	mg/L	169	34.7	97.4	129	146	123
Ion Balance	N/A	1					0.96
Ammonia Total	mg/L	0.0077	0.025	0.034	0.01	0.022	0.015
Nitrate, as N	mg/L	0.373	0.111	0.196	0.126	0.092	<1.0
Cyanide, Total	mg/L						<0.00050
Cyanide, Weak Acid Dissociable	mg/L	0.00069	0.00063	0.00063	0.00059	0.0014	<0.00050
Silver (Ag), Total	mg/L	<0.0000050	0.000018	0.000005	<0.0000050	<0.000020	<0.0000050
Aluminum (Al), Total	mg/L	0.00759	0.302	0.0912	0.0158	0.0235	0.0035
Arsenic (As), Total	mg/L	0.000205	0.000682	0.000374	0.000259	0.00034	0.000206
Barium (Ba), Total	mg/L	0.0544	0.0516	0.0524	0.0459	0.0528	0.0425
Beryllium (Be), Total	mg/L	<0.000010	0.000041	<0.000010	<0.000010	<0.00010	<0.000010
Bismuth (Bi), Total	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0010	<0.0000050
Boron (B), Total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050

Parameter	Unit	23-Jan-13	26-May-13	28-Jun-13	24-Jul-13	13-Aug-13	11-Oct-13
Calcium (Ca), Total	mg/L	87.3	20.8	54	54.2	68.4	67.4
Cadmium (Cd), Total	mg/L	0.000123	0.000304	0.000116	0.000082	0.00008	0.000022
Cobalt (Co), Total	mg/L	0.00006	0.000539	0.000148	0.000053	<0.00050	0.00003
Chromium (Cr), Total	mg/L	<0.00010	0.00064	0.00024	0.00014	<0.0010	<0.00010
Copper (Cu), Total	mg/L	0.000883	0.00473	0.00197	0.00135	0.00143	0.00126
Iron (Fe), Total	mg/L	0.026	0.648	0.219	0.0487	0.0686	0.0218
Mercury (Hg), Total	mg/L	<0.000010		<0.000010		<0.000010	<0.000010
Potassium (K), Total	mg/L	0.765	1.18	0.72	0.739	0.781	0.733
Lithium (Li), Total	mg/L	0.00269	0.00119	0.00221	0.00231	<0.0050	0.00252
Magnesium (Mg), Total	mg/L	31.9	7.32	19.5	20.6	26.4	24.9
Manganese (Mn), Total	mg/L	0.0147	0.061	0.0141	0.00829	0.0093	0.00673
Molybdenum (Mo), Total	mg/L	0.00122	0.000577	0.0014	0.00164	0.0018	0.00167
Sodium (Na), Total	mg/L	1.71	0.541	1.3	1.29	1.49	1.51
Nickel (Ni), Total	mg/L	0.00207	0.00535	0.00263	0.0021	0.0024	0.00202
Lead (Pb), Total	mg/L	0.000016	0.000453	0.000127	0.000043	<0.00020	<0.0000050
Antimony (Sb), Total	mg/L	0.000217	0.000241	0.000274	0.000269	<0.00050	0.000261
Selenium (Se), Total	mg/L	0.00251	0.00082	0.00203	0.00227	0.00188	0.00258
Silicon (Si), Total	mg/L	3.54	2.11	3.28	2.92	3.29	3.49
Tin (Sn), Total	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.0050	<0.00020
Strontium (Sr), Total	mg/L	0.355	0.0826	0.224	0.239	0.291	0.248
Sulphur (S), Total	mg/L	68.2	12.2	34.3	43.7	47.4	43.9
Titanium (Ti), Total	mg/L	<0.00050	0.00774	0.00204	<0.00050	<0.0050	<0.00050
Thallium (Tl), Total	mg/L	0.000003	0.000011	0.000002	0.000003	<0.000050	0.000002
Uranium (U), Total	mg/L	0.00269	0.000445	0.00143	0.00166	0.00168	0.00183
Vanadium (V), Total	mg/L	0.00078	0.00384	0.00137	0.00079	<0.0050	0.00057
Zinc (Zn), Total	mg/L	0.0109	0.0288	0.00897	0.00604	0.0068	0.00224
Zirconium (Zr), Total	mg/L	<0.00010	0.0004	0.0001	<0.00010	<0.00050	0.00013

At station BC-39, no exceedances were observed in 2013. Note that as per Clause 45 of the Water Use License, the maximum concentration of selenium is not to exceed the site specific water quality objective (SSWQO) of 0.0038 mg/L at monitoring station BC-39. However, all 2013 results are below the CWQG of 0.001 mg/L. Results are presented in Table 3-4.

Table 3-4 Surface Water Quality Results for BC-39

Parameter	Unit	22-Jan-13	23-Jul-13	10-Oct-13
pH (field)	pH units	7.73	7.83	8.23
pH (lab)	pH units	7.9	7.83	7.99
Specific Conductivity (field)	µS/cm	97	249	277.5
Conductivity (lab)	µS/cm	342	256	283
Temperature (field)	C	0.48	7.2	2
Hardness (from dissolved)	mg/L	171	113	138
Alkalinity, Total	mg/L	97.5	74.2	83
Total Dissolved Solids	mg/L	186	148	172
Total Suspended Solids	mg/L	<1.0	7.7	1.5
Chloride	mg/L	0.64	<0.50	0.53
Sulphate, Dissolved	mg/L	75.9	50.7	61.4
Ion Balance	N/A	0.99		0.97
Ammonia Total	mg/L	0.013	0.035	0.011
Nitrate, as N	mg/L	0.242	0.043	<1.0
Cyanide, Total	mg/L			<0.00050
Cyanide, Weak Acid Dissociable	mg/L	0.00071	<0.00050	0.00076
Silver (Ag), Total	mg/L	<0.0000050	<0.0000050	<0.0000050
Aluminum (Al), Total	mg/L	0.00472	0.0116	0.0058
Arsenic (As), Total	mg/L	0.00051	0.000387	0.000623
Barium (Ba), Total	mg/L	0.0724	0.0699	0.0521
Beryllium (Be), Total	mg/L	<0.000010	<0.000010	<0.000010
Bismuth (Bi), Total	mg/L	<0.0000050	0.000009	<0.0000050
Boron (B), Total	mg/L	<0.05	<0.05	<0.050
Calcium (Ca), Total	mg/L	46.1	29.9	38.1
Cadmium (Cd), Total	mg/L	0.000028	0.000031	0.000025
Cobalt (Co), Total	mg/L	0.000019	0.000072	0.000032
Chromium (Cr), Total	mg/L	<0.00010	<0.00010	<0.00010
Copper (Cu), Total	mg/L	0.000328	0.000805	0.000526
Iron (Fe), Total	mg/L	0.0126	0.0244	0.023
Mercury (Hg), Total	mg/L	<0.000010		<0.000010
Potassium (K), Total	mg/L	0.497	0.589	0.483
Lithium (Li), Total	mg/L	0.00202	0.00158	0.00218
Magnesium (Mg), Total	mg/L	13	8.33	11.1
Manganese (Mn), Total	mg/L	0.00641	0.00237	0.00676
Molybdenum (Mo), Total	mg/L	0.000594	0.000573	0.000519
Sodium (Na), Total	mg/L	2.27	1.96	2.07

Parameter	Unit	22-Jan-13	23-Jul-13	10-Oct-13
Nickel (Ni), Total	mg/L	0.00102	0.000459	0.000695
Lead (Pb), Total	mg/L	0.000006	0.000047	0.00001
Antimony (Sb), Total	mg/L	0.000163	0.000295	0.000166
Selenium (Se), Total	mg/L	0.000857	0.000533	0.000584
Silicon (Si), Total	mg/L	3.1	3.07	2.62
Tin (Sn), Total	mg/L	<0.00020	<0.00020	<0.00020
Strontium (Sr), Total	mg/L	0.262	0.182	0.225
Sulphur (S), Total	mg/L	27.6	17.6	22.5
Titanium (Ti), Total	mg/L	<0.00050	<0.00050	<0.00050
Thallium (Tl), Total	mg/L	<0.0000020	<0.0000020	0.000002
Uranium (U), Total	mg/L	0.00131	0.00039	0.00075
Vanadium (V), Total	mg/L	0.00023	<0.00020	<0.00020
Zinc (Zn), Total	mg/L	0.00176	0.00137	0.00173
Zirconium (Zr), Total	mg/L	<0.00010	<0.00010	<0.00010

The exceedances observed in 2013 are consistent with historical data, including during the pre-mining phase, which indicate that levels of those contaminants are naturally elevated. No significant trends either up or down appear in any of the stations for the parameters of concern.

A more in depth discussion of those and other parameters is included in Appendix B. Other surface water stations sampled in 2013 as part of the compliance monitoring program include: BC-01, BC-02, BC-03, BC-04, BC-05, BC-06 and BC-53 and results are presented in Appendix B.

3.3.3 Groundwater Quality

3.3.3.1 Methods

Monitoring and sampling was carried out in accordance with the procedures and standards described in the *Standard Guide for Sampling Ground-Water Monitoring Wells* (STM D4448-01, ASTM International, PA, USA). All samples were preserved and filtered on the day of collection, where applicable, and kept cool until shipment to Maxxam Analytics Inc. Samples were analyzed for the following parameters:

- Routine parameters (conductivity, pH, alkalinity, hardness, hydroxide, carbonate);
- Total dissolved solids;
- Ammonia;

- Anions (nitrite, nitrate, fluoride, sulphate, cholride, bromide, ortho-phosphate);
- Cyanide (Weak Acid Dissociable and Total); and
- Total and dissolved metals (suite of 33 metals at low level detection limits).

QA/QC samples were collected as part of each sampling event.

3.3.3.2 Effluent Quality Standards

For effluent and groundwater monitoring stations relating to heap effluent discharge via direct discharge and groundwater infiltration, water quality results were screened against the effluent quality standards established in Clause 42, 43 and 44 of WL QZ96-007 (Table 3-5). **Clause 42 and 44 of the license refer to standards for heap discharges either via land application or directly to surface water. Clause 43 refers to standards for groundwater stations immediately down gradient of the heap.** As such, water quality results from groundwater wells BC-65 and BC-66 were screened against the standards listed in Clause 43.

Table 3-5 Effluent Quality Standards (mg/L), Water License QZ96-007

Parameter	Maximum Concentration (mg/L)		
	Clause 42	Clause 43	Clause 44
WAD Cyanide	0.25	0.125	0.25
Total Cyanide	2.0	1.0	2.0
Ammonia (as N)	15.0	7.5	5.0
Copper	0.5	0.1	0.2
Arsenic	0.5	0.25	0.5
Antimony	1.0	0.5	1.0
Mercury	0.005	0.0025	0.005
Zinc	0.5	0.25	0.5
Selenium	0.75	0.3	0.25
Lead	0.2	0.1	0.2
Aluminum	1.0	3.0	1.0
Bismuth	0.5	0.25	0.5
Cadmium	0.1	0.05	0.1
Chromium	0.5	0.25	0.5
Iron	1.0	5.0	1.0
Manganese	2.0	6.0	2.0
Molybdenum	0.5	0.25	0.5
Nickel	0.8	0.25	0.5
Silver	0.1	0.05	0.1
pH	-	-	6.0 to 9.5
Suspended Solids	-	-	50

3.3.3.3 Results

All results from stations BC-65 and BC-66 are well below the standards prescribed in Clause 43, as shown in Table 3-6 below.

Table 3-6 Groundwater Quality Results, BC-65 and BC-66

Station Name		BC-65	BC-65	BC-66	BC-66	BC-66
Parameter	Unit	22-Jan-13	29-May-13	22-Jan-13	29-May-13	09-Oct-13
pH (field)	pH units	6.7	6.98	7.96	8.14	7.77
pH (lab)	pH units	7.66	7	8.05	8.14	8.22
Specific Conductivity (field)	µS/cm	125	2050	746.8	525	690
Conductivity (lab)	µS/cm	111	33.5	732	659	715
Temperature (field)	C		12.47	2.7	4.83	3.4
Hardness (from dissolved)	mg/L	50.1	13.4	352	292	347
Alkalinity, Total	mg/L	45.9	11.2	247	202	243
Total Dissolved Solids	mg/L	58	1026		269	440
Total Suspended Solids	mg/L	182				
Chloride	mg/L	0.74	1.9	5.6	5.5	5.4
Sulphate, Dissolved	mg/L	6.2	1.45	20	21.8	23.9
Ammonia Total	mg/L	0.032	0.017	0.011	0.0087	0.026
Nitrate, as N	mg/L	0.422	<0.020	32.6	30.2	28.2
Cyanide, Total	mg/L					0.00771
Cyanide, Weak Acid Dissociable	mg/L	<0.00050	0.00124	0.00414	0.0183	0.00489
Aluminum (Al), Dissolved	mg/L	0.00814	0.26	0.00207	0.00309	0.00125
Antimony (Sb), Dissolved	mg/L	0.00118	0.00442	0.000165	0.000574	0.000163
Arsenic (As), Dissolved	mg/L	0.000443	0.0011	0.000183	0.000444	0.000256
Barium (Ba), Dissolved	mg/L	0.0263	0.0445	0.0525	0.0562	0.0693
Beryllium (Be), Dissolved	mg/L	<0.000010	0.000027	<0.000010	<0.000010	<0.000010
Bismuth (Bi), Dissolved	mg/L	<0.0000050	0.000022	<0.0000050	<0.0000050	<0.0000050
Boron (B), Dissolved	mg/L	<0.05	<0.05	<0.05	<0.05	<0.050
Cadmium (Cd), Dissolved	mg/L	0.000041	0.000072	0.000027	0.000093	0.000015
Calcium (Ca), Dissolved	mg/L	10.3	3.23	73.4	57.7	67.5
Chromium (Cr), Dissolved	mg/L	<0.00010	0.00055	0.00019	0.00061	0.00032
Cobalt, Dissolved	mg/L	0.000153	0.000283	0.0801	0.0743	0.0709
Copper (Cu), Dissolved	mg/L	0.00102	0.00415	0.00041	0.000986	0.000156
Iron (Fe), Dissolved	mg/L	0.0136	0.281	0.0019	0.0083	<0.0010
Lead (Pb), Dissolved	mg/L	0.00008	0.000282	0.000034	0.000017	<0.0000050
Lithium (Li), Dissolved	mg/L	0.00396	<0.00050	0.0187	0.0156	0.0175
Magnesium (Mg), Dissolved	mg/L	5.9	1.28	41	36	43.4

Station Name		BC-65	BC-65	BC-66	BC-66	BC-66
Parameter	Unit	22-Jan-13	29-May-13	22-Jan-13	29-May-13	09-Oct-13
Manganese (Mn), Dissolved	mg/L	0.00459	0.012	0.00109	0.0021	0.000122
Mercury (Hg), Dissolved	mg/L	<0.000010		<0.000010		<0.000010
Molybdenum (Mo), Dissolved	mg/L	0.000064	0.000106	0.000381	0.00044	0.000383
Nickel (Ni), Dissolved	mg/L	0.00115	0.00417	0.00123	0.00147	0.00126
Potassium (K), Dissolved	mg/L	1.13	2.53	2.4	2.34	2.72
Selenium (Se), Dissolved	mg/L	0.00205	0.000156	0.0173	0.0156	0.0175
Silicon (Si), Dissolved	mg/L	5.31	2.51	5.44	4.5	4.37
Silver (Ag), Dissolved	mg/L	<0.0000050	0.000018	<0.0000050	<0.0000050	<0.0000050
Sodium (Na), Dissolved	mg/L	1.67	0.726	10.9	14.1	11.4
Strontium (Sr), Dissolved	mg/L	0.0412	0.0198	0.357	0.313	0.357
Sulphur (S), Dissolved	mg/L	<3.0	<3.0	7.2	7.1	9.1
Thallium (Tl), Dissolved	mg/L	0.000002	0.000005	0.000009	0.000011	0.000023
Tin (Sn), Dissolved	mg/L	<0.00020	0.00027	<0.00020	<0.00020	<0.00020
Titanium (Ti), Dissolved	mg/L	<0.00050	0.00893	<0.00050	<0.00050	<0.00050
Uranium (U), Dissolved	mg/L	0.000026	0.000084	0.000874	0.000759	0.000923
Vanadium (V), Dissolved	mg/L	<0.00020	0.00066	<0.00020	<0.00020	<0.00020
Zinc (Zn), Dissolved	mg/L	0.00777	0.0219	0.00361	0.0114	0.00188
Zirconium (Zr), Dissolved	mg/L	<0.00010	0.00102	<0.00010	<0.00010	<0.00010

Piezometers located at stations BC-20, BC-23, BC-24, BC-25 and BC-26 were removed from license QZ96-007 in Amendment #8 and are therefore no longer required to be monitored. Groundwater monitoring stations BC-19, BC-21, BC-22, BC-27, BC-67, BC-68 and BC-69 continue to be monitored and results are presented in Appendix B. The lysimeter at BC-70 could not be sampled in 2013 as the reservoir did not contain water at time of sampling.

3.3.4 In-Pit and Heap Effluent Monitoring Stations Water Quality Results

3.3.4.1 Methods

Mined out pits were used effectively as sediment control basins. Snow melt and precipitation run-off was directed to the closest inactive pit. Samples from all pits were taken from surface standing water within each pit. All samples were preserved and filtered on the day of collection, where applicable, and were kept cool until shipment to Maxxam Analytics Inc. Samples were analyzed for the following parameters:

- Routine parameters (conductivity, pH, alkalinity, hardness, hydroxide, carbonate);
- Total suspended and dissolved solids;
- Ammonia;
- Anions (nitrite, nitrate, fluoride, sulphate, cholride, bromide, ortho-phosphate);
- Cyanide (Weak Acid Dissociable and Total); and
- Total and dissolved metals (suite of 33 metals, at low level detection limits).

QA/QC samples were collected as part of each sampling event.

3.3.4.2 Effluent Quality Standards

In 2013, no effluent was discharged from monitoring station BC-28 to the land application area or to Laura Creek, Lucky Creek or Pacific Creek, and no effluent was discharged from BC-28b, therefore water quality results from those stations did not need to be screened against standards from Water License Clauses 42 and 44 (see Table 3-5).

3.3.4.3 Results

In-pit and heap effluent samples were collected from the following stations:

- BC-10: Kokanee Pit and Dump
- BC-12: Blue Pit
- BC-15: Moosehead Pit
- BC-16: Pacific Gulch
- BC-17: Golden Pit and Dump
- BC-18N: Lucky Pit and Dump (North side)
- BC-28: Overflow Pond
- BC-28A: Heap Discharge
- BC-28B: Biological Treatment Cell
- BC-51W: Pacific Pit

Stations located at BC-9 (Upper Foster Pit and Dump), BC-13 (Moosehead West Waste Dump) and BC-14 (Moosehead East Waste Dump) were removed from license QZ96-007 in Amendment #8 and are therefore no longer required to be monitored.

The following points highlight noteworthy trends from water samples collected at in-pit monitoring stations: Pacific (BC-51W), Blue (BC-12), Moosehead (BC-15), Kokanee Phase 3 (BC-10), Golden (BC-17), and Lucky (BC-18):

- Water that is contained in all pits either exfiltrates or evaporates.
- Neither the Pacific nor Blue Pits discharge to surface waters; water infiltrates through the pit bottoms.
- Samples collected from the Kokanee Phase 3 and Golden pits (BC-10 and BC-17 respectively), show no abnormal values, except for the May 2013 samples which exhibited slightly elevated copper values at both stations (2.09 µg/L and 2.59 µg/L at BC-10 and BC-17 respectively). Samples from October 2013 returned copper values that were within the usual range at both stations.
- Although the Blue Pit (BC-12) exhibited relatively low pH values in 2012 (4.85 in June), pH values obtained during the 2013 sampling were close to neutral (ranging from 6.66 in May to 7.94 in September). These pH values are considerably higher than historic (mining) results in the Blue Pit and suggest pit chemistry is stable and not trending towards any ARD concerns. pH levels in Pacific Pit (BC-51W) however have been consistently low since 2008. Overall, the results of pit water sampling indicate no significant trends or changes from previous years (see graph presented in Appendix B).
- Previous years' sampling in Moosehead (BC-15) showed higher levels of selenium. This trend reversed beginning in 2009, and selenium levels in Moosehead from 2009-2013 continued below 0.05 mg/L, with an average of 0.0157 mg/L in 2013 (see graph presented in Appendix B).

Overall, the results of pit water sampling indicate no upward trends from previous years.

3.3.5 Bioassay Monitoring

Bioassays were not collected from station BC-28a during 2013 as the site was not actively discharging.

3.3.6 Hydrology

Stream flow measurements for stations situated along Laura Creek, Golden Creek, Lucky Creek, Lee Creek, and Pacific Creek were conducted in 2013 during the regularly scheduled monitoring periods, where conditions allowed. Measurements were taken according to the procedures and standards described in the *Guidance Document for Flow Measurement of Metal Mining Effluents* (April 2001, EPS 2/MM/4, Mineral and Metal Division, Environment Canada), and all data are presented in Table 3-1.

Table 3-7 Stream Flow Measurements (liters/sec)

	BC-01	BC-02	BC-03	BC-05	BC-31	BC-34
26-Jun-13				182.82		
27-Jun-13		11.89	91.85			
23-Jul-13	101.54			119.93	479.14	
24-Jul-13		5.63	60.98			
13-Aug-13	75.00			66.00	338.00	
14-Aug-13			44.00			
10-Oct-13	192.80	18.80	108.10	193.40	809.40	
11-Oct-13						2165.10

Inspection of the discharge channel from the outflow of the Overflow Pond siphon pipe has demonstrated each year that the discharge water goes to ground and does not enter any receiving water directly. No direct surface water discharge was initiated in 2013 as the pond liners were removed in 2008 and the heap effluent meets water license criteria and now infiltrates into the ground within the reclaimed ponds.

Daily flows at the pump house (BC-1) were not recorded during the year as no direct surface discharge was carried out. Based on past experience, inspections, and monitoring, it has been demonstrated that significant flows at BC-1 are evident. Despite an observed increase in selenium concentrations on Laura Creek, results were rarely in excess of the SSWQS, and in no cases exceeded the standard >10% of the time at any station on Laura Creek (BC-01, BC-03 and BC-39). Nonetheless, selenium is regarded as a contaminant of concern within the Carolyn and Laura Creek watershed as a result of the observed high concentrations of selenium in Carolyn Creek relative to background conditions, and the earlier need to establish an SSWQS for this area.

3.4 Sediment and Benthic Monitoring

As specified in Part F, Clause 45, of Water License QZ96-007, sediment and benthic monitoring were both carried out in 2009. This ended the requirements for these monitoring programs under QZ96-007.

Sediment and benthic monitoring were completed in 2012 as part of Golden Predator's extended baseline monitoring program at Brewery Creek and results were presented in the 2012 Annual Report. No sediment or benthic monitoring was conducted in 2013.

3.5 Leak Detection and Recovery Systems

Monitoring of (LDRS) systems was discontinued in 2005, consistent with long-term closure plans and the fact the heap has been fully decommissioned and drained. The leak detection piping and collection system remains intact however.

3.6 Air Quality

No air quality monitoring for mercury emissions was conducted in 2013 due to the dismantling of the ADR facility in 2004 and the cessation of refining. No further air quality monitoring is anticipated.

3.7 Effects on Wildlife

No wildlife process – related mortalities occurred during 2013. The fence constructed in June 2006 to prevent wildlife from entering the process ponds was removed in 2008 during the final reclamation of the ponds. There is no liner remaining on site to pose any wildlife entrapment risk.

3.8 Reclamation Activities Report

The only reclamation activities that took place in 2013 are the removal of contractor equipment on site (drills) and of the tent camp in July and August. Removal of the tent camp consisted of the removal of nine canvas tents and dismantling and removal of 9 plywood tent floors and frames. Three canvas tents with plywood frames and floors remain on site.

The last inspection of the reclamation activities and remaining liabilities was completed by Vista Tek Ltd. and the Yukon Government. Vista Tek visited the site and completed the inspection on September 19th and 20th, 2012. The Yukon Government inspection was conducted on October 11th, 2012. The Vista Tek inspection served as the annual geotechnical report as well as a status of the reclamation progress to date. Both inspection reports were presented as part of the 2012 Annual Water License Report.

4 ADDITIONAL PLANS AND STUDIES

4.1 Blue Zone Assessment

4.1.1 Purpose and Study Objectives

Mining at Brewery Creek consisted primarily of oxide-type ores with low potential for acid generation due to the prior removal of sulphide minerals by natural weathering processes. The exception was the Blue Zone which occurred in partially oxidized graphitic shales containing sulphide minerals.

In response to concerns raised by the regulatory agencies that approximately 1.1 million tonnes of waste rock generated from the Blue Zone is a current or potential source of acidic and/or metal-bearing water that could cause downstream impact to Laura Creek if not mitigated, an evapotranspiration soil cover was designed and constructed over the Blue WRSA to reduce infiltration. The cover was placed in 2003. In the same year, SRK Consulting was retained to:

- re-evaluate the available geochemical data for the Blue Waste Rock Storage Area (WRSA);
- estimate if the Blue WRSA could be a source of acid drainage; and
- predict the possible impacts of water originating from the Blue WRSA on Laura Creek at BC-1 and the South Klondike River at BC-6.

The last task culminated in the development of downstream water quality predictions for Laura Creek and the South Klondike River. A Blue Zone Monitoring and Assessment Program was designed and completed by VMC in 2005 to assess a number of components of the Blue Zone, among which were the geochemical stability of the waste rock and the quality of surrounding surface and groundwater. The monitoring program committed to revisiting those predictions made by SRK in 2003 to assess the overall effectiveness of remedial measures on surface water and determine if additional measures need to be implemented.

This chapter compares the water quality results collected from Laura Creek at BC-1 and the South Klondike River at BC-6 with the SRK predictions and provides discussion on the degree to which water quality predictions are being met.

4.1.2 SRK Downstream Surface Water Quality Predictions

The findings of the work SRK completed in 2003 on the acid generation potential of the Blue WRSA showed that overall, waste rock was geochemically stable during the time of their assessment and that conditions at that time could be used to accurately predict future behaviour of the waste rock and pore water chemistry, and from that downstream water chemistry.

Two scenarios of acid generation potential were used to model downstream water quality parameters. The first approach (Approach A), used the assumption that all of the annual production of soluble contaminant is leached each year, and that all of the waste rock is flushed by infiltration. The second approach (Approach B), used a higher water volume to obtain lower water concentrations for comparison with Approach A. The result was that the waste rock pore water chemistry modeled in Approach A was estimated to be greater than that of Approach B by a factor of roughly 25. Because Approach A represents a scenario in which all leachable contamination is flushed, it was determined to be a reasonable worst case.

The results of pore water chemistry modeling were then combined with groundwater chemistry observed at monitoring wells BC-67, -68 and -69 in a mixing model. The final step involved a dilution calculation to mix seepage from the Blue WRSA with Laura Creek discharge.

Downstream water quality was predicted for each of the two approaches described above and for each of the three conditions: winter low flow, spring freshet and summer flow. Downstream surface water quality predictions for BC-1 and BC-6 are summarized in Table 4-1.

4.1.3 Results and Discussion

Water quality results are compared against predictions in the following sections. A comprehensive comparison of flow water quality results against predicted concentrations can be found in Table 4-22 to 4-4. Where water chemistry predictions differ, results are compared against the more conservative (i.e. lower water quality) predictions of Approach B. Where water quality results do not exceed predicted values of a given parameter, they are not discussed.

Water quality results are generally thought to meet predictions where results range closely on either side of the predicted concentration. Copper and arsenic were the two primary contaminants of concern during the environmental assessment and licensing phase of the Brewery Creek decommissioning and closure plan.

Table 4-1 Water Quality Predictions at BC-1 and BC-6 (SRK 2003)

		Total Aluminum	Total Antimony	Total Arsenic	Total Cadmium	Total Copper	Total Iron	Total Manganese	Total Mercury	Total Selenium	Dissolved SO_4	Total Zinc
Winter Flow Conditions												
Approach "A"												
	BC-1	0.08	0.03	0.008	0.002	0.04	0.1	0.1	0.00004	0.001	172	0.01
	BC-6	0.01	0.0012	0.001	0.0002	0.001	0.05	0.002	0.00002	0.001	76	0.005
Approach "B"												
	BC-1	0.08	0.0041	0.005	0.0003	0.003	0.1	0.04	0.00002	0.001	165	0.0077
	BC-6	0.006	0.001	0.001	0.0002	0.001	0.05	0.002	0.00002	0.001	76	0.005
Spring Flow Conditions												
Approach "A"												
	BC-1	1.17	0.01	0.01	0	0.03	1.8	0.1	0.00003	0.001	37	0.02
	BC-6	0.25	0.001	0	0.0002	0.002	0.4	0.014	0.00002	0.001	29	0.005
Approach "B"												
	BC-1	1.2	0.0051	0.01	0.0003	0.03	1.8	0.0867	0.00003	0.001	37	0.02
	BC-6	0.3	0.001	0.001	0.0002	0.002	0.4	0.0143	0.00002	0.001	29	0.01
Summer Flow Conditions												
Approach "A"												
	BC-1	0.6	0.01	0.01	0	0.01	1.3	0	0	0.001	63	0.01
	BC-6	0.17	0.0011	0	0.0002	0.008	0.3	0.021	0.0002	0.001	42	0.008
Approach "B"												
	BC-1	0.6	0.0051	0.005	0.0002	0.004	1.3	0.05	0.00002	0.001	62	0.008
	BC-6	0.17	0.001	0.001	0.0002	0.008	0.3	0.02	0.0002	0.001	42	0.008

4.1.3.1 Winter Low Flow Condition

No winter observations are available at BC-1 for 2013. At BC-6, winter low flow conditions did not exceed the predicted water quality concentrations developed by SRK with any regularity for any parameters. Two samples out of four exceeded the predictions under both approaches for total manganese, total selenium and dissolved sulfate. In comparison, all the 2012 winter flow results at BC-6 exceeded the predicted manganese concentrations, indicating that manganese levels were on average lower in 2013 during winter flow conditions. BC-6 results from 2012 were also occasionally in excess of the predictions for aluminum, arsenic, iron, selenium, sulfate and zinc. As no exceedences were observed in 2013 for aluminum, arsenic, iron and zinc, it can be concluded that the average concentration of these parameters has decreased in 2013 during low flow conditions.

BC-1 winter flow observations from 2012 were in excess of SRK predictions under one or both approaches for aluminum, arsenic, copper, iron, manganese, selenium and zinc. Most exceedences occurred for only one of the two winter flow samples, except for manganese which exceeded predictions under approach B for both samples.

Table 4-2 Water Quality Results Relative to Predictions at BC-1 and BC-6, Winter Flow Condition

		Total Aluminum	Total Antimony	Total Arsenic	Total Cadmium	Total Copper	Total Iron	Total Manganese	Total Mercury	Total Selenium	Dissolved SO_4	Total Zinc
Approach "A" - Winter Flow Conditions												
Predicted @ BC-1		0.08	0.03	0.008	0.002	0.04	0.1	0.1	0.00004	0.001	172	0.01
Observed @ BC-1	No winter observations in 2013											
Predicted @ BC-6		0.01	0.0012	0.001	0.0002	0.001	0.05	0.002	0.00002	0.001	76	0.005
Observed @ BC-6	23-Jan-13	0.00352	0.000179	0.000461	0.00004	0.000421	0.017	0.00522	<0.000010	0.00116	82.7	0.0029
	12-Feb-13	0.00231	0.000212	0.00024	0.000038	0.00029	0.0059	0.00219	<0.000010	0.000739	73.1	0.00168
	25-Mar-13	0.0028	0.000154	0.000311	0.00004	0.000386	0.0148	0.00131	<0.000010	0.000783	74.5	0.0017
	16-Apr-13	0.00157	0.000156	0.000267	0.000036	0.000333	0.005	0.00101	<0.000010	0.00101	85.2	0.00221
Approach "B" - Winter Flow Conditions												
Predicted @ BC-1		0.08	0.0041	0.005	0.0003	0.003	0.1	0.04	0.00002	0.001	165	0.0077
Observed @ BC-1	No winter observations in 2013											
Predicted @ BC-6		0.006	0.001	0.001	0.0002	0.001	0.05	0.002	0.00002	0.001	76	0.005
Observed @ BC-6	23-Jan-13	0.00352	0.000179	0.000461	0.00004	0.000421	0.017	0.00522	<0.000010	0.00116	82.7	0.0029
	12-Feb-13	0.00231	0.000212	0.00024	0.000038	0.00029	0.0059	0.00219	<0.000010	0.000739	73.1	0.00168
	25-Mar-13	0.0028	0.000154	0.000311	0.00004	0.000386	0.0148	0.00131	<0.000010	0.000783	74.5	0.0017
	16-Apr-13	0.00157	0.000156	0.000267	0.000036	0.000333	0.005	0.00101	<0.000010	0.00101	85.2	0.00221

Table 4-3 Water Quality Results Relative to Predictions at BC-1 and BC-6, Spring Flow Condition

		Total Aluminum	Total Antimony	Total Arsenic	Total Cadmium	Total Copper	Total Iron	Total Manganese	Total Mercury	Total Selenium	Dissolved SO_4	Total Zinc
Approach "A" - Spring Flow Conditions												
Predicted @ BC-1		1.17	0.01	0.01	0	0.03	1.8	0.1	0.00003	0.001	37	0.02
Observed @ BC-1	24-May-13	0.293	0.00351	0.00516	0.00007	0.00274	0.435	0.0441	0.000012	0.00081	24.3	0.00965
	26-Jun-13	0.831	0.00398	0.00632	0.000111	0.00428	1.64	0.0913	<0.000010	0.00213	102	0.0135
Predicted @ BC-6		0.25	0.001	0	0.0002	0.002	0.4	0.014	0.00002	0.001	29	0.005
Observed @ BC-6	24-May-13	0.211	0.000224	0.000773	0.000227	0.00357	0.451	0.0497		0.000955	49.7	0.0199
	26-Jun-13	0.0312	0.000196	0.000683	0.000036	0.000786	0.0673	0.0105	<0.000010	0.000594	50.4	0.00224
Approach "B" - Spring Flow Conditions												
Predicted @ BC-1		1.2	0.0051	0.01	0.0003	0.03	1.8	0.0867	0.00003	0.001	37	0.02
Observed @ BC-1	24-May-13	0.293	0.00351	0.00516	0.00007	0.00274	0.435	0.0441	0.000012	0.00081	24.3	0.00965
	26-Jun-13	0.831	0.00398	0.00632	0.000111	0.00428	1.64	0.0913	<0.000010	0.00213	102	0.0135
Predicted @ BC-6		0.3	0.001	0.001	0.0002	0.002	0.4	0.0143	0.00002	0.001	29	0.01
Observed @ BC-6	24-May-13	0.211	0.000224	0.000773	0.000227	0.00357	0.451	0.0497		0.000955	49.7	0.0199
	26-Jun-13	0.0312	0.000196	0.000683	0.000036	0.000786	0.0673	0.0105	<0.000010	0.000594	50.4	0.00224

Table 4-4 Water Quality Results Relative to Predictions at BC-1 and BC-6, Summer Flow Condition

		Total Aluminum	Total Antimony	Total Arsenic	Total Cadmium	Total Copper	Total Iron	Total Manganese	Total Mercury	Total Selenium	Dissolved SO_4	Total Zinc
Approach "A" - Summer Flow Conditions												
Predicted @ BC-1		0.6	0.01	0.01	0	0.01	1.3	0	0	0.001	63	0.01
Observed @ BC-1	23-Jul-13	0.507	0.00371	0.00551	0.000115	0.0041	0.992	0.0984		0.00199	133	0.00804
	13-Aug-13	3.15	0.00396	0.00775	0.000121	0.00788	4.97	0.124	<0.000010	0.00166	141	0.0194
	10-Oct-13	0.288	0.00274	0.00401	0.000219	0.00356	0.672	0.0898	<0.000010	0.00147	104	0.00989
Predicted @ BC-6		0.17	0.0011	0	0.0002	0.008	0.3	0.021	0.0002	0.001	42	0.008
Observed @ BC-6	23-Jul-13	0.00835	0.000208	0.000704	0.000023	0.000785	0.0263	0.0077		0.000561	57.9	0.00109
	13-Aug-13	0.0149	<0.00050	0.00029	0.000075	0.00114	0.053	0.0058	<0.000010	0.00189	138	<0.0050
	10-Oct-13	0.00582	0.000193	0.000497	0.000039	0.000634	0.0247	0.00653	<0.000010	0.000988	75.4	0.00295
Approach "B" - Summer Flow Conditions												
Predicted @ BC-1		0.6	0.0051	0.005	0.0002	0.004	1.3	0.05	0.00002	0.001	62	0.008
Observed @ BC-1	23-Jul-13	0.507	0.00371	0.00551	0.000115	0.0041	0.992	0.0984		0.00199	133	0.00804
	13-Aug-13	3.15	0.00396	0.00775	0.000121	0.00788	4.97	0.124	<0.000010	0.00166	141	0.0194
	10-Oct-13	0.288	0.00274	0.00401	0.000219	0.00356	0.672	0.0898	<0.000010	0.00147	104	0.00989
Predicted @ BC-6		0.17	0.001	0.001	0.0002	0.008	0.3	0.02	0.0002	0.001	42	0.008
Observed @ BC-6	23-Jul-13	0.00835	0.000208	0.000704	0.000023	0.000785	0.0263	0.0077		0.000561	57.9	0.00109
	13-Aug-13	0.0149	<0.00050	0.00029	0.000075	0.00114	0.053	0.0058	<0.000010	0.00189	138	<0.0050
	10-Oct-13	0.00582	0.000193	0.000497	0.000039	0.000634	0.0247	0.00653	<0.000010	0.000988	75.4	0.00295

4.1.3.2 Spring Flow Condition

Results obtained during spring freshet conditions were variable with respect to the SRK water quality predictions. Notably, dissolved sulphate at BC-6 exceeded the predicted water quality under both prediction approaches during all sampling events (Table 4-3). In comparison to 2012 spring flow results, a smaller proportion of samples exceeded the predictions for most parameters in 2013.

4.1.3.3 Summer Flow Condition

Results obtained during summer flow conditions were similarly variable with respect to the SRK water quality predictions as that seen during spring freshet. Dissolved sulphate exceeded the predicted water quality under both prediction approaches during all sampling events carried out at BC-1 and BC-6 during 2013 (Table 4-4). At BC-1, cadmium, manganese and selenium were in excess of the predictions under approach “A” for all summer sampling events, while manganese, selenium and zinc were in excess of the predictions under approach “B” for all summer sampling events. At BC-6, all samples were in excess of the predictions under approach “A” for arsenic. Similar exceedences were observed at both stations in 2012, however, occasional exceedences for aluminum, copper and iron at BC-1 were observed in 2013 and not in 2012.

4.1.4 Conclusion

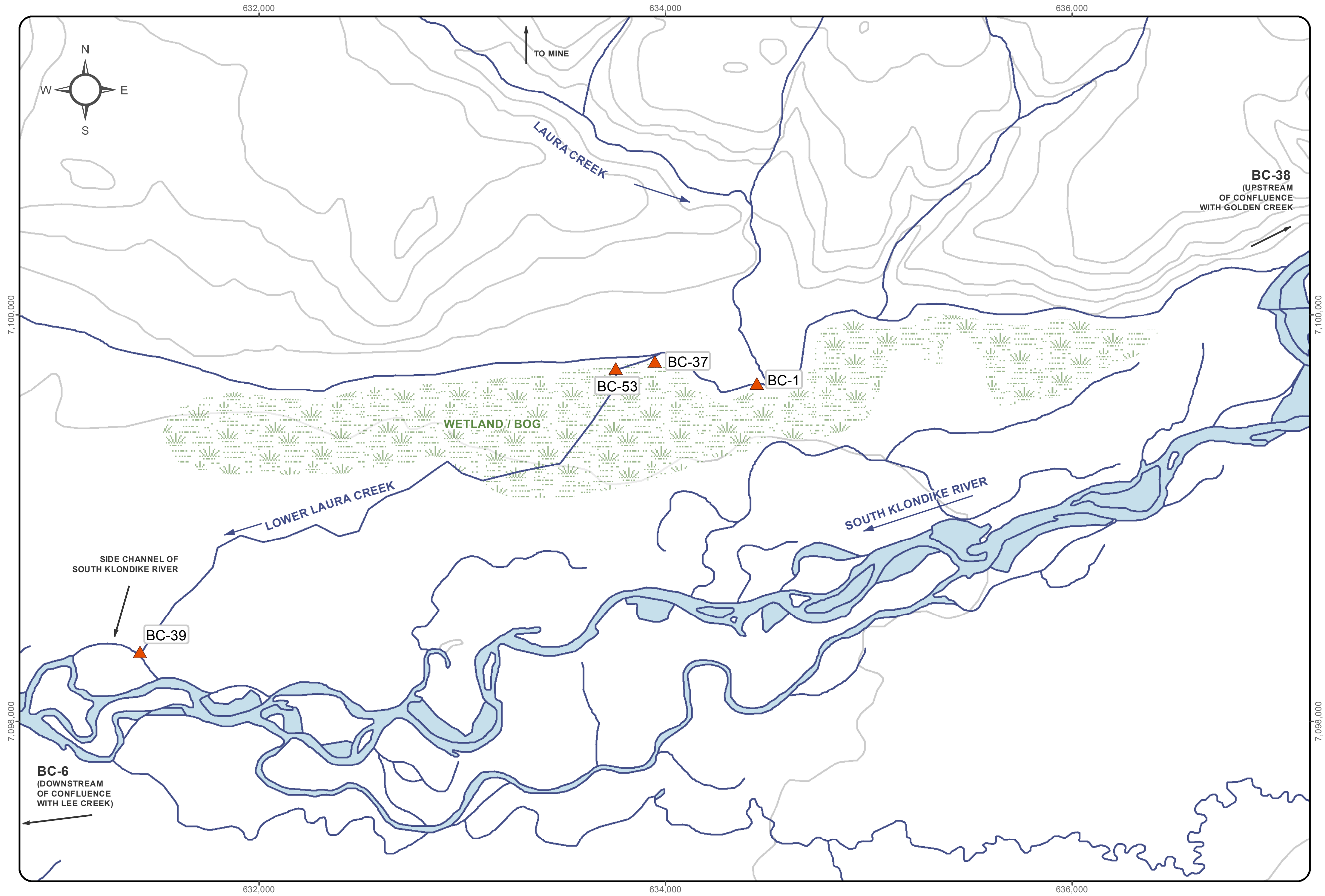
Results for most parameters are either commensurate with or below predicted water quality concentrations from SRK’s 2003 work. Dissolved sulphate is the only parameter showing results that are consistently higher than the predicted water quality, indicating that predictions for this parameter underestimate the actual levels. In 2012, selenium was consistently found to be in excess of the predictions, while in 2013, this was only the case at BC-1 under summer flow conditions. From these results it is confirmed that the Blue WRSA and cover are performing as expected and the reclamation and closure measures have achieved their objective for the Blue WRSA.

4.2 Lower Laura Creek Impact Study

4.2.1 Purpose and Study Objective

In April 2004, the Laura Creek Adaptive Management Plan (AMP) was prepared in response to Clause 70 of Water Use License QZ96-007 Amendment No. 6. The AMP is a component of the overall Environmental Management System for the site and provides a contingency response plan to address downstream effects to aquatic resources in lower Laura Creek resulting from the release of mine site effluents containing selenium. In December 2004, a Lower Laura Creek Impact Study Plan was developed, which utilizes some of the responses described in the AMP, and details specific study components to be undertaken during the period 2005 – 2007 on the lower reach of Laura Creek from BC-53 to BC-39 (Figure 4-1), an approximate distance of three kilometers. Following the initial study phase from 2004 – 2007, the Study Plan documents a commitment to assess results collected as per the monitoring conditions of QZ96-007 every three years. An assessment of the results obtained for the period 2008-2010 was provided as part of the 2011 Annual Water License Report, and this chapter provides an updated assessment including results for the period 2011-2013.

The purpose of the study was to characterize the potential effects to Lower Laura Creek and the South Klondike River resulting from the release of effluents from the project. The following report summarizes data collected as part of the licensed monitoring program conducted on Laura Creek and the South Klondike River during the period 2008 – 2013.



Datum: NAD 83; Map Projection: UTM Zone 7N

1:25,000 *When printed on 81/2 by 11 inch paper*

0 250 500 750 1,000
Meters

TSX: GPD

ACCESS

BREWERY CREEK MINE

FIGURE 4-1
SAMPLE STATION LOCATIONS

FEBRUARY 2014

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(*Last edited by: jpan;2/26/2014/13:19 PM*)

4.2.2 Water Quality Analysis

Water samples have been collected at BC-39 as per Water License QZ96-007, Schedule B, and also at BC-53 for the analysis of pH, conductivity, hardness, alkalinity, dissolved solids, suspended solids, sulfate, ammonia, nitrate and ICP total metals. In-situ measurements (temperature, pH, and conductivity) are also collected during sampling events.

Water quality data collected from 2008 – 2013 from lower Laura Creek at stations BC-53 and BC-39, is presented in Tables 4-5 and 4-6, respectively. Water quality data have also been collected at other stations on lower Laura Creek (BC-1 and BC-37) as well as in the South Klondike River (BC-38 and BC-6). Data collected for these stations are presented in Appendix B.

A discussion of water quality at BC-39 and BC-53 is provided below, followed by a comparison of selected parameters also measured at BC-1, BC-6, BC-37, and BC-38.

Between January 1, 2008 and December 31, 2013, BC-53 was sampled on seventeen occasions (Table 4-6), while BC-39 was sampled on nine occasions over the same period (Table 4-5).

CCME Guidelines

The following discussion compares water quality parameters at stations on Laura Creek and the South Klondike River to the CCME guidelines to provide an idea of overall water quality in lower Laura Creek (these guidelines are presented in Table 4-7). Amendment #7 to Water Licence QZ96-007 added Clause 38(e) (now clause 46 under Amendment #8), which stated that water quality at BC-39 shall not exceed the water quality guidelines specified for the protection of aquatic life contained in the Canadian Environmental Quality Guidelines prepared by the Canadian Council of Ministers of the Environment (CCME).

As is shown in Tables 4-5 and 4-6, water quality at both BC-53 and BC-39 met the CCME guidelines for pH, molybdenum, nickel, and thallium. At BC-53, water quality exceeded the CCME guidelines for total aluminum, arsenic, chromium, copper and iron, and much less commonly for cadmium, lead, mercury, silver, zinc, nitrate and cyanide. At station BC-39, water quality occasionally exceeded the CCME guidelines for total aluminum, chromium, copper and iron.

In 2003 the CCME guideline for mercury was revised from 0.0001 mg/L to 0.000026 mg/L. The laboratory Method Detection Limit (MDL) for mercury ranges from 0.01 – 0.00001 mg/L for the samples collected from 2008 – 2013. Whether or not mercury met the CCME guideline at stations BC-39 and BC-53 on all occasions is not known given the samples where the laboratory detection limit is greater than the guideline. However, results for total mercury at BC-39 were either non-detect or below CCME on all occasions, while at BC-53 they are known to exceed CCME on only two occasions.

In February 2014, new guidelines for short term and long term exposure to cadmium were published by the CCME to replace the interim guideline. The long term exposure guideline is the most conservative and is used in the assessment below.

Further discussion of parameters of concern is provided below.

Selenium Guideline

A site-specific water quality objective (SSWQO) consistent with CCME guidelines was developed for selenium in the Laura Creek watershed. As per Clause 45 of the Water License, the maximum concentration of selenium shall not exceed 0.0038 mg/L at Lower Laura Creek monitoring station BC-39. The Laura Creek AMP (2004) indicates the company will also use a site-specific selenium objective of 0.0038 mg/L at BC-53 as a trigger under the AMP.

Table 4-5 Water Quality Data for BC-53: Laura Creek 300m below BC-37

Parameter	Units	24-Jan-2008	18-Apr-2008	24-May-2008	18-Jun-2008	9-Jul-2008	12-Aug-2008	17-Sep-2008	18-Dec-2008	3-Jun-2009	1-Sep-2009	15-Jun-2010	1-Sep-2010	7-Jun-2011	15-Sep-2011	20-Jun-2012	23-Jul-2013	10-Oct-2013
Field Parameters																		
pH, in-field	pH units		7.85	7.69				7.42		7.4	7.76	7.92				8.12	8.82	8.36
Conductivity, in-field	µS/cm		755	271				344		1185	452	429				369		
Temperature, in-field	C		0.2	0				3		2	4	6.3				4.5	8.18	0.1
pH, Laboratory	pH units	7.38	8.05	7.9	8.1	7.72	7.98	8.08	8.07	8.3	8.1	8.1	8.23	7.99	8.16	8.15	8.07	7.95
Conductivity, Laboratory	µS/cm	700	1100	349	480	304	310	386	584	430	441	454	435	442	460	383	390	382
Hardness calcualted from total metal scan	mg/L	406	598	184	254	322	164	210	304	214	225	226	220	213	221	199	181	197
Alkalinity, Total	mg/L	216	283	79	134	84	97	114	168	110	130	130	130	110	130	107	108	99.7
Alkalinity, Hydroxide OH	mg/L	<5	<5	<5	<5	<5	<5	<5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50
Alaklinity, Carbonate CO3	mg/L	<6	<6	<6	<6	<6	<6	<6	<6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50
Alkalinity, Bicarbonate HCO3	mg/L	263	346	100	160	100	100	140	200	140	150	160	150	140	150	131	131	122
Total Dissolved Solids	mg/L	562	946	270	352	234	274	312	502	280	270	300	270	300	320	254	236	276
Total Suspended Solids	mg/L	<2	<2	<2	18	231	126	38	<2	64	9	110	24	65	7	67.9	37.9	29.6
Chloride	mg/L	0.78	1.93	1.19	0.59	0.32	0.37	0.75	0.51	1.2	<0.5	0.8	<0.5	1	1	1	<0.50	1
Sulphate, Dissolved	mg/L	210	428	78.5	124	68.3	63.4	97	158	100	94	110	110	110	115	86.9	99.7	100
Ammonium Nitrogen (NH3, NH4+), as N	mg/L	0.01	0.013	0.012	0.008	0.032	0.021	0.024	0.08	<0.005	<0.005					0.01	0.023	0.027
Nitrate Nitrogen, as N	mg/L	0.04	<0.02	4.44	0.5	0.85	0.43	1.03	0.1	0.19	0.24	0.16	0.14	0.22	0.14	0.356	0.116	<1.0
Cyanide, Total	mg/L	0.001	0.002	0.017	0.001	0.76	0.001	0.002	0.001	0.0011	<0.0005	0.001	<0.0005	<0.0005	<0.0005			0.00107
Cyanide, Weak Acid Dissociable.	mg/L	0.002	<0.002	0.004	0.004	0.122	0.002	<0.002	<0.002	0.0007	<0.0005	0.0007	0.001	<0.0005	<0.0005	0.00106	0.00066	0.00095
Total Metals, CCME-Regulated																		
Aluminum, total	mg/L	0.013	0.013	10.6	0.942	8.26	2.86	0.616	0.158	0.459	0.0844	0.556	0.0347	0.344	0.0682	0.79	0.25	0.103
Arsenic, total	mg/L	0.0045	0.0081	0.0387	0.0053	0.0178	0.0076	0.0039	0.004	0.0066	0.00406	0.00602	0.00379	0.00669	0.00443	0.00622	0.00345	0.00316
Cadmium, total	mg/L	0.00014	0.00024	0.00077	0.00007	0.00046	0.00016	0.00007	0.00004	0.000142	0.000039	0.000122	0.000016	0.000144	0.000035	0.000169	0.000054	0.000047
Chromium, total	mg/L	0.0008	0.0012	0.0222	0.0021	0.0159	0.0056	0.0021	<0.0005	0.0012	0.0002	0.0012	0.0002	0.0008	0.0003	0.00138	0.00053	0.00037
Copper, total	mg/L	0.001	0.002	0.025	0.007	0.019	0.007	0.002	<0.001	0.00334	0.00157	0.00353	0.00129	0.00344	0.00139	0.00513	0.00215	0.00206
Iron, total	mg/L	<0.1	<0.1	16.8	1.14	17.5	3.32	1.06	0.16	1.16	0.244	1.15	0.106	0.854	0.211	1.65	0.504	0.283
Lead, total	mg/L	0.0002	0.0001	0.0083	0.0007	0.0121	0.0016	0.0006	0.0001	0.00128	0.000167	0.000949	0.000027	0.000993	0.000102	0.00147	0.000438	0.000154
Mercury, total	mg/L	<0.0001	<0.0001	0.001	<0.0001	0.0001	<0.0001	<0.01	<0.0001	0.00002		<0.00001	<0.00001	<0.00001	<0.00001			<0.000010
Molybdenum, total	mg/L	0.004	0.004	0.003	0.004	0.003	0.002	0.00234	0.003	0.00256	0.0027	0.00237	0.00262	0.0022	0.00222	0.00155	0.00179	0.0018
Nickel, total	mg/L	0.0011	0.002	0.0281	0.0025	0.0196	0.0088	0.002	0.0019	0.0049	0.00216	0.00388	0.0022	0.00357	0.00245	0.0048	0.00209	0.00483
Selenium, total	mg/L	0.0028	0.0044	0.004	0.0012	0.0031	0.0017	0.0012	0.002	0.00165	0.00159	0.00197	0.00152	0.0018	0.00174	0.00229	0.00136	0.00132
Silver, total	mg/L	<0.0001	<0.00001	0.00019	<0.00001	0.00017	0.00006	0.00002	<0.00001	<0.000005	<0.000005	0.000008	<0.000005	0.000012	<0.000005	0.0000122	<0.0000050	<0.0000050
Thallium, total	mg/L					0.0001	<0.00005	0.00001		0.00001	0.000004	0.000009	0.000003	0.000007	0.000003	0.0000083	0.000003	0.000004
Zinc, total	mg/L	0.024	0.02	0.108	0.011	0.085	0.022	0.008	0.007	0.0155	0.0027	0.0101	0.0007	0.0094	0.0021	0.0109	0.00372	0.00458
Total Metals, Anions																		
Calcium, total	mg/L	99.3	140	45.5	61.5	76.1	40.5	52.6	75.5	54	56.4	54.1	53.8	52.6	53.9	50.6	44.8	47
Manganese, total	mg/L	0.005	0.029	0.826	0.047	0.441	0.092	0.0541	0.027	0.137	0.0252	0.0755	0.0108	0.118	0.0397	0.104	0.0501	0.0509
Magnesium, total	mg/L	38.5	60.2	17.2	24.3	32.1	15.3	19.1	28.1	19.3	20.5	22	20.8	19.9	21.1	17.7	16.7	19.3
Sodium, total	mg/L	8	11.9	12.3	5	4240	3.1	4.8	4.7	3.57	3.61	3.56	3.38	3.32	3.28	3.07	2.96	3.52
Potassium, total	mg/L	2.5	4.8	2.8	1.4	5.5	1.2	1.28	1.3	1.32	1.17	1.26	1.15	1.32	1.16	1.02	0.928	0.998

Table 4-6 Water Quality Data for BC-39: Laura Creek in side channel of South Klondike River

Parameter	Units	13-May-2008	18-Jun-2008	9-Jul-2008	12-Aug-2008	3-Jun-2009	7-Jun-2011	22-Jan-2013	23-Jul-2013	10-Oct-2013
Field Parameters										
pH, in-field	pH units					7.27		7.73	7.83	8.23
Conductivity, in-field	µS/cm					1059				
Temperature, in-field	°C					6		0.48	7.2	2
pH, Laboratory	pH units	7.86	8	7.73	7.98	8.3	7.97	7.9	7.83	7.99
Conductivity, Laboratory	µS/cm	262	477	299	299	400	415	342	256	283
Hardness calcualted from total metal scan	mg/L	129	253	296	155	196	200	169	109	141
Alkalinity, Total	mg/L	73	133	82	94	110	110	97.5	74.2	83
Alkalinity, Hydroxide OH	mg/L	<5	<5	<5	<5	<0.5	<0.5	<0.50	<0.50	<0.50
Alaklinity, Carbonate CO3	mg/L	<6	<6	<6	<6	<0.5	<0.5	<0.50	<0.50	<0.50
Alkalinity, Bicarbonate HCO3	mg/L	90	160	100	100	130	130	119	90.6	101
Total Dissolved Solids	mg/L	204	354	226	272	270	280	186	148	172
Total Suspended Solids	mg/L	<2	8	8	7	20	2	<1.0	7.7	1.5
Chloride	mg/L	0.46	0.56	0.31	0.28	1.2	0.8	0.64	<0.50	0.53
Sulphate, Dissolved	mg/L	58.7	124	67.1	61.2	97	98	75.9	50.7	61.4
Ammonium Nitrogen (NH3, NH4+), as N	mg/L	0.025	0.017	0.013	0.017	<0.005		0.013	0.035	0.011
Nitrate Nitrogen, as N	mg/L	0.52	0.44	0.8	0.41	0.15	0.05	0.242	0.043	<1.0
Cyanide, Total	mg/L	0.002	0.002	0.003	0.002	0.0011	<0.0005			<0.00050
Cyanide, Weak Acid Dissociable.	mg/L	0.002	0.004	0.002	0.002	0.0007	<0.0005	0.00071	<0.00050	0.00076
Total Metals, CCME-Regulated										
Aluminum, total	mg/L	0.336	0.364	0.749	0.521	0.0897	0.0339	0.00472	0.0116	0.0058
Arsenic, total	mg/L	0.0033	0.0043	0.0038	0.0035	0.00357	0.00241	0.00051	0.000387	0.000623
Cadmium, total	mg/L	0.00008	0.00004	0.00004	0.00004	0.000037	0.000054	0.000028	0.000031	0.000025
Chromium, total	mg/L	0.0013	0.001	0.002	0.0017	0.0003	0.0002	<0.00010	<0.00010	<0.00010
Copper, total	mg/L	0.004	0.002	0.004	0.003	0.00118	0.00113	0.000328	0.000805	0.000526
Iron, total	mg/L	0.3	0.41	2.01	0.61	0.221	0.065	0.0126	0.0244	0.023
Lead, total	mg/L	0.0007	0.0003	0.0008	0.0002	0.000165	0.000062	0.000006	0.000047	0.00001
Mercury, total	mg/L	<0.01	<0.01	<0.01	<0.0001	0.00001	<0.00001	<0.000010		<0.000010
Molybdenum, total	mg/L	0.002	0.003	0.002	0.002	0.00234	0.00177	0.000594	0.000573	0.000519
Nickel, total	mg/L	0.003	0.0009	0.0032	0.0033	0.00157	0.00132	0.00102	0.000459	0.000695
Selenium, total	mg/L	0.0013	0.0013	0.0015	0.0014	0.00126	0.00108	0.000857	0.000533	0.000584
Silver, total	mg/L	0.00002	<0.00001	0.00004	0.00002	<0.000005	<0.000005	<0.0000050	<0.0000050	<0.0000050
Thallium, total	mg/L			<0.00005	<0.00005	0.000003	<0.000002	<0.0000020	<0.0000020	0.000002
Zinc, total	mg/L	0.02	0.007	0.008	0.007	0.0016	0.0012	0.00176	0.00137	0.00173
Total Metals, Anions										
Calcium, total	mg/L	32.3	61.9	73.5	38.4	49.9	50.4	46.1	29.9	38.1
Manganese, total	mg/L	0.01	0.015	0.038	0.016	0.0134	0.00475	0.00641	0.00237	0.00676
Magnesium, total	mg/L	11.7	24	27.5	14.3	17.4	17.9	13	8.33	11.1
Sodium, total	mg/L	2.9	4.8	8.9	2.9	3.15	2.96	2.27	1.96	2.07
Potassium, total	mg/L	1.2	1.4	2.2	0.9	1.24	1.31	0.497	0.589	0.483

Table 4-7 CCME Water Quality Guidelines for the Protection of Aquatic Life

Parameter	Concentration	Units	Notes	Minimum Conc.	Maximum Conc.
Aluminum	100	µg/L	if pH >= 6.5		
Arsenic	5	µg/L			
Cadmium*	Long term exposure: $10^{0.83[\log10(\text{hardness})]-2.46}$	µg/L	BC-53	0.239	0.699
			BC-39	0.170	0.390
Chromium	1	µg/L			
Copper	$e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$	µg/L	BC-53	3.61	10.90
			BC-39	2.55	5.98
Iron	300	µg/L			
Lead	$e^{1.273[\ln(\text{hardness})]-4.705}$	µg/L	BC-53	5.97	31.00
			BC-39	3.55	12.66
Mercury	0.026	µg/L			
Molybdenum	73	µg/L			
Nickel	$e^{0.76[\ln(\text{hardness})]+1.06}$	µg/L	BC-53	139.2	372.1
			BC-39	102.1	218.0
Nitrate	13000	µg/L			
pH	6.5-9.0	pH units			
Selenium	1	µg/L			
Silver	0.1	µg/L			
Thallium	0.8	µg/L			
Zinc	30	µg/L			

** New guidelines published in 2014 (CCME)*

Selenium

The site specific selenium water quality objective of 0.0038 mg/L at BC-53 was exceeded during two sampling events of the seventeen carried out there (~12% of samples). The two exceedances occurred in April and May of 2008. Total selenium ranged between 0.0012 and 0.0044 mg/L, with an average concentration of 0.0021 mg/L observed. See Figure 4-2.

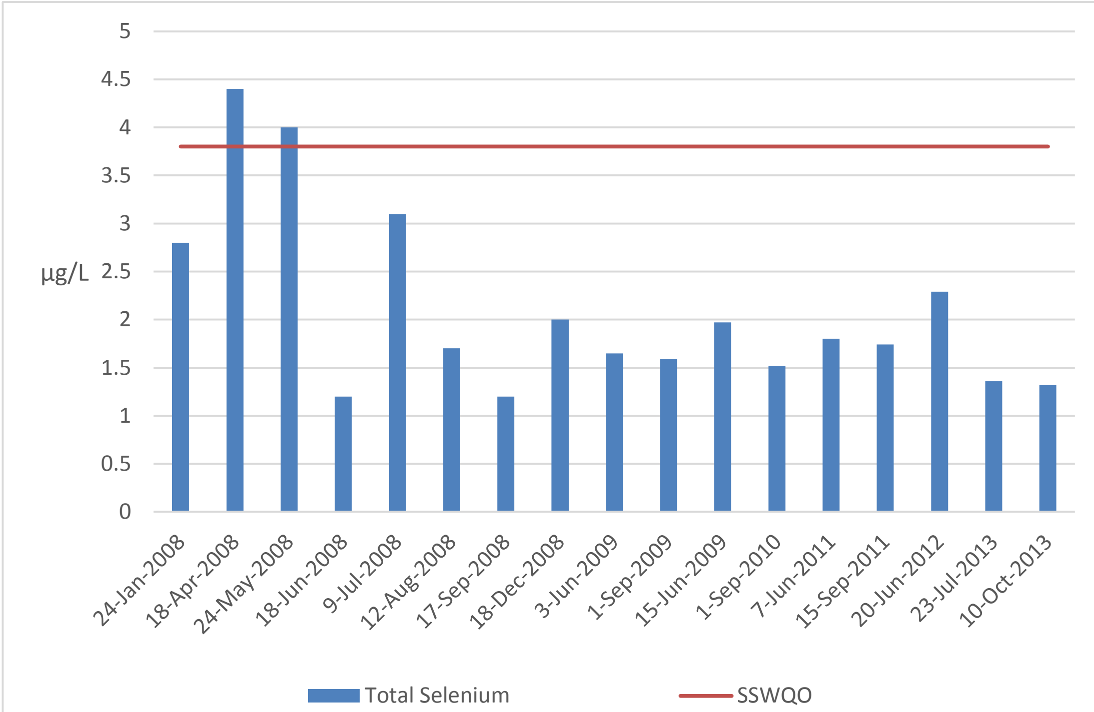


Figure 4-2 BC-53 Total Selenium, 2008-2013

Selenium results at BC-39 were consistently compliant with Clause 45 of the Water Licence; selenium did not exceed 0.0038 mg/L at monitoring station BC-39. Observed values ranged from 0.0005 – 0.0015 mg/L. The average concentration of selenium during this time was 0.0011 mg/L. See Figure 4-3.

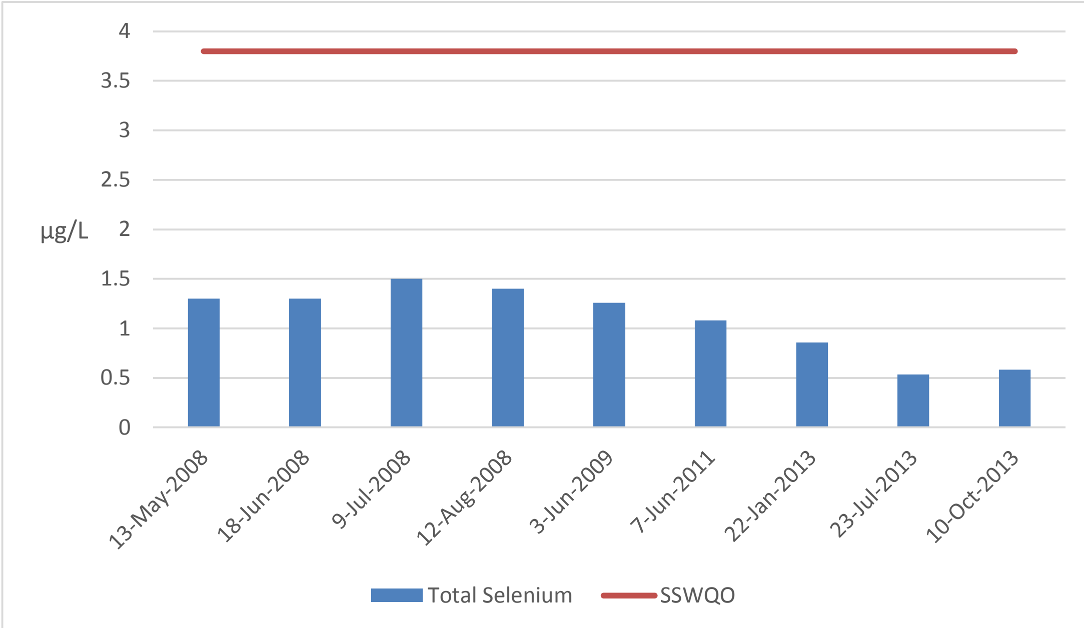


Figure 4-3 BC-39 Total Selenium, 2008-2013

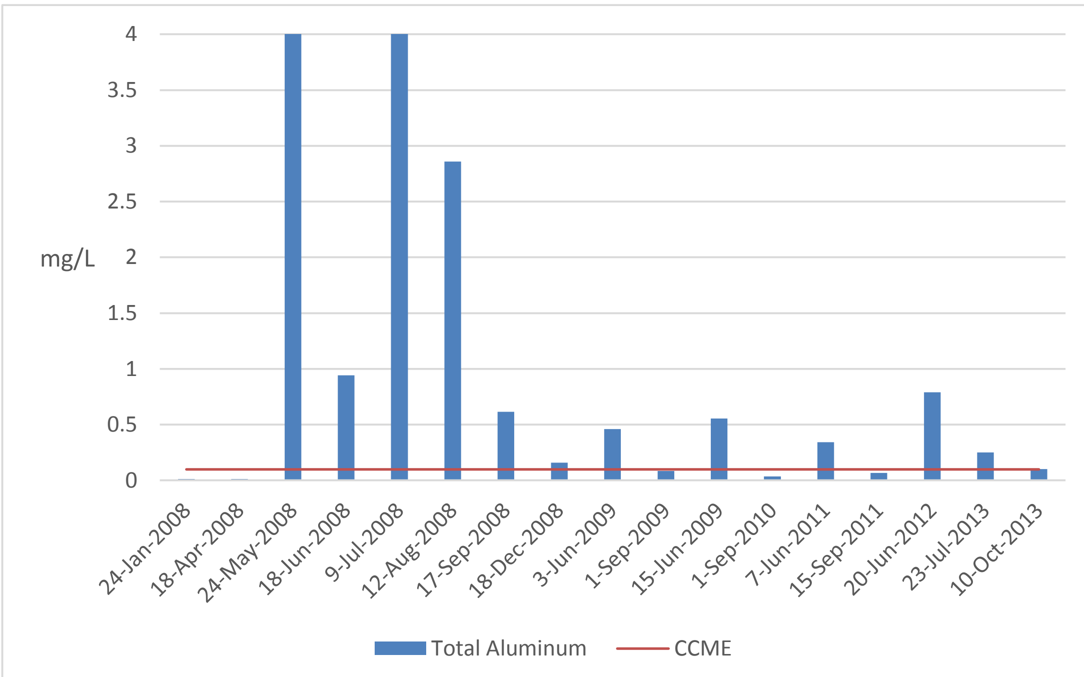
At stations on Laura Creek above the Lower Laura Creek Study area (BC-1 and BC-37), selenium was below the BC-39 SSWQO of 0.0038 mg/L during every sampling event from 2008 – 2013, except for one occurrence out of fifteen, in April 2008, where this objective was exceeded at station BC-37 (~7% of samples for this station).

The concentration of total selenium in the South Klondike River above Laura Creek (BC-38) was below the CCME guideline of 0.001 mg/L for all but one sample collected (4% of samples). This exceedance was observed in February 2013. In the South Klondike River below Laura Creek (BC-6), 17 samples out of 36 (~47% of samples) were above the CCME guideline; however, all were below the selenium licence condition for BC-39. At BC-6, the dataset showed an average selenium concentration of 0.0011mg/L, which is only marginally above the CCME guideline, and well below the licence condition for BC-39.

Aluminum

Total aluminum exceeded the CCME guideline (0.1 mg/L) twelve of fifteen sampling events at BC-53 (~71% of samples). The average concentration of aluminum is 1.54 mg/L. A maximum concentration of 10.6 mg/L was observed on May 24th, 2008. This sample likely represents high-energy erosional conditions during freshet. Samples collected at BC-39 for 13 May 2008 (during the same sampling event), show an aluminum concentration of 0.336 mg/L. This indicates that freshet likely began in late May. Figure 4-4 shows the total aluminum results at BC-53.

Figure 4-4 BC-53 Total Aluminum, 2008-2013



Total aluminum exceeded the CCME guideline on four of nine sampling events at BC-39 (~44% of samples). The average concentration of aluminum for the nine samples is 0.235 mg/L. A maximum concentration of 0.749 mg/L was observed in July 2008 (see Figure 4-5).

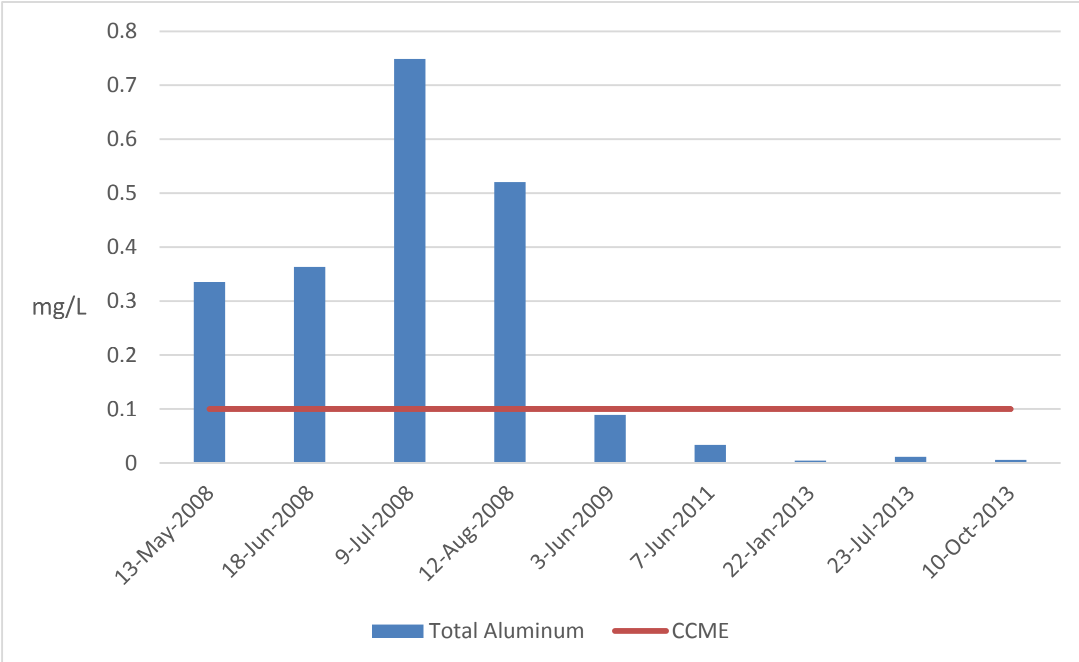


Figure 4-5 BC-39 Total Aluminum, 2008-2013

At stations on Laura Creek above the Lower Laura Creek Study area (BC-1 and BC-37), the CCME aluminum guideline was regularly exceeded (>50% of the time at both BC-1 and BC-37).

Aluminum concentrations in the South Klondike River exceeded the CCME guidelines on three occasions upstream and two occasions downstream of the Brewery Creek property. All the exceedances occurred on April and May of 2012 and 2013, and are therefore likely caused by natural sediment loading associated with spring freshet.

Cadmium

The new CCME long term guideline for total cadmium recommends the use of the formula:

$$CWQG = 10^{\{0.83(log[hardness])-2.46\}}$$

Using this equation, the guideline at BC-53 and BC-39 is calculated within the range indicated in Table 4-7. The interim guideline used previously was a lot more conservative and was exceeded on several occasion at stations of interest on Laura Creek and the South Klondike River.

The long term guideline was exceeded twice at BC-53, out of 17 samples (~12% of samples), both times in 2008, while the short term guideline was never exceeded. The maximum concentration observed was

0.77µg/L, in May 2008. The average cadmium concentration at BC-53 is 0.160 µg/L, which is well below the range presented in Table 4-7.

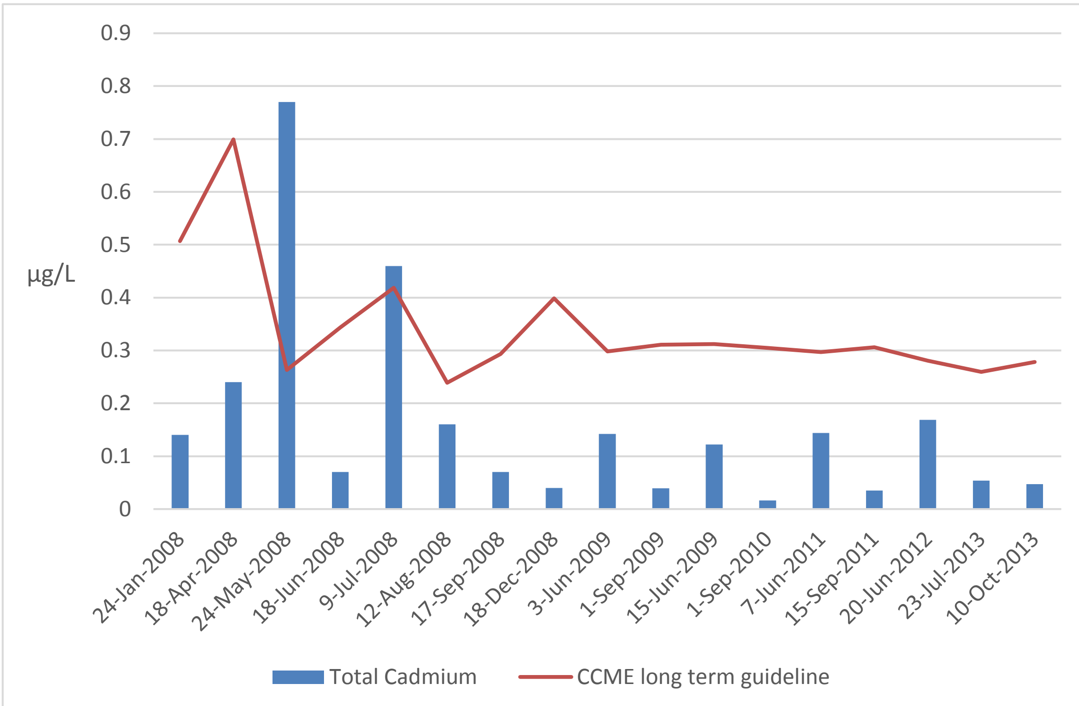


Figure 4-6 BC-53 Total Cadmium, 2008-2013

All cadmium results at BC-39 are well below both the new short term and long term exposure guidelines, as shown on Figure 4-7 below. For comparison, the interim guideline would have been exceeded once over the 2008-2013 period. The average cadmium concentration at BC-39 is 0.042 µg/L, which is well below the range of the new long term guideline presented in Table 4-7.

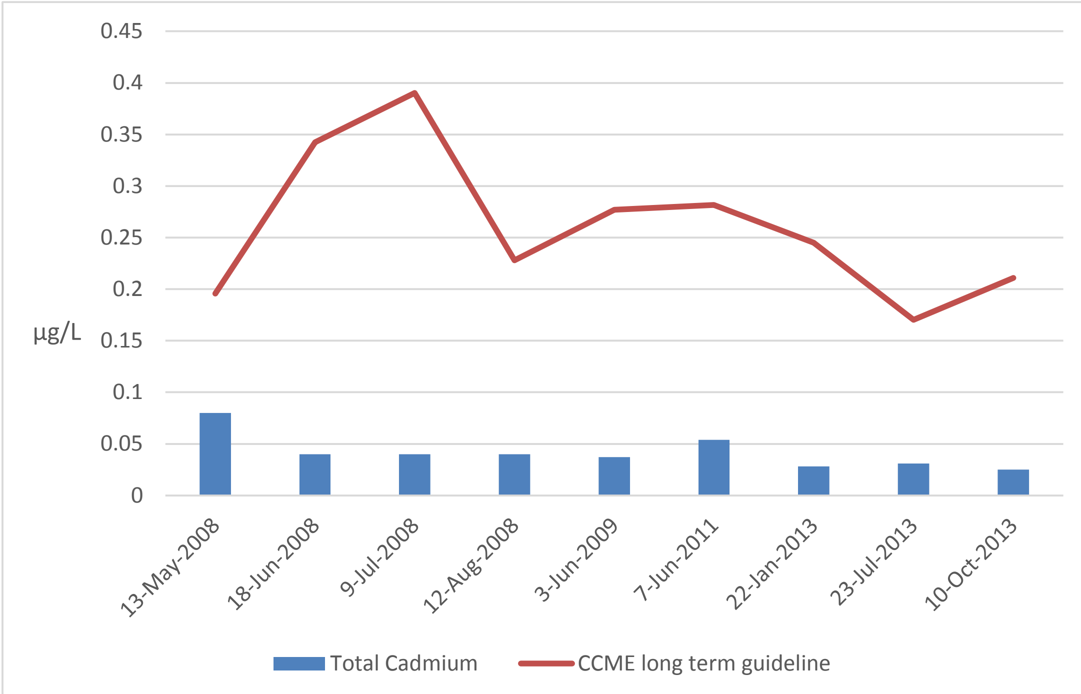


Figure 4-7 BC-39 Total Cadmium, 2008-2013

Total cadmium levels exceeded calculated long term guideline at sample stations BC-1 on two occasions (~6% of samples), in April and May 2012. No exceedances were observed at station BC-37. On the South Klondike River, one exceedence was observed upstream of the Brewery Creek property (4% of samples) and three downstream (~8% of samples).

Chromium

Total chromium exceeded the CCME guideline of 0.001 mg/L on nine of seventeen sampling events at BC-53 (~53% of samples), with a maximum concentration of 0.0222 mg/L in May 2008 (Figure 4-8).

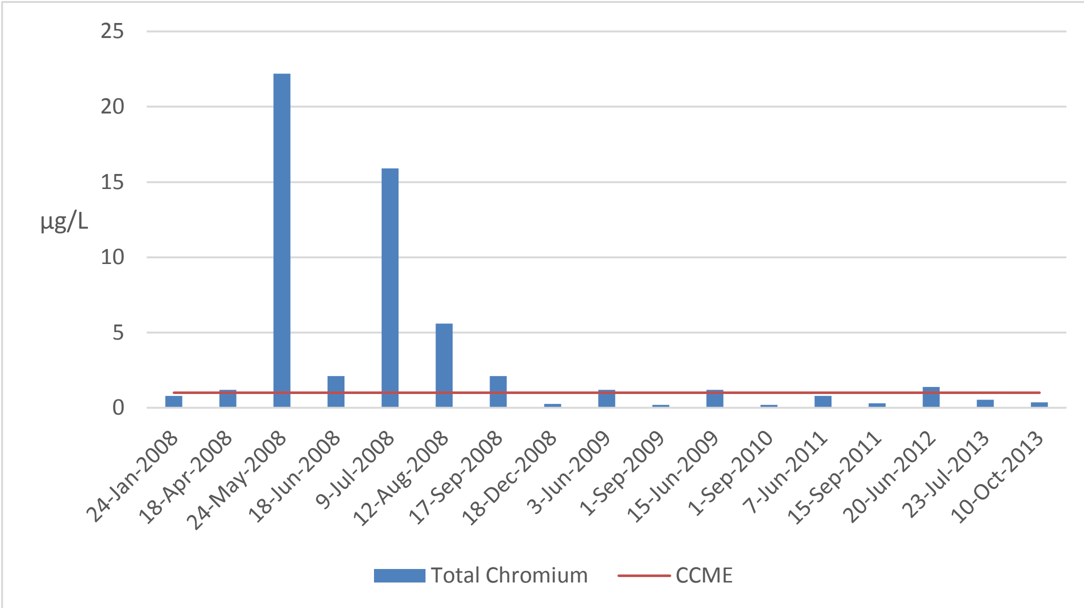


Figure 4-8 BC-53 Total Chromium, 2008-2013

Total chromium exceeded the CCME guideline on three of nine sampling events at BC-39 (~33% of samples), with a maximum concentration of 0.002 mg/L observed in July 2008 (Figure 4-9).

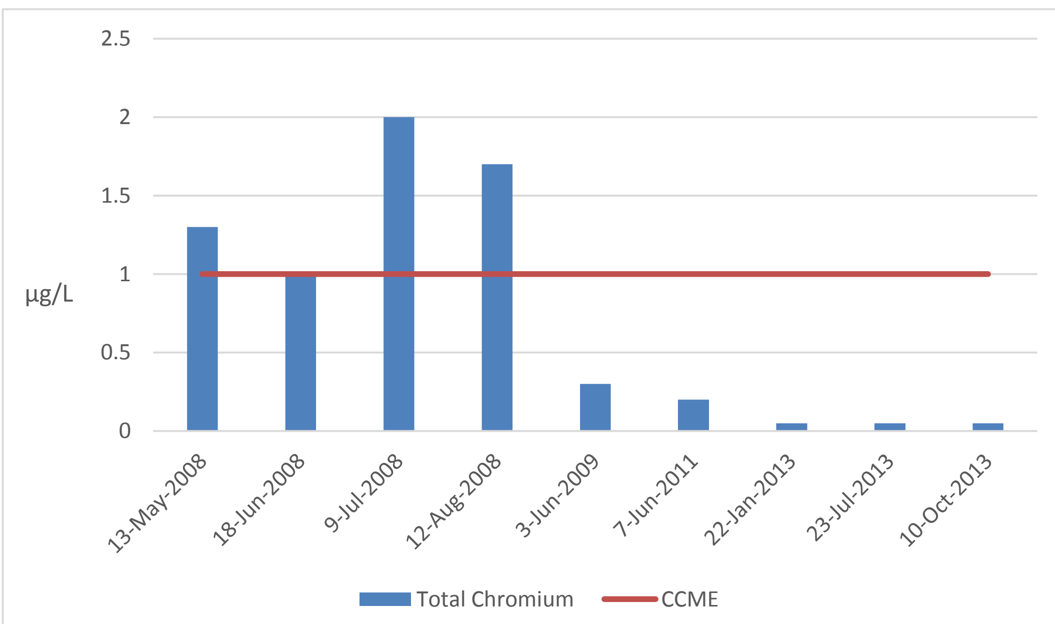


Figure 4-9 BC-39 Total Chromium, 2008-2013

At BC-1 total chromium exceeded the CCME guideline in six of the nineteen samples collected between January 2008 and December 2013 (~32% of samples). Total chromium concentrations at BC-1 during this period range from 0.0001 to 0.0075 mg/L and average 0.0013 mg/L. Samples collected at BC-37 exceeded the CCME on five of fifteen occasions (~33% of samples), range from 0.0001 to 0.0070 mg/L and average 0.0016 mg/L. The South Klondike River samples were all below the CCME guideline for total chromium, except for the March 2008 sample from BC-6.

Copper

The CCME guideline for total copper varies slightly between sites as the guideline is dependent on hardness according to the equation $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$. The range of values calculated for BC-39 and BC-53 are presented in Table 4-7.

Total copper exceeded the CCME guideline five of seventeen times at BC-53 (~29% of samples), and once out of nine sampling events at BC-39 (~11% of samples). Figures 4-10 and 4-11 present the results.

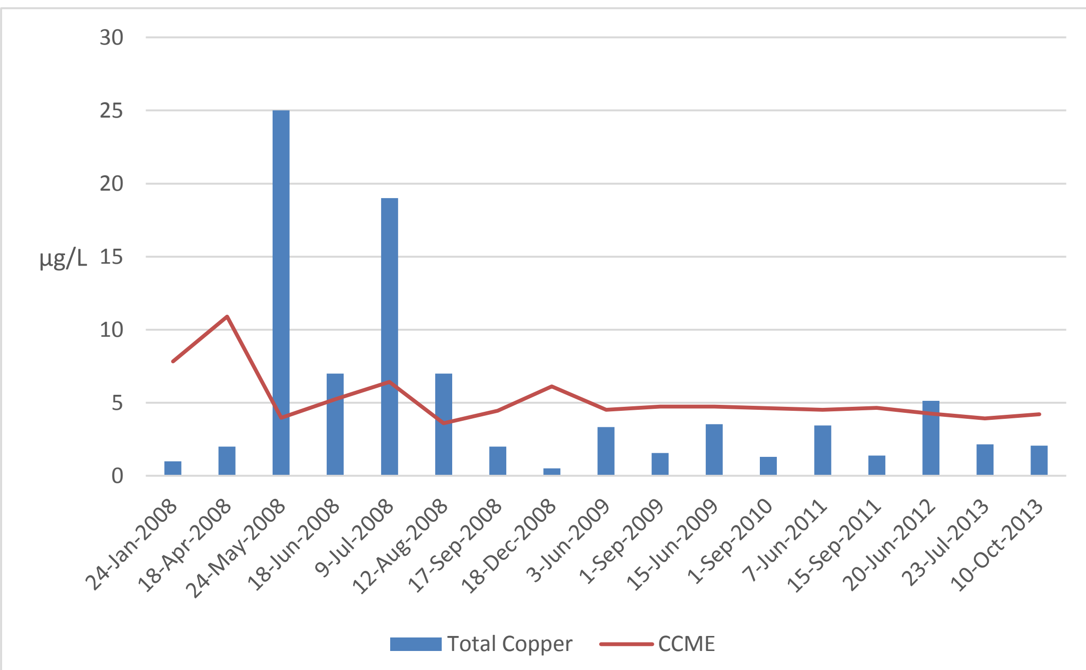


Figure 4-10 BC-53 Total Copper, 2008-2013

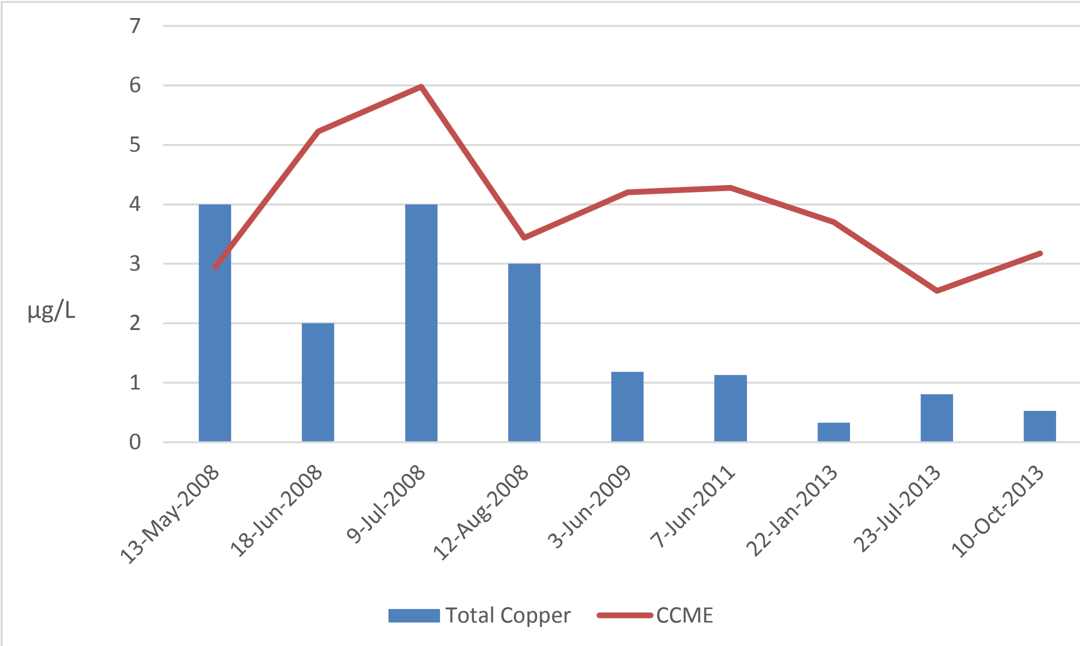


Figure 4-11 BC-39 Total Copper, 2008-2013

The CCME guideline for total copper was exceeded seven times out of 32 at BC-1 (~22% of samples) and three times out of 15 at BC-37 (20% of samples). On the South Klondike River, the CCME guideline was exceeded twice upstream (8% of samples) and twice downstream (~6% of samples) of the Brewery Creek property. The exceedences occurred in May 2012 and May 2013 at both sites and are likely caused by natural sediment loading associated with spring freshet. Note that aluminum was also found to be elevated during the same sampling events.

<u>Iron</u>

Total iron exceeded the CCME guideline of 0.3 mg/L on ten of the seventeen sampling events at BC-53 (~59% of samples). The average concentration of total iron over this period was approximately 2.72 mg/L. Results are shown on Figure 4-12. Total iron at BC-53 was higher overall (both in the number of times the concentration exceeded the CCME guideline, and in the magnitude of those events) than it had been in 2007 during the previous Lower Laura Creek assessment.

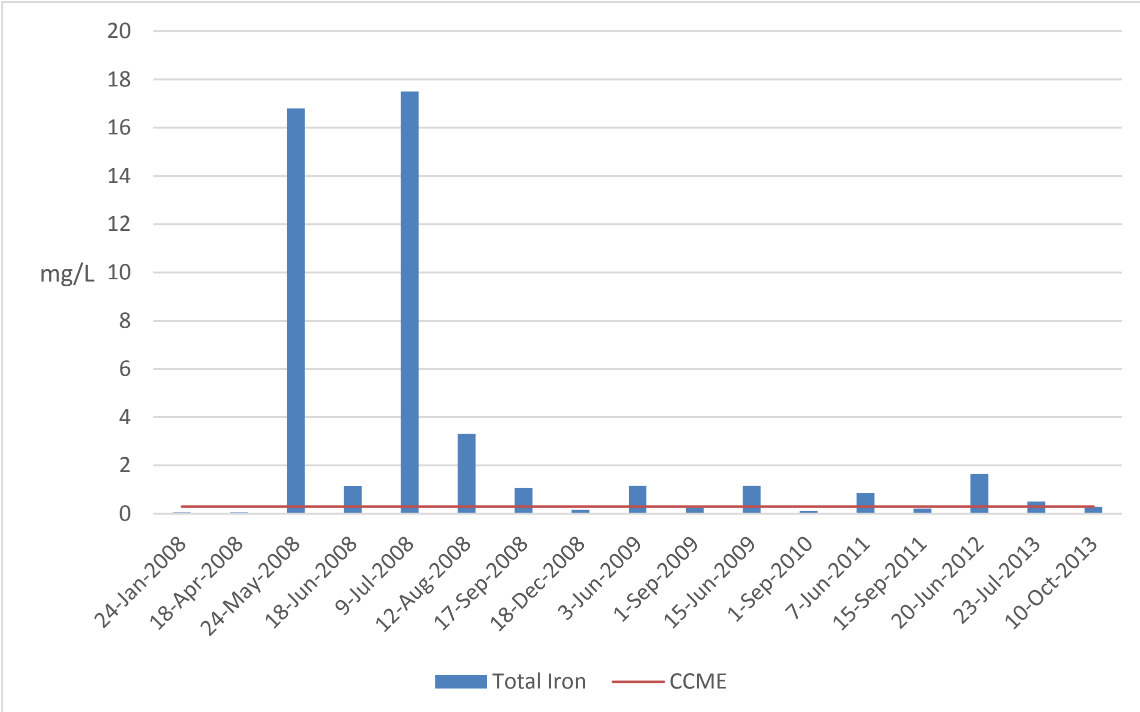


Figure 4-12 BC-53 Total Iron, 2008-2013

Total iron exceeded the CCME guideline during three of the nine sampling events at BC-39 (~33% of samples). The average concentration of total iron during this time is approximately 0.41 mg/L. A maximum concentration of 2.01 mg/L was observed in July 2008 (see Figure 4-13). Similarly to the trend in data at BC-53 between the 2007 and 2011 assessments, the concentration of iron at BC-39 was higher overall during the period 2008 – 2013 than during the 2007 assessment.

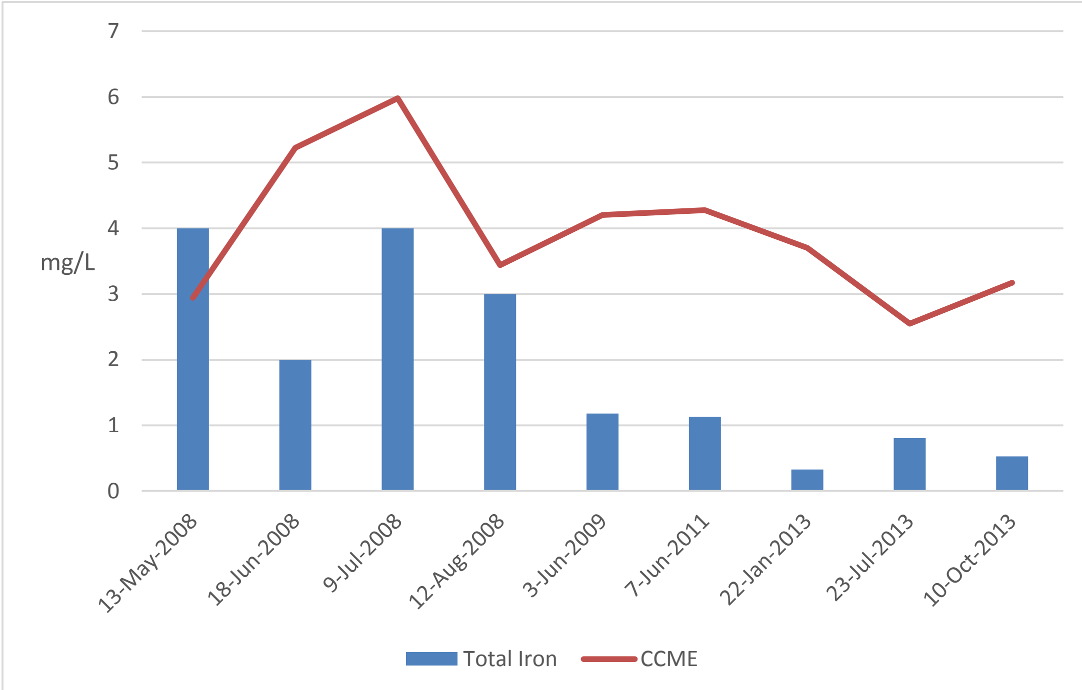


Figure 4-13 BC-39 Total Iron, 2008-2013

The CCME guideline for total iron was exceeded 20 times out of 32 at BC-1 (~63% of samples) and 9 times out of 15 at BC-37 (60% of samples).

The CCME guideline for total iron was exceeded twice in the South Klondike River upstream of the Brewery Creek property (8% of samples) and twice downstream (~6% of samples).

4.2.3 Hydrology

Laura Creek hydrology exhibits a typical seasonal pattern that has remained mostly unchanged over the years. During the winter months (October to April) no flow measurements are generally taken as the flow is minimal or zero. It has been documented over the years that Laura Creek typically goes to ground between the Klondike Ditch Road and the South Klondike River at various times of the year. Table 4-8 presents stream discharge results taken in Laura Creek since 2006.

Table 4-8 Stream Discharge Measurements (m^3/s) in Laura Creek, 2006-2013

Date	BC-1	BC-37	BC-39	BC-53
29-Aug-06	0.181			
1-May-07			1.176	0.121
1-Jun-07	0.164		0.072	
1-Aug-07	0.111		0.032	0.044
1-Sep-07	0.998	0.052	0.037	0.158
18-Jun-08	0.066		0.002	
9-Jul-08	0.124			
12-Aug-08	0.184		0.079	
18-Sep-08		0.073		
3-Jun-09	0.095	0.107	0.007	
1-Sep-09	0.086			0.101
1-Sep-10		0.100		
7-Jun-11		0.074		
1-May-12	0.251			
1-Jul-12	0.175			
1-Aug-12	0.152			
1-Sep-12	0.088			
23-Jul-13	0.102			
13-Aug-13	0.075			
10-Oct-13	0.193			

4.2.4 Sediment and Benthic Analysis

The benthic invertebrate community, water quality and stream sediments were monitored between 1991 and 2009, as part of baseline studies and under Water Use License (WUL) QZ96-007 and its amendments. The 2009 event marked the end of the post-closure monitoring programs for both benthics (bi-annually) and sediment (annually) at Brewery Creek. Additionally, information pertaining to stream sediments and benthic invertebrate communities of Laura Creek was collected for the Lower Laura Creek Impact Study in 2005 (Access Consulting Group 2007). A similar monitoring program was re-launched in 2012, in order to establish current conditions.

4.2.4.1 Stream Sediments

The most recent stream sediment and benthic invertebrate baseline information was described by Laberge Environmental in 2012 (Appendix C). The results of their analyses indicate that little change has been noted in the concentrations of metals in stream sediments from assessments carried out in previous years. Seven metals were examined in detail as they may be present in the ore bodies and/or have the potential to be toxic to aquatic organisms. The concentrations of these metals were compared to the CCME (1999) interim freshwater sediment quality guidelines (ISQG) and to the probably effects levels (PEL). Generally, concentrations greater than the PEL have a 50% incidence of creating adverse biological effects. Results from stations located on Laura Creek (BC-1, BC-37, BC-39, BC-53) and on the South Klondike River (BC-6 and BC-38) are discussed below.

<u>Arsenic</u>

The ISQG (5.9 ppm) was exceeded at all stations of interest and at every sampling event, including during baseline. The PEL (17 ppm) was also regularly exceeded in Laura Creek, with the highest concentration recorded at BC-1 in 2000, at 121.6 ppm. Arsenic levels in the South Klondike River also exceeded the PEL on several occasions, but only marginally. Figure 4-14 shows historic yearly sediment quality results available for arsenic on Laura Creek and the South Klondike River. As Figure 4-14 shows, arsenic levels at BC-1, BC-37 have decreased from what they were in the late 1990's and early 2000. Arsenic levels at BC-53 is also showing a decreasing trend although the record is shorter. Levels at BC-39 were still high in 2007, but the station has not been sampled for stream sediments since. Overall recent arsenic levels in Laura Creek sediments are comparable to pre-mine levels the early 1990's. Arsenic is a naturally occurring element in the study area, however disturbance near Laura Creek may have created an increase in concentrations. Arsenic levels in the South Klondike River remained relatively constant over the period 1991-2012.

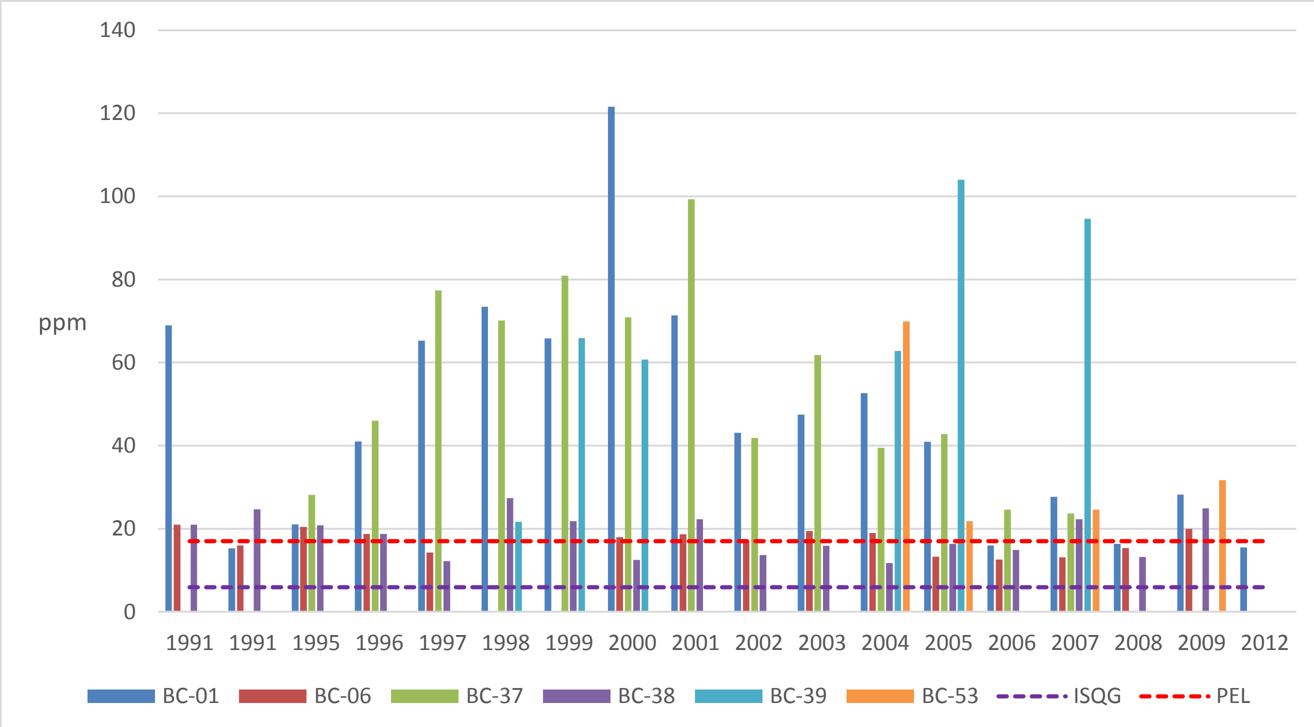


Figure 4-14 Arsenic Concentrations in Stream Sediments

Cadmium

The concentration of cadmium exceeded the ISQG of 0.6 ppm in several of the streams sediments but all were below the PEL of 3.5 ppm, except for one sample collected on the South Klondike River in 1991 that reached 13 ppm. Such high cadmium values were never observed again, and it is unknown if this result is anomalous. Data are presented in Figure 4-15. Note that results that are below the lab detection limit are not shown on this graph. In one of the 1991 studies as well as in 1995, the detection limit was higher than the ISQG so it is not known if there were exceedances. Also note that the y-axis scale was truncated at 4.0 ppm, even though one result was higher as mentioned above. There are no clear trends in cadmium values over time, although recent results generally appear to be in the lower range of values encountered since 1991.

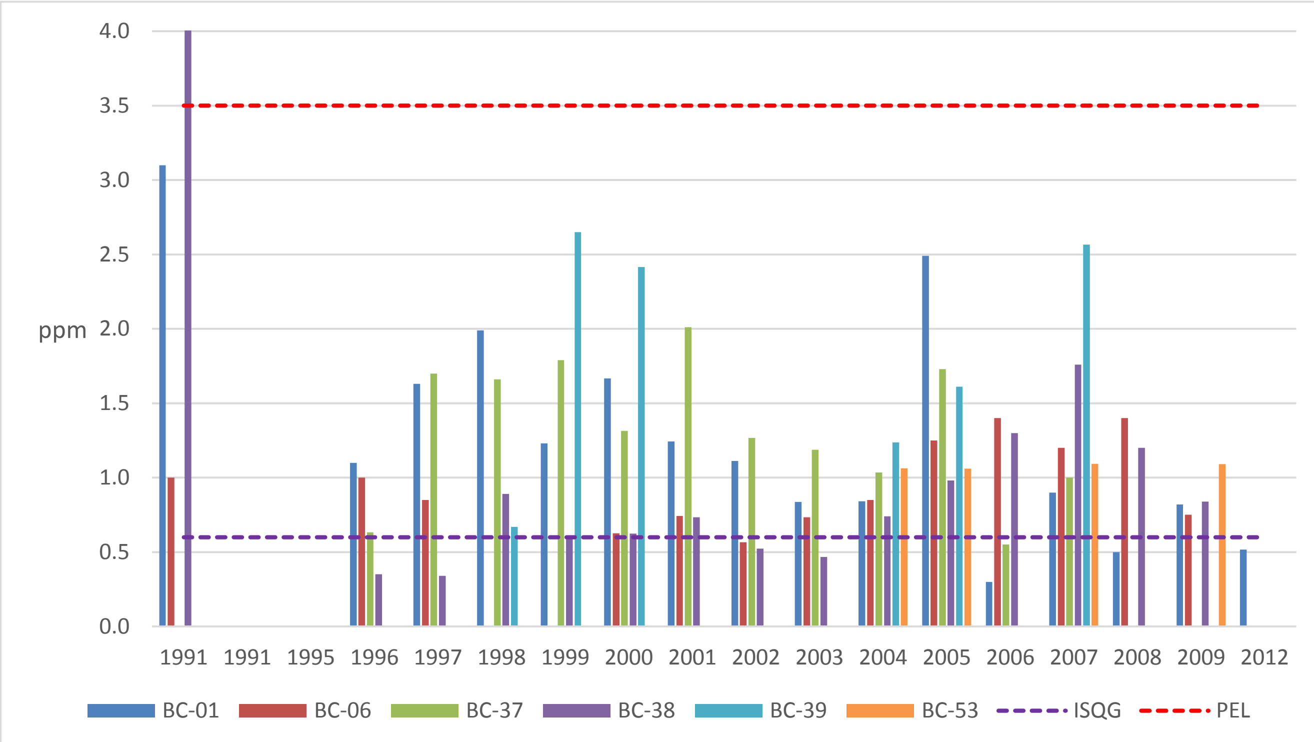


Figure 4-15 Cadmium Concentrations in Stream Sediments

<u>Copper</u>

Copper results are generally below the ISQG of 35.7 ppm, although exceedences were observed at all stations sampled in 1999 (reaching a maximum of 115.1 ppm at station BC-38), and occasional exceedences occurred at other stations, the most important ones being at BC-6. All results are well below the PEL of 197 ppm. Little change was observed in the copper levels over the period 1991-2012, and most of the elevated concentrations were found in the South Klondike River. Results are shown in Figure 4-16.

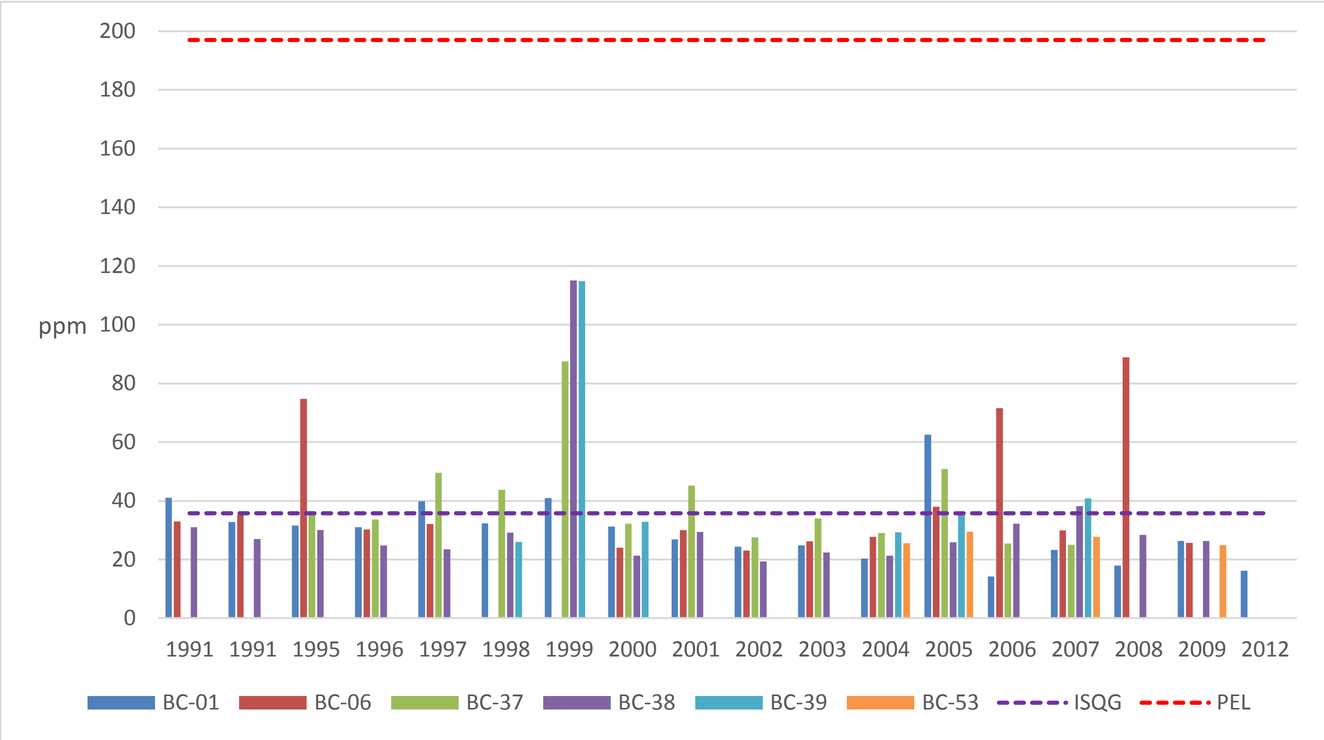


Figure 4-16 Copper Concentrations in Stream Sediments

Mercury

The ISQG of 170 ppb for mercury was exceeded on numerous occasions in Laura Creek and marginally on two occasions in the South Klondike River over the period 1991-2012. The PEL of 486 ppb was exceeded twice, once at BC-1 in 2000 (507.6 ppb) and once at BC-37 in 2001 (499.3 ppb). Mercury levels in the South Klondike River remained relatively constant over the period 1991-2012, while levels in Laura Creek generally increased in the late 1990's and early 2000, and decreased subsequently. Recent mercury levels observed in Laura creek are comparable to pre-mining levels (see Figure 4-17). Note that results that are below the lab detection limit are not shown on Figure 4-17. This was the case at all stations sampled in 1996, but given that the detection limit was 100 ppb, it can be concluded that results were below the ISQG.

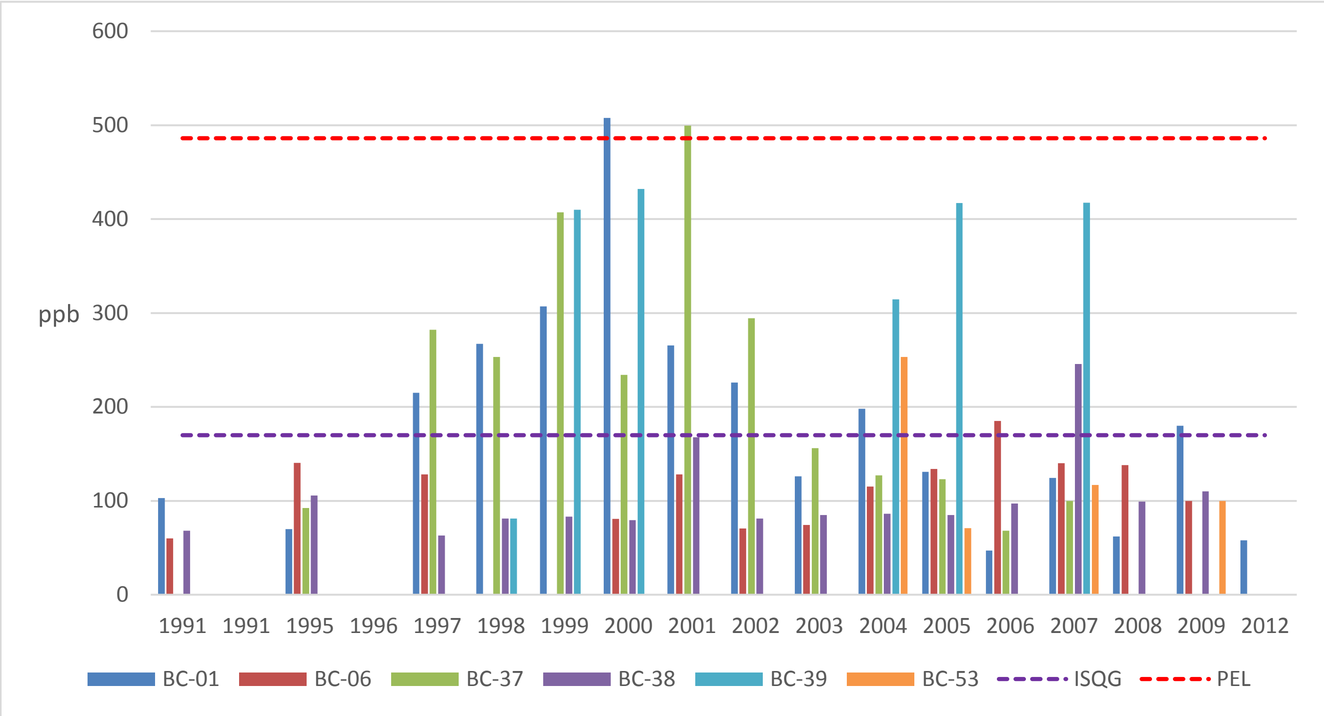


Figure 4-17 Mercury Concentrations in Stream Sediments

Lead

Concentrations of lead were very low throughout the study area and were all below the ISQG of 35 ppm at all of the sites, and well below the PEL of 91.3 ppm. Lead levels have remained relatively constant over the period 1991-2012, although slightly higher levels were observed in Laura Creek between 1997 and 2000, and again in 2005. Figure 4-18 present the results. Note that results that are below the lab detection limit are not shown in Figure 4-18. This was the case at station BC-38 in 1991 and at BC-1 and BC-38 in 1995, but given that the detection limit was below the ISQG, results are known not to exceed the guideline.

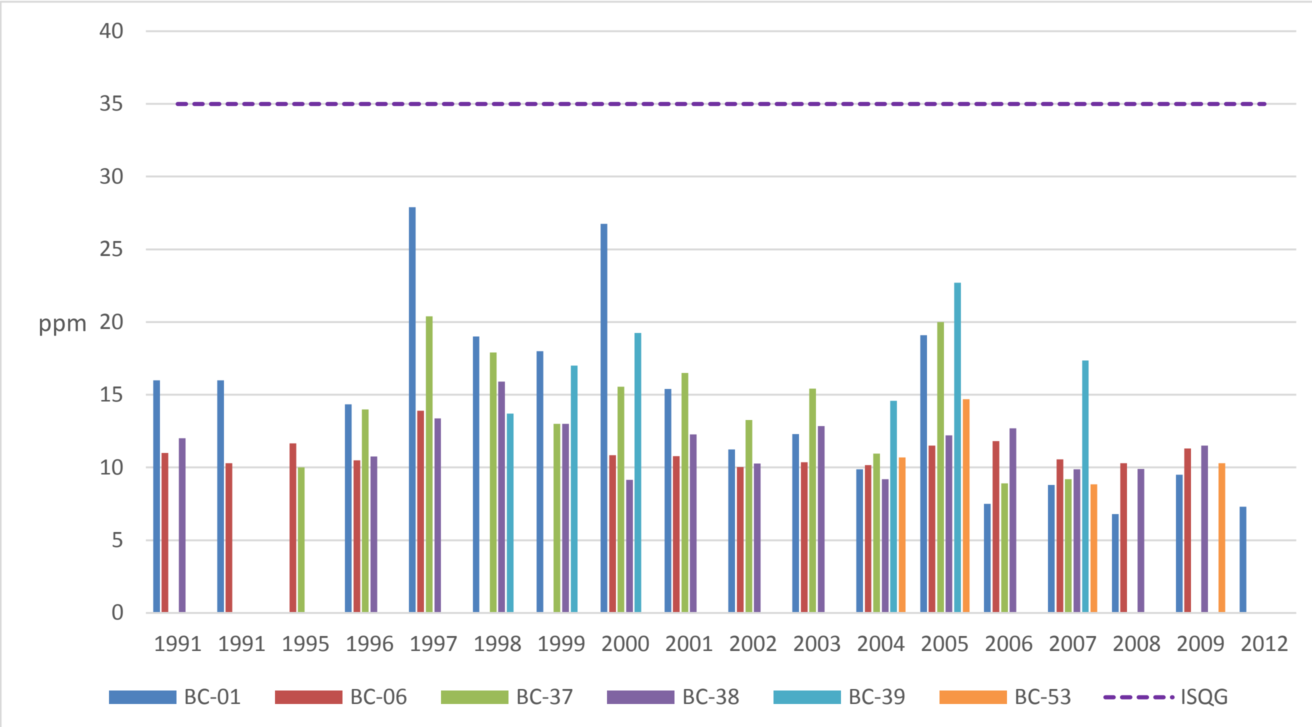


Figure 4-18 Lead Concentrations in Stream Sediments

Selenium

Selenium has been identified as an element of concern at the Brewery Creek mine site but currently there are no sediment quality guidelines for selenium. In Laura Creek, selenium values ranged between below the lab detection limit of 0.3 ppm (BC-1 in 2006) to 4.2 ppm (BC-37 in 1997), and show a decreasing trend over the 1997-2012 period (no selenium data is available prior to 1997). Selenium values in the South Klondike River are more or less constant over the same period, ranging between below the detection limit of 0.3 ppm (BC-38 in 2006) to 1.7 ppm (BC-06 in 2008). Results are shown in Figure 4-19.

Environment Canada (EC) maintains a database on metals in stream sediments from sites around the Yukon. As reported by Laberge Environmental Services (Appendix C), of 1,011 sediment samples where selenium was detected in the EC database, concentrations ranged from 0.1 ppm to 38.8 ppm with a median of 1.1 ppm. Selenium results in Laura Creek and the South Klondike River generally lay within close range to the median.

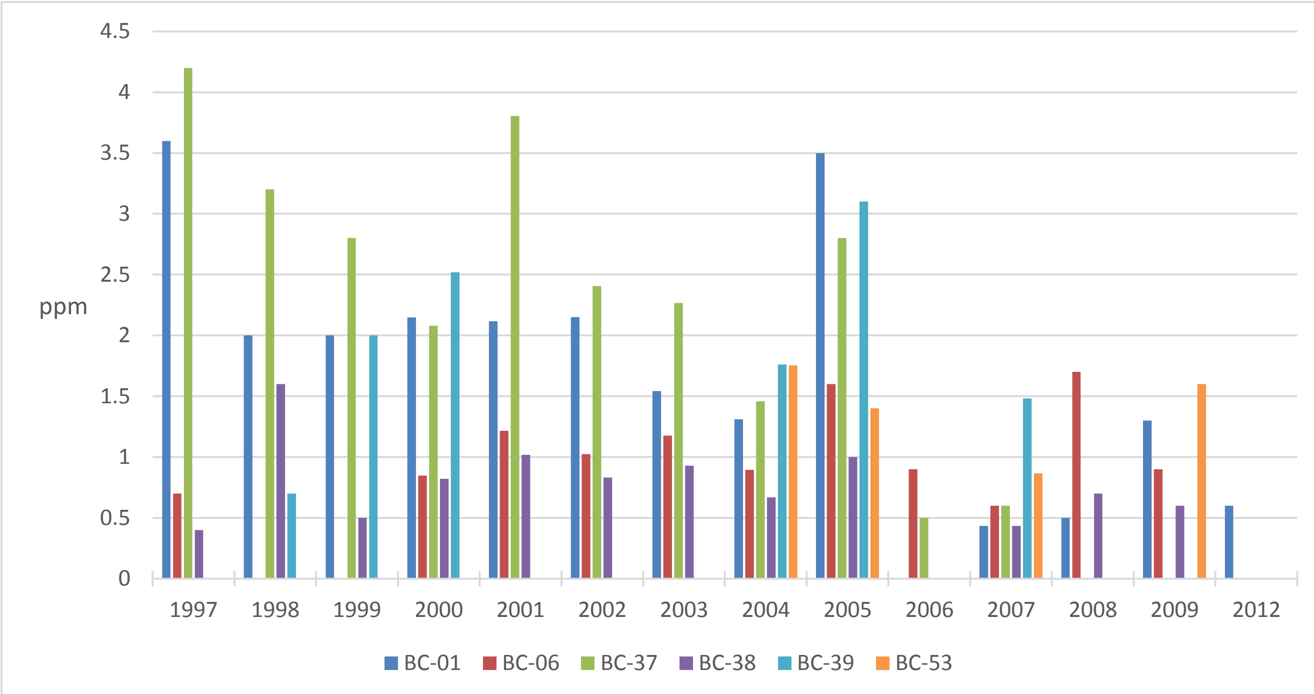


Figure 4-19 Selenium Concentrations in Stream Sediments

<u>Zinc</u>

Zinc concentrations exceeded the ISQG of 123 ppm for most samples, however levels in Laura Creek and in the South Klondike River are all well below the PEL (315 ppm). The highest value was observed at BC-39 in 1999 (233 ppm). No obvious trend in zinc levels can be detected over the record period, as can be seen in Figure 4-20.

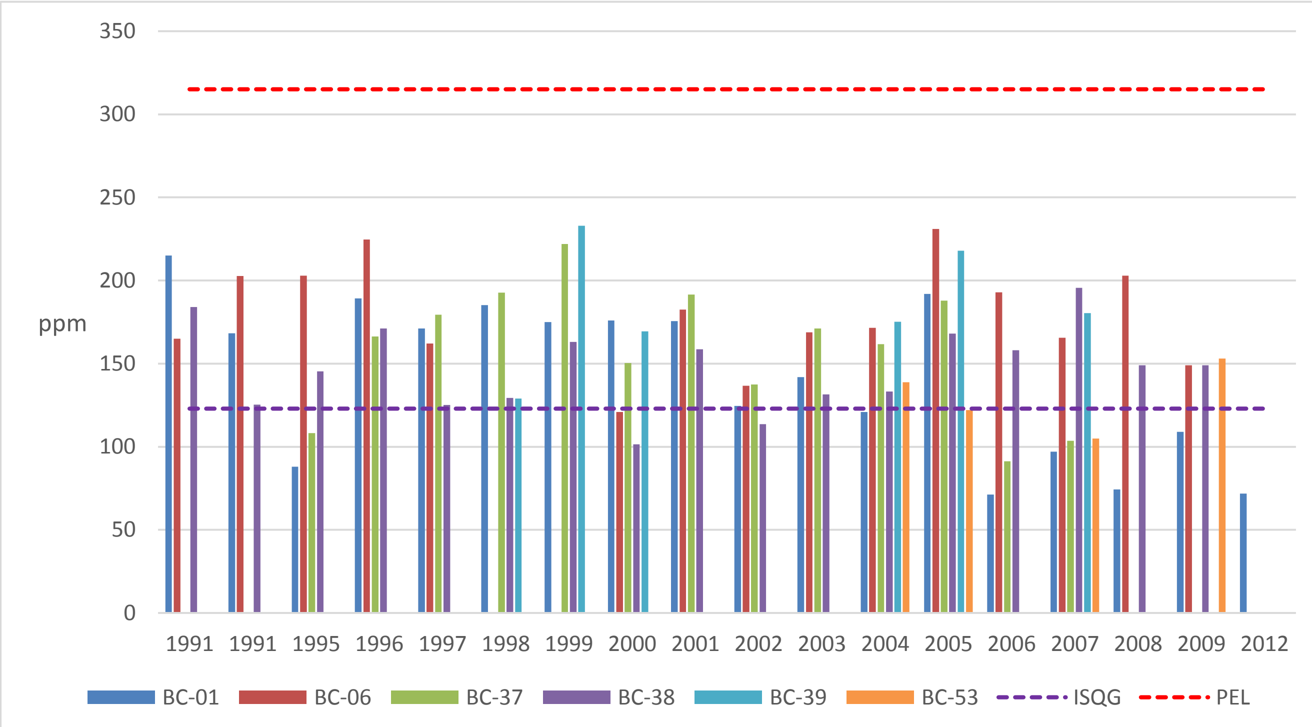


Figure 4-20 Zinc Concentrations in Stream Sediments

4.2.4.2 Benthic Invertebrates

Overall, good taxonomic abundance and diverse benthic communities with good representation of the major groups of organisms was noted in Laura Creek and in the South Klondike River. Laberge concluded that the benthic invertebrate community composition has been relatively similar throughout the years but relative abundance (organism density) has fluctuated. In Laura Creek, benthic densities were the highest in 1997, suggesting a potential enrichment in the water. The organism density, as well as diversity (number of taxa) at Laura Creek (BC-01) was the lowest in 2012. Tables 4-9 to 4-11 below present a few benthic indices and metrics over time for the monitoring stations relevant to Laura Creek Impact Study.

Table 4-9 Benthic organism diversity (number of taxa) on the Brewery creek mine site between 1991 and 2012

Monitoring Station	Watercourse	1991	1994	1995	1997	1999	2001	2003	2005	2007	2009	2012
BC-01	Laura creek (B3)	50	28	23	29	40	38	35	29	30	38	21
BC-38	S. Klondike river upstream (B4)	75	37	41	32	37	51	35	37	36	43	-
BC-06	S. Klondike river downstream (B5)	61	38	41	26	31	43	41	32	46	18	-
BC-53	Laura creek wetland (B8)	-	-	-	-	-	-	30	44	40	32	-
BC-39	Laura creek near mouth (B9)	-	-	-	-	-	-	-	31	23		-

Table 4-10 Summary of available taxonomic richness indexes

Monitoring Station	Watercourse	2005	2007	2009	2012
BC-01	Laura creek (B3)	4.4	4.9	5.6	4.2
BC-38	S. Klondike river upstream (B4)	5.7	5.4	6.6	-
BC-06	S. Klondike river downstream (B5)	3.6	5.8	3.7	-
BC-53	Laura creek wetland (B8)	6.6	4.7	4.8	-
BC-39	Laura creek near mouth (B9)	3.9	3.1	-	-

Table 4-11 Benthic organism densities (organism/m^2) on the Brewery creek mine site between 1991 and 2012

Monitoring Station	Watercourse	1991	1994	1995	1997	1999	2001	2003	2005	2007	2009	2012
BC-01	Laura creek (B3)	2 537	3 350	4 539	6 390	4 582	3 373	1 406	2 171	1 363	2 569	1 312
BC-38	S. Klondike river upstream (B4)	3 936	6 436	4 449	542	6 179	2 852	1 084	1 973	2 311	2 174	-
BC-06	S. Klondike river downstream (B5)	1 299	5 946	7 155	466	7 130	3 093	1 909	18 446	8 088	355	-
BC-53	Laura creek wetland (B8)	-	-	-	-	-	-	3 732	2 386	13 846	2 408	-
BC-39	Laura creek near mouth (B9)	-	-	-	-	-	-	-	7 521	4 453		-

4.3 Conclusion

Data from the study was assessed to determine if downstream receiving waters are being adversely affected relative to historic conditions. Results from the surface water quality program was reviewed and compared with the existing Water Use Licence parameters and CCME Guidelines to assess downstream receiving water effects. Based on the results of this study, the hydrology of lower Laura Creek is unchanged from historic conditions.

The Laura Creek AMP was not implemented; as such the site specific selenium criterion was not recalculated.

The site specific water quality standard for selenium was met at BC-39. The objective for BC-53 was exceeded on two occasions only very marginally. Water quality at BC-39 exceeded the CCME guidelines for freshwater aquatic life for total aluminum, arsenic, chromium, copper and iron. These results are similar to the observations made in the 2007 study.

Only water quality at BC-39 is elaborated on here as the water use license requires that the CCME guidelines at this station not be exceeded.

- Arsenic levels observed at BC-39 in 2005 and 2006 marginally exceed the CCME guideline. However, this was not the case from 2008 – 2013, and arsenic concentrations appear to have returned to historic concentrations. This may be related to the 2004 fire and subsequent natural reclamation near the mine site.
- Aluminum concentrations are similar to levels assessed in the 2007 study report, and lower than the historic average from 1997 to 2004.
- While total cadmium occasionally exceeded the interim CCME guideline at BC-39, all results are well below the new long term and short term exposure guidelines.
- Generally, total chromium concentrations only marginally exceed CCME guidelines; this is consistent with observations made in 2007.
- The calculated CCME guideline for total copper was slightly exceeded once over the period from 2008 – 2013. This is consistent with observations made in 2007.
- While total iron exceeded the CCME guideline at BC-39 on a few occasions, this was also the case during pre-mine conditions. The most recent samples (since June 2008) were all below the CCME guideline. The guidelines for Canadian Drinking Water Quality note that iron is an aesthetic parameter.
- Generally speaking, little change has been noted over time in the concentrations of metals in stream sediments in Laura Creek and in the South Klondike River, with the exception of arsenic mercury and

selenium that appeared to have been more elevated in Laura Creek towards the late 1990's and early 2000, after what their concentrations decreased again.

- In their 2007, 2009 and 2014 (Appendix C) reports, Laberge Environmental noted good taxonomic abundance, and diverse benthic communities with good representation of the major groups of organisms.

Results of this study provide valuable insight into downstream effects of the Brewery Creek mine site on lower Laura Creek. Hydrological conditions in lower Laura Creek have not changed appreciably since this area was investigated, as the creek still goes to ground during low flow or winter conditions. Water quality at BC-39 and BC-53 has met the Water Use License criterion for selenium, with the exception of two occasions at BC-53 during the spring of 2008, and the criterion was not recalculated. Other water quality parameters at BC-39 that did not meet CCME guidelines (aluminum, chromium, copper and iron) were elevated during pre-mine conditions and may also be elevated due to high flow freshet or fire run off influences. Most of these parameters show a decreasing trend with post closure.

5 REAGENT AND WASTE MANAGEMENT

5.1 Spill Occurrence and Response

No reportable spills occurred in 2013.

5.2 Reagent Storage and Handling

Other than some miscellaneous laboratory chemicals, there are no reagents or chemicals in storage at the Brewery Creek Mine. During the removal of the liner in the pregnant pond, approximately 70 bags of sludge/carbon were removed. This material was rebagged and shipped offsite in October 2009 for recovery of metals and final disposal.

6 WATER MANAGEMENT

6.1 Direct Release

There was no direct release of solution in 2013. Heap drainage is diverted into the barren pond (biological treatment cell) and overflows into the overflow pond where it infiltrates into the ground. The infiltrating water meets water license discharge criteria. Heap surface water is directed to the pregnant pond (now sediment settling pond) where it likewise infiltrates into the ground. All samples from BC-28a (heap effluent) were below 2.0 ppm total cyanide in 2013. The first sample from the heap below 2.0 ppm total cyanide was in February 2002. All samples subsequently taken have returned a total cyanide value below 2.0 ppm.

7 GEOTECHNICAL INVESTIGATION

Alexco Resource Corp. issued a report titled Blue Zone Monitoring and Assessment Program (August 2005), as required by QML section 17.5.2. Section 3.1 of this report requires that an annual geotechnical inspection is conducted of the Blue WRSA and Pit for years 1-5 during mine reclamation. As a condition of the report, the next geotechnical investigation is scheduled to occur in 2014.

The last geotechnical investigation was conducted by Vista Tek Ltd. on September 19th and 20th, 2012. Results of this inspection were presented as part of the 2012 Annual Water License Report.

8 CLOSING STATEMENT

Access Consulting Group (ACG) of Whitehorse, Yukon, has prepared this Annual Water Licence Report for Water Licence QZ96-007. If you have any questions or require further details, please contact the undersigned.

Prepared By:	Reviewed By:
Catherine Henry, M.Sc.	David Petkovich, B. Sc. P. Biol.
Environmental Scientist	Senior Environmental Manager

9 REFERENCES

Canadian Council of the Ministers of the Environment, 2014. Canadian Water Quality Guidelines for the Protection of Aquatic Life.

Ontario Ministry of Environment and Energy, 1994. Policies, Guidelines Provincial Water Quality Objective of the Ministry of Environment and Energy (Ontario).

SRK Consulting, 2003. Geochemical Assessment, Blue Waste Rock Storage Area, Brewery Creek Mine.

APPENDIX A

CLIMATE DATA SUMMARY MEMO 2013

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Whitehorse, Yukon Y1A 2V3
Phone (867) 668-6463 Fax (867) 667-6680
www.accessconsulting.ca

Memorandum

To: Golden Predator Corp.

From: Catherine Henry, Access Consulting Group

CC: David Petkovich, Access Consulting Group

Date: February 13, 2014

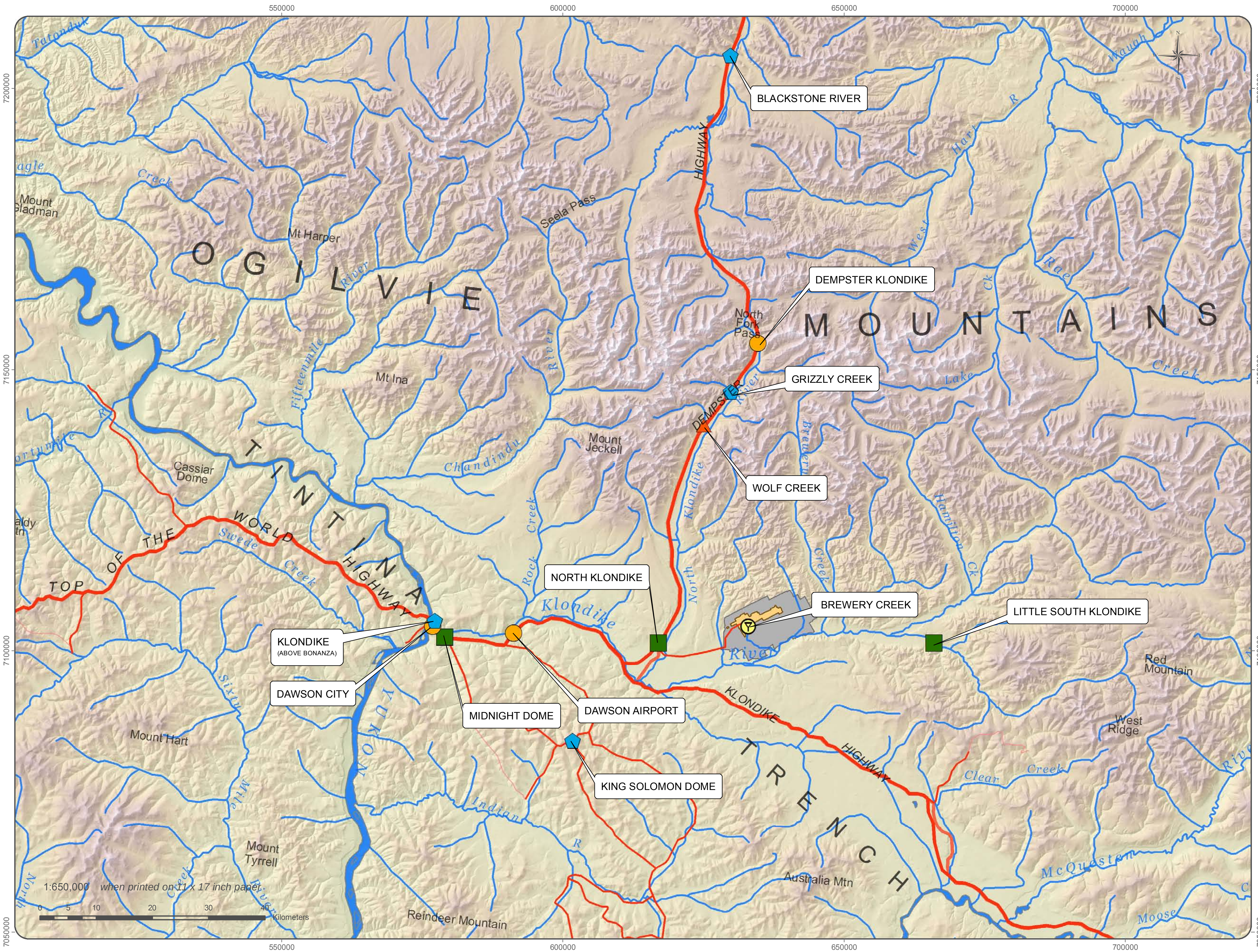
Re: Brewery Creek Mine Site Meteorological Data Summary

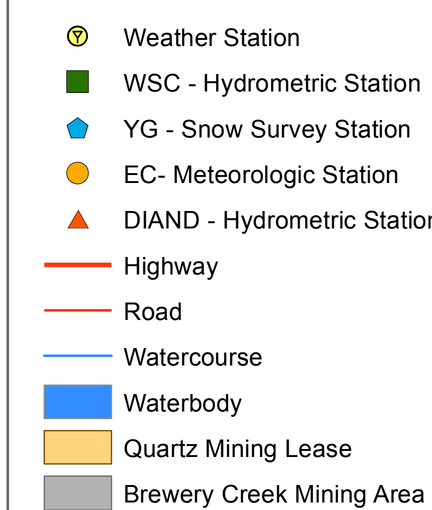
INTRODUCTION

This memo summarizes the data collected since November 2011 at the Brewery Creek Campbell Scientific meteorological station, and compares it to data collected at the site since 1991 and at Dawson Airport (Dawson A) by Meteorological Services Canada. Although more parameters are collected and available, the focus is on those affecting the water balance; temperature, precipitation and evaporation. The station was commissioned on November 9, 2011 and is located at the following coordinates: (64.040669; -138.27948) and at an elevation of 837 m above sea level. Figure 1 shows the relative location of the Brewery Creek meteorological station to Dawson A and the Midnight Dome snow course (Yukon Environment, Water Resources).

BREWERY CREEK

FIGURE 1:
LOCATION OF BREWERY CREEK METEOROLOGICAL STATION RELATIVE TO DAWSON A AND MIDNIGHT DOME





NAD 83 UTM Zone 7N

I:\BreweryCreek\Maps\1_Overview_Maps\Specific_Topics\WeatherStations\WeatherStations20121205.mxd (*Last edited by: jpan; 12/19/2012/16:05 PM*)

INSTRUMENTATION

The Brewery Creek Campbell Scientific station consists of a ten meter tower and of the following components:

Component	Model
Relative Humidity and Air Temperature Probe	HC2-S3-L
Pyranometer	SP-Lite2
Tipping Bucket	TE525WS
Snowfall Conversion Adaptor	CS705
Wind Speed and Direction Sensor	05103AP-10-L
Barometric Pressure Sensor	61302V
Solar Panel	MSX20R
Datalogger	CR800
Battery	BP12

RESULTS

The Campbell Scientific CR800 datalogger is set with a scanning interval of 10 seconds, and records hourly and daily data, which have been compiled into a monthly summary presented below. Note that results shown in grey italics were compiled based on incomplete hourly or daily data.

Table 1 Brewery Creek Monthly Meteorological Data Summary 2011-2013

Year	Month	Monthly Air Temperature (°C)					Monthly Average Solar Radiation (kW/m²)	Monthly Total Precipi-tation (mm)	Monthly Average Relative Humidity (%)	Monthly Average Pressure (hPa)	Monthly Average Wind Speed (m/s)	Monthly Maximum Wind Speed (m/s)	Monthly Total Evapo-transpirati on (mm)	Comments
		Extreme Minimum	Average Minimum	Mean	Average Maximum	Extreme Maximum								
2011	11	-33.29	-23.22	-21.46	-19.68	-10.54	0.005	20.58		994.67	0.46**	11.37**		Station commissioned on Nov. 9th - 15 complete days
2011	12													Data lost
2012	1													Station down
2012	2													Only 3 complete days - monthly not calculated
2012	3	-24.68	-14.72	-11.70	-7.88	5.23	0.090	6.10		995.39	2.37	16.74		RH sensor malfunctioning - needs replacement
2012	4	-12.60	-1.20	2.15	5.74	9.31	0.174	0	53.2	1005.67	3.15	12.13	5.10	5 complete days for RH and ET
2012	5	-5.37	3.27	6.68	10.07	18.02	0.196	5.34	51.5	1004.18	4.12	16.69	45.41	Precip: 23 complete days
2012	6	5.36	10.33	13.95	17.62	25.75	0.213	20.57	54.9	1005.19	2.50	19.59	37.59	Precip: 11 complete days
2012	7	5.40	10.21	13.96	17.81	25.13	0.212	62.49	60.7	1008.78	2.74	17.78	35.19	
2012	8	0.507	8.59	12.30	16.38	21.73	0.167	33.54	62.1	1008.70	2.31	12.95	28.20	
2012	9	-2.756	4.49	7.26	10.21	18.22	0.088	28.71*	57.8	1003.48	3.89	17.21	35.22	
2012	10	-19.22	-8.22	-6.21	-4.28	7.24	0.031	27.68*	73.2	1010.88	1.83	12.41	7.42	
2012	11	-34.45	-22.93	-21.03	-18.80	-10.44	0.01	13.72*	71.44	1007.23	0.50**	8.31**	0.65	
2012	12	-38.87	-25.69	-23.38	-21.15	-1.69	0.00	20.57	69.64	1000.67	1.05**	11.23**	1.06	
2013	1	-30.64	-17.26	-14.67	-11.96	-1.24	0.00	22.86	76.07	1005.41	1.72**	15.61**	2.02	Station down on Jan.22 - 21 complete days of data
2013	2	-25.90	-14.08	-11.90	-9.18	-0.06	0.02	4.67	74.36	996.92	2.34**	16.13**	3.27	Station back online on Feb.11 - 17 complete days of data
2013	3	-26.22	-14.34	-11.23	-7.63	3.68	0.10	0.00	54.80	1008.95	2.79	20.80	10.63	
2013	4	-18.34	-11.35	-7.21	-3.26	4.31	0.19	0.15	48.11	1008.60	3.31	18.92	17.20	

Year	Month	Monthly Air Temperature (°C)					Monthly Average Solar Radiation (kW/m²)	Monthly Total Precipi-tation (mm)	Monthly Average Relative Humidity (%)	Monthly Average Pressure (hPa)	Monthly Average Wind Speed (m/s)	Monthly Maximum Wind Speed (m/s)	Monthly Total Evapo-transpirati on (mm)	Comments
		Extreme Minimum	Average Minimum	Mean	Average Maximum	Extreme Maximum								
2013	5	-7.51	1.17	5.33	9.25	21.73	0.22	4.96	54.05	1007.81	3.33	17.11	34.58	
2013	6	3.65	11.36	15.70	20.11	29.30	0.26	0.00***	50.03	1010.55	2.91	16.26	49.90	
2013	7	6.81	11.43	15.40	19.39	25.13	0.23	3.07***	54.73	1011.57	2.69	13.67	45.48	
2013	8	2.09	10.64	14.40	18.41	28.02	0.17	15.32	56.73	1006.11	2.49	13.65	37.39	
2013	9	-5.24	3.25	5.99	9.30	17.62	0.08	32.98	71.34	999.49	3.50	21.17	20.48	
2013	10	-9.58	-1.08	0.63	2.56	6.79	0.03	16.64	74.27	1004.77	3.24	16.18	12.81	
2013	11	-36.56	-17.89	-15.23	-12.11	-0.34	0.01	9.63	73.70	1006.96	1.87	15.88	3.64	
2013	12	-33.98	-24.92	-22.54	-20.01	-0.59	0.00	9.77	66.97	1010.37	*1.27***	*17.81***	*1.76*	Wind: 24 complete days

**Precipitation may be underestimated (due to potential undercatch caused by snowfall cylinders inverted upon installation Sept.19). Situation rectified on November 20, 2012.*
***Wind speeds may be underestimated due to periodic icing of the wind sensor*
****Precipitation values suspiciously low. Snowfall adaptor still in place - antifreeze level may have dropped too lo*

NOTES AND DATA GAPS

- Three months of data from December 2011 to February 2012 were lost due to power failure.
- In April 2012, the relative humidity sensor was found to be malfunctioning and was sent back to Campbell Scientific for repair. A replacement sensor was installed at the same time to avoid data loss.
- Evapotranspiration is calculated based on several parameters, including relative humidity (RH), and is therefore invalid for the period where RH is invalid.
- Precipitation is collected using a tipping bucket rain gauge with a snowfall conversion adapter mounted in the winter months.
- The snowfall conversion adaptor was incorrectly removed on May 24, 2012, causing precipitation data to be invalid between then and June 19, 2012, when the problem was corrected.
- The cylinders of the snowfall conversion adaptor were inverted upon installation on September 19, 2012, potentially causing undercatch and underestimation of snowfall. The situation was rectified on November 20, 2012.
- The station was down from January 22, 2013 to February 11, 2013 due to low battery voltage.
- The snowfall conversion adaptor was removed on July 24 and reinstalled on October 7, 2013.
- Precipitation values for June and July 2013 are very low. Because the snowfall conversion adaptor was still in place until late July, it is suspected that evaporation lowered the antifreeze level enough to prevent most of the new precipitation to reach the overflow and tube and to flow into the tipping bucket.

1991-2010 DATA REVIEW

Meteorological data has been collected at Brewery creek intermittently since 1991:

- Manual temperature and precipitation measurements were collected intermittently from 1991 to August 1995;
- An automated station was installed on the knoll above the leach pad in August 1995. It collected hourly temperature, relative humidity, precipitation, wind magnitude and direction and solar radiation;
- The automated station was relocated to the top of the administration building in April 1997;
- Due to concerns regarding the reliability of the automated weather station, a manual weather station was established at the mine camp in the spring of 1996. Weather observations, maximum, minimum

and current temperature measurements were recorded twice daily, and the precipitation gauge was measured and emptied weekly;

- The manual station was relocated to the top of the administration building at the same time as the automated one in April 1997;
- From May 1991 until the establishment of the manual station in April 1997, measurements from a precipitation gauge located near the automated stations were recorded;
- In 1997, an evaporation pan was established between the overflow and intermediate ponds;
- Climate monitoring was discontinued at the end of 2010 as updates to the Blue WRSA infiltration rate and the Heap water balance carried out in 2009 showed that detoxification of the heap had occurred and monitoring results at BC-28a had met the requirement laid out in Part E, Clause 8 of licence QZ96-007 Amendment #7.

Air Temperature

Table 2 and Figure 2 below present air temperature monthly extreme and average minima, means and extreme and average maxima for the period 1994-2010. Note that this summary is largely based on partial monthly data. Individual annual data traces are shown in Appendix A.

Table 2 Brewery Creek Air Temperature Monthly Summary 1994-2010

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Extreme Minimum	-43.5	-46.0	-39.9	-21.5	-13.7	-5.2	3.4	-2.5	-11.0	-28.0	-39.5	-37.9	-46.0
Average Minimum	-35.8	-30.7	-27.9	-15.6	-5.0	2.1	6.1	1.4	-5.6	-13.2	-24.3	-31.0	-14.9
Mean	-19.1	-15.7	-10.0	0.3	8.4	14.4	15.9	12.2	5.8	-1.9	-11.1	-14.2	-1.2
Average Maximum	0.0	0.9	5.1	12.9	22.2	26.9	26.8	25.2	16.9	9.0	1.7	1.4	12.4
Extreme Maximum	4.5	5.1	10.0	19.3	28.7	33.8	29.9	31.2	22.0	18.8	9.9	6.9	33.8

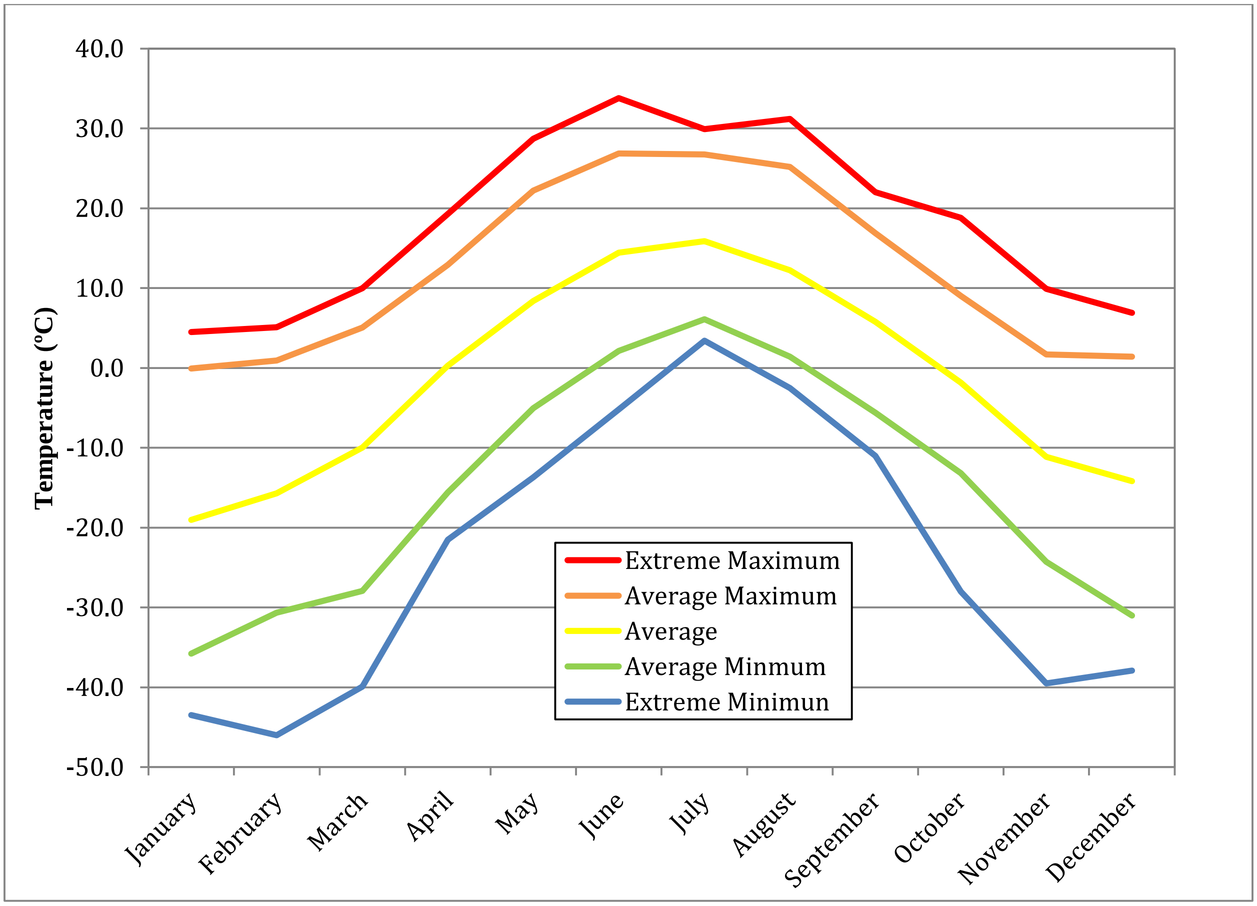


Figure 2 Brewery Creek Air Temperature, 1994-2010

Comparison between 2013 air temperature and historical averages and extremes indicates that 2013 average and extreme monthly maximum temperatures were all cooler than the 1994-2010 average, while the average and extreme monthly minima were much warmer, indicating a reduced annual range. The 2013 mean annual temperature was -2.1 °C while the mean annual temperature for the 1994-2010 period was -1.2 °C.

Figure 2 and Figure 3 show the 1991-2010 January and July temperature trends, respectively. The January minimum temperature has been increasing at the most rapid rate (0.47°C/year), while the January maximum temperature has been decreasing at a rate of 0.55°C/year. The July minimum, average and maximum temperature have all been increasing. Note that 20 years is a short period for evaluating temperature trends and that more confidence will be gained with a longer data record. For comparison, a longer temperature record is available at Dawson A and January mean, maximum and minimum temperatures show a very slightly decreasing trend over 32 years (1977-2008). July temperatures at Dawson A are available over an even longer period (1976-2012), and while extreme maxima show a slightly decreasing trend, mean monthly temperature and minimum monthly temperatures have been increasing slightly. Figure 4 and Figure 5 show the temperature trends at Dawson A for January and July, respectively.

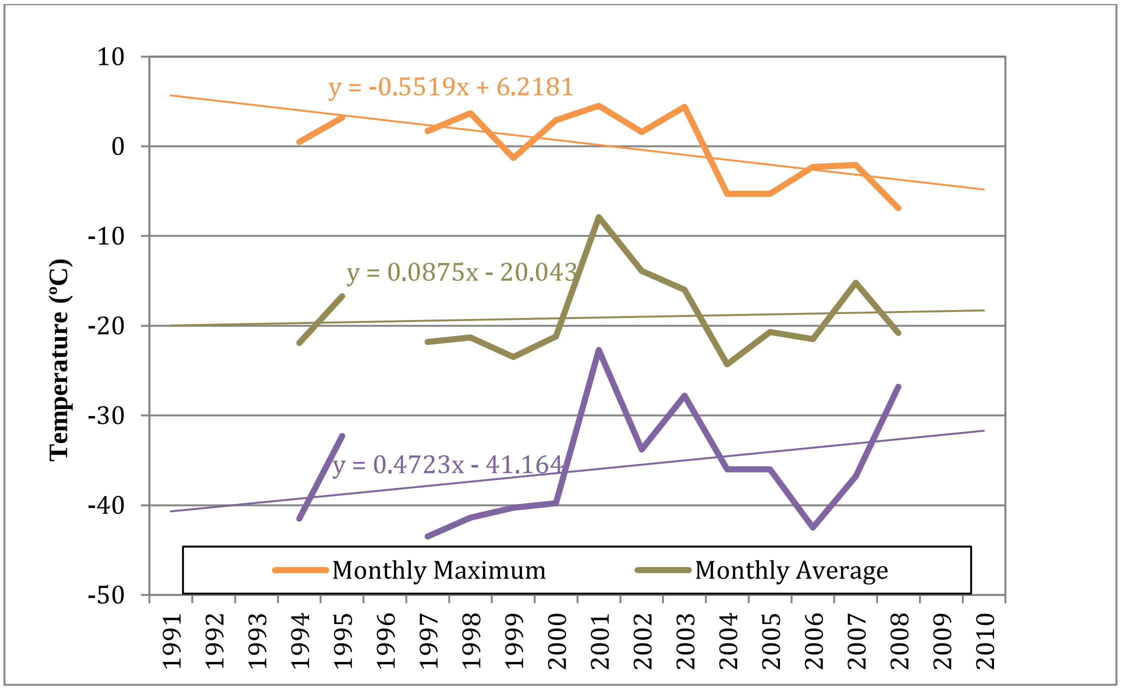


Figure 2: Brewery Creek Average January Temperature Trend

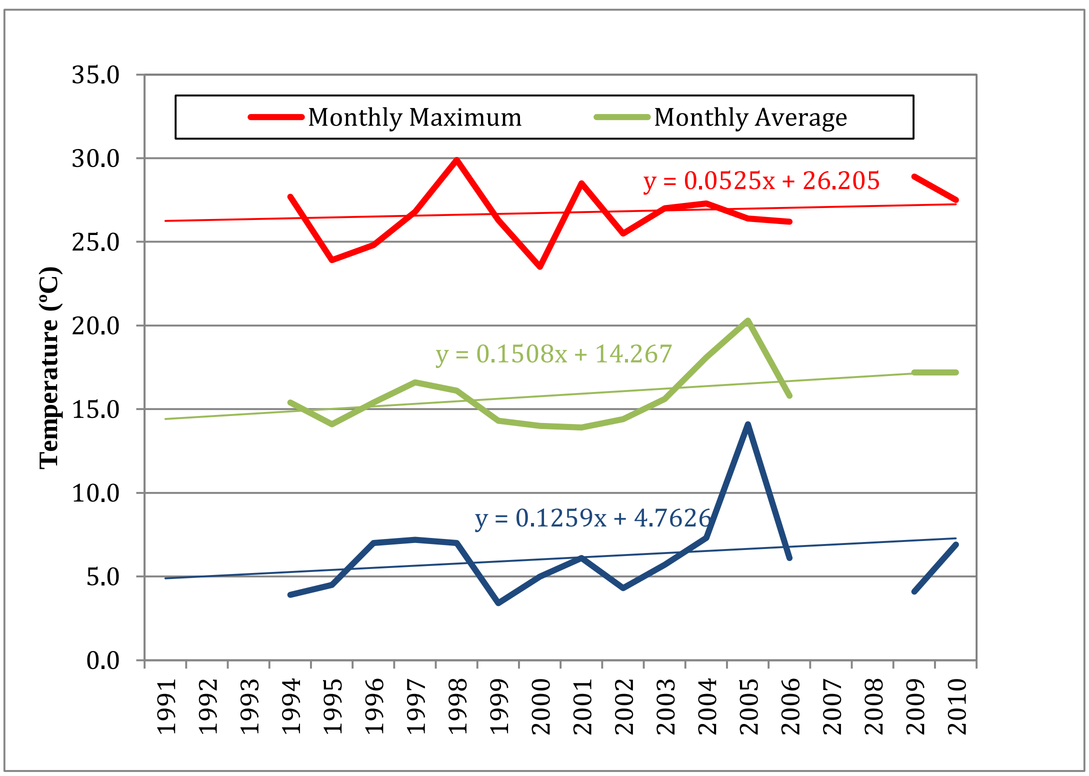


Figure 3: Brewery Creek July Temperature Trend

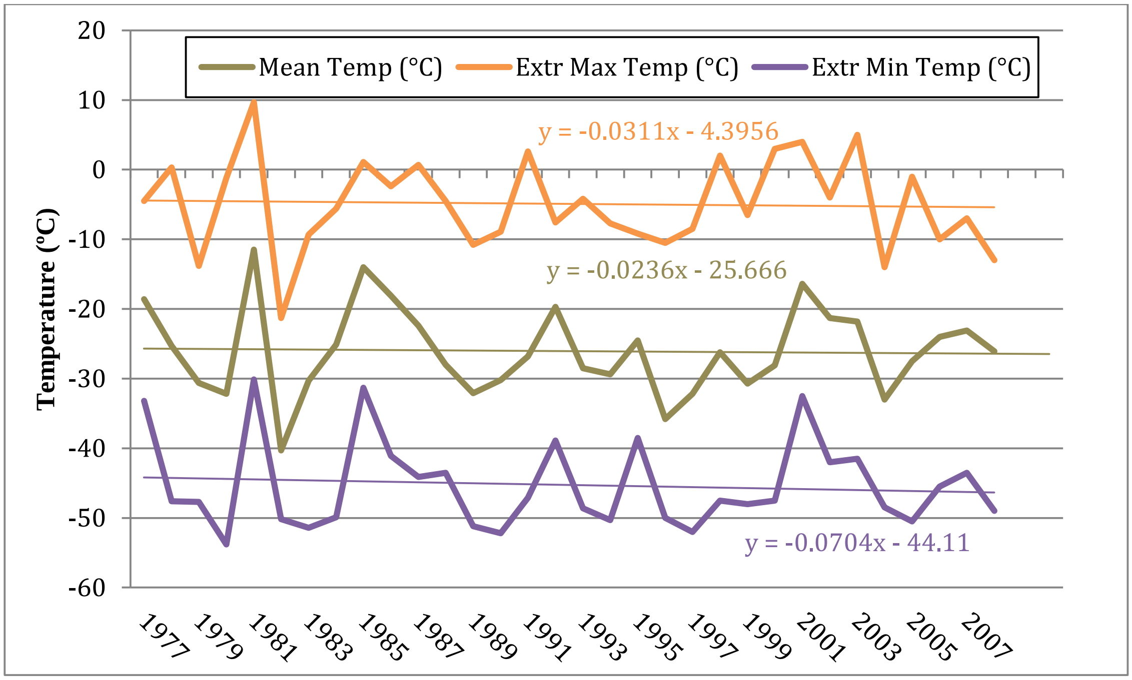


Figure 4: Dawson A January Temperature Trend

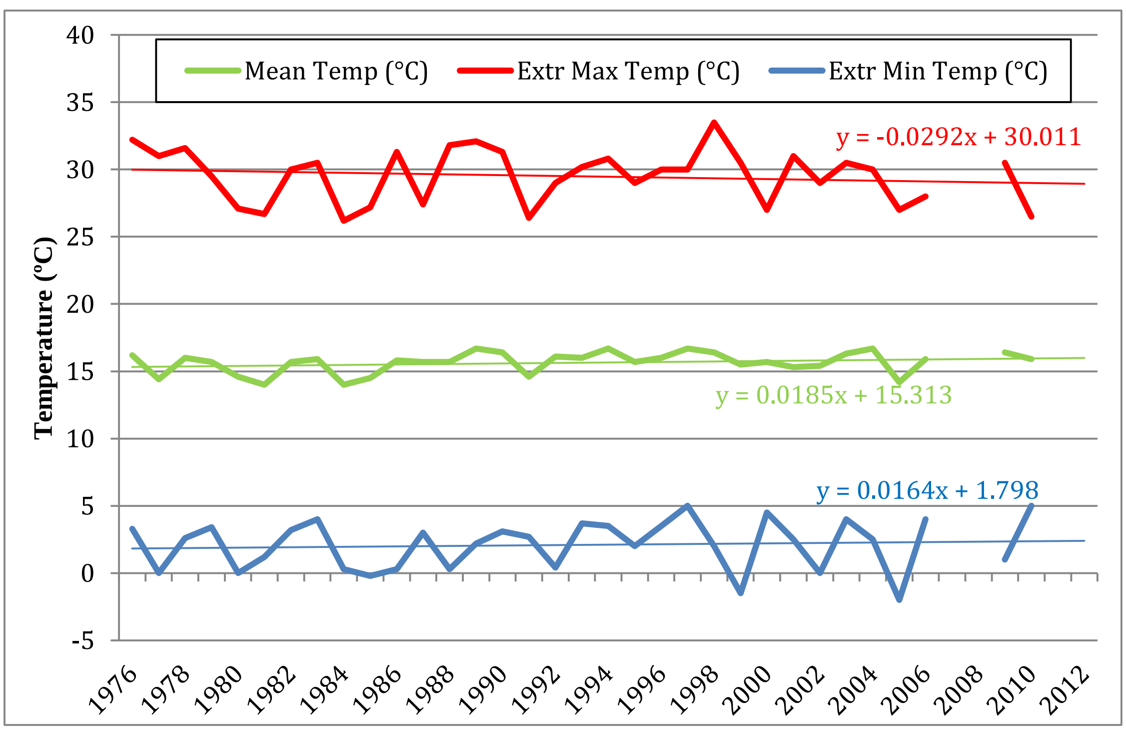
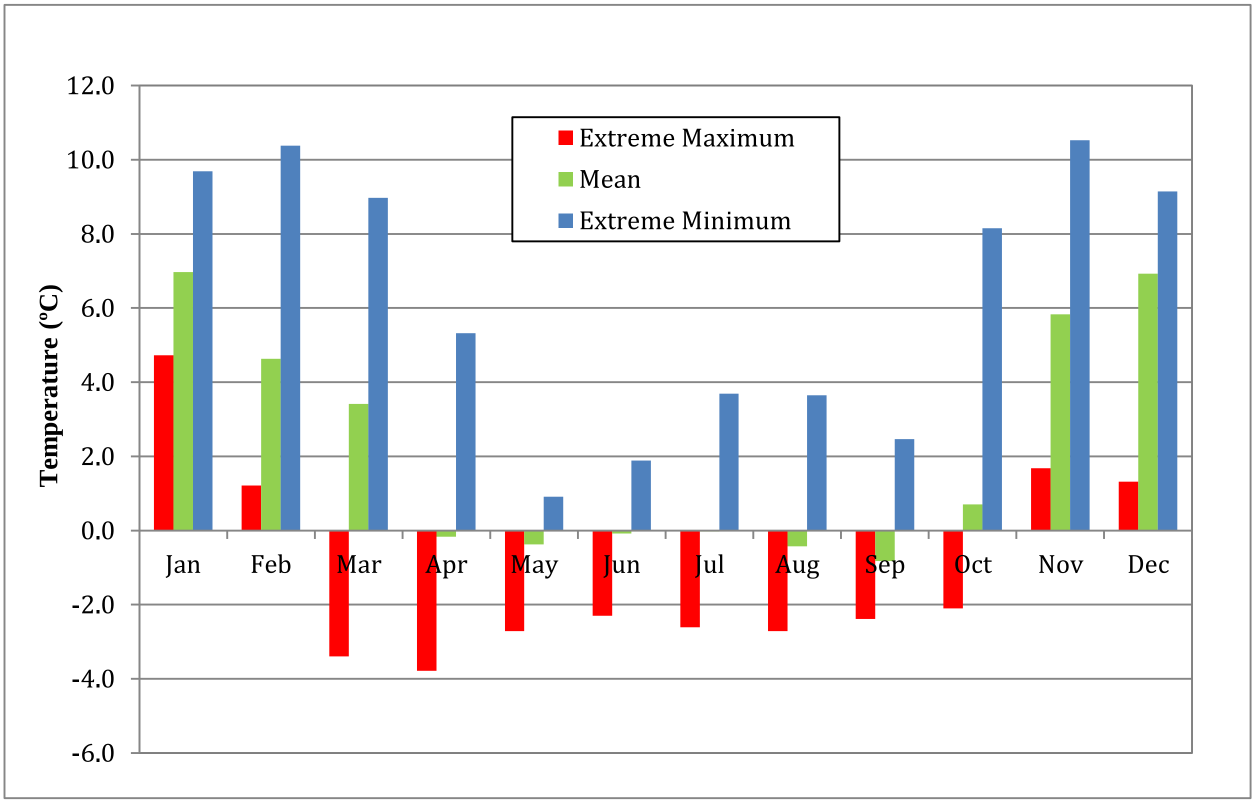


Figure 5: Dawson A July Temperature Trend

Comparison with temperature data from Dawson airport over the period 1991-2012 (2013 data from Dawson A was not yet available yet the time of writing this report) indicates that the annual mean temperature is on average 2.0°C warmer at Brewery creek than in Dawson. The extreme maximum is lower by 4.1°C and the extreme minimum is warmer by 10.1°C, indicating a smaller diurnal range at Brewery creek than in Dawson. There are also some seasonal variations in the differences as shown in Figure 6 below.

Figure 6: Monthly Average Temperature Difference between Dawson A and Brewery Creek 1991-2012



**a positive difference indicates that the value is higher at Brewery creek than at Dawson Airport*

Precipitation and Evaporation

Table 3 and

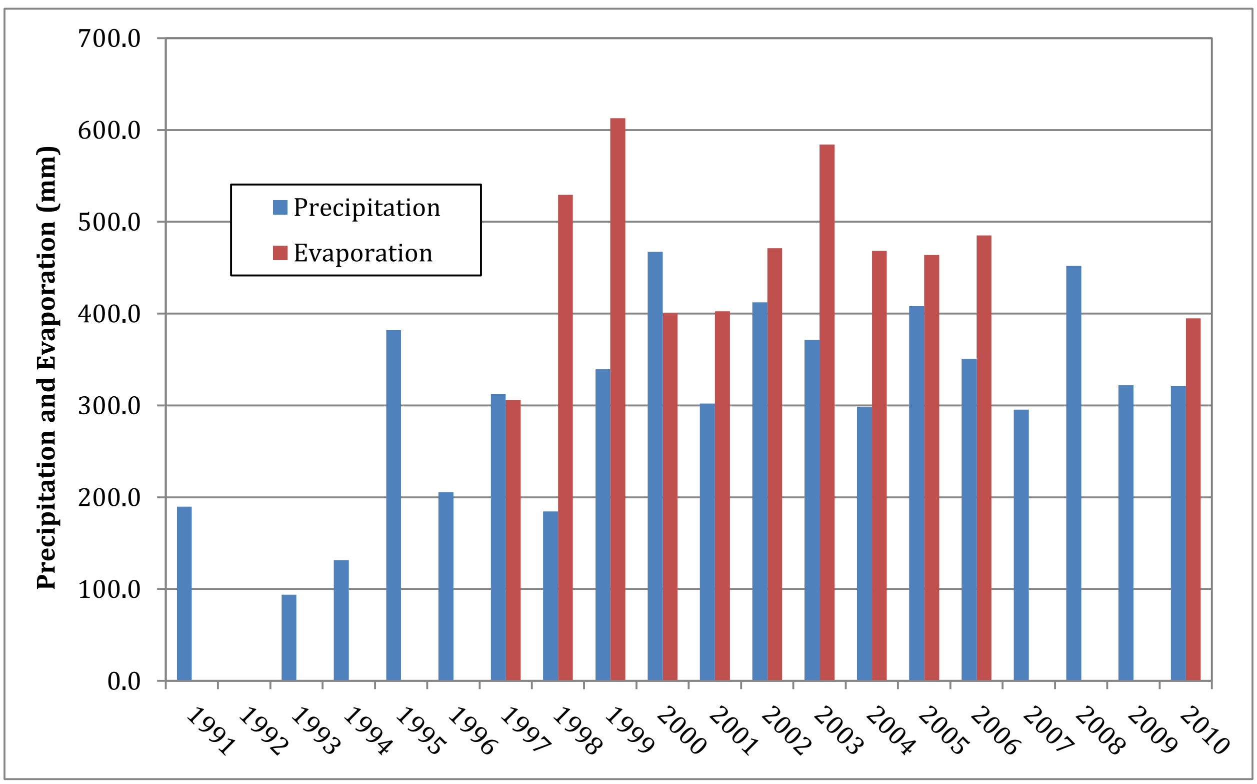
Figure 7 below show the annual precipitation and evaporation at Brewery creek recorded between 1991 and 2010. Values shown in italics were compiled using partial data and therefore underestimate total annual precipitation or evaporation. Lake evaporation is calculated using a pan coefficient of 0.70.

Both 2012 and 2013 have incomplete precipitation data, therefore annual totals cannot be compared directly with historical values. However the precipitation total for the 2012 summer period (June to September inclusively) was less than the historical average. The total summer precipitation in 2012 was 145.3 mm while the average for the period 1991-2010 is 177.4 mm. In 2013, the summer total was 51.37mm but it is suspected that June and July precipitations were under recorded.

Table 3 Brewery Creek Annual Precipitation and Evaporation

Year	Precipitation (mm)	Pan Evaporation (mm)	Calculated Lake Evaporation (mm)
1991	189.7		
1992			
1993	94.0		
1994	131.4		
1995	381.8		
1996	205.6		
1997	312.4	306	
1998	184.4	529.4	
1999	339.2	612.8	429
2000	467.4	400.5	280.4
2001	301.9	402.4	281.7
2002	412.2	471.1	329.8
2003	371.4	584.2	408.9
2004	298.5	468.5	328
2005	408.0	464	342.8
2006	351.0	485	339.5
2007	295.3		
2008	452		
2009	322		
2010	320.8	394.8	

Figure 7: Total Annual Precipitation and Evaporation at Brewery Creek 1991-2010

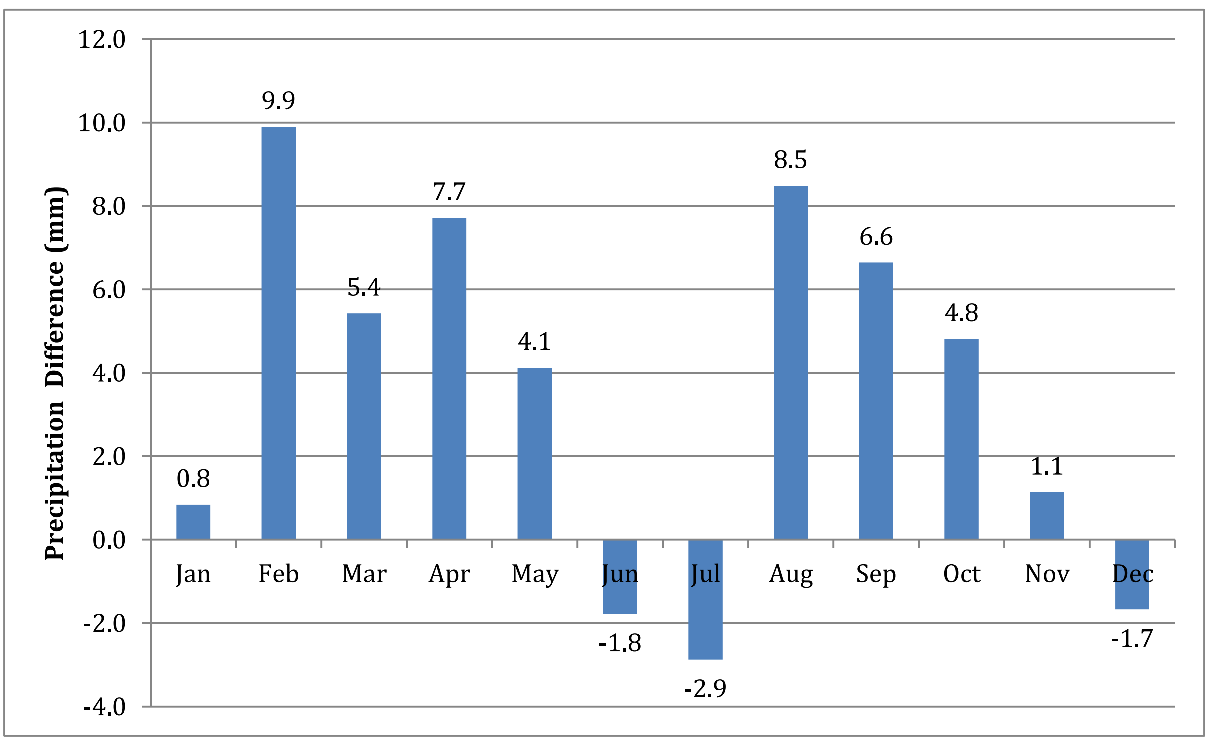


Total evapotranspiration for the 2012 summer period was 136.2 mm, and 153.3 mm for the 2013 summer period. Evapotranspiration is the evaporation from the ground surface and transpiration from vegetation and it used for the total catchment water balance. An evapotranspiration calculation was incorporated into the datalogger program instead. This instruction uses the following input parameters: average daily max temperature, average daily minimum temperature, average daily wind speed and average dew point temperature, and is calculated for a short grass crop, as recommended by Campbell Scientific. It only provides an approximation of evapotranspiration as specific terrain features and vegetation need to be considered. Evapotranspiration was not calculated prior to 2012 as only evaporation from the surface of the ponds was of concern for water balance purposes. An evaporation pan was not installed in 2011 with the new meteorological station.

From, 1991-2010 average total potential evaporation (TPE) was 404.5mm and average lake evaporation (LE = TPE x 0.70) was calculated at 340.2mm. Evaporation pans are considered a measure of total potential evaporation. CCL (Appendix C) recommended adopting a conservative estimate of 390-400mm for water balance purposes. The data collected from 1991-2010 suggest that on average lake evaporation may be even lower than the CCL (Appendix C) estimate.

When comparing precipitation at Brewery creek precipitation with Dawson precipitation for the period 1991-2012 (using only years for which all months were available), it was found that Brewery creek receives on average 6.9 mm more precipitation in a year. This corresponds to an average of 2.2 % more precipitation annually. The average monthly differences are shown in Figure 8.

Figure 8: Average monthly precipitation differences between Brewery creek and Dawson 1991-2012



**a positive difference indicates that the value is higher at Brewery creek than at Dawson Airport*

Table 4 below is reproduced and updated from Design Memorandum CCL-BCM3 and compares monthly total precipitation at the Brewery Creek Mine and Dawson Airport from 1991 to 2000 (CCL 2000).

Table 4: Monthly Total Precipitation - Brewery Creek Mine and Dawson Airport 1991-2000

Brewery Creek Mine - Total Precipitation (mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
1991						16.7	23.8	94.1	43.7				
1992													
1993										20.0	35.3	20.3	
1994									42.4	40.4	32.7	14.2	
1995	19.8	19.1	10.1	5.5	49.4	39.1	97.9	45.2	64.4	31.3			
1996	9.3	10.6	6.5	6.6	20.0	38.1	11.1	30.7	34.8	11.9	18.3	8.9	**206.8**
1997	9.5	3.6	4.1	8.3	24.2	62.0	36.6	52.9	43.3	30.6	13.0	25.4	**313.5**
1998	5.9	4.7	3.6	4.1	31.3	36.6	21.9	25.4	18.3	20.6	6.5	7.7	**186.6**
1999	16.0	10.1	10.1	18.9	39.0	40.8	44.3	54.4	7.7	50.2	16.0	31.9	**339.4**
2000	17.1	4.7	1.8	3.5	31.3	54.4	95.7	30.0					
Mean	**12.9**	**8.8**	**6.0**	**7.8**	**32.5**	**41.1**	**47.3**	**47.5**	**36.4**	**29.3**	**20.3**	**18.1**	**308.1**

Dawson A. - Total Precipitation (mm) - Common Months with Brewery Creek Mine

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
1991	34.4	22.4	20.2	0.8	11	21.8	56.6	71.8	49.6	23	31.6	19	**362.2**
1992	37.4	17.6	7.2	11.9	36.8	49.8	55.4	49.2	25	20.6	24.6	17.8	**353.3**
1993	24.9	12.3	12.2	1.2	26.4	40.8	22.4	49.5	35.8	13.9	34.8	15.5	**289.7**
1994	6.6	3.2	29	9.2	13.2	55.9	52.6	33.2	24	43.4	27.8	8.2	**306.3**
1995	11.4	13.2	11.8	5.8	61.4	20.2	64.8	35.4	41.2	27.2	9.4	19.1	**320.9**
1996	8.3	14.6	8.2	7.0	11.5	28.6	10.7	41.0	31.8	30.4	18.0	20.0	**230.1**
1997	17.6	6.0	5.4	5.2	24.2	84.6	60.8	53.8	16.2	34.8	14.4	28.0	**351.0**
1998	11.7	4.0	0.0	0.2	42.4	53.4	16.0	25.8	21.8	7.1	8.3	16.0	**206.7**
1999	11.0	14.6	10.8	13.6	34.3	16.7	32.0	63.7	22.6	57.6	36.0	56.0	**352.1**
2000	28.4	9.6	5.2	5.4	20.4	60.5	99	30.2	50.5	34.8	13.6	10.8	**357.7**
Mean	**14.7**	**10.3**	**6.9**	**6.4**	**34.8**	**37.6**	**40.2**	**48.6**	**29.6**	**26.1**	**23.2**	**24.0**	**302.3**

Table 5 compares monthly precipitation at the Brewery Creek Mine and Dawson Airport from 2001-2012.

Table 5: Monthly Total Precipitation - Brewery Creek Mine and Dawson Airport 2001-2012

Brewery Creek Mine - Total Precipitation (mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
2001	13.6	18.9	16.5	12.4	30.7	17.7	69.7	36.6	34.9	21.3	17.7	11.8	**301.8**
2002	21.9	11.2	9.5	28.4	27.8		49.9	104.6		28.4	29.5	37.2	
2003	22.5	29.5			36.6	27.8	55.0	41.4			39.0	32.2	
2004	27.9	18.4	17.5	11.9		19.8	47.6	5.8	27.0	43.0	31.0	37.1	
2005	22.4	33.2	18.9	26.0	37.9	37.6	38.9	63.7	49.9	13.9	44.5	21.1	**408.0**
2006	6.4	20.4	20.3	33.0	34.7	52.8	20.7	64.6	39.2	29.3	12.3		
2007	22.4	38	31.2	9.8		29.5	30		38.9	11.6	13.6	15.7	
2008	21.3	30.5	26.3	35	43.6		55	94.2	52.6	22.9	19.6	20.9	
2009	14.5	22.9	21.3	22.8	25	31.3	29		66.8		15.5		
2010						41.2	82	39.1	70.5	88			
2011													
2012			6.1	0.0	5.3	20.6	62.5	33.5	28.7	27.7			
Mean	**19.2**	**24.8**	**18.6**	**19.9**	**30.2**	**30.9**	**49.1**	**53.7**	**45.4**	**31.8**	**24.7**	**25.1**	**354.9**

Dawson A. - Total Precipitation (mm) - Common Months with Brewery Creek Mine

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
2001	26.6	17.4	5.6	5.6	27.1	23	91	23.2	28	21	14.8	12.2	**295.5**
2002	14.6	9.6	10.2	12.4	44.9		52	78.3		26.8	14.4	32.8	
2003	4.6	10.2	10.0	0.0	42.6	31.6	37.9	40			35.6	29.6	
2004	24.8	11.4	11.2	8		12.8	32.6	8.2	24.6	41.9	19.8	42.2	
2005	20.2	14.8	14.6	5.4	18.7	51.3	46.8	38.3	50.6	18	49	17.4	**345.1**
2006	5.2	4.2	1.8	25	21	48.6	30	49.8	39.8	28.4	4.8		
2007	24	1.4	15	8.8		14	53.7		60.4	8.2	16.2	12.8	
2008	18.2	2.2	8.8	8.2	15.8		157.7	42.2	38.4	17.7	25.4	12.6	
2009	23.4	8.6	13.8	0.4	11.4	62.4	16.4		43.8		17.2		
2010			6.2	0.6	6.4	50	52.8	45.8	10	12.6			
2011	25.1								36.4			40.6	
2012			12.6	13.4	21.6	22.8	50.8	35.3	33.3				
Mean	**18.0**	**8.9**	**10.4**	**9.7**	**25.4**	**35.2**	**56.5**	**40.1**	**36.5**	**21.8**	**21.9**	**22.8**	**320.3**

Table 6 shows a comparison of the monthly total precipitation between the Brewery Creek Mine and Dawson Airport. Note that on average between 2001 and 2012 the Brewery Creek Mine received 10.8% more precipitation annually than Dawson Airport (Dawson A.). From 1991 till 2000 Brewery Creek received only 1.9% more precipitation annually. This may represent changes in climate cycle over time.

Table 6: Comparison of Mean Monthly Total Precipitation

Station	Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Brewery Creek	2001-12	19.2	24.8	18.6	19.9	30.2	30.9	49.1	53.7	45.4	31.8	24.7	25.1	354.9
Dawson A.	2001-12	18.0	8.9	10.4	9.7	25.4	35.2	56.5	40.1	36.5	21.8	21.9	22.8	320.3
Brewery Creek	1991-00	12.9	8.8	6.0	7.8	32.5	41.1	47.3	47.5	36.4	29.3	20.3	18.1	308.1
Dawson A.	1991-00	14.7	10.3	6.9	6.4	34.8	37.6	40.2	48.6	29.6	26.1	23.2	24.0	302.3
Dawson A.	1976-2012	19.1	11.7	10.7	8.0	27.0	39	50.9	41.9	35.5	28.8	24.3	22.9	319.8
Brewery Creek	1991-2012	16.5	17.8	13.1	14.6	31.3	35.7	48.4	50.8	41.1	30.6	22.8	21.6	344.3

Finally, a total annual precipitation frequency analysis for Dawson Airport is shown in Table 7 with corresponding estimates for the Brewery Creek Mine. The Brewery Creek Mine values are simply the Dawson value multiplied by a conversion factor, which is the average ration for the years where a complete record is available for both sites. The return periods are taken from CCL-BCM3 and will be updated to 2012 in the near future.

Table 7: Annual Total Precipitation Frequency Analysis

Return Period (years)	Exceedance Probability	Annual Total Precipitation (mm)	
		Dawson A.	Brewery Creek
2	50.00%	319	325
5	20.00%	375	382
10	10.00%	405	413
20	5.00%	431	439
50	2.00%	461	470
100	1.00%	482	491
200	0.50%	501	511
500	0.20%	525	535

Note: Brewery Creek Total Precipitation = 1.0193 times Dawson A. Total Precipitation.

SNOWPACK

Snow pack observations have been taken at the Brewery Creek property since 1995. Clearwater Consultants Ltd. reviewed the data to date in 2000 (Appendix A). The following is an excerpt from their Design Memorandum CCL-BCM3:

Brewery Creek personnel have collected snowpack survey data since 1995 at a number of locations around the mine site. Data collection starts in early November and continues until early to mid-April each year. Typically, all snow has melted from the leach pad and in the general area of the leach pad by the end of April. Some snow remains on the ground into May in undisturbed forested areas around the site. Regional snow survey data are available since 1975 for the Midnight Dome station operated by DIAND Water Resources. Table 3 summarizes the available data for the 1995 to 2000 period.

The following comments are made on the available data:

- *Snow accumulations start during October each year at Brewery Creek;*
- *Maximum snowpacks each year generally occur on or about April 1 for both Brewery Creek and for Midnight Dome, although annual maxima may occur earlier or later;*
- *Snow is generally all melted on and around the leach pad by the end of April whereas measurable snow may remain on the ground at Midnight Dome until at mid- or late May;*
- *Snowpack water equivalents for all locations around Brewery Creek are consistently less than values recorded at Midnight Dome;*
- *For all data, Brewery Creek maximum April 1 snowpacks are about 66% of the Midnight Dome values. Measurements taken on natural ground near April 1 at Brewery Creek are about 71% of the Midnight Dome values;*
- *Snowpack water equivalents are lower within the leach pad area than on natural ground surrounding the leach pad;*
- *Variability in readings taken within the leach pad area reflects areas of additional snow accumulation by drifting, typically near the bottom of the slopes, and exposed areas subject to removal of snow by wind, typically on the flat top of the heap;*
- *Areas under active leach during the winter appear to experience lower maximum snowpacks than areas not under active leaching, possibly due to some melting of snow during the winter over the actively leaching areas.*

Maximum annual snowpacks applicable to the leach pad area at Brewery Creek were estimated using different methods. The results are shown in Table 4 and described following:

- *Method "A" involved carrying out a frequency analysis of the 26 years of annual maximum snowpacks reported for Midnight Dome and multiplying the results by 0.709, the average ratio of Brewery Creek to Midnight Dome April 1 snowpacks measured on natural ground from 1995 to 2000. The estimated 100 year return period snowpack for Midnight Dome is 258 mm of water equivalent (Table 4). The resulting estimated 100 year return period snowpack for Brewery Creek was 183 mm of water equivalent;*
- *Method "B" involved carrying out a frequency analysis of the 22 years of cumulative October to March total precipitation reported for Dawson A. and multiplying the results by 1.0193, the average ratio of Brewery Creek to Dawson A. total average annual precipitation. The resulting estimated 100-year return period snowpack for Brewery Creek was 210 mm of water equivalent.*

It is recommended that, for the evaluation of water storage requirements for the Brewery Creek heap leach pad, the most conservative estimate of the 100 year return period maximum snowpack accumulation should be adopted. Given the long period of record available at Midnight Dome and the variability in data collected at and *around the Brewery Creek site over the last six years (Table 3), it is recommended that the estimated 100 year return period snowpack for Midnight Dome of 258 mm of water equivalent be adopted for the Brewery Creek area.*

Table 8 and Table 9 are taken from CCL-BCM3 and updated with data collected since 2000. The general snow survey procedure noted by Clearwater continued till 2004 although with far less frequency. No survey data were found for 2005. In 2006, a different set of survey sites were implemented. These data were gathered by the caretaker and consist of sites on the leach pad and the blue dump. No distinction is made between top and sides of leach pad and relative area. No data were found for 2011. Equal weight is given to each site in computing the average. Return periods for Maximum annual snowpack are not updated at this time, but tables from 2000 are reproduced from CCL-BCM3 here (

Table 10).

Table 8: Snowpack Survey Data, Snow Water Equivalent (mm) – Brewery Creek and Midnight Dome

Year	Station	Comment	Elev (m)	Note	Jan-01	Feb-01	Mar-01	Apr-01	May-01
1995	Brewery Creek	Natural Ground	775-830	1		78.5	87.6		
	Midnight Dome	DIAND natural ground	855	2			150	170	123
1996	Brewery Creek	Natural Ground	760-780	3		78.4		92.4	
	Midnight Dome	DIAND natural ground	855	2			91	109	101
1997	Brewery Creek	Natural Ground	740-850	4	90.3	102.3	104.3	107.6	
	Brewery Creek	Within leach pad area		5	94.6	69.1	97.5	105.4	
	Brewery Creek	All Data	740-850	6	80.7	87.7	96.8	102.8	
	Midnight Dome	DIAND natural ground	855	2			146	161	117
1998	Brewery Creek	Natural Ground	740-850	4	36.5	62.5	72.5	97.9	
	Brewery Creek	Leach pad slopes cells 1,2,4	800-820	7	71.9	54.3	74.2	28.9	
	Brewery Creek	Leach pad slopes cell 5	810-830	7	27.3	52.2	41.2	85.4	
	Brewery Creek	Leach pad top cells 3 & 4	820-840	7	34.2	24.3	39.6	9.2	
	Brewery Creek	Leach Pad weighted average	800-840	8	36.7	31.2	43.1	22.2	
	Brewery Creek	All Data	740-850	6	39.2	51.9	61.9	69.1	
	Midnight Dome	DIAND natural ground	855	2			129	119	92
1999	Brewery Creek	Natural Ground	740-850		40.6	41.8	80.4	86.9	
	Brewery Creek	Leach Pad Top (837 lift)	837	9	39.7	46.1	41		
	Brewery Creek	Leach Pad Slopes (cells1,2,5)	800-830	9	46.1	43	64	84.4	
	Brewery Creek	Leach Pad weighted average	800-840	9	42	45	49.3		

Year	Station	Comment	Elev (m)	Note	Jan-01	Feb-01	Mar-01	Apr-01	May-01
	Brewery Creek	All Data	740-850	6	42.7	42.9	66.2	88.6	
	Midnight Dome	DIAND natural ground	855	2			84	90	92
2000	Brewery Creek	Natural Ground	740-850	10	64.9	85.5	146		
	Brewery Creek	Leach Pad Top (830 lift)	830	9	12.1	46.7	54.5		
	Brewery Creek	Leach Pad Slopes (cells1,7)	800-830	9	141.6	181.2	135.4		
	Brewery Creek	Leach Pad weighted average	800-840	9	56.4	95.1	83.624		
	Brewery Creek	All Data	740-850	6	46.6	75.8	96.2	94.5	
	Midnight Dome	DIAND natural ground	855	2			187	197	195
2001	Brewery Creek	Natural Ground	740-850	11	53.9	74		83.7	
	Brewery Creek	Leach Pad Top (830 lift)	830	9		91.4		71.3	
	Brewery Creek	Leach Pad Slopes (cells1,7)	800-830	9		102.1		95.8	
	Brewery Creek	Leach Pad weighted average	800-840	9		95.3		80.1	
	Brewery Creek	All Data	740-850	18	50.7	82.2		79.7	
	Midnight Dome	DIAND natural ground	855	2			140	154	172
2002	Brewery Creek	Natural Ground	740-850	12	43.3	57.5	75.1	78	
	Brewery Creek	Leach Pad Top (830 lift)	830	9	34.9	60.3	88.1	78.6	
	Brewery Creek	Leach Pad Slopes (cells1,7)	800-830	9	41.8	60.9	83.1	77.1	
	Brewery Creek	Leach Pad weighted average	800-840	9	37.4	60.5	86.3	78.1	
	Brewery Creek	All Data	740-850	18	37.9	58.4	80	77.5	
	Midnight Dome	DIAND natural ground	855	2			93	105	75
2003	Brewery Creek	Natural Ground	740-850	13				80.1	
	Brewery Creek	Leach Pad Top (830 lift)	830	9				79	
		Leach Pad Slopes (cells1,7)	800-830	9				133.9	
		Leach Pad weighted average	800-840	9				98.8	
	Brewery Creek	All Data	740-850	18				84.2	
	Midnight Dome	DIAND natural ground	855	2			102	98	44
2004	Brewery Creek	Natural Ground	740-850	14		150.5	143.6		
	Brewery Creek	Leach Pad Top (830 lift)	830	9		144.7	139.6		

Year	Station	Comment	Elev (m)	Note	Jan-01	Feb-01	Mar-01	Apr-01	May-01
	Brewery Creek	Leach Pad Slopes (cells1,7)	800-830	9		177.5	192.7		
	Brewery Creek	Leach Pad weighted average	800-840	9		156.5	158.7		
	Brewery Creek	Blue Dump	750-850	15			132.7		
	Brewery Creek	All Data	740-850	18		153.5	144.7		
	Midnight Dome	YE natural ground	855	16			153	190	167
2005	Midnight Dome	YE natural ground	855	16			196	199	197
2006	Brewery Creek	Blue Dump	750-850	15		59.2			
	Brewery Creek	Leach Pad	800-840	17		62.2			
	Brewery Creek	All Data	750-850	18		60.9			
	Midnight Dome	YE natural ground	855	16			120	121	162
2007	Brewery Creek	Blue Dump	750-850	15				99.9	
	Brewery Creek	Leach Pad	800-840	17				105.2	
	Brewery Creek	All Data	750-850	18				102.8	
	Midnight Dome	YE natural ground	855	16			114	145	145
2008	Brewery Creek	Blue Dump	750-850	15			51.1		
	Brewery Creek	Leach Pad	800-840	17			85.9		
	Brewery Creek	All Data	750-850	18			70.7		
	Midnight Dome	YE natural ground	855	16			83	103	147
2009	Brewery Creek	Blue Dump	750-850	15				160.1	
	Brewery Creek	Leach Pad	800-840	17				171.7	
	Brewery Creek	All Data	750-850	18				166.4	
	Midnight Dome	YE natural ground	855	16			127	172	182
2010	Brewery Creek	Blue Dump	750-850	15				74	
	Brewery Creek	Leach Pad	800-840	17				109.2	
	Brewery Creek	All Data	750-850	18				93.2	
	Midnight Dome	YE natural ground	855	16			110	160	98
2011	Midnight Dome	YE natural ground	855	16			152	195	174
2012	Brewery Creek	Blue Dump	750-850	15			81.3	198	
	Brewery Creek	Leach Pad	800-840	17			136.3	261	
	Brewery Creek	Natural Ground	740-850	19			170.2	213.1	124
	Brewery Creek	All Data		18			176.4	222.2	
	Midnight Dome	YE natural ground	855	16			153	184	188
2013	Brewery Creek	Blue Dump	750-850	15				113.5	
	Brewery Creek	Leach Pad	800-840	17				118.5	
	Brewery Creek	Natural Ground	740-850	19				141.6	
	Brewery Creek	All Data		18				128.1	
	Midnight Dome	YE natural ground	855	16			192	239	253

Table 9 Average Snowpack Water Equivalents

Years	Station	Comment	Elev	Note(s)	Jan-01	Feb-01	Mar-01	Apr-01	May-01
1995-2013	Brewery Creek	Natural Ground	740-850		54.9	81.6	110.0	111.1	
	Brewery Creek	Within leach pad area	800-840	17	53.4	79.0	92.6	115.0	
	Brewery Creek	Blue Dump	750-850	15		59.2	88.4	129.1	
	Brewery Creek	All Data	740-850		49.6	77.0	97.8	107.8	
	Midnight Dome	Common years with BCM	855	20			130.9	148.0	
	Midnight Dome	All years 1995-2012	855	20			132.7	153.2	143.4
1975-2013	Midnight Dome	All available years		20		98	132	149	128
Midnight Dome – Average (1995-2013) / (1975-2013)				20			100.6%	102.8%	112.0%
1995-2013	**Ratios of (Brewery Creek to Midnight Dome)**			20					
	Natural Ground						84.01%	75.08%	
	Within leach pad area						70.74%	77.71%	
	All Data						74.75%	72.84%	

Notes for Tables 8 and 9

1) 1995 BCM data includes sites at Canadian Zone, within leach pad and outside leach pad. No ore in place on heap. Averages for all sample points.
2) All Midnight Dome data reported by DIAND Water Resources. Feb. 1 data not collected since 1985
3) 1996 BCM data includes sites within and outside leach pad area. No ore on heap. Averages for all sample points.
4) 1997 and 1998 BCM data for "Natural Ground" include six locations surrounding leach pad.
5) 1997 BCM data "Within leach pad area" is area-weighted average, 6 to 9 sites per month covering active & inactive leaching areas. Total 1.9 Mt ore, 0.5 Mt under leach.
6) 1997 to 2000 BCM "All Data" reflects average of all individual sample points for all locations.
7) 1998 BCM data "Leach pad slopes cells 1, 2, 4" represents approx. 20,000 m2 area on pad; "Leach pad slopes cell 5" represents approx. 31,000 m2: and, "Leach pad top cells 3 & 4" represents approx. 161,000 m2 on pad. Areas estimated by BCM personnel in the field. Total 3.9 Mt ore with 1.1 Mt under leach.
8) 1998-2004 BCM data "Leach pad weighted average" represents average SWE for entire leach pad area based on relative areas and SWE's.
9) For 1999 - 2004, "Leach Pad Top" estimated by BCM personnel as 64% of total area, "Leach Pad Slopes" equal to 36% of total area to estimate "Leach Pad Weighted Average" snow water equivalents (SWE).
10) Brewery Creek data shown for Jan 1, 2000 collected on Jan 14, 2000.
11) Brewery Creek data shown for Jan 1, Feb 1 and Apr 1, 2001 collected on Jan 8, Feb 7 and Mar 23, 2001, respectively.
12) Sample dates were mid-month Dec-Mar in 2002 so values are linearly interpolated for all Brewery Creek sites.
13) Brewery Creek Data collected Mar 23, 2003.
14) Actual sample dates are Jan 30 and Feb 28, 2004.
15) Snow surveys began on blue waste rock dump in 2004, means are not area weighted.
16) Water Resources came under the jurisdiction of Yukon Environment after 2003
17) For 2006-2013, leach pad averages are not area weighted.
18) For 2000-2013 all sites are given equal weight in average calculation.
19) Starting in 2012, the natural ground survey is a new network of sample sights near water quality stations.
20) Midnight Dome monthly snow averages provided be Environment Yukon (Environment Yukon, 2012)

Table 10: Maximum Annual Snowpack Frequency Analysis

Return Period Years	Exceedance Probability	Midnight Dome Max. Snowpack	Dawson A. Precipitation (Note 1)	Brewery Creek Snowpack	
				Method A (Note 2)	Method B (Note 2)
1.05	95.20%	94	82	67	84
1.25	80.00%	120	99	85	101
2	50.00%	150	120	106	122
5	20.00%	185	148	131	151
10	10.00%	205	164	145	167
20	5.00%	223	178	158	181
50	2.00%	244	194	173	198
100	1.00%	258	206	183	210
200	0.50%	272	216	193	220
500	0.20%	290	229	206	233

Notes for
Table 10*10*
1) "Dawson A. Precipitation" corresponds to cumulative total precipitation from October 1 to March 31. Frequency analysis based on 1976 - 2000 data.
2) Potential maximum snowpack at Brewery Creek estimated as follows:
Method A: Brewery Creek snowpack = 0.709 times snowpack at Midnight Dome, or,
Method B: Brewery Creek snowpack = 1.0193 times total October to March precipitation at Dawson A, or, Brewery Creek snowpack = Midnight Dome snowpack
3) All snowpacks and precipitation in millimetres of water equivalent.

REFERENCES

Clearwater Consultants Ltd. 2000. Design Memorandum CCL-BCM3, November 8, 2012.

Environment Yukon 2013 Yukon Snow Survey Bulletin & Water Supply Forecasts, May 1, 2013

Environment Yukon 2013 Yukon Snow Survey Bulletin & Water Supply Forecasts, April 1, 2013

Environment Yukon 2013 Yukon Snow Survey Bulletin & Water Supply Forecasts, March 1, 2013

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APPENDIX A

DESIGN MEMORANDUM CCL-BCM3

Design Memorandum CCL-BCM3

Date: November 8, 2000 **Our File:** 013.05

To: Viceroy Resource Corporation Brewery Creek Mine

Brad Thrall (bthrall@viceroyresource.com)

From: Clearwater Consultants Ltd.

Peter S. McCreath (pmccreath@cs.com)

Subject: Brewery Creek Mine - Hydrology Update 2000

Design Memorandum CCL-BCM1 dated November 13, 1998 presented a review of hydrological conditions for the Brewery Creek Mine site based on climatic data available up to September 1998. This memorandum CCL-BCM3 presents the results of an update by Clearwater Consultants Ltd. of the hydrological conditions and key design parameters for the site. The update has been based on all the available precipitation, evaporation and snowsurvey data collected at Brewery Creek and at regional sources up to August 2000.

1. Available Data

Available hydrologic data at the Brewery Creek Mine site include the following:

- monthly total precipitation data for a total of 77 months between June 1991 and August 2000. The data collection has been essentially continuous since September 1994;
- snowpack survey data at a number of locations around the site since 1995.
- monthly pan evaporation data during the non-freezing period (typically May through September) for a total of 16 months from July 1997 to August 2000.

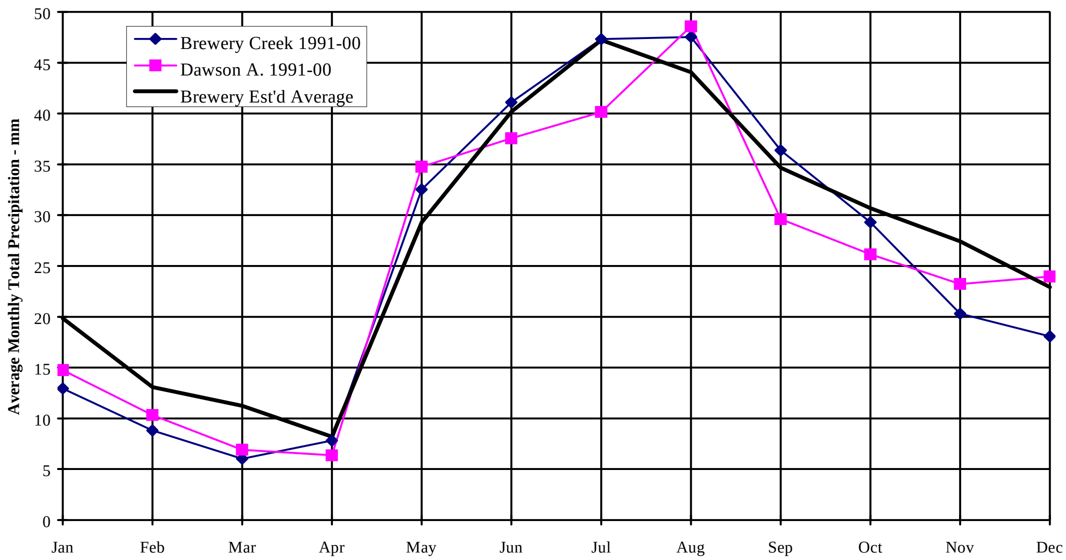
Regional data used in the comparisons reported herein include:

- monthly precipitation, rainfall and snowfall data reported by Environment Canada for the Dawson Airport station for the period February 1976 to March 2000;
- snowpack survey data reported by the Water Resources Division of DIAND for the period 1975 to 2000;
- Monthly lake evaporation data reported by Environment Canada for stations at Pelly Ranch (June 1964 to July 1998) and at Whitehorse Airport (August 1974 to June 1996).

2. Precipitation

Table 1 summarizes all the available concurrent monthly total precipitation data for Brewery Creek Mine and for Dawson Airport. Figure 1 presents a comparison of the average monthly values over the common period. Comparing annual average total precipitation for the two stations over the common months of data indicates that on average the Brewery Creek site experiences about 2% more precipitation per year than Dawson A. Based on the concurrent data and the long-term average total precipitation at Dawson A. of 323 mm, the estimated long-term average annual total precipitation for Brewery Creek Mine is 329 mm.

FIGURE 1 - Brewery Creek & Dawson A. Average Total Precipitation



Frequency analysis were carried out on total annual precipitation for the complete period of record for Dawson A. Applying a factor of 1.0193, corresponding values were estimated for Brewery Creek. The results of the frequency analysis are shown in Table 2.

3. Snowpack

Brewery Creek personnel have collected snowpack survey data since 1995 at a number of locations around the mine site. Data collection starts in early November and continues until early to mid-April each year. Typically, all snow has melted from the leach pad and in the general area of the leach pad by the end of April. Some snow remains on the ground into May in undisturbed forested areas around the site. Regional snowsurvey data are available since 1975 for the Midnight Dome station operated by DIAND Water Resources. Table 3 summarizes the available data for the 1995 to 2000 period.

The following comments are made on the available data:

- Snow accumulations start during October each year at Brewery Creek;
- Maximum snowpacks each year generally occur on or about April 1 for both Brewery Creek and for Midnight Dome, although annual maxima may occur earlier or later;
- Snow is generally all melted on and around the leach pad by the end of April whereas measurable snow may remain on the ground at Midnight Dome until at mid- or late May;
- Snowpack water equivalents for all locations around Brewery Creek are consistently less than values recorded at Midnight Dome;
- For all data, Brewery Creek maximum April 1 snowpacks are about 66% of the Midnight Dome values. Measurements taken on natural ground near April 1 at Brewery Creek are about 71% of the Midnight Dome values;

- Snowpack water equivalents are lower within the leach pad area than on natural ground surrounding the leach pad;
- Variability in readings taken within the leach pad area reflects areas of additional snow accumulation by drifting, typically near the bottom of the slopes, and exposed areas subject to removal of snow by wind, typically on the flat top of the heap;
- Areas under active leach during the winter appear to experience lower maximum snowpacks than areas not under active leaching, possibly due to some melting of snow during the winter over the actively leaching areas.

Maximum annual snowpacks applicable to the leach pad area at Brewery Creek were estimated using different methods. The results are shown in Table 4 and described following:

- Method "A" involved carrying out a frequency analysis of the 26 years of annual maximum snowpacks reported for Midnight Dome and multiplying the results by 0.709, the average ratio of Brewery Creek to Midnight Dome April 1 snowpacks measured on natural ground from 1995 to 2000. The estimated 100 year return period snowpack for Midnight Dome is 258 mm of water equivalent (Table 4). The resulting estimated 100 year return period snowpack for Brewery Creek was 183 mm of water equivalent;
- Method "B" involved carrying out a frequency analysis of the 22 years of cumulative October to March total precipitation reported for Dawson A. and multiplying the results by 1.0193, the average ratio of Brewery Creek to Dawson A. total average annual precipitation. The resulting estimated 100-year return period snowpack for Brewery Creek was 210 mm of water equivalent.

It is recommended that, for the evaluation of water storage requirements for the Brewery Creek heap leach pad, the most conservative estimate of the 100 year return period maximum snowpack accumulation should be adopted. Given the long period of record available at Midnight Dome and the variability in data collected at and around the Brewery Creek site over the last six years (Table 3), it is recommended that the estimated 100 year return period snowpack for Midnight Dome of 258 mm of water equivalent be adopted for the Brewery Creek area.

4. Lake Evaporation

Pan evaporation data have been collected at Brewery Creek during the warm weather season for a total of 16 complete months between July 1997 and August 2000. The evaporation pan is located beside the overflow pond. The data are shown on Table 5. Also shown on the Table are monthly lake evaporation depths calculated for Brewery Creek using a pan coefficient of 0.70 and regional long-term average lake evaporation data reported for stations at Pelly Ranch (1964 to 1998) and at Whitehorse Airport (1974 to 1996). A comparison of average monthly temperatures at Brewery Creek and at Pelly Ranch shown on the Table indicates that average temperatures during the summer period are similar for the two stations.

Based on the data in Table 5, average lake evaporation at Brewery Creek was estimated using three methods as follows:

- Method "A" assumes that Brewery Creek lake evaporation is equal to Pelly Ranch lake evaporation, based on (1) the similarity of average summer temperatures, and, (2) the comparable measured total June to September lake evaporation at the two stations. The resulting estimated annual average lake evaporation at Brewery Creek would be about 450 mm;

- Method "B" assumes lake evaporation decreases at a rate of 10% per 350 m increase in elevation from Pelly Ranch at elevation 454 m to Brewery Creek at about elevation 850 m. This rate of decrease for evaporation with elevation has been suggested by the BC Ministry of Environment in the "Manual of Operational Hydrology" as being applicable to the interior of British Columbia. If this trend is assumed to be also applicable to Yukon, the resulting estimated annual average lake evaporation at Brewery Creek would be about 400 mm.
- Method "C" assumes that the pan evaporation data measured directly at the Brewery Creek site from 1997 to 2000 in conjunction with an assumed pan coefficient of 0.70 together provide sufficient site-specific data to estimate the long-term average lake evaporation at the site. The resulting estimated annual average lake evaporation at Brewery Creek would be about 390 mm

It is recommended that the lower value of 390 to 400 mm be conservatively adopted for average annual lake evaporation at Brewery Creek for the evaluation of water storage requirements for the heap leach pad. Make-up water requirements should be conservatively assessed using the higher value of about 450 mm.

5. Conclusions

The on-going collection of precipitation, snowsurvey and evaporation data at the Brewery Creek mine site has allowed key design parameters to be re-evaluated using actual site data and concurrent and long-term regional data. Key design parameters include: average annual total precipitation, the 100 year return period wet year total precipitation, the 100 year maximum snowpack, and average lake evaporation. Table 6 compares values estimated previously in the Water License (1995), values estimated in 1998, and currently-estimated values.

The Brewery Creek Mine site is drier than assumed in the Water License: annual precipitation is lower and lake evaporation is higher as shown on Table 6. The revised values should be used for the on-going evaluation of the heap water balance and determination of solution storage requirements. Data collection activities should be continued for all the parameters discussed herein and the data should be fully re-evaluated every year.

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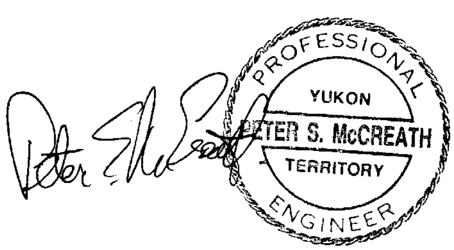

Peter S. McCreath P.Eng.

Table 1 - Monthly Total Precipitation - Brewery Creek Mine and Dawson Airport

Brewery Creek Mine - Total Precipitation (mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
1991						16.7	23.8	94.1	43.7				
1992													
1993										20.0	35.3	20.3	
1994									42.4	40.4	32.7	14.2	
1995	19.8	19.1	10.1	5.5	49.4	39.1	97.9	45.2	64.4	31.3			
1996	9.3	10.6	6.5	6.6	20.0	38.1	11.1	30.7	34.8	11.9	18.3	8.9	206.8
1997	9.5	3.6	4.1	8.3	24.2	62.0	36.6	52.9	43.3	30.6	13.0	25.4	313.5
1998	5.9	4.7	3.6	4.1	31.3	36.6	21.9	25.4	18.3	20.6	6.5	7.7	186.6
1999	16.0	10.1	10.1	18.9	39.0	40.8	44.3	54.4	7.7	50.2	16.0	31.9	339.4
2000	17.1	4.7	1.8	3.5	31.3	54.4	95.7	30.0					
Mean	12.9	8.8	6.0	7.8	32.5	41.1	47.3	47.5	36.4	29.3	20.3	18.1	308.1

Dawson A. - Total Precipitation (mm) - Common Months with Brewery Creek Mine

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
1991						21.8	56.6	71.8	49.6				
1992													
1993										13.9	34.8	15.5	
1994									24.0	43.4	27.8	8.2	
1995	11.4	13.2	11.8	5.8	61.4	20.2	64.8	35.4	41.2	27.2			
1996	8.3	14.6	8.2	7.0	11.5	28.6	10.7	41.0	31.8	30.4	18.0	20.0	230.1
1997	17.6	6.0	5.4	5.2	24.2	84.6	60.8	53.8	16.2	34.8	14.4	28.0	351.0
1998	11.7	4.0	0.0	0.2	42.4	53.4	16.0	25.8	21.8	7.1	8.3	16.0	206.7
1999	11.0	14.6	10.8	13.6	34.3	16.7	32.0	63.7	22.6		36.0	56.0	
2000	28.4	9.6	5.2										
Mean	14.7	10.3	6.9	6.4	34.8	37.6	40.2	48.6	29.6	26.1	23.2	24.0	302.3

Comparison of Mean Monthly Total Precipitation

Station	Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Brewery Creek	1991-00	12.9	8.8	6.0	7.8	32.5	41.1	47.3	47.5	36.4	29.3	20.3	18.1	308.1
Dawson A.	1991-00	14.7	10.3	6.9	6.4	34.8	37.6	40.2	48.6	29.6	26.1	23.2	24.0	302.3
Dawson A.	1976-00	19.5	12.8	11.0	8.0	28.7	39.4	46.3	43.2	34.0	30.1	26.9	22.5	322.6
Brewery Creek	**Average**	**19.9**	**13.1**	**11.2**	**8.2**	**29.3**	**40.2**	**47.2**	**44.1**	**34.7**	**30.7**	**27.4**	**22.9**	**328.8**

Average ratio (Brewery : Dawson) for Annual Total Precipitation = 1.0193

Table 2 - Annual Total Precipitation Frequency Analysis

Return Period (years)	Exceedance Probability	Annual Total Precipitation (mm)	
		Dawson A	Brewery Creek
2	50.0%	319	325
5	20.0%	375	382
10	10.0%	405	413
20	5.0%	431	439
50	2.0%	461	470
100	1.0%	482	491
200	0.5%	501	511
500	0.2%	525	535

Note - Brewery Creek Total Precipitation = 1.0193 times Dawson A. Total Precipitation.

Table 3 - Snowpack Survey Data - Brewery Creek Mine and Midnight Dome

					Snowpack Water Equivalent (mm water)				
Year	Station	Comment	Elev (m)	Note	Jan 1	Feb 1	March 1	April 1	May 1
1995	Brewery Creek	Natural Ground	775-830	1		78.5	87.6		
	Midnight Dome	DIAND natural ground	855	2			150	170	123
1996	Brewery Creek	Natural Ground	760-780	3		78.4		92.4	
	Midnight Dome	DIAND natural ground	855	2			91	109	101
1997	Brewery Creek	Natural Ground	740-850	4	90.3	102.3	104.3	107.6	
	Brewery Creek	Within leach pad area		5	94.6	69.1	97.5	105.4	
	Brewery Creek	All Data	740-850	6	80.7	87.7	96.8	102.8	
	Midnight Dome	DIAND natural ground	855	2			146	161	117
1998	Brewery Creek	Natural Ground	740-850	4	36.5	62.5	72.5	97.9	
	Brewery Creek	Leach pad slopes cells 1,2,4	800-820	7	71.9	54.3	74.2	28.9	
	Brewery Creek	Leach pad slopes cell 5	810-830	7	27.3	52.2	41.2	85.4	
	Brewery Creek	Leach pad top cells 3 & 4	820-840	7	34.2	24.3	39.6	9.2	
	Brewery Creek	Leach Pad weighted average	800-840	8	36.7	31.2	43.1	22.2	
	Brewery Creek	All Data	740-850	6	39.2	51.9	61.9	69.1	
	Midnight Dome	DIAND natural ground	855	2			129	119	92
1999	Brewery Creek	Natural Ground	740-850		40.6	41.8	80.4	86.9	
	Brewery Creek	Leach Pad Top (837 lift)	837	9	39.7	46.1	41.0		
	Brewery Creek	Leach Pad Slopes (cells1,2,5)	800-830	9	46.1	43.0	64.0	84.4	
	Brewery Creek	Leach Pad weighted average	800-840	9	42.0	45.0	49.3		
	Brewery Creek	All Data	740-850	6	42.7	42.9	66.2	88.6	
	Midnight Dome	DIAND natural ground	855	2			84	90	92
2000	Brewery Creek	Natural Ground	740-850		64.9	85.5	96.2	94.5	
	Brewery Creek	Leach Pad Top (830 lift)	830	9	8.5	46.7			
	Brewery Creek	Leach Pad Slopes (cells1,7)	800-830	9	141.6	181.2			
	Brewery Creek	Leach Pad weighted average	800-840	9	56.4	95.1			
	Brewery Creek	All Data	740-850	6	46.6	75.8	96.2	94.5	
	Midnight Dome	DIAND natural ground	855	2			187	197	195

Average Snowpack Water Equivalents (mm)

Years	Station	Comment	Elev	Note(s)	Jan 1	Feb 1	March 1	April 1	May 1
1995-00	Brewery Creek	Natural Ground	740-850		58.1	74.8	88.2	95.9	
	Brewery Creek	Within leach pad area	800-840		57.4	48.4	63.3	70.7	
	Brewery Creek	All Data	740-850		52.3	69.2	81.7	89.5	
	Midnight Dome	Common years with BCM	855				139.2	135.2	120.0
1975-00	Midnight Dome	All available years				96.0	128.6	148.6	121.8
Midnight Dome – Average (1995-2000) / (1975-2000)							108.2%	91.0%	98.5%
1995-00	**Ratios of (Brewery Creek to Midnight Dome)**								
		Natural Ground					63.4%	**70.9%**	
		Within leach pad area					45.5%	52.3%	
		All Data					58.7%	66.2%	

Notes for Table 3

1) 1995 BCM data includes sites at Canadian Zone, within leach pad and outside leach pad. No ore in place on heap. Averages for all sample points.
2) All Midnight Dome data reported by DIAND Water Resources. Feb. 1 data not collected since 1985
3) 1996 BCM data includes sites within and outside leach pad area. No ore on heap. Averages for all sample points.
4) 1997 and 1998 BCM data for “Natural Ground” include six locations surrounding leach pad.
5) 1997 BCM data “Within leach pad area” is area-weighted average, 6 to 9 sites per month covering active & inactive leaching areas. Total 1.9 Mt ore, 0.5 Mt under leach.
6) 1997 to 2000 BCM “All Data” reflects average of all individual sample points for all locations.
7) 1998 BCM data “Leach pad slopes cells 1, 2, 4” represents approx. 20,000 m^2 area on pad; “Leach pad slopes cell 5” represents approx. 31,000 m^2: and, “Leach pad top cells 3 & 4” represents approx. 161,000 m^2 on pad. Areas estimated by BCM personnel in the field. Total 3.9 Mt ore with 1.1 Mt under leach.
8) 1998 to 2000 BCM data “Leach pad weighted average” represents average SWE for entire leach pad area based on relative areas and SWE's.
9) For 1999 & 2000, "Leach Pad Top" estimated by BCM personnel as 64% of total area, "Leach Pad Slopes" equal to 36% of total area to estimate "Leach Pad Weighted Average" snow water equivalents (SWE).
10) Brewery Creek data shown for Jan 1, 2000 collected on Jan 14, 2000.

Table 4 - Maximum Annual Snowpack Frequency Analysis

Return Period (years)	Exceedance Probability	Midnight Dome Max. Snowpack	Dawson A. Precipitation (Note 1)	Brewery Creek Snowpack	
				Method A (Note 2)	Method B (Note 2)
1.050	95.2%	94	82	67	84
1.250	80.0%	120	99	85	101
2	50.0%	150	120	106	122
5	20.0%	185	148	131	151
10	10.0%	205	164	145	167
20	5.0%	223	178	158	181
50	2.0%	244	194	173	198
100	1.0%	258	206	183	210
200	0.5%	272	216	193	220
500	0.2%	290	229	206	233

Notes for Table 4

1) “Dawson A. Precipitation” corresponds to cumulative total precipitation from October 1 to March 31. Frequency analysis based on 1976 - 2000 data.
2) Potential maximum snowpack at Brewery Creek estimated as follows:
Method A: Brewery Creek snowpack = 0.709 times snowpack at Midnight Dome, or,
Method B: Brewery Creek snowpack = 1.0193 times total October to March precipitation at Dawson A,
or, Brewery Creek snowpack = Midnight Dome snowpack
3) All snowpacks and precipitation in millimetres of water equivalent.

Table 5 - Lake Evaporation

Monthly Pan Evaporation Data - Brewery Creek

	May	June	July	August	September	YEAR
1997			138.0	85.8	82.2	
1998		148.0	199.6	128.5	53.3	
1999	75.9	181.8	169.8	128.5	56.8	
2000	67.2	155.8	106.6	80.0		
Average	67.2	161.9	153.5	105.7	64.1	552.4

Calculated Monthly Lake Evaporation - Brewery Creek

(using pan coefficient of 0.70)

	May	June	July	August	September	YEAR
1997			96.6	60.1	57.5	
1998		103.6	139.7	90.0	37.3	
1999	53.1	127.3	118.9	90.0	39.8	
2000	47.0	109.1	74.6	56.0		
Average	50.1	113.3	107.5	74.0	44.9	389.5

Total June Through September = 339.7 mm

Regional Lake Evaporation – Long-Term Averages

	May	June	July	August	September	YEAR
Pelly Ranch (Elev. 454 m)	106.0	121.0	111.3	79.7	36.8	454.8
Whitehorse (Elev. 703 m)	106.4	127.0	114.5	96.2	50.3	494.4

Total June Through September = 348.8 mm

Temperatures (°C) - Brewery Creek Mine and Pelly Ranch

Station	Period	May	June	July	August	September	Average
Brewery Creek	1997-00	6.9	13.9	15.2	11.3	6.6	11.0
Pelly Ranch	Average	7.5	13.0	15.1	12.5	6.5	10.9

Estimated Average Lake Evaporation (mm) - Brewery Creek

	May	June	July	August	September	YEAR
Method A	105	120	110	80	35	450
Method B	94	107	99	71	32	403
Method C	50	113	107	74	45	390

- Method A assumes Brewery Creek lake evaporation is equal to Pelly Ranch lake evaporation.
- Method B decreases Pelly Ranch evaporation at 10% per 350 m elevation, factor of 0.887.
- Method C assumes Brewery Creek lake evaporation is equal to the estimated average lake evaporation 1997-2000 at Brewery Creek (calculated using pan coefficient of 0.70)

Table 6 - Comparison of Key Hydrological Design Parameters - Brewery Creek Mine

Parameter	Value reported in Water License *	Revised Value (Memo BCM1 ** November 1998)	Revised Value (Memo BCM3 November 2000)
Average Annual Total Precipitation	420 mm	329 mm	329 mm
100 Year Wet year Precipitation	610 mm	513 mm	491 mm
100 Year Maximum Snowpack	405 mm	229 mm	258 mm
Average Lake Evaporation	350 mm	400 mm	400 mm

References

***** Loki Gold Corporation (1995) – Brewery Creek Project Solution Management Plan, Appendix A, “Heap Leach Water Balance Sensitivity”, April 13, 1995.

** Clearwater Consultants Ltd. (1998) – "Brewery Creek Mine – Hydrology Review", Design Memorandum CCL-BCM1 prepared for Viceroy Minerals Corporation Brewery Creek Mine, November 13, 1998, File 013.03

APPENDIX B

WATER QUALITY DATA SUMMARY MEMO

ACCESS
CONSULTING GROUP

BREWERY CREEK MINE

2013 WATER QUALITY ASSESSMENT

February 2014

Prepared for:

GOLDEN PREDATOR CORP.

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1 INTRODUCTION

1.1 BACKGROUND

Mining activities were carried out at the Brewery Creek Mine over a five-year period between 1996 and 2000 by Loki Gold Corp. and Viceroy Resource Corp. Ore processing (9.5 million tonnes of ore) employed conventional heap leach technology on run of mine ore, commencing in November 1996. Brewery Creek originally operated under Water Use Licence (WUL) QZ94-003, issued in August 1995 and under Quartz Mining License (QML) A99-001 issued in June 1999. In July 1997 the mine began operating under WUL QZ96-007, created as a result of an amendment application to WUL QZ94-003. Brewery Creek ceased active mining operations in September of 2000 and no additional ore was added to the heap leach after this date. This cessation date was more than 2 years earlier than predicted in the planning and permitting stages, due primarily to depressed gold prices. Active cyanide leaching of the heap leach pad continued until December 2001. Detoxification of the heap leach was completed in the second and third quarters of 2002 with some release of detoxified waters over 2002 and 2003 and regular post closure monitoring. In March 2005 licences and permits were again transferred, from Viceroy to Alexco Resource Corp. (after Alexco purchased the property. (Access, 2010)

In 2011, Alexco applied for an amendment QZ11-035 to licence QZ96-007 with the aim of clarifying and unifying licence conditions to reflect the current post-closure phase of the mine, in anticipation of a transfer of ownership to Golden Predator Corp. In 2012 Golden Predator Corp. purchased the Brewery Creek property from Alexco with the intent of amending the Water Licence to re-open the mine site.

The subject of this report is an examination of the results of the 2013 water quality monitoring program carried out by Golden Predator at the Brewery Creek Mine pursuant to the licence conditions of WL QZ96-007. This report also includes an examination of additional baseline sampling conducted during 2013 in anticipation of the mine re-opening. The results and discussion herein include results of all sampling carried out over the course of the mine life, including a discussion of the 2013 data relative to historical conditions. The 2013 monitoring program reflects the current post-closure phase of the mine life.

The principal receiving creeks in the Brewery Creek Mine area are Lee Creek, Laura Creek, and Carolyn Creek which are tributaries of the South Klondike River. Three additional creeks are included in this assessment: Pacific Creek, Carolyn Creek, and Lucky Creek, the main tributaries to Lee, Laura and Golden Creeks, respectively (Figure 1-1).

Lee Creek and Pacific Creek both occur in the northwest portion of the Brewery Creek property. Lee Creek headwaters originate 46 kilometres north of the property and flow due south, converging with Pacific Creek east of the property, eventually flowing into the South Klondike River. Pacific Creek headwaters originate immediately north of the mine in two separate forks, which converge and flow southwest into Lee Creek.

Laura and Carolyn Creeks receive runoff from a total combined area of 30.5 km^2. Flow in the upper reaches of these creeks is seasonal, while Lower Laura Creek[1] flows year round with the exception of occasional freezing

[1] Lower Laura Creek refers to the portion of Laura Creek between stations BC-53 and BC-39

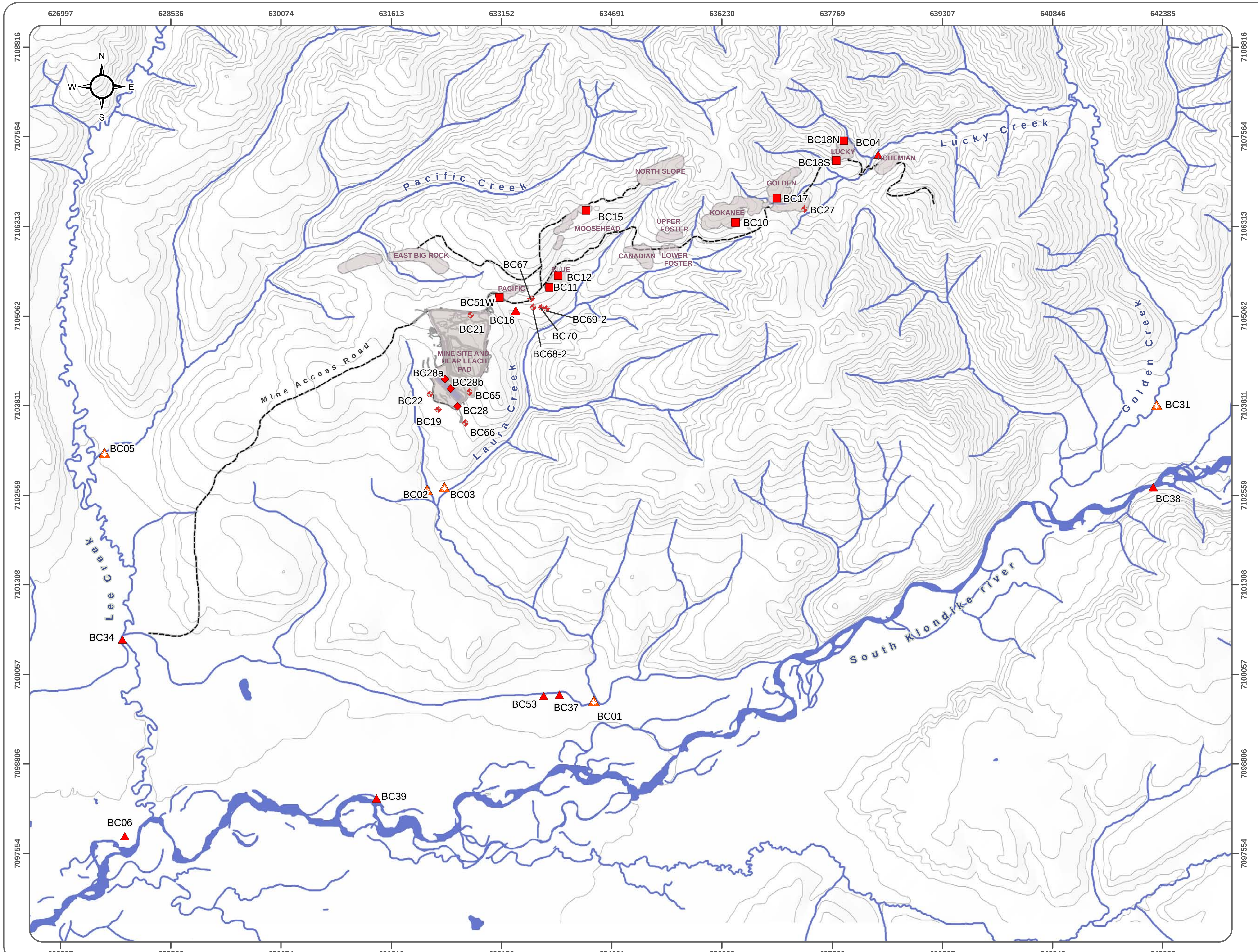
conditions in winter. Carolyn Creek joins Laura Creek roughly two kilometres from its headwaters, with both eventually flowing to the South Klondike River via a wetlands area in Lower Laura Creek.

Laura and Carolyn Creeks were the historical receivers for mine effluent deposited from the Brewery Creek heap leach pad both during mining activities and post-closure reclamation. The leach pad and ponds were situated within the boundary of the two watersheds, and a land application system was employed during post-closure drain-down of the heap over the watershed boundary separating the streams.

The historical workings consist of seven open pit areas (nine pits total), which influenced the receiving watersheds variously. The following pits were worked during the past phase of mining at Brewery Creek:

- Pacific
- Blue
- West Canadian
- Canadian
- Upper Fosters
- Lower Fosters
- Kokanee
- Golden
- Lucky

The majority of mining occurred in the Laura Creek drainage; the Pacific, Blue, Canadian, Fosters and Kokanee developments, as well as a significant portion of the Moosehead development and the heap leach facility are all located within the Carolyn and Laura Creek watersheds. The Golden and Lucky developments lie within the Lucky Creek watershed, while the Moosehead pit also lies partially within the Pacific Creek catchment.



BREWERY CREEK MINE

FIGURE 1-1 WATER QUALITY STATIONS

Monitoring Stations

- Groundwater
- Heap Effluent
- Surface Water Quality and Hydrometric
- Surface Pit/Dump Discharge
- Surface
- Mine Area
- Watercourse
- Waterbody

NAD 83 UTM Zone 7N

0 0.5 1 2 Kilometers

1:50,000 (when printed on 11 X 17 inch paper)

GOLDEN PREDATOR TSX: GPD

ACCESS

FEBRUARY 2014

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2 BREWERY CREEK MINE WATER QUALITY MONITORING PROGRAM

2.1 MONITORING PROGRAM

Environmental monitoring at Brewery Creek has transitioned to the post-closure phase, which involves twice-annual monitoring of water quality surveillance sites where conditions allow. These events are typically conducted during or shortly following freshet, in May or June, and again in September or October, during low-flow conditions. The amount of environmental monitoring has declined since closure of the heap has been accomplished and the drain down solutions treated. Environmental monitoring under QZ96-007 during the post-closure period has been reduced commensurate with the expected level of site activity. The current water quality monitoring schedule is presented in Appendix A.

During 2013, Golden Predator has continued a baseline program initiated in 2011 in anticipation of reopening the mine, concurrent with ongoing reclamation monitoring activities. The baseline program of sampling has thus been carried out in concert with sampling required under QZ96-007. The results of both programs are discussed in this report. Water quality sampling was performed as required by Schedule B of Water Licence QZ96-007, and results can be found in Appendix A to this memo.

2.2 EFFLUENT QUALITY STANDARDS AND WATER QUALITY GUIDELINES

Clause 46 of Water Licence QZ96-007 states that:

"Water quality at monitoring stations BC-31, BC-34 and BC-39 shall not exceed the water quality guidelines specified for the protection of aquatic life contained in the Canadian Environmental Quality Guidelines prepared by the Canadian Council of Ministers of Environment, as amended from time to time."

As such, for the receiving water quality data assessment, water quality parameters were screened against Canadian Water Quality Guidelines for Protection of Aquatic Life (CWQG; CCME 2012) (Table 2-1); however for antimony, the Provincial Water Quality Objective for Ontario (PWQO; OMOE 1994) was chosen as no CWQG exists.

Some water quality guidelines vary on the basis of water hardness (e.g., cadmium, copper, lead; CCME 2012). A water hardness of 251 mg/L (as CaCO3) was used to select the appropriate guideline in such cases, as this represented the mean hardness of the pooled reference station data. This value can be considered conservative since median water hardness observed at receiving environment stations were often greater than 300 mg/L where toxicity may be somewhat less relative to water with hardness of 251 mg/L.

Two guidelines have been derived for nitrate under the CCME Water Quality Guidelines for Protection of Aquatic Life based on the species measured; the guideline for ionic nitrate is 13 mg/L, while for nitrate as nitrogen it is 3 mg/L. For results obtained prior to 2006, information on the nitrogen species measured is not available; therefore the more conservative guideline of 3 mg/L has been used for comparisons.

In addition to the CCME guideline, Laura Creek at station BC-39 has an established site-specific selenium criterion of 0.0038 mg/L as defined as per Clause 38(d) of Water Licence QZ96-007. Furthermore, the Laura Creek AMP (2004) indicated the company would also use a site specific selenium water quality standard

(SSWQS) of 0.0038 mg/L at Laura Creek station BC-53. Therefore, this report includes the use of the SSWQS guideline for comparison on the Laura Creek and Carolyn Creek watersheds.

Table 2-1 Relevant Canadian Water Quality Guidelines and Provincial Water Quality Objectives (Ontario) Used in the Assessment

Parameter	Units	Guideline	
		Source	Value (mg/L)
Antimony	mg/L	PWQO	0.02
Arsenic	mg/L	CWQG	0.005
Copper[a]	mg/L	CWQG	0.003
Lead[a]	mg/L	CWQG	0.007
Nitrate Nitrogen	mg/L	CWQG	3
Selenium	mg/L	CWQG/SSWQS	0.001/0.0038
Zinc	mg/L	CWQG	0.03
Total Suspended Solids	mg/L	n/a	n/a

a. Hardness-dependent; mean reference station hardness of 251mg/L used

For the receiving environment water quality assessment, a reference condition has also been established using pooled reference data for the Brewery Creek region collected between 2008 and 2012. These values reflect the upper limit on the range of variability in the region and can be used together with CCME guidelines and Water Licence standards, or where guidelines and standards are not available or appropriate. These reference guidelines are used in this report for comparison and assessment of the Lee Creek and Golden Creek watersheds. It has been determined that these reference conditions are not appropriate for use in the Laura Creek watershed, where reference data were not available for use in developing the reference condition.

For effluent and groundwater monitoring stations relating to heap effluent discharge via direct discharge and groundwater infiltration, water quality results were screened against the effluent quality standards established in Clause 42, 43 and 44 of WL QZ96-007 (Table 2-2). **Clause 42 and 44 of the licence refer to standards for heap discharges either via land application or directly to surface water. Clause 43 refers to standards for groundwater stations immediately down gradient of the heap.**

Table 2-2 Effluent Quality Standards (mg/L), Water License QZ96-007

Parameter	Maximum Concentration (mg/L)		
	Clause 42	Clause 43	Clause 44
WAD Cyanide	0.25	0.125	0.25
Total Cyanide	2.0	1.0	2.0
Ammonia (as N)	15.0	7.5	5.0
Copper	0.5	0.1	0.2
Arsenic	0.5	0.25	0.5
Antimony	1.0	0.5	1.0
Mercury	0.005	0.0025	0.005
Zinc	0.5	0.25	0.5

Parameter	Maximum Concentration (mg/L)		
	Clause 42	Clause 43	Clause 44
Selenium	0.75	0.3	0.25
Lead	0.2	0.1	0.2
Aluminum	1.0	3.0	1.0
Bismuth	0.5	0.25	0.5
Cadmium	0.1	0.05	0.1
Chromium	0.5	0.25	0.5
Iron	1.0	5.0	1.0
Manganese	2.0	6.0	2.0
Molybdenum	0.5	0.25	0.5
Nickel	0.8	0.25	0.5
Silver	0.1	0.05	0.1
pH	-	-	6.0 to 9.5
Suspended Solids	-	-	50

3 WATER QUALITY

3.1 RECEIVING ENVIRONMENT WATER QUALITY CONDITIONS

The following sections address the three main watersheds and tributaries in the project area, which are assessed on the basis of a few metrics via different methods. First, where relevant, a comment on the quality of the data is made with respect to both MDLs and the occurrence of zero values in the dataset for selected parameters. Second, the data is assessed in relation to the benchmark concentrations selected for this assessment (CCME/PWQO and reference). Third and lastly, summary statistics and trends in the data are discussed, with a focus on the 2013 data in relation to historical results. At the end of each watershed chapter, the discussion expands to identify issues more broadly associated with each watershed on the whole, and summary remarks are made.

3.1.1 Lucky and Golden Creeks

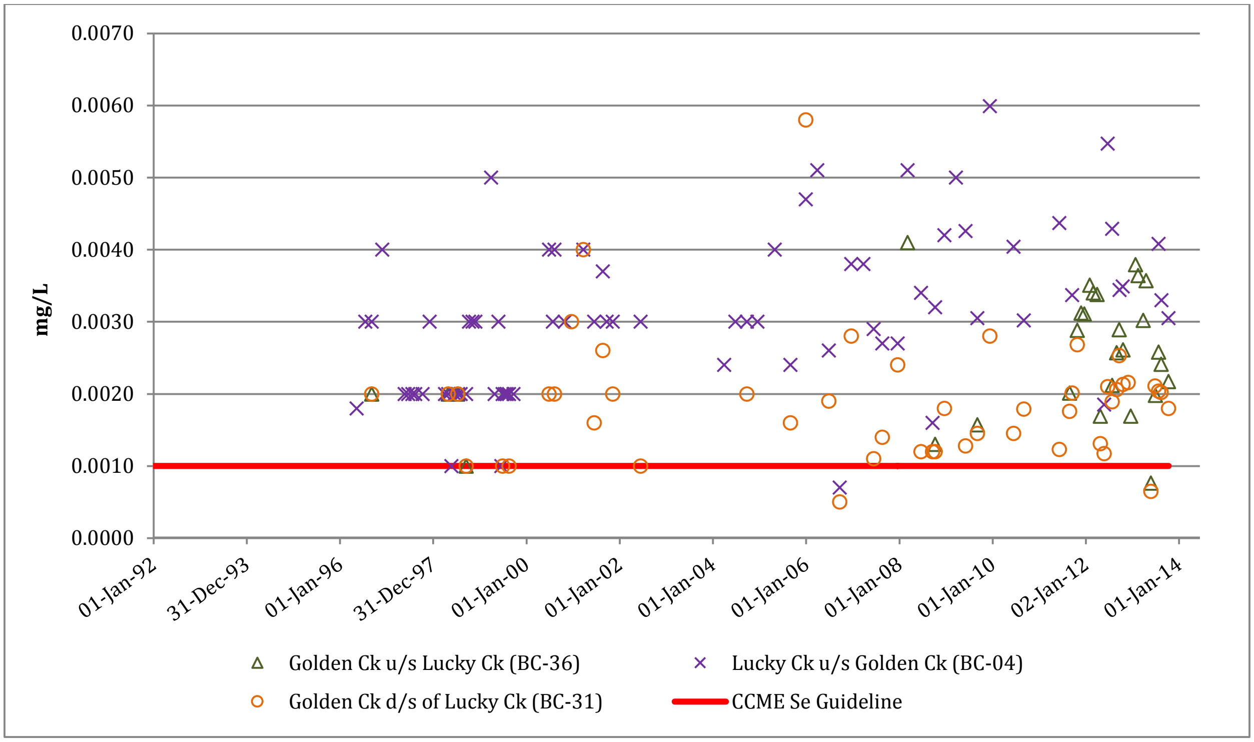
A total of three stations have been established on Lucky and Golden Creek watersheds to determine and assess water quality characteristics (Table 3-1). One of these is located on Lucky Creek below all mine related developments, and thus reflects the cumulative impact of all mining activities on that stream. Two stations are located on Golden Creek, one upstream of the confluence with Lucky Creek, and the other downstream of it. Monitoring at BC-31 began in 1991, before the commencement of mining, while monitoring at BC-04 began in 1995, shortly before mining commenced. BC-36 has been monitored periodically, beginning in 1996 for a year, and resuming again in mid-2007 until the present.

Table 3-1 Water Quality Monitoring Stations on Lucky and Golden Creeks

Stations on Lucky and Golden Creeks		Included in Assessment
BC-36	Golden Creek upstream of Lucky Creek	Yes
BC-31	Golden Creek downstream of Lucky Creek	Yes
BC-04	Lucky Creek d/s from Lucky Pit	Yes

3.1.1.1 Observations: Selenium

Selenium concentrations were shown to exceed the CCME guideline in all samples and at all sites on Lucky and Golden Creeks in 2013, except for one occurrence in May where selenium levels were below the guideline at BC-31 and BC-36 (BC-04 was not sampled during this event). Data collected during monitoring prior to 2004 is confounded by the presence of high MDLs, although this has been resolved with lower detection limits in recent years, and it can be confirmed that both background and receiving waters are in excess of the CCME guideline in this watershed. Trends for selenium show no change over the last decade, as shown on Figure 3-1.



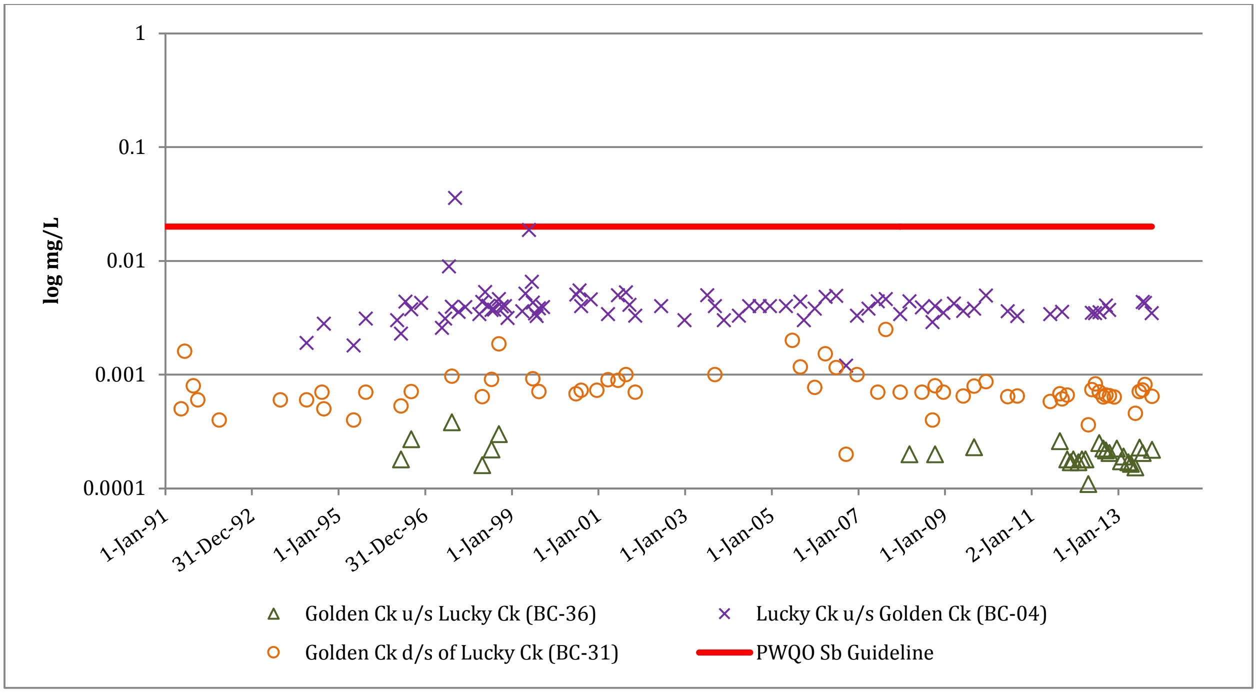
Note: Results that are below MDL are not shown on this figure

Figure 3-1 Selenium Concentrations, 1992 – 2013, Lucky and Golden Creeks

3.1.1.2 Observations: Antimony

Antimony concentrations at the background station on Golden Creek (BC-36) are statistically significantly lower than at the downstream receiving environment station (BC-31) (Figure 3-2). Concentrations of antimony are much higher in Lucky Creek (mean background concentration at BC-36 is 1/20 of the concentration at BC-04 – note the logarithmic scale on the y-axis), suggesting that Lucky Creek is likely the primary source of antimony entering Golden Creek.

Antimony results at BC-31 have remained relatively constant throughout the pre-mining, mining, and decommissioning and reclamation phases of the mine life, indicating that antimony concentrations may not have been impacted greatly by mining activities. Moreover, concentrations remain well below the Ontario PWQO for antimony, and as such it poses little threat to the receiving environment in either Golden or Lucky Creeks.

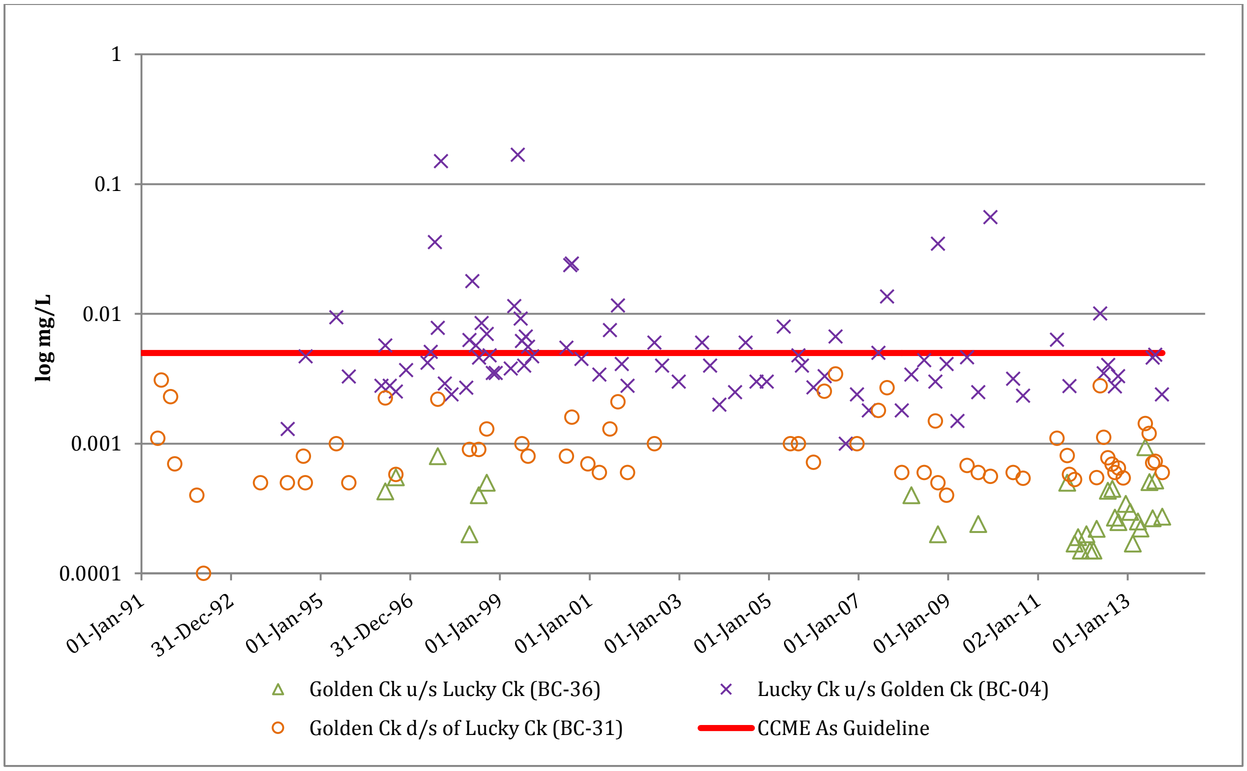


Note: Results that are below MDL are not shown on this figure

Figure 3-2 Total Antimony Concentrations, 1991 – 2013, Lucky and Golden Creeks

3.1.1.3 Observations: Arsenic

Arsenic concentrations in Golden and Lucky Creek exhibit a similar pattern to antimony in that it appears as though Lucky Creek is the primary source of arsenic to Golden Creek (Figure 3-3 - again, note the logarithmic scale). Here too arsenic concentrations are constant during all three mine phases, indicating a high background concentration as the result of the region's natural mineralization. Results at BC-04 are at or near the CCME guideline, exceeding the guideline in roughly 37% of samples.



Note: Results that are below MDL are not shown on this figure

Figure 3-3 Total Arsenic Concentrations, 1991 – 2013, Lucky and Golden Creeks

3.1.1.4 Conditions during Decommissioning and Reclamation

Water quality data collected in the Lucky and Golden Creek watershed show no increasing or decreasing trend for the major parameters assessed in this report, or those regulated under QZ96-007. Data for all parameters assessed are generally at or below CCME guidelines with the exception of selenium, which appears to occur in naturally elevated concentrations in this region.

Additional parameters zinc, copper, lead, total suspended solids and nitrate are presented graphically in Appendix B for Lucky and Golden Creeks.

3.1.2 Lee and Pacific Creeks

Five water quality monitoring stations have been established on the two creeks; two on Lee Creek and three on Pacific Creek (Table 3-2). Each creek contains one reference, and at least one receiving environment station. The reference stations were used in establishing the reference benchmark for the watershed, while the receiving stations will be assessed here relative to those benchmarks.

Table 3-2 Water Quality Monitoring Stations on Pacific and Lee Creeks

Stations on Pacific Creek and Lee Creek		Included in Assessment
BC-35R	Pacific Creek Reference Station	Yes
BC-33	Lee Creek Reference Station	Yes
BC-35	Pacific Creek below Leach Pad	No
BC-05	Pacific Creek before confluence w/ Lee Creek	Yes
BC-34	Lee Creek below confluence w/ Pacific Creek	Yes

Station BC-35 on Pacific Creek is impacted by previous developments in the northern region of the property, including the Moosehead pit; however, station BC-05 is better situated to represent the cumulative downstream impacts of mining on this Creek. Additionally, data is not available for BC-35 earlier than 2008, which limits the usefulness of this station for background information. As such, BC-35 was not used or considered in this assessment.

In August 2011, a new reference station was established on the north branch Pacific Creek as a result of a lack of available background data for this stream. Data collected at this station was used in establishing the reference conditions referred to in Section 2.

3.1.2.1 Observations: Selenium

The interpretation of selenium results obtained on Lee and Pacific Creeks are confounded by the occurrence of high MDLs for the entire dataset, and zero values on some early dates prior to mining. The typical MDL observed was 0.001 mg/L, which precludes an interpretation of the data with respect to the CCME guideline (also 0.001mg/L). Although it is known that these values are below the CCME guideline of 0.001mg/L, it is not known to what degree. In addition, among all other results only two show values higher than a practical quantitative limit set at 3X the MDL. These results can be seen in Figure 3-4 as a flat line in the data series prior to 2002, and vary after that date. In the presence of high MDLs and lacking additional information, it is unclear at what rate selenium results exceed the CCME guideline, or to what degree they are below.

Despite these challenges, the pooled reference dataset for 2008 – 2012 provided insight into background conditions for the watershed. Selenium turned out to be one of two parameters (the other being copper) for which the reference condition was higher than the CCME guideline, and therefore a more appropriate benchmark for comparison.

Of all observations, only two were higher than the reference condition (Figure 3-4), leading to a low rate of results exceeding the benchmark. Also notable was the low variability in selenium concentrations over the entire record; results were generally at or near the MDL for all samples collected. None of the results obtained in 2013 exceeded the background condition in the downstream receiver on Lee Creek (BC-34), although all of the results were in excess of the CCME guideline (Figure 3-4).

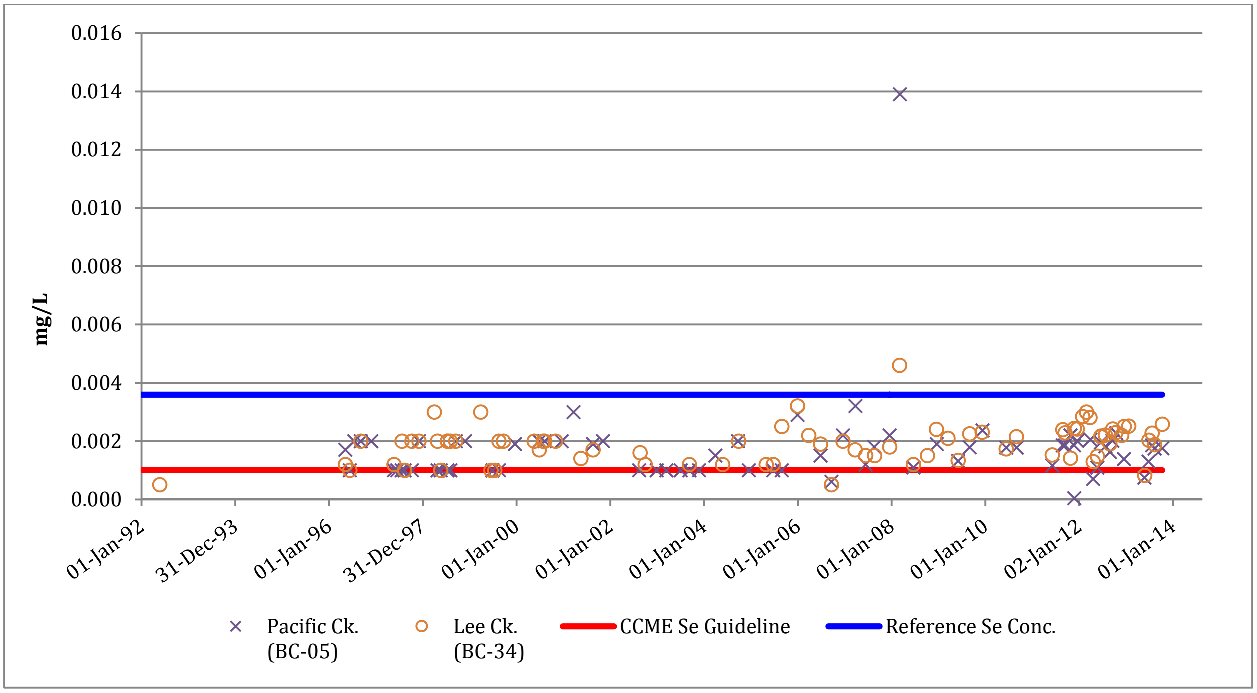


Figure 3-4 Total Selenium Concentrations, 1991 – 2013, Pacific and Lee Creeks

3.1.2.2 Observations: Antimony

Antimony results were not generally problematic with respect to high MDLs, except over one period at each station (BC-34: mid-2002 through mid-2005; BC-05: 2002 through mid-2005). In these cases, MDLs were higher than the reference concentration, but lower than the CCME guideline. Overall concentrations showed little variability from the 0.0003 mg/L reference benchmark, or between non-mining, mining, and D/R periods (Figure 3-5). The mean at both station BC-05 (Pacific Creek receiver) and BC-34 (Lee Creek receiver) was less than the CCME guideline by two orders of magnitude.

Notably, in Pacific Creek, antimony exhibited consistently higher results at the downstream receiver station than the reference benchmark, including during pre-mining (Figure 3-5). None of the results obtained in 2013 exceeded the Ontario PWQO for antimony in the downstream receiver on Lee Creek (BC-34).

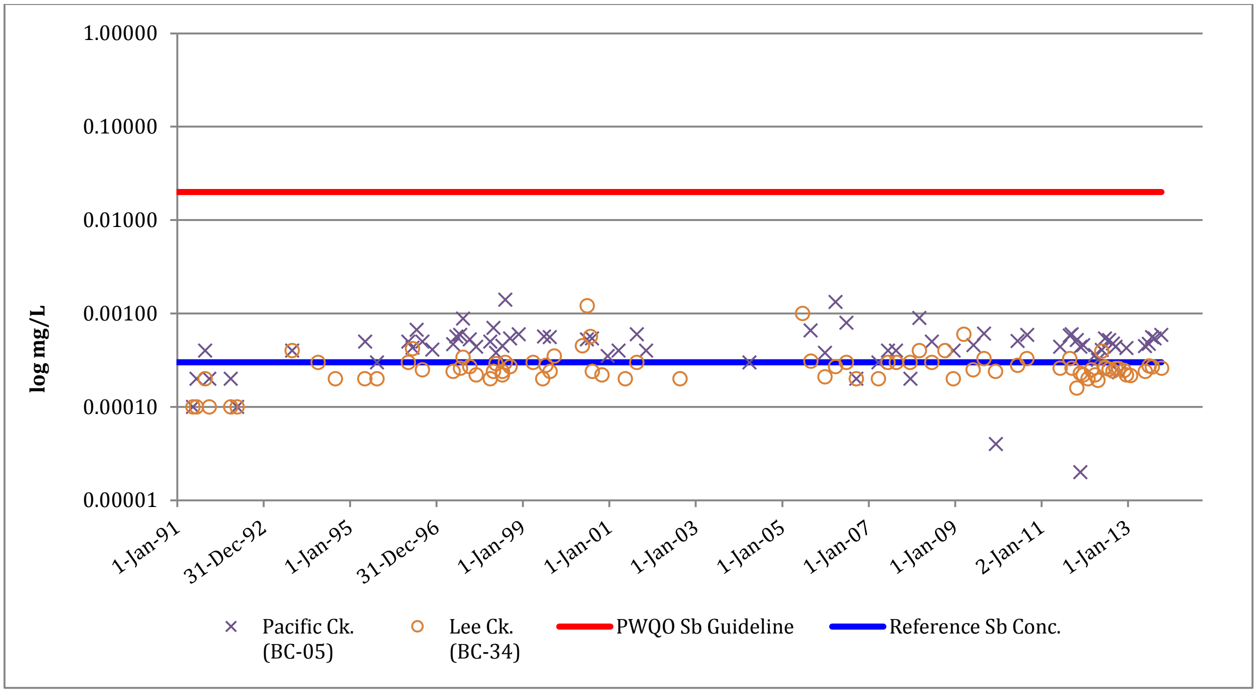


Figure 3-5 Total Antimony Concentrations, 1991 – 2013, Pacific and Lee Creeks

3.1.2.3 Observations: Arsenic

Arsenic exceeded background in >10% of samples in Pacific Creek during the mining and decommissioning and reclamation phases, and in Lee Creek during the decommissioning phase. It did not exceed reference in Pacific Creek on any occasions prior to mining. It was also primarily below reference in Lee Creek prior to mining, with rare exception (Figure 3-6). None of the results obtained in 2013 exceeded the CCME guideline for arsenic in the downstream receiver on Lee Creek (BC-34).

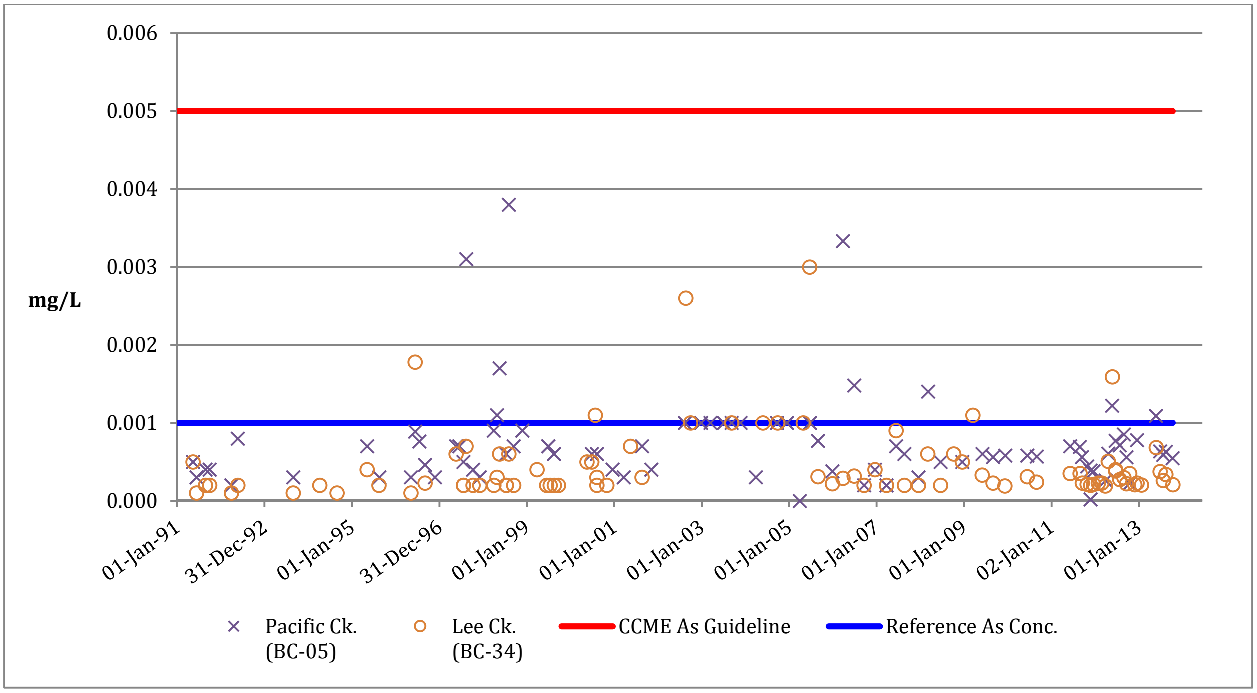


Figure 3-6 Total Arsenic Concentrations, 1991 – 2013, Pacific and Lee Creeks

3.1.2.4 Observations: Zinc, Copper and Lead

In Lee Creek, it was noted that zinc, copper and lead occasionally (>10% of the time) exceeded reference conditions. Zinc and copper (not lead) also occasionally (>10% of the time) exceeded the CCME guideline. However, these elements do not generally pose a threat in Lee Creek, as higher-than-reference concentrations occurred both prior to and after production activities began in 1996.

In Pacific Creek, lead exceeded the reference condition >10% of the time during pre-mining and mining conditions, but not during decommissioning and reclamation. Copper was found to exceed reference >10% of the time only during pre-mining conditions.

The pre-mine variability of zinc, copper and lead in Lee Creek, and of copper and lead in Pacific Creek above the reference condition indicate that these elements do not pose a risk to these watersheds as a result of mining. Moreover, the reference condition for both zinc and lead is *below* CCME guidelines.[2]

In 2013, copper exhibited concentrations in excess of the CCME guideline during two of the five sampling events (May and August) in the downstream receiver on Lee Creek (BC-34). Lead and zinc concentrations were all below their respective CCME guidelines.

[2] *The CCME guideline for copper and the reference condition are roughly equal.*

3.1.2.5 Observations: Nitrate (as Nitrogen)

Nitrate concentrations in Lee and Pacific Creeks were well below the CCME guideline (Figure 3-7) during pre-mine, mining and decommissioning and reclamation phases.

In 2004, a fire occurred at the Brewery Creek Mine primarily within the Laura and Carolyn Creek watersheds, but also affected the Lee and Pacific Creek watersheds to a lesser extent. Fire-caused changes in nutrient availability can have enormous effects on the downstream environment; in particular, fires have a great influence on nitrate nitrogen, as the availability of this nutrient increases following forest fires. The post-fire flush of inorganic nitrogen is not solely due to the physical breakdown of plant and animal tissues by fire; it is also a function of the enhanced activity of microbes in the warmer and more alkaline soil of a recently-burned forest.

Nitrate results in Pacific Creek, and to a lesser extent in Lee Creek, showed a minor spike in the years after the fire. Increased nutrient availability may be responsible for the high values observed in Pacific Creek in 2007 and 2008, and may be responsible for the uptick in overall concentrations of nitrate on Lee Creek (Figure 3-7). None of the results obtained in 2013 exceeded the CCME guideline for nitrate in the downstream receiver on Lee Creek (BC-34).

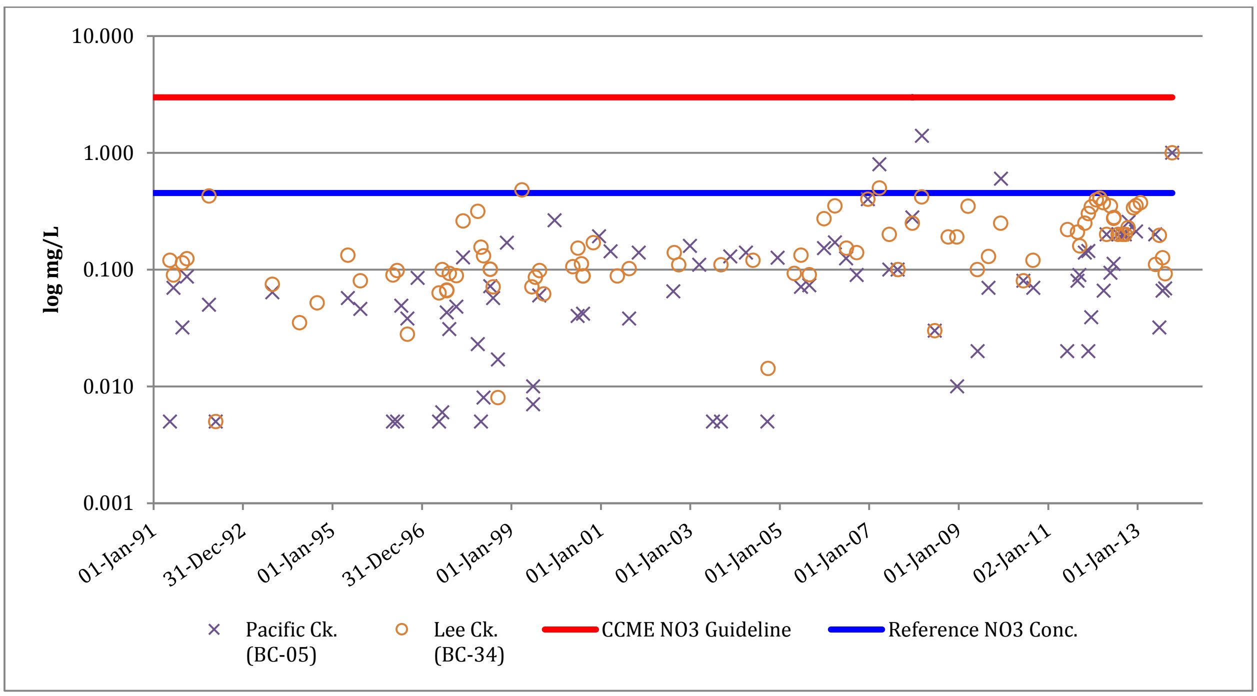


Figure 3-7 Nitrate as Nitrogen Concentrations, 1991 – 2013, Pacific and Lee Creeks

3.1.2.6 Conditions during Production and Decommissioning and Reclamation

Only one notable increase in metals content was noted in Pacific and Lee Creeks over the course of the mine life. Pacific Creek saw levels of arsenic above reference during mining and decommissioning and reclamation (>10% of samples), indicating that mining may have had an impact on arsenic concentrations. However, all arsenic samples obtained over the course of the mine life were well below the CCME guideline. Pacific Creek saw high levels of antimony (>50% exceeding reference) during all periods, indicating that the reference condition may not appropriately characterize antimony at this station. In Lee Creek, antimony, zinc, copper and lead concentrations were observed to exceed reference >10% of the time in all samples; however, this was found to be true during pre-mining conditions, and was not particular to mining or decommissioning and reclamation. Nitrate nitrogen exhibited values above the reference condition (but not CCME) in the years following the 2004 forest fire at Brewery Creek, indicating that the fire had a measurable effect on this parameter, and could also be influencing the results of other parameters.

The results of this study indicate that none of the parameters investigated in Lee Creek or Pacific Creek occur at concentrations which would lead to a designation as a contaminant of concern. In general, concentrations are below CCME guidelines and in cases where they exceed CCME, such variability is observed even during pre-mining conditions, indicating that mining activities have not had an adverse impact on receiving water quality. Moreover, observed concentrations were not elevated during either mining or decommissioning and reclamation relative to reference concentrations, with the exception of arsenic on Pacific Creek, leading to the conclusion that the impact to the Pacific Creek and Lee Creek receiving environments is negligible even relative to background (which is generally lower than CCME). Only arsenic in Pacific Creek was observed to have increased above reference.

No notable changes in water quality were observed in Pacific and Lee Creeks during 2013. In general, results were below CCME guidelines with the exception of selenium, a parameter that has not been observed at concentrations lower than CCME at any point in the mine's history.

3.1.3 Laura and Carolyn Creeks

Seven stations have been established on Laura and Carolyn Creek watersheds (Table 3-3). Six of these are located on Laura Creek, and one on Carolyn Creek. Monitoring of stations BC-01, BC-02 and BC-03 began in 1991, before the commencement of mining. As a result of impacts observed in the Lower portion of Laura Creek during mining and at the start of decommissioning and reclamation, a program was established to assess water quality in the Lower Laura Creek system. This program used additional stations established in the lower portion of the creek, including BC-37, BC-53 and BC-39 (Table 3-3). Only BC-39 has been analyzed in this assessment.

Table 3-3 Water Quality Monitoring Stations on Carolyn and Laura Creeks

Stations on Carolyn Creek and Laura Creek		Included in Assessment
BC-32	Laura Creek below Exploration Camp	No
BC-03	Laura Creek above confluence w/ Carolyn Creek	Yes
BC-01	Laura Creek 50m u/s Ditch Road	Yes

Stations on Carolyn Creek and Laura Creek		Included in Assessment
BC-37	Laura Creek @ Ditch Road	No
BC-53	Laura Creek 50m d/s Ditch Road	No
BC-39	Laura Creek in the side channel of South Klondike River	Yes
BC-02	Carolyn Creek before confluence with Laura Creek	Yes

3.1.3.1 Observations: Selenium

High MDLs for selenium complicated analysis of results obtained on Laura and Carolyn Creeks (as was the case for Lee and Pacific Creeks), especially prior to mining. However, higher results (>MDL) observed in Carolyn Creek after 2003 allowed analysis of selenium at least on that stream (Figure 3-8). On Laura Creek however, results were often at or near the detection limit, making interpretation of the results difficult.

Another factor related to the MDL that influenced interpretation of water quality was that the SSWQS established during the previous 1996 water licencing process was only slightly less than 4 times the typical MDL. A Practical Quantitative Limit (PQL) of 5 times the MDL is considered prudent in assessing water quality results, although a PQL of 3 times the MDL is sometimes used.

Carolyn Creek saw the greatest increase in selenium concentrations over the study period, reaching over 0.03 mg/L in August 2004, and nearly as high on several other occasions between 2005 and 2008, at which point concentrations decreased. During the decommissioning and reclamation phase at Brewery Creek, Carolyn Creek exceeded the SSWQO for selenium in 48% of samples, compared with only 6% during mining, and 14% prior to mining.

During the period between 2005 and 2008, upstream concentrations of selenium on Laura Creek were occasionally higher than the SSWQO, reaching 0.006 mg/L on one occasion at BC-01. These results drove values up in the downstream reaches of Laura Creek at BC-39 as well. In June 2007 during the spring freshet, BC-39 reached as high as the site-specific standard of 0.0038 mg/L. These higher concentrations however have abated more recently (since 2008).

Despite an observed increase in selenium concentrations on Laura Creek, results were rarely in excess of the SSWQO, and in no cases exceeded the standard >10% of the time at any station on Laura Creek (BC-01, BC-03 and BC-39). Nonetheless, selenium is regarded as a contaminant of concern within the Carolyn and Laura Creek watershed as a result of the observed high concentrations of selenium in Carolyn Creek relative to background conditions, and the earlier need to establish an SSWQO for this area.

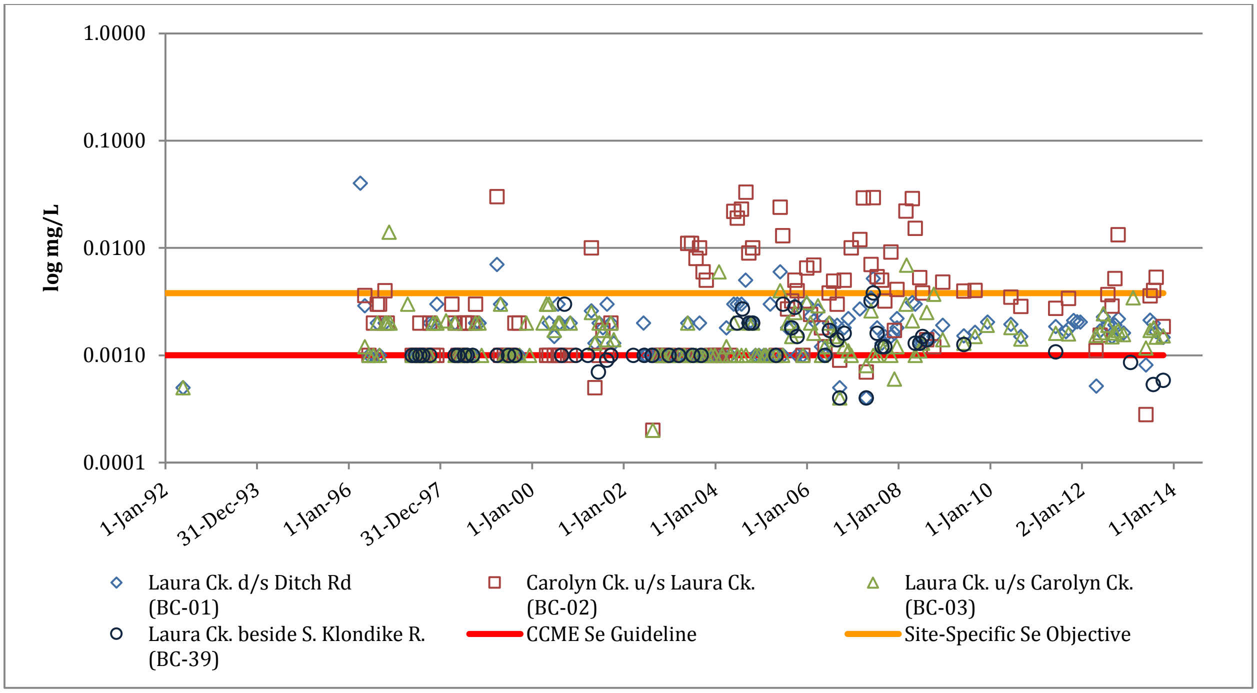


Figure 3-8 Total Selenium Concentrations, 1991 – 2013, Laura and Carolyn Creeks

3.1.3.2 Observations: Arsenic

Arsenic results were not affected by high MDLs. The results show that arsenic concentrations rose in the Laura and Carolyn Creek watersheds primarily *after* the start of mining; however, the limited background dataset for these sites makes comparison with background benchmarks tenuous[3].

Arsenic concentrations did not show a specific trend for any sites, but did exceed the CCME guideline in many of the samples at all four stations analyzed (Figure 3-9). At BC-01, arsenic exceeded the CCME guideline in >50% of results during production and decommissioning and reclamation, but only exceeded CCME 20% of the time prior to mining. At BC-02 and BC-03, arsenic was in excess of CCME >10% of the time both during production and decommissioning and reclamation, and exceeded CCME more commonly during mining and D/R than it did prior to mining. Even at BC-39, which is a compliance point with respect to CCME guidelines, arsenic exceeded the guideline 5% of the time during mining, and 13% of the time during decommissioning and reclamation.

Arsenic is considered a contaminant of concern in the Laura Creek and Carolyn Creek watersheds as a result of the increases observed during the past mining and decommissioning and reclamation phases.

[3] A pooled reference dataset may produce a more robust background benchmark for the Laura Creek watershed.

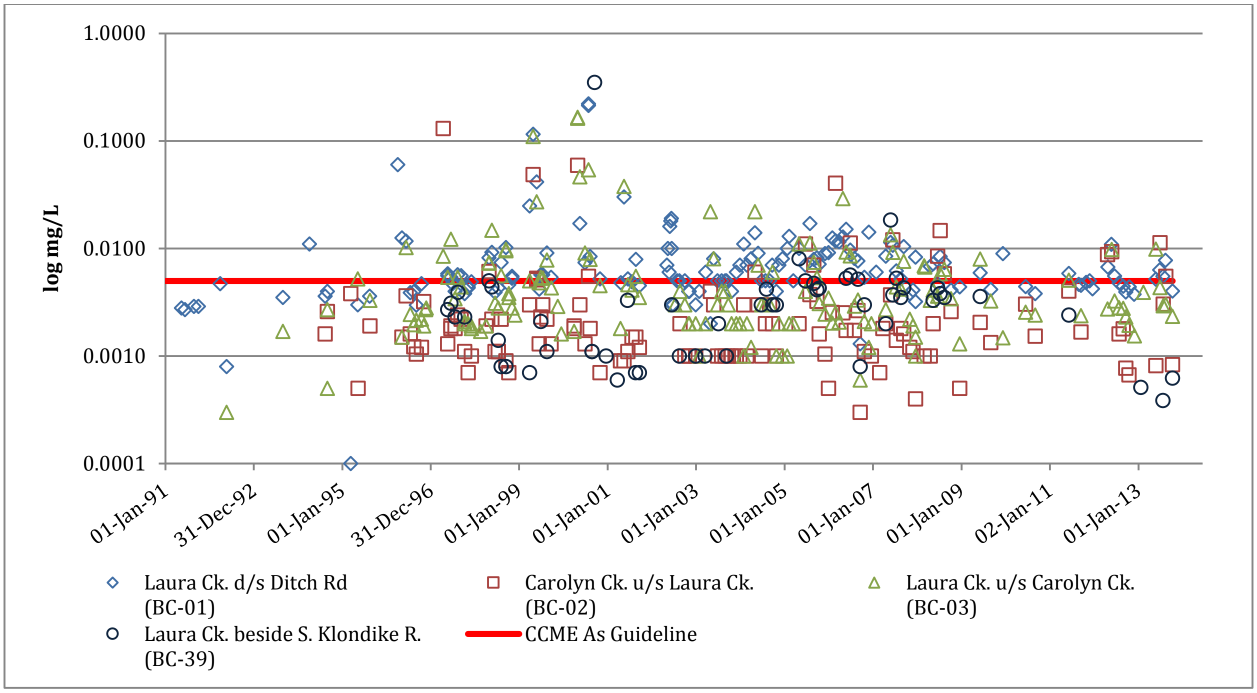


Figure 3-9 Total Arsenic Concentrations, 1991 – 2013, Laura and Carolyn Creeks

3.1.3.3 Observations: Zinc

Like arsenic, the zinc dataset was not impacted by high MDLs and zero values. Relative to the arsenic time series for these sites, zinc exceeded CCME with significantly lower frequency. At no site and during no period did zinc exceed the guideline in >50% of samples, although the guideline was exceeded >10% of the time in Laura Creek at station BC-03 during mining, and at Carolyn Creek during decommissioning and reclamation.

Although zinc values spiked somewhat during production, Figure 3-10 shows a bimodal distribution where zinc again peaks after 2005. The June 2004 fire in the Carolyn and Laura Creek watersheds may have increased the availability of soils containing some zinc for erosion into river waters. In the absence of dissolved zinc concentrations with which to compare the total zinc results, this concept cannot be confirmed or denied.

The zinc results do not indicate that zinc is, or has become as a result of mining, a problem in the Laura Creek/Carolyn Creek watershed.

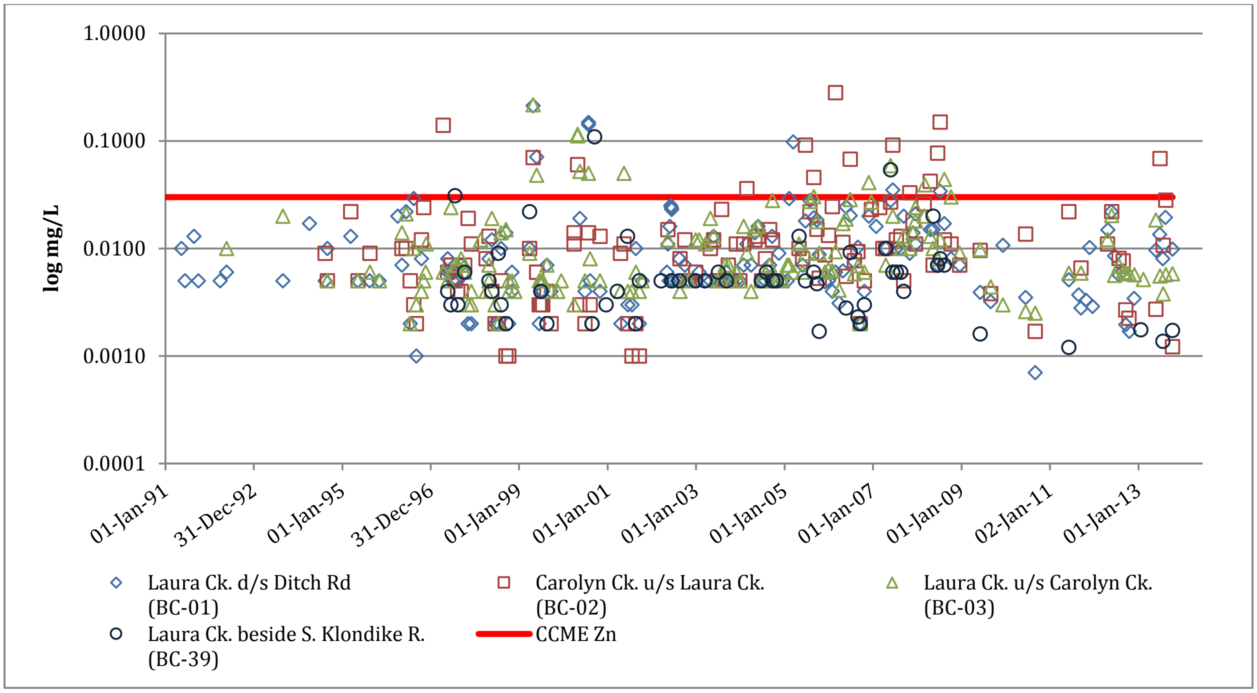


Figure 3-10 Total Zinc Concentrations, 1991 – 2013, Laura and Carolyn Creeks

3.1.3.4 Observations: Copper

Copper results show variation about the CCME guideline, but do not exhibit any specific trend (Figure 3-11). All upstream stations (BC-01, BC-02 and BC-03) show copper results exceeding the CCME guideline >10% of the time during all phases (pre-mine, production, and decommissioning and reclamation).

Results indicate that copper is has not become a concern in the Laura Creek watershed as a result of mining.

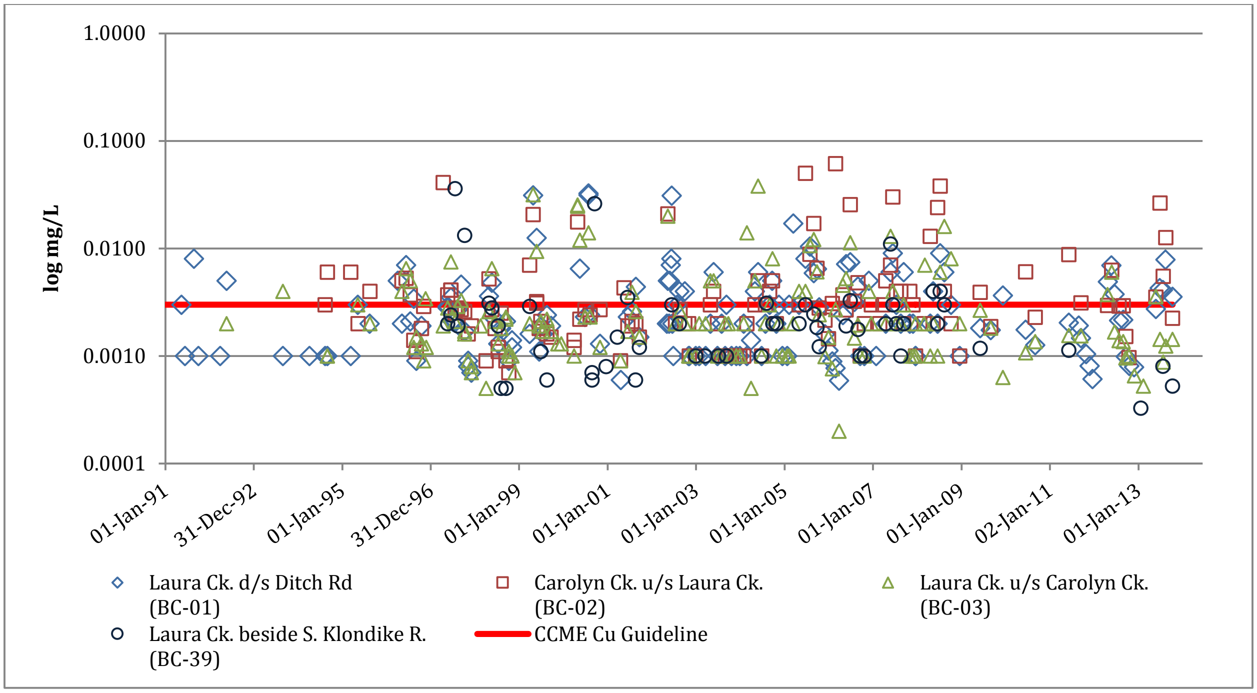


Figure 3-11 Total Copper Concentrations, 1991 – 2013, Laura and Carolyn Creeks

3.1.3.5 Observations: Antimony and Lead

Antimony and lead were notable in that they did not exceed Ontario PWQG (Sb) or CCME guideline (Pb) at any station during any phase in a significant way (<10% exceed rate).

3.1.3.6 Observations: Total Suspended Solids

Results for total suspended solids (TSS) require a closer examination because this parameter often exhibits a seasonal pattern during high and low flow periods. On Figure 3-12, all points occurring over the reference TSS value[4] of 33 mg/L occurred during the summer months, especially during May and June, at the spring freshet.

[4] *The reference TSS value for this dataset is a simple pooled mean calculation of all available data for Laura and Carolyn Creeks.*

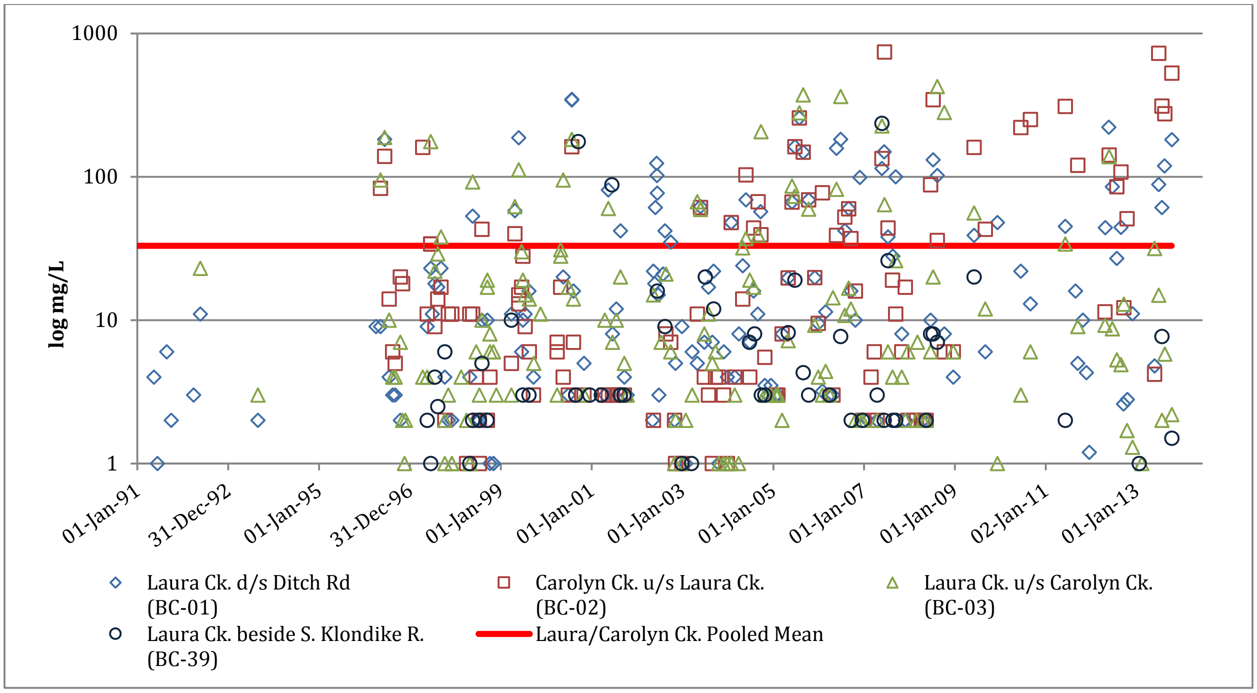


Figure 3-12 Total Suspended Solids Concentrations, 1991 – 2012, Laura and Carolyn Creeks

3.1.3.7 Observations: Nitrate

As mentioned in Section 3.1.2.5, in 2004 a fire occurred at the Brewery Creek Mine within the Laura and Carolyn Creek watersheds which likely had an impact on the amount of nitrate observed here. Perhaps more significant, however, was the release of detoxified heap solution in 2002 and 2003 to the Laura Creek watershed. These releases and later free-draining of the heap would have resulted in an increase in nitrate availability to the Carolyn and Laura Creek systems. Figure 3-13 shows just such an increase in Carolyn Creek, beginning in September 2002.

In 2002, the Laura and Carolyn Creek watersheds also saw the implementation of an evapo-transpirative cover over the Blue Waste Rock Storage Area and Heap Leach Pad, as a part of the decommissioning and closure effort. These covers require the application of fertilizers to facilitate plant growth. Fertilizers can have a profound impact on surface waters as nutrients dissolve into runoff and are carried into the downstream environment, and could be a source of nitrates here.

Nitrate concentrations rose starkly in Laura and Carolyn Creeks in the years following release of detoxified heap solution, implementation of the waste rock and heap leach covers, and the forest fire. Figure 3-13 shows that these watersheds are still absorbing the effects of increased nitrogen inputs, as evidenced by sustained high nitrate concentrations.

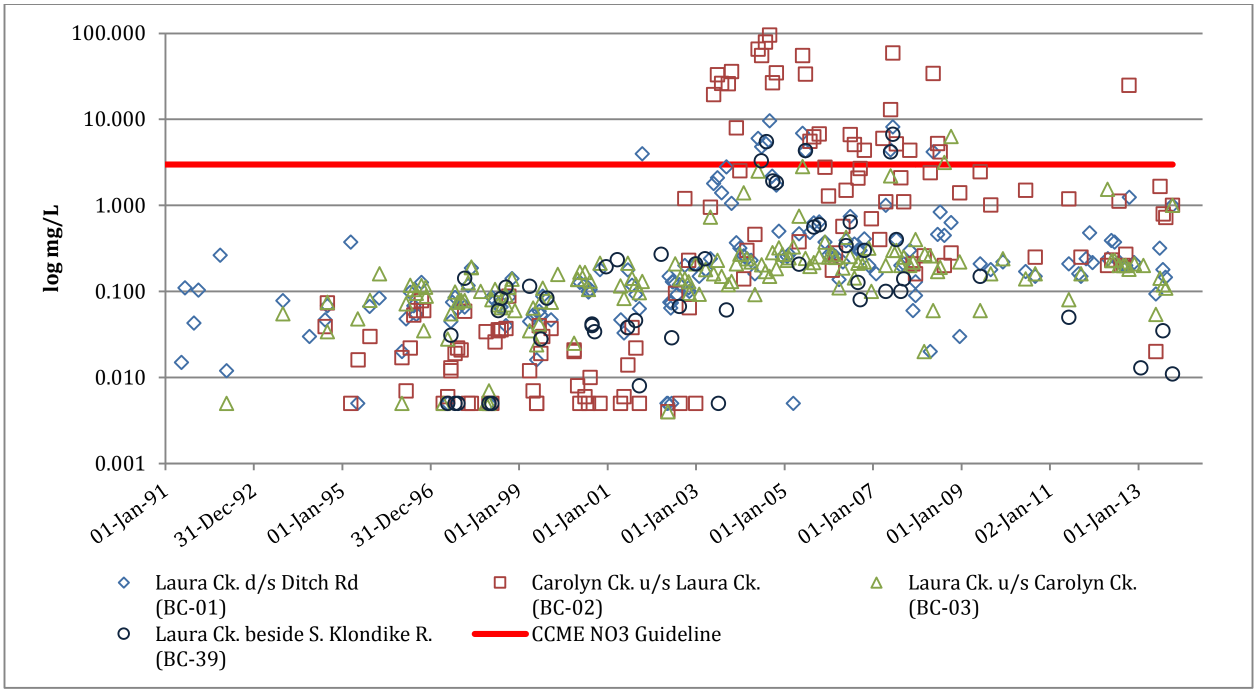


Figure 3-13 Nitrate as Nitrogen Concentrations, 1991 – 2013, Laura and Carolyn Creeks

3.1.3.8 Conditions during Production and Decommissioning and Reclamation

Of all parameters assessed for the production and decommissioning and reclamation periods, the most problematic appeared to be arsenic and nitrate, with selenium to a lesser extent, followed by zinc. The mechanisms causing the issues with each of these parameters differ in origin and spatial distribution.

Arsenic, as discussed, exceeded CCME at all sites and over most phases of mining and decommissioning and reclamation. Copper exceeded the CCME guideline in >10% of samples for all sites and during all periods, but was higher than the CCME guideline prior to the start of mining in 1996. Zinc did not generally pose a significant risk, and elevated values may be associated with environmental conditions caused by the 2004 fire. Nitrate concentrations were also elevated during decommissioning and reclamation as a result of the combined influences of released detoxified heap solution, implementation of the waste rock and heap leach covers, and the 2004 forest fire.

Selenium has an elevated SSWQO to reflect conditions associated with the natural mineralogy of the area and mining activities. Results have consistently met this objective at the compliance station BC-39.

Additional parameters antimony and lead are presented graphically in Appendix B for Laura and Carolyn Creeks.

3.1.4 South Klondike River

3.1.4.1 Observations

Datasets for the South Klondike River were affected to a considerable degree by data at or near the MDL, particularly for the early years of monitoring. Data collected from the South Klondike River generally tended to be lower than data collected elsewhere on the property for all parameters. While this drove the issues associated with MDL interference, the very fact that so many reportable results occurred below both CCME and reference reduced the concern associated with the data removal. It is likely for values less than problematic MDLs that these results were also below the guidelines, based on the data trends observed in the graphs contained in Appendix B.

No trends indicating increased concentration of parameters of concern have been observed in the South Klondike River as a result of mining activities at the Brewery Creek Mine during 1996 – 2000. Moreover, no appreciable effects have been observed during the significant period of decommissioning and reclamation activities at the mine from 2000 – 2013. However, nitrate has been steadily rising in the watershed as nutrient-rich runoff from the burn area of the forest fire makes its way into the South Klondike River (Figure 3-14).

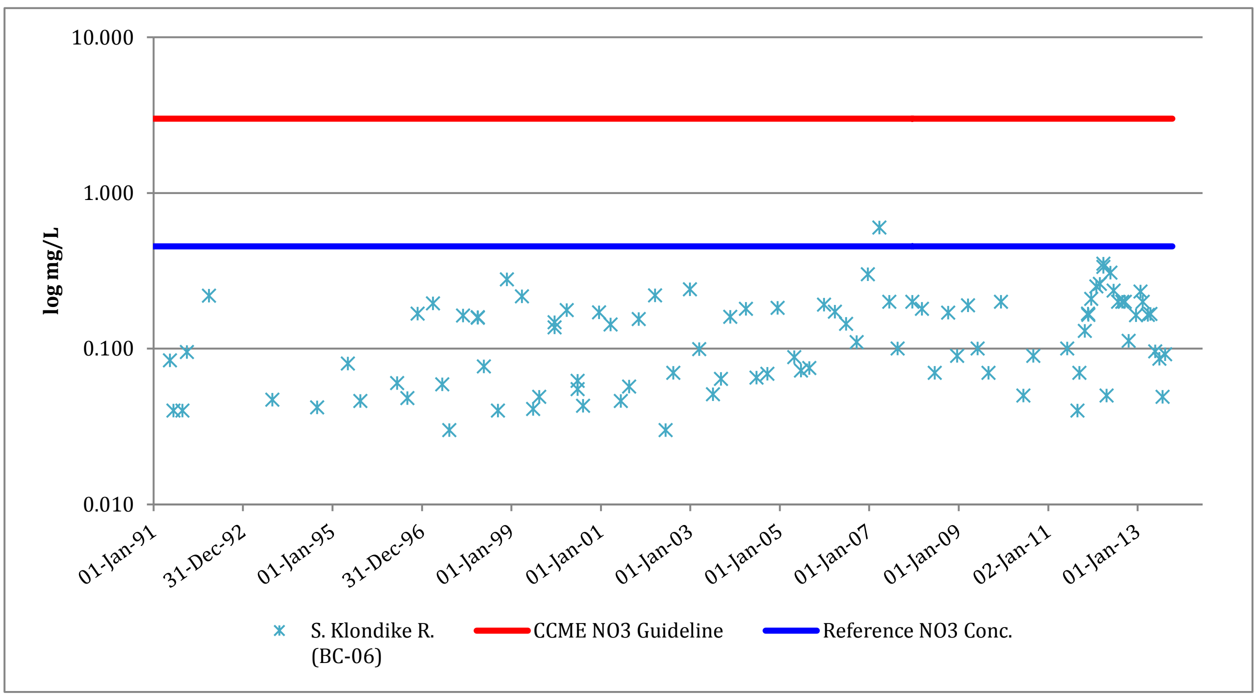


Figure 3-14 Nitrate as Nitrogen Concentrations, 1991 – 2013, South Klondike River

Additional parameters antimony, selenium, arsenic, zinc, copper, lead, and total suspended solids are presented graphically in Appendix B for the South Klondike River.

3.2 GROUNDWATER QUALITY

Like surface water monitoring, groundwater monitoring at Brewery Creek has transitioned to the post-closure phase, which involves twice-annual monitoring of groundwater monitoring piezometers where conditions allow. These events are typically conducted during or shortly following freshet, in May or June, and again in September or October, during low-flow conditions. The amount of environmental monitoring at BC-19, BC-21, BC-22, BC-65 and BC-66 has reduced in frequency since closure of the heap has been accomplished and the drain down solutions treated. Similarly, since closure of the Blue Waste Rock Storage area has been achieved, monitoring at stations BC-67, BC-68 and BC-69 has been reduced. Piezometers located at stations BC-20, BC-23, BC-24, BC-25 and BC-26 were removed from license QZ96-007 in Amendment #8 and are therefore no longer required to be monitored.

3.2.1 Heap Pad Groundwater Monitoring

Monitoring at stations BC-19, BC-21 and BC-22 showed no sign of increasing or decreasing trends for most metals, total and WAD cyanide, nitrate or ammonia. Antimony levels appear to have decreased slightly in 2012 and 2013, but this trend will have to be confirmed with continued monitoring. At BC-21, arsenic levels appear to be slightly higher in 2012-2013 than the average for the decommissioning and reclamation period, but are not as high as during production. Close attention will be given to this parameter in future sampling. Data are presented graphically in Appendix C. Note that where results were below the MDL, half of the MDL was used in the graphs. Although WAD and total cyanide concentrations appear to be decreasing, this is an artefact of lower MDLs in the recent years.

3.2.2 Land Application Area Groundwater Monitoring

Monitoring at stations BC-65 and BC-66 showed no sign of increasing or decreasing trends for most metals, total and WAD cyanide, nitrate or ammonia. Dissolved antimony and arsenic levels at BC-66 are lower in 2013 than levels observed between 2008 and 2011. All results were in compliance with respect to Clause 43 of Water Licence QZ96- 007. Data are presented graphically in Appendix C.

3.2.3 Blue WRSA Groundwater Monitoring

Monitoring at stations BC-67and BC-69 showed no sign of increasing or decreasing trends for metals, total and WAD cyanide, nitrate or ammonia. Monitoring could not be carried out at Blue WRSA stations BC-68 and BC-70 during 2013. Attempts to sample these locations will continue in future years. Data are presented graphically in Appendix C.

3.3 IN-PIT WATER QUALITY

Mined out pits were used effectively as sediment control basins during operations and mine decommissioning. Snow melt and precipitation run-off is directed to the closest inactive pit. Pit samples are taken from surface standing water within each pit.

One to three in-pit or heap effluent samples were collected from the following stations during 2013:

- BC-10: Kokanee Pit and Dump
- BC-12: Blue Pit
- BC-15: Moosehead Pit
- BC-16: Pacific Gulch
- BC-17: Golden Pit and Dump
- BC-18N: Lucky Pit and Dump (north side)
- BC-51W: Pacific Pit (west side)

BC-11 was not sampled in 2013 as it was found to contain no water at time of sampling.

The following points highlight pit water characteristics:

- Water that is contained in all pits either exfiltrates or evaporates.
- Neither the Pacific nor Blue Pits discharge to surface waters; water infiltrates through the pit bottoms.
- Samples collected from the Kokanee Phase 3 and Golden pits (BC-10 and BC-17 respectively), show no abnormal values, except for the May 2013 samples which exhibited slightly elevated copper values at both stations (2.09 µg/L and 2.59 µg/L at BC-10 and BC-17 respectively). Samples from October 2013 returned copper values that were within the usual range at both stations.
- Although the Blue Pit (BC-12) exhibited relatively low pH values in 2012 (4.85 in June), pH values obtained during the 2013 sampling were close to neutral (ranging from 6.66 in May to 7.94 in September). These pH values are considerably higher than historic (mining) results in the Blue Pit and suggest pit chemistry is stable and not trending towards any ARD concerns. pH levels in Pacific Pit (BC-51W) however have been consistently low since 2008 (see Figure 3-15).

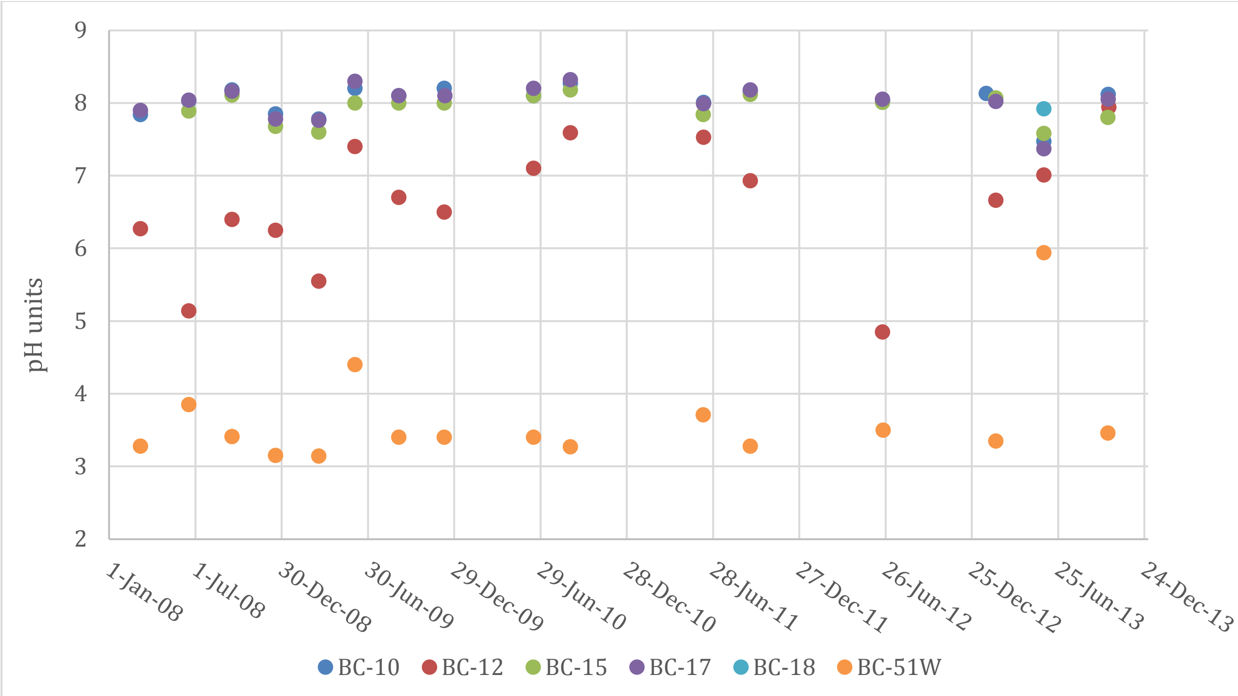


Figure 3-15 pH levels, 2008 – 2013, In-Pit Water

- Previous years' sampling in Moosehead (BC-15) showed higher levels of selenium. This trend reversed beginning in 2009, and selenium levels in Moosehead from 2009-2013 continued below 0.05 mg/L, with an average of 0.0157 mg/L in 2013 (see Figure 3-16).

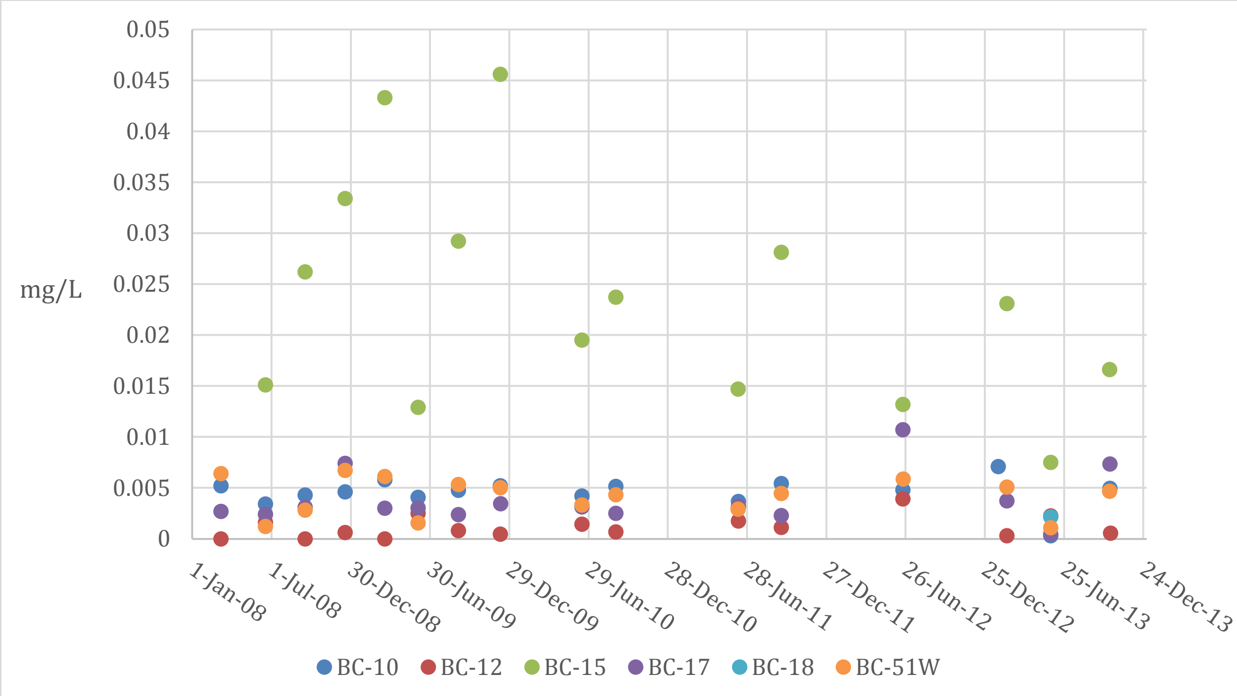


Figure 3-16 Total Selenium, 2008-2013, In-Pit Water

Overall, the results of pit water sampling indicate no upward trends from previous years.

3.4 HEAP EFFLUENT WATER QUALITY

In 2013, samples were collected from the following stations:

- BC-28: Overflow Pond
- BC-28A: Heap Discharge
- BC-28B: Biological Treatment Cell

During 2013, no water was discharged to the receiving environment from the heap either via direct discharge or land application. As such, water quality results were not screened again standards provided in Water License QZ96-007 Clauses 42 and 44. Heap discharge was activated temporarily for samples to be collected, and then immediately discontinued following sample collection. Tabular results for stations BC-28, BC-28A and BC-28B are presented in Appendix A.

4 SUMMARY AND RECOMMENDATIONS

4.1 SUMMARY

- No contaminants of concern have been identified for Lucky, Golden, Lee and Pacific Creeks.
- Arsenic has been identified as a contaminant of concern in the Laura and Carolyn Creek watersheds, based on elevated mining and decommissioning and reclamation concentrations.
- Nitrate has been identified as a contaminant of concern in the Laura and Carolyn Creek watersheds, based on elevated decommissioning and reclamation concentrations.
- Selenium has been identified as a contaminant of concern in the Laura and Carolyn Creek watersheds, based both on the previously licenced site-specific water quality standard and elevated concentrations in upstream reaches of Laura and Carolyn Creeks during decommissioning and reclamation.
- Selenium concentrations in Laura and Carolyn Creeks rose several years after land application of the heap effluent. The land application system ceased operations in 2000, while concentrations of selenium in the environment began rising in Carolyn Creek in 2003, and in Laura Creek in 2004.
- The fire had a significant impact on some parameters in Laura and Carolyn Creeks. The fire also had an impact on at least nitrate nitrogen in Lee and Pacific Creeks.
- Background concentrations exceeded CCME in some parameters (e.g. BC-34) which supports the need for site specific water quality objectives at some sites, rather than a blanket approach to regulation.
- The South Klondike River achieved CCME or better in 99% of samples collected over all three periods (pre-mining, production and D/R). No impacts have been observed in the river as a result of mining activities at the Brewery Creek Mine during 1996 – 2000. Moreover, no effects have been observed during the period of decommissioning and reclamation activities at the mine from 2000 – 2013.

4.2 RECOMMENDATIONS

- It is suggested that the analysis be extended to pool the data from 1991 – 1996 at sites on Laura and Carolyn Creeks to get a background condition and determine if it exceeds CCME for any parameters. This will increase the robustness of the analysis and potentially allow for subsequent comparison with production and post-mining data. It will also provide a basis to evaluate whether or not CCME guidelines are an appropriate water quality standard for BC-39.
- Future sampling should employ MDLs which are sufficiently below relevant water quality guidelines and benchmarks, in particular for selenium.
- The original rationale for the site-specific selenium criteria should revisited and assessed to determine if the original assumptions which were used to derive the guideline are still applicable to current conditions.

5 REFERENCES

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Steffen, Robertson and Kirsten, 1994. *Brewery Creek Project Initial Environmental Evaluation, Supporting Document II, Environmental Baseline*.

APPENDIX A

2013 TABULAR DATA

Station Name		BC-01	BC-01	BC-01	BC-01	BC-01	BC-02	BC-02	BC-02	BC-02	BC-02
Parameter	Unit	24-May-13	26-Jun-13	23-Jul-13	13-Aug-13	10-Oct-13	25-May-13	27-Jun-13	24-Jul-13	14-Aug-13	10-Oct-13
Discharge (Flow)	L/s			101.538	75	192.8		11.888	5.631		18.8
StaffGauge Reading/Water Level	m			0.37	0.42	0.672		0.2	0.26		0.182
pH (field)	pH units	7.67	8.17	8.66	8.32	8.36	7.63	7.71	7.86	8.15	8.21
pH (lab)	pH units	7.44	8.02	8.19	8.24	8	6.87	7.88	8.03	8.14	7.72
Specific Conductivity (field)	µS/cm	121	136	487	500	390.5	86	473	560	807	363.1
Conductivity (lab)	µS/cm	122	427	490	544	397	84.3	486	558	799	372
Temperature (field)	C	0.56	4.07	4.68	5.67	0.1	0.63	6.64	5.49	4.83	0.3
Hardness (from dissolved)	mg/L	61.9	193	236	283	200	41	209	259	406	179
Alkalinity, Total	mg/L	32.4	112	131	146	102	12.9	79.2	103	149	63.5
Total Dissolved Solids	mg/L	110	278	320	382	264	86	382	394	602	282
Total Suspended Solids	mg/L	4.8	88.3	61.1	119	181	4.2	727	311	275	529
Chloride	mg/L	1.5	0.82	0.76	0.77	0.83	1.5	1.8	1.2	1.1	1.2
Sulphate, Dissolved	mg/L	24.3	102	133	141	104	21.2	152	181	254	124
Ion Balance	N/A					0.99					1
Ammonia Total	mg/L	0.023	0.044	0.021	0.026	0.05	0.027	0.21	0.15	0.17	0.081
Nitrate, as N	mg/L	0.094	0.319	0.18	0.146	<1.0	<0.020	1.67	0.794	0.725	<1.0
Cyanide, Total	mg/L					0.00106					0.00173
Cyanide, Weak Acid Dissociable	mg/L	0.00089	0.00084	0.00075	0.00135	0.00105	0.00111	0.00199	0.00093	0.00134	0.00122
Silver (Ag), Total	mg/L	0.000017	0.000015	<0.0000050	0.000035	0.000005	0.000013	0.000056	<0.0000050	0.000053	<0.0000050
Aluminum (Al), Total	mg/L	0.293	0.831	0.507	3.15	0.288	0.295	5.92	0.843	5.21	0.176
Arsenic (As), Total	mg/L	0.00516	0.00632	0.00551	0.00775	0.00401	0.000812	0.0113	0.00304	0.00551	0.000833
Barium (Ba), Total	mg/L	0.0439	0.116	0.115	0.179	0.0778	0.0666	0.355	0.159	0.317	0.0736
Beryllium (Be), Total	mg/L	0.00005	0.000075	0.000055	0.00011	0.000061	0.000046	0.000519	0.00012	0.0002	0.00003
Bismuth (Bi), Total	mg/L	<0.0000050	0.000016	0.000008	<0.0010	<0.0000050	<0.0000050	0.000028	0.000007	<0.0010	<0.0000050
Boron (B), Total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.050	<0.05	<0.05	<0.05	<0.05	<0.050
Calcium (Ca), Total	mg/L	15.6	51.1	57.8	73	52.6	9.29	61.2	57	101	43.3
Cadmium (Cd), Total	mg/L	0.00007	0.000111	0.000115	0.000121	0.000219	0.000013	0.000718	0.000141	0.000182	0.000018
Cobalt (Co), Total	mg/L	0.000709	0.0017	0.00108	0.00213	0.00088	0.00215	0.015	0.00464	0.00688	0.00213
Chromium (Cr), Total	mg/L	0.00062	0.00171	0.00095	0.0055	0.00055	0.00068	0.0102	0.00136	0.0094	0.00058
Copper (Cu), Total	mg/L	0.00274	0.00428	0.0041	0.00788	0.00356	0.00353	0.0264	0.00552	0.0126	0.00224
Iron (Fe), Total	mg/L	0.435	1.64	0.992	4.97	0.672	0.71	17.6	2.99	9.13	0.701
Mercury (Hg), Total	mg/L	0.000012	<0.000010		<0.000010	<0.000010		<0.000010		0.00001	<0.000010
Potassium (K), Total	mg/L	1.24	1.26	1.33	1.68	1.06	0.636	1.35	1.17	2	0.808
Lithium (Li), Total	mg/L	0.00295	0.00938	0.0101	0.015	0.00837	0.00131	0.0139	0.0108	0.0185	0.00632
Magnesium (Mg), Total	mg/L	5.12	19.7	22.4	29	19	4.11	24.3	25.7	46.4	17.7
Manganese (Mn), Total	mg/L	0.0441	0.0913	0.0984	0.124	0.0898	0.278	0.582	0.334	0.536	0.143
Molybdenum (Mo), Total	mg/L	0.00083	0.00259	0.00231	0.0036	0.00202	0.000156	0.000325	0.000386	0.0011	0.000318
Sodium (Na), Total	mg/L	1.26	3.63	3.85	4.8	3.5	1.53	10.4	8.45	12.2	5.62
Nickel (Ni), Total	mg/L	0.00304	0.0047	0.00382	0.008	0.0042	0.00337	0.0199	0.00478	0.0113	0.00248
Lead (Pb), Total	mg/L	0.000221	0.00132	0.00102	0.0018	0.000622	0.000145	0.0131	0.00298	0.00438	0.000175
Antimony (Sb), Total	mg/L	0.00351	0.00398	0.00371	0.00396	0.00274	0.000304	0.00142	0.00125	0.00178	0.000684
Selenium (Se), Total	mg/L	0.00081	0.00213	0.00199	0.00166	0.00147	0.000281	0.00359	0.00401	0.00532	0.00185
Silicon (Si), Total	mg/L	2.7	5.44	5.54	11.1	5.59	2.8	11.3	5.14	13.7	5.67
Tin (Sn), Total	mg/L	<0.00020	0.00176	<0.00020	<0.0050	<0.00020	<0.00020	0.0004	<0.00020	<0.0050	<0.00020
Strontium (Sr), Total	mg/L	0.0728	0.254	0.284	0.367	0.228	0.037	0.204	0.186	0.316	0.128
Sulphur (S), Total	mg/L	8.4	37	45.1	49.9	34.7	7.9	54.6	64.4	106	42.7
Titanium (Ti), Total	mg/L	0.00556	0.0167	0.0144	0.124	0.00623	0.0049	0.0634	0.0261	0.195	0.00554
Thallium (Tl), Total	mg/L	0.000007	0.000007	0.000005	<0.000050	0.000005	0.000003	0.000028	0.000006	0.00006	0.000003
Uranium (U), Total	mg/L	0.000308	0.00218	0.00244	0.00262	0.00152	0.00016	0.0025	0.00148	0.00216	0.000569
Vanadium (V), Total	mg/L	0.00231	0.00405	0.00315	0.0104	0.00227	0.00108	0.0307	0.00683	0.0175	0.00132
Zinc (Zn), Total	mg/L	0.00965	0.0135	0.00804	0.0194	0.00989	0.00272	0.0686	0.0107	0.0282	0.00122
Zirconium (Zr), Total	mg/L	0.00058	0.00047	0.00042	0.00071	0.00042	0.00111	0.00193	0.00085	0.00191	0.00096

Station Name		BC-03	BC-03	BC-03	BC-03	BC-03	BC-03	BC-04	BC-04	BC-04	BC-05
Parameter	Unit	12-Feb-13	25-May-13	27-Jun-13	24-Jul-13	14-Aug-13	10-Oct-13	24-Jul-13	14-Aug-13	08-Oct-13	24-May-13
Discharge (Flow)	L/s			91.846	60.976	44	108.1				
StaffGauge Reading/Water Level	m										
pH (field)	pH units	7.97	8.11	8.4	766	7.86	8.34	8.49	4.28	8.22	8.83
pH (lab)	pH units	8.11	7.42	8.17	8.13	8.19	8.03	8.08	8.26	8	7.47
Specific Conductivity (field)	µS/cm	771	111	460	623	590	459.2	417	748	566.4	121
Conductivity (lab)	µS/cm	1190	111	476	563	582	465	702	749	576	121
Temperature (field)	C	0.46	0.53	3.88	4.06	4.37	0	3.03	3.86	0.4	0.5
Hardness (from dissolved)	mg/L	615	57.9	230	288	313	239	379	410	292	67.2
Alkalinity, Total	mg/L	204	31.3	128	142	155	121	162	178	126	33.6
Total Dissolved Solids	mg/L	878	88	324	386	412	318	490	502	412	116
Total Suspended Solids	mg/L	<1.0	31.6	14.9	2	5.8	2.2	43.3	40.5	22.5	2.4
Chloride	mg/L	1.1	1.5	1	0.52	0.69	0.82	<0.50	0.68	0.53	1.4
Sulphate, Dissolved	mg/L	473	21.4	114	160	164	123	197	207	173	21.9
Ion Balance	N/A						0.99			0.97	
Ammonia Total	mg/L	0.015	0.03	0.031	0.037	0.021	0.017	0.023	0.034	0.019	0.034
Nitrate, as N	mg/L	<0.020	0.054	0.142	0.119	0.109	<1.0	0.22	0.133	<1.0	<0.020
Cyanide, Total	mg/L						0.0008			0.00064	
Cyanide, Weak Acid Dissociable	mg/L	0.00055	0.00143	0.0007	<0.00050	0.00088	0.00082	0.00058	0.00096	0.00074	0.00111
Silver (Ag), Total	mg/L	<0.0000050	0.000016	<0.0000050	<0.0000050	<0.000020	<0.0000050	<0.0000050	<0.000020	<0.0000050	0.000012
Aluminum (Al), Total	mg/L	0.00555	0.424	0.156	0.0251	0.107	0.0528	0.19	0.893	0.0601	0.269
Arsenic (As), Total	mg/L	0.00392	0.00986	0.00432	0.00294	0.00302	0.00234	0.00461	0.00484	0.00239	0.00109
Barium (Ba), Total	mg/L	0.0964	0.0588	0.0674	0.0605	0.0726	0.0529	0.0933	0.133	0.0744	0.0635
Beryllium (Be), Total	mg/L	<0.000010	0.000075	0.000037	0.000016	<0.00010	0.00003	0.000024	<0.00010	0.000014	0.000022
Bismuth (Bi), Total	mg/L	<0.0000050	0.000005	<0.0000050	<0.0000050	<0.0010	<0.0000050	<0.0000050	<0.0010	<0.0000050	<0.0000050
Boron (B), Total	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.05	<0.05	<0.050	<0.05
Calcium (Ca), Total	mg/L	135	15	58.3	62.6	80.1	57.4	74.8	96.7	74.7	18.1
Cadmium (Cd), Total	mg/L	0.000059	0.000202	0.000069	0.00005	0.000051	0.000053	0.000211	0.000233	0.000137	0.000087
Cobalt (Co), Total	mg/L	0.00115	0.00101	0.000573	0.000369	<0.00050	0.000616	0.002	0.00235	0.00106	0.000462
Chromium (Cr), Total	mg/L	<0.00010	0.00082	0.0004	0.00011	<0.0010	0.00017	0.00031	0.0017	0.00022	0.00067
Copper (Cu), Total	mg/L	0.000527	0.00358	0.00143	0.000876	0.00124	0.00143	0.00152	0.00238	0.00109	0.00305
Iron (Fe), Total	mg/L	0.0153	0.768	0.443	0.152	0.297	0.141	0.735	1.86	0.347	0.379
Mercury (Hg), Total	mg/L	<0.000010		<0.000010		<0.000010	<0.000010		0.000012	<0.000010	0.000026
Potassium (K), Total	mg/L	2.35	1.23	1.4	1.55	1.59	1.29	1.39	1.49	1.25	1.02
Lithium (Li), Total	mg/L	0.027	0.00287	0.0103	0.012	0.0148	0.0111	0.00772	0.009	0.0074	0.00147
Magnesium (Mg), Total	mg/L	60.5	5.01	21.6	26.5	32.4	23.7	34.6	42.7	31.3	5.59
Manganese (Mn), Total	mg/L	0.00636	0.0812	0.0661	0.124	0.0717	0.0567	0.18	0.207	0.12	0.044
Molybdenum (Mo), Total	mg/L	0.00154	0.000641	0.00227	0.0024	0.0026	0.00188	0.00263	0.0037	0.00196	0.000698
Sodium (Na), Total	mg/L	10.9	0.97	2.57	3.38	4.33	3.07	1.91	2.02	2.18	0.643
Nickel (Ni), Total	mg/L	0.00115	0.00437	0.00333	0.00306	0.0035	0.00431	0.00921	0.0113	0.00681	0.00494
Lead (Pb), Total	mg/L	0.000015	0.00104	0.000241	0.000042	<0.00020	0.000022	0.000494	0.00072	0.000397	0.000132
Antimony (Sb), Total	mg/L	0.00191	0.00355	0.0056	0.00548	0.00517	0.00438	0.00435	0.00427	0.00347	0.000449
Selenium (Se), Total	mg/L	0.00343	0.00117	0.00171	0.0018	0.00148	0.00152	0.00408	0.0033	0.00305	0.000741
Silicon (Si), Total	mg/L	6.54	2.4	4.15	3.72	4.81	4.32	3.01	4.64	3.72	2.3
Tin (Sn), Total	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.0050	<0.00020	<0.00020	<0.0050	<0.00020	<0.00020
Strontium (Sr), Total	mg/L	0.823	0.0702	0.292	0.349	0.414	0.288	0.515	0.611	0.41	0.063
Sulphur (S), Total	mg/L	141	8.1	40.1	55.9	57.8	47.9	84	83.4	65.7	8.1
Titanium (Ti), Total	mg/L	<0.00050	0.00799	0.00508	<0.00050	<0.0050	<0.00050	0.00545	0.0326	0.00329	0.00924
Thallium (Tl), Total	mg/L	<0.0000020	0.000016	0.000003	0.000004	<0.000050	0.000003	0.000012	<0.000050	0.000011	0.000006
Uranium (U), Total	mg/L	0.00303	0.000451	0.00221	0.00233	0.00228	0.00148	0.00442	0.00444	0.00264	0.000235
Vanadium (V), Total	mg/L	<0.00020	0.00224	0.00077	0.00042	<0.0050	0.00032	0.00237	<0.0050	0.00118	0.00241
Zinc (Zn), Total	mg/L	0.00513	0.0184	0.00556	0.00377	0.0057	0.00583	0.0177	0.0227	0.0114	0.0219
Zirconium (Zr), Total	mg/L	<0.00010	0.0006	0.00017	0.00011	<0.00050	0.00022	0.00015	<0.00050	0.00016	0.00089

Station Name		BC-05	BC-05	BC-05	BC-05	BC-06	BC-06	BC-06	BC-06	BC-06	BC-06
Parameter	Unit	26-Jun-13	23-Jul-13	13-Aug-13	10-Oct-13	23-Jan-13	12-Feb-13	25-Mar-13	16-Apr-13	24-May-13	26-Jun-13
Discharge (Flow)	L/s	182.82	119.928	66	193.4						
StaffGauge Reading/Water Level	m	0.255	0.25	0.22	0.295						
pH (field)	pH units	8.54	8.85	7.83	8.43	7.73	8.36	8.02	7.44	8.14	7.79
pH (lab)	pH units	8.19	8.17	8.3	8.09	7.97	7.95	7.78	7.94	7.78	7.96
Specific Conductivity (field)	µS/cm	457	544	659	431	394	410	343	202	211	256
Conductivity (lab)	µS/cm	474	543	651	446	371	338	335	364	222	265
Temperature (field)	C	2.27	3.78	5.45	0.4	0.56	1.6	2.09	1.22	3.06	8.94
Hardness (from dissolved)	mg/L	230	278	348	234	185	154	162	180	111	119
Alkalinity, Total	mg/L	128	148	183	115	107	98.4	99.9	108	56.7	78.7
Total Dissolved Solids	mg/L	324	368	466	314	210	218	202	232	160	164
Total Suspended Solids	mg/L	2	1.2	<1.0	1.5	<1.0	<1.0	<5.0	<1.0	37.2	2.7
Chloride	mg/L	0.77	<0.50	0.68	<0.50	0.79	1.1	<0.50	1.1	0.95	<0.50
Sulphate, Dissolved	mg/L	117	146	171	112	82.7	73.1	74.5	85.2	49.7	50.4
Ion Balance	N/A				1	0.99					
Ammonia Total	mg/L	0.018	0.019	0.049	0.017	0.014	0.01	0.031	0.013	0.025	0.013
Nitrate, as N	mg/L	0.032	0.066	0.069	<1.0	0.233	0.2	0.165	0.167	0.096	0.086
Cyanide, Total	mg/L				0.00078						
Cyanide, Weak Acid Dissociable	mg/L	0.00082	0.00056	<0.00050	0.00076	0.00069	<0.00050	<0.00050	<0.00050	0.00064	<0.00050
Silver (Ag), Total	mg/L	<0.0000050	<0.0000050	<0.000020	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000011	<0.0000050
Aluminum (Al), Total	mg/L	0.0444	0.0252	0.0255	0.0309	0.00352	0.00231	0.0028	0.00157	0.211	0.0312
Arsenic (As), Total	mg/L	0.000636	0.000588	0.00063	0.000548	0.000461	0.00024	0.000311	0.000267	0.000773	0.000683
Barium (Ba), Total	mg/L	0.0632	0.0663	0.0765	0.0546	0.0659	0.0779	0.068	0.0619	0.0532	0.0533
Beryllium (Be), Total	mg/L	<0.000010	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000024	<0.000010
Bismuth (Bi), Total	mg/L	<0.0000050	<0.0000050	<0.0010	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Boron (B), Total	mg/L	<0.05	<0.05	<0.05	<0.050	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Calcium (Ca), Total	mg/L	62.8	66.3	90.3	57.8	49.9	40.4	46.1	46.2	28	35.1
Cadmium (Cd), Total	mg/L	0.000079	0.000044	0.000055	0.00002	0.00004	0.000038	0.00004	0.000036	0.000227	0.000036
Cobalt (Co), Total	mg/L	0.000121	0.00007	<0.00050	0.000071	0.000021	0.00002	0.000023	0.000016	0.000384	0.000058
Chromium (Cr), Total	mg/L	0.00016	0.00021	<0.0010	0.00027	<0.00010	<0.00010	<0.00010	<0.00010	0.00051	<0.00010
Copper (Cu), Total	mg/L	0.00163	0.00145	0.00152	0.00188	0.000421	0.00029	0.000386	0.000333	0.00357	0.000786
Iron (Fe), Total	mg/L	0.166	0.123	0.108	0.119	0.017	0.0059	0.0148	0.005	0.451	0.0673
Mercury (Hg), Total	mg/L	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010		<0.000010
Potassium (K), Total	mg/L	0.812	0.804	0.883	0.608	0.589	0.67	0.724	0.714	1.1	0.542
Lithium (Li), Total	mg/L	0.00386	0.00479	0.0051	0.00397	0.00242	0.00278	0.00312	0.00291	0.00155	0.00194
Magnesium (Mg), Total	mg/L	22	25.3	35.1	22.9	14.8	13	13	15	9.6	9.99
Manganese (Mn), Total	mg/L	0.0212	0.0124	0.01	0.0133	0.00522	0.00219	0.00131	0.00101	0.0497	0.0105
Molybdenum (Mo), Total	mg/L	0.00243	0.0035	0.0039	0.00301	0.000707	0.000488	0.000637	0.000774	0.000612	0.000534
Sodium (Na), Total	mg/L	1.41	1.68	1.89	1.83	2.74	3.44	2.96	2.95	1.05	2.01
Nickel (Ni), Total	mg/L	0.00434	0.00346	0.0034	0.00409	0.000673	0.000455	0.000442	0.000502	0.00437	0.000759
Lead (Pb), Total	mg/L	0.000045	0.000026	<0.00020	0.000008	0.000011	0.000009	0.000034	0.000015	0.000485	0.000046
Antimony (Sb), Total	mg/L	0.000472	0.000557	0.00054	0.000591	0.000179	0.000212	0.000154	0.000156	0.000224	0.000196
Selenium (Se), Total	mg/L	0.00129	0.00185	0.00174	0.00176	0.00116	0.000739	0.000783	0.00101	0.000955	0.000594
Silicon (Si), Total	mg/L	3.29	3.72	4.14	4.19	3.35	2.83	3.39	2.92	2.33	3.07
Tin (Sn), Total	mg/L	<0.00020	<0.00020	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Strontium (Sr), Total	mg/L	0.232	0.254	0.352	0.217	0.256	0.257	0.244	0.25	0.127	0.187
Sulphur (S), Total	mg/L	40.4	51.8	59	40	29.6	23.4	24.8	28.2	17.9	17.8
Titanium (Ti), Total	mg/L	0.00083	<0.00050	<0.0050	0.00089	<0.00050	<0.00050	<0.00050	<0.00050	0.00401	0.00054
Thallium (Tl), Total	mg/L	<0.0000020	0.000004	<0.000050	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	0.000008	<0.0000020
Uranium (U), Total	mg/L	0.00214	0.00267	0.00323	0.00131	0.00123	0.000713	0.000761	0.00101	0.000607	0.000535
Vanadium (V), Total	mg/L	0.00092	0.00106	<0.0050	0.00089	0.00037	<0.00020	0.00021	0.00026	0.00321	<0.00020
Zinc (Zn), Total	mg/L	0.0116	0.00743	0.0072	0.00864	0.0029	0.00168	0.0017	0.00221	0.0199	0.00224
Zirconium (Zr), Total	mg/L	0.00018	0.0002	<0.00050	0.00043	<0.00010	<0.00010	<0.00010	<0.00010	0.00032	<0.00010

Station Name		BC-06	BC-06	BC-06	BC-10	BC-10	BC-10	BC-12	BC-12	BC-12	BC-15
Parameter	Unit	23-Jul-13	13-Aug-13	10-Oct-13	24-Jan-13	25-May-13	08-Oct-13	13-Feb-13	25-May-13	09-Oct-13	13-Feb-13
Discharge (Flow)	L/s										
StaffGauge Reading/Water Level	m										
pH (field)	pH units	8.7	7.49	8.1		7.84	8.62	8.35	6.33	7.44	8.23
pH (lab)	pH units	8.01	8.22	7.96	8.13	7.47	8.12	6.66	7.01	7.94	8.07
Specific Conductivity (field)	µS/cm	263	514	318.7		71	398.8	1643	513	1032	1178
Conductivity (lab)	µS/cm	269	505	329	529	71.5	421	1180	519	812	1170
Temperature (field)	C	9.74	7.19	2		1.97	1.2	1.9	5.44	4.7	1.92
Hardness (from dissolved)	mg/L	125	259	165	289	29.2	221	610	248	518	640
Alkalinity, Total	mg/L	80.3	138	93.5	169	29.1	129	46	22.4	161	166
Total Dissolved Solids	mg/L	156	350	184	308	58	286	964	376	752	882
Total Suspended Solids	mg/L	1.3	2.83	1.1	<1.0	3.6	1	3.4	14.2	<1.0	<1.0
Chloride	mg/L	<0.50	0.79	<0.50	1	0.59	<0.50	1.1	1	0.7	0.68
Sulphate, Dissolved	mg/L	57.9	138	75.4	111	4.42	95.6	616	208	457	504
Ion Balance	N/A			0.99	1		0.98			0.81	
Ammonia Total	mg/L	0.032	0.15	0.019	0.056	0.073	0.014	0.099	0.036	0.015	0.016
Nitrate, as N	mg/L	0.049	0.092	<1.0	0.263	0.127	<1.0	0.03	0.226	<1.0	0.056
Cyanide, Total	mg/L			0.00058			0.00052			0.0006	
Cyanide, Weak Acid Dissociable	mg/L	<0.00050	0.00111	0.00082	<0.00050	0.00051	<0.00050	<0.00050	0.00068	0.00068	<0.00050
Silver (Ag), Total	mg/L	<0.0000050	<0.000020	<0.0000050	0.000007	0.000011	<0.0000050	<0.0000050	0.000026	<0.0000050	<0.0000050
Aluminum (Al), Total	mg/L	0.00835	0.0149	0.00582	0.0141	0.122	0.0175	0.501	0.132	0.0493	0.00252
Arsenic (As), Total	mg/L	0.000704	0.00029	0.000497	0.0191	0.00766	0.0197	0.15	0.0116	0.0238	0.0341
Barium (Ba), Total	mg/L	0.0544	0.0532	0.0511	0.0707	0.146	0.121	0.00656	0.126	0.0104	0.0395
Beryllium (Be), Total	mg/L	<0.000010	<0.00010	<0.000010	<0.000010	0.000011	<0.000010	0.00131	0.000421	0.00035	<0.000010
Bismuth (Bi), Total	mg/L	<0.0000050	<0.0010	<0.0000050	<0.0000050	0.000006	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Boron (B), Total	mg/L	<0.05	<0.05	<0.050	<0.05	<0.05	<0.050	<0.05	<0.05	<0.050	<0.05
Calcium (Ca), Total	mg/L	30.8	64.2	43.7	67.2	7.79	51	148	61.2	146	136
Cadmium (Cd), Total	mg/L	0.000023	0.000075	0.000039	0.000028	0.000083	0.000022	0.00146	0.00114	0.000567	0.000039
Cobalt (Co), Total	mg/L	0.000033	<0.00050	0.000035	0.000017	0.000086	0.000033	0.0334	0.0117	0.00329	0.000029
Chromium (Cr), Total	mg/L	<0.00010	<0.0010	<0.00010	<0.00010	0.00024	<0.00010	<0.00010	0.00012	<0.00010	<0.00010
Copper (Cu), Total	mg/L	0.000785	0.00114	0.000634	0.000298	0.00209	0.000574	0.0217	0.00626	0.00206	0.00021
Iron (Fe), Total	mg/L	0.0263	0.053	0.0247	0.0118	0.0764	0.0096	3.24	0.205	0.034	0.005
Mercury (Hg), Total	mg/L		<0.000010	<0.000010	<0.000010	0.000024	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Potassium (K), Total	mg/L	0.527	0.783	0.539	1.51	5.24	2.17	2.47	2.64	2.59	1.02
Lithium (Li), Total	mg/L	0.00172	<0.0050	0.00211	0.00343	<0.00050	0.00274	0.00695	0.00319	0.00549	0.00139
Magnesium (Mg), Total	mg/L	9.47	24.7	13.4	27.2	2.3	21.4	56.9	21.9	49.2	68.4
Manganese (Mn), Total	mg/L	0.0077	0.0058	0.00653	0.0164	0.00919	0.00618	1.48	0.501	0.409	0.00807
Molybdenum (Mo), Total	mg/L	0.000551	0.0015	0.000602	0.00449	0.0015	0.00411	0.000361	0.00169	0.0005	0.00101
Sodium (Na), Total	mg/L	1.93	1.64	2	0.818	0.087	0.705	1.21	0.604	1.23	0.578
Nickel (Ni), Total	mg/L	0.000511	0.0019	0.00114	0.000345	0.00147	0.000784	0.0984	0.0414	0.0503	0.000671
Lead (Pb), Total	mg/L	0.000028	<0.00020	0.000014	0.000019	0.000199	0.000073	0.000007	0.000194	0.000027	0.000014
Antimony (Sb), Total	mg/L	0.000208	<0.00050	0.000193	0.153	0.00927	0.139	0.00924	0.0302	0.209	0.00398
Selenium (Se), Total	mg/L	0.000561	0.00189	0.000988	0.00708	0.000306	0.00494	0.000306	0.00225	0.000545	0.0231
Silicon (Si), Total	mg/L	2.69	3.27	2.95	2.86	0.963	1.69	3.4	3.33	4.4	1.86
Tin (Sn), Total	mg/L	<0.00020	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Strontium (Sr), Total	mg/L	0.197	0.287	0.226	0.561	0.0537	0.456	1.06	0.381	0.906	1.35
Sulphur (S), Total	mg/L	18.5	47.1	24.8	40.8	<3.0	33.7	200	81.2	155	175
Titanium (Ti), Total	mg/L	<0.00050	<0.0050	<0.00050	<0.00050	0.00204	0.0008	<0.00050	0.00101	<0.00050	<0.00050
Thallium (Tl), Total	mg/L	0.000002	<0.000050	0.000003	0.000086	0.000026	0.000073	0.00014	0.000104	0.000072	0.00004
Uranium (U), Total	mg/L	0.000622	0.00164	0.000821	0.0102	0.000347	0.00767	0.000912	0.000406	0.00236	0.00611
Vanadium (V), Total	mg/L	<0.00020	<0.0050	0.00025	0.00023	0.00127	<0.00020	<0.00020	0.00092	<0.00020	<0.00020
Zinc (Zn), Total	mg/L	0.00109	<0.0050	0.00295	0.00101	0.00667	0.00055	0.161	0.0939	0.0852	0.00091
Zirconium (Zr), Total	mg/L	<0.00010	<0.00050	<0.00010	<0.00010	0.00015	<0.00010	<0.00010	0.00012	<0.00010	<0.00010

Station Name		BC-15	BC-15	BC-16	BC-17	BC-17	BC-17	BC-18N	BC-28	BC-28	BC-28a
Parameter	Unit	25-May-13	07-Oct-13	26-May-13	13-Feb-13	25-May-13	08-Oct-13	25-May-13	03-Jun-13	07-Oct-13	03-Jun-13
Discharge (Flow)	L/s									0.3	
StaffGauge Reading/Water Level	m										
pH (field)	pH units	8.04	6.43	7.73	8.35	8.26	8.33	8.4	9.5	8.95	9.66
pH (lab)	pH units	7.58	7.8	7.72	8.02	7.37	8.05	7.92	9.5	7.57	9.66
Specific Conductivity (field)	µS/cm	270	943	285	621	44	372.6	1416	1984	86.1	284
Conductivity (lab)	µS/cm	292	1010	286	679	61.4	371	301	2000	87.9	284
Temperature (field)	C	1.26	3.1	0.53	2.15	1.77	1.6	3.22	15.15	1.8	16.54
Hardness (from dissolved)	mg/L	138	583	138	355	24.6	191	174	502		69.6
Alkalinity, Total	mg/L	34.6	126	58.1	187	24.2	128	61.9	63.9		46
Total Dissolved Solids	mg/L	210	802	232	464	38	262	224			
Total Suspended Solids	mg/L	15.7	1.1	182	<1.0	10.2	<1.0	11.2		27.8	
Chloride	mg/L	1.2	<0.50	2.3	1	0.67	<0.50	<0.50	15	1	3.6
Sulphate, Dissolved	mg/L	105	458	82.3	170	7.63	67.3	87.4	8.12	17.9	8.11
Ion Balance	N/A		0.97				0.99				
Ammonia Total	mg/L	0.016	0.023	0.05	0.022	0.061	0.0093	0.017	0.79	0.026	0.51
Nitrate, as N	mg/L	0.172	<1.0	0.113	0.113	0.055	<1.0	0.06	0.301	<1.0	0.202
Cyanide, Total	mg/L		0.00059				<0.00050			0.0016	
Cyanide, Weak Acid Dissociable	mg/L	<0.00050	<0.00050	0.00052	0.00071	<0.00050	<0.00050	<0.00050	0.0586	0.00137	0.0046
Silver (Ag), Total	mg/L	0.000025	<0.0000050	0.000092	<0.0000050	0.00002	<0.0000050	0.000019	0.132	0.000056	0.0119
Aluminum (Al), Total	mg/L	0.17	0.02	1.2	0.00431	0.417	0.00456	0.0224	<0.000025	0.587	0.000041
Arsenic (As), Total	mg/L	0.0402	0.0367	0.171	0.0211	0.0138	0.0567	0.0363	0.168	0.00551	0.249
Barium (Ba), Total	mg/L	0.0712	0.034	0.205	0.0442	0.149	0.0838	0.0188	0.185	0.153	0.0466
Beryllium (Be), Total	mg/L	0.000021	<0.000010	0.000183	<0.000010	0.000033	<0.000010	0.000012	0.044	0.000051	0.0883
Bismuth (Bi), Total	mg/L	<0.0000050	<0.0000050	0.000008	<0.0000050	0.000009	<0.0000050	<0.0000050	0.000051	<0.0000050	0.000015
Boron (B), Total	mg/L	<0.05	<0.050	<0.05	<0.05	<0.05	<0.050	<0.05	<0.000025	<0.050	<0.0000050
Calcium (Ca), Total	mg/L	30.6	141	40.9	79.4	6.98	47.6	42.8	<0.50	10.3	0.23
Cadmium (Cd), Total	mg/L	0.000029	0.000023	0.000846	0.000022	0.000096	0.000029	0.000017	<0.25	0.000025	<0.05
Cobalt (Co), Total	mg/L	0.000293	0.000026	0.00178	0.000206	0.000282	0.000007	0.000047	0.00007	0.000849	0.000056
Chromium (Cr), Total	mg/L	0.00023	<0.00010	0.00141	<0.00010	0.00063	0.00014	0.0001	0.329	0.00046	0.0363
Copper (Cu), Total	mg/L	0.00134	0.000259	0.0086	0.000133	0.00259	0.000147	0.000202	<0.00050	0.00404	0.00042
Iron (Fe), Total	mg/L	0.112	0.0126	1.65	0.0427	0.413	0.0027	0.066	0.00395	1.25	0.00304
Mercury (Hg), Total	mg/L		<0.000010	0.00003	<0.000010	0.000039	<0.000010			<0.000010	
Potassium (K), Total	mg/L	0.449	1.06	1.85	1.24	3.54	0.801	0.946	151	1.37	21
Lithium (Li), Total	mg/L	0.00054	0.00137	0.00364	0.00873	<0.00050	0.00263	0.00143	0.116	0.00258	0.181
Magnesium (Mg), Total	mg/L	14	65.8	9.96	31.4	2.03	15.9	15.3	3.75	2.96	4.2
Manganese (Mn), Total	mg/L	0.016	0.00248	0.267	0.0893	0.0239	0.000163	0.0144	<0.0025	0.0275	0.00076
Molybdenum (Mo), Total	mg/L	0.000533	0.000955	0.000548	0.0107	0.00164	0.00889	0.000541	0.071	0.000109	0.00878
Sodium (Na), Total	mg/L	0.144	0.528	0.868	1.73	0.183	1.2	0.133	34.2	3.94	4.21
Nickel (Ni), Total	mg/L	0.00236	0.000639	0.00777	0.0015	0.0027	0.0016	0.000287	0.0125	0.00207	0.00389
Lead (Pb), Total	mg/L	0.000638	0.000026	0.00263	0.000017	0.000944	0.000011	0.000363	0.00588	0.00118	0.00219
Antimony (Sb), Total	mg/L	0.00168	0.00391	0.0307	0.0337	0.00755	0.3	0.0839	0.000143	0.0082	0.000467
Selenium (Se), Total	mg/L	0.00751	0.0166	0.00235	0.00373	0.000454	0.00735	0.00215	0.951	0.000165	0.167
Silicon (Si), Total	mg/L	1.21	2.16	4.75	3.68	1.8	3.64	0.756	0.079	5.04	0.012
Tin (Sn), Total	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	2.36	<0.00020	2.36
Strontium (Sr), Total	mg/L	0.288	1.16	0.139	0.572	0.0462	0.282	0.426	<0.0010	0.0495	<0.00020
Sulphur (S), Total	mg/L	35.9	173	27.1	58.8	<3.0	21.9	39.2	206	5.7	23.5
Titanium (Ti), Total	mg/L	0.0033	<0.00050	0.0172	<0.00050	0.00987	<0.00050	<0.00050	0.779	0.00547	0.0973
Thallium (Tl), Total	mg/L	0.000037	0.000036	0.00004	0.000037	0.00005	0.00005	0.000135	<0.0025	0.000022	0.00796
Uranium (U), Total	mg/L	0.000755	0.00438	0.00287	0.0101	0.000333	0.00576	0.0013	0.00011	0.000124	0.000029
Vanadium (V), Total	mg/L	0.00085	<0.00020	0.00532	<0.00020	0.00257	<0.00020	0.00044	0.00863	0.00151	0.000718
Zinc (Zn), Total	mg/L	0.0102	0.00074	0.0412	0.00298	0.0142	0.0124	0.00367	<0.0010	0.0103	0.00116
Zirconium (Zr), Total	mg/L	0.00016	<0.00010	0.00122	<0.00010	0.00069	<0.00010	<0.00010	0.00675	0.00047	0.0034

Station Name		BC-28a	BC-28b	BC-28b	BC-31	BC-31	BC-31	BC-31	BC-31	BC-34	BC-34
Parameter	Unit	07-Oct-13	03-Jun-13	07-Oct-13	24-May-13	26-Jun-13	23-Jul-13	13-Aug-13	10-Oct-13	23-Jan-13	26-May-13
Discharge (Flow)	L/s						479.136	338	809.4		
StaffGauge Reading/Water Level	m						0.39	0.34	0.533		
pH (field)	pH units	7.95	9.6	8.21	8.03	8.4	8.95	8.29	8.58	7.93	7.97
pH (lab)	pH units	7.89	9.6	7.7	7.63	8.23	8.28	8.37	8.11	8.07	7.63
Specific Conductivity (field)	µS/cm	3634	381	2263	163	453	571	635	480.9	655	159
Conductivity (lab)	µS/cm	3640	367	2300	162	475	573	627	495	656	161
Temperature (field)	C	3.6	16.18	4.3	0.69	6.15	6.24	6.69	0.8	0.47	0.99
Hardness (from dissolved)	mg/L		84.3		84.7	232	296	350	254	351	81.3
Alkalinity, Total	mg/L		23.3		43	137	165	185	142	169	42
Total Dissolved Solids	mg/L				130	314	386	448	314	384	134
Total Suspended Solids	mg/L	<1.0		1.1	36.3	13.1	3	<1.0	3.4	1.2	45.3
Chloride	mg/L	23	3.7	16	1.5	0.83	<0.50	0.54	0.62	0.78	1.5
Sulphate, Dissolved	mg/L	791	7.61	466	32.8	106	150	159	125	169	34.7
Ion Balance	N/A								0.95	1	
Ammonia Total	mg/L	0.014	0.18	0.22	0.022	0.022	0.033	0.019	0.029	0.0077	0.025
Nitrate, as N	mg/L	269	0.088	157	0.068	0.312	0.219	0.143	<1.0	0.373	0.111
Cyanide, Total	mg/L	0.484		0.0434					0.00085		
Cyanide, Weak Acid Dissociable	mg/L	0.0708	0.00596	0.0314	0.00082	<0.00050	0.00067	0.0014	0.00106	0.00069	0.00063
Silver (Ag), Total	mg/L	<0.000050	0.0198	<0.000025	0.000016	<0.0000050	<0.0000050	<0.000020	<0.0000050	<0.0000050	0.000018
Aluminum (Al), Total	mg/L	0.0156	0.000017	0.0262	0.318	0.16	0.0289	0.0249	0.0336	0.00759	0.302
Arsenic (As), Total	mg/L	0.279	0.218	0.147	0.00143	0.0012	0.000712	0.00073	0.0006	0.000205	0.000682
Barium (Ba), Total	mg/L	0.039	0.02	0.0458	0.0546	0.0692	0.063	0.0701	0.0555	0.0544	0.0516
Beryllium (Be), Total	mg/L	<0.00010	0.052	<0.000050	0.000043	0.000012	<0.000010	<0.00010	0.000011	<0.000010	0.000041
Bismuth (Bi), Total	mg/L	<0.000050	0.000012	<0.000025	<0.0000050	<0.0000050	<0.0000050	<0.0010	<0.0000050	<0.0000050	<0.0000050
Boron (B), Total	mg/L	<0.50	<0.0000050	<0.25	<0.05	<0.05	<0.05	<0.05	<0.050	<0.05	<0.05
Calcium (Ca), Total	mg/L	365	<0.10	195	20.2	58.2	66	81.2	63.8	87.3	20.8
Cadmium (Cd), Total	mg/L	0.000224	<0.05	<0.000025	0.000189	0.000075	0.000079	0.000046	0.000057	0.000123	0.000304
Cobalt (Co), Total	mg/L	0.595	<0.0000050	0.349	0.000626	0.000256	0.000084	<0.00050	0.000103	0.00006	0.000539
Chromium (Cr), Total	mg/L	<0.0010	0.0447	<0.00050	0.00051	0.00035	0.00045	<0.0010	0.00015	<0.00010	0.00064
Copper (Cu), Total	mg/L	0.00147	0.00039	0.00221	0.00398	0.00224	0.00153	0.0012	0.00162	0.000883	0.00473
Iron (Fe), Total	mg/L	0.216	0.0018	0.029	0.772	0.364	0.0831	0.0626	0.112	0.026	0.648
Mercury (Hg), Total	mg/L	0.000028		<0.000050		<0.000010		<0.000010	<0.000010	<0.000010	
Potassium (K), Total	mg/L	5.27	23.3	4.31	1.26	0.883	1.04	1.05	0.835	0.765	1.18
Lithium (Li), Total	mg/L	<0.0050	0.195	<0.0025	0.00182	0.00445	0.00541	0.0065	0.00515	0.00269	0.00119
Magnesium (Mg), Total	mg/L	78.9	1.69	43.6	7.69	23.2	27.3	37.5	25.6	31.9	7.32
Manganese (Mn), Total	mg/L	0.0173	<0.00050	0.016	0.108	0.0272	0.0131	0.0117	0.0164	0.0147	0.061
Molybdenum (Mo), Total	mg/L	0.0167	0.0174	0.0157	0.000516	0.00144	0.00166	0.0019	0.00133	0.00122	0.000577
Sodium (Na), Total	mg/L	389	5.66	237	0.596	1.75	2.1	2.38	1.85	1.71	0.541
Nickel (Ni), Total	mg/L	0.0071	0.00258	0.00374	0.00455	0.00274	0.00195	0.002	0.00242	0.00207	0.00535
Lead (Pb), Total	mg/L	<0.000050	0.00157	0.000113	0.000614	0.00033	0.000164	<0.00020	0.000061	0.000016	0.000453
Antimony (Sb), Total	mg/L	1.75	0.000314	1.18	0.000456	0.000708	0.000731	0.00082	0.000643	0.000217	0.000241
Selenium (Se), Total	mg/L	0.154	0.132	0.089	0.000647	0.00211	0.00204	0.00202	0.0018	0.00251	0.00082
Silicon (Si), Total	mg/L	4.9	0.0112	0.53	1.93	3.59	3.68	3.71	3.86	3.54	2.11
Tin (Sn), Total	mg/L	<0.0020	0.75	<0.0010	<0.00020	0.00181	0.00022	<0.0050	<0.00020	<0.00020	<0.00020
Strontium (Sr), Total	mg/L	1.48	<0.00020	0.862	0.0952	0.291	0.346	0.428	0.294	0.355	0.0826
Sulphur (S), Total	mg/L	286	33.2	172	11.8	37.4	50.4	58.7	40.4	68.2	12.2
Titanium (Ti), Total	mg/L	<0.0050	0.118	<0.0025	0.00692	0.00396	0.00072	<0.0050	0.00093	<0.00050	0.00774
Thallium (Tl), Total	mg/L	0.000189	0.00532	0.000061	0.000007	0.000002	0.000003	<0.000050	0.000002	0.000003	0.000011
Uranium (U), Total	mg/L	0.0186	0.000013	0.0101	0.000686	0.00248	0.00326	0.00348	0.00225	0.00269	0.000445
Vanadium (V), Total	mg/L	<0.0020	0.00152	<0.0010	0.00318	0.0013	0.00066	<0.0050	0.00071	0.00078	0.00384
Zinc (Zn), Total	mg/L	0.0064	0.00074	<0.00050	0.0183	0.00599	0.02	<0.0050	0.0047	0.0109	0.0288
Zirconium (Zr), Total	mg/L	<0.0010	0.00178	<0.00050	0.00038	0.00016	0.00014	<0.00050	0.00018	<0.00010	0.0004

Station Name		BC-34	BC-34	BC-34	BC-34	BC-37	BC-38	BC-38	BC-38	BC-38	BC-38
Parameter	Unit	28-Jun-13	24-Jul-13	13-Aug-13	11-Oct-13	23-Jul-13	22-Jan-13	12-Feb-13	25-Mar-13	16-Apr-13	24-May-13
Discharge (Flow)	L/s				2165.1						
StaffGauge Reading/Water Level	m										
pH (field)	pH units	8.11	7.99	8.34	8.4	8.97	7.95	8.3	8.02	7.7	7.84
pH (lab)	pH units	8.15	8.2	8.24	8.14	8.09	7.93	7.92	7.82	8.02	7.6
Specific Conductivity (field)	µS/cm	374	241	265	455	386	205	163	363	196	139
Conductivity (lab)	µS/cm	428	480	521	488	389	350	363	360	365	140
Temperature (field)	C	6.58	6.74	7.54	0.6	8.06	0.49	0.48	0.48	-0.08	1.67
Hardness (from dissolved)	mg/L	214	234	275	242	187	177	169	178	189	70.6
Alkalinity, Total	mg/L	120	130	142	129	108	99.8	99.8	101	104	40.4
Total Dissolved Solids	mg/L	278	330	368	322	242	198	222	222	220	110
Total Suspended Solids	mg/L	10.3	2.4	4.7	2.7	47.7	5.7	1	<5.0	<1.0	64.6
Chloride	mg/L	0.67	<0.50	<0.50	<0.50	0.58	0.91	<0.50	<0.50	1.1	1.3
Sulphate, Dissolved	mg/L	97.4	129	146	123	98.5	74	84.9	86.8	89	28
Ion Balance	N/A				0.96		1				
Ammonia Total	mg/L	0.034	0.01	0.022	0.015	0.018	0.022	0.0064	0.035	0.03	0.025
Nitrate, as N	mg/L	0.196	0.126	0.092	<1.0	0.117	0.296	0.272	0.301	0.272	0.05
Cyanide, Total	mg/L				<0.00050						
Cyanide, Weak Acid Dissociable	mg/L	0.00063	0.00059	0.0014	<0.00050	0.00068	0.0005	<0.00050	<0.00050	<0.00050	0.00067
Silver (Ag), Total	mg/L	0.000005	<0.0000050	<0.000020	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.00001
Aluminum (Al), Total	mg/L	0.0912	0.0158	0.0235	0.0035	0.287	0.029	0.00434	0.0035	0.00497	0.44
Arsenic (As), Total	mg/L	0.000374	0.000259	0.00034	0.000206	0.00356	0.000461	0.000511	0.000378	0.000502	0.0017
Barium (Ba), Total	mg/L	0.0524	0.0459	0.0528	0.0425	0.0864	0.078	0.0661	0.075	0.0715	0.0772
Beryllium (Be), Total	mg/L	<0.000010	<0.000010	<0.00010	<0.000010	0.000034	<0.000010	<0.000010	<0.000010	<0.000010	0.000058
Bismuth (Bi), Total	mg/L	<0.0000050	<0.0000050	<0.0010	<0.0000050	0.000006	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000007
Boron (B), Total	mg/L	<0.05	<0.05	<0.05	<0.050	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Calcium (Ca), Total	mg/L	54	54.2	68.4	67.4	45.6	46.6	44.5	54.6	48.1	19.2
Cadmium (Cd), Total	mg/L	0.000116	0.000082	0.00008	0.000022	0.000067	0.000036	0.00003	0.000035	0.000033	0.000239
Cobalt (Co), Total	mg/L	0.000148	0.000053	<0.00050	0.00003	0.000598	0.00014	0.000024	0.000014	0.000022	0.000842
Chromium (Cr), Total	mg/L	0.00024	0.00014	<0.0010	<0.00010	0.00059	0.00016	<0.00010	0.00016	<0.00010	0.00059
Copper (Cu), Total	mg/L	0.00197	0.00135	0.00143	0.00126	0.00241	0.00056	0.00042	0.000298	0.000344	0.00398
Iron (Fe), Total	mg/L	0.219	0.0487	0.0686	0.0218	0.568	0.067	0.0137	0.013	0.0127	0.88
Mercury (Hg), Total	mg/L	<0.000010		<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	
Potassium (K), Total	mg/L	0.72	0.739	0.781	0.733	0.917	0.49	0.514	0.573	0.519	0.73
Lithium (Li), Total	mg/L	0.00221	0.00231	<0.0050	0.00252	0.00665	0.00217	0.00255	0.00238	0.00243	0.00178
Magnesium (Mg), Total	mg/L	19.5	20.6	26.4	24.9	16.3	12.6	14.2	14.3	14.8	5.35
Manganese (Mn), Total	mg/L	0.0141	0.00829	0.0093	0.00673	0.052	0.00347	0.00739	0.0062	0.00689	0.114
Molybdenum (Mo), Total	mg/L	0.0014	0.00164	0.0018	0.00167	0.00165	0.000388	0.000668	0.000563	0.000749	0.000243
Sodium (Na), Total	mg/L	1.3	1.29	1.49	1.51	2.85	2.17	2.41	2.41	2.46	0.996
Nickel (Ni), Total	mg/L	0.00263	0.0021	0.0024	0.00202	0.00232	0.000437	0.000752	0.000557	0.000587	0.00378
Lead (Pb), Total	mg/L	0.000127	0.000043	<0.00020	<0.0000050	0.000518	0.000465	0.000014	0.000016	0.000016	0.00115
Antimony (Sb), Total	mg/L	0.000274	0.000269	<0.00050	0.000261	0.00215	0.0002	0.000165	0.000136	0.000137	0.000142
Selenium (Se), Total	mg/L	0.00203	0.00227	0.00188	0.00258	0.00132	0.000842	0.00116	0.000889	0.000931	0.000403
Silicon (Si), Total	mg/L	3.28	2.92	3.29	3.49	4.42	3.18	2.72	3.42	2.81	2.16
Tin (Sn), Total	mg/L	<0.00020	<0.00020	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	0.00021	<0.00020	<0.00020
Strontium (Sr), Total	mg/L	0.224	0.239	0.291	0.248	0.24	0.268	0.276	0.296	0.293	0.12
Sulphur (S), Total	mg/L	34.3	43.7	47.4	43.9	35.3	28.6	29.1	30	29.6	9.2
Titanium (Ti), Total	mg/L	0.00204	<0.00050	<0.0050	<0.00050	0.00938	0.00079	<0.00050	<0.00050	<0.00050	0.00981
Thallium (Tl), Total	mg/L	0.000002	0.000003	<0.000050	0.000002	0.000003	<0.0000020	<0.0000020	<0.0000020	0.000002	0.000007
Uranium (U), Total	mg/L	0.00143	0.00166	0.00168	0.00183	0.00172	0.00104	0.00132	0.00137	0.00157	0.000569
Vanadium (V), Total	mg/L	0.00137	0.00079	<0.0050	0.00057	0.0019	0.00031	<0.00020	<0.00020	<0.00020	0.00241
Zinc (Zn), Total	mg/L	0.00897	0.00604	0.0068	0.00224	0.00474	0.00557	0.00262	0.0025	0.00241	0.0168
Zirconium (Zr), Total	mg/L	0.0001	<0.00010	<0.00050	0.00013	0.00024	<0.00010	<0.00010	<0.00010	<0.00010	0.00045

Station Name		BC-38	BC-38	BC-38	BC-38	BC-39	BC-39	BC-39	BC-51W	BC-51W	BC-51W
Parameter	Unit	26-Jun-13	23-Jul-13	13-Aug-13	10-Oct-13	22-Jan-13	23-Jul-13	10-Oct-13	13-Feb-13	25-May-13	07-Oct-13
Discharge (Flow)	L/s	84.19									
StaffGauge Reading/Water Level	m										
pH (field)	pH units	8.01	8.53	8.52	8.36	7.73	7.83	8.23	4.25	6.21	3.5
pH (lab)	pH units	7.91	8.01	8.09	8.02	7.9	7.83	7.99	3.35	5.94	3.46
Specific Conductivity (field)	µS/cm	188	258	276	271.9	97	249	277.5	1095	156	918
Conductivity (lab)	µS/cm	221	262	285	278	342	256	283	1070	150	867
Temperature (field)	C	10.12	10.67	11.27	2.5	0.48	7.2	2	1.53	6.43	2.9
Hardness (from dissolved)	mg/L	99.5	119	136	139	171	113	138	384	59	306
Alkalinity, Total	mg/L	66.2	78.4	86.3	82	97.5	74.2	83	<0.50	3.59	<0.50
Total Dissolved Solids	mg/L	122	154	196	172	186	148	172	754	128	570
Total Suspended Solids	mg/L	6.5	<1.0	<1.0	1	<1.0	7.7	1.5	<1.0	53.4	3.3
Chloride	mg/L	0.56	<0.50	0.52	<0.50	0.64	<0.50	0.53	1.3	1.2	0.77
Sulphate, Dissolved	mg/L	40.2	56.1	60.6	59.3	75.9	50.7	61.4	488	56.7	368
Ion Balance	N/A				1	0.99		0.97			0.99
Ammonia Total	mg/L	0.012	0.0092	0.014	0.015	0.013	0.035	0.011	0.14	0.15	0.0092
Nitrate, as N	mg/L	0.076	0.05	0.059	<1.0	0.242	0.043	<1.0	<0.020	0.138	<1.0
Cyanide, Total	mg/L				0.00061			<0.00050			<0.00050
Cyanide, Weak Acid Dissociable	mg/L	<0.00050	<0.00050	0.00072	0.00082	0.00071	<0.00050	0.00076	<0.00050	0.00084	<0.00050
Silver (Ag), Total	mg/L	<0.0000050	<0.0000050	<0.000020	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000007	0.000079	0.00001
Aluminum (Al), Total	mg/L	0.0614	0.00718	0.0156	0.00584	0.00472	0.0116	0.0058	7.27	1.68	7.69
Arsenic (As), Total	mg/L	0.00104	0.000839	0.00074	0.000514	0.00051	0.000387	0.000623	0.0114	0.0335	0.0239
Barium (Ba), Total	mg/L	0.0461	0.0484	0.0608	0.0502	0.0724	0.0699	0.0521	0.0243	0.152	0.0328
Beryllium (Be), Total	mg/L	<0.000010	<0.000010	<0.00010	<0.000010	<0.000010	<0.000010	<0.000010	0.0175	0.00204	0.0178
Bismuth (Bi), Total	mg/L	0.000006	<0.0000050	<0.0010	<0.0000050	<0.0000050	0.000009	<0.0000050	<0.0000050	0.000008	<0.0000050
Boron (B), Total	mg/L	<0.05	<0.05	<0.05	<0.050	<0.05	<0.05	<0.050	<0.05	<0.05	<0.050
Calcium (Ca), Total	mg/L	28.9	31.4	39.6	37.7	46.1	29.9	38.1	78	14.4	66.4
Cadmium (Cd), Total	mg/L	0.000024	0.000022	0.000025	0.000026	0.000028	0.000031	0.000025	0.00619	0.00087	0.00596
Cobalt (Co), Total	mg/L	0.000086	0.000027	<0.00050	0.000029	0.000019	0.000072	0.000032	0.0689	0.00801	0.0556
Chromium (Cr), Total	mg/L	0.00012	<0.00010	<0.0010	<0.00010	<0.00010	<0.00010	<0.00010	0.00235	0.0015	0.00308
Copper (Cu), Total	mg/L	0.000879	0.000519	0.00057	0.000508	0.000328	0.000805	0.000526	0.377	0.0708	0.419
Iron (Fe), Total	mg/L	0.125	0.0193	0.0353	0.0193	0.0126	0.0244	0.023	6.02	1.71	9.11
Mercury (Hg), Total	mg/L	<0.000010		<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	0.000027	<0.000010
Potassium (K), Total	mg/L	0.451	0.499	0.588	0.447	0.497	0.589	0.483	2.48	3.63	2.58
Lithium (Li), Total	mg/L	0.00182	0.00195	<0.0050	0.00223	0.00202	0.00158	0.00218	0.016	0.002	0.0123
Magnesium (Mg), Total	mg/L	7.89	8.91	12.4	11.2	13	8.33	11.1	44.7	5.62	33.7
Manganese (Mn), Total	mg/L	0.0103	0.00586	0.0064	0.00681	0.00641	0.00237	0.00676	3.17	0.373	2.42
Molybdenum (Mo), Total	mg/L	0.00045	0.000837	<0.0010	0.000525	0.000594	0.000573	0.000519	0.000058	0.000528	0.000063
Sodium (Na), Total	mg/L	1.68	1.89	2.27	2.09	2.27	1.96	2.07	1.1	0.402	0.786
Nickel (Ni), Total	mg/L	0.00077	0.00046	<0.0010	0.000613	0.00102	0.000459	0.000695	0.206	0.0262	0.175
Lead (Pb), Total	mg/L	0.000111	0.000855	<0.00020	0.00001	0.000006	0.000047	0.00001	0.000292	0.00109	0.000346
Antimony (Sb), Total	mg/L	0.000194	0.000164	<0.00050	0.00015	0.000163	0.000295	0.000166	0.00143	0.0104	0.00303
Selenium (Se), Total	mg/L	0.000414	0.000552	0.00063	0.000588	0.000857	0.000533	0.000584	0.00509	0.00108	0.00468
Silicon (Si), Total	mg/L	2.81	2.74	3.07	2.64	3.1	3.07	2.62	11.7	3.31	10.5
Tin (Sn), Total	mg/L	0.00063	<0.00020	<0.0050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Strontium (Sr), Total	mg/L	0.172	0.195	0.253	0.222	0.262	0.182	0.225	0.618	0.0814	0.446
Sulphur (S), Total	mg/L	14.2	18.9	22.1	21.2	27.6	17.6	22.5	161	20.3	135
Titanium (Ti), Total	mg/L	0.00157	<0.00050	<0.0050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0164	<0.00050
Thallium (Tl), Total	mg/L	<0.0000020	0.000002	<0.000050	<0.0000020	<0.0000020	<0.0000020	0.000002	0.000202	0.000071	0.000123
Uranium (U), Total	mg/L	0.000442	0.000653	0.00067	0.000723	0.00131	0.00039	0.00075	0.00657	0.00121	0.00721
Vanadium (V), Total	mg/L	<0.00020	<0.00020	<0.0050	<0.00020	0.00023	<0.00020	<0.00020	<0.00020	0.00343	0.00035
Zinc (Zn), Total	mg/L	0.00257	0.00098	<0.0050	0.00147	0.00176	0.00137	0.00173	0.551	0.0646	0.481
Zirconium (Zr), Total	mg/L	<0.00010	<0.00010	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00078	<0.00010

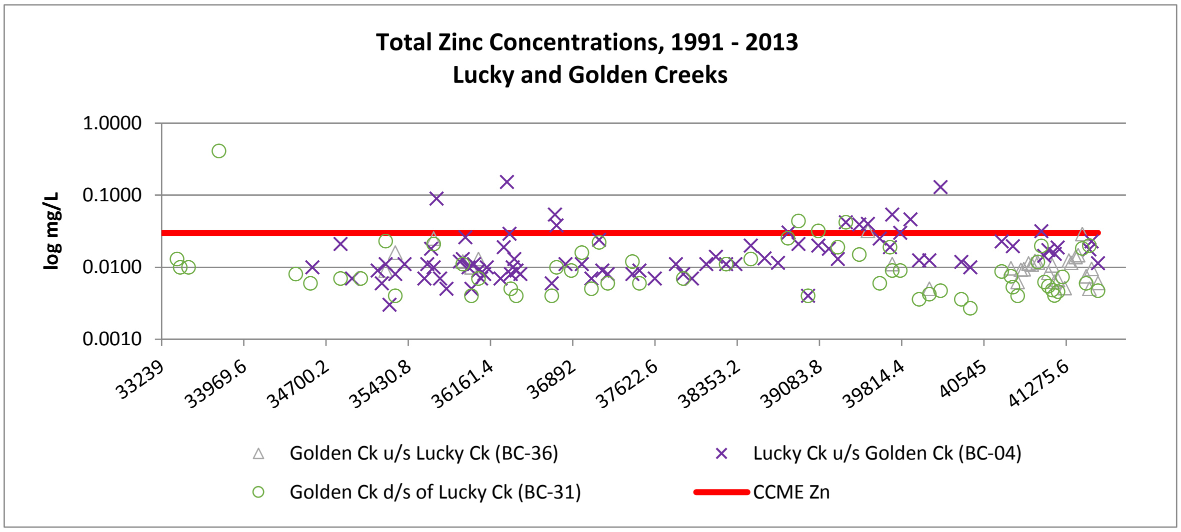
Station Name		BC-53	BC-53
Parameter	Unit	23-Jul-13	10-Oct-13
Discharge (Flow)	L/s		
StaffGauge Reading/Water Level	m		
pH (field)	pH units	8.82	8.36
pH (lab)	pH units	8.07	7.95
Specific Conductivity (field)	µS/cm	386	377.4
Conductivity (lab)	µS/cm	390	382
Temperature (field)	C	8.18	0.1
Hardness (from dissolved)	mg/L	189	189
Alkalinity, Total	mg/L	108	99.7
Total Dissolved Solids	mg/L	236	276
Total Suspended Solids	mg/L	37.9	29.6
Chloride	mg/L	<0.50	1
Sulphate, Dissolved	mg/L	99.7	100
Ion Balance	N/A		0.97
Ammonia Total	mg/L	0.023	0.027
Nitrate, as N	mg/L	0.116	<1.0
Cyanide, Total	mg/L		0.00107
Cyanide, Weak Acid Dissociable	mg/L	0.00066	0.00095
Silver (Ag), Total	mg/L	<0.0000050	<0.0000050
Aluminum (Al), Total	mg/L	0.25	0.103
Arsenic (As), Total	mg/L	0.00345	0.00316
Barium (Ba), Total	mg/L	0.0826	0.0582
Beryllium (Be), Total	mg/L	0.000027	0.000025
Bismuth (Bi), Total	mg/L	0.000022	<0.0000050
Boron (B), Total	mg/L	<0.05	<0.050
Calcium (Ca), Total	mg/L	44.8	47
Cadmium (Cd), Total	mg/L	0.000054	0.000047
Cobalt (Co), Total	mg/L	0.000529	0.000498
Chromium (Cr), Total	mg/L	0.00053	0.00037
Copper (Cu), Total	mg/L	0.00215	0.00206
Iron (Fe), Total	mg/L	0.504	0.283
Mercury (Hg), Total	mg/L		<0.000010
Potassium (K), Total	mg/L	0.928	0.998
Lithium (Li), Total	mg/L	0.00647	0.00764
Magnesium (Mg), Total	mg/L	16.7	19.3
Manganese (Mn), Total	mg/L	0.0501	0.0509
Molybdenum (Mo), Total	mg/L	0.00179	0.0018
Sodium (Na), Total	mg/L	2.96	3.52
Nickel (Ni), Total	mg/L	0.00209	0.00483
Lead (Pb), Total	mg/L	0.000438	0.000154
Antimony (Sb), Total	mg/L	0.00223	0.00277
Selenium (Se), Total	mg/L	0.00136	0.00132
Silicon (Si), Total	mg/L	4.23	5.11
Tin (Sn), Total	mg/L	0.0002	<0.00020
Strontium (Sr), Total	mg/L	0.249	0.223
Sulphur (S), Total	mg/L	32.8	36.4
Titanium (Ti), Total	mg/L	0.00833	0.00331
Thallium (Tl), Total	mg/L	0.000003	0.000004
Uranium (U), Total	mg/L	0.0017	0.0013
Vanadium (V), Total	mg/L	0.00187	0.00099
Zinc (Zn), Total	mg/L	0.00372	0.00458
Zirconium (Zr), Total	mg/L	0.00019	0.0004

Station Name		BC-19	BC-19	BC-19	BC-21	BC-21	BC-21	BC-22	BC-22	BC-22
Parameter	Unit	20-Jan-13	27-May-13	09-Oct-13	19-Jan-13	28-May-13	08-Oct-13	20-Jan-13	28-May-13	09-Oct-13
pH (field)	pH units	6.73	6.68	7.2	7.01	7.84	7.1	5.79	8.11	6.36
pH (lab)	pH units	7.44	7.83	7.77	7.64	8.03	7.85	7.09	6.95	7.08
Specific Conductivity (field)	µS/cm	725	888	942	764	529	958	1048	1218	1228
Conductivity (lab)	µS/cm	881	926	974	862	553	1010	1270	1230	1250
Temperature (field)	C	1.6	4.91	2.0	0.9	4.91	2.7	1.6	3.05	1.8
Hardness (from dissolved)	mg/L	447	474	520	453	278	634	685	626	679
Alkalinity, Total	mg/L	248	257	256	253	228	255	127	146	160
Total Dissolved Solids	mg/L		444	700		265	722		609	1030
Total Suspended Solids	mg/L									
Chloride	mg/L	0.93	1.1	0.94	2.5	1.3	13	1.4	1.6	1.6
Sulphate, Dissolved	mg/L	209	236	287	236	77.2	275	563	537	524
Ammonia Total	mg/L	0.014	0.014	0.03	0.094	0.028	0.13	0.11	0.008	0.01
Nitrate, as N	mg/L	0.206	0.257	<1.0	0.027	0.021	<1.0	2.62	3.87	5.2
Cyanide, Total	mg/L			<0.00050			<0.00050			<0.00050
Cyanide, Weak Acid Dissociable	mg/L	<0.00050	0.00094	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00058	<0.00050
Aluminum (Al), Dissolved	mg/L	0.00137	0.00267	<0.00050	0.00104	0.00148	<0.00050	0.115	0.132	0.0242
Antimony (Sb), Dissolved	mg/L	0.000225	0.000235	0.000242	0.0002	0.000148	0.000371	0.000069	0.000071	0.000098
Arsenic (As), Dissolved	mg/L	0.0005	0.000596	0.000504	0.0112	0.0107	0.0185	0.000182	0.000321	0.000238
Barium (Ba), Dissolved	mg/L	0.0017	0.00217	0.00188	0.0478	0.0267	0.0367	0.0307	0.0221	0.0216
Beryllium (Be), Dissolved	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000053	0.000069	0.000049
Bismuth (Bi), Dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Boron (B), Dissolved	mg/L	<0.05	<0.05	<0.050	<0.05	<0.05	<0.050	<0.05	<0.05	<0.050
Cadmium (Cd), Dissolved	mg/L	0.000333	0.000335	0.000339	0.000123	0.000081	0.000276	0.00538	0.00534	0.00579
Calcium (Ca), Dissolved	mg/L	99.7	105	112	88.2	47.7	134	168	150	161
Chromium (Cr), Dissolved	mg/L	0.00024	0.00041	<0.00010	0.00014	0.00021	<0.00010	0.00024	0.00092	<0.00010
Cobalt, Dissolved	mg/L	0.000148	0.000132	0.000141	0.00228	0.000542	0.0044	0.00217	0.00277	0.00327
Copper (Cu), Dissolved	mg/L	0.000232	0.000678	<0.000050	0.000102	0.000205	0.000233	0.000517	0.000979	0.000317
Iron (Fe), Dissolved	mg/L	0.0049	0.0064	0.0016	0.102	0.103	0.0032	0.0335	0.0557	0.0037
Lead (Pb), Dissolved	mg/L	0.000008	0.000022	<0.0000050	0.000013	<0.0000050	<0.0000050	0.000006	0.00002	<0.0000050
Lithium (Li), Dissolved	mg/L	0.0276	0.033	0.0308	0.0279	0.0211	0.0327	0.0527	0.0504	0.0437
Magnesium (Mg), Dissolved	mg/L	48	51.7	58.4	56.6	38.6	72.4	64.2	60.9	67.3
Manganese (Mn), Dissolved	mg/L	0.165	0.134	0.137	1.26	0.469	2.07	0.205	0.24	0.277
Mercury (Hg), Dissolved	mg/L	<0.000010		<0.000010	<0.000010		<0.000010	<0.000010		<0.000010
Molybdenum (Mo), Dissolved	mg/L	0.000063	0.000078	0.000071	0.000209	0.000175	0.000354	0.000212	0.000276	0.000238
Nickel (Ni), Dissolved	mg/L	0.00182	0.0018	0.00178	0.00472	0.00201	0.00742	0.0401	0.0475	0.051
Potassium (K), Dissolved	mg/L	2.3	2.33	2.55	3.46	2.83	3.78	3.81	3.73	3.76
Selenium (Se), Dissolved	mg/L	0.00489	0.00562	0.00646	0.00264	0.0031	0.00122	0.0459	0.0639	0.061
Silicon (Si), Dissolved	mg/L	6.49	6.78	7.03	4.7	4.41	5.55	17.4	15.1	16
Silver (Ag), Dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na), Dissolved	mg/L	9.33	9.77	10.8	8.25	7.83	8.85	20	20.3	21.7
Strontium (Sr), Dissolved	mg/L	0.367	0.398	0.421	0.381	0.24	0.494	0.459	0.418	0.397
Sulphur (S), Dissolved	mg/L	83.2	87.9	108	83.3	25.3	130	218	176	199
Thallium (Tl), Dissolved	mg/L	0.000007	0.000009	0.000006	0.000025	0.000016	0.00004	0.000026	0.000027	0.000025
Tin (Sn), Dissolved	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Titanium (Ti), Dissolved	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Uranium (U), Dissolved	mg/L	0.000571	0.000599	0.000658	0.00141	0.00044	0.00227	0.0002	0.000284	0.000579
Vanadium (V), Dissolved	mg/L	<0.00020	0.00031	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00036	<0.00020
Zinc (Zn), Dissolved	mg/L	0.0197	0.0227	0.0198	0.0577	0.0145	0.136	0.0862	0.115	0.104
Zirconium (Zr), Dissolved	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

Station Name		BC-53	BC-53	BC-65	BC-65	BC-66	BC-66	BC-66	BC-67	BC-69	BC-69
Parameter	Unit	23-Jul-13	10-Oct-13	22-Jan-13	29-May-13	22-Jan-13	29-May-13	09-Oct-13	29-May-13	29-May-13	09-Oct-13
pH (field)	pH units	8.82	8.36	6.7	6.98	7.96	8.14	7.77	6.58	8.34	8
pH (lab)	pH units	8.07	7.95	7.66	7	8.05	8.14	8.22	7.43	8.07	8.08
Specific Conductivity (field)	µS/cm	386	377.4	125	2050	746.8	525	690	168	655	688
Conductivity (lab)	µS/cm	390	382	111	33.5	732	659	715	152	668	705
Temperature (field)	C	8.18	0.1		12.47	2.7	4.83	3.4	7.95	8.12	2.3
Hardness (from dissolved)	mg/L	189	189	50.1	13.4	352	292	347	60.4	341	386
Alkalinity, Total	mg/L	108	99.7	45.9	11.2	247	202	243	42.3	303	312
Total Dissolved Solids	mg/L	236	276	58	1026		269	440	84	327	426
Total Suspended Solids	mg/L	37.9	29.6	182							
Chloride	mg/L	<0.50	1	0.74	1.9	5.6	5.5	5.4	6.1	1.6	1.8
Sulphate, Dissolved	mg/L	99.7	100	6.2	1.45	20	21.8	23.9	14.8	79.2	90.8
Ammonia Total	mg/L	0.023	0.027	0.032	0.017	0.011	0.0087	0.026	0.013	0.017	0.063
Nitrate, as N	mg/L	0.116	<1.0	0.422	<0.020	32.6	30.2	28.2	1.69	<0.020	<1.0
Cyanide, Total	mg/L		0.00107					0.00771			<0.00050
Cyanide, Weak Acid Dissociable	mg/L	0.00066	0.00095	<0.00050	0.00124	0.00414	0.0183	0.00489	0.00062	0.00059	<0.00050
Aluminum (Al), Dissolved	mg/L	0.0102	0.0434	0.00814	0.26	0.00207	0.00309	0.00125	0.006	0.00578	0.00215
Antimony (Sb), Dissolved	mg/L	0.00214	0.00282	0.00118	0.00442	0.000165	0.000574	0.000163	0.019	0.00541	0.00765
Arsenic (As), Dissolved	mg/L	0.00244	0.0028	0.000443	0.0011	0.000183	0.000444	0.000256	0.00882	0.0456	0.0198
Barium (Ba), Dissolved	mg/L	0.0629	0.0551	0.0263	0.0445	0.0525	0.0562	0.0693	0.395	0.0277	0.0547
Beryllium (Be), Dissolved	mg/L	<0.000010	0.000014	<0.000010	0.000027	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Bismuth (Bi), Dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050	0.000022	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Boron (B), Dissolved	mg/L	<0.05	<0.050	<0.05	<0.05	<0.05	<0.05	<0.050	<0.05	<0.05	<0.050
Cadmium (Cd), Dissolved	mg/L	0.000015	0.000031	0.000041	0.000072	0.000027	0.000093	0.000015	0.000091	0.000759	0.00101
Calcium (Ca), Dissolved	mg/L	47.8	44.8	10.3	3.23	73.4	57.7	67.5	16.5	60.3	68.7
Chromium (Cr), Dissolved	mg/L	0.00011	0.00024	<0.00010	0.00055	0.00019	0.00061	0.00032	0.00041	0.00056	<0.00010
Cobalt, Dissolved	mg/L	0.000252	0.000443	0.000153	0.000283	0.0801	0.0743	0.0709	0.000999	0.000047	0.000014
Copper (Cu), Dissolved	mg/L	0.000787	0.00169	0.00102	0.00415	0.00041	0.000986	0.000156	0.00135	0.00103	0.000421
Iron (Fe), Dissolved	mg/L	0.0464	0.174	0.0136	0.281	0.0019	0.0083	<0.0010	0.0171	0.0048	0.001
Lead (Pb), Dissolved	mg/L	0.00002	0.000026	0.00008	0.000282	0.000034	0.000017	<0.0000050	0.000021	0.000039	<0.0000050
Lithium (Li), Dissolved	mg/L	0.00638	0.00802	0.00396	<0.00050	0.0187	0.0156	0.0175	0.0022	0.00795	0.0084
Magnesium (Mg), Dissolved	mg/L	17	18.6	5.9	1.28	41	36	43.4	4.65	46.2	52.2
Manganese (Mn), Dissolved	mg/L	0.0361	0.0473	0.00459	0.012	0.00109	0.0021	0.000122	0.0558	0.0805	0.0772
Mercury (Hg), Dissolved	mg/L		<0.000010	<0.000010		<0.000010		<0.000010			<0.000010
Molybdenum (Mo), Dissolved	mg/L	0.002	0.00213	0.000064	0.000106	0.000381	0.00044	0.000383	0.000409	0.00026	0.000506
Nickel (Ni), Dissolved	mg/L	0.00118	0.00297	0.00115	0.00417	0.00123	0.00147	0.00126	0.0064	0.00262	0.0042
Potassium (K), Dissolved	mg/L	0.843	0.985	1.13	2.53	2.4	2.34	2.72	0.713	5.8	6.05
Selenium (Se), Dissolved	mg/L	0.00114	0.00138	0.00205	0.000156	0.0173	0.0156	0.0175	0.000277	0.000943	0.00138
Silicon (Si), Dissolved	mg/L	4.22	4.45	5.31	2.51	5.44	4.5	4.37	5.32	2.61	2.82
Silver (Ag), Dissolved	mg/L	<0.0000050	<0.0000050	<0.0000050	0.000018	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium (Na), Dissolved	mg/L	3.05	3.45	1.67	0.726	10.9	14.1	11.4	2.17	1.91	2.09
Strontium (Sr), Dissolved	mg/L	0.242	0.222	0.0412	0.0198	0.357	0.313	0.357	0.0925	0.409	0.424
Sulphur (S), Dissolved	mg/L	31.9	32.1	<3.0	<3.0	7.2	7.1	9.1	5	25.1	32.4
Thallium (Tl), Dissolved	mg/L	<0.0000020	0.000004	0.000002	0.000005	0.000009	0.000011	0.000023	0.000019	0.000244	0.000421
Tin (Sn), Dissolved	mg/L	<0.00020	<0.00020	<0.00020	0.00027	<0.00020	<0.00020	<0.00020	<0.00020	0.00031	<0.00020
Titanium (Ti), Dissolved	mg/L	<0.00050	0.00083	<0.00050	0.00893	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Uranium (U), Dissolved	mg/L	0.00172	0.00134	0.000026	0.000084	0.000874	0.000759	0.000923	0.000134	0.00181	0.00242
Vanadium (V), Dissolved	mg/L	0.00084	0.00069	<0.00020	0.00066	<0.00020	<0.00020	<0.00020	0.00067	0.00055	<0.00020
Zinc (Zn), Dissolved	mg/L	0.00061	0.0012	0.00777	0.0219	0.00361	0.0114	0.00188	0.0433	0.107	0.0657
Zirconium (Zr), Dissolved	mg/L	<0.00010	0.00037	<0.00010	0.00102	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

APPENDIX B

SURFACE WATER GRAPHICAL DATA


Total Zinc Concentrations, 1991 - 2013
Lucky and Golden Creeks
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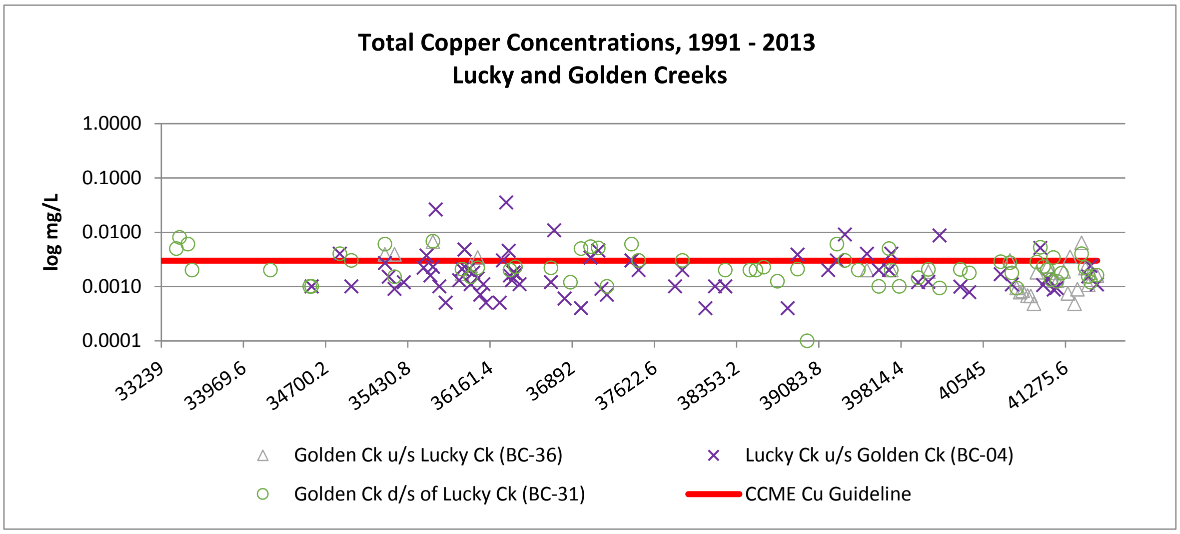
0.1000
0.0100
0.0010
log mg/L
33239
33969.6
34700.2
35430.8
36161.4
36892
37622.6
38353.2
39083.8
39814.4
40545
41275.6
Golden Ck u/s Lucky Ck (BC-36)
Lucky Ck u/s Golden Ck (BC-04)
Golden Ck d/s of Lucky Ck (BC-31)
CCME Zn


Total Copper Concentrations, 1991 - 2013
Lucky and Golden Creeks
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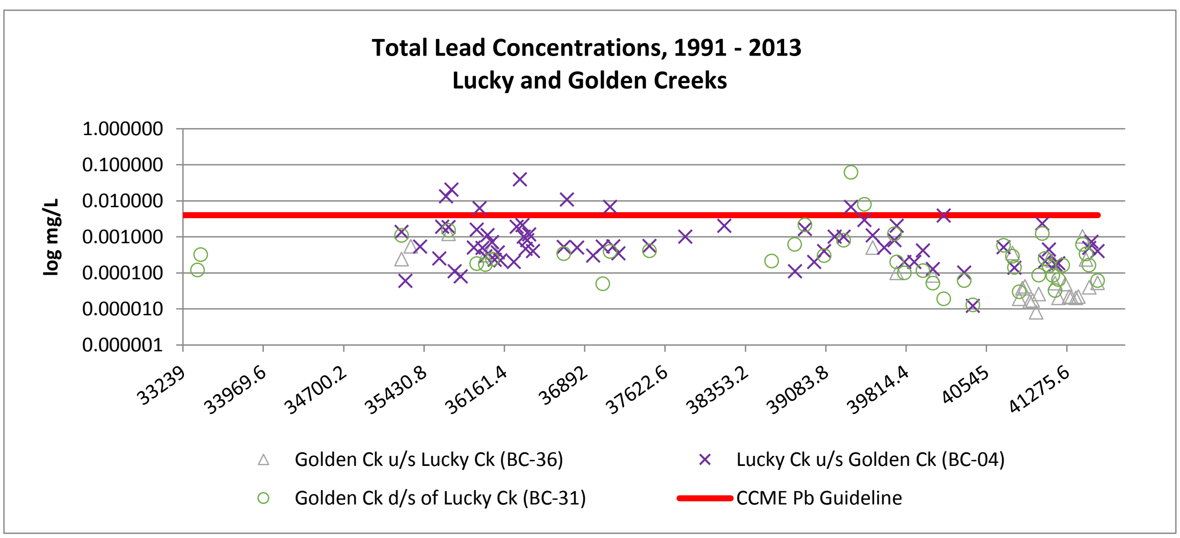
0.1000
0.0100
0.0010
0.0001
log mg/L
33239
33969.6
34700.2
35430.8
36161.4
36892
37622.6
38353.2
39083.8
39814.4
40545
41275.6
Golden Ck u/s Lucky Ck (BC-36)
Lucky Ck u/s Golden Ck (BC-04)
Golden Ck d/s of Lucky Ck (BC-31)
CCME Cu Guideline


Total Lead Concentrations, 1991 - 2013
Lucky and Golden Creeks
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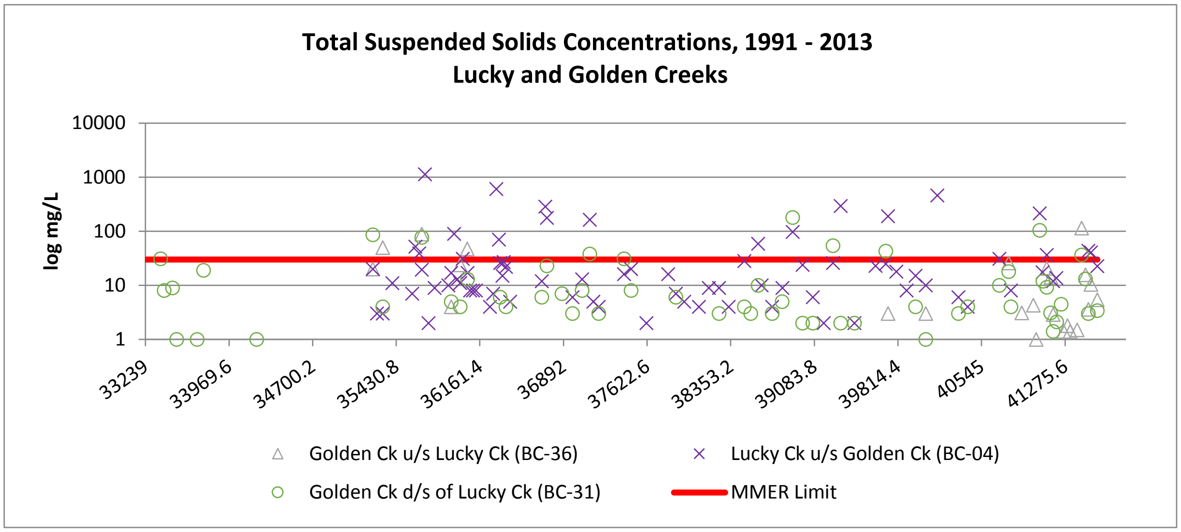
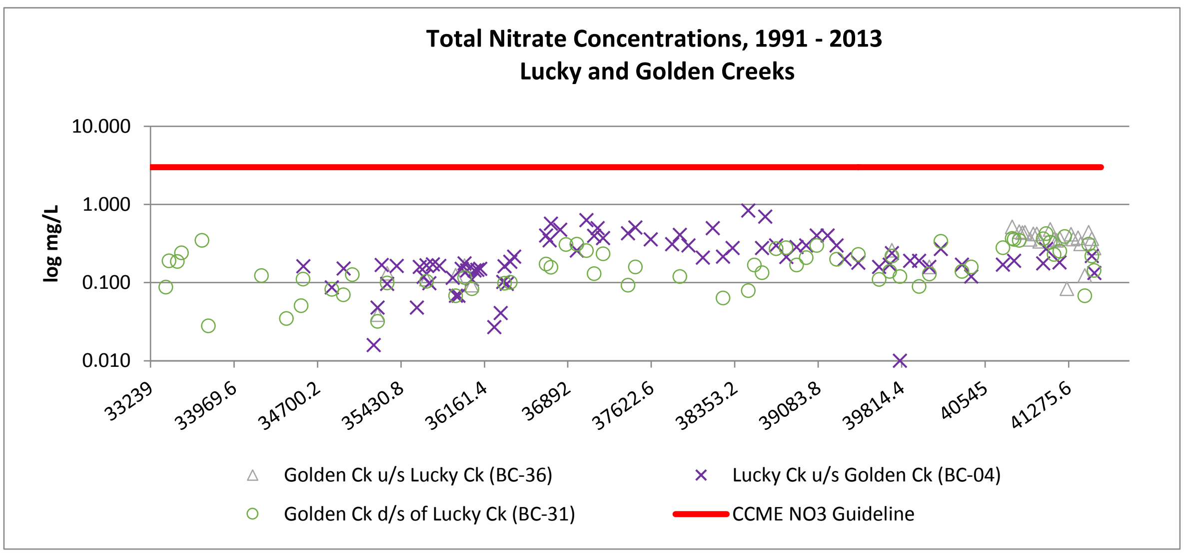
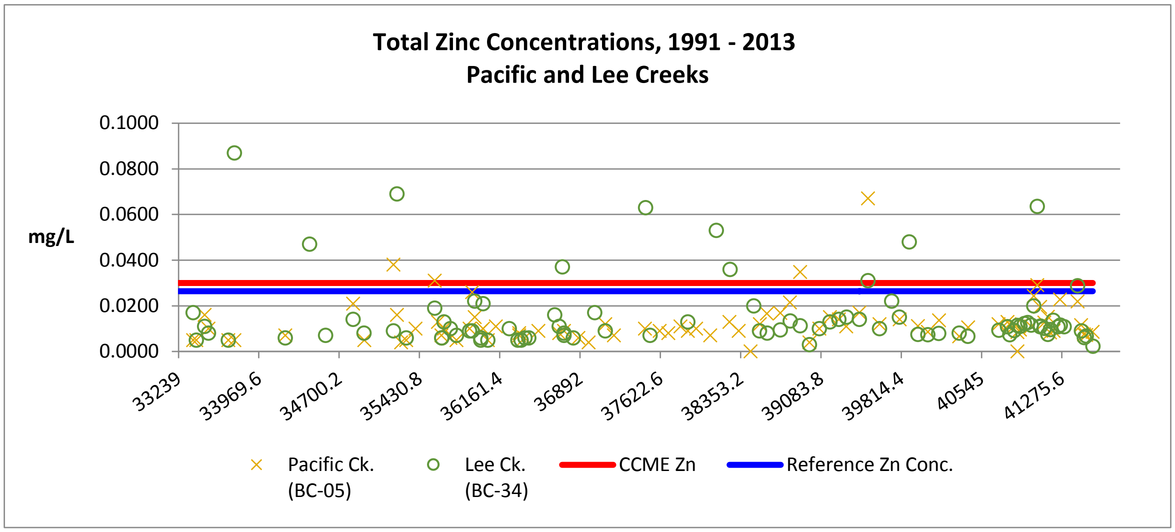
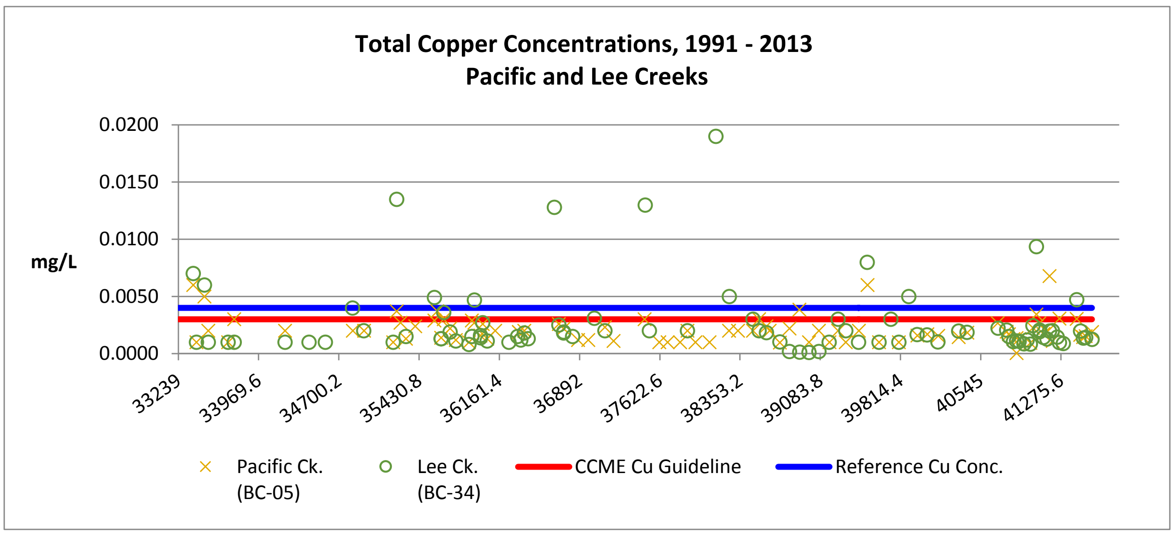
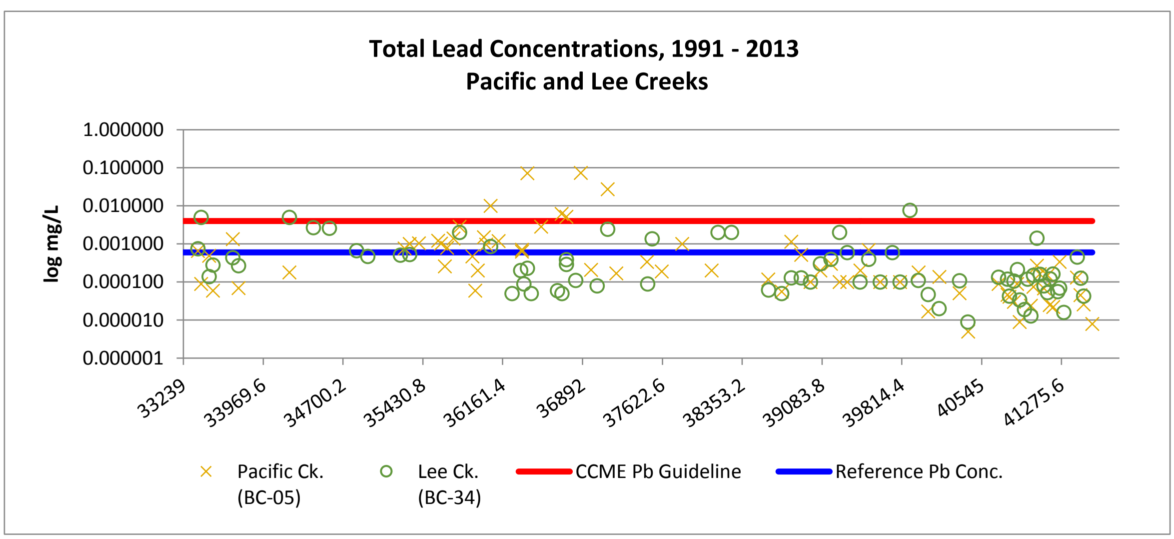
0.100000
0.010000
0.001000
0.000100
0.000010
0.000001
log mg/L
33239
33969.6
34700.2
35430.8
36161.4
36892
37622.6
38353.2
39083.8
39814.4
40545
41275.6
Golden Ck u/s Lucky Ck (BC-36)
Lucky Ck u/s Golden Ck (BC-04)
Golden Ck d/s of Lucky Ck (BC-31)
CCME Pb Guideline

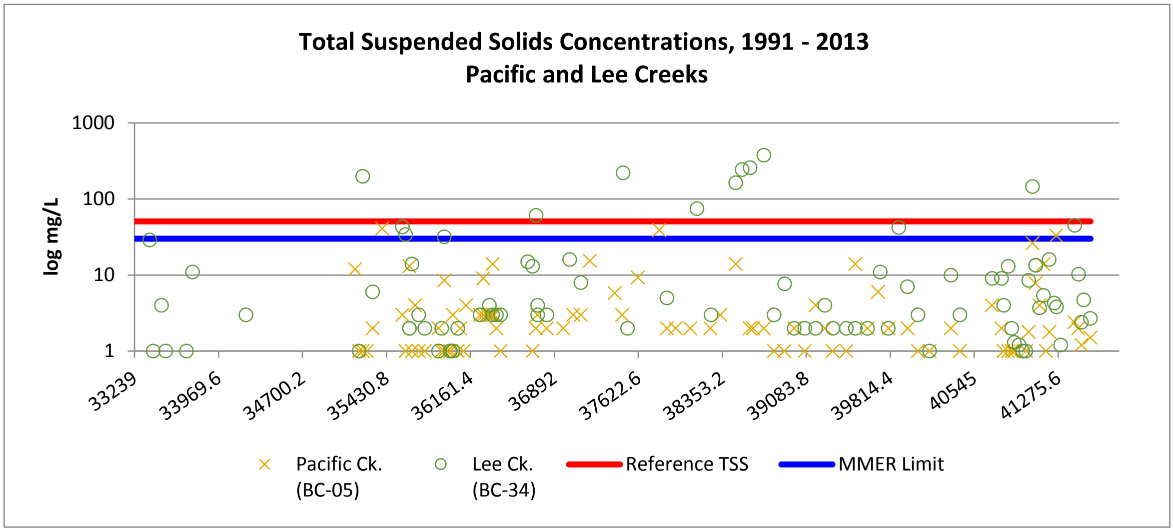

Total Suspended Solids Concentrations, 1991 - 2013
Lucky and Golden Creeks
log mg/L
10000
1000
100
10
1
33239
33969.6
34700.2
35430.8
36161.4
36892
37622.6
38353.2
39083.8
39814.4
40545
41275.6
Golden Ck u/s Lucky Ck (BC-36)
Lucky Ck u/s Golden Ck (BC-04)
Golden Ck d/s of Lucky Ck (BC-31)
MMER Limit

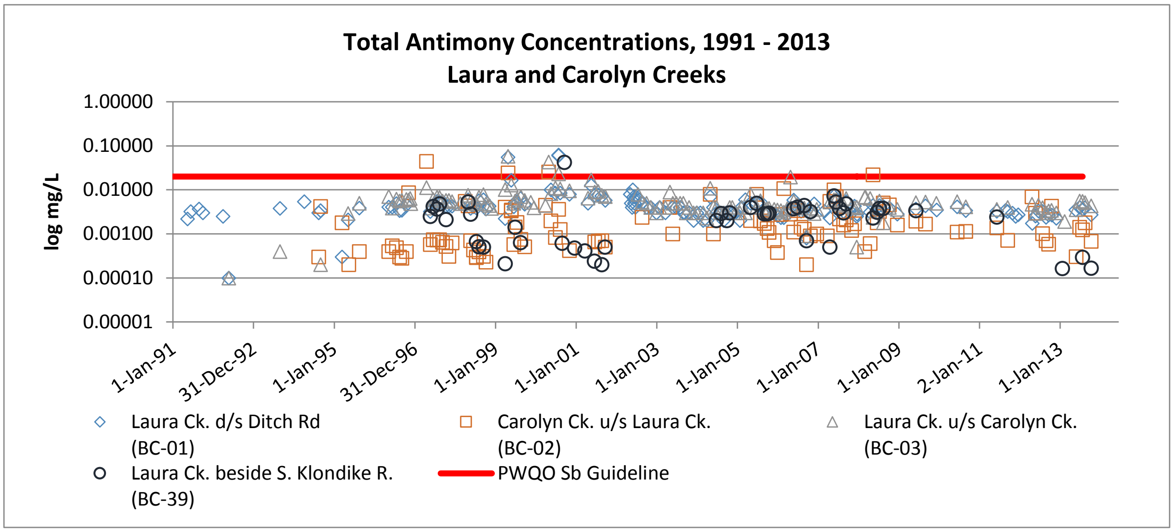

Total Nitrate Concentrations, 1991 - 2013
Lucky and Golden Creeks
log mg/L
10.000
1.000
0.100
0.010
33239
33969.6
34700.2
35430.8
36161.4
36892
37622.6
38353.2
39083.8
39814.4
40545
41275.6
Golden Ck u/s Lucky Ck (BC-36)
Lucky Ck u/s Golden Ck (BC-04)
Golden Ck d/s of Lucky Ck (BC-31)
CCME NO3 Guideline

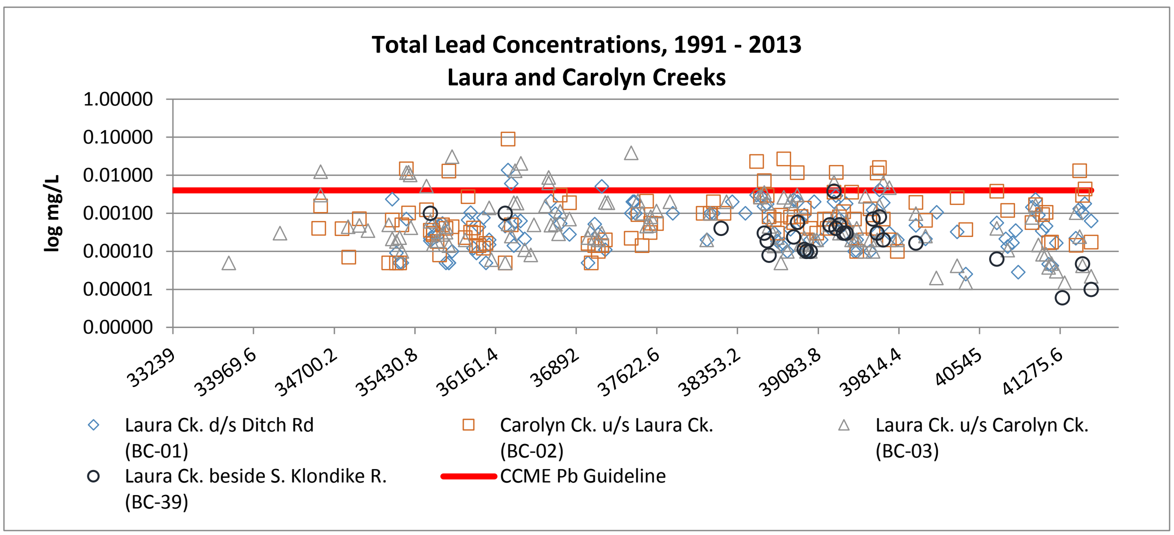

Total Zinc Concentrations, 1991 - 2013
Pacific and Lee Creeks
0.1000
0.0800
0.0600
0.0400
0.0200
0.0000
mg/L
33239
33969.6
34700.2
35430.8
36161.4
36892
37622.6
38353.2
39083.8
39814.4
40545
41275.6
Pacific Ck. (BC-05)
Lee Ck. (BC-34)
CCME Zn
Reference Zn Conc.

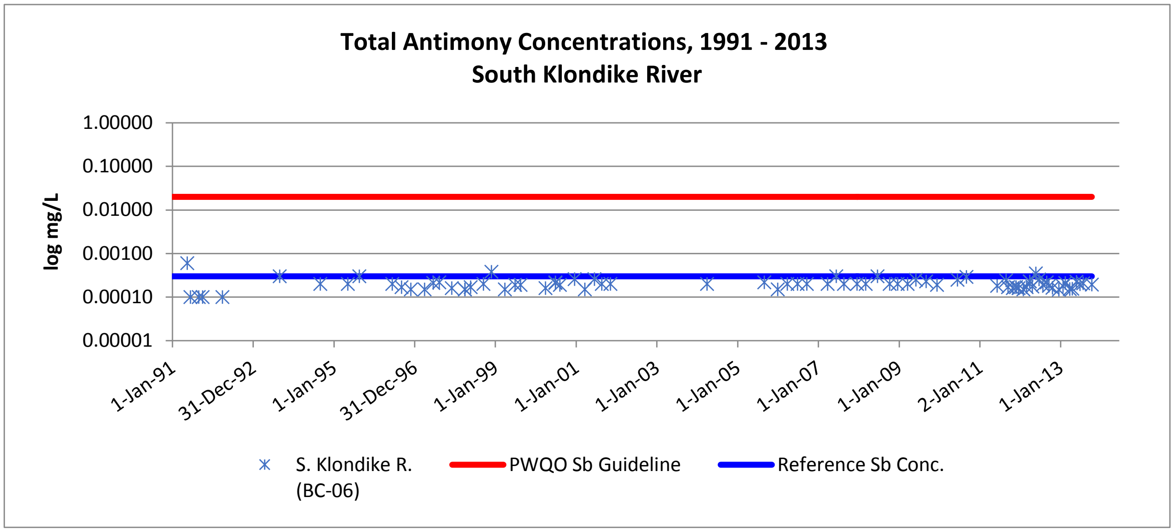

Total Copper Concentrations, 1991 - 2013
Pacific and Lee Creeks
0.0200
0.0150
0.0100
0.0050
0.0000
mg/L
33239
33969.6
34700.2
35430.8
36161.4
36892
37622.6
38353.2
39083.8
39814.4
40545
41275.6
Pacific Ck. (BC-05)
Lee Ck. (BC-34)
CCME Cu Guideline
Reference Cu Conc.

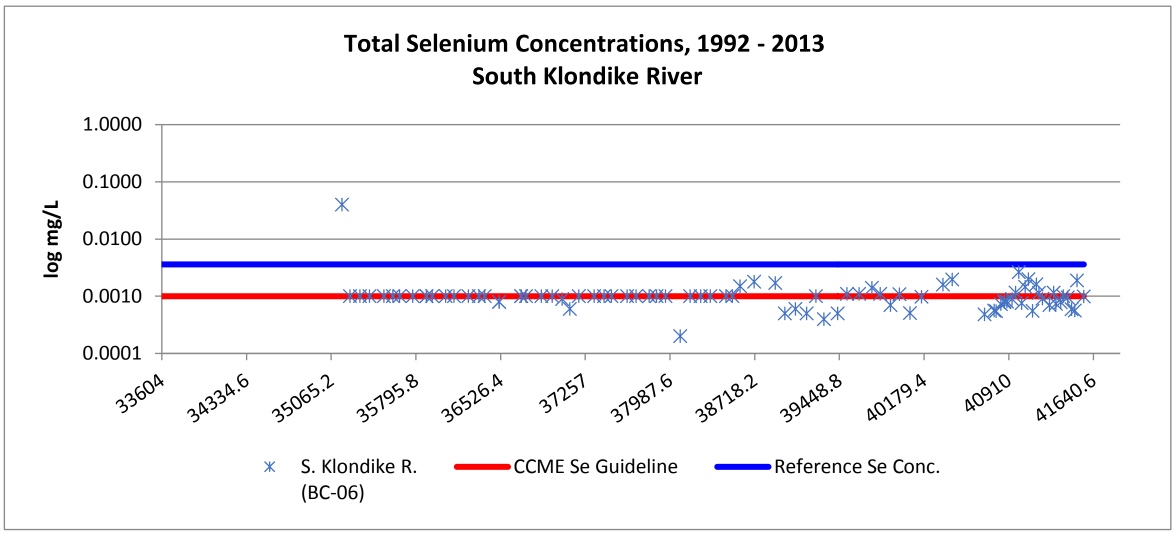

Total Lead Concentrations, 1991 - 2013
Pacific and Lee Creeks
1.000000
0.100000
0.010000
0.001000
0.000100
0.000010
0.000001
log mg/L
33239
33969.6
34700.2
35430.8
36161.4
36892
37622.6
38353.2
39083.8
39814.4
40545
41275.6
Pacific Ck. (BC-05)
Lee Ck. (BC-34)
CCME Pb Guideline
Reference Pb Conc.

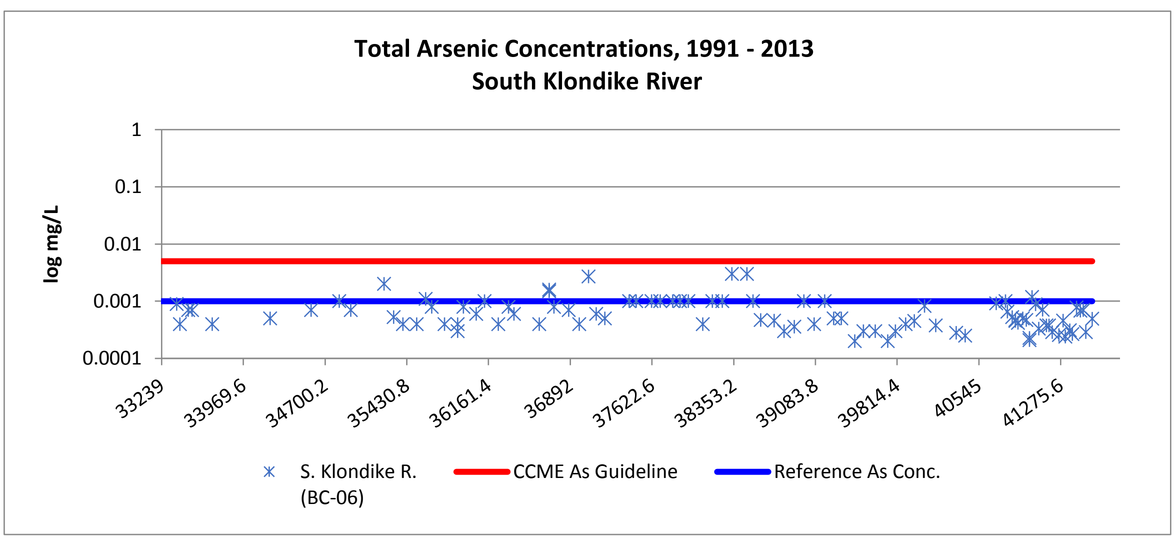

Total Suspended Solids Concentrations, 1991 - 2013
Pacific and Lee Creeks
log mg/L
1000
100
10
1
33239
33969.6
34700.2
35430.8
36161.4
36892
37622.6
38353.2
39083.8
39814.4
40545
41275.6
Pacific Ck. (BC-05)
Lee Ck. (BC-34)
Reference TSS
MMER Limit

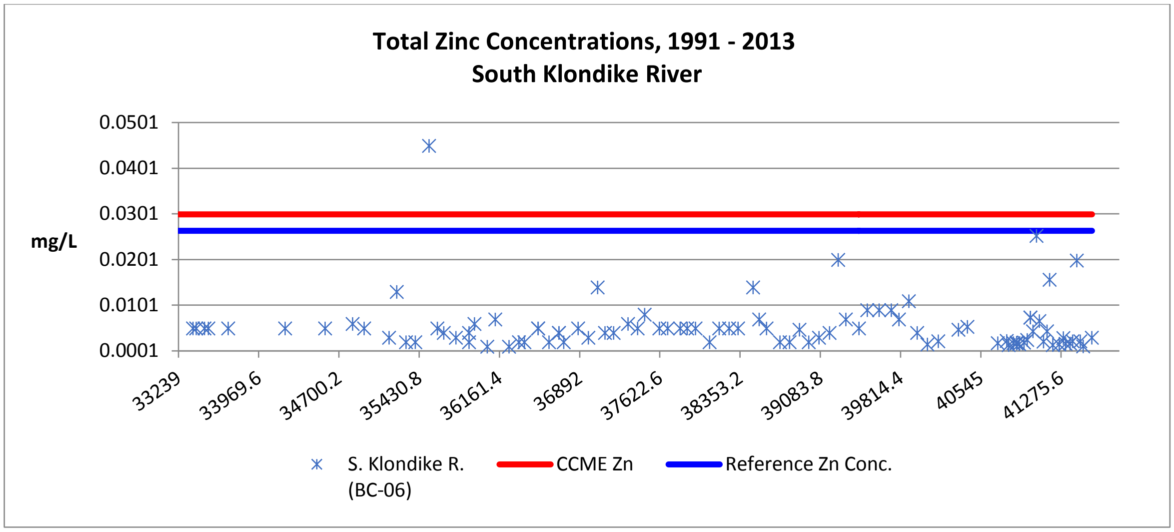

Total Antimony Concentrations, 1991 - 2013
Laura and Carolyn Creeks
log mg/L
1.00000
0.10000
0.01000
0.00100
0.00010
0.00001
1-Jan-91
31-Dec-92
1-Jan-95
31-Dec-96
1-Jan-99
1-Jan-01
1-Jan-03
1-Jan-05
1-Jan-07
1-Jan-09
2-Jan-11
1-Jan-13
Laura Ck. d/s Ditch Rd (BC-01)
Carolyn Ck. u/s Laura Ck. (BC-02)
Laura Ck. u/s Carolyn Ck. (BC-03)
Laura Ck. beside S. Klondike R. (BC-39)
PWQO Sb Guideline

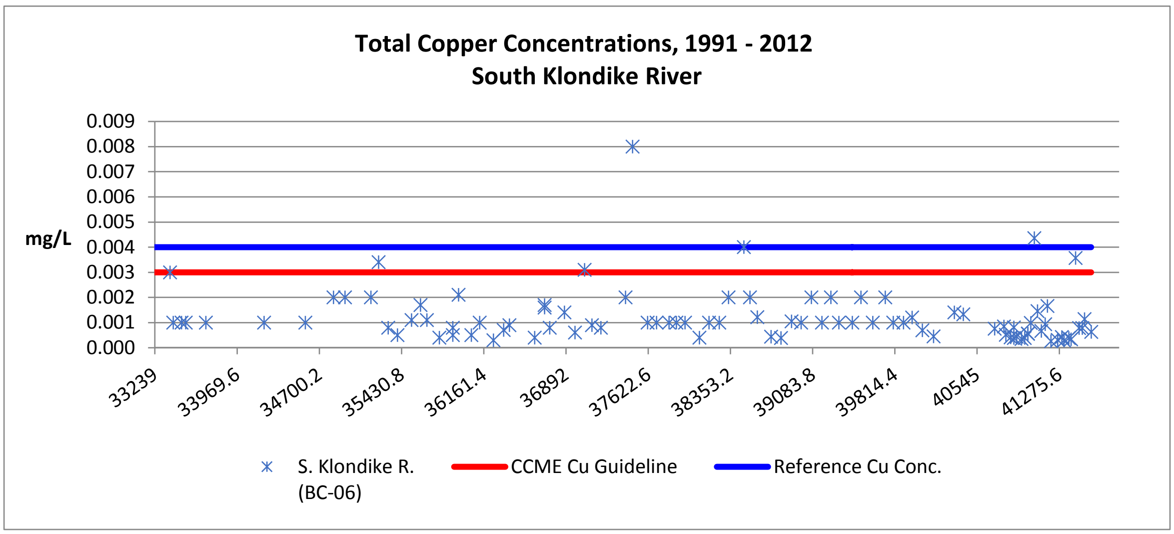

Total Lead Concentrations, 1991 - 2013
Laura and Carolyn Creeks
log mg/L
1.00000
0.10000
0.01000
0.00100
0.00010
0.00001
0.00000
33239
33969.6
34700.2
35430.8
36161.4
36892
37622.6
38353.2
39083.8
39814.4
40545
41275.6
Laura Ck. d/s Ditch Rd (BC-01)
Carolyn Ck. u/s Laura Ck. (BC-02)
Laura Ck. u/s Carolyn Ck. (BC-03)
Laura Ck. beside S. Klondike R. (BC-39)
CCME Pb Guideline

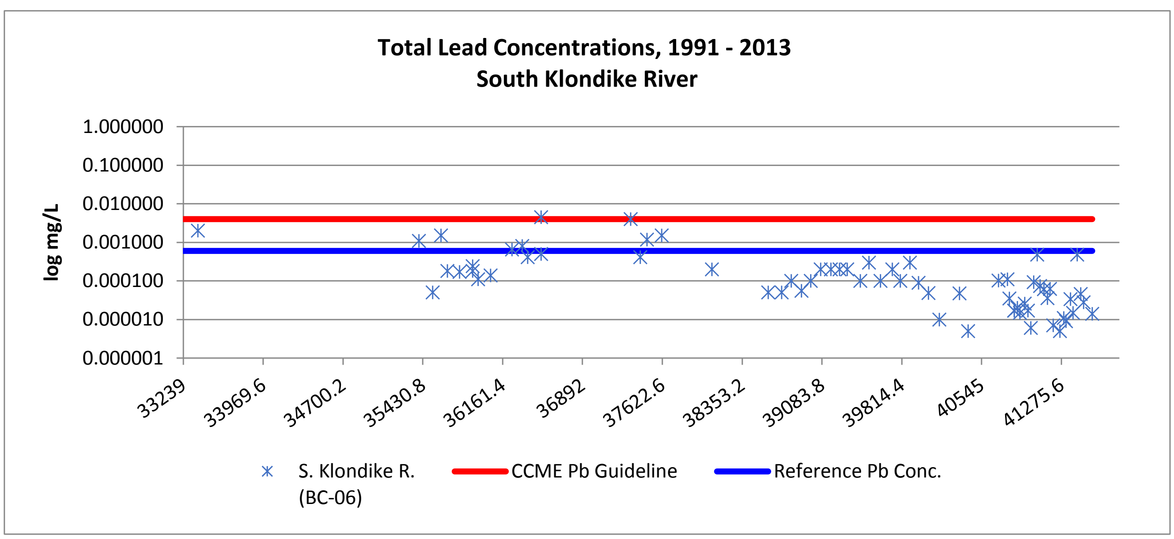

Total Antimony Concentrations, 1991 - 2013
South Klondike River
log mg/L
1.00000
0.10000
0.01000
0.00100
0.00010
0.00001
1-Jan-91
31-Dec-92
1-Jan-95
31-Dec-96
1-Jan-99
1-Jan-01
1-Jan-03
1-Jan-05
1-Jan-07
1-Jan-09
2-Jan-11
1-Jan-13
S. Klondike R. (BC-06)
PWQO Sb Guideline
Reference Sb Conc.

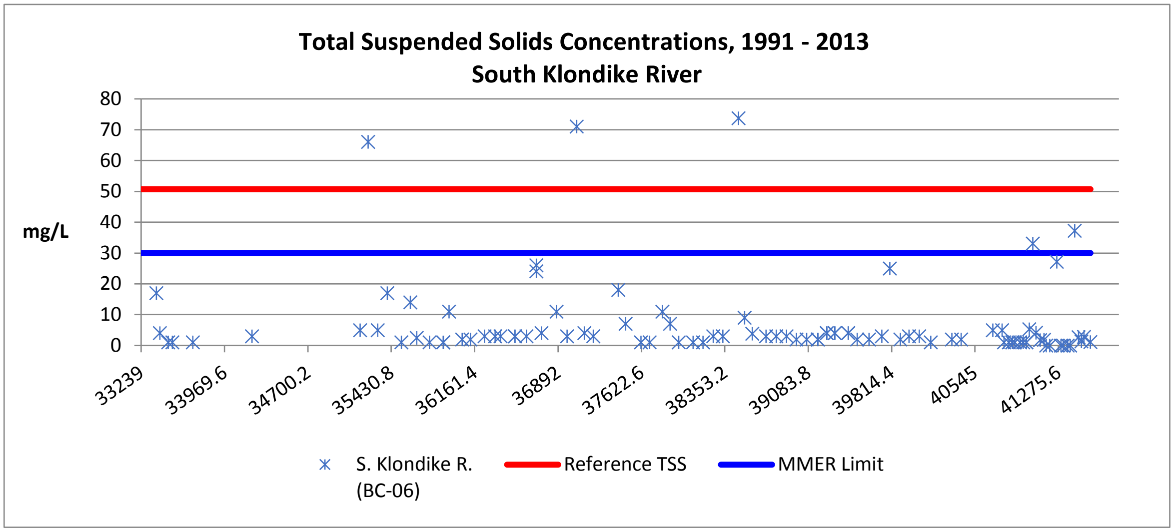

Total Selenium Concentrations, 1992 - 2013
South Klondike River
log mg/L
1.0000
0.1000
0.0100
0.0010
0.0001
33604
34334.6
35065.2
35795.8
36526.4
37257
37987.6
38718.2
39448.8
40179.4
40910
41640.6
S. Klondike R. (BC-06)
CCME Se Guideline
Reference Se Conc.


Total Arsenic Concentrations, 1991 - 2013
South Klondike River
log mg/L
1
0.1
0.01
0.001
0.0001
33239
33969.6
34700.2
35430.8
36161.4
36892
37622.6
38353.2
39083.8
39814.4
40545
41275.6
S. Klondike R. (BC-06)
CCME As Guideline
Reference As Conc.


Total Zinc Concentrations, 1991 - 2013
South Klondike River
mg/L
0.0501
0.0401
0.0301
0.0201
0.0101
0.0001
33239
33969.6
34700.2
35430.8
36161.4
36892
37622.6
38353.2
39083.8
39814.4
40545
41275.6
S. Klondike R. (BC-06)
CCME Zn
Reference Zn Conc.

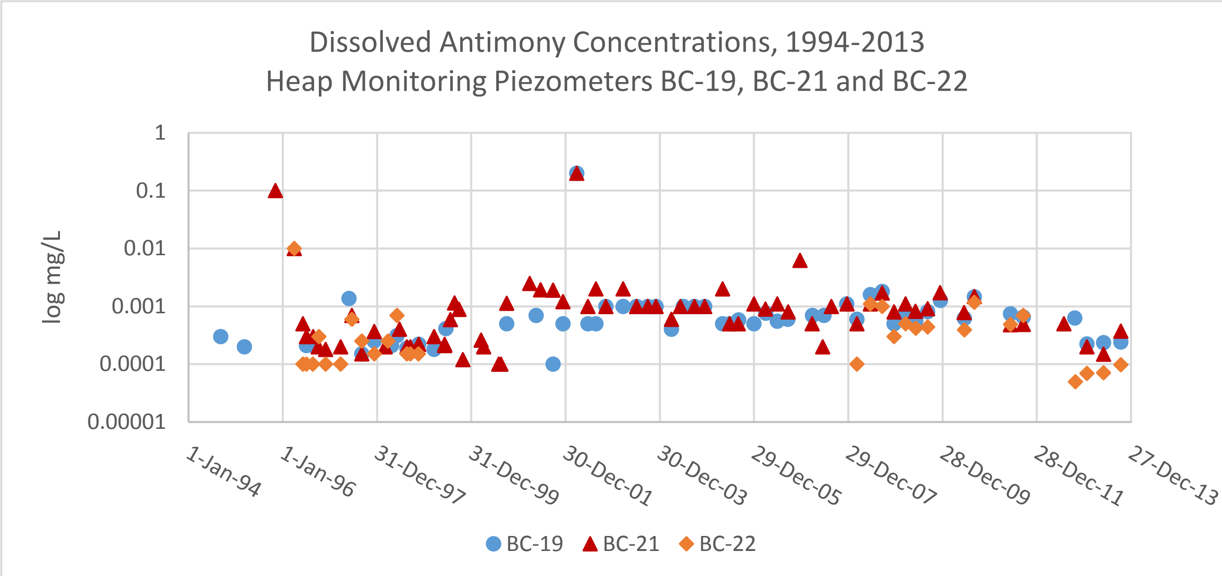

Total Copper Concentrations, 1991 - 2012
South Klondike River
mg/L
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
33239
33969.6
34700.2
35430.8
36161.4
36892
37622.6
38353.2
39083.8
39814.4
40545
41275.6
S. Klondike R. (BC-06)
CCME Cu Guideline
Reference Cu Conc.


Total Lead Concentrations, 1991 - 2013
South Klondike River
log mg/L
1.000000
0.100000
0.010000
0.001000
0.000100
0.000010
0.000001
33239
33969.6
34700.2
35430.8
36161.4
36892
37622.6
38353.2
39083.8
39814.4
40545
41275.6
S. Klondike R. (BC-06)
CCME Pb Guideline
Reference Pb Conc.

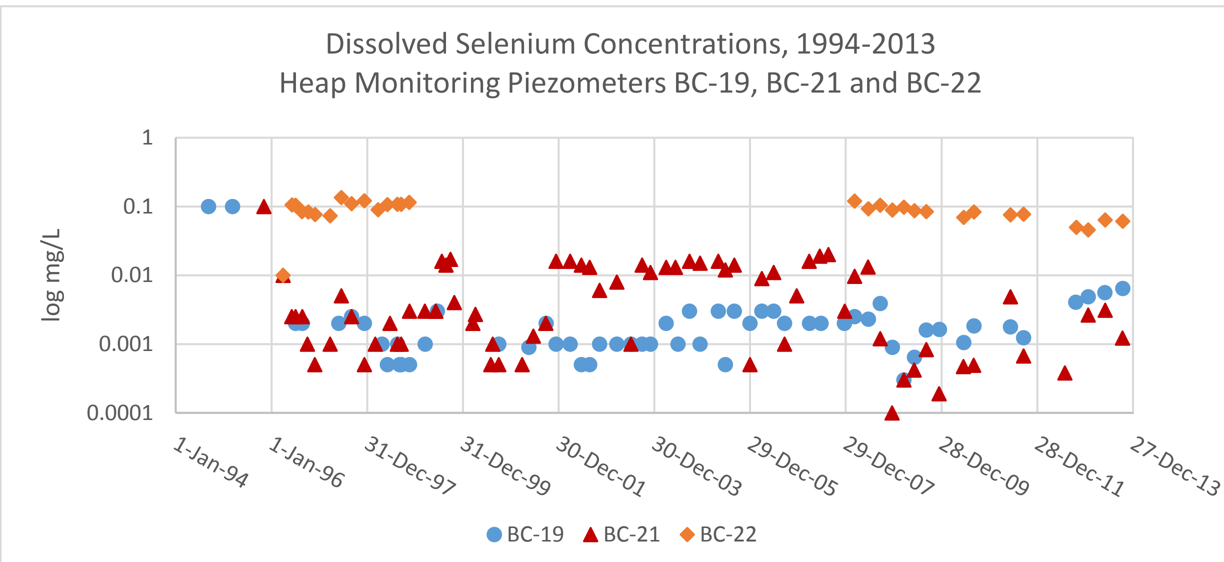

Total Suspended Solids Concentrations, 1991 - 2013
South Klondike River
mg/L
80
70
60
50
40
30
20
10
0
33239
33969.6
34700.2
35430.8
36161.4
36892
37622.6
38353.2
39083.8
39814.4
40545
41275.6
S. Klondike R. (BC-06)
Reference TSS
MMER Limit

APPENDIX C

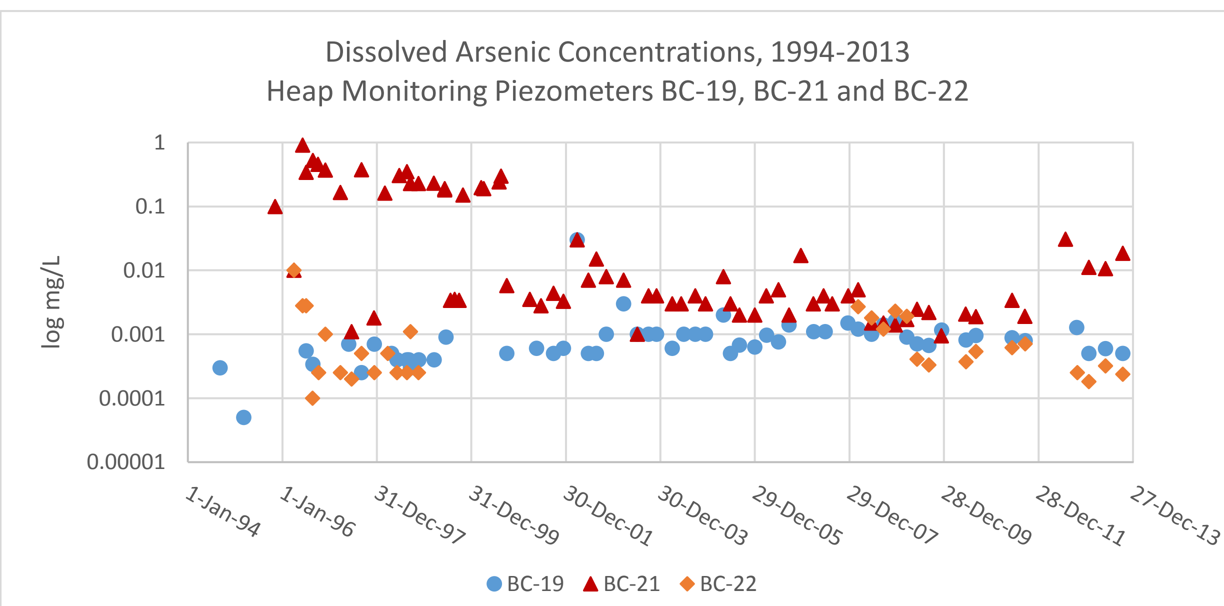
GROUNDWATER GRAPHICAL DATA



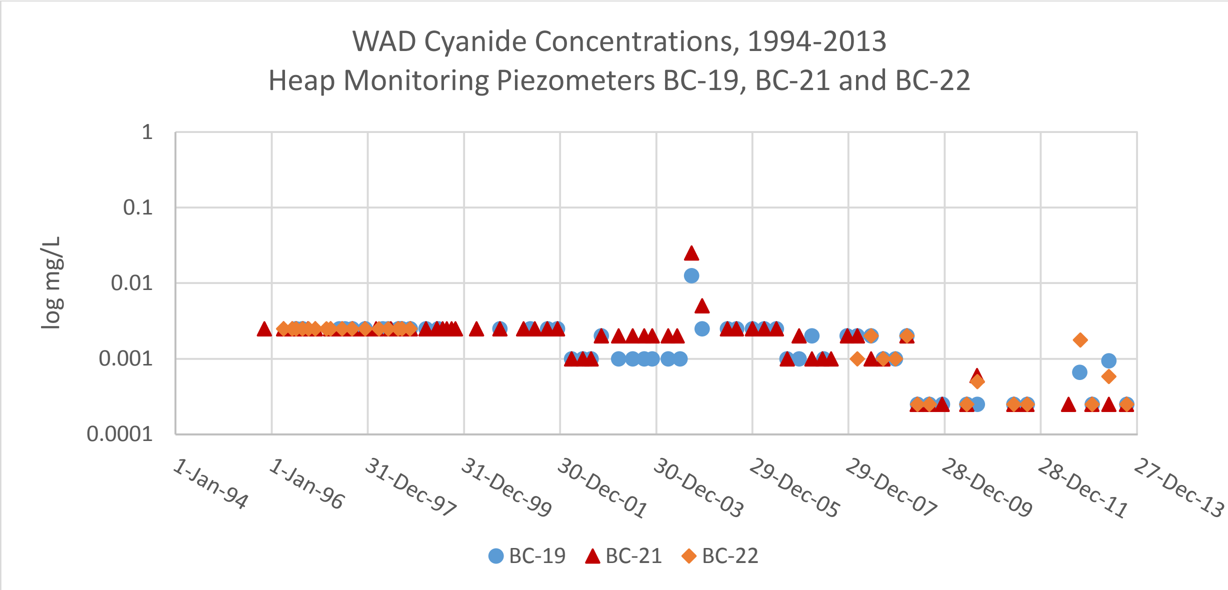
Dissolved Antimony Concentrations, 1994-2013
Heap Monitoring Piezometers BC-19, BC-21 and BC-22
log mg/L
1
0.1
0.01
0.001
0.0001
0.00001
1-Jan-94
1-Jan-96
31-Dec-97
31-Dec-99
30-Dec-01
30-Dec-03
29-Dec-05
29-Dec-07
28-Dec-09
28-Dec-11
27-Dec-13
BC-19
BC-21
BC-22



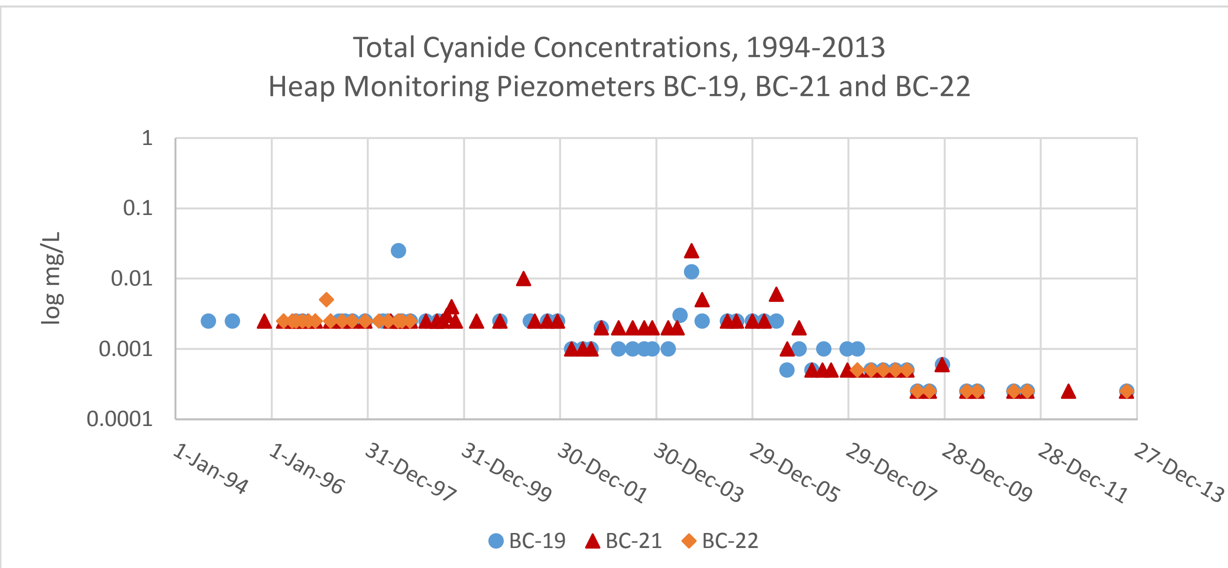
Dissolved Selenium Concentrations, 1994-2013
Heap Monitoring Piezometers BC-19, BC-21 and BC-22
log mg/L
1
0.1
0.01
0.001
0.0001
1-Jan-94
1-Jan-96
31-Dec-97
31-Dec-99
30-Dec-01
30-Dec-03
29-Dec-05
29-Dec-07
28-Dec-09
28-Dec-11
27-Dec-13
BC-19
BC-21
BC-22



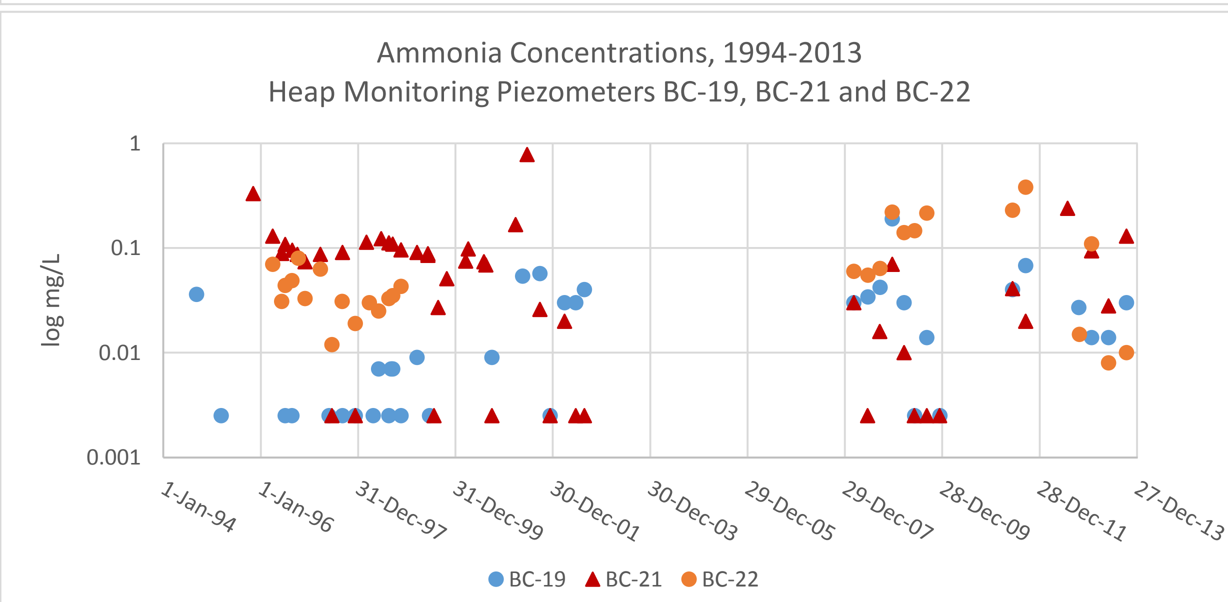
Dissolved Arsenic Concentrations, 1994-2013
Heap Monitoring Piezometers BC-19, BC-21 and BC-22
log mg/L
1
0.1
0.01
0.001
0.0001
0.00001
1-Jan-94
1-Jan-96
31-Dec-97
31-Dec-99
30-Dec-01
30-Dec-03
29-Dec-05
29-Dec-07
28-Dec-09
28-Dec-11
27-Dec-13
BC-19
BC-21
BC-22



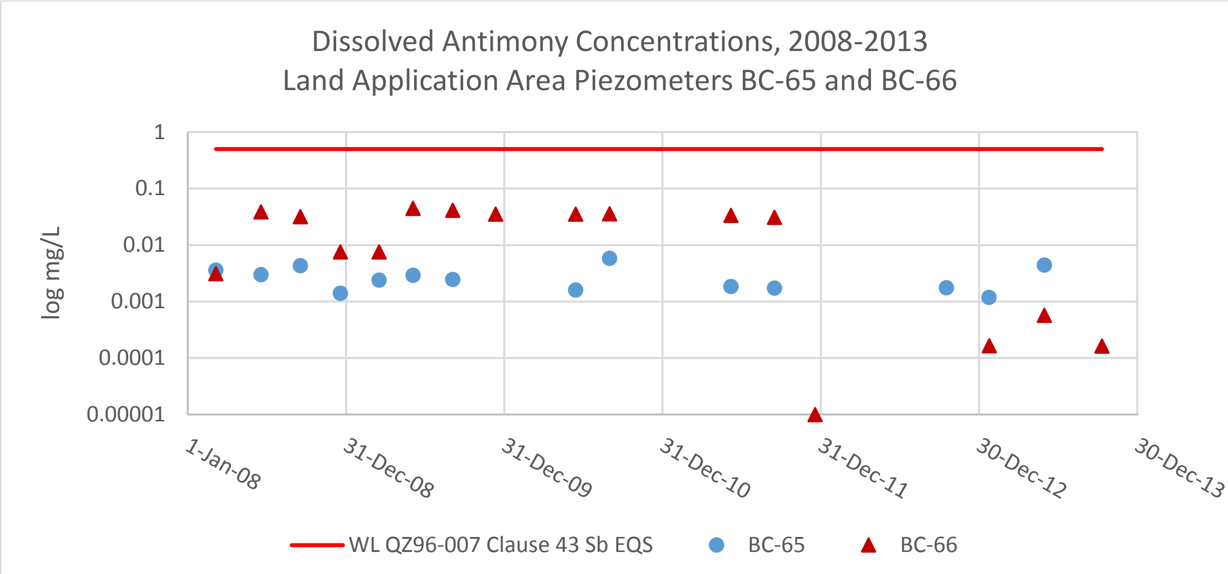
WAD Cyanide Concentrations, 1994-2013
Heap Monitoring Piezometers BC-19, BC-21 and BC-22
log mg/L
1
0.1
0.01
0.001
0.0001
1-Jan-94
1-Jan-96
31-Dec-97
31-Dec-99
30-Dec-01
30-Dec-03
29-Dec-05
29-Dec-07
28-Dec-09
28-Dec-11
27-Dec-13
BC-19
BC-21
BC-22

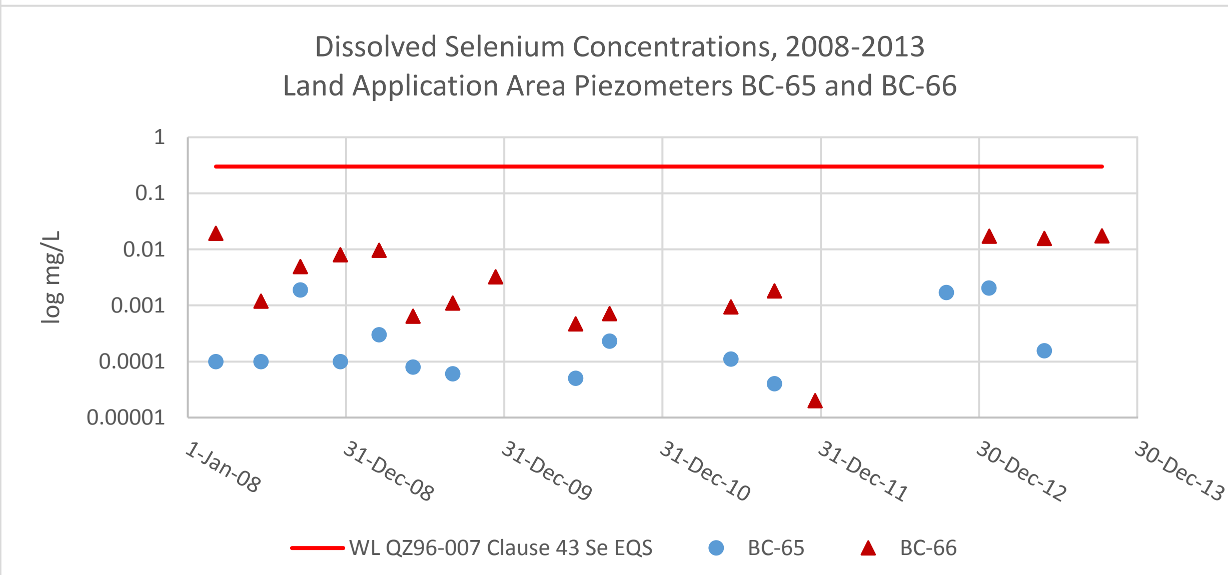


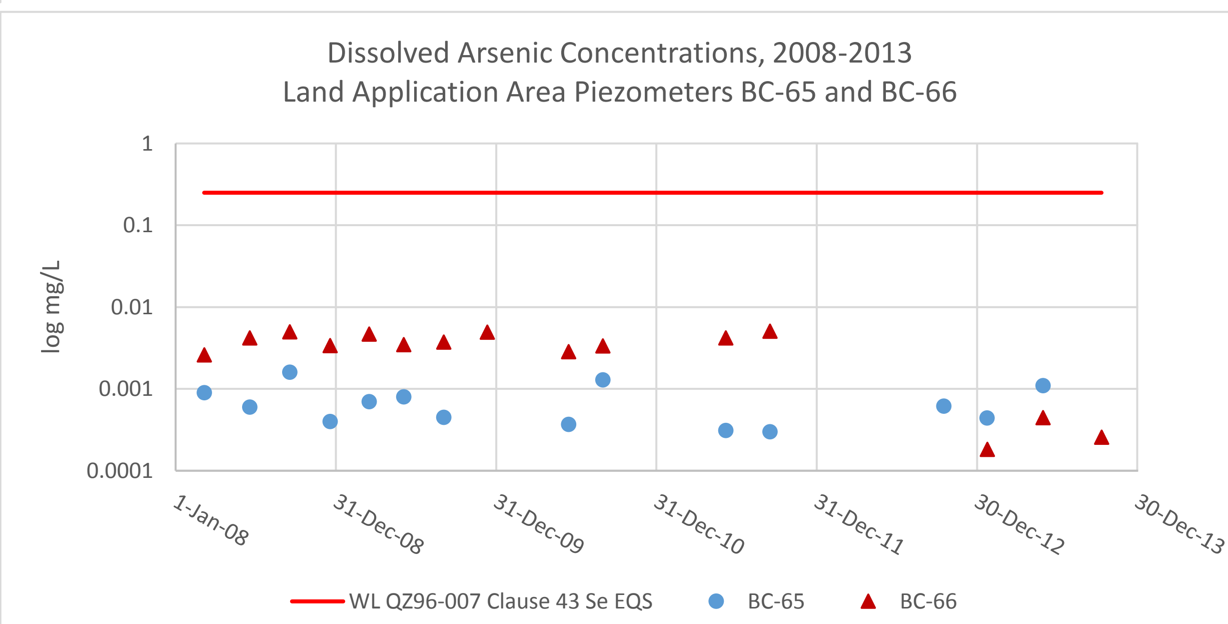
Total Cyanide Concentrations, 1994-2013
Heap Monitoring Piezometers BC-19, BC-21 and BC-22
log mg/L
1
0.1
0.01
0.001
0.0001
1-Jan-94
1-Jan-96
31-Dec-97
31-Dec-99
30-Dec-01
30-Dec-03
29-Dec-05
29-Dec-07
28-Dec-09
28-Dec-11
27-Dec-13
BC-19
BC-21
BC-22

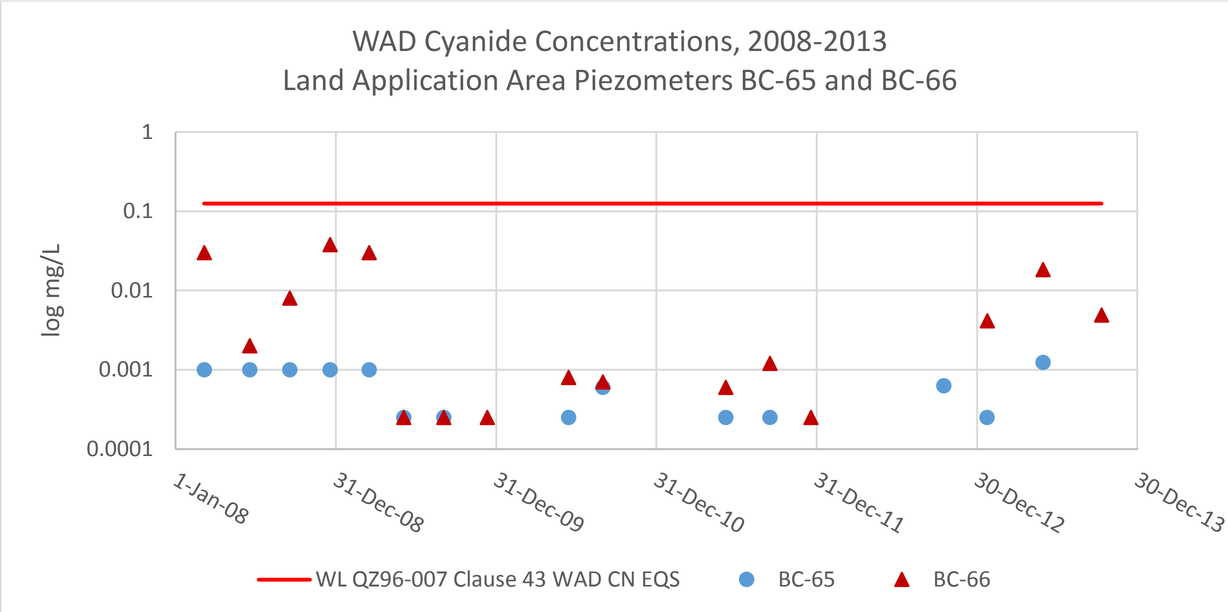


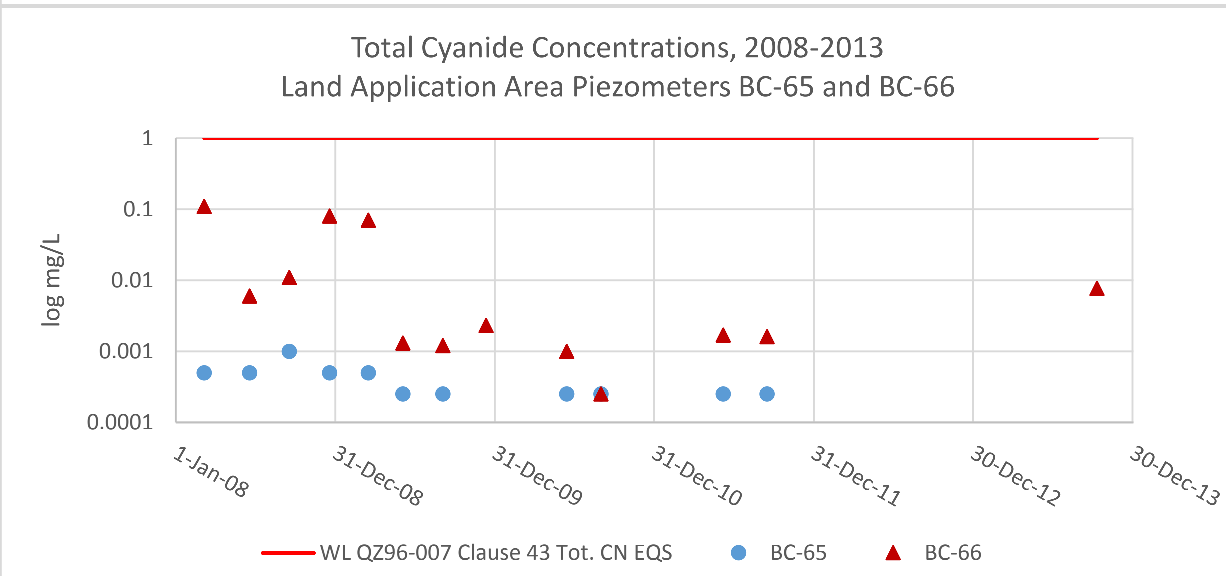
Ammonia Concentrations, 1994-2013
Heap Monitoring Piezometers BC-19, BC-21 and BC-22
log mg/L
1
0.1
0.01
0.001
1-Jan-94
1-Jan-96
31-Dec-97
31-Dec-99
30-Dec-01
30-Dec-03
29-Dec-05
29-Dec-07
28-Dec-09
28-Dec-11
27-Dec-13
BC-19
BC-21
BC-22

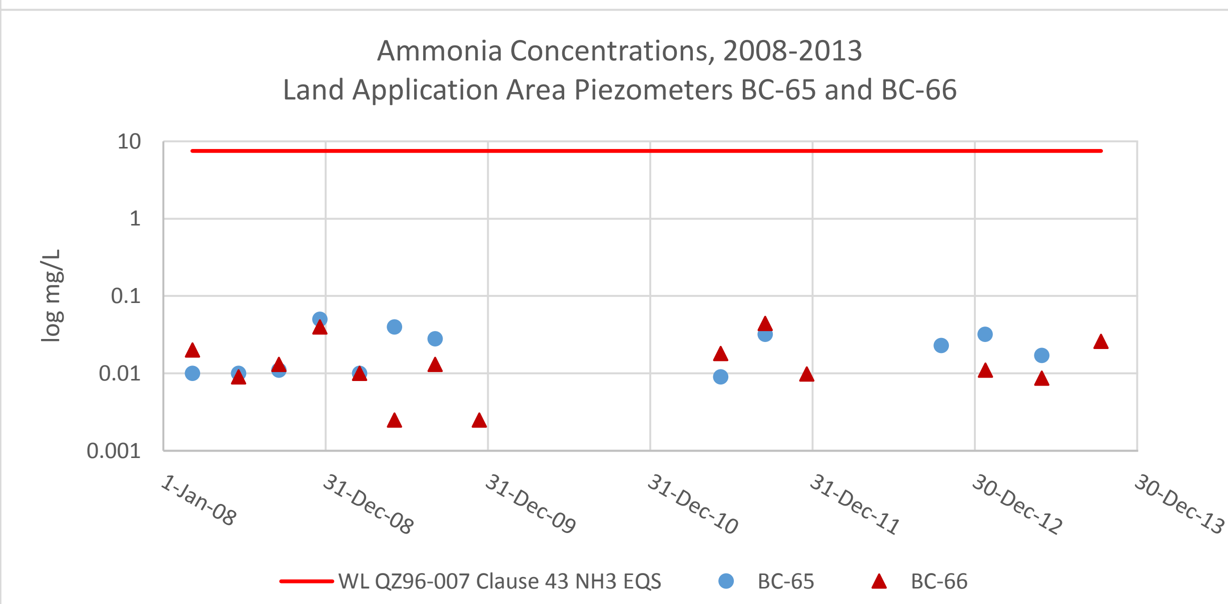

Dissolved Antimony Concentrations, 2008-2013
Land Application Area Piezometers BC-65 and BC-66
log mg/L
1
0.1
0.01
0.001
0.0001
0.00001
1-Jan-08
31-Dec-08
31-Dec-09
31-Dec-10
31-Dec-11
30-Dec-12
30-Dec-13
WL QZ96-007 Clause 43 Sb EQS
BC-65
BC-66

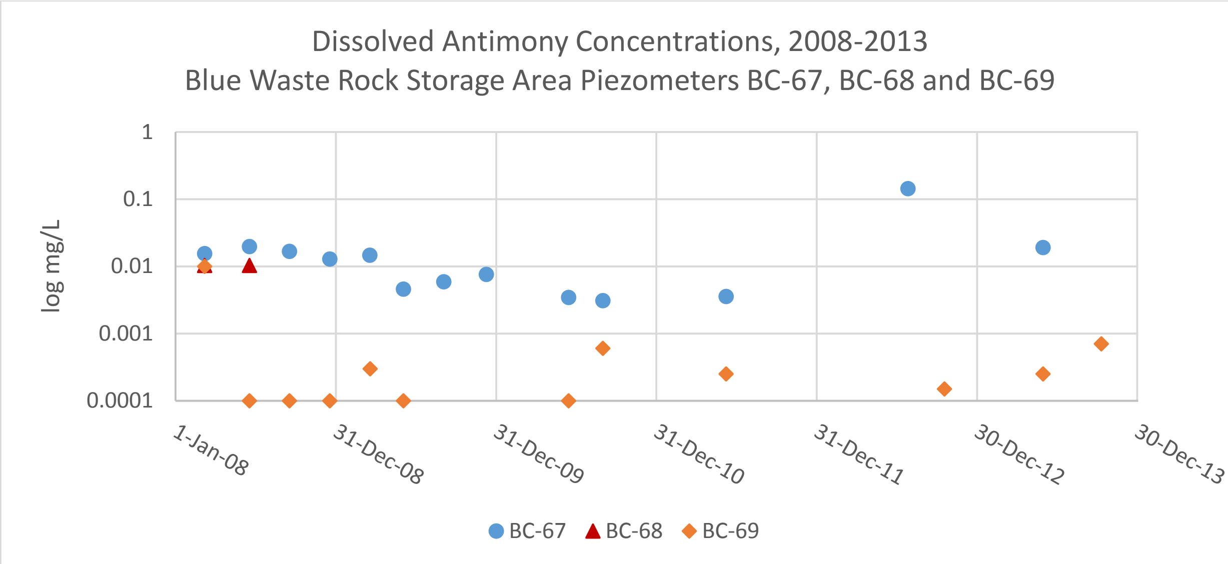

Dissolved Selenium Concentrations, 2008-2013
Land Application Area Piezometers BC-65 and BC-66
log mg/L
1
0.1
0.01
0.001
0.0001
0.00001
1-Jan-08
31-Dec-08
31-Dec-09
31-Dec-10
31-Dec-11
30-Dec-12
30-Dec-13
WL QZ96-007 Clause 43 Se EQS
BC-65
BC-66

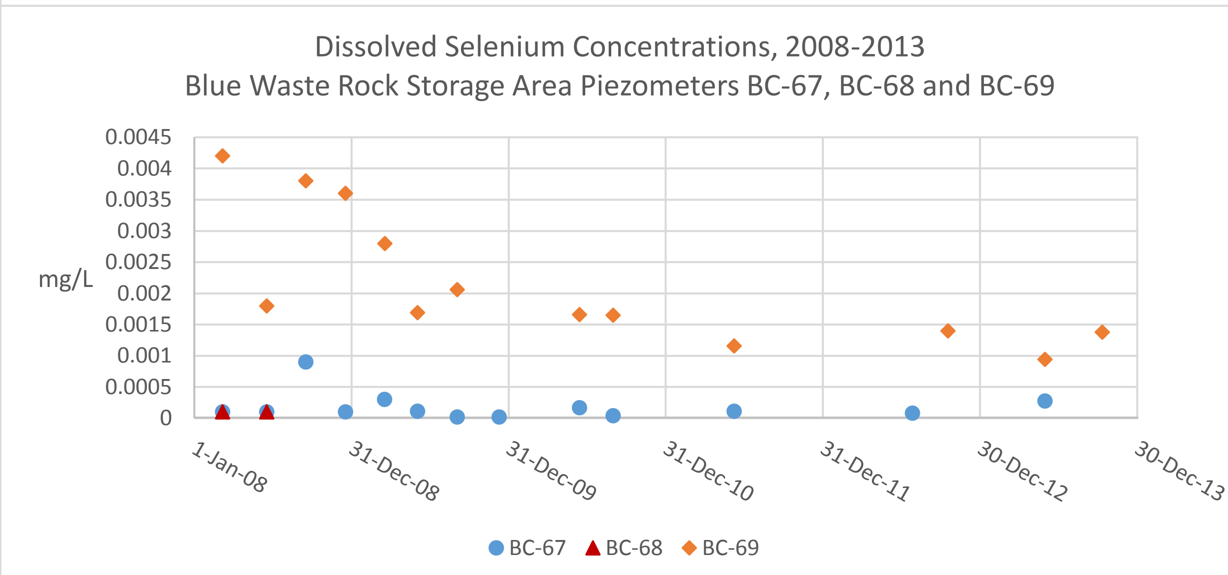

Dissolved Arsenic Concentrations, 2008-2013
Land Application Area Piezometers BC-65 and BC-66
log mg/L
1
0.1
0.01
0.001
0.0001
1-Jan-08
31-Dec-08
31-Dec-09
31-Dec-10
31-Dec-11
30-Dec-12
30-Dec-13
WL QZ96-007 Clause 43 Se EQS
BC-65
BC-66

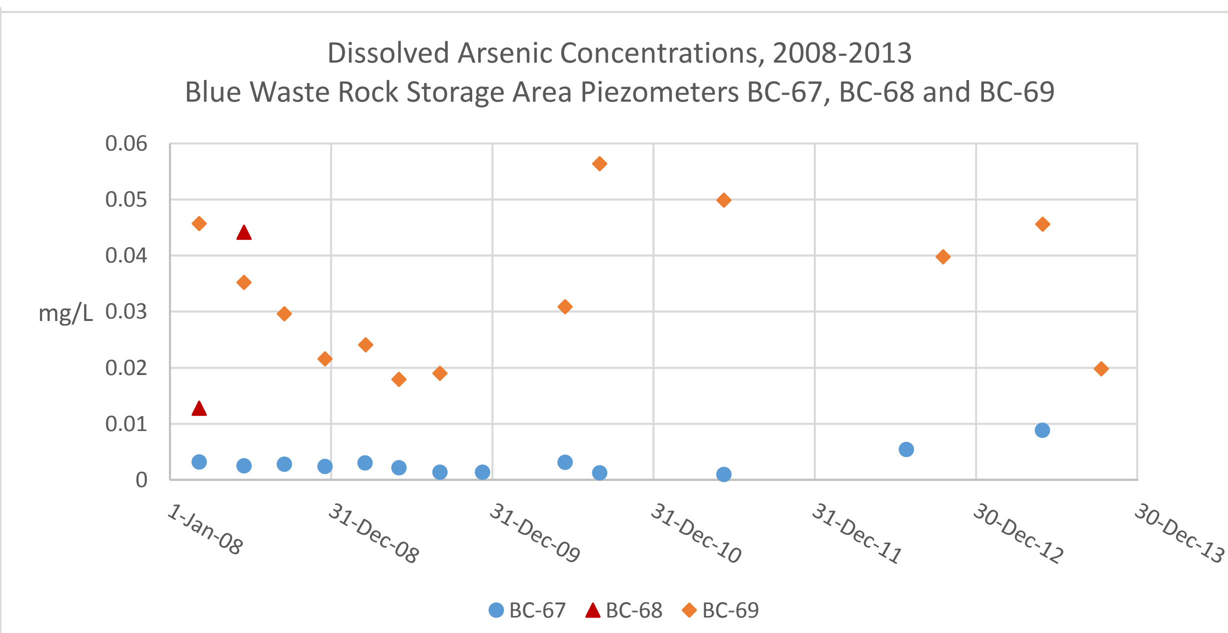

WAD Cyanide Concentrations, 2008-2013
Land Application Area Piezometers BC-65 and BC-66
log mg/L
1
0.1
0.01
0.001
0.0001
1-Jan-08
31-Dec-08
31-Dec-09
31-Dec-10
31-Dec-11
30-Dec-12
30-Dec-13
WL QZ96-007 Clause 43 WAD CN EQS
BC-65
BC-66

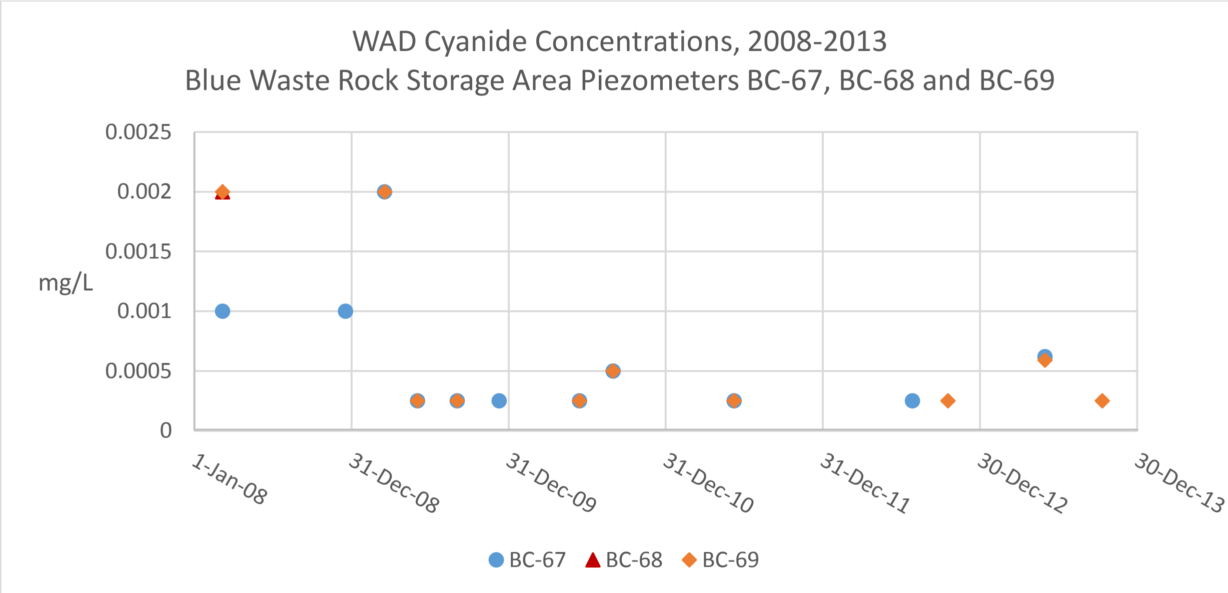

Total Cyanide Concentrations, 2008-2013
Land Application Area Piezometers BC-65 and BC-66
log mg/L
1
0.1
0.01
0.001
0.0001
1-Jan-08
31-Dec-08
31-Dec-09
31-Dec-10
31-Dec-11
30-Dec-12
30-Dec-13
WL QZ96-007 Clause 43 Tot. CN EQS
BC-65
BC-66

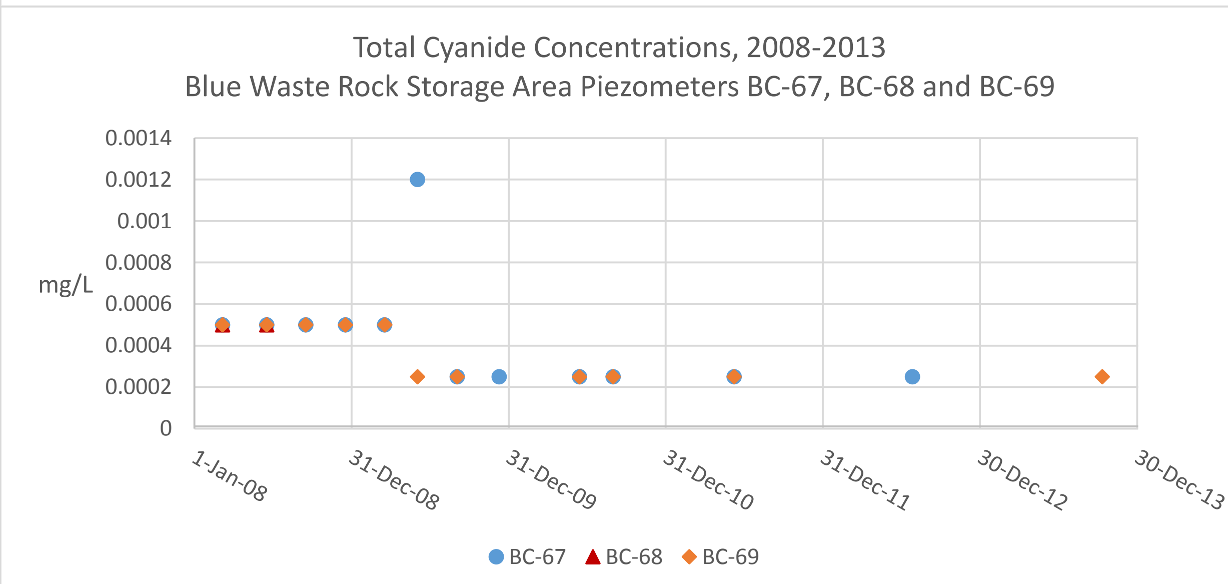

Ammonia Concentrations, 2008-2013
Land Application Area Piezometers BC-65 and BC-66
log mg/L
10
1
0.1
0.01
0.001
1-Jan-08
31-Dec-08
31-Dec-09
31-Dec-10
31-Dec-11
30-Dec-12
30-Dec-13
WL QZ96-007 Clause 43 NH3 EQS
BC-65
BC-66

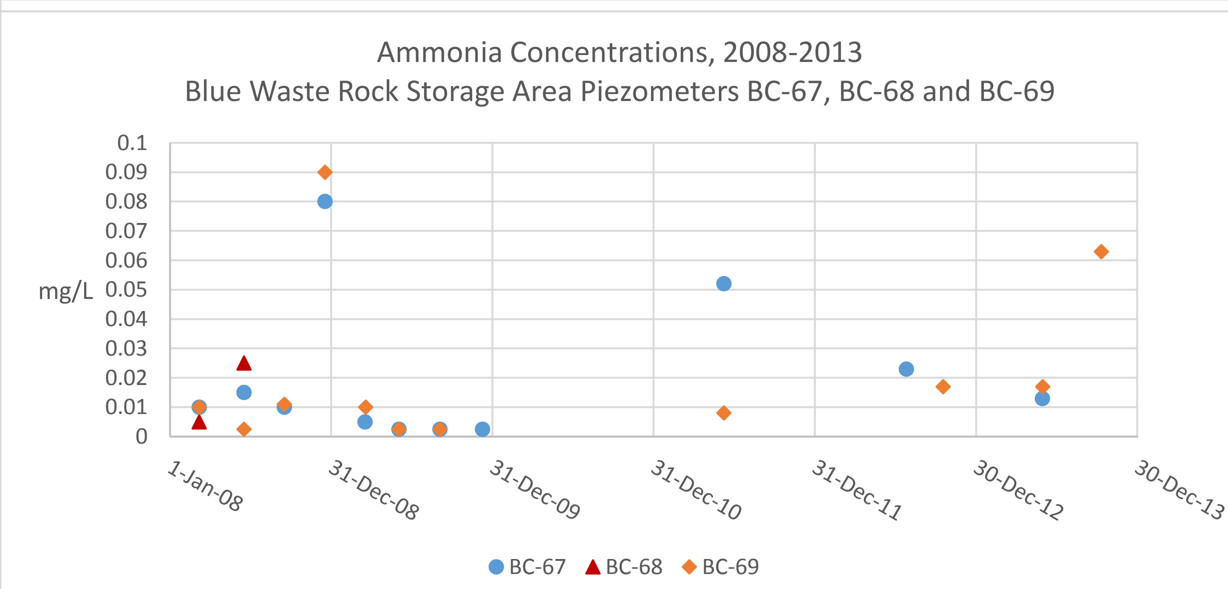

Dissolved Antimony Concentrations, 2008-2013
Blue Waste Rock Storage Area Piezometers BC-67, BC-68 and BC-69
log mg/L
1
0.1
0.01
0.001
0.0001
1-Jan-08
31-Dec-08
31-Dec-09
31-Dec-10
31-Dec-11
30-Dec-12
30-Dec-13
BC-67
BC-68
BC-69


Dissolved Selenium Concentrations, 2008-2013
Blue Waste Rock Storage Area Piezometers BC-67, BC-68 and BC-69
mg/L
0.0045
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
1-Jan-08
31-Dec-08
31-Dec-09
31-Dec-10
31-Dec-11
30-Dec-12
30-Dec-13
BC-67
BC-68
BC-69


Dissolved Arsenic Concentrations, 2008-2013
Blue Waste Rock Storage Area Piezometers BC-67, BC-68 and BC-69
mg/L
0.06
0.05
0.04
0.03
0.02
0.01
0
1-Jan-08
31-Dec-08
31-Dec-09
31-Dec-10
31-Dec-11
30-Dec-12
30-Dec-13
BC-67
BC-68
BC-69


WAD Cyanide Concentrations, 2008-2013
Blue Waste Rock Storage Area Piezometers BC-67, BC-68 and BC-69
mg/L
0.0025
0.002
0.0015
0.001
0.0005
0
1-Jan-08
31-Dec-08
31-Dec-09
31-Dec-10
31-Dec-11
30-Dec-12
30-Dec-13
BC-67
BC-68
BC-69


Total Cyanide Concentrations, 2008-2013
Blue Waste Rock Storage Area Piezometers BC-67, BC-68 and BC-69
mg/L
0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
1-Jan-08
31-Dec-08
31-Dec-09
31-Dec-10
31-Dec-11
30-Dec-12
30-Dec-13
BC-67
BC-68
BC-69


Ammonia Concentrations, 2008-2013
Blue Waste Rock Storage Area Piezometers BC-67, BC-68 and BC-69
mg/L
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1-Jan-08
31-Dec-08
31-Dec-09
31-Dec-10
31-Dec-11
30-Dec-12
30-Dec-13
BC-67
BC-68
BC-69

APPENDIX C

LABERGE ENVIRONMENTAL BASELINE REPORT, 2014

BASELINE ENVIRONMENTAL ASSESSMENTS

FOR THE

BREWERY CREEK PROPERTY, 2012

For

PREDATOR GROUP

Submitted by

Laberge Environmental Services

January 23rd, 2014

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EXECUTIVE SUMMARY

Predator Group retained Laberge Environmental Services (Laberge) to conduct a baseline environmental assessment characterizing the wildlife, vegetation, benthic invertebrates, stream sediments and fisheries resources in the vicinity of the Brewery Creek property throughout 2012. This report presents background information, methods and results for each component.

The study area is located approximately 55 kilometres east of Dawson City in central Yukon. The district falls within the ecoregion Yukon Plateau-North, northeast of the Tintina Trench and hosts considerable potential for metallic mineral deposits. The Brewery Creek property is a past gold heap leach operation (1996 to 2002). The information from this report will help to support a proposal for renewed mining and processing at Brewery Creek.

Three aerial wildlife surveys were conducted in 2012 (March, June and October) to document the distribution and seasonal use of animals throughout the study area. Moose were clearly the most conspicuous and abundant large mammal observed. Wolves and bears were the primary furbearers observed albeit in low numbers. No sheep or caribou were documented during the surveys. Other species recorded were lynx, porcupine, ptarmigan, fox, red-tailed hawk, trumpeter swan and unidentified ducks.

Large scale vegetation descriptions had previously been conducted for the area but the 2012 assessments concentrated on the seven ore zones; Lower Fosters, Classic, North Face, Bohemian, Schooner, Sleemans and Big Rock. Field surveys were carried out following mapping generated from satellite imagery. Six vegetation communities were identified within the study area. A list of all vascular plants was compiled for each zone. No rare plants were observed.

Although an intensive water quality sampling program exists at Brewery Creek, surface water samples were collected during the August survey to aid in the habitat characterization for the aquatic biota (invertebrates and fish). Several parameters (arsenic, cadmium and selenium) exceeded the recommended CCME guidelines for the protection of freshwater aquatic life. Considering the fact that these streams drain highly mineralized areas, detectable concentrations of metals are not unexpected.

Due to the close proximity of benthic invertebrates and some fish species (slimy sculpin) to the substrate, stream sediments were analyzed to further characterize the habitat. Similar to the waters that drain these areas, some of the stream sediments had high concentrations of some parameters, notably arsenic.

The use of benthic invertebrates as a biomonitoring tool provides a useful measure in which to assess the health of a watershed. Various species respond differently depending on environmental stress. With the exception of the benthic community at Lucky Creek, all populations were relatively robust with good representation of pollution sensitive organisms.

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The water and stream sediment quality at Classic Creek would indicate a degraded environment, however the benthic community was healthy here suggesting that the metal concentrations are not in a bioavailable form.

Four drainages were assessed for fish resources; Lee Cr (includes Pacific Creek), Laura Creek, Golden Creek and Brewery Creek. Beaver dams on lower Laura Creek provide fish barriers and no fish were captured at the upper sites on Laura Creek. Pacific Creek has low quality habitat and fish were not documented in this drainage. Lee, Golden and Brewery Creeks all provide high quality habitat. Species captured consisted of Slimy Sculpin (most common), Arctic grayling, burbot and juvenile Chinook salmon. Tissues from Arctic grayling and sculpin were analyzed for metals. Mercury is the only metal that has a guideline for fish tissue based on human consumption. Concentrations were well below the Canadian guideline of 0.5 ug/g for the consumption of fish and fish products.

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1.0 INTRODUCTION

The claims comprising the Brewery Creek Project were initially staked in 1987 by Noranda Exploration Limited. Initial environmental baseline studies, similar to the ones conducted in this report, were completed by Norecol Dames and Moore (Norecol) in 1991 for Loki Gold Corporation (Steffen Robertson and Kirsten Inc, 1994).

The property is a past heap leach operation which operated from 1996 through 2002; Loki Gold Corporation from 1993 to 1996, Viceroy Minerals Resources from 1996 to 2002. During that time the mine produced approximately 280,000 oz of gold from seven near surface oxide deposits, shutting down in 2002 due to low gold prices.

On March 15th, 2005, Alexco Resource Corporation (Alexco) acquired mine assets and completed all reclamation work by the end of 2007. In 2012 Golden Predator signed a purchase agreement with Alexco to acquire a 100% interest in the project, which will replace their existing Brewery Creek Option Agreement once closed.

The Brewery Creek property operates under an existing Type A Water License and a Quartz Mining License, both with an expiration date in 2021.

In 2011, Golden Predator, through their extensive drilling program discovered three new deposits, Classic, Sleemans and Schooner. In the spring of 2012, Golden Predator contracted Laberge Environmental Services of Whitehorse, Yukon, to conduct environmental baseline surveys of these areas as well as update information for the entire property.

This report covers the wildlife, vegetation, benthic invertebrate and fisheries components of an environmental baseline study.

2.0 STUDY AREA

The study area lies within and surrounding Golden Predator's Brewery Creek claim block and is located approximately 55 kilometres east of Dawson City, Yukon (Figure 1).

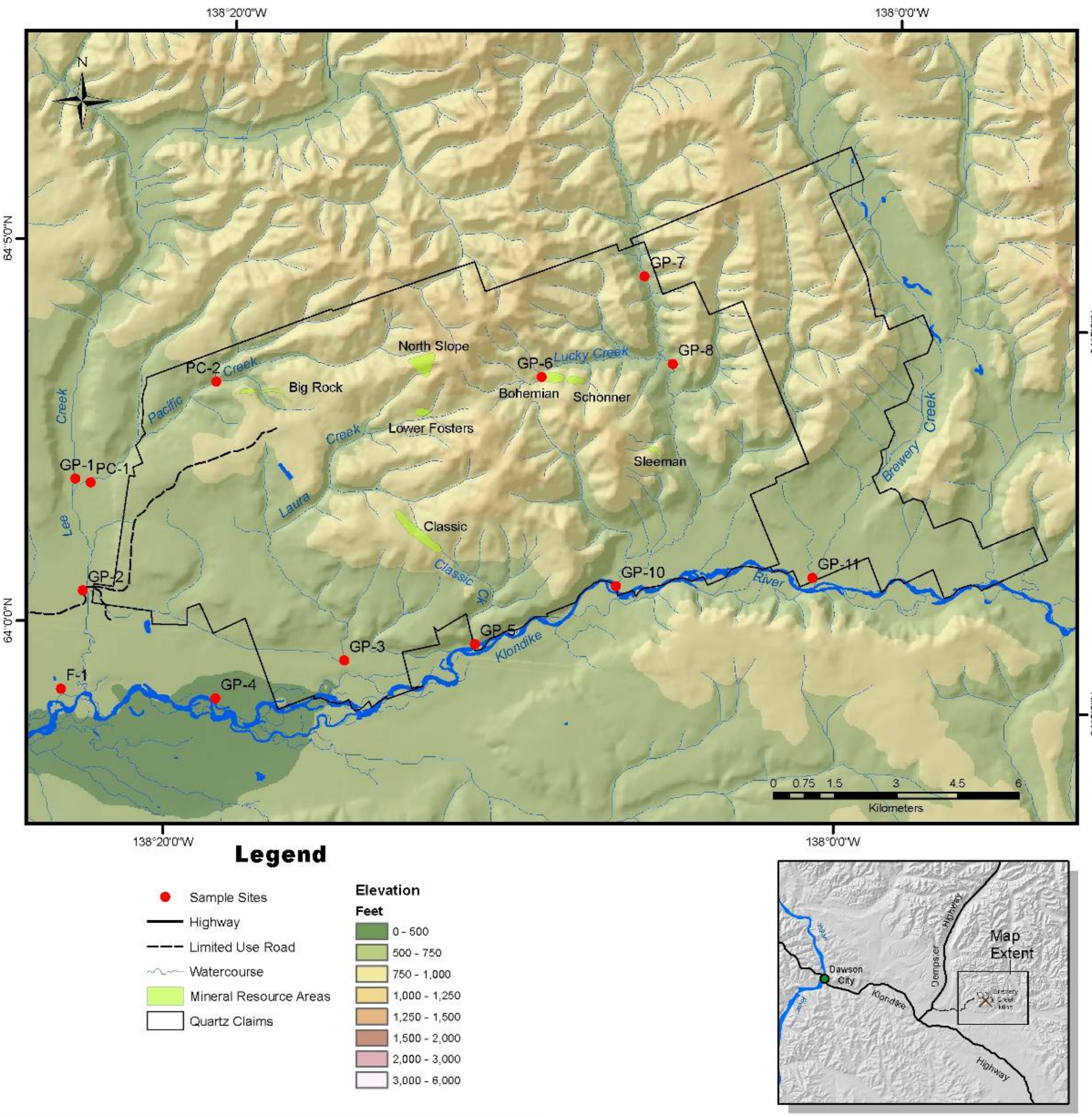
This district falls within the ecoregion Yukon Plateau-North northeast of the Tintina Trench and hosts considerable potential for metallic mineral deposits. The glaciated valleys contain numerous wetlands. The study area is within the northern boreal forest with talus slopes at the higher elevations (Yukon Ecoregions Working Group, 2006).

Sample sites were established on Lee, Pacific, Laura, Golden and Brewery Creeks (Figure 1) and are described in Table 2-1. Most sites were accessed by helicopter.

TABLE 2-1 SITE DESCRIPTIONS AND LOCATIONS

BASELINE SITE #	LICENSED SITE #	SITE DESCRIPTION	COORDINATES (NAD 83)
GP-1	BC-33 (B6)	Lee Creek upstream of Pacific Creek	N 64°1.9214' W 138°23.4448'
PC-1	BC-05	Pacific Creek upstream of Lee Creek	N 64°1.8891' W 138°23.1072'
PC-2	BC-35	South trib of Pacific Creek below Big Rock ore bodies	N 64° 3.357' W 138° 19.633'
GP-2	BC-34 (B1)	Lee Creek at Yukon Ditch Road	N 64° 0.469' W 138° 23.051'
F-1		Lee Creek at mouth	N 63° 59.153' W 138° 23.425'
GP-3	BC-01 (B3)	Laura Creek	N 63° 59.867' W 138° 15.042'
GP-4	BC-39 (B9)	Laura Creek near mouth u/s of the South Klondike River	N 63° 59.215' W 138° 18.782'
GP-5	BC70	Classic Creek at mouth	N 64°0.232' W 138°11.175'
GP-6	BC-04 (B7)	Lucky Creek	N 64°3.808' W 138°9.892'
GP-7	BC-36	Golden Cr u/s Lucky Cr	N 64° 5.247' W 138° 7.074'
GP-8		Golden Cr d/s Lucky Cr	N 64° 4.129' W 138° 5.988'
GP-9	BC-31 (B2)	Golden Creek	N 64°01'51" W 138°04'57"
GP-10		Golden Cr at mouth	N 64° 1.156' W 138° 7.114'
GP-11		Brewery Cr at mouth	N 64° 1.493' W 138° 1.253'

The licensed sites (column two) with a BC prefix indicate it is a water quality site. The site names in brackets are the licensed benthic inverterbrate sample sites.



Site #	Type of Sampling
GP-1	Fisheries, benthic inverebrates, stream sediments, water quality.
PC-1	Fisheries
PC-2	Fisheries
GP-2	Fisheries, benthic inverebrates, stream sediments, water quality.
F-1	Fisheries
GP-3	Fisheries, benthic inverebrates, stream sediments, water quality.
GP-4	Not sampled. Dry due to beaver dam much father upstream.
GP-5	Benthic inverebrates, stream sediments, water quality
GP-6	Fisheries, benthic inverebrates, stream sediments, water quality.
GP-7	Water quality.
GP-8	Benthic inverebrates, stream sediments, water quality.
GP-10	Fisheries, benthic inverebrates, stream sediments, water quality.
GP-11	Fisheries, benthic inverebrates, stream sediments, water quality.

BREWERY CREEK PROJECT

Figure 1

SAMPLE SITE LOCATIONS

Drawing prepared by K. Pelletier,
Ibex Consulting, October 2012
Baseline data: http:/geogratis.cgdi.gc.cageogratis

3.0 WILDLIFE

3.1 BACKGROUND INFORMATION

A literature search revealed two previous wildlife studies that had been conducted in and near the study area; in 1993 and in 2009.

In 1993, Norecol conducted aerial wildlife surveys in March and October as a component of the Initial Environmental Evaluation prepared for Loki Gold Corporation (Steffen Roberston and Kirsten, 1994).

In March 2009, Dawson Land Use Planning conducted a fixed wing aerial survey for moose covering the Klondike River drainage, the North Klondike Highway as far south as Gravel Lake and north to the Tombstone Territorial Park (Dawson Land Use Planning Summary Report, 2009). Our study area constituted a small portion of the region surveyed by DLU.

In addition, information was gathered from interviews with Yukon Government personnel; the Harvest Management Specialist, Regional biologists and field technicians, the Fur Harvest Technician and Wildland Fire Management.

The camp's wildlife logs were also reviewed to get an idea of incidental animal observations.

Mortalities have been documented at the site on only two occasions; both were drownings in the process ponds. In 2003 a fox was discovered in the Stage 2 Pond of the effluent treatment system. Two young moose calves were found in the overflow pond in May 2006. The fence around the process ponds had been removed earlier as a condition of the approved reclamation and closure plan. A new fence was erected in June 2006 to prevent future wildlife incidents and remained in place until the pond liners were removed in 2008.

3.2 METHODS

Aerial wildlife surveys were conducted on three occasions in 2012 (March, June and October) with a primary focus on moose. Grant Lortie was the lead wildlife biologist for each trip. The purpose of the surveys was to demonstrate seasonal range use and timing of these events, with some insight into seasonal social behavior and influencing environmental factors proximal to exploration and mining activities.

All surveys were conducted from a Trans North B206 jet ranger helicopter flying at a speed of approximately 120 km/hour at around 120 m above ground surface. The wildlife biologist/navigator sat in the front seat with two observers providing assistance in both directions from the rear seat.

Track logs and waypoints (observations) of each survey were downloaded from a hand held GPS onto maps and are provided in Appendix A.

Following each survey, a technical memo detailing the findings was submitted to Predator Mining Group. The results from each survey are summarized in the following section.

3.3 RESULTS AND DISCUSSION

During the three surveys conducted in 2012, moose were clearly the most conspicuous and abundant large mammal observed.

When comparing the results of the 1993 survey prior to the development of Loki Gold's mine at Brewery Creek, and the 2012 survey, there appears to be little change in moose numbers and distribution. If anything, populations may have increased.

Wolves and bears were the primary furbearers observed albeit in low numbers. No caribou or sheep were documented in or near the study area during any of the surveys.

The Brewery Creek claim block lies outside of the known ranges of the three caribou herds (Hart River, Porcupine and 40 Mile) but the possibility of caribou visiting the property does exist. Long time Dawson residents have mentioned seeing caribou close to the Klondike Highway in the past. During a fall caribou survey in 2005, the Dawson office of Yukon Environment observed caribou on the lower part of the Dempster Highway (Kienzler, 2005). By tracking collared animals it was determined that both the Hart River and Porcupine Caribou herds were represented. The southern range of the Porcupine Herd is considered to be around Km 68 on the Dempster Highway however in mid October, 2005, animals had ranged as far south as Km 13. Deep caribou trails were observed paralleling the Dempster Highway and the North Klondike River between the Dempster Corner and the Tombstone Campground. As there was some local suspicion that some of the caribou seen on the lower Dempster may have been from the 40 Mile herd, considerable time was spent listening for collared animals from this herd but none were found. Three collared Hart River caribou were found on ridges directly above the Brewery Creek mine site, an area where they had not previously been documented. Following the telemetry survey there were reports of as many as 500 to 1000 caribou on the reclaimed areas just above the mine (Kienzler, 2005).

Caribou were documented on site on one occasion. During a weekly water sampling program on November 1st, 2005, Viceroy personnel discovered 53 caribou trapped on the frozen tailings ponds (M. Kienzler, email correspondence). The ponds had previously been fenced to keep out wildlife, but fencing was removed during decommissioning. The ponds were lined and the caribou could not ascend the slippery slopes to escape. It is not known how many days they may have been there but due the amount of sign, it appeared to have been quite some time. After chain-link fencing was laid down on the slopes and covered with hay, all caribou eventually managed to get out (see Photos #1 and #2 in Appendix A). Due to the amount of sign on the recently reclaimed slopes of the leach pad, the caribou may have been attracted to the planted cover of vegetation.

Details of the 2012 and 1993 surveys are presented below.

3.3.1 Late Winter Survey

The late winter survey was conducted on March 13th, 2012 to determine the winter range of moose and to identify the use of the study area by other species. The Trans North B206 helicopter was piloted by Doug Hladin, with Bonnie Burns (Laberge Environmental Services) and Ryan Peterson (Tr'ondëk Hwëch'in First Nation) providing observational support for Grant Lortie. The complete claim block was surveyed including a surrounding buffer zone of up to five kilometers. An additional 30 kilometres was flown north along Brewery Creek in attempts to locate caribou in the uplands (Map 1, Appendix A). Total survey time was three hours and 26 minutes.

The survey documented 61 sightings of moose and considerable sign (Tables 3-1 and 3-2, Appendix A). Moose were widely dispersed throughout the study area primarily along stream courses below timberline. As males are antler-less at this time of year, no attempt was made to classify the observed animals.

A total of 36 moose were observed during the late winter survey conducted by Norecol on March 26, 1993, over 3.2 hours of survey time. The Dawson Land Use Planning survey covered an area of 10,600 square kilometres and recorded 553 moose. It is difficult to extrapolate how many of these were actually within our study area, however, suffice to say, moose are in important ungulate in the Brewery Creek vicinity.

No caribou or sheep were observed within the current study area during any of the aforementioned surveys.

Five wolves were observed during the March 2012 survey, one at a moose kill site on Brewery Creek at Waypoint #26 (Table 3-3, Map 1, Photo #3, in Appendix A).

Lynx tracks, the only sign of other species, were observed at Waypoint #52 (Map 1, Appendix A).

3.3.2 Early Summer Survey

A late spring / early summer survey was completed on June 5th, 2012 to document the abundance and distribution of moose and calves near and throughout the study area. The Trans North B206 helicopter was piloted by Kevin Duff, with Bonnie Burns and Marissa Hackman (Laberge Environmental Services) providing observational support for Grant Lortie. The complete claim block was surveyed over the course of three hours and four minutes. (Map 2, Appendix A).

Ground conditions were less than favorable as most deciduous shrubs and trees had leafed out. More importantly the main stem of the South Klondike River and the lower tributaries were in flood stage, inundating much of the preferred riparian calving habitat.

A total of seven moose were observed, 3 males and 4 females (Tables 3-4 and 3-5, Appendix A). No calves were seen. Incidental observations included a beaver, a black bear, a red-tailed hawk and two trumpeter swans (Table 3-6, Appendix A).

An examination of the camp wildlife log from May 6 to June 5, 2012 (Table3- 7, Appendix A) reveals that 13 bears and 11 moose were observed. The majority of the sightings were on access routes to and through the property. (Fox are typically observed at the camp.) This concurrence can be expected as bears of both species actively hunt neonate moose calves, a specialty with some individual bears. Suboptimal calving conditions and the observed presence of important neonate predators are likely contributing factors to the poor survey results.

3.3.3 Late Autumn Survey

The late autumn / early winter survey was conducted on October 30th, 2012, to determine the post-rut aggregations of moose. Ground cover of snow allowed easy viewing of animals. Moose have not lost their antlers at this time of year so males could be identified during the survey.

The Trans North B206 helicopter was piloted by Vince Williams, with Bonnie Burns and Marissa Hackman (Laberge Environmental Services) providing observational support for Grant Lortie. Survey conditions were good to very good. Winds were light and except for occasional fog patches in the morning, the skies were sunny. Recent snow provided easily observable tracking. Total survey time was two hours and 45 minutes. The track route and observations are displayed in Map 3 in Appendix A.

The few moose observations were noted above 4000 feet asl, in higher terrain peripheral to the north of the main claim block and typically in burn areas. Sporadic older moose tracks were occasionally noted at lower elevations on the claim block. No evidence of moose or their sign was noted in the valleys of the claim block or along the South Klondike River. The locations of the 13 moose observed and noted tracking are provided in Table 3-9 of Appendix A.

Wolf tracking was noted at three locations on the claim block (Table 3-10, Appendix A). A group of approximately six wolves appears to be resident in the area. Evidence of this pack has been noted on previous surveys.

The only other incidental sighting was of a flock of ptarmigan in the subalpine zone of the upper Golden Creek area (Table 3-10, Appendix A).

No caribou or their sign were observed during the late fall survey.

Norecol conducted a similar survey on October 28th, 1993. A total of five moose were observed: two adult bulls above treeline east of Lee Creek; one cow in the flood plain of the Klondike River east of Lee Creek; and one cow/calf pair in the flood plain of the confluence of Lee Creek and the Klondike River. Other incidental sightings were wolf tracks along the Klondike River, marten tracks in the Lee and Brewery Creek drainages and six ptarmigan in the subalpine zone.

The camp maintains a wildlife log (Table 3-7, Appendix A). The page for June was unavailable but Table 3-7 summarizes observations from May 6th to October 22nd, 2012. A total of 19 moose and 18 bears were seen over this time period (excluding June). Incidental observations include porcupine, rabbits, lynx, grouse and fox.

3.3.4 Outfitter Concessions

The study area lies wholly within Concession #3, operated by Hunt Yukon Outfitting Ltd. Game Management Areas (GMA) 229, 250 and 251 cover the Dempster Highway corridor, mine access and mine properties. A modest level of both resident and non-resident harvest of the principal big game species from 2002 to 2011 is presented in Table 3-8 in Appendix A. In the table Non-Res means non resident hunters who would have been guided by an outfitter, and Res refers to resident licensed hunters but does not include first nation hunters.

3.3.5 Trapline Concessions

Concession #23, overlying most of the study area is operated by the Fraser Family. Adjacent on the east and for the most part with Brewery Creek as the common boundary, lies Concession #65 operated by Greg Brunner and Cynthia Hunt. Concession #63 includes Lower Brewery Creek and the entire Aussie Creek drainage. Fur harvest information remains privileged.

4.0 VEGETATION ASSESSMENTS

4.1 BACKGROUND INFORMATION

With the planned reopening of the Brewery Creek gold mine, an update of environmental baseline conditions at the site is now required, including an inventory of the currently occurring vegetation.

Former efforts at characterizing the vegetation in the area include a regional level vegetation description for the Klondike Valley Plan by Kennedy and Staniforth (1991), a 1:40,000 scale vegetation map of the Brewery Creek Mine area by Steffen Robertson Kirsten (1994), and a localized description of the vegetation at the Bohemian and Big Rock ore zones by Access Mining Consulting Limited (1999).

The 2012 report focuses on the vegetation occurring at seven targeted ore zones. These include the Lower Fosters, Classic, North Face, Bohemian, Schooner, Sleemans and Big Rock zones.

4.2 METHODS

4.2.1 Survey Preparations

Existing information on the vegetation at the Brewery Creek Mine was acquired and reviewed, including the reports and maps referred to above.

2009 satellite imagery (1:20,000 scale) and a 2011 orthophoto (1;20,000 scale) were provided by Golden Predator Corp. From these images, preliminary field maps were prepared by Ibex Valley Environmental Consulting Inc. Probable vegetation zones at each of the targeted ore zones were then delineated by air photo interpretation prior to the field survey. A fire history map of the area was acquired from Wildland Fire Management, Government of Yukon.

A listing and description of vascular plant species currently considered to be rare in the Yukon were acquired from the Yukon Conservation Data Centre, Government of Yukon. These were reviewed, resulting in a short list of rare plant species most likely to occur in the Brewery Creek Mine area.

4.2.2 Field Surveys

Field surveys were carried out July 9th to 13th, 2012. Surveys consisted of randomly chosen walking transects through the vegetation zones encountered on and around each of the seven targeted ore zones. A list of the vascular plant species observed was compiled for each vegetation zone. If plant species were not readily identifiable, specimens were collected. The dominant species in each layer (upper story, tall shrub layer and ground cover) were noted. Photographs were taken.

The plant specimens collected were identified if possible in the field camp. If not identifiable in the field, specimens were preserved for later identification.

The identification and cataloguing of nonvascular plant species (lichens, mosses and liverworts), although not planned for this field survey, were also recorded.

4.3 RESULTS AND DISCUSSION

4.3.1 Vegetation Communities in Study Area

4.3.1.1 Black Spruce Vegetation Community

The black spruce vegetation community is prevalent on north-facing slopes throughout the Brewery Creek Mine area. *Picea mariana* dominates the upper storey with *Betula neoalaskana* being more prominent in open areas. *Alnus crispa* is the only tall shrub occurrence. *Ledum decumbens*, *Vaccinium vitus-idaea*, *Empetrum nigrum*, along with mosses (particularly *Pleurozium schreberi*) and lichens dominate the ground cover.

4.3.1.2 Black Spruce / Birch Vegetation Community

The black spruce/birch vegetation community is found on the more gentle south-facing slopes throughout the Brewery Creek Mine area. *Picea mariana* and *Betula neoalaskana* are the most common tree species. *Picea glauca, Populus balsamifera*, and *Populus tremuloides* also occur. *Salix scouleriana* is the only common tall shrub. The ground cover is predominately *Vaccinium vitus-idaea*, *Empetrum nigrum*, *Geocaulon lividum*, *Cornus canadensis*, along with mosses, primarily *Pleurozium schreberi*.

4.3.1.3 Black Spruce / Aspen Vegetation Community

The black spruce/aspen vegetation community occurs on well drained upland slopes and near-level areas. *Populus tremuloides* forms the upper storey in this vegetation type. The sub-canopy consists of a dense layer of *Picea mariana*. The ground cover is primarily *Vaccinium vitus-idaea* and *Empetrum nigrum* with mosses (mostly *Pleurozium schreberi*) and lichens (*Peltigera apthosa* and *Stereocaulon* sp.).

4.3.1.4 White Spruce Vegetation Community

The white spruce vegetation community in the Brewery Creek Mine area is restricted to well drained southerly-facing slopes. The upper storey consists of an open canopy of *Picea glauca* and *Populus tremuloides*. Small open canopy stands of *Populus tremuloides* occur on the steeper slopes. *Salix souleriana* and *Salix bebbiana* are the dominant tall shrubs. The ground cover consists mostly of *Arctostaphylos uva-ursi*, *Vaccinium vitis-idaea* and *Juniperus communis* along with the grasses *Calamagrostis purpurascens* and *Festuca altaica*. Lichens and mosses are uncommon.

4.3.1.5 Dwarf Birch Vegetation Community

In the Brewery Creek Mine area, the dwarf birch vegetation community occurs in sub-alpine areas. Small stands of *Abies lasiocarpa* and *Picea glauca* are found throughout this vegetation type. The dominant shrub is *Betula glandulosa*. Herbaceous species are uncommon. Lichens and mosses (primarily *Pleurozium schreberi*) form the ground cover.

4.3.1.6 Willow Vegetation Community

The willow vegetation community is restricted to narrow valley bottoms in the Brewery Creek Mine area. This tall shrub community is dominated by *Salix* spp. along with the occasional *Alnus incana*. Trees are uncommon, although *Picea glauca* and *Populus balsamifera* do occur. The ground cover consists of forbs such as *Petasites sagitattus* and *Parnassia* spp. and grasses such as *Calamagrostis canadensis* and *Arctagrostis latifolia*, along with lichens and mosses.

4.3.2 Vegetation Zonation in the Target Ore Zones

The approximate delineation of vegetation communities in each of the seven targeted ore zones are shown on the six maps in Appendix B. A list of all species observed in each ore zone and associated photographs are also presented in Appendix B.

4.3.2.1 Lower Fosters

The upslope portion of the Lower Fosters ore zone has been previously cleared. Part of the cleared area was recontoured and seeded during the earlier reclamation program. The ground cover here includes seeded species such as *Festuca rubra and Trifolium hybridum* along with naturally colonizing species such as *Crepis tectorum*, *Taraxacum officinale* and *Agrostis scabra*. Farther to the east, the previously cleared but un-mined ground has naturally regenerated with 6 m tall *Populus tremuloides* and *Populus balsamifera* along with *Salix scouleriana*, *Betula neoalaskana* and *Alnus crispa*. Lower shrubs include *Ribes hudsonianum, Rubus idaeus* and *Picea glauca*.

The upper part of the uncleared slope in this ore zone is the white spruce vegetation community, dominated by an upper story of *Picea glauca* (up to 80 cm dbh). The shrub layer is *Ribes lacustre, Spiraea beauverdiana*. The ground cover is dominantly *Vaccinium vitus-idaea*, *Cornus canadensis* and *Pleurozium shreberi*.

The lower part of the uncleared slope in this ore zone is the black spruce/birch vegetation community, dominated by an upper story of *Picea mariana* and *Betula neoalaskana.* The shrub layer is primarily *Alnus incana* and *Alnus crispa*. The ground cover is dominantly *Vaccinium vitus-idaea*, *Empetrum nigrum* and *Pleurozium shreberi*.

The Laura Creek valley bottom is the willow vegetation community, consisting of a dense layer of *Salix* spp. (mostly *Salix pulchra*) and *Alnus incana*. The ground cover is *Arctagrostis latifolia* and *Calamagrostis canadensis*, along with several forb species.

4.3.2.2 Classic

The upper near-level area of the Classic ore zone is black spruce/aspen community. Most of this area burned in the 2004 forest fire. The upper story consists of standing dead *Picea mariana* with a few unburned *Populus tremuloides* and *Betula neoalaskana*. The shrub layer is a regeneration of *Populus tremuloides, Betula neoalaskana* and *Salix scouleriana.* The diverse ground cover consists of colonizing low shrubs such as *Ledum groenlandicum*, *Vaccinium vitus-*

idaea and *Linnae borealis*, and forbs including *Epilobium angustifolium*, *Lupinus arcticus* and *Polemonium acutiflorum.*

Unburned areas at the southern limits of the ore zone are gently sloping, south-facing white spruce forest. These unburned areas have a canopy of *Picea glauca* and *Populus tremuloides* and a tall shrub layer of *Salix scouleriana*. Forbs such as *Senecio lugens*, *Zygadenus elegans* and *Lupinus arcticus*, along with the grass *Festuca altaica*, make up the ground cover.

Patches of unburned black spruce forest remain along the north-facing areas of the ore zone. These areas have a canopy of *Picea mariana* and a shrub layer of *Salix glauca* and *Betulosa glandulosa*. The ground cover is made up of low shrubs such as *Empetrum nigrum*, *Rubus chamaemorus* and *Vaccinium vitis-idaea*, along with mosses and lichens. Forbs and grasses are uncommon.

4.3.2.3 North Slope

Two distinct vegetation communities cover the North Slope ore zone. The north-facing slope is typical black spruce forest with sparse *Picea mariana* and a few tall *Betula neoalaskana* as the upper story and dense *Betula glandulosa* as the shrub layer. *Ledum* spp., *Empetrum nigrum* and *Vaccinium uliginosum*, along with mosses and lichens, dominate the ground cover.

The south-facing slope is white spruce forest with *Picea glauca* and *Populus tremuloides* making up the tree canopy and *Salix scouleriana*, *Salix bebbiana* and *Shepherdia canadensis* dominating the shrub layer. The ground cover is a diversity of forbs and grasses including *Linnaea borealis*, *Cornus canadensis*, *Lycopodium complanatum* and *Festuca altaica*.

4.3.2.4 Bohemian

The vegetation at the Bohemian ore zone is mostly of the north-facing black spruce community, with *Picea mariana* and the occasional *Betula neoalaskana* as the upper story. *Alnus crispa* forms the shrub layer and mosses (primarily *Pleurozium schreberi*) form the ground cover. Much of the original vegetation on this slope has been removed during earlier mineral exploration work.

The dwarf birch vegetation community covers the subalpine area of this ore zone. Scattered stands of *Picea glauca* occur while *Betula glandulosa* is the dominant shrub. Lichens and mosses form the ground cover. Most of this part of the Bohemian ore zone was burned during the 2004 fire.

The Lucky Creek valley bottom is the willow vegetation community, consisting of a dense layer of *Salix* spp. (mostly *Salix pulchra*) and *Alnus incana*. The ground cover is *Arctagrostis latifolia* and *Calamagrostis canadensis*, along with several forb species.

The steeper part of the south-facing slope north of Lucky Creek is white spruce forest with an open canopy of *Picea glauca* and *Populus tremuloides*. *Shepherdia canadensis* and *Rosa acicularis* dominate the shrub layer. The ground cover is a diversity of forbs and grasses including *Linnaea borealis*, *Cornus canadensis*, *Lupinus arcticus* and *Festuca altaica*.

The less steep part of the south-facing slope north of Lucky Creek is the black spruce/birch vegetation community, dominated by an upper story of Picea *mariana* and *Betula neoalaskana.*

Tall shrubs are uncommon. The ground cover is dominantly *Vaccinium vitus-idaea*, *Geocaulon lividum* and *Pleurozium shreberi*.

4.3.2.5 Schooner

Two distinct vegetation communities occur in the Schooner ore zone. The north-facing slope is black spruce forest with *Picea mariana* forming the upper story and *Betula glandulosa* dominating the shrub layer. *Ledum* spp., *Rubus chamaemorus* and *Vaccinium uliginosum*, along with mosses and lichens, dominate the ground cover.

The south-facing slope is white spruce forest with *Picea glauca* and *Populus tremuloides* making up the tree canopy on the upper slope, with more *Picea mariana* and *Betula neoalaskana* occurring lower down the slope. The shrub layer is dominated by *Ribes hudsonianum*, *Ledum* sp., and *Rosa acicularis*. The ground cover is a diversity of forbs and grasses including *Linnaea borealis*, *Cornus canadensis*, *Lycopodium clavatum* and *Arctagrostis latifolia*.

4.3.2.6 Sleemans

The upper portion of the north-facing slope at the Sleemans ore zone was burned in the 2004 forest fire. Regeneration includes a shrub layer of *Betula glandulosa* along with *Betula neoalaskana*, *Salix scouleriana* and *Picea mariana*. The ground cover is mostly forb species including *Polygonum alaskanum* and *Epilobium angustifolium*. Ferns growing on a steep scree incline just inside the burned area include *Dryopteris fragrans*, *Gymnocarpium jessoense* and *Woodsia alpina*.

The lower part of this slope was not burned in the 2004 fire. This typical black spruce forest has a sparse canopy of *Picea mariana* and a shrub layer of *Salix barratiana*, *Ribes triste, Ledum decumbens* and *Spiraea beauverdiana.* The ground cover is dominated by *Empetrum nigrum*, *Rubus chamaemorous* and *Arctagrostis latifolia*, along with mosses and lichens.

The southeast-facing slope was entirely burned in the 2004 fire, except for the occasional pocket of trees that were missed by the blaze. *Salix bebbiana*, *Salix scouleriana* and *Populus tremuloides* are the most prevalent shrubs in the regenerating forest. *Picea glauca* and *Betula neoalaskana* also occur. The ground cover consists of a wide diversity of regenerating dwarf shrubs, forbs and grasses, including *Polygonum alaskanum*, *Equisetum sylvaticum*, *Gentianella propinqua*, *Conioselinum cnidiifolium*, *Arctagrostis latifolia* and *Festuca altaica*.

4.3.2.7 Big Rock

The north-facing slopes of the Big Rock ore zone are covered by typical black spruce forest with sparse *Picea mariana* and a few tall *Betula neoalaskana* as the upper story, and *Betula glandulosa* as the shrub layer. *Ledum* spp., *Empetrum nigrum* and *Vaccinium uliginosum*, along with mosses and lichens, dominate the ground cover.

The south-facing slope on the north side of Pacific Creek is white spruce forest with *Picea glauca* and *Populus tremuloides* making up the tree canopy and *Salix scouleriana*, *Shepherdia canadensis* and *Rosa acicularis* dominating the shrub layer. The ground cover is a diversity of forbs and grasses including *Linnaea borealis*, *Calamagrostis purpurascens*, *Lycopodium complanatum* and *Festuca altaica*.

Much of the upland area in this ore zone is the black spruce/birch vegetation community, dominated by an upper story of *Picea mariana* and *Betula neoalaskana.* Tall shrubs are uncommon. The ground cover is dominantly *Vaccinium vitus-idaea*, *Geocaulon lividum* and *Pleurozium shreberi*.
The vegetation on the near-level well drained upland areas is the black spruce/aspen community, with *Populus tremuloides* forming the upper story and a dense layer of *Picea mariana* forming the sub-canopy. Tall shrubs are uncommon. The ground cover is *Vaccinium vitus-idaea* and *Empetrum nigrum* along with mosses and lichens.

The Pacific Creek valley bottom is the willow vegetation community, consisting of a dense layer of *Salix* spp. (mostly *Salix pulchra*) and *Alnus incana*. The ground cover is *Arctagrostis latifolia* and *Calamagrostis canadensis*, along with several forb species.

The north-facing slopes in Big Rock ore zone are covered by typical black spruce forest with sparse *Picea mariana* and a few tall *Betula neoalaskana* as the upper story and *Betula glandulosa* as the shrub layer. *Ledum* spp., *Empetrum nigrum* and *Vaccinium uliginosum*, along with mosses and lichens, dominate the ground cover.

4.4 Rare Plants

The Yukon Conservation Data Centre, Government of Yukon, maintains a listing of vascular plant species currently considered to be rare in the Yukon. This was reviewed, resulting in a short list of rare plant species most likely to occur in the Brewery Creek Mine area. They include:

Botrychium alaskense	Alaska Moonwort
Botrychium mulitfidum	Leathery Grape Fern
Polystichum lonchitis	Northern Hollyfern
Asplenium trichomanes-ramosum	Green Spleenwort
Agrostis clavata	Clubbed Bentgrass
Trisetum sibiricum	Siberian Trisetum
Cypripedium guttatum var. *guttatum*	Spotted Lady's-slipper
Cypripedium parviflorum	Small Yellow Lady's-slipper
Claytonia scammaniana	Scamman's Springbeauty
Minuartia yukonensis	Yukon Stitchwort
Silene uralensis ssp. *ogilviensis*	Ogilvie Mountains Nodding Campion
Silene williamsii	Williams' Campion
Draba stenopetola	Star-flowered Draba
Erysimum angustum	Dawson Wallflower
Oxytropis mertensia	Merten's Locoweed
Podistera yukonensis	Yukon Woodroot
Primula eximia	Arctic Primrose
Phacelia mollis	MacBride's Phacelia
Senecio sheldonensis	Mount Sheldon Groundsel
Taraxacum carneocoloratum	Pink Dandelion

No plant species currently considered to be rare were observed within the survey areas in and around the seven targeted ore zones.

4.5 Fire History

Much of the area within the Brewery Creek Mine claim block has been burned by forest fires in recent years (see map in Appendix B). The most significant recent fires in the area occurred in 1989, 2004 and 2010.

The 1989 fire burned a large area to the east of Golden Creek. The most westerly edge of the fire reached the southern limits of the Sleemans ore zone.

The 2004 fire covered the largest area within the Brewery Creek Mine claim block, including most of the area between Laura Creek and the South Klondike River. It burned most of the forest cover on the Classic ore zone and the southern subalpine area of the Bohemian ore zone. Most of the southeast-facing slope and part of the north-facing slope of the Sleemans ore zone were also burned in this fire.

The 2010 fire burned only small areas in the northeast corner of the Brewery Creek Mine claim block and did not reach any of the targeted ore zones.

The Big Rock, Lower Fosters, North Slope and Schooner ore zones were not affected by either of these fires.

4.6 Revegetation

The disturbed areas of the Brewery Creek mine site were revegetated by Viceroy and Alexco during mining and decommissioning. As a component of the current Water License the revegetated areas were assessed annually by Laberge Environmental Services from 2005 to 2009. Details on these assessments can be found in the annual reports submitted to the Yukon Territory Water Board. Assessments are to be conducted every five years following 2009 until the expiry of the license.

The vegetation on each of the seven targeted ore zones has had significant levels of disturbance, in some cases dating back to the 1980s. Much of the current vegetation on these ore zones consists of naturally occurring revegetation on access roads, drill pads, etc. Willows, alder, poplar and aspen are the most prolific pioneering shrub species. Plant species observed colonizing disturbed sites include:

Shrubs
Alnus crispa
Alnus incana
Picea glauca
Picea mariana
Populus balsamifera
Populus tremuloides
Ribes glandulosum
Rosa acicularis
Rubus idaea
Salix alaxensis
Salix bebbiana

Forbs
Corydalis sempervirens
Crepis tectorum
Epilobium angustifolium
Erigeron acris
Lupinus arcticus
Polygonum alaskanum
Taraxacum officinale
Trifolium hybridum

Grasses
Agrostis scabra
Calamagrostis canadensis
Festuca rubra
Hordeum jubatum

The only area in the seven targeted ore zones that has previously been reclaimed is the upper slope of the Lower Fosters ore zone. This area was recontoured and seeded during the earlier revegetation program.

5.0 SURFACE WATER QUALITY

5.1 METHODS

Surface water quality was not a component of this baseline survey but samples were collected at the benthic invertebrate sites in August 2012 to help characterize habitat conditions. Extensive surface water quality monitoring programs are conducted at the site and all data is compiled and reported in the Brewery Creek annual water license reports.

Water samples for the current study were collected in a fast flowing section of the stream, prior to any other sampling activity. In-situ measurements were taken at each site. Conductivity, water temperature and pH were determined with a handheld Combo Hanna, Model # HI 98130 multi probe meter. Dissolved oxygen measurements were obtained with a YSI 550A dissolved oxygen meter. Instruments were calibrated daily.

All sample bottles were supplied by Maxxam Analytics in Burnaby, BC and obtained at the Brewery Creek site. To be consistent with the current water quality monitoring program being carried out at the Brewery Creek property, the same parameters were analyzed using the same laboratory. At each sampling location, water samples were collected in a one litre plastic bottle for the analyses of nutrients, dissolved anions and for physical tests. Samples to be analyzed for total metals were collected in 120 ml plastic bottles and preserved with nitric acid. Dissolved metals samples were filtered into 120 mL plastic bottles in the field and then preserved with nitric acid. Samples to be analyzed for total cyanide were collected in 120 mL plastic bottles and preserved with sodium hydroxide. Total and dissolved organic carbon samples were collected in 120 mL plastic bottles and preserved with sulphuric acid. The DOC sample was filtered in the field before preserving. Samples were kept cool prior to shipment to the laboratory. The analytical methods are provided with Maxxam's report in Appendix C.

As a measure of quality assurance and quality control (QA/QC), one blind duplicate was collected at one of the sample sites during the survey. Maxxam performs their own QA/QC and their report is included in the analytical report (Appendix C).

5.2 RESULTS

The in-situ data is provided in Table 5-1, Appendix C. All waters sampled were slightly alkaline and well aerated. Temperatures were relatively cool for mid summer and ranged from 2.9^{o}C to 7.3^{o}C. Due to the construction of a beaver dam a short distance downstream of Laura Creek at the ditch road, there was no flow at Laura Creek near the mouth. The section from the ditch road to the South Klondike River was thoroughly flown but no surface flow could be located. Photos are included in Appendix C.

Selected parameters portraying the water characteristics at each site are presented in Table 5-2 (Appendix C) with comparisons to the CCME guidelines for the protection of freshwater aquatic life.

Although cyanide has not been used on the property for several years, cyanide was detected at all of the sites and ranged from a low of 0.00075 mg/L at GP-3, Laura Creek, to 0.00133 mg/L at GP11, Brewery Creek. Cyanide can be found in nature and the detection at all sites, including the reference sites, is either an artifact of the laboratory analytical process or is naturally occurring throughout the study area.

The recommended guideline for arsenic was exceeded at GP-3, GP-5 and GP-6. A very high concentration of 147 ug/g was documented at GP-5, Classic Creek. The water at Laura and Lucky Creeks (GP-3 and GP-6) only slightly exceeded the guideline.

The guideline for cadmium depends on the hardness of the sampled waters and is determined using an equation. The calculated guideline was exceeded at all of the sites with the exception of GP-10 (Golden Creek at mouth) and GP-11 (Brewery Creek at mouth). The guidelines for copper and zinc were exceeded only at GP-6, Lucky Creek.

The guideline for iron was exceeded at GP-3, GP-6 and GP-8. With the exception of GP-11, all sites exceeded the guideline for selenium.

CCME guidelines are based on the total metal concentrations in the water. Lucky Creek had very turbid water (177 mg/L TSS) and several metals exceeded the guidelines. When the dissolved metals data was reviewed (Appendix C), cadmium and lead were not detected in Lucky Creek and arsenic, copper and zinc met the guideline.

6.0 STREAM SEDIMENT CHARACTERIZATION

6.1 BACKGROUND INFORMATION

As a requirement of Water Licence QZ96-007, stream sediment samples were collected on an annual basis from 12 sites until 2009. Stream sediments were collected from several of these sites during baseline studies undertaken in 1991 by Norecol (SRK, 1994) and Environment Protection

(Davidge, 1995). An analysis of this database is not included in this report as it is being reported in a separate submission. However past data at some of the locations examined during the 2012 survey are discussed below in Section 6.3.

6.2 METHODS

Composite stream sediment samples were collected from several sites during the benthic invertebrate survey conducted in August 2012. Fine grained materials were collected from depositional areas using a stainless steel trowel and placed into plastic freezer bags. Samples were kept cool until shipped to Maxxam Analytical in Surrey, BC. At the lab the samples were dried and the portion passing a 100 mesh screen (0.15mm) was acidified and analyzed for 30 metals by ICPMS. The fine portion was targeted as this fraction has a higher potential for exposure to and ingestion by resident biota.

6.3 RESULTS AND DISCUSSION

The analytical results for the stream sediments are presented in Appendix D. Of the 30 elements analyzed, the concentrations of 20 of the metals were the greatest in the stream sediments collected from Classic Creek, indicating that it drains a highly mineralized area.

Seven metals were examined in detail as they may be present in the ore bodies and/or have the potential to be toxic to aquatic organisms (Table 6-1). The concentrations of these metals were compared to the CCME (1999) interim freshwater sediment quality guidelines (ISQG) and to the probably effects levels (PEL). Generally, concentrations greater than the PEL have a 50% incidence of creating adverse biological effects.

TABLE 6-1 SUMMARY OF STREAM SEDIMENT METAL CONCENTRATIONS, 2012

Site #	Station Description	Arsenic ug/g	Cadmium ug/g	Copper ug/g	Lead ug/g	Mercury ug/g	Selenium ug/g	Zinc ug/g
GP-1	Lee Cr u/s Pacific Cr	**7.39**	**2.09**	**42.3**	8.48	**0.183**	1.89	**285**
GP-2	Lee Cr u/s Ditch Road	**8.05**	**3.25**	**52.2**	9.51	**0.269**	2.50	**345**
GP-3	Laura Creek u/s Ditch Road	**15.5**	**0.516**	16.2	7.30	0.058	0.60	71.9
GP-5	Classic Cr near mouth	**343**	**3.44**	**57.8**	14.3	<0.050	1.23	**251**
GP-6	Lucky Cr d/s road crossing	**27.1**	**1.08**	16.2	10.4	**0.257**	1.41	**145**
GP-8	Golden Cr d/s Lucky Cr	**14.7**	**1.29**	32.4	9.66	**0.247**	1.06	**152**
GP-10	Golden Cr near mouth	**13.3**	**1.22**	27.6	9.83	**0.182**	1.21	**162**
GP-11	Brewery Cr near mouth	**39.4**	**0.732**	31.4	14.7	0.107	0.79	95.5
ISQG		5.9	0.6	35.7	35.0	0.170		123
PEL		17.0	3.5	197.0	91.3	0.486		315

Note: ISQG = Interim freshwater Sediment Quality Guidelines, in **bold** where exceeded.
PEL = Probable Effects Level (>50% of adverse effects occur above this level), shaded and in **bold** where exceeded.

Arsenic has the potential to be an element of concern in the study area. The ISQG was exceeded at all sites and the PEL was exceeded at three sites (Classic, Lucky and Brewery Creeks). The concentration of arsenic at Classic Creek was extremely high, 343 ug/g, significantly greater than the PEL of 17 ug/g. To put this data into perspective, Environment Canada's database on metals in Yukon stream sediments was examined. Of 2,180 samples where arsenic was detected, concentrations ranged from 0.4 ug/g to 5,190 ug/g with a median of 17.1 ug/g. The very high concentrations of arsenic were found in the sediments of the Mt. Nansen and Ketza River mine areas.

The concentration of cadmium exceeded the ISQG in all of the streams sediments but all were below the PEL. Concentrations of copper slightly exceeded the ISQG in the stream sediments at both Lee Creek sites and at Classic Creek. Concentrations of lead were very low throughout the study area and were well below the ISQG at all of the sites. Mercury was detected at all of the sites with the exception of Classic Creek. The ISQG for mercury was exceeded at both of the Lee Creek sites, both of the Golden Creeks sites and at Lucky Creek.

Selenium has been identified as an element of concern at the Brewery Creek mine site but currently there are no sediment quality guidelines for selenium. Concentrations ranged from 0.60 ug/g at Laura Creek to 2.50 u/g at Lee Creek u/s of the ditch road (GP-2). Selenium is also included in Environment Canada’s database. Of 1,011 sediment samples where selenium was detected, concentrations ranged from 0.1 ug/g to 38.8 ug/g with a median of 1.1 u/g. The high concentrations were documented in the Mac Pass region. The selenium concentrations reported during the 2012 survey all lay within close range to the median.

Zinc concentrations in the stream sediments ranged from 71.9 ug/g at Laura Creek to 345 u/g at Lee Creek u/s of the ditch road. The ISQG was exceeded at all sites except for Laura and Brewery Creeks and the PEL was exceeded at Lee Creek u/s of the ditch road.

Company stream sediment data exists for GP1, GP2, GP3 and GP6 from 1995 to 2009 and has been compiled for arsenic and selenium in Tables 6-2 and 6-3 respectively in Appendix D. Baseline data from 1991 and the current data for 2012 have also been included where applicable. Since Golden Creek at the mouth and Brewery Creek were sampled during the initial baseline surveys, these two sites are also included in the table. Graphs have also been generated and accompany the tables in Appendix D.

Arsenic concentrations have been consistently low at the Lee Creek sites (GP-1 and GP-2). Levels have fluctuated at Laura Creek (GP-3), frequently exceeding the PEL, but there appears to be a downward trend since 2000. Concentrations have varied considerably at Lucky Creek, GP-6. This could be attributable to the fact that this site has not been sampled at a regular location. Depending upon helicopter access, Lucky Creek has been sampled downstream of the Bohemian Zone. Currently there is no helipad on Lucky Creek and recently samples have been collected near the road crossing. The stream sediments at Lucky Creek have the highest concentrations of arsenic and are usually well above the PEL.

Interestingly, predevelopment baseline studies conducted in 1991 documented high arsenic levels (greater than the PEL) at Laura Creek, at the mouth of Golden Creek (GP-10) and at the mouth of Brewery Creek (GP-11). Arsenic is a naturally occurring element in the study area, however disturbance near Laura and Lucky Creeks may be creating an increase in concentrations.

There is a more limited set of selenium data as it was not analyzed in the early years. Selenium concentrations have been relatively stable with the greatest variation occurring at GP-3, Laura Creek. Over time it has had the lowest concentration of 0.05 ug/g in 2008 and the greatest concentration of 3.6 ug/g in 1997.

7.0 BENTHIC INVERTEBRATE SURVEY

7.1 BACKGROUND INFORMATION

Benthic invertebrate monitoring programs have been conducted on several occasions at the Brewery Creek mine site. Baseline studies were conducted in 1991 by Norecol (SRK, 1994), Environment Protection (Davidge,1995) and in 1994 (Burns, 1994). Loki/Viceroy/Alexco conducted routine benthic invertebrate monitoring programs as a component of the water license up until 2009 (Burns 1995, 1998, 1999, 2000, 2002, 2004, 2006, 2008 and 2010).

The use of benthic invertebrates as a biomonitoring tool provides a useful measure in which to assess the health of a watershed. Unlike chemical measures, invertebrate assemblages reflect long-term exposure to varying water quality conditions and thus integrate effects of contaminants over time (Rosenberg and Resh, 1993). These organisms are useful in this respect as their abundance and taxonomic diversity respond to a wide range of impacts including sedimentation, organic loading and changes in chemical water quality. Using benthic invertebrates as biomonitoring tools offers many advantages for the following reasons; they are ubiquitous, they are abundant and easy to collect, there are a large number of species offering a spectrum of responses to environmental stress, they are generally sedentary and therefore are representative of local conditions, and they have long life cycles compared to other groups (i.e. periphyton). As such, benthic macroinvertebrates act as continuous monitors of the water they inhabit and therefore can serve as sentinels of change in local conditions. By assessing the benthos populations and their community composition and structure over time, from baseline conditions through to active mining, followed by decommissioning and then introduced exploration again, changes in the populations could indicate possible impacts to the receiving environments.

7.2 METHODS

To conform to all the previous benthic invertebrate sampling that has taken place on the property, the same method of organism collection was used during the 2012 survey. Triplicate samples were collected at each site using a Surber sampler (area = 0.0920m^2) with a mesh size of 300 microns. The bed material within the frame was cleaned and washed by hand with the fast flowing current carrying the disturbed bottom fauna and detritus into the collection bag. The level of effort for each sample and at each site was comparable. Riffle areas were targeted at each site as this habitat supports the greatest density and diversity of invertebrates (Epele et al, 2012). The captured invertebrates and detritus were transferred from the collection bag to one litre nalgene bottles and preserved with 10% formalin. Samples were shipped by ground transport to an entomologist for sorting, identification and enumeration.

Analysis of the benthic invertebrate samples was conducted by Sue Salter of Cordillera Consulting in Summerland, BC. Once the samples were received at the laboratory they were assigned a Cordillera Consulting code (CC#). The first step in the processing was elutriation to remove the field preservative and inorganic debris. The debris (sand and gravel) was discarded after examination under low power microscope for mollusc shells or trichopteran cases. A 5% solution of Rose Bengal stain was added to the sample to aid in sorting efficiency. The sample was evaluated for total numbers and if the numbers were estimated to be greater than 600 the sample was subsampled to achieve a minimum number of 300 organisms. The method of subsampling used was the plankton splitter (Motodo 1959, Van Guelpen 1982 a, b) because there was very fine debris with minimal 'clumpiness'.

The unsorted portion of the debris was labeled and preserved in 80% ethanol. The sorted portion was labeled and preserved in 80% ethanol for resorting analysis. Sorting and identification was done using a low magnification of a dissecting scope in gridded Petri dishes. Empty snail or bivalve shells, empty caddis fly cases, invertebrate fragments such as legs, gills, antennae etc. were not removed or counted. When organism fragments were encountered only heads were counted towards the total. Larval and pupa exuviae were not counted. Terrestrial stages and terrestrial drop-ins are indicated as such and do not contribute to the total count. The sorted invertebrates were stored in 80% ethanol in snap cap vials.

The identifications were processed using current literature for the taxa encountered. Chironomids were identified to the level of genus with the aid of slide mounts of head capsules under a compound microscope.

As a measure of QA/QC, three samples were chosen for resorting efficiency. All resorts were greater than 95% and therefore above industry standards.

7.3 RESULTS AND DISCUSSION

7.3.1 Analysis of the 2012 Survey

Sites where benthos was collected is displayed in Figure 1 on Page 3. Sample site selection for the 2012 study did not totally overlap with previous studies. Additional watersheds were added. For example previous company sampling did not include collections from Classic Creek or Brewery Creek. Brewery Creek has however been sampled once before in 1991 during the baseline survey conducted by Environment Protection (Davidge, 1995). It should also be noted that Brewery Creek did not lie within the previous claim block. Since Classic Creek drains the Classic ore body currently under exploration, it was deemed important to assess the benthic community here. A water quality and hydrology site has also been established here by Golden Predator.

The regular site on Golden Creek (BC-31) was not sampled although it does have past data. It was possible to find a suitable landing location just downstream of the confluence with Lucky Creek which contained a favourable riffle area for sampling. This site is much closer to the confluence of Lucky than BC-31 and any impacts stemming from influences from Lucky Creek could potentially affect benthic organisms at this location on Golden Creek. It is also upstream of a large tributary draining to the northeast. Photos of this site and Classic Creek are included in Appendix E.

Considerable investigation did not produce a suitable landing spot near any riffle areas upstream of the confluence with Lucky Creek although this reach of Golden Creek was carefully flown. The regular site, BC-36, was examined but its geomorphology (steep banks, high velocity, deep water and large boulders) prevented the collection of benthic invertebrates. Only water samples were collected at this site.

Another site on Golden Creek was established near the mouth (see photos in Appendix E) . This lies below the west fork of Golden Creek, where a water quality site, BC-72, has been proposed. Portions of this stream drain the Sleeman's deposit. The sample site established near the mouth, GP10, will capture all influences to Golden Creek. Benthos was also collected here in 1991.

In-situ conditions at the time of benthic invertebrate collection are included with the field data for the water quality component in Table 5-1 in Appendix C. All waters were cool, slightly alkaline and well aerated.

Five phyla were found in the study area: Arthropoda, Mollusca, Annelida, Nemata (Nematoda) and Platyhelminthes. A total of 16,749 individual invertebrates, representing 161 different taxonomic groups were identified within the study area. These data are presented in Appendix E, Table 7-1.

The number of organisms in each sample was summed to give an abundance value. As a measure of community diversity the number of taxonomic groups identified from species to phylum was tallied for each sample. To further characterize the taxonomic wealth of each community, the diversity was related to the population size using the formula: (Diversity -1) divided by the natural log of the abundance value for that sample. The above data is summarized below in Table 7-2.

TABLE 7-2 ABUNDANCE, DIVERSITY AND TAXONOMIC RICHNESS, 2012

Site	Sample	Abundance	Diversity	Taxonomic Richness Index
Lee Cr u/s Pacific	GP1A	317	25	4.2
	GP1B	1060	28	3.9
	GP1C	565	35	5.4
Lee Cr @ ditch	GP2A	1210	28	3.8
	GP2B	1660	19	2.4
	GP2C	1672	26	3.4
Laura Cr	GP3A	112	22	4.5
	GP3B	146	24	4.6
	GP3C	104	17	3.4
Classic Cr near mouth	GP5A	748	26	3.8
	GP5B	578	21	3.1
	GP5C	672	26	3.8
Lucky Cr	GP6A	178	15	2.7
	GP6B	99	12	2.4
	GP6C	80	19	4.1
Golden Cr d/s Lucky	GP8A	339	27	4.5
	GP8B	274	26	4.5
	GP8C	180	19	3.5
Golden Cr @ mouth	GP10A	2584	24	2.9
	GP10B	540	18	2.7
	GP10C	1785	16	2.0
Brewery Cr @ mouth	GP11A	642	36	5.4
	GP11B	318	34	5.7
	GP11C	893	28	4.0

The population numbers ranged from a low of 80 individuals in sample GP6A, Lucky Creek, to 2,584 individuals in sample GP10A, Golden Creek near the mouth. Most communities were quite diverse and ranged from 12 different taxonomic groups identified in sample GP6B, Lucky Creek, to 36 different taxa that were recorded in sample GP11A, Brewery Creek. The assumption is that diversity increases with increasing water quality and habitat quality, availability and/or suitability. When the population size is taken into consideration, the richest community was still present at Brewery Creek in sample GP11B with and index of 5.7. However the least diverse community was at Golden Creek near the mouth in sample GP10C where the taxonomic richness index was 2.0.

Golden Creek, GP10, has habitat values of high quality (see Section 8.0), and although supported the largest population the benthic community was not very diverse. Both the water and stream sediments were of good quality (Sections 5.0 and 6.0) and it is unknown why the benthic community appears compromised.

The triplicates collected at each site were grouped together to determine the overall composition of the communities for each location. The composition is displayed as a percentage of the major taxonomic groups per site in pie charts in Figure 7-1 (Appendix E). A cursory view of Figure 7-1 shows that Diptera (true flies) forms a large part of each community. Oligochaeta (aquatic earthworms) and Plecoptera (stoneflies) are also well represented at some of the sites.

The distribution of the benthic invertebrates in each community is summarized in Table 7-3. Diptera was the dominant order at all of the sites, with Oligochaeta sharing dominance at Laura Creek. The majority of the Dipterans throughout the study area were identified within the family Chironomidae (midges). *Eukiefferiella sp* (of the subfamily Orthocladinae of the family Chironomidae) was the most abundant organism identified in the study area comprising 48.7% of all invertebrates collected. There appears to be little in the literature on this genus. It is not well known in North America but is a common genus in Europe and New Zealand. Apparently most species prefer cold, swift-flowing, well-oxygenated streams, conditions that were typical in the current study. Some species attach themselves to mayfly nymphs and thus are found in high quality streams (Landcare Research Website). After reviewing the BISY database, it was learned that *Eukiefferiells sp* is a commonly documented organism in many benthic communities throughout the Yukon Territory (BISY, 2011).

TABLE 7-3 TAXONOMIC DISTRIBUTION OF BENTHIC INVERTEBRATES, 2012

SITE	LOCATION	DOMINANT (≥25%)	SUBDOMINANT (10% to 24.9%)	COMMON (1.0% to 9.9%)	RARE (0.1% to 0.9%)
GP1	Lee Creek u/s Pacific Creek	Diptera	Oligochaeta Ephemeroptera	Plecoptera Other	Trichoptera
GP2	Lee Creek u/s Ditch Road	Diptera		Ephemeroptera Oligochaeta Plecoptera Other	Trichoptera
GP3	Laura Creek	Dipera Oligochaeta	Ephemeroptera	Other Plecoptera	Trichoptera
GP5	Classic Creek near mouth	Diptera	Oligochaeta Plecoptera Other		Ephemeroptera Trichoptera
GP6	Lucky Creek d/s Bohemian Road	Diptera		Other Oligochaeta Plecoptera	Trichoptera
GP8	Golden Creek d/s Lucky Creek	Diptera	Oligochaeta Plecoptera	Ephemeroptera Other	Trichoptera
GP10	Golden Creek near mouth	Diptera		Plecoptera Ephemeroptera Oligochaeta Other	
GP11	Brewery Creek near mouth	Diptera	Ephemeroptera	Plecoptera Other	Trichoptera Oligochaeta

As GP2, GP6 and GP10 were so heavily dominated by Diptera there were no subdominant groups in their communities. Ephemeroptera (mayflies) was the subdominant group at GP1, GP3 and GP11. Oligochaeta was also subdominant at GP1 and shared subdominance with Plecoptera at GP5 and GP8. Trichoptera (caddisflies) was rare at all of the sites. Ephemeroptera was also rare at GP5. No caddisflies were collected from GP10 and no mayflies were collected from GP6.

Ephemeroptera, Plecoptera and Trichoptera are generally regarded as invertebrates that are sensitive to pollution. The composition of EPT in the community can be an indication of the health of the aquatic ecosystem. The EPT for each site is tabulated below (Table 7-4). Other measures of abundance, richness and indices are included in Table 7-5 in Appendix E.

TABLE 7-4 THE PERCENT OF EPT AT EACH BENTHIC COMMUNITY								
SITE	GP1	GP2	GP3	GP5	GP6	GP8	GP10	GP11
EPT (%)	21.4	11.9	30.5	19.3	1.7	32.2	8.6	30.3

The benthic community at Lucky Creek, GP6, had a very low proportion of EPT, 1.7%, indicating a stressed environment. The water quality (Section 5.0) and the stream sediment quality (Section 6.0) at Lucky Creek when sampled in August 2012, show impairment with several parameters exceeding recommended guidelines for the protection of freshwater aquatic life. During a baseline study conducted on the Bohemian area in 1999, very few EPT were documented in Lucky Creek both upstream and downstream of tributaries draining the Bohemian zone (Burns, 2000).

The greatest representation of EPT, 32.2%, was at Golden Creek downstream of Lucky Creek, GP8. There was also approximately a third of the population represented by EPT at Laura Creek, GP3, and at Brewery Creek, GP11, with values of 30.5% and 30.3% respectively.

It is interesting to note that contrary to what the water quality data and the stream sediment data indicate, the benthic community at Classic Creek, GP5, appears relatively healthy. Concentrations of arsenic, cadmium and selenium exceeded the guidelines in the water column (refer to Table 5-2). Very high concentrations of arsenic have been recorded at Classic Creek in the past. The mean of 11 monthly water samples spanning a time period from August 2011 to June 2012 was 130 ug/L. The concentration during the current study was 147 ug/L. These values significantly exceed the recommended guideline of 5 ug/g for the protection of freshwater aquatic life, yet pollution sensitive organisms were collected here.

Arsenic concentrations in the stream sediments also exceeded the guideline considerably at GP5. The PEL concentration of 17 ug/g was grossly exceeded at Classic Creek where a concentration of 343 ug/g was recorded. There should be effects to the biota at this level, however the composition of the benthic community suggests that the arsenic present in the water and sediments is not in a bioavailable form. Two major uptake vectors are through the ingestion of metal enriched sediments or suspended particles and/or uptake from solution. The toxicity of arsenic is dependent on speciation. Arsenite (AsO_3^{-3}) forms are much more toxic to biological species. Metallo-organic forms of arsenic also may be much more bioavailable than inorganic forms; however, organic-bound arsenic is excreted by most species and does not appear to be highly toxic (Luoma, 1983). Without conducting costly speciation analysis, it is unknown what the prevalent form of arsenic is in the Classic watershed. However, Classic Creek has relatively high alkalinity plus the water is hard, factors which may help to buffer potential toxicity.

7.3.2 Comparisons with Past Studies

As mentioned in Section 7.1 several benthic invertebrate surveys have been conducted in the Brewery Creek area. Several of the sites in these surveys coincide with sites examined in the 2012 study. The 2012 triplicate data for each site has been summed and calculated as density (# of invertebrates/m^2) to enable comparisons with past data. These have been tabulated and graphed (Table 7-6 and Figure 7-2 in Appendix E). The densities reported by Norecol were significantly higher than during any other time period, including the sampling done the same year by Environment Protection. The Norecol raw data was recently acquired and the densities recalculated and reported in Table 7-6. There were high numbers in the some of the samples, but the recalculations show that densities were not as great as originally reported in earlier reports. The population size has varied between sites and over time with the largest population documented in 1991 for several of the sites examined. Generally densities appear lower at Laura and Lucky Creeks. Many variables contribute to benthic invertebrate productivity including water temperature, air temperature, rainfall, canopy cover, substrate type and size, stream depth and velocity, as well as the quality of the water and the sediments.

The first dominant taxonomic group was determined for each site for all of the years sampled (Table 7-7). Diptera and Oligochaeta were frequently the dominant groups throughout the study area and the study period. Occasionally Plecoptera or Ephemeroptera was the dominant group at the Lee Creek sites. Diptera has consistently dominated the benthic communities at Lucky Creek.

TABLE 7-7 DOMINANT TAXONOMIC GROUP OVER TIME, BREWERY CREEK

Site	GP1	GP2	GP3	GP6	GP10	GP11
Location	Lee Cr u/s Pacific Cr	Lee Cr @ Ditch Road	Laura Cr	Lucky Cr	Golden Cr @ mouth	Brewery Cr @ mouth
1991 (EP)	Diptera	Diptera	Diptera		Oligochaeta	Diptera
1991 (Norecol)	Oligochaeta	Ephemeroptera	Diptera			
1994	Diptera,	Oligochaeta	Diptera	Diptera		
1995	Plecoptera	Oligochaeta	Oligochaeta	Diptera		
1997	Diptera	Diptera	Oligochaeta	Diptera		
1999	Diptera	Oligochaeta	Oligochaeta	Diptera		
2001	Oligochaeta	Diptera	Oligochaeta	Diptera		
2003	Oligochaeta	Oligochaeta	Oligochaeta	Diptera		
2005	Plecoptera	Oligochaeta	Oligochaeta	Diptera		
2007	Diptera	Oligochaeta	Oligochaeta	Diptera		
2009	Diptera	Diptera	Diptera	Diptera		
2012	Diptera	Diptera	Dipera	Diptera	Diptera	Diptera

In summary, the composition of the benthic invertebrates communities has been relatively similar over time although abundance has fluctuated to some extent at the sites examined.

8.0 FISHERIES

8.1 BACKGROUND INFORMATION

Fisheries investigations in the study area were initially completed in the early 1990s as part of the environmental baseline characterizations associated with the establishment of the Brewery Creek Mine. The former mine site was largely a greenfield development and the studies were geared to determine fish utilization habitat characterizations of the principle drainages in the area (Norecol 1991, Norecol Dames and Moore 1993; Steffen Roberson and Kirsten 1994). These studies provided baseline information on fish assemblages and habitats within the Brewery Creek project area, with a focus on the major drainages in the region (Golden Creek, Laura Creek, Lee Creek, Pacific Creek, and the South Klondike River). Additionally, metal contaminants in the fish on Lee Creek were part of a study by Steffen Robertson and Kirsten (1994). The study concluded low concentrations of metal contaminants in the fish that were tested. With the change of ownership of the mining property in the late 1990s subsequent fisheries surveys focused on the same principle drainages (Access Mining Consultants Ltd and White Mountain Environmental Consultants 1999). A further study of metal contaminants was completed by Access Consulting Group on lower Laura Creek and the South Klondike River in August of 2001 to gather fish samples for the study. The objective of this project was to collect several fish from watercourses draining the Brewery Creek mine site and analyze their tissues for metal concentrations, particularly mercury. These concentrations were thought to provide background fish tissue data and allow a comparison to applicable national and international guidelines.

It's long been known that the Klondike River is an important salmon spawning stream (Mercer 2011; R.L.&L 1989). Chinook salmon (*Oncorhynchus tshawytscha*) have previously been observed spawning in the mainstem of the South Klondike River but not in the side channels that are more typically used by chum salmon (*Oncorhynchus* keta). Other fish species that have been previously documented in the Klondike River watershed include Arctic grayling (*Thymallus thymallus*), burbot (*Lota lota*), inconnu (*Stenodus leucichthys*), round whitefish (*Prosopium cylindraceum*), slimy sculpin (*Cottus cognatus*), and longnose sucker (*Catostomus catostomus*) (DFO 2011; Norecol Dames and Moore 1993). Based on the predicted habitat suitability and restoration standards associated with the Yukon Placer Authorization, the mainstem and side channels of the South Klondike River, as well as the low gradient reaches of Lee, Golden and Brewery creeks are classified as high habitat suitability for fish (Yukon Placer Secretariat 2011). The upper reaches of Laura, Lucky and Pacific creeks are classified as low habitat suitability. The mainstem of Lee Creek is also an area of special cultural consideration.

Past studies have suggested Lee Creek as having excellent fish habitat values and abundant opportunities for spawning and rearing of fish in most areas of the stream (Norcol Dames and Moore 1993). The study also concluded there were significant numbers of Chinook fry utilizing the lower reaches of Lee Creek, below the Klondike Ditch Road, during July and October. The study suggested that the remains of a wooden weir on the mainstem of Lee Creek appeared to be acting as a fish barrier, with only slimy sculpin observed upstream of the structure. The weir was removed in 1992 but only slimy sculpin were seen, or caught in Lee or Pacific Creek (a tributary of Lee Creek) during the 1993 investigations. A subsequent survey in 1999 by Viceroy Mineral Corporation observed Arctic grayling and captured slimy sculpin upstream of the old weir site, in the vicinity of the Klondike Ditch Road Bridge crossing.

Investigations of Laura Creek suggest the stream does not contain any suitable fish habitat except near the outlet. The presumption, based on several observations, is that the lower channel of Laura Creek is intermittent, with only seasonal surface flows reporting to the South Klondike River (Norecol 1991; Steffen Robertson and Kirsten 1994). When water is present at the outlet there is potential for fish originating from the Klondike River to utilize the resulting inundated habitat (Viceroy Mineral Corporation 1999). However, nearly all of the studies to date have observed summer flows in Laura Creek becoming subsurface before reaching the South Klondike River posing a barrier to fish movement.

Golden and Brewery creeks are presumed to contain excellent quality fish habitat however fish had yet to be documented in these streams. There continues to be speculation that beaver dams specifically in Golden Creek act as barriers to the upstream movement of fish originating from the Klondike River. Steffen Robertson and Kirsten (1994) did not capture any fish in Golden Creek and further concluded none may be present above the beaver dams (Norecol Dames and Moore 1993).

8.2 METHODS

8.2.1 Fish Habitat and Utilization Assessment

Four sites on Lee Creek (including the confluence with Pacific Creek), one site on Pacific Creek, one site on Laura Creek, one site on Golden Creek and one site on Brewery Creek were sampled for the presence of fish through August 7th to 10th, 2012. These sites represent part of a larger environmental network used for previous baseline studies in the study area. Fish habitat descriptions and metrics were recorded at locations where fish were captured or reported previously. Measurements were collected using methodology described in the Stream Survey Toolkit prepared by the BC Ministry of Sustainable Resource Management (RISC 2004).

Fish sampling was conducted under a permit obtained from Fisheries and Oceans Canada. Each sampling site was accessed either by vehicle using access roads or with the aid of a helicopter. A Smith Route LR-24 battery powered electroshocker was the primary method used for establishing fish presence. A minimum of 150 seconds of active shocking time was completed at each site. In addition, six baited Gee type minnow traps were set overnight at each site using methods described by the Yukon River Panel (2007). Minnow traps were set in scour pools, behind boulders, in undercut banks or where woody debris offered cover for fish. Angling and beach seining were also conducted where feasible. Angling employed the use of flies and/or small spinners. The seine net was 7 meters in length and constructed of 6.3 mm (¼ inch) mesh. Captured fish, except those that were retained for metal analysis, were identified, enumerated and measured for a total or fork length (± 1 mm), weighed (± 0.1 gm) using a digital scale and subsequently live-released at site of capture.

8.2.2 Fish Tissue Metal Sampling

A minimum of six slimy sculpin were retained from Lee, Golden and Brewery creeks for whole body ICP metal analysis. Additionally, four Arctic grayling were obtained from Lee Creek. In most cases the largest specimens from each capture site were euthanized and placed in individual ®Whirlpac plastic bags. Collections were immediately placed on ice and subsequently frozen within 12 hours. For shipment, samples were packed with ice packs and couriered to Maxxam

Analytics Laboratory in Burnaby, British Columbia. Analytical results were expressed in wet weights for comparison with guidelines, previous studies, and other sites throughout Yukon and Alaska.

8.3 RESULTS AND DISCUSSION

8.3.1 Brewery Creek

This watershed represents the largest drainage in the study area. The single sample site (GP-11) on Brewery Creek had the largest average channel width of 31.2 m with pools that were too deep to wade (Table 1, Photo 1 in Appendix F). Fish cover was abundant and dominated by accumulations of small woody debris and deep pools. Other cover types included the occasion large timber in the active channel, undercut banks and a well-established riparian zone that offered an abundance of overhanging vegetation. The slope of the main channel was modest at about 1.0 percent. Streambed material was dominated by cobble-sized armor with slack water regions containing aggregations of clean gravel. The channel was unconfined by the valley walls and meanders were sinuous with a well-developed riffle-pool sequence. Pools were located on the outsides of bends with riffle crossovers on the opposite margin of the stream. Islands were infrequent and large gravel bars along the sides of the channel were common. Captured fish included 6 juvenile Chinook salmon ranging in size from 53 to 58 mm in fork length, 13 slimy sculpin from 26 to 91 mm in total length and 1 juvenile burbot that was 210 mm in total length. Fish were generally in low densities based on frequency of capture in the various gear types (Table 2, Appendix F). Arctic grayling appeared to be absent although the habitat was ideally suited for this species.

8.3.2 Laura Creek

Only one site on Laura Creek was sampled (GP-3) for the presence of fish, as the second site near its confluence with the South Klondike River was dry (Photo 2, Appendix F). An aerial inspection of the drainage revealed flow in the stream became subsurface in an area that was heavily modified by beaver activity just downstream of the Ditch Road (Photo 3, Appendix F). The same situation has been noted in the past by other researchers (Steffen Robertson and Kirsten 1994). With no surface connection to the South Klondike River there would be no means for any movements of fish between these drainages with Laura Creek being an isolated drainage. Laura Creek is the smallest watershed in the project area. Its channel width at the Ditch Road sampling site was only 3.2 m with a gradient of only 1.1 percent as the stream at this location is flowing within the South Klondike River valley floor. Cover for fish was low and largely in the form of overhanging vegetation and beaver accumulations of small woody debris. Other cover types included scour pools and undercut banks. The riparian vegetation primarily consisted of dense stands of alder and willow providing a crown closure of between 71 to 90 percent of the stream (Photo 4, Appendix F). The substrate was dominated by fines, mainly organics, with the occasional accumulation of gravel. The D_{95} was 12 cm, the smallest of the surveyed sites. The meanders were tortuous and there were many small barriers creating a step-pool channel type morphology. The streams were generally unconfined although sections were deeply incised by the banks. There was the occasional gravel bar along the margins of the channel. No fish were captured in this stream despite considerable effort using the electrofisher and minnow traps (Table 2, Appendix F).

8.3.3 Lee Creek

Three sites on the mainstem of Lee Creek (F-1, GP-1 and GP-2) were surveyed. Sampling sites were equidistantly spaced from the mouth by about 2.5 kilometers. Channel width averages ranged from 11.3 m at GP-1 near the Pacific Creek confluence to 14.1 m at site GP-2 at the Ditch Road Bridge. Residual pool depths were high throughout the channel and ranged from 0.4 m to 0.6 m in depth. The highest stream gradient was located at site GP-1 where it was determined to be 1.1 percent. The other sites were low in gradient measuring only 0.4 percent. Cover for fish was abundant at all sites. Primary cover types were small woody debris, overhanging vegetation and undercut banks. Deep pools were the primary subdominant cover type. These deep pools, when combined with aggregations of small and large woody debris, offered excellent fish cover. Banks were well vegetated at all sites and mainly composed of grasses and shrubs. Deciduous trees were especially conspicuous at site GP-2 (Photo 5, Appendix F). Instream vegetative types that included mosses and algae were commonly observed at all sites. Cobble was the dominant substrate at site F-1 near the confluence with the South Klondike River. Sample sites further upstream were primarily composed of gravels. Fines were more prominent at the most upstream site GP-1 near the confluence with Pacific Creek. The channel through the three samples sites was a riffle pool sequence that had regular and sinuous meanders. There were occasional islands observed and bars were primarily along the sides of the channel. The stream was largely unconfined as it flowed along the valley floor of the South Klondike River. A total of 37 slimy sculpin were captured at the three sites sampled in Lee Creek. Slimy sculpin were captured at about the same frequency at all three sites with sizes ranging from 33 to 95 mm in total length. Juvenile Chinook salmon were only captured at site F-1 near the South Klondike River confluence. Juvenile Chinook salmon were 0+ in age based on their size and ranged from 54 to 65 mm in fork length. Arctic grayling sub adults and adults ranging in size from 273 to 400 mm in fork length were only captured at site GP-2 near the Ditch Road Bridge. This site is above the old weir that was believed to be a barrier prior to its removal in the early 1990s. The species that were captured during this assessment have all been previously documented in the steam by other surveys (Viceroy Mineral Corporation 1998; Steffen Robertson and Kirsten 1994).

Pacific Creek, a tributary of Lee Creek, was also briefly assessed during the survey. With the exception of a small section of accessible habitat at the confluence with Lee Creek, habitat quality is generally poor throughout the drainage. At site PC-2 there were several obvious barriers with one section of the stream flow becoming subsurface. The stream channel averaged less than 1 meter in width at this location (Photo 6, Appendix F). Further downstream at the confluence the channel width was 6 meters however the plethora of deadfall in the stream likely posed a barrier to any upstream movements of fish. The channel meandered irregularly and was also deeply incised at this location. Peat moss and areas of permafrost were common features in this small watershed and the substrate was almost entirely composed of fines. Only modest numbers of slimy sculpin have been documented at the mouth of this small tributary where the gradient is low. The gradient at site PC-2 was estimated to be 5.9 percent. No fish were captured in Pacific Creek during this survey.

8.3.4 Golden Creek

Only a single site (GP-10) on the mainstem of Golden Creek was surveyed (Photo 7, Appendix F). The surveyed site (GP-10) was a 100 m section of the stream near South Klondike River confluence. The average channel width at this location was approximately 8.7 m suggesting a sizable watershed. Residual pool depths averaged 0.5 m which was deep enough to provide for some excellent fish cover. The stream gradient was low and estimated to be only 0.7 percent. Overall, fish cover was abundant and primarily composed of small woody debris. Other cover types included undercut banks, large timbers and overhanging vegetation. Bank vegetation consisted of grasses and shrubs with sections bounded by a mature conifer forest. Cobble dominated the substrate although gravel was commonly observed in slack water areas along the stream banks. The unconfined channel was a riffle pool sequence with irregular meanders. Exposed side bars were few and a beaver dam spanned the creek approximately 200 meters upstream for the confluence. The beaver dam may serve as a partial barrier to the upstream movement of fish. Three species of fish were captured at this location. This included 1 burbot that was 215 mm in total length, 6 juvenile Chinook salmon ranging in size from 54 to 64 mm in fork length and 26 slimy sculpin ranging in size from 53 to 83 mm in total length. The juvenile Chinook salmon were presumed to be 0+ in age. Fish have never been documented previously in Golden Creek.

Lucky Creek, a headwater tributary of Golden Creek, was also briefly assessed during the survey. The assessment site (GP-6) was located along an access road that crossed the creek northwest of the mining camp (Photo 8, Appendix F). The stream channel averaged about 0.3 m in width away from the disturbed area associated with the road crossing. The installed culvert was perched with a plunge pool and the stream at the time of the survey was being used as a water source for a drill program in the local vicinity. The channel was deeply incised by the valley walls and was a step pool configuration. The stream gradient at this location was estimated to be 4.0 percent. There were many potential barriers observed downstream of the culvert. Fish habitat values were low in this small tributary stream. No fish were captured at this location.

8.3.5 Metal Contaminants in Fish

Summaries of the laboratory results of chemical analysis of four Arctic grayling originating from Lee Creek and 18 whole body slimy sculpin collected from Lee, Golden and Brewery Creeks are presented in Tables 3 and 4 in Appendix F. The complete analytical report of the tissue analysis is also presented in Appendix F.

The Arctic grayling that were analyzed represented a size that would be typically consumed by anglers. With the exception of methyl mercury, there currently are no Canadian fish tissue residue guidelines for the protection of wildlife consumers of aquatic biota for all of the elements tested. However, for a small number of the most toxic elements, fish tissue residue guidelines have been prepared for chemical contaminants and toxins in fish and fish products for human consumption.

The current CCME (1999) guidelines for the protection of wildlife consumers of aquatic biota address those substances for which aquatic food sources are the main route of exposure. These guidelines apply to any aquatic species consumed by wildlife, including fish, shellfish, invertebrates, or aquatic plants. To date, only a few substances have had a guideline developed and include DDT, Dioxins and Furans, PCBs, Toxaphene and Methylmercury. These substances are known to bioaccumulate and can be persistent in aquatic food chains. The recommended guideline (TRGs) for these persistent pollutants represent the tissue residue concentration of the contaminant in an aquatic organism that is not expected to result in adverse effects in predaceous wildlife. Conversely, the Canadian Food Inspection Agency (2009) has also developed TRGs for chemical contaminants and toxins in Canadian fish and fish products. These guidelines were prepared to promote product and process standards that contribute to the achievement of acceptable quality and safety of fish and seafood products in the consumer marketplace. For comparative purposes, the values for three of the elements (arsenic, lead and mercury) listed by the Canadian Food Inspection Agency were compared to concentrations determined for fish sampled from the three separate drainages in this study.

For simplicity, seven of the most toxic contaminants in the aquatic environment (Arsenic, Cadmium, Copper, Lead, Mercury, Selenium and Zinc) were chosen for presentation. Each of these contaminants has varying toxicity to fish and other aquatic organisms depending on their molecular form. Table 5 (Appendix F) summarizes the average residue found in slimy sculpin and Arctic grayling samples collected from each separate drainage. The values are then compared to both the CCME guideline for wildlife consumers and Canadian Food Agency fish tissue guideline. While these guidelines are specifically intended to protect human health or protect wildlife consumers of aquatic biota, they do provide some use in evaluating the levels found in this assessment. Additionally, databases of fresh water fish (INAC 2009; USGS 2011) were also presented to provide an overview of the range of values found naturally in other freshwater populations in other freshwaters of the Yukon Territory and the Yukon River Basin.
Arsenic concentrations for all samples were generally low in comparison to the mean and maximum concentrations from the INAC and USGS databases. Individual values ranged from a low of 0.013 ug/g for Arctic grayling in Lee Creek to a high of 0.47 ug/g for a single slimy sculpin from Brewery Creek. The Canadian guideline for the consumption of fish and fish products is currently set at 3.5 ug/g, which is well above the concentrations found in this study and the other databases.

Cadmium concentrations were also generally low for all samples. The maximum concentration recorded was 0.198 ug/g for a slimy sculpin from Lee Creek. Arctic grayling had the lowest values averaging 0.016 ug/g. Average values for the drainages were below the mean and maximum cadmium concentrations reported from fish in the INAC and USGS databases.

Sculpin copper concentrations were consistent and did not exceed 1.28 ug/g. Average concentrations were the lowest in Arctic grayling at 0.518 ug/g. Overall concentrations were generally below the INAC database for average sculpin concentrations but above the USGS database for freshwater fish from the Yukon River.

Lead concentrations in slimy sculpin were generally low in comparison to the mean and maximum concentrations in whole body sculpin from the INAC and USGS databases. The highest concentration was 0.156 ug/g found in a slimy sculpin from Brewery Creek. The Canadian guideline of lead for the consumption of fish and fish products is 0.5 ug/g.

Mercury in fish is almost entirely methylmercury (Rodgers 1994). Methylmercury is a neurotoxin, and the form of mercury that is most easily bioaccumulated in organisms. Mercury concentrations in Arctic grayling and slimy sculpin in Golden Creek averaged higher than the Environment Canada tissue residue guideline of 0.033 ug/g for wildlife consumers. All sites were also above the averages of the INAC and USGS databases but well below the Canadian guideline of 0.5 ug/g for the consumption of fish and fish products. The highest concentration for an individual fish was 0.073 for an Arctic grayling sampled from Lee Creek.

Average selenium concentrations in fish were consistent between drainages and did not exceed

2.18 ug/g. Concentrations in the INAC and USGS databases average 1.7 ug/g and 0.51 ug/g, respectfully. The highest concentration for an individual fish was 2.84 ug/g from a slimy sculpin sampled in Lee Creek.

Zinc concentrations in sculpin were relatively consistent between drainages attaining a maximum concentration of 36.4 ug/g for a single sculpin sampled in Golden Creek. Concentrations of zinc reported in Arctic grayling were generally lower than those for sculpin. The average concentration in sculpin reported in the INAC database was 42.2 ug/g with a concentration maximum of 187.1 ug/g reported in a sculpin from VanGorda Creek. The USGS database for other freshwater fish averaged 34.8 ug/g with a maximum of 56.4 ug/g reported for a single fish.

Concentrations of arsenic, cadmium, lead, copper, mercury, selenium and zinc did not appear to be elevated in any particular drainage. Notable, however, were differences in the concentrations of copper, lead, and zinc between Arctic grayling and slimy sculpin. Overall concentrations of these three metals were higher in sculpin and may be reflective of the natural background levels in these streams. Sculpin are not known to be migratory and generally have a much smaller range than Arctic grayling.

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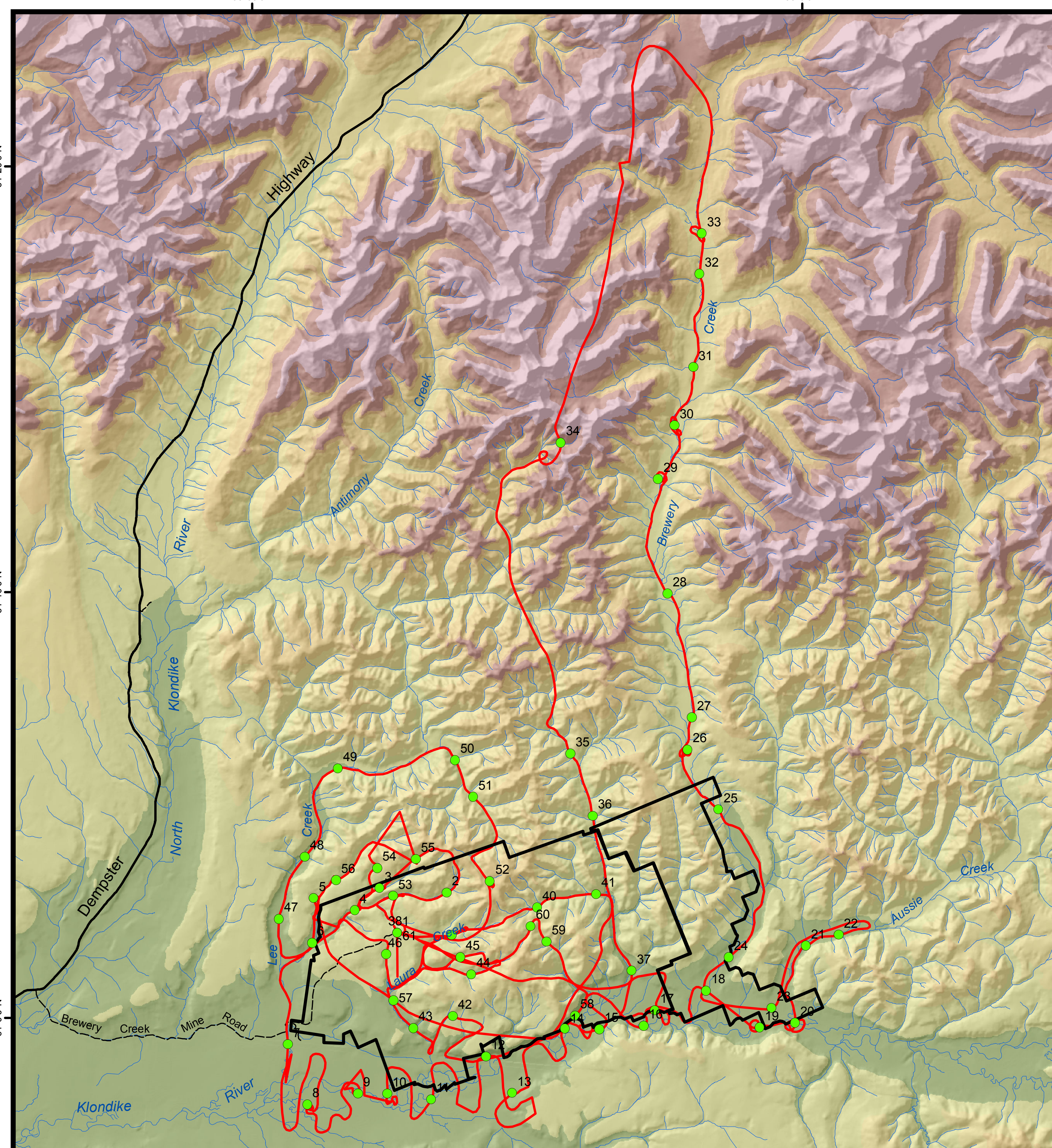
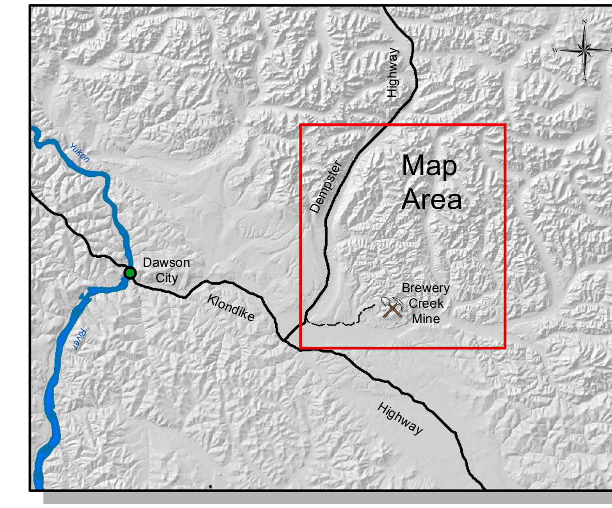
APPENDIX A

WILDLIFE SURVEYS

ident	lat	long_	altitude
1	64.047481	-138.291486	824
2	64.065017	-138.250359	922
3	64.064305	-138.311037	767
4	64.054846	-138.331441	689
5	64.058004	-138.369191	719
6	64.040495	-138.367062	0
7	63.999814	-138.380302	589
8	63.97705	-138.35782	596
9	63.983131	-138.313417	598
10	63.984107	-138.287019	588
11	63.983493	-138.247305	604
12	64.002209	-138.201706	646
13	63.988851	-138.175454	640
14	64.015918	-138.133427	664
15	64.01686	-138.102411	660
16	64.019791	-138.063051	645
17	64.026249	-138.054202	626
18	64.035662	-138.009747	668
19	64.023052	-137.958882	652
20	64.02612	-137.927398	676
21	64.056659	-137.923662	727
22	64.061986	-137.895153	713
23	64.03107	-137.949708	687
24	64.049562	-137.992079	710
25	64.107052	-138.013049	744
26	64.129508	-138.045386	787
27	64.142228	-138.044049	796
28	64.18994	-138.075838	869
29	64.234443	-138.09345	939
30	64.256001	-138.082893	945
31	64.279536	-138.070552	974
32	64.3163	-138.072317	1028
33	64.332242	-138.073558	1093
34	64.245337	-138.184422	1682
35	64.123831	-138.150397	840
36	64.100234	-138.125531	762
37	64.040939	-138.078203	658
38	64.047545	-138.291458	831
39	64.048481	-138.242281	817
40	64.062414	-138.167984	842
41	64.069663	-138.116161	697
42	64.016849	-138.234792	759
43	64.010814	-138.269196	612
44	64.033858	-138.221739	836
45	64.040243	-138.232845	843
46	64.038724	-138.299726	758
47	64.048711	-138.398553	626
48	64.073946	-138.380635	662
49	64.109709	-138.358417	725
50	64.117306	-138.253545	786
51	64.103504	-138.234184	810
52	64.071075	-138.21243	1131
53	64.061829	-138.298219	749
54	64.072172	-138.31473	877
55	64.077066	-138.280973	807
56	64.065923	-138.350678	747
57	64.020948	-138.289442	716
58	64.021336	-138.125314	625
59	64.04938	-138.156967	844
60	64.054837	-138.172361	960
61	64.047541	-138.291403	828





Legend

- Wildlife Observations
- Wildlife Survey Flight Line
- Quarz Claims
- Unpaved Road
- Limited Use Road
- Watercourse

Elevation

Feet

- 0 - 400
- 400 - 650
- 650 - 850
- 850 - 1,050
- 1,050 - 1,250
- 1,250 - 1,300
- 1,300 - 1,300
- 1,300 - 1,500
- 1,500 - 3,300
- 3,300 - 5,920

1:200,000

0 2 4 8 12 16

Kilometers

Laberge Environmental Services

BREWERY CREEK PROJECT

SPRING 2012 WILDLIFE SURVEY

Map 1

Laberge ENVIRONMENTAL SERVICES

Drawing prepared by K. Pelletier,
Ibex Consulting
March 2012
Wildlife Survey Data:
LES (UTM Zone 7N, WGS 84)
Baseline data:
http:/geogratis.cgdi.gc.cageogratis

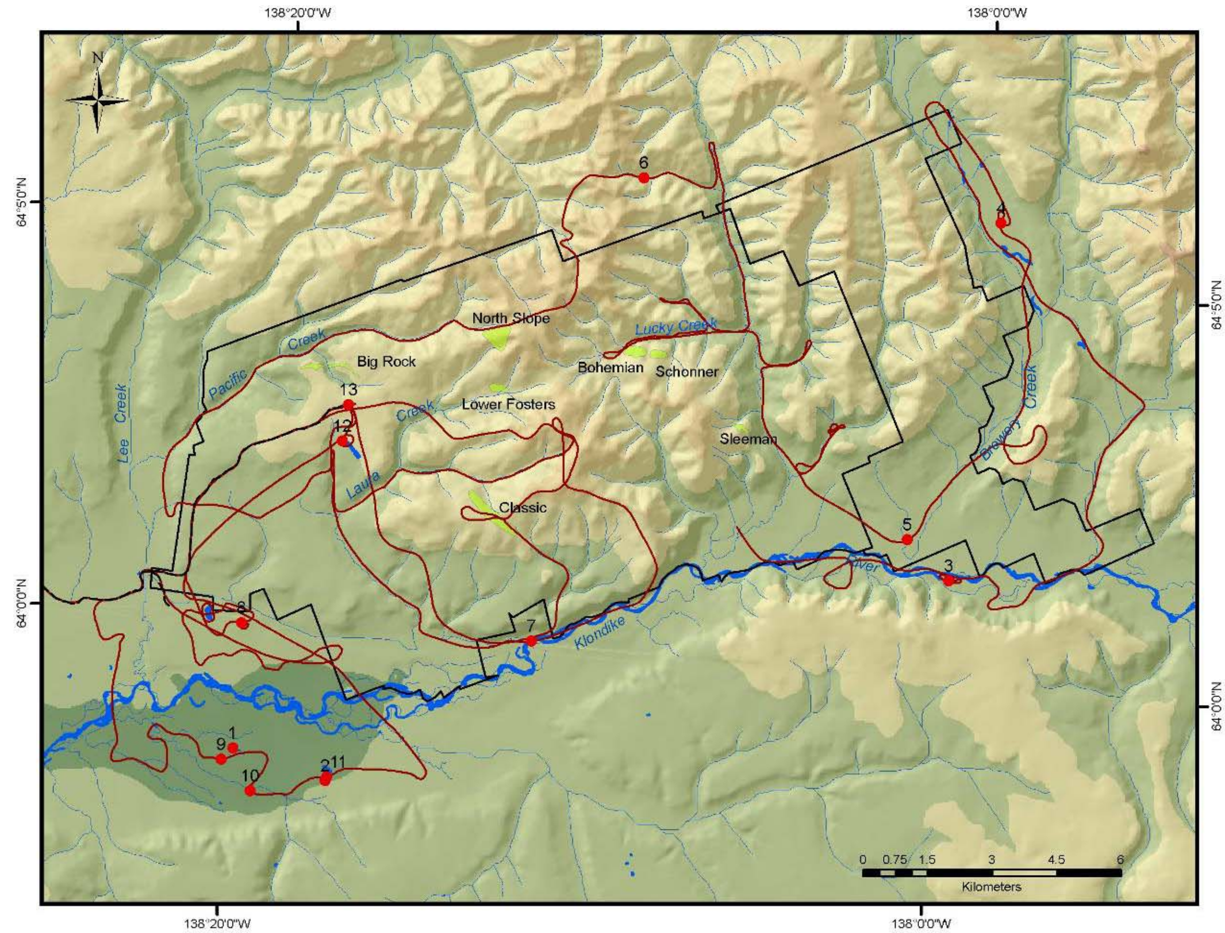
WAYPOINT DESCRIPTIONS FOR MAP #1

TABLE 3-1	MOOSE OBSERVATIONS	
Waypoint #	**# of Moose Observed**	**General Location**
5	1	Upper Pacific Creek
9	3	Klondike River
13	2	Klondike River
14	1	Klondike River
16	4	Klondike River
19	5	Klondike River
20	3	Klondike River
21	2	Aussie Creek
22	3	Aussie Creek
24	3	Brewery Creek
27	2	Brewery Creek
33	2	Brewery Creek
29	4	Brewery Creek
30	3	Brewery Creek
31	1	Brewery Creek
32	2	Brewery Creek
39	1	Laura Creek
47	2	Lee Creek
50	1	Upper Lee Creek
56	3	Pacific Creek
57	2	Lower Laura Creek
58	8	Lower Golden Creek
59	2	West Golden Creek
60	1	West Golden Creek
Total:	**61**	

TABLE 3-2	MOOSE TRACK EVIDENCE
Waypoint #	**Comment**
1	Brewery Creek Camp
2	Old track of one animal – Upper Pacific Creek
3	New tracks of two animals – Pacific Creek
4	Old track – Pacific Creek
5	New tracks – Pacific Creek
6	New tracks – Pacific Creek
7	Mixed age tracks – Lower lee Creek
10	Mixed age tracks – Klondike River
11	Old tracks – Klondike River
12	Mixed age tracks – Klondike River
15	Mixed age tracks – Klondike River
17	New tracks – Klondike River
18	Mixed age tracks – Brewery Creek confluence
23	Abundant mixed age tracks – Confluence Aussie Creek

TABLE 3-2	MOOSE TRACK EVIDENCE
Waypoint #	**Comment**
25	Abundant mixed age tracks – Brewery Creek
26	Moose kill – Brewery Creek
28	Mixed age tracks – Brewery Creek
33	Abundant fresh tracking – Upper Brewery Creek – see Photo #5
34	Marked waypoint but no observation
35	Old tracking – Upper Golden Creek
36	New tracking of 2 to 4 animals – Upper Golden Creek
37	Scattered old sign in mid and lower Golden Creek
38	Brewery Creek Camp – end of morning survey
40	Fresh track of one animal – Lucky Creek
41	Mixed age tracking – Upper and mid Lucky Creek
42	Mixed age tracking – Laura Creek
43	Mixed age tracking – Laura Creek
44	Scattered old sign – Laura Creek
45	Scattered old sign – Laura Creek
46	Scattered old sign – Laura Creek
48	Abundant mixed age sign – Upper Lee Creek
49	Abundant mixed age sign – Upper Lee Creek
51	Scattered old sign
53	Very old sign – Upper Pacific Creek
54	Very old sign – Upper Pacific Creek
55	Very old sign – Upper Pacific Creek
61	Brewery Creek Camp – end of survey

TABLE 3-3	WOLF OBSERVATIONS AND SIGN
Waypoint #	**Comment**
8	4 wolves observed – Klondike River
11	Old trail of 6 animals
26	1 observed at kill site – Brewery Creek



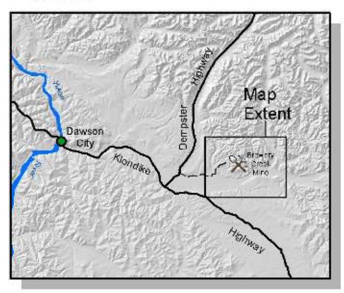
Legend

- Wildlife Observations
- Flight Line
- Highway
- Limited Use Road
- Watercourse
- Mineral Resource Areas
- Quartz Claims

Elevation

Feet

- 0 - 500
- 500 - 750
- 750 - 1,000
- 1,000 - 1,250
- 1,250 - 1,500
- 1,500 - 2,000
- 2,000 - 3,000
- 3,000 - 6,000



waypoint	lat	long	altitude
1	63.973709	-138.332718	574
2	63.968602	-138.287578	585
3	64.021693	-138.000288	634
4	64.09687	-137.990067	681
5	64.029494	-138.021592	651
6	64.099802	-138.162114	859
7	64.001511	-138.195797	622
8	63.999856	-138.334159	549
9	63.971103	-138.337891	533
10	63.965071	-138.322604	540
11	63.969379	-138.287059	550
12	64.039529	-138.294168	789
13	64.047182	-138.292801	825

BREWERY CREEK PROJECT

JUNE 2012 WILDLIFE SURVEY

Map 2

Laberge ENVIRONMENTAL SERVICES

PREDATOR GROUP

Drawing prepared by K. Pelletier,
Ibex Consulting, June 2012
Wildlife Survey Data: LES (GCS_WG_1984)
Baseline data: http:/geogratis.cgdi.gc.cageogratis

WAYPOINT DESCRIPTIONS FOR MAP #2

TABLE 3-4	MOOSE OBSERVATIONS	
Waypoint #	**# of Moose Observed**	**Specifics**
1	1	Adult male
2 and 11	3	2 female and 1 male
3	1	Adult female
8	1	Adult female
12	1	Subadult male
Total:	**7**	

TABLE 3-5	INCIDENTAL WILDLIFE OBSERVATIONS
Waypoint #	**Comment**
3	Large beaver (*Castor canadensis*)
4	Brown phase black bear (*Ursus americanus*)
6	Red-tailed hawk (*Buteo jamaicensis*)
9	Trumpeter swan (*Cygnus buccinator*)
10	Trumpeter swan on nest (*Cygnus buccinator*)

TABLE3- 6	DESCRIPTION
Waypoint #	**Comment**
5	Cabin
7	Cabin
13	Brewery Camp

TABLE 3-7 BREWERY CREEK WILDLIFE LOG

BREWERY CREEK WILDLIFE OBSERVATION LOG, 2012			
Date, 2012	**Species**	**Number**	**Location**
6-May	Bear	1	outside camp
7-May	Bear	1	North Fork Road
7-May	Moose	1	North Fork Road
7-May	Porcupine	1	~ 500 m past fuel station
8-May	Moose	1	North Fork Road
8-May	Porcupine	1	Km 6
8-May	Moose	2	Km 5
8-May	Bull moose	1	Km 5
9-May	Moose	1	Km 5
16-May	Bear	1	Camp
16-May	Bear	1	Km 3
20-May	Bear	1	Km 20
20-May	Bear	1	North Fork Road
20-May	Bull Moose	1	North Fork Road
20-May	Porcupine	3	North Fork Road
20-May	Rabbit	2	North Fork Road
22-May	Bear	1	3 miles down road
23-May	Lynx	1	3 Km
23-May	Birds (probably swallows)	37	office area
23-May	Mice	2	core shack
29-May	Moose	1	Km 4
29-May	Bear	1	Km 16
1-Jun	Bear	1	?
1-Jun	Moose	5	North Fork Road
2-Jun	Porcupine	1	by laydown
2-Jun	Fox	1	by laydown
3-Jun	Black bear	3	Lower Fosters
5-Jun	Black bear	1	Classic
14-Jul	Black bear	1	2nd bridge
16-Jul	Moose	1	Classic Road
18-Jul	Black bear	1	North Fork Road
19-Jul	Fox	1	yard
24-Jul	Black Bear	1	WBR
25-Jan	Grizzly bear	1	3/4 mile
26-Jul	Black Bear	1	North Fork Road, near R22
28-Jul	Moose	1	gas tanks
7-Aug	Wolf	2	North fork
11-Aug	Moose and 2 calves	3	Moosehead
11-Aug	Ducklings	2	1st bridge
24-Aug	Black Bear	1	Front gate
7-Sep	Grouse	3	EBRK
11-Sep	Moose cow and calf	2	North Fork Road
11-Sep	Porcupine	1	by bridge
17-Sep	Fox	1	camp
17-Sep	Bear	1	5 km from camp
26-Sep	Fox	1	Warehouse
4-Oct	Red Fox	1	Dry shack
10-Oct	Black/red Fox	1	Tents
11-Oct	Lynx	1	1 km from camp
22-Oct	Willow grouse	5	2 km from camp

TABLE 3-8 **WILDLIFE HARVESTS IN BREWERY CREEK STUDY AREA**

BLACK BEAR				
GMA	Year	Non-Res	Res	Total
229	2008		1	1
	2007	1		1
229 Total		1	1	2
251	2004		1	1
251 Total			1	1
Grand Total		1	2	3

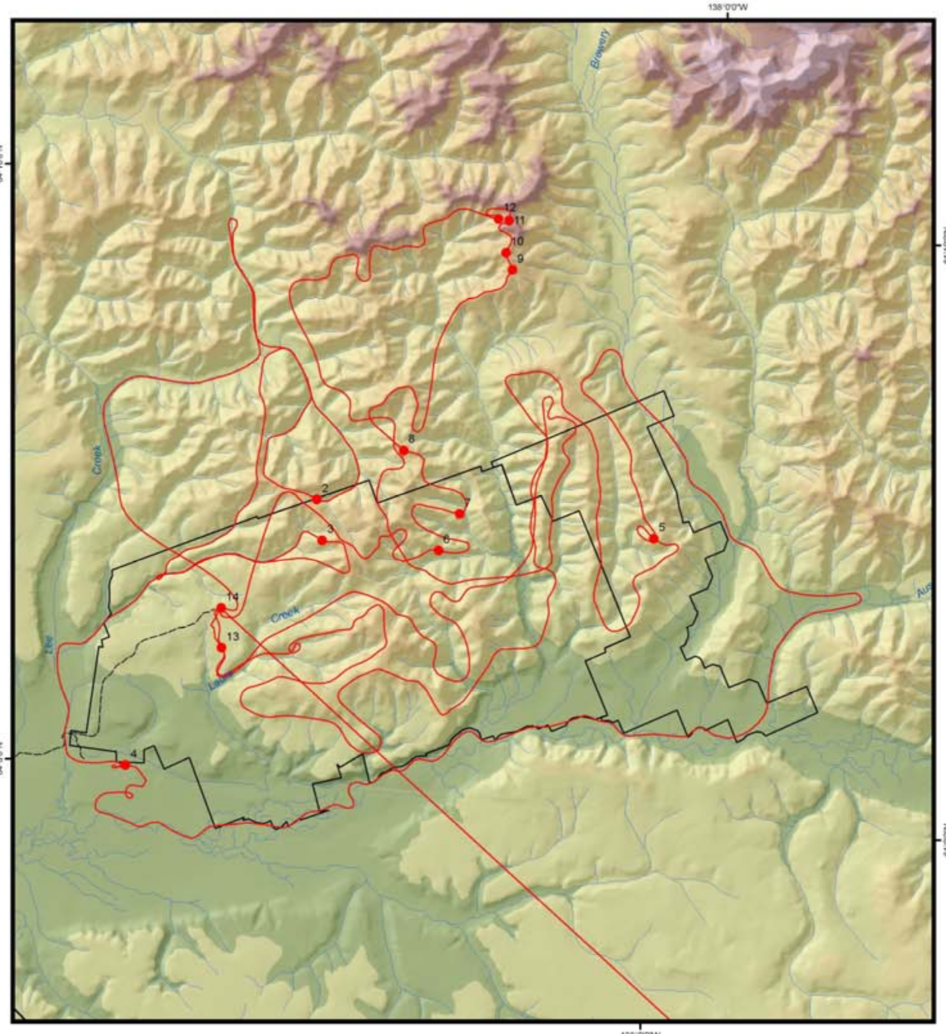
GRIZZLY BEAR				
GMA	Year	Non-Res	Res	Total
229	2010		1	1
	2005	1		1
	2004		1	1
229 Total		1	2	3
Grand Total		1	2	3

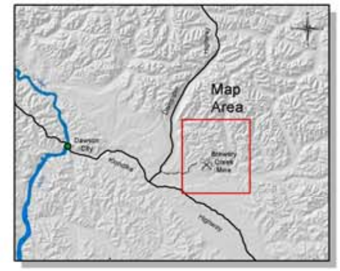
CARIBOU				
GMA	Year	Non-Res	Res	Total
229	2011	1	5	6
	2010	2		2
	2009	1	1	2
	2007		1	1
	2006		3	3
	2005	2	23	25
	2004		1	1
	2003	1	4	5
	2002		1	1
	2001		3	3
	2000		8	8
	1999		1	1
	1998		6	6
	1997	2	2	4
	1996		3	3
	1995		1	1
229 Total		9	63	72
250	2003		2	2
250 Total		0	2	2
Grand Total		9	65	74

MOOSE				
GMA	Year	NR	Res	Total
229	2011		2	2
	2010		1	1
	2009	2		2
	2008		3	3
	2007	1	1	2
	2006	2	2	4
	2005	3	4	7
	2004	1	1	2
	2003	1	3	4
	2002		2	2
229 Total		10	19	29
250	2011		1	1
	2009		1	1
	2008	1		1
	2006		2	2
	2005		1	1
	2003	1		1
250 Total		2	5	7
251	2011		3	3
	2010		2	2
	2009		1	1
	2007		1	1
	2006	1	1	2
	2005		1	1
	2004	1	1	2
	2003		1	1
	2002	2	5	7
251 Total		4	16	20
Grand Total		16	40	56

SHEEP				
GMA	Year	Non-Res	Res	Total
229	2006		1	1
	2003		1	1
	2002		1	1
229 Total			3	3
250	2009	1		1
250 Total		1		1
Grand Total		1	3	4

ident	lat	long	altitude
2	64.080578	-138.235864	1097
3	64.069228	-138.229883	1097
4	64.001272	-138.342181	573
5	64.077907	-138.018315	1029
6	64.069292	-138.15508	944
7	64.080097	-138.143653	974
8	64.096519	-138.183132	1163
9	64.14978	-138.123964	1259
10	64.154463	-138.128971	1305
11	64.163502	-138.128905	1338
12	64.163743	-138.135718	1238
13	64.03662	-138.287938	764
14	64.047733	-138.290531	928





Legend

- Wildlife Viewing
- Helecopter Track
- Quarz Claims
- Unpaved Road
- Limited Use Road
- Watercourse

Elevation
Feet

- 0 - 400
- 400 - 650
- 650 - 850
- 850 - 1,050
- 1,050 - 1,250
- 1,250 - 1,300
- 1,300 - 1,300
- 1,300 - 1,500
- 1,500 - 3,300
- 3,300 - 5,920

1:125,000

0 1.25 2.5 5 7.5 10
Kilometers

Laberge Environmental Services

BREWERY CREEK PROJECT

FALL 2012 WILDLIFE SURVEY

Map 3

Laberge
ENVIRONMENTAL SERVICES

Drawing prepared by K. Pelletier,
Ibex Consulting
March 2012
Wildlife Survey Data:
LES (UTM Zone 7N, WGS 84)
Baseline data:
http://geogratis.cgdi.gc.cageogratis

WAYPOINT DESCRIPTIONS FOR MAP #3

TABLE 3-9	MOOSE AND TRACK OBSERVATIONS	
Waypoint #	Specifics	General location
2	2 adult females	Upper Pacific Creek
3	Old tracking	
5	5 females & 3 males	Post rut group in Golden Creek
6	Old tracking	
8	Old tracking	
10	1 male	Upper Golden Creek
12	1 female and 1 calf	Upper Golden Creek

TABLE 3-10	INCIDENTAL WILDLIFE OBSERVATIONS
Waypoint #	Comment
4	Recent tracking of about 6 wolves
7	Old tracks of a single wolf
9	Recent wolf trail on ridge line
13	Numerous tracks of about 6 wolves on road below camp
11	Flock of 30 or so Ptarmigan

PHOTOGRAPHS, WILDLIFE SECTION CHAPTER THREE

Photo #1; Caribou trapped on frozen pond at Brewery Creek, November 2005. (Photo credit; M. Kienzler)

Photo #2; Caribou able to leave pond after application of fencing and hay, November 2005. (Photo credit; M. Kienzler)

Photo #3; Wolf at moose kill site at Waypoint #26, Map 1, on March 13th, 2012. (Photo credit; B. Burns)

Photo #4; One moose on Canadian Knoll near the Blue Zone, Waypoint #39 on Map 1, March 13th, 2012. (Photo credit; B. Burns)

Photo #5; Female moose at pond edge, June 5th, 2012, Waypoint #2, Map 2. (Photo credit; M. Hackman)

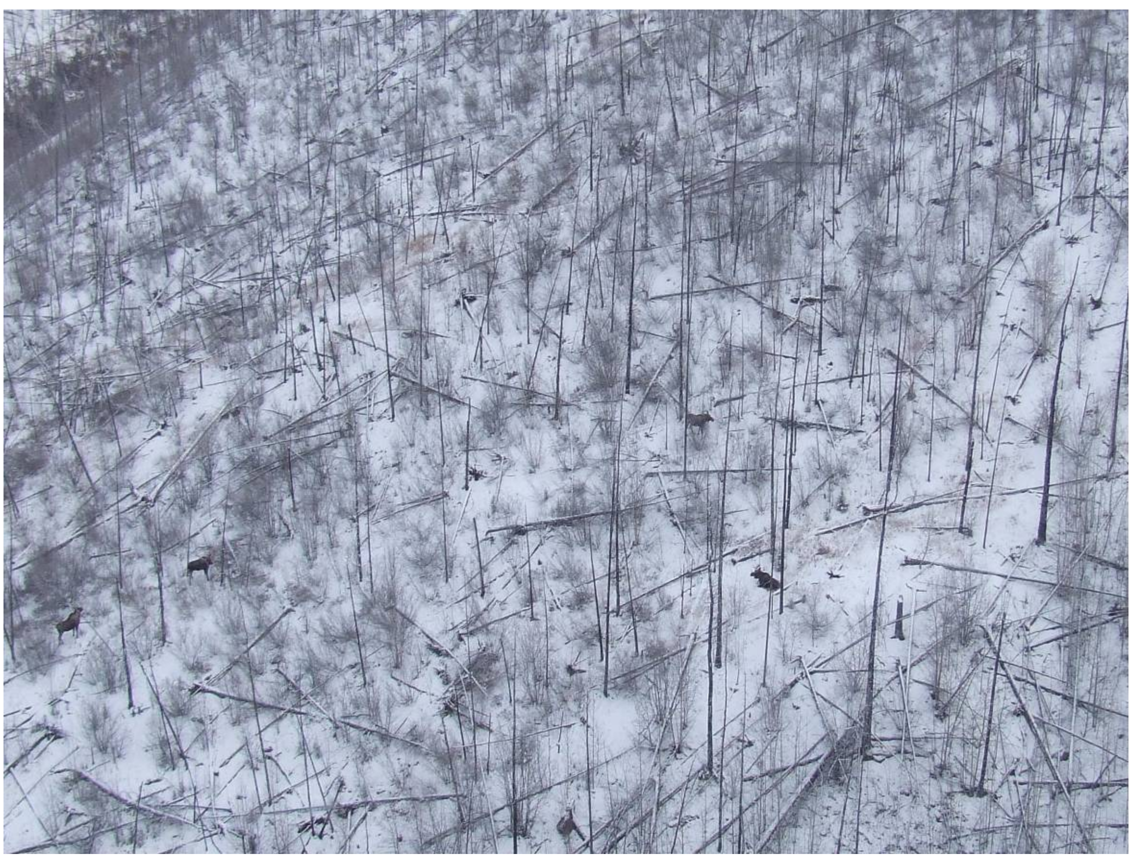


Photo #6; Part of the post-rut moose group at Waypoint 5, Map 3, on October 30th, 2012. A bull moose is bedded down, three females are standing. (Photo credit; B. Burns)

APPENDIX B

VEGETATION ASSESSMENTS

Appendix B

Vascular Plant Species Observed in Targeted Ore Zones

LOWER FOSTERS

Previously Cleared Area
Agrostis scabra
Alnus crispa
Arctagrostis latifolia
Artemisia tilesii
Betula neoalaskana
Calamagrostis canadensis
Crepis tectorum
Epilobium angustifolium
Equisetum sylvaticum
Erigeron acris
Festuca rubra
Lupinus arcticus
Mertensia paniculata
Picea glauca
Polemonium acutiflorum
Polygonum alaskanum
Populus balsamifera
Populus tremuloides
Ribes hudsonianum
Rubus idaeus
Salix bebbiana
Salix glauca
Salix scouleriana
Taraxacum officinale
Trifolium hybridum

Upper South-facing Slope - White Spruce Community
Alnus crispa
Anemone richardsonii
Arctagrostis latifolia
Betula neoalaskana
Cornus canadensis
Empetrum nigrum
Epilobium angustifolium
Equisetum sylvaticum
Equisetum variegatum
Geocaulon lividum
Ledum groenlandicum
Linnaea borealis
Mertensia paniculata
Orthilea secunda
Picea glauca
Picea mariana
Populus tremuloides
Pyrola asarifolia
Ribes lacustre

Rosa acicularis
Rubus arcticus
Rubus idaeus
Salix bebbiana
Spiraea beauverdiana
Stellaria sp.
Vaccinium uliginosum
Vaccinium vitus-idaea

Lower South-facing Slope - Black Spruce/Birch Community
Alnus crispa
Alnus incana
Anemone richardsonii
Arctagrostis latifolia
Arctostaphylos rubra
Betula neoalaskana
Empetrum nigrum
Equisetum sylvaticum
Ledum groenlandicum
Lycopodium annotinum
Mertensia paniculata
Monenses uniflora
Petasites sagittatus
Picea glauca
Picea mariana
Polygonum alaskanum
Populus balsamifera
Rosa acicularis
Rubus chamaemorus
Salix glauca
Salix scouleriana
Vaccinium uliginosum
Vaccinium vitus-idaea

Laura Creek Valley Bottom - Willow Community
Alnus incana
Anemone richardsonii
Arctagrostis latifolia
Calamagrostis canadensis
Equisetum sylvaticum
Polemonium acutiflorum
Rubus arcticus
Rubus idaeus
Salix bebbiana
Salix pulchra
Salix scouleriana
Saxifraga radiata
Viola episila

CLASSIC
Burned Upper Area - Black Spruce/Aspen Community
Arctagrostis latifolia
Betula glandulosa
Betula neoalaskana

Cornus canadensis
Epilobium angustifolium
Equisetum arvense
Geocaulon lividum
Ledum groenlandicum
Linnaea borealis
Lupinus arcticus
Lycopodium complanatum
Pedicularis labradorica
Picea mariana
Polemonium acutiflorum
Populus tremuloides
Rosa acicularis
Rubus idaeus
Salix bebbiana
Salix scouleriana
Vaccinium uliginosum
Vaccinium vitus-idaea

Unburned South-facing Slope - Black Spruce/Birch Community
Arctagrostis latifolia
Arctostaphylos uva-ursi
Betula glandulosa
Betula neoalaskana
Cornus canadensis
Empetrum nigrum
Epilobium angustifolium
Equisetum sylvaticum
Festuca altaica
Gentianella propinqua
Geocaulon lividum
Ledum groenlandicum
Linnaea borealis
Lupinus arcticus
Lycopodium complanatum
Lycopodium annotinum
Mertensia paniculata
Pedicularis labradorica
Picea glauca
Picea mariana
Populus tremuloides
Rosa acicularis
Rubus chamaemorus
Salix glauca
Salix scouleriana
Senecio lugens
Spiraea beauverdiana
Vaccinium vitus-idaea
Zygadenus elegans

Unburned North-facing Slope - Black Spruce Community
Betula glandulosa
Empetrum nigrum
Equisetum sylvaticum

Geocaulon lividum
Ledum groenlandicum
Picea glauca
Picea mariana
Rubus chamaemorus
Spiraea beauverdiana
Vaccinium uliginosum
Vaccinium vitus-idaea

North Slope

North-facing Slope - Black Spruce Community
Alnus crispa
Arctagrostis latifolia
Betula glandulosa
Betula neoalaskana
Cornus canadensis
Empetrum nigrum
Ledum decumbens
Ledum groenlandicum
Picea mariana
Polygonum alaskanum
Rosa acicularis
Salix pseudomyrsinites
Spiraea beauverdiana
Vaccinium uliginosum
Vaccinium vitus-idaea

South-facing Slope - White Spruce Community
Achillea millefolium
Aconitum delphinifolium
Alnus crispa
Antennaria sp.
Betula neoalaskana
Cornus canadensis
Deschampsia caespitosa
Empetrum nigrum
Epilobium angustifolium
Festuca altaica
Gentianella propinqua
Juniperus communis
Ledum groenlandicum
Linnaea borealis
Lupinus arcticus
Lycopodium complanatum
Mertensia paniculata
Moehringia lateriflora
Pedicularis labradorica
Pedicularis langsdorfii
Pedicularis sudetica
Picea glauca
Populus tremuloides
Salix bebbiana

Salix pseudomyrsinites
Salix scouleriana
Saxifraga tricuspidata
Shepherdia canadensis
Solidago simplex
Vaccinium uliginosum
Vaccinium vitus-idaea
Viburnum edule

Bohemian

Subalpine Area - Dwarf Birch Community
Abies lasiocarpa
Betula glandulosa
Empetrum nigrum
Epilobium angustifolium
Ledum decumbens
Lycopodium complanatum
Picea glauca
Vaccinium vitus-idaea

North-facing Slope- Black Spruce Community
Alnus crispa
Arctagrostis latifolia
Betula glandulosa
Betula neoalaskana
Boschniakia rossica
Calamagrostis canadensis
Carex sp.
Cornus canadensis
Corydalis sempervirens
Epilobium angustifolium
Equisetum arvense
Eriophorum vaginatum
Geocaulon lividum
Ledum decumbens
Lycopodium alpinum
Mertensia paniculata
Oxycoccus mirocarpus
Petastes sagittatus
Picea mariana
Polygonum alaskanum
Populus balsamifera
Rosa acicularis
Rubus arcticus
Rubus chamaemorus
Rubus idaeus
Salix alaxensis
Salix bebbiana
Salix scouleriana
Spiraea beauverdiana
Vaccinium uliginosum
Vaccinium uliginosum
Viburnum edule

Lucky Creek Valley Bottom - Willow Community
Alnus crispa
Alnus incana
Anemone richardsonii
Arctagrostis latifolia
Betula glandulosa
Calamagrostis canadensis
Epilobium angustifolium
Equisetum arvense
Equisetum scirpoides
Hedysarum alpinum
Juncus castaneus
Ledum decumbens
Ledum groenlandicum
Parnassia palustris
Pedicularis labradorica
Petastes sagittatus
Picea glauca
Picea mariana
Populus balsamifera
Potentilla palustris
Ribes lacustre
Salix pulchra
Scirpus sp.
Spiraea beauverdiana
Vaccinium uliginosum

Steep South-facing Slope - White Spruce Community
Achillea millefolium
Arctostaphylos uva-ursi
Calamagrostis purpurascens
Conioselinum cnidiifolium
Epilobium angustifolium
Festuca altaica
Galium boreale
Juniper communis
Linnaea borealis
Lupinus arcticus
Picea glauca
Picea mariana
Betula neoalaskana
Poa sp.
Populus tremuloides
Rosa acicularis
Saxifraga tricuspidata
Shepherdia canadensis
Solidago simplex
Vaccinium vitus-idaea
Viburnum edule

Low South-facing Slopes - Black Spruce/Birch Community
Alnus crispa
Alnus incana
Arctostaphylos uva-ursi

Betula neoalaskana
Calamagrostis canadensis
Cornus canadensis
Empetrum nigrum
Epilobium angustifolium
Erigeron acris
Geocaulon lividum
Ledum groenlandicum
Lupinus arcticus
Lycopodium alpinum
Picea glauca
Picea mariana
Polygonum alaskanum
Polygonum alaskanum
Populus tremuloides
Ribes glandulosum
Rosa acicularis
Rubus idaeus
Salix glauca
Salix scouleriana
Solidago simplex
Vaccinium uliginosum
Vaccinium vitus-idaea

Schooner

North-facing Slope - Black Spruce Community

Alnus crispa
Andromeda polefolia
Arctagrostis latifolia
Betula glandulosa
Boschniakia rossica
Empetrum nigrum
Epilobium angustifolium
Epilobium latifolium
Equisetum scirpoides
Erigeron acris
Geocaulon lividum
Ledum groenlandicum
Ledum decumbens
Lycopodium annotinum
Oxycoccus mirocarpus
Petasites sagittatus
Picea mariana
Polygonum alaskanum
Ribes triste
Rubus chamaemorus
Salix alaxensis
Salix bebbiana
Salix glauca
Stellaria longipes
Taraxacum officinale
Vaccinium uliginosum
Vaccinium vitus-idaea

South-facing Slope - White Spruce Community

Agrostis scabra
Arctagrostis latifolia
Betula glandulosa
Betula neoalaskana
Cornus canadensis
Corydalis sempervirens
Crepis tectorum
Empetrum nigrum
Epilobium angustifolium
Geocaulon lividum
Hordeum jubatum
Ledum decumbens
Ledum groenlandicum
Linnaea borealis
Lupinus arcticus
Lycopodium clavatum
Pedicularis labradorica
Picea glauca
Picea mariana
Populus tremuloides
Ribes hudsonianum
Rosa acicularis
Rubus chamaemorus
Spiraea beauverdiana
Trifolium hybridum
Vaccinium vitus-idaea

Sleemans

Burned Upper Section of North-facing Slope - Black Spruce Community

Betula glandulosa
Betula neoalaskana
Dryopteris fragrans
Epilobium angustifolium
Gentianella propinqua
Gymnocarpium jessoense
Ledum groenlandicum
Linnaea borealis
Luzula parviflora
Mertensia paniculata
Petasites sagittatus
Picea mariana
Polygonum alaskanum
Populus tremuloides
Ribes triste
Rosa acicularis
Salix glauca
Salix pulchra
Salix scouleriana
Saxifraga tricuspidata
Vaccinium vitus-idaea
Woodsia alpina

Unburned Lower Section of North-facing Slope - Black Spruce Community

Arctagrostis latifolia
Empetrum nigrum
Equisetum scirpoides
Ledum decumbens
Lycopodium annotinum
Oxycoccus mirocarpus
Pedicularis labradorica
Picea mariana
Ribes triste
Rubus chamaemorus
Salix barrattiana
Salix bebbiana
Spiraea beauverdiana

Southeast-facing Slope - White Spruce Community
Aconitum delphinifolium
Alnus crispa
Arctagrostis latifolia
Arctostaphylos uva-ursi
Betula glandulosa
Betula neoalaskana
Calamagrostis lapponica
Calamagrostis purpurascens
Conioselinum cnidiifolium
Cornus canadensis
Crepis elegans
Epilobium angustifolium
Equisetum sylvaticum
Erigeron acris
Eriophorom brachyantherum
Festuca altaica
Gentianella propinqua
Geocaulon lividum
Ledum groenlandicum
Linnaea borealis
Lupinus arcticus
Luzula parviflora
Lycopodium annotinum
Mertensia paniculata
Moehringia lateriflora
Oxycoccus mirocarpus
Pedicularis labradorica
Picea glauca
Picea mariana
Poa arctica
Polygonum alaskanum
Populus tremuloides
Rosa acicularis
Rubus chamaemorus
Rubus idaeus
Salix bebbiana
Salix glauca

Salix scouleriana
Senecio lugens
Senecio pauperculus
Shepherdia canadensis
Solidago simplex
Spiraea beauverdiana
Trisetum spicatum
Vaccinium vitus-idaea
Viburnum edule

Big Rock

Southerly-facing Slopes - White Spruce Community
Achillea millefolium
Arctostaphylos uva-ursi
Calamagrostis purpurascens
Conioselinum cnidiifolium
Epilobium angustifolium
Festuca altaica
Galium boreale
Juniper communis
Linnaea borealis
Lupinus arcticus
Picea glauca
Picea mariana
Betula neoalaskana
Poa sp.
Populus tremuloides
Rosa acicularis
Salix scouleriana
Saxifraga tricuspidata
Shepherdia canadensis
Solidago simplex
Vaccinium vitus-idaea
Viburnum edule

Northerly-facing Slopes - Black Spruce Community
Alnus crispa
Arctagrostis latifolia
Betula glandulosa
Betula neoalaskana
Boschniakia rossica
Calamagrostis canadensis
Carex sp.
Cornus canadensis
Corydalis sempervirens
Epilobium angustifolium
Equisetum arvense
Eriophorum vaginatum
Geocaulon lividum
Ledum decumbens
Ledum groenlandicum
Lupinus arcticus
Lycopodium alpinum

Mertensia paniculata
Oxycoccus mirocarpus
Petasites sagittatus
Picea mariana
Polygonum alaskanum
Rosa acicularis
Rubus arcticus
Rubus chamaemorus
Rubus idaeus
Salix sp.
Spiraea beauverdiana
Vaccinium uliginosum
Vaccinium vitus-idaea
Viburnum edule

Upland Near-level Areas- Black Spruce/Aspen Community
Achillea millefolium
Betula glandulosa
Betula neoalaskana
Calamagrostis canadensis
Corydalis sempervirens
Empetrum nigrum
Epilobium angustifolium
Equisetum arvense
Geocaulon lividum
Ledum decumbens
Ledum groenlandicum
Lupinus arcticus
Lycopodium complanatum
Pedicularis labradorica
Picea mariana
Polygonum alaskanum
Populus tremuloides
Rosa acicularis
Rubus idaeus
Salix scouleriana
Solidago simplex
Vaccinium vitus-idaea

Low South-facing Slopes - Black Spruce/Birch Community
Alnus crispa
Alnus incana
Arctostaphylos uva-ursi
Betula neoalaskana
Calamagrostis canadensis
Cornus canadensis
Empetrum nigrum
Epilobium angustifolium
Erigeron acris
Geocaulon lividum
Ledum groenlandicum
Lupinus arcticus
Lycopodium alpinum
Picea glauca

Picea mariana
Polygonum alaskanum
Polygonum alaskanum
Populus tremuloides
Ribes glandulosum
Rosa acicularis
Rubus idaeus
Salix glauca
Salix scouleriana
Solidago simplex
Vaccinium uliginosum
Vaccinium vitus-idaea

Pacific Creek Valley Bottom - Willow Community
Alnus crispa
Alnus incana
Anemone richardsonii
Arctagrostis latifolia
Betula glandulosa
Calamagrostis canadensis
Epilobium angustifolium
Equisetum arvense
Equisetum scirpoides
Hedysarum alpinum
Juncus castaneus
Ledum decumbens
Ledum groenlandicum
Parnassia palustris
Pedicularis labradorica
Petastes sagittatus
Picea glauca
Picea mariana
Populus balsamifera
Potentilla palustris
Ribes lacustre
Salix pulchra
Scirpus sp.
Spiraea beauverdiana
Vaccinium uliginosum

APPENDIX B

Nonvascular Plant Species Observed

Mosses
Bryum sp.
Plagiomnium sp.
Pleurozium schreberi
Polytrichum sp.
Sphagnum spp.
Splachnum luteum

Liverworts
Pellia neesiana

Lichens
Cetraria nivalis
Cladina mitis
Cladina rangiferina
Cladina stellaris
Cladonia sp.
Nephroma arcticum
Peltigera aphthosa
Stereocaulon sp.
Thamnolia sp.
Xanthoria sp.

APPENDIX B – PHOTOGRAPHS, JULY 2012

Lower Fosters Ore Zone - Previously Reclaimed Area

Lower Fosters Ore Zone - Previously Cleared Area

Lower Fosters Ore Zone - Upper South-facing Slope

Lower Fosters Ore Zone – Lower south-facing slope.

Lower Fosters Ore Zone – Laura Creek

Classic Ore Zone – Burned Upper Area

Classic Ore Zone – Unburned South Facing Slope

North Slope Ore Zone – South Facing Area

North Slope Ore Zone – North Facing Slope

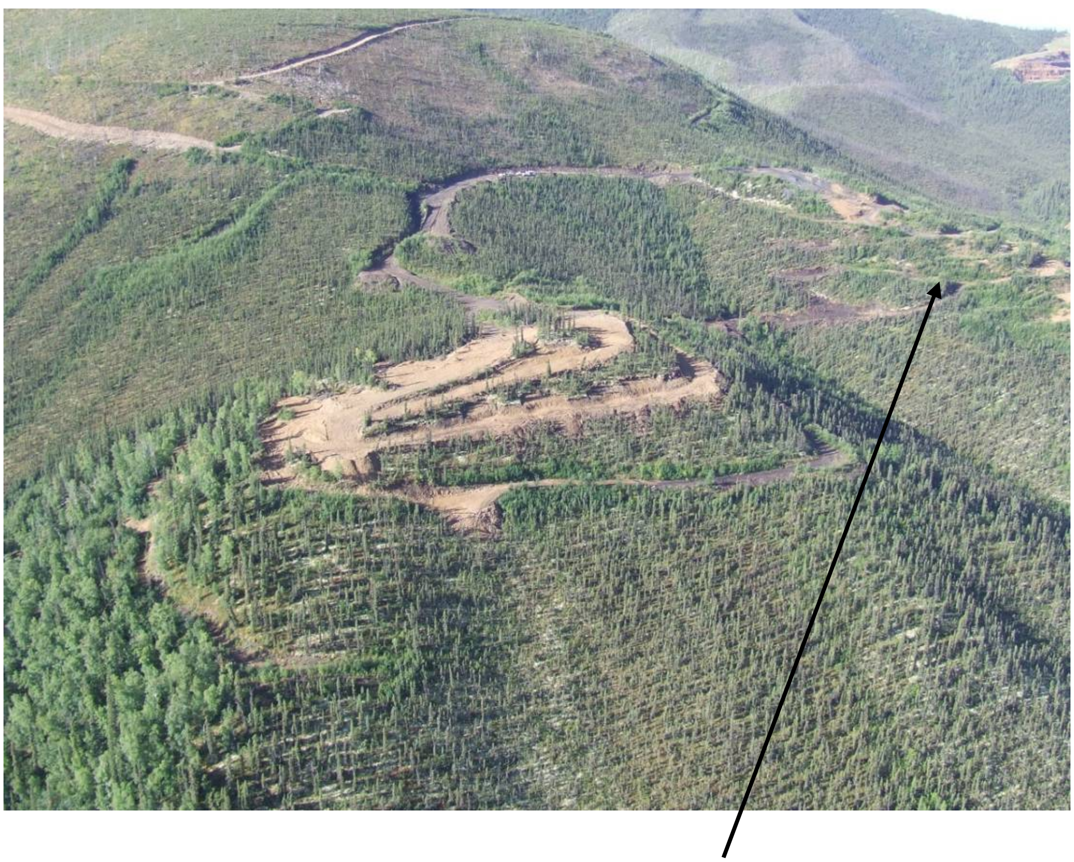
Bohemian Ore Zone – Subalpine and north facing areas

Bohemian Ore Zone – Willows are colonizing the access road

Schooner Ore Zone – North facing slope

Schooner Ore Zone – South facing slope

Schooner Ore Zone – South facing slope



Schooner Ore Zone and Bohemian Ore Zone in background

Sleemans Ore Zone – Burned north facing slope

Sleemans Ore Zone – Unburned north facing slope

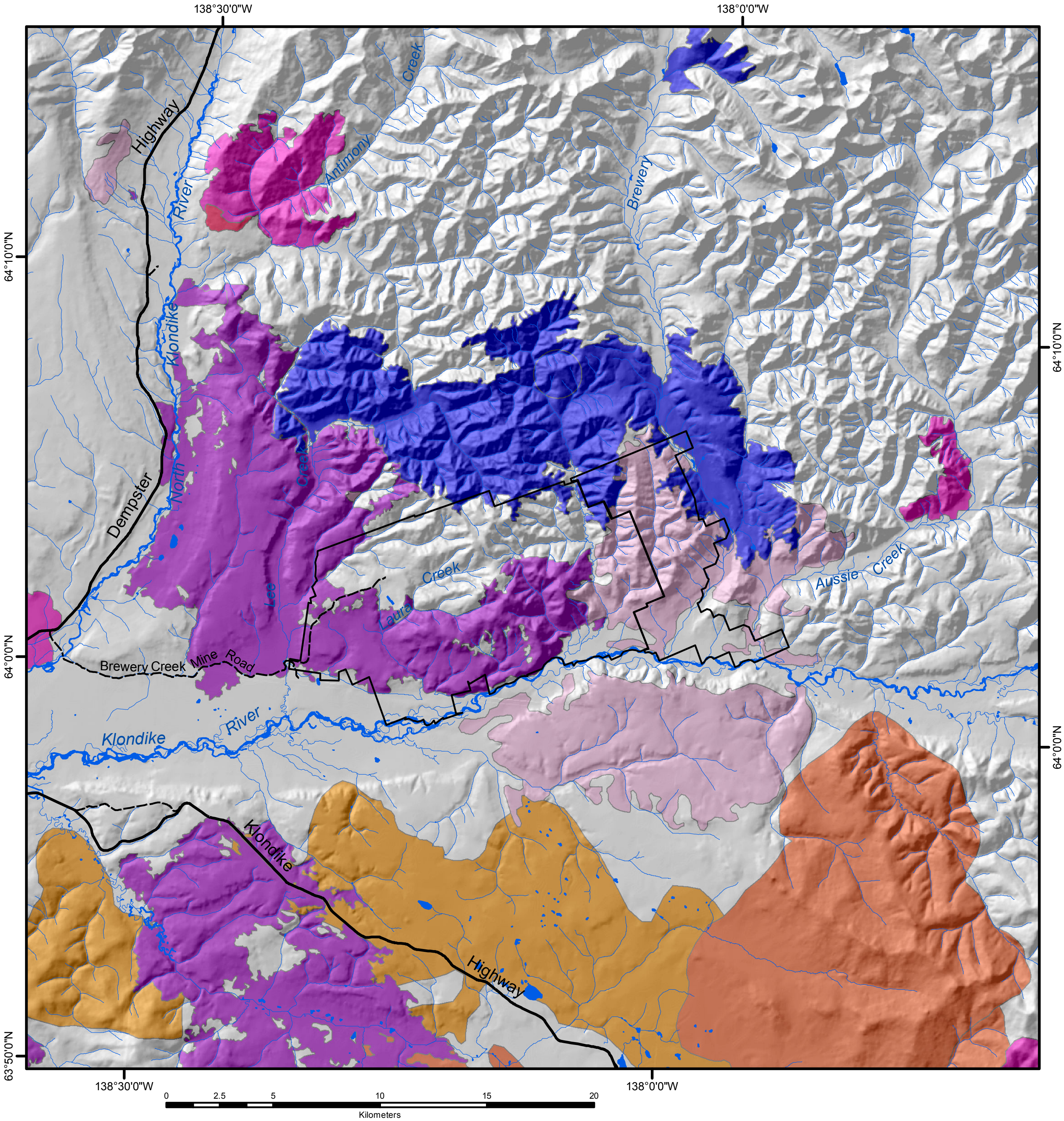
Sleemans Ore Zone – North facing scree, several pockets of ferns

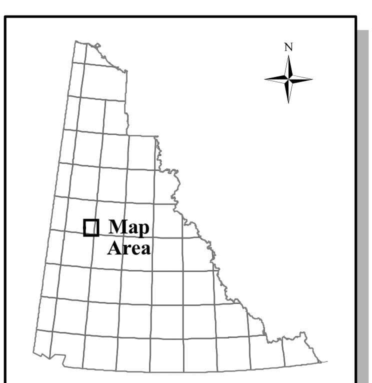
Sleemans Ore Zone – Regenerating south facing slope

Big Rock Zone – Black Spruce – Aspen community

Big Rock Zone – North facing Black Spruce slope

Big Rock Zone – Black Spruce / Birch vegetation





Legend

Yukon Fire History

Year

- 1946 - 1950
- 1951 - 1960
- 1961 - 1970
- 1971 - 1980
- 1981 - 1990
- 1991 - 2000
- 2001 - 2005
- 2006 - 2010

- Quartz Claims
- Highway
- Limited Use Road

Laberge Environmental Services

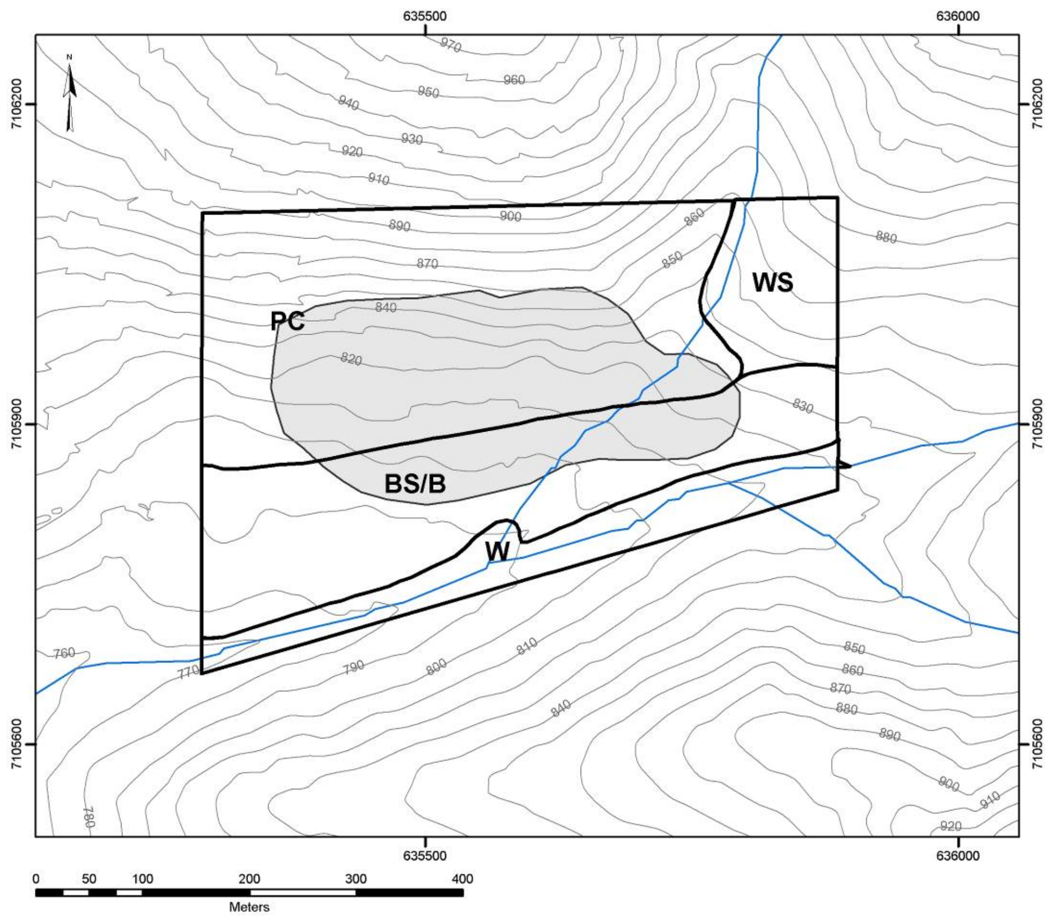
BREWERY CREEK PROJECT

FIRE HISTORY MAP

Laberge ENVIRONMENTAL SERVICES

Map 2

Drawing prepared by K. Pelletier, Ibex Consulting
March 2012
Fire Data: Wildland Fire Management, YG
Baseline data:http:/geogratis.cgdi.gc.cageogratis



Legend

Lower Fosters Area

Vegetation Type

WS White Spruce
BS/B Black Spruce/Birch
W Willow
PC Previously Cleared

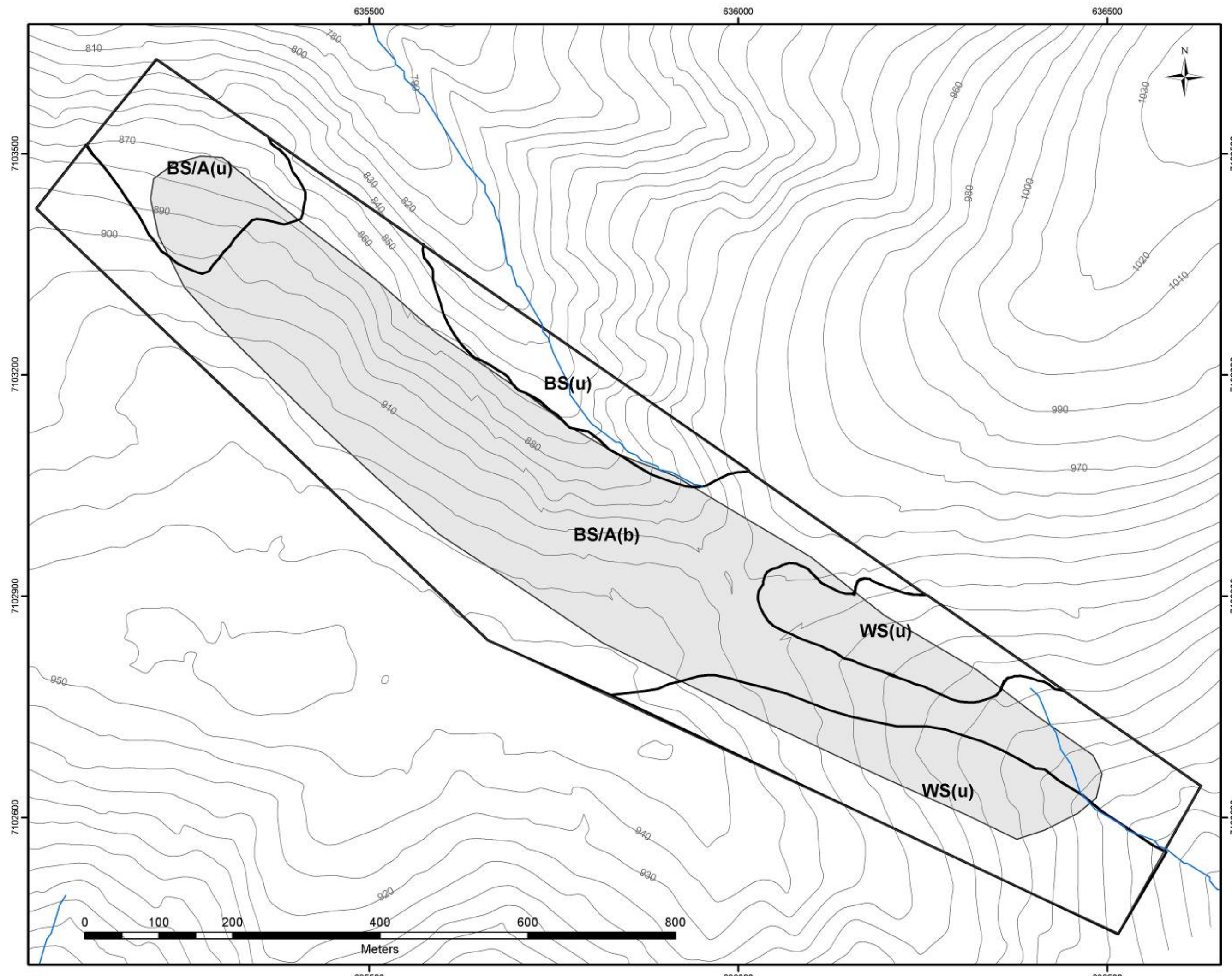
Brewery Creek Mine
Yukon

Figure 1
Vegetation Map
Lower Fosters Area

1:5,000

Laberge Environmental Services
PREDATOR GROUP

Drawing Prepared by K.Pelletier,
Ibex Consulting, November, 2012



Legend

Classic Area

Vegetation Type

WS White Spruce
BS Black Spruce
BS/A Black Spruce/Aspen
(b) burned
(u) unburned

Brewery Creek Mine
Yukon

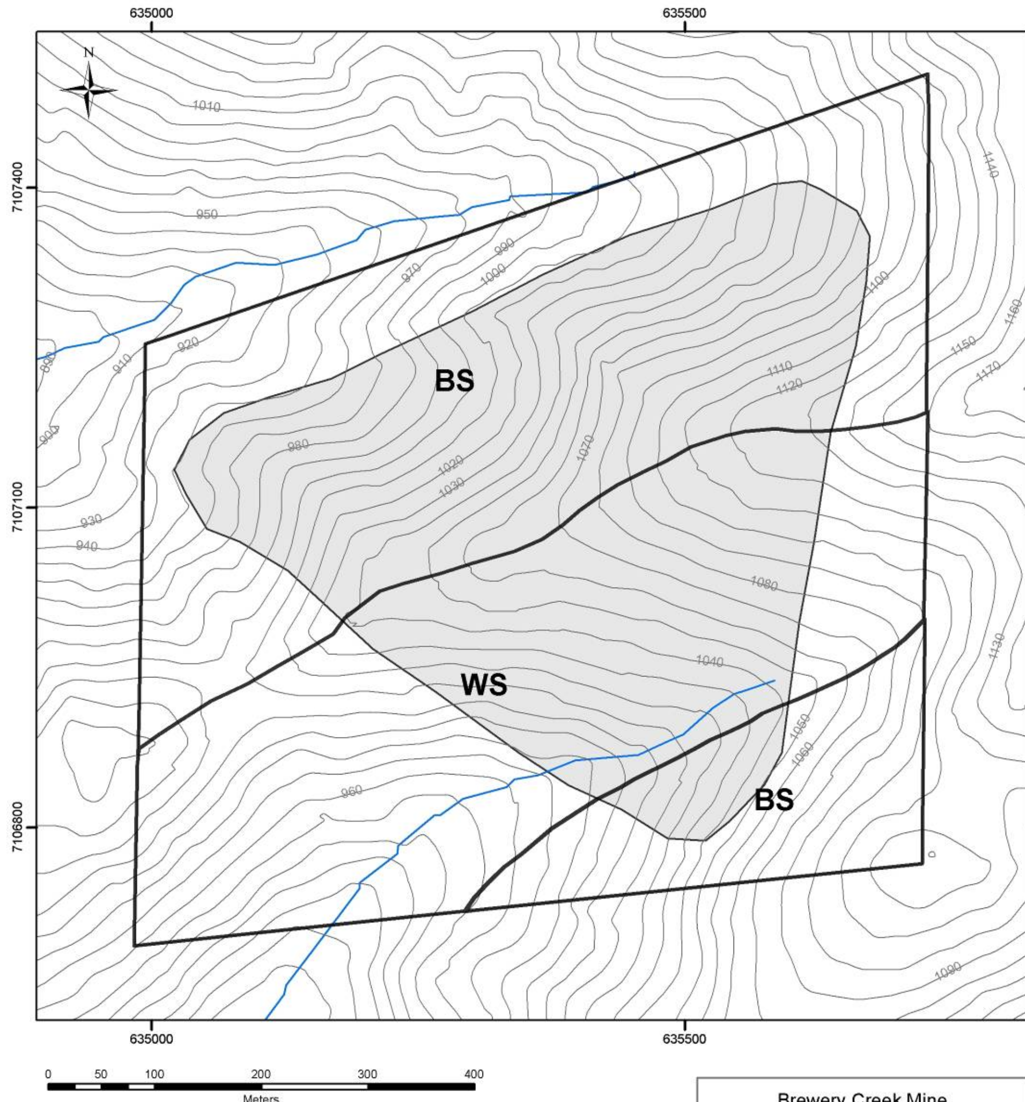
Figure 2
Vegetation Map
Classic Area

1:5,000

Laberge Environmental Services

Predator Group

Drawing Prepared by K.Pelletier,
Ibex Consulting, November, 2012



Legend

North Slope Area

Vegetation Type

WS White Spruce
BS Black Spruce

Brewery Creek Mine
Yukon

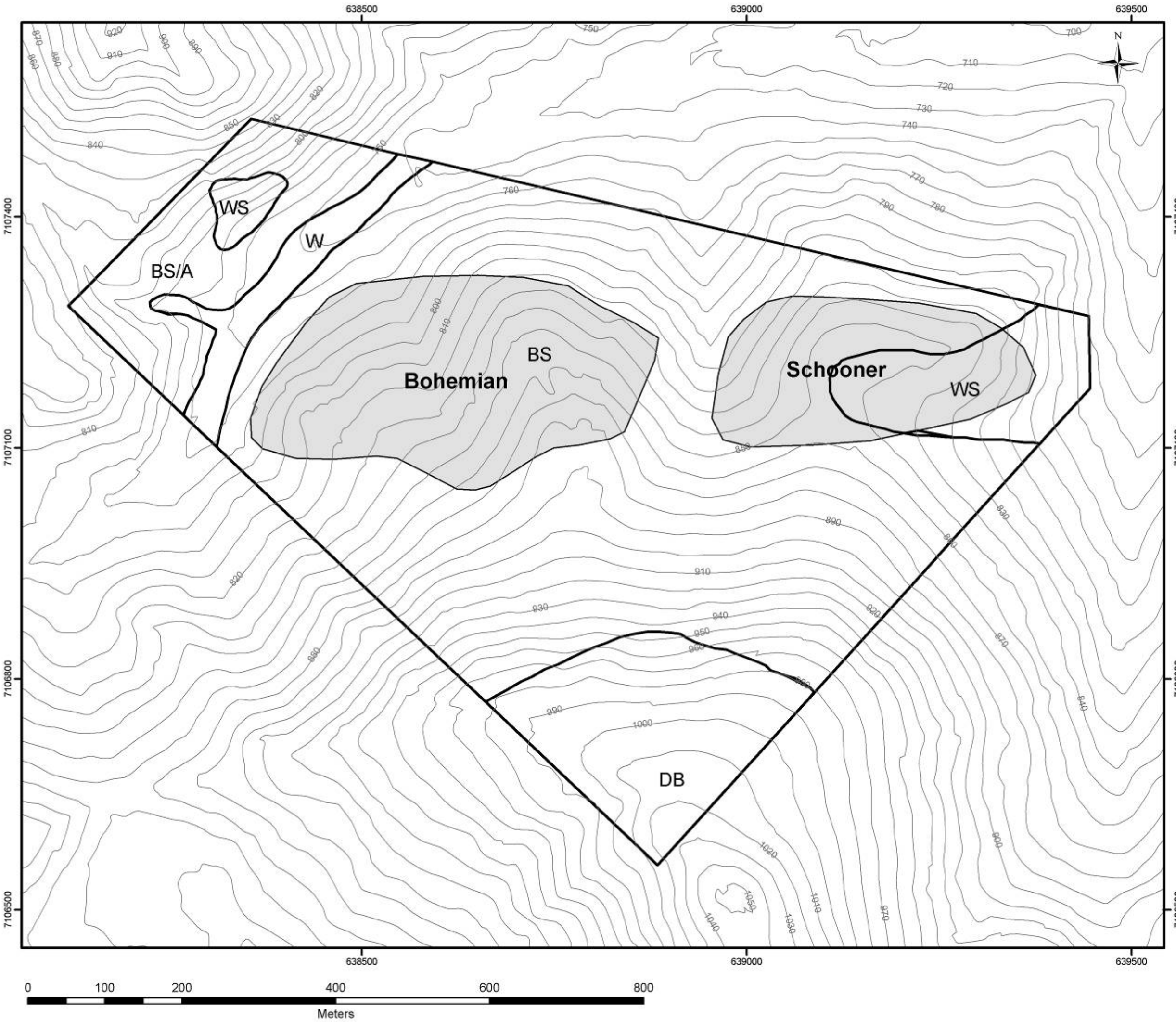
Figure 3
Vegetation Map
North Slope Area

1:5,000

Laberge ENVIRONMENTAL SERVICES

PREDATOR GROUP

Drawing Prepared by K.Pelletier,
Ibex Consulting, November, 2012



Legend

Resource Areas

Vegetation Type

WS White Spruce
BS Black Spruce
BS/A Black Spruce/Aspen
DB Dwarf Birch
W Willow

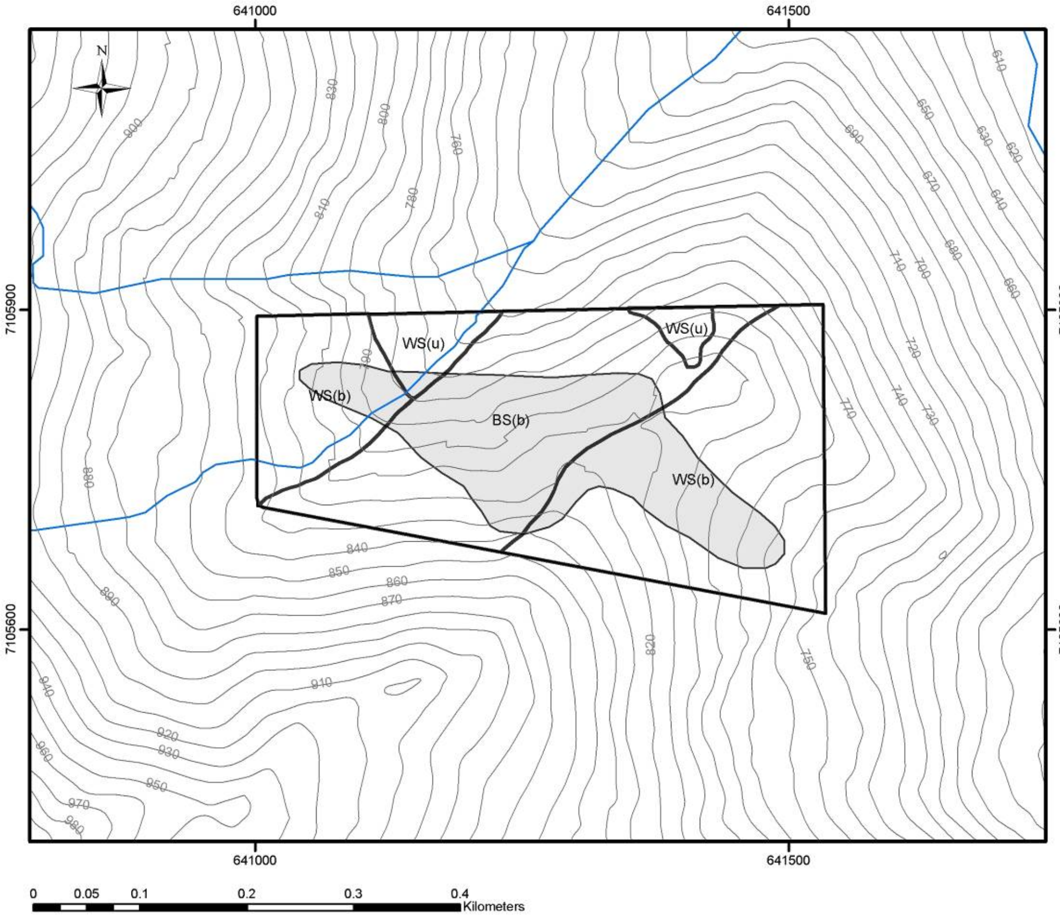
Brewery Creek Mine
Yukon

Figure 4
Vegetation Map
Bohemian & Schooner Areas

1:5,000

Laberge Environmental Services
Predator Group

Drawing Prepared by K.Pelletier,
Ibex Consulting, November, 2012



Legend

Sleeman Area

Vegetation Type

WS	White Spruce
BS	Black Spruce
(b)	burned
(u)	unburned

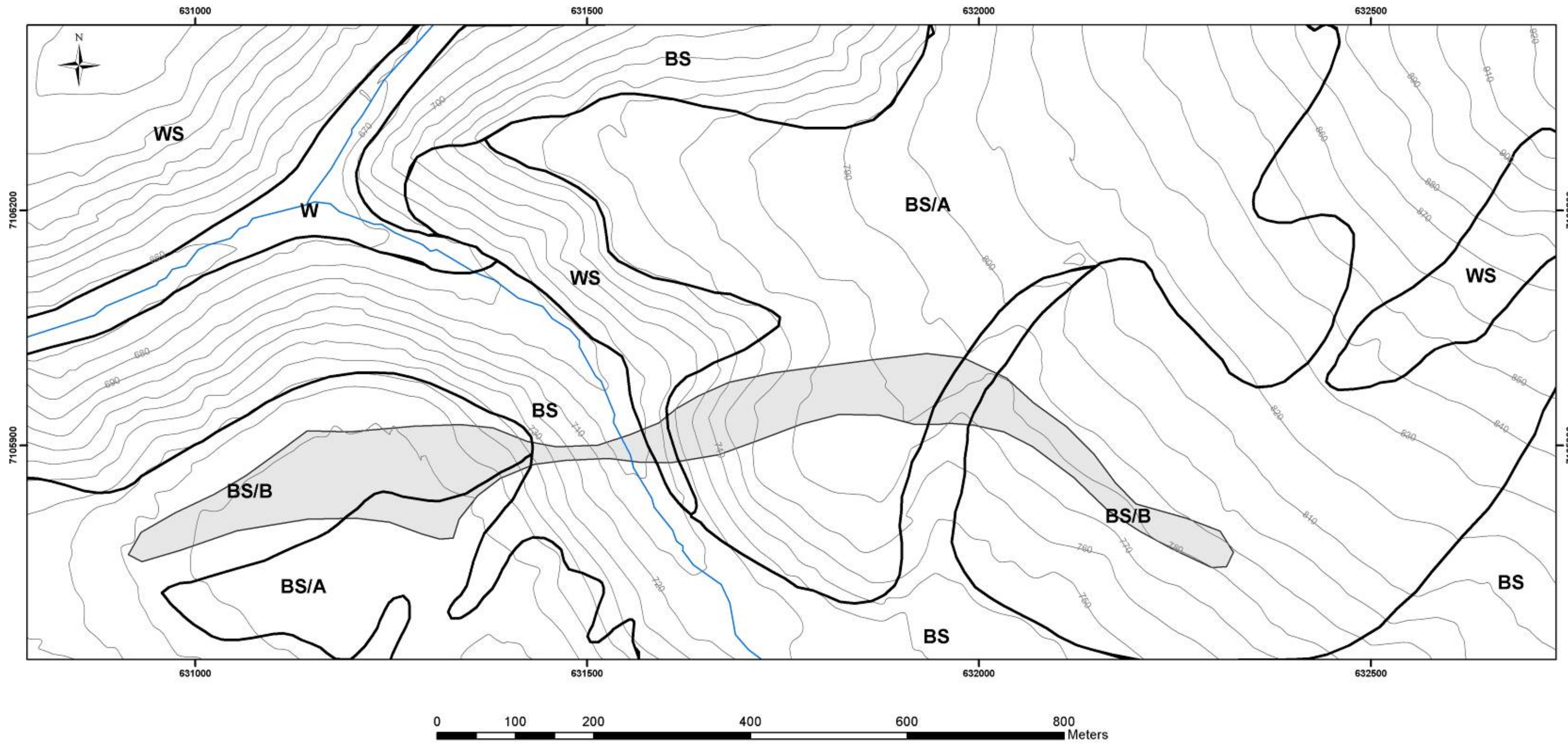
Brewery Creek Mine
Yukon

Figure 5
Vegetation Map
Sleemans Area

1:5,000

Laberge Environmental Services
Predator Group

Drawing Prepared by K.Pelletier,
Ibex Consulting, November, 2012



Legend

Big Rock Area

Vegetation Type

BS Black Spruce
BS/A Black Spruce/Aspen
BS/B Black Spruce/Birch
WS White Spruce
W Willow

Brewery Creek Mine
Yukon

Figure 6
Vegetation Map
Big Rock Area

1:5,000

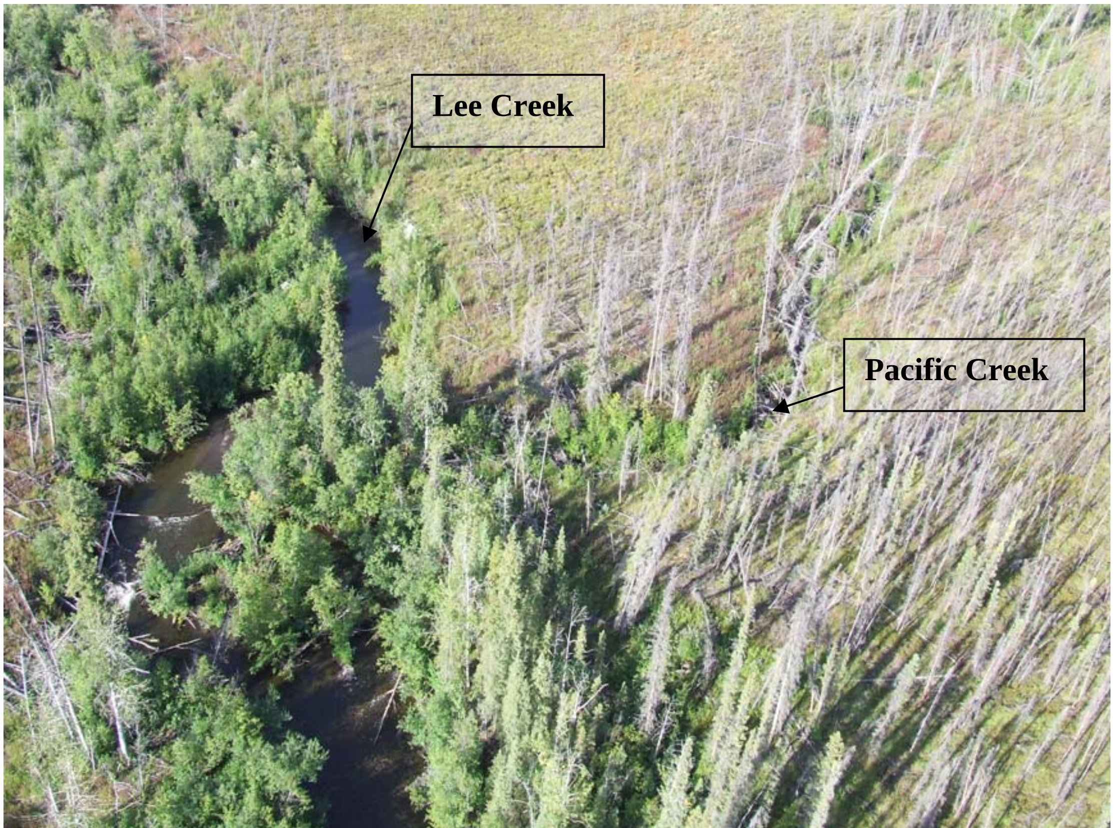
Laberge Environmental Services
PREDATOR GROUP

Drawing Prepared by K.Pelletier,
Ibex Consulting, November, 2012

APPENDIX C

SURFACE WATER QUALITY, 2012

PHOTOGRAPHS – WATER QUALITY CHAPTER, SECTION 5.0



The confluence of Lee and Pacific Creeks, August 7th, 2012.

The flow of Laura Creek downstream of the ditch road is disrupted due to beaver activity, Aug 8th, 2012.

The waters of Lucky Creek (GP-6) are very turbid, August 9th, 2012.

The steep banks, deep water and high velocity prevented the collection of sediment and benthic samples at GP-7, upper Golden Creek, August 8th, 2012.

TABLE 5-1 **IN-SITU RESULTS, BREWERY CREEK SITES, AUGUST 2012**

BASELINE SITE #	SITE DESCRIPTION	Date Sampled	Time	Water Temp oC	pH	Conductivity uS/cm	D.O. mg/L	D.O. % saturation	Gauge Height m	Comments
GP-1	Lee Creek upstream of Pacific Creek	August 7	17:30	7.3	8.3	426	12.0	102.3		Very deep with high velocity, hard to find suitable benthic sampling sites. Helicopter pad needs work.
GP-2	Lee Creek u/s Yukon Ditch Road	August 6	16:30	6.5	8.34	451	12.5	101.2		Clear water, exposed gravel bars.
GP-3	Laura Creek u/s Ditch Road	August 8	9:30	4.2	8.36	456	12.7	97.5	0.32	Water is quite clear.
GP-4	Laura Creek near mouth u/s of the South Klondike River	August 8	10:30	---	---	---	---	---		Dry. An active beaver dam just downstream of the ditch road has prevented sufficient flow for a benthic and fisheries sampling site. (see photos)
GP-5	Classic Creek at mouth	August 8	11:45	2.9	8.26	325	13.0	96.6	0.165	Clear water.
GP-6	Lucky Creek	August 9	11:30	3.0	7.53	403	12.2	90.8		Flow is turbid.
GP-7	Golden Cr u/s Lucky Cr	August 8	16:30	5.2	8.4	486	12.4	97.2	0.475	Confined channel with high velocity flow and deep water (~60 cm) and too deep for Surber sampler. Also no areas of deposition for sediment sampling.
GP-8	Golden Cr d/s Lucky Cr	August 8	15:30	6.2	8.44	494	12.1	97.5		Good riffle area for benthic sampling, good gravel bar for landing.
GP-9	Golden Creek	August 8	---	---	---	---	---	---		GP-8 a much better site so this site not sampled.
GP-10	Golden Cr at mouth	August 8	13:15	6.2	8.08	497	12.2	98.3		A good riffle area for benthic sampling u/s of confluence
GP-11	Brewery Cr at mouth	August 9	9:15	7.0	8.23	262	11.2	92		A good riffle area for benthic sampling u/s of confluence

TABLE 5-2	WATER QUALITY AT BREWERY CREEK PROPERTY, AUGUST 2012										
Site #	**GP-1**	**GP-2**	**GP-3**	**GP-5**	**GP-6**	**GP-7**	**GP-8**	**GP-10**	**GP-11**	**Blind Duplicate of GP-11**	**Guideline***
Date (2012)	August 7	August 7	August 8	August 8	August 9	August 8	August 8	August 8	August 9	August 9	
Time	17:30	14:30	9:30	11:45	11:30	16:30	15:30	13:15	9:15	9:15	
Total Alkalinity as CaCO3 mg/L	139	133	137	129	88.3	165	160	154	86.7	87.0	
Sulphate mg/L	103	102	110	46.8	126	104	112	114	50.7	56.6	
Ammonia Nitrogen mg/L	0.0088	0.0085	0.11	0.094	0.047	0.014	0.011	<0.0050	0.0081	0.011	1.54**
Weak Acid Dissoc. Cyanide (CN)	0.00098	0.00093	0.00075	0.00100	0.00108	0.00075	0.00096	0.00108	0.00133	0.00081	5
Total Suspended Solids mg/L	3.7	2.9	21.8	1.2	177	12.1	24.2	4.3	3.2	2.6	
Total Dissolved Solids mg/L	306	308	350	244	310	428	364	370	194	182	
Total Metals ug/L											
Arsenic	0.200	0.219	**5.05**	**147**	**6.66**	0.398	1.14	0.825	2.40	2.29	5
Cadmium	**0.0970**	**0.0900**	0.0380	**0.173**	**0.353**	**0.0800**	**0.0810**	0.0630	0.0160	0.0150	***
Copper	1.29	1.31	1.46	1.10	**4.04**	1.65	1.98	1.43	0.607	0.639	4
Iron	76.1	79.5	**428**	64.2	**2080**	280	**386**	173	73.9	68.9	300
Lead	0.0360	0.0370	0.209	0.0200	1.59	0.139	0.329	0.0940	0.0550	0.0500	5
Selenium	**2.14**	**2.22**	**1.75**	**4.00**	**2.52**	**2.45**	**2.03**	**2.15**	0.575	0.513	1
Zinc	7.72	7.30	3.14	14.5	**30.9**	6.69	6.90	3.69	1.39	1.02	30
Hardness as CaCO3 mg/L	227	237	248	173	214	272	261	277	141	140	
Calculated Cadmium Guideline	0.067	0.070	0.072	0.053	0.064	0.078	0.076	0.080	0.044		

* CCME (1999) Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life

** at pH 8 and temp at 5°C

*** Varies with Hardness: For the hardness of the waters in the study area, the guideline ranges from 0.044 to 0.080 u/L, according to the calculation 10{0.86[log(hardness)]-3.2}

Values in **bold** iand shaded ndicate that the CCME guideline has been exceeded

Maxxam

Your Project #: BASELINE SURVEY
Your C.O.C. #: 31006602

Attention: Jillian Chown
GOLDEN PREDATOR CORP.
1 LINDEMAN ROAD
WHITEHORSE, YT
CANADA Y1A 5Z7

Report Date: 2012/08/22
This report supersedes all previous reports with the same Maxxam job number

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B270943
Received: 2012/08/11, 12:18

Sample Matrix: Water
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity - Water	10	2012/08/14	2012/08/14	BBY6SOP-00026	SM2320B
Chloride by Automated Colourimetry	9	N/A	2012/08/13	BBY6SOP-00011	SM-4500-Cl-
Chloride by Automated Colourimetry	1	N/A	2012/08/14	BBY6SOP-00011	SM-4500-Cl-
Cyanide WAD (weak acid dissociable)	10	N/A	2012/08/20	BBY6SOP-00005	SM-4500CN I
Carbon (DOC)	9	N/A	2012/08/14	BBY6SOP-00003	SM-5310C
Carbon (DOC)	1	N/A	2012/08/15	BBY6SOP-00003	SM-5310C
Conductance - water	10	N/A	2012/08/14	BBY6SOP-00026	SM-2510B
Fluoride - Mining Clients	9	N/A	2012/08/13	BBY6SOP-00038	SM - 4500 F C
Fluoride - Mining Clients	1	N/A	2012/08/14	BBY6SOP-00038	SM - 4500 F C
Hardness Total (calculated as CaCO3)	10	N/A	2012/08/17	BBY WI-00033	Calculated Parameter
Hardness (calculated as CaCO3)	10	N/A	2012/08/17	BBY WI-00033	Calculated Parameter
Ion Balance	10	N/A	2012/08/20	Calc	
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	10	N/A	2012/08/17	BBY7SOP-00002	EPA 6020A
Elements by ICPMS Low Level (dissolved)	10	N/A	2012/08/17	BBY7SOP-00002	EPA 6020A
Na, K, Ca, Mg, S by CRC ICPMS (total)	10	N/A	2012/08/17	BBY7SOP-00002	EPA 6020A
Elements by ICPMS Low Level (total)	10	N/A	2012/08/17	BBY7SOP-00002	EPA 6020A
Ammonia-N	9	N/A	2012/08/13	BBY6SOP-00009	SM-4500NH3G
Ammonia-N	1	N/A	2012/08/14	BBY6SOP-00009	SM-4500NH3G
Nitrate + Nitrite (N)	9	N/A	2012/08/11	BBY6SOP-00010	USEPA 353.2
Nitrate + Nitrite (N)	1	N/A	2012/08/14	BBY6SOP-00010	USEPA 353.2
Nitrite (N) by CFA	9	N/A	2012/08/11	BBY6SOP-00010	EPA 353.2
Nitrite (N) by CFA	1	N/A	2012/08/14	BBY6SOP-00010	EPA 353.2
Nitrogen - Nitrate (as N)	9	N/A	2012/08/13	BBY6SOP-00010	Based on EPA 353.2
Nitrogen - Nitrate (as N)	1	N/A	2012/08/15	BBY6SOP-00010	Based on EPA 353.2
Filter and HNO3 Preserve for Metals	9	N/A	2012/08/11	BBY6WI-00001	EPA 200.2
Filter and HNO3 Preserve for Metals	1	N/A	2012/08/13	BBY6WI-00001	EPA 200.2
pH Water	10	N/A	2012/08/14	BBY6SOP-00026	SM-4500H+B
Sulphate by Automated Colourimetry	8	N/A	2012/08/13	BBY6SOP-00017	SM4500-SO42
Sulphate by Automated Colourimetry	1	N/A	2012/08/15	BBY6SOP-00017	SM4500-SO42
Sulphate by Automated Colourimetry	1	N/A	2012/08/21	BBY6SOP-00017	SM4500-SO42
Total Dissolved Solids (Filt. Residue)	2	2012/08/14	2012/08/14	BBY6SOP-00033	SM 2540C
Total Dissolved Solids (Filt. Residue)	8	2012/08/15	2012/08/15	BBY6SOP-00033	SM 2540C
Carbon (Total Organic)	8	N/A	2012/08/14	BBY6SOP-00003	SM-5310C
Carbon (Total Organic)	1	N/A	2012/08/15	BBY6SOP-00003	SM-5310C
Carbon (Total Organic)	1	N/A	2012/08/20	BBY6SOP-00003	SM-5310C
Total Suspended Solids-LowLevel	10	2012/08/14	2012/08/14	BBY6SOP-00034	SM-2540 D

* Results relate only to the items tested.

../2

GOLDEN PREDATOR CORP.
Maxxam Job #: B270943
Client Project #: BASELINE SURVEY
Report Date: 2012/08/22

Sampler Initials: BB

Encryption Key

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

Sheleeza Mohamed, Burnaby Project Manager
Email: SMohamed@maxxam.ca
Phone# (604) 734 7276

==

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 #: B270943
Report Date: 2012/08/22

GOLDEN PREDATOR CORP.
Client Project #: BASELINE SURVEY

Sampler Initials: BB

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		EE1786	EE1787		EE1788	EE1789		EE1790		EE1791		
Sampling Date		2012/08/07 17:30	2012/08/07 14:30		2012/08/08 09:30	2012/08/08 11:45		2012/08/09 11:30		2012/08/08 16:30		
	UNITS	**GP-1 LEE CR U/S**	**GP-2 LEE CR @ BRIDGE**	**QC Batch**	**GP-3 LAURA CR**	**GP-5 CLASSIC CR**	**QC Batch**	**GP-6 LUCKY CR**	**QC Batch**	**GP-7 GOLDEN CR U/S**	**RDL**	**QC Batch**
Misc. Inorganics												
Fluoride (F)	mg/L	0.180	0.190	6077322	0.270	0.260	6077322	0.240	6077322	0.220	0.010	6077322
ANIONS												
Nitrite (N)	mg/L	<0.0050(1)	<0.0050(1)	6075024	<0.0050	<0.0050	6075024	<0.0050	6075024	<0.0050	0.0050	6075024
Calculated Parameters												
Filter and HNO3 Preservation	N/A	FIELD	FIELD	ONSITE	FIELD	FIELD	ONSITE	FIELD	ONSITE	FIELD	N/A	ONSITE
Ion Balance	N/A	0.96	1.0	6075198	1.0	1.0	6075198	0.54	6075198	1.0	0.010	6075198
Nitrate (N)	mg/L	0.181	0.156	6074993	0.149	0.171	6074993	0.156	6074993	0.418	0.020	6074993
Misc. Inorganics												
Weak Acid Dissoc. Cyanide (CN)	mg/L	0.00098	0.00093	6096589	0.00075	0.00100	6096589	0.00108	6096589	0.00075	0.00050	6096589
Dissolved Organic Carbon (C)	mg/L	3.60	3.33	6080477	4.43	3.70	6080477	6.57	6080477	4.69	0.50	6080477
Alkalinity (Total as CaCO3)	mg/L	139	133	6083024	137	129	6083024	88.3	6083024	165	0.50	6083024
Total Organic Carbon (C)	mg/L	4.18	4.45	6080485	4.87	4.01	6080485	8.12	6080485	4.96	0.50	6080485
Alkalinity (PP as CaCO3)	mg/L	<0.50	<0.50	6083024	<0.50	<0.50	6083024	<0.50	6083024	<0.50	0.50	6083024
Bicarbonate (HCO3)	mg/L	170	162	6083024	168	157	6083024	108	6083024	202	0.50	6083024
Carbonate (CO3)	mg/L	<0.50	<0.50	6083024	<0.50	<0.50	6083024	<0.50	6083024	<0.50	0.50	6083024
Hydroxide (OH)	mg/L	<0.50	<0.50	6083024	<0.50	<0.50	6083024	<0.50	6083024	<0.50	0.50	6083024
Anions												
Dissolved Sulphate (SO4)	mg/L	103	102	6077193	110	46.8	6077193	126	6100769	104	0.50	6077193
Dissolved Chloride (Cl)	mg/L	0.56	0.61	6077128	0.84	0.66	6077128	0.76	6077128	<0.50	0.50	6077128
Nutrients												
Ammonia (N)	mg/L	0.0088	0.0085	6076440	0.11	0.094	6076440	0.047	6076440	0.014	0.0050	6076440
Nitrate plus Nitrite (N)	mg/L	0.181(1)	0.156(1)	6075023	0.149	0.171	6075023	0.156	6075023	0.418	0.020	6075023
Physical Properties												
Conductivity	uS/cm	447	450	6083033	472	341	6083033	410	6083033	506	1.0	6083033
pH	pH Units	8.10	8.20	6083034	8.20	8.18	6083034	8.06	6083034	8.23		6083034
Physical Properties												
Total Suspended Solids	mg/L	3.7	2.9	6080245	21.8	1.2	6080245	177	6080245	12.1	1.0	6080245
Total Dissolved Solids	mg/L	306	308	6081236	350	244	6085845	310	6085845	428	10	6085845

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) - Sample arrived to laboratory past recommended hold time.

Maxxam Job #: B270943
Report Date: 2012/08/22

GOLDEN PREDATOR CORP.
Client Project #: BASELINE SURVEY

Sampler Initials: BB

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		EE1792	EE1793		EE1794		EE1795		
Sampling Date		2012/08/08 15:30	2012/08/08 13:15		2012/08/09 09:15				
	UNITS	**GP-8 GOLDEN CR D/S LUCKY**	**GP-10 GOLDEN @ MORK**	**QC Batch**	**GP-11 BREWERY CR**	**QC Batch**	**BD**	**RDL**	**QC Batch**
Misc. Inorganics									
Fluoride (F)	mg/L	0.240	0.230	6077322	0.076	6077322	0.069	0.010	6082102
ANIONS									
Nitrite (N)	mg/L	<0.0050	<0.0050	6075024	<0.0050	6075024	<0.0050	0.0050	6083075
Calculated Parameters									
Filter and HNO3 Preservation	N/A	FIELD	FIELD	ONSITE	FIELD	ONSITE	FIELD	N/A	ONSITE
Ion Balance	N/A	0.97	1.0	6075198	NC	6075198	NC	0.010	6078625
Nitrate (N)	mg/L	0.354	0.247	6074993	0.097	6074993	0.102	0.020	6077797
Misc. Inorganics									
Weak Acid Dissoc. Cyanide (CN)	mg/L	0.00096	0.00108	6096589	0.00133	6096589	0.00081	0.00050	6096589
Dissolved Organic Carbon (C)	mg/L	4.97	4.31	6080477	1.26	6080477	1.59	0.50	6083934
Alkalinity (Total as CaCO3)	mg/L	160	154	6083024	86.7	6083024	87.0	0.50	6083040
Total Organic Carbon (C)	mg/L	4.70	5.40	6080485	1.77	6097068	1.57	0.50	6084006
Alkalinity (PP as CaCO3)	mg/L	<0.50	<0.50	6083024	<0.50	6083024	<0.50	0.50	6083040
Bicarbonate (HCO3)	mg/L	195	188	6083024	106	6083024	106	0.50	6083040
Carbonate (CO3)	mg/L	<0.50	<0.50	6083024	<0.50	6083024	<0.50	0.50	6083040
Hydroxide (OH)	mg/L	<0.50	<0.50	6083024	<0.50	6083024	<0.50	0.50	6083040
Anions									
Dissolved Sulphate (SO4)	mg/L	112	114	6077193	50.7	6077193	56.6	0.50	6085128
Dissolved Chloride (Cl)	mg/L	0.72	0.63	6077128	0.64	6077128	<0.50	0.50	6080136
Nutrients									
Ammonia (N)	mg/L	0.011	<0.0050	6076440	0.0081	6076440	0.011	0.0050	6079562
Nitrate plus Nitrite (N)	mg/L	0.354	0.247	6075023	0.097	6075023	0.102	0.020	6083074
Physical Properties									
Conductivity	uS/cm	512	507	6083033	276	6083033	271	1.0	6083050
pH	pH Units	8.23	8.21	6083034	8.07	6083034	8.02		6083053
Physical Properties									
Total Suspended Solids	mg/L	24.2	4.3	6080245	3.2	6080245	2.6	1.0	6080245
Total Dissolved Solids	mg/L	364	370	6085845	194	6085845	182	10	6085845

N/A = Not Applicable
NC = Non-calculable
RDL = Reportable Detection Limit

Maxxam Job #: B270943
Report Date: 2012/08/22

GOLDEN PREDATOR CORP.
Client Project #: BASELINE SURVEY

Sampler Initials: BB

LOW LEVEL DISSOLVED METALS IN WATER (WATER)

Maxxam ID		EE1786	EE1787	EE1788	EE1789	EE1790	EE1791		
Sampling Date		2012/08/07 17:30	2012/08/07 14:30	2012/08/08 09:30	2012/08/08 11:45	2012/08/09 11:30	2012/08/08 16:30		
	UNITS	**GP-1 LEE CR U/S**	**GP-2 LEE CR @ BRIDGE**	**GP-3 LAURA CR**	**GP-5 CLASSIC CR**	**GP-6 LUCKY CR**	**GP-7 GOLDEN CR U/S**	**RDL**	**QC Batch**
Misc. Inorganics									
Dissolved Hardness (CaCO3)	mg/L	234	236	247	169	117	273	0.50	6074989

RDL = Reportable Detection Limit

Success Through Science®

Maxxam Job #: B270943
Report Date: 2012/08/22

GOLDEN PREDATOR CORP.
Client Project #: BASELINE SURVEY

Sampler Initials: BB

LOW LEVEL DISSOLVED METALS IN WATER (WATER)

Maxxam ID		EE1786	EE1787	EE1788	EE1789	EE1790	EE1791		
Sampling Date		2012/08/07 17:30	2012/08/07 14:30	2012/08/08 09:30	2012/08/08 11:45	2012/08/09 11:30	2012/08/08 16:30		
	UNITS	**GP-1 LEE CR U/S**	**GP-2 LEE CR @ BRIDGE**	**GP-3 LAURA CR**	**GP-5 CLASSIC CR**	**GP-6 LUCKY CR**	**GP-7 GOLDEN CR U/S**	**RDL**	**QC Batch**
Dissolved Metals by ICPMS									
Dissolved Aluminum (Al)	ug/L	11.1	11.1	24.3	10.3	3.08	14.5	0.20	6085496
Dissolved Antimony (Sb)	ug/L	0.225	0.247	3.13	2.21	0.143	0.225	0.020	6085496
Dissolved Arsenic (As)	ug/L	0.206	0.237	4.33	148	3.14	0.281	0.020	6085496
Dissolved Barium (Ba)	ug/L	46.7	49.3	61.1	74.1	3.28	72.0	0.020	6085496
Dissolved Beryllium (Be)	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	6085496
Dissolved Bismuth (Bi)	ug/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	6085496
Dissolved Boron (B)	ug/L	<50	<50	<50	<50	<50	<50	50	6085496
Dissolved Cadmium (Cd)	ug/L	0.0840	0.0750	0.0230	0.166	<0.0050	0.0440	0.0050	6085496
Dissolved Chromium (Cr)	ug/L	0.14	0.15	0.19	0.33	0.13	0.11	0.10	6085496
Dissolved Cobalt (Co)	ug/L	0.0390	0.0390	0.210	0.105	0.348	0.0800	0.0050	6085496
Dissolved Copper (Cu)	ug/L	1.10	1.23	0.984	1.05	0.502	1.16	0.050	6085496
Dissolved Iron (Fe)	ug/L	24.8	27.9	96.8	29.8	249	67.1	1.0	6085496
Dissolved Lead (Pb)	ug/L	0.0110	0.0200	0.0380	0.0070	<0.0050	0.0150	0.0050	6085496
Dissolved Lithium (Li)	ug/L	2.33	2.50	10.8	9.52	<0.50	4.83	0.50	6085496
Dissolved Manganese (Mn)	ug/L	6.73	7.29	37.9	26.2	36.8	24.5	0.050	6085496
Dissolved Mercury (Hg)	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	6085496
Dissolved Molybdenum (Mo)	ug/L	1.27	1.42	2.97	14.8	0.421	1.53	0.050	6085496
Dissolved Nickel (Ni)	ug/L	1.86	2.04	1.96	2.89	2.13	1.59	0.020	6085496
Dissolved Selenium (Se)	ug/L	2.21	2.27	1.85	4.08	1.85	2.54	0.040	6085496
Dissolved Silicon (Si)	ug/L	3580	3490	5530	12700	2730	4070	100	6085496
Dissolved Silver (Ag)	ug/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	6085496
Dissolved Strontium (Sr)	ug/L	236	247	297	225	11.9	347	0.050	6085496
Dissolved Thallium (Tl)	ug/L	0.0030	0.0030	0.0030	0.0070	<0.0020	0.0030	0.0020	6085496
Dissolved Tin (Sn)	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	6085496
Dissolved Titanium (Ti)	ug/L	<0.50	<0.50	0.57	<0.50	<0.50	<0.50	0.50	6085496
Dissolved Uranium (U)	ug/L	1.21	1.35	2.08	8.71	0.166	2.71	0.0020	6085496
Dissolved Vanadium (V)	ug/L	0.86	0.92	1.03	21.5	0.79	0.77	0.20	6085496
Dissolved Zinc (Zn)	ug/L	6.58	6.74	2.07	14.4	3.23	4.34	0.10	6085496
Dissolved Zirconium (Zr)	ug/L	<0.10	<0.10	0.13	0.11	<0.10	<0.10	0.10	6085496
Dissolved Calcium (Ca)	mg/L	60.8	59.9	63.8	49.4	35.8	69.2	0.050	6075199
Dissolved Magnesium (Mg)	mg/L	20.0	21.1	21.2	11.1	6.78	24.3	0.050	6075199
Dissolved Potassium (K)	mg/L	0.632	0.663	1.15	2.02	0.258	0.709	0.050	6075199
Dissolved Sodium (Na)	mg/L	1.33	1.39	3.38	3.53	0.647	2.02	0.050	6075199
Dissolved Sulphur (S)	mg/L	35	37	38	17	13	35	10	6075199

RDL = Reportable Detection Limit

Success Through Science®

Maxxam Job #: B270943
Report Date: 2012/08/22

GOLDEN PREDATOR CORP.
Client Project #: BASELINE SURVEY

Sampler Initials: BB

LOW LEVEL DISSOLVED METALS IN WATER (WATER)

Maxxam ID		EE1792		EE1793		EE1794		EE1795		
Sampling Date		2012/08/08 15:30		2012/08/08 13:15		2012/08/09 09:15				
	UNITS	**GP-8 GOLDEN CR D/S LUCKY**	**QC Batch**	**GP-10 GOLDEN @ MORK**	**QC Batch**	**GP-11 BREWERY CR**	**QC Batch**	**BD**	**RDL**	**QC Batch**
Misc. Inorganics										
Dissolved Hardness (CaCO3)	mg/L	267	6074989	274	6074989	139	6074989	140	0.50	6076098

RDL = Reportable Detection Limit

LOW LEVEL DISSOLVED METALS IN WATER (WATER)

Maxxam ID		EE1792		EE1793		EE1794		EE1795		
Sampling Date		2012/08/08 15:30		2012/08/08 13:15		2012/08/09 09:15				
	UNITS	**GP-8 GOLDEN CR D/S LUCKY**	**QC Batch**	**GP-10 GOLDEN @ MORK**	**QC Batch**	**GP-11 BREWERY CR**	**QC Batch**	**BD**	**RDL**	**QC Batch**
Dissolved Metals by ICPMS										
Dissolved Aluminum (Al)	ug/L	17.1	6085496	16.2	6085496	5.43	6085496	6.27	0.20	6085496
Dissolved Antimony (Sb)	ug/L	0.687	6085496	0.776	6085496	0.370	6085496	0.389	0.020	6085496
Dissolved Arsenic (As)	ug/L	0.551	6085496	0.645	6085496	2.26	6085496	2.17	0.020	6085496
Dissolved Barium (Ba)	ug/L	71.1	6085496	65.9	6085496	46.5	6085496	45.4	0.020	6085496
Dissolved Beryllium (Be)	ug/L	<0.010	6085496	<0.010	6085496	<0.010	6085496	<0.010	0.010	6085496
Dissolved Bismuth (Bi)	ug/L	<0.0050	6085496	<0.0050	6085496	<0.0050	6085496	<0.0050	0.0050	6085496
Dissolved Boron (B)	ug/L	<50	6085496	<50	6085496	<50	6085496	<50	50	6085496
Dissolved Cadmium (Cd)	ug/L	0.0410	6085496	0.0440	6085496	0.0110	6085496	0.0120	0.0050	6085496
Dissolved Chromium (Cr)	ug/L	0.13	6085496	0.13	6085496	<0.10	6085496	<0.10	0.10	6085496
Dissolved Cobalt (Co)	ug/L	0.0980	6085496	0.0780	6085496	0.0220	6085496	0.0200	0.0050	6085496
Dissolved Copper (Cu)	ug/L	1.19	6085496	1.34	6085496	0.493	6085496	0.499	0.050	6085496
Dissolved Iron (Fe)	ug/L	59.7	6085496	70.0	6085496	11.9	6085496	12.8	1.0	6085496
Dissolved Lead (Pb)	ug/L	0.0130	6085496	0.0660	6085496	<0.0050	6085496	0.0160	0.0050	6085496
Dissolved Lithium (Li)	ug/L	4.82	6085496	5.25	6085496	1.98	6085496	2.00	0.50	6085496
Dissolved Manganese (Mn)	ug/L	28.1	6085496	22.8	6085496	3.88	6085496	3.93	0.050	6085496
Dissolved Mercury (Hg)	ug/L	<0.010	6085496	<0.010	6085496	<0.010	6085496	<0.010	0.010	6085496
Dissolved Molybdenum (Mo)	ug/L	1.53	6085496	1.56	6085496	0.480	6085496	0.402	0.050	6085496
Dissolved Nickel (Ni)	ug/L	1.76	6085496	2.03	6085496	0.331	6085496	0.326	0.020	6085496
Dissolved Selenium (Se)	ug/L	2.15	6085496	1.76	6085496	0.452	6085496	0.603	0.040	6085496
Dissolved Silicon (Si)	ug/L	3860	6085496	4080	6085496	3110	6085496	3330	100	6085496
Dissolved Silver (Ag)	ug/L	<0.0050	6085496	<0.0050	6085496	<0.0050	6085496	<0.0050	0.0050	6085496
Dissolved Strontium (Sr)	ug/L	336	6085496	318	6085496	201	6085496	196	0.050	6085496
Dissolved Thallium (Tl)	ug/L	0.0030	6085496	0.0020	6085496	<0.0020	6085496	<0.0020	0.0020	6085496
Dissolved Tin (Sn)	ug/L	<0.20	6085496	<0.20	6085496	<0.20	6085496	<0.20	0.20	6085496
Dissolved Titanium (Ti)	ug/L	<0.50	6085496	<0.50	6085496	<0.50	6085496	<0.50	0.50	6085496
Dissolved Uranium (U)	ug/L	2.59	6085496	2.73	6085496	0.605	6085496	0.570	0.0020	6085496
Dissolved Vanadium (V)	ug/L	0.79	6085496	0.71	6085496	<0.20	6085496	<0.20	0.20	6085496
Dissolved Zinc (Zn)	ug/L	3.86	6085496	2.79	6100427	0.58	6085496	0.76	0.10	6085496
Dissolved Zirconium (Zr)	ug/L	<0.10	6085496	0.10	6085496	<0.10	6085496	<0.10	0.10	6085496
Dissolved Calcium (Ca)	mg/L	66.7	6075199	68.1	6075199	37.8	6075199	38.4	0.050	6077888
Dissolved Magnesium (Mg)	mg/L	24.5	6075199	25.2	6075199	10.9	6075199	10.7	0.050	6077888
Dissolved Potassium (K)	mg/L	0.727	6075199	0.822	6075199	0.495	6075199	0.483	0.050	6077888
Dissolved Sodium (Na)	mg/L	1.85	6075199	1.92	6075199	1.72	6075199	1.67	0.050	6077888
Dissolved Sulphur (S)	mg/L	38	6075199	39	6075199	19	6075199	17	10	6077888

RDL = Reportable Detection Limit

Maxxam Job #: B270943
Report Date: 2012/08/22

GOLDEN PREDATOR CORP.
Client Project #: BASELINE SURVEY

Sampler Initials: BB

LOW LEVEL TOTAL METALS IN WATER (WATER)

Maxxam ID		EE1786	EE1787	EE1788	EE1789	EE1790		
Sampling Date		2012/08/07 17:30	2012/08/07 14:30	2012/08/08 09:30	2012/08/08 11:45	2012/08/09 11:30		
	UNITS	**GP-1 LEE CR U/S**	**GP-2 LEE CR @ BRIDGE**	**GP-3 LAURA CR**	**GP-5 CLASSIC CR**	**GP-6 LUCKY CR**	**RDL**	**QC Batch**
Calculated Parameters								
Total Hardness (CaCO3)	mg/L	227	237	248	173	214	0.50	6074933

RDL = Reportable Detection Limit

Maxxam Job #: B270943
Report Date: 2012/08/22

GOLDEN PREDATOR CORP.
Client Project #: BASELINE SURVEY

Sampler Initials: BB

LOW LEVEL TOTAL METALS IN WATER (WATER)

Maxxam ID		EE1786	EE1787	EE1788	EE1789	EE1790		
Sampling Date		2012/08/07 17:30	2012/08/07 14:30	2012/08/08 09:30	2012/08/08 11:45	2012/08/09 11:30		
	UNITS	**GP-1 LEE CR U/S**	**GP-2 LEE CR @ BRIDGE**	**GP-3 LAURA CR**	**GP-5 CLASSIC CR**	**GP-6 LUCKY CR**	**RDL**	**QC Batch**
Total Metals by ICPMS								
Total Aluminum (Al)	ug/L	31.3	28.1	183	21.2	763	0.20	6085695
Total Antimony (Sb)	ug/L	0.239	0.234	3.03	2.15	3.21	0.020	6085695
Total Arsenic (As)	ug/L	0.200	0.219	5.05	147	6.66	0.020	6085695
Total Barium (Ba)	ug/L	50.0	48.7	71.4	73.6	145	0.020	6085695
Total Beryllium (Be)	ug/L	<0.010	<0.010	0.014	<0.010	0.064	0.010	6085695
Total Bismuth (Bi)	ug/L	<0.0050	<0.0050	<0.0050	<0.0050	0.0110	0.0050	6085695
Total Boron (B)	ug/L	<50	<50	<50	<50	<50	50	6085695
Total Cadmium (Cd)	ug/L	0.0970	0.0900	0.0380	0.173	0.353	0.0050	6085695
Total Chromium (Cr)	ug/L	0.15	0.13	0.47	0.37	1.39	0.10	6085695
Total Cobalt (Co)	ug/L	0.0710	0.0650	0.400	0.118	2.08	0.0050	6085695
Total Copper (Cu)	ug/L	1.29	1.31	1.46	1.10	4.04	0.050	6085695
Total Iron (Fe)	ug/L	76.1	79.5	428	64.2	2080	1.0	6085695
Total Lead (Pb)	ug/L	0.0360	0.0370	0.209	0.0200	1.59	0.0050	6085695
Total Lithium (Li)	ug/L	2.38	2.42	10.9	9.50	7.55	0.50	6085695
Total Manganese (Mn)	ug/L	9.39	9.90	50.4	27.7	163	0.050	6085695
Total Mercury (Hg)	ug/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	6085695
Total Molybdenum (Mo)	ug/L	1.34	1.39	2.95	15.1	2.13	0.050	6085695
Total Nickel (Ni)	ug/L	2.02	2.09	2.50	2.85	10.2	0.020	6085695
Total Selenium (Se)	ug/L	2.14	2.22	1.75	4.00	2.52	0.040	6085695
Total Silicon (Si)	ug/L	3270	3430	5500	12800	4170	100	6085695
Total Silver (Ag)	ug/L	<0.0050	<0.0050	0.0070	<0.0050	0.0170	0.0050	6085695
Total Strontium (Sr)	ug/L	248	240	290	220	320	0.050	6085695
Total Thallium (Tl)	ug/L	0.0030	0.0030	0.0050	0.0060	0.0200	0.0020	6085695
Total Tin (Sn)	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	6085695
Total Titanium (Ti)	ug/L	1.14	0.64	5.18	0.73	17.3	0.50	6085695
Total Uranium (U)	ug/L	1.29	1.32	2.09	8.70	2.11	0.0020	6085695
Total Vanadium (V)	ug/L	1.00	0.94	1.59	21.7	5.73	0.20	6085695
Total Zinc (Zn)	ug/L	7.72	7.30	3.14	14.5	30.9	0.10	6085695
Total Zirconium (Zr)	ug/L	<0.10	<0.10	0.16	0.10	0.38	0.10	6085695
Total Calcium (Ca)	mg/L	56.8	61.1	63.3	50.6	50.5	0.050	6075200
Total Magnesium (Mg)	mg/L	20.8	20.6	21.9	11.2	21.2	0.050	6075200
Total Potassium (K)	mg/L	0.663	0.661	1.21	2.07	0.895	0.050	6075200
Total Sodium (Na)	mg/L	1.35	1.36	3.43	3.54	2.03	0.050	6075200
Total Sulphur (S)	mg/L	37	36	40	17	41	10	6075200

RDL = Reportable Detection Limit

Maxxam

Maxxam Job #: B270943
Report Date: 2012/08/22

GOLDEN PREDATOR CORP.
Client Project #: BASELINE SURVEY

Sampler Initials: BB

LOW LEVEL TOTAL METALS IN WATER (WATER)

Maxxam ID		EE1791	EE1792	EE1793	EE1794		EE1795		
Sampling Date		2012/08/08 16:30	2012/08/08 15:30	2012/08/08 13:15	2012/08/09 09:15				
	UNITS	**GP-7 GOLDEN CR U/S**	**GP-8 GOLDEN CR D/S LUCKY**	**GP-10 GOLDEN @ MORK**	**GP-11 BREWERY CR**	**QC Batch**	**BD**	**RDL**	**QC Batch**
Calculated Parameters									
Total Hardness (CaCO3)	mg/L	272	261	277	141	6074933	140	0.50	6077795

RDL = Reportable Detection Limit

Maxxam Job #: B270943
Report Date: 2012/08/22

GOLDEN PREDATOR CORP.
Client Project #: BASELINE SURVEY

Sampler Initials: BB

LOW LEVEL TOTAL METALS IN WATER (WATER)

Maxxam ID		EE1791	EE1792	EE1793	EE1794		EE1795		
Sampling Date		2012/08/08 16:30	2012/08/08 15:30	2012/08/08 13:15	2012/08/09 09:15				
	UNITS	**GP-7 GOLDEN CR U/S**	**GP-8 GOLDEN CR D/S LUCKY**	**GP-10 GOLDEN @ MORK**	**GP-11 BREWERY CR**	**QC Batch**	**BD**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	ug/L	110	179	53.9	35.2	6085695	31.4	0.20	6085695
Total Antimony (Sb)	ug/L	0.242	0.754	0.789	0.386	6085695	0.393	0.020	6085695
Total Arsenic (As)	ug/L	0.398	1.14	0.825	2.40	6085695	2.29	0.020	6085695
Total Barium (Ba)	ug/L	77.1	81.9	67.9	47.0	6085695	47.2	0.020	6085695
Total Beryllium (Be)	ug/L	<0.010	0.011	<0.010	<0.010	6085695	<0.010	0.010	6085695
Total Bismuth (Bi)	ug/L	<0.0050	<0.0050	<0.0050	<0.0050	6085695	<0.0050	0.0050	6085695
Total Boron (B)	ug/L	<50	<50	<50	<50	6085695	<50	50	6085695
Total Cadmium (Cd)	ug/L	0.0800	0.0810	0.0630	0.0160	6085695	0.0150	0.0050	6085695
Total Chromium (Cr)	ug/L	0.28	0.35	0.19	0.14	6085695	0.12	0.10	6085695
Total Cobalt (Co)	ug/L	0.170	0.282	0.131	0.0530	6085695	0.0470	0.0050	6085695
Total Copper (Cu)	ug/L	1.65	1.98	1.43	0.607	6085695	0.639	0.050	6085695
Total Iron (Fe)	ug/L	280	386	173	73.9	6085695	68.9	1.0	6085695
Total Lead (Pb)	ug/L	0.139	0.329	0.0940	0.0550	6085695	0.0500	0.0050	6085695
Total Lithium (Li)	ug/L	4.76	4.96	5.30	1.97	6085695	1.94	0.50	6085695
Total Manganese (Mn)	ug/L	31.6	38.9	27.1	5.49	6085695	5.31	0.050	6085695
Total Mercury (Hg)	ug/L	<0.010	<0.010	<0.010	<0.010	6085695	<0.010	0.010	6085695
Total Molybdenum (Mo)	ug/L	1.52	1.50	1.61	0.499	6085695	0.435	0.050	6085695
Total Nickel (Ni)	ug/L	1.95	2.40	1.99	0.399	6085695	0.374	0.020	6085695
Total Selenium (Se)	ug/L	2.45	2.03	2.15	0.575	6085695	0.513	0.040	6085695
Total Silicon (Si)	ug/L	3890	3620	3950	3140	6085695	3090	100	6085695
Total Silver (Ag)	ug/L	0.0060	0.0100	<0.0050	<0.0050	6085695	<0.0050	0.0050	6085695
Total Strontium (Sr)	ug/L	348	344	321	198	6085695	199	0.050	6085695
Total Thallium (Tl)	ug/L	0.0030	0.0050	0.0030	<0.0020	6085695	0.0020	0.0020	6085695
Total Tin (Sn)	ug/L	<0.20	<0.20	<0.20	<0.20	6085695	<0.20	0.20	6085695
Total Titanium (Ti)	ug/L	3.44	5.58	1.37	1.13	6085695	1.29	0.50	6085695
Total Uranium (U)	ug/L	2.83	2.70	2.77	0.597	6085695	0.579	0.0020	6085695
Total Vanadium (V)	ug/L	1.26	1.66	0.92	0.23	6085695	0.26	0.20	6085695
Total Zinc (Zn)	ug/L	6.69	6.90	3.69	1.39	6085695	1.02	0.10	6085695
Total Zirconium (Zr)	ug/L	0.12	0.16	0.12	<0.10	6085695	<0.10	0.10	6085695
Total Calcium (Ca)	mg/L	67.6	62.6	67.9	38.1	6075200	37.6	0.050	6077889
Total Magnesium (Mg)	mg/L	25.1	25.4	26.1	11.2	6075200	11.2	0.050	6077889
Total Potassium (K)	mg/L	0.740	0.775	0.868	0.513	6075200	0.511	0.050	6077889
Total Sodium (Na)	mg/L	2.05	1.92	1.98	1.77	6075200	1.76	0.050	6077889
Total Sulphur (S)	mg/L	36	40	41	19	6075200	19	10	6077889

RDL = Reportable Detection Limit

Package 1	6.7°C
Package 2	5.7°C

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

General Comments

Sample EE1786-01: The BC-MOE and APHA Standard Method require pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the BC-MOE/APHA Standard Method holding time.

Sample EE1787-01: The BC-MOE and APHA Standard Method require pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the BC-MOE/APHA Standard Method holding time.

Sample EE1788-01: The BC-MOE and APHA Standard Method require pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the BC-MOE/APHA Standard Method holding time.

Sample EE1789-01: The BC-MOE and APHA Standard Method require pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the BC-MOE/APHA Standard Method holding time.

Sample EE1790-01: The BC-MOE and APHA Standard Method require pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the BC-MOE/APHA Standard Method holding time.

Sample EE1791-01: The BC-MOE and APHA Standard Method require pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the BC-MOE/APHA Standard Method holding time.

Sample EE1792-01: The BC-MOE and APHA Standard Method require pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the BC-MOE/APHA Standard Method holding time.

Sample EE1793-01: The BC-MOE and APHA Standard Method require pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the BC-MOE/APHA Standard Method holding time.

Sample EE1794-01: The BC-MOE and APHA Standard Method require pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the BC-MOE/APHA Standard Method holding time. Ion Balance: NC = Not Calculable due to low ion sum [< 3 meq/L].

Sample EE1795-01: The BC-MOE and APHA Standard Method require pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the BC-MOE/APHA Standard Method holding time. Ion Balance: NC = Not Calculable due to low ion sum [< 3 meq/L].

Sample EE1793, Elements by ICPMS Low Level (dissolved): Test repeated.

Maxxam Job #: B270943
Report Date: 2012/08/22

GOLDEN PREDATOR CORP.
Client Project #: BASELINE SURVEY

Sampler Initials: BB

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
6075023	Nitrate plus Nitrite (N)	2012/08/11	106	80 - 120	103	80 - 120	<0.020	mg/L	NC(1)	25
6075024	Nitrite (N)	2012/08/11	108	80 - 120	103	80 - 120	<0.0050	mg/L	NC(1)	20
6076440	Ammonia (N)	2012/08/13	NC	80 - 120	95	80 - 120	<0.0050	mg/L	2.0	20
6077128	Dissolved Chloride (Cl)	2012/08/13	NC	80 - 120	101	80 - 120	<0.50	mg/L	NC	20
6077193	Dissolved Sulphate (SO4)	2012/08/13			98	80 - 120	<0.50	mg/L	0.5	20
6077322	Fluoride (F)	2012/08/13	NC	80 - 120	102	80 - 120	<0.010	mg/L	0	20
6079562	Ammonia (N)	2012/08/14	91	80 - 120	96	80 - 120	<0.0050	mg/L	NC	20
6080136	Dissolved Chloride (Cl)	2012/08/14	NC	80 - 120	106	80 - 120	<0.50	mg/L	0.2	20
6080245	Total Suspended Solids	2012/08/14			100	80 - 120	<1.0	mg/L		
6080477	Dissolved Organic Carbon (C)	2012/08/14	111	80 - 120	108	80 - 120	<0.50	mg/L	NC	20
6080485	Total Organic Carbon (C)	2012/08/14	NC	80 - 120	109	80 - 120	<0.50	mg/L	7.2	20
6081236	Total Dissolved Solids	2012/08/14	NC	80 - 120	100	80 - 120	<10	mg/L	1.9	20
6082102	Fluoride (F)	2012/08/14	104	80 - 120	98	80 - 120	<0.010	mg/L	0	20
6083024	Alkalinity (Total as CaCO3)	2012/08/14	NC	80 - 120	93	80 - 120	<0.50	mg/L	1.7	20
6083024	Alkalinity (PP as CaCO3)	2012/08/14					<0.50	mg/L	NC	20
6083024	Bicarbonate (HCO3)	2012/08/14					<0.50	mg/L	1.7	20
6083024	Carbonate (CO3)	2012/08/14					<0.50	mg/L	NC	20
6083024	Hydroxide (OH)	2012/08/14					<0.50	mg/L	NC	20
6083033	Conductivity	2012/08/14			99	80 - 120	<1.0	uS/cm	0.1	20
6083040	Alkalinity (Total as CaCO3)	2012/08/14	93	80 - 120	95	80 - 120	<0.50	mg/L	2.2	20
6083040	Alkalinity (PP as CaCO3)	2012/08/14					<0.50	mg/L	NC	20
6083040	Bicarbonate (HCO3)	2012/08/14					<0.50	mg/L	2.1	20
6083040	Carbonate (CO3)	2012/08/14					<0.50	mg/L	NC	20
6083040	Hydroxide (OH)	2012/08/14					<0.50	mg/L	NC	20
6083050	Conductivity	2012/08/14			98	80 - 120	<1.0	uS/cm	3.3	20
6083074	Nitrate plus Nitrite (N)	2012/08/14	99	80 - 120	108	80 - 120	<0.020	mg/L	NC	25
6083075	Nitrite (N)	2012/08/14	100	80 - 120	102	80 - 120	<0.0050	mg/L	NC	20
6083934	Dissolved Organic Carbon (C)	2012/08/15	109	80 - 120	109	80 - 120	<0.50	mg/L	5.1	20
6084006	Total Organic Carbon (C)	2012/08/15	105	80 - 120	107	80 - 120	<0.50	mg/L	3.1	20
6085128	Dissolved Sulphate (SO4)	2012/08/15	NC	80 - 120	98	80 - 120	<0.50	mg/L	0.7	20
6085496	Dissolved Aluminum (Al)	2012/08/17	96	80 - 120	107	80 - 120	<0.20	ug/L	19.4	20
6085496	Dissolved Antimony (Sb)	2012/08/17	100	80 - 120	103	80 - 120	<0.020	ug/L	0.5	20
6085496	Dissolved Arsenic (As)	2012/08/17	102	80 - 120	99	80 - 120	<0.020	ug/L	6.4	20
6085496	Dissolved Barium (Ba)	2012/08/17	NC	80 - 120	100	80 - 120	<0.020	ug/L	1.4	20
6085496	Dissolved Beryllium (Be)	2012/08/17	98	80 - 120	102	80 - 120	<0.010	ug/L	NC	20
6085496	Dissolved Bismuth (Bi)	2012/08/17	94	80 - 120	103	80 - 120	<0.0050	ug/L	NC	20
6085496	Dissolved Cadmium (Cd)	2012/08/17	96	80 - 120	99	80 - 120	<0.0050	ug/L	NC	20
6085496	Dissolved Chromium (Cr)	2012/08/17	96	80 - 120	99	80 - 120	<0.10	ug/L	NC	20
6085496	Dissolved Cobalt (Co)	2012/08/17	94	80 - 120	98	80 - 120	<0.0050	ug/L	NC	20
6085496	Dissolved Copper (Cu)	2012/08/17	92	80 - 120	97	80 - 120	<0.050	ug/L	5.5	20

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
6085496	Dissolved Iron (Fe)	2012/08/17	92	80 - 120	114	80 - 120	<1.0	ug/L	12.5	20
6085496	Dissolved Lead (Pb)	2012/08/17	94	80 - 120	101	80 - 120	<0.0050	ug/L	NC	20
6085496	Dissolved Lithium (Li)	2012/08/17	97	80 - 120	102	80 - 120	<0.50	ug/L	NC	20
6085496	Dissolved Manganese (Mn)	2012/08/17	94	80 - 120	96	80 - 120	<0.050	ug/L	2.0	20
6085496	Dissolved Mercury (Hg)	2012/08/17	93	80 - 120	97	80 - 120	<0.010	ug/L	NC	20
6085496	Dissolved Molybdenum (Mo)	2012/08/17	91	80 - 120	98	80 - 120	<0.050	ug/L	2.7	20
6085496	Dissolved Nickel (Ni)	2012/08/17	93	80 - 120	101	80 - 120	<0.020	ug/L	1.9	20
6085496	Dissolved Selenium (Se)	2012/08/17	94	80 - 120	107	80 - 120	<0.040	ug/L	11.4	20
6085496	Dissolved Silver (Ag)	2012/08/17	96	80 - 120	100	80 - 120	<0.0050	ug/L	NC	20
6085496	Dissolved Strontium (Sr)	2012/08/17	NC	80 - 120	98	80 - 120	<0.050	ug/L	0.6	20
6085496	Dissolved Thallium (Tl)	2012/08/17	105	80 - 120	113	80 - 120	<0.0020	ug/L	NC	20
6085496	Dissolved Tin (Sn)	2012/08/17	98	80 - 120	100	80 - 120	<0.20	ug/L	NC	20
6085496	Dissolved Titanium (Ti)	2012/08/17	107	80 - 120	102	80 - 120	<0.50	ug/L	NC	20
6085496	Dissolved Uranium (U)	2012/08/17	98	80 - 120	99	80 - 120	<0.0020	ug/L	0.9	20
6085496	Dissolved Vanadium (V)	2012/08/17	94	80 - 120	96	80 - 120	<0.20	ug/L	NC	20
6085496	Dissolved Zinc (Zn)	2012/08/17	96	80 - 120	100	80 - 120	<0.10	ug/L	6.5	20
6085496	Dissolved Boron (B)	2012/08/17					<50	ug/L	NC	20
6085496	Dissolved Silicon (Si)	2012/08/17					<100	ug/L	6.1	20
6085496	Dissolved Zirconium (Zr)	2012/08/17					<0.10	ug/L	NC	20
6085695	Total Aluminum (Al)	2012/08/17	105	80 - 120	106	80 - 120	<0.20	ug/L	35.4(2)	20
6085695	Total Antimony (Sb)	2012/08/17	103	80 - 120	103	80 - 120	<0.020	ug/L	NC	20
6085695	Total Arsenic (As)	2012/08/17	100	80 - 120	102	80 - 120	<0.020	ug/L	NC	20
6085695	Total Barium (Ba)	2012/08/17	98	80 - 120	100	80 - 120	<0.020	ug/L	NC	20
6085695	Total Beryllium (Be)	2012/08/17	101	80 - 120	97	80 - 120	<0.010	ug/L	NC	20
6085695	Total Bismuth (Bi)	2012/08/17	91	80 - 120	102	80 - 120	<0.0050	ug/L	NC	20
6085695	Total Cadmium (Cd)	2012/08/17	103	80 - 120	100	80 - 120	<0.0050	ug/L	NC	20
6085695	Total Chromium (Cr)	2012/08/17	98	80 - 120	101	80 - 120	<0.10	ug/L	NC	20
6085695	Total Cobalt (Co)	2012/08/17	99	80 - 120	102	80 - 120	<0.0050	ug/L	NC	20
6085695	Total Copper (Cu)	2012/08/17	98	80 - 120	102	80 - 120	<0.050	ug/L	NC	20
6085695	Total Iron (Fe)	2012/08/17	107	80 - 120	109	80 - 120	<1.0	ug/L	NC	20
6085695	Total Lead (Pb)	2012/08/17	100	80 - 120	101	80 - 120	<0.0050	ug/L	NC	20
6085695	Total Lithium (Li)	2012/08/17	104	80 - 120	102	80 - 120	<0.50	ug/L	NC	20
6085695	Total Manganese (Mn)	2012/08/17	100	80 - 120	103	80 - 120	<0.050	ug/L	NC	20
6085695	Total Mercury (Hg)	2012/08/17	97	80 - 120	95	80 - 120	<0.010	ug/L		
6085695	Total Molybdenum (Mo)	2012/08/17	97	80 - 120	99	80 - 120	<0.050	ug/L	NC	20
6085695	Total Nickel (Ni)	2012/08/17	100	80 - 120	103	80 - 120	<0.020	ug/L	NC	20
6085695	Total Selenium (Se)	2012/08/17	104	80 - 120	102	80 - 120	<0.040	ug/L	NC	20
6085695	Total Silver (Ag)	2012/08/17	103	80 - 120	103	80 - 120	<0.0050	ug/L	NC	20
6085695	Total Strontium (Sr)	2012/08/17	98	80 - 120	100	80 - 120	0.081, RDL=0.050	ug/L	NC	20
6085695	Total Thallium (Tl)	2012/08/17	110	80 - 120	110	80 - 120	<0.0020	ug/L	NC	20

Maxxam

GOLDEN PREDATOR CORP.
Client Project #: BASELINE SURVEY

Maxxam Job #: B270943
Report Date: 2012/08/22

Sampler Initials: BB

QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
6085695	Total Tin (Sn)	2012/08/17	97	80 - 120	102	80 - 120	<0.20	ug/L	NC	20
6085695	Total Titanium (Ti)	2012/08/17	100	80 - 120	97	80 - 120	<0.50	ug/L	NC	20
6085695	Total Uranium (U)	2012/08/17	100	80 - 120	100	80 - 120	0.0020, RDL=0.0020	ug/L	NC	20
6085695	Total Vanadium (V)	2012/08/17	99	80 - 120	97	80 - 120	<0.20	ug/L	NC	20
6085695	Total Zinc (Zn)	2012/08/17	106	80 - 120	105	80 - 120	<0.10	ug/L	NC	20
6085695	Total Boron (B)	2012/08/17					<50	ug/L	NC	20
6085695	Total Silicon (Si)	2012/08/17					<100	ug/L	NC	20
6085695	Total Zirconium (Zr)	2012/08/17					<0.10	ug/L	NC	20
6085845	Total Dissolved Solids	2012/08/15	NC	80 - 120	102	80 - 120	<10	mg/L	18.6	20
6096589	Weak Acid Dissoc. Cyanide (CN)	2012/08/20	110	80 - 120	101	80 - 120	<0.00050	mg/L	NC	20
6097068	Total Organic Carbon (C)	2012/08/20			104	80 - 120	<0.50	mg/L	6.5	20
6100427	Dissolved Zinc (Zn)	2012/08/21			106	80 - 120	<0.10	ug/L		
6100769	Dissolved Sulphate (SO4)	2012/08/21	NC	80 - 120	98	80 - 120	<0.50	mg/L	NC	20

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.

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) - RDL raised due to sample matrix interference. Sample arrived to laboratory past recommended hold time.

(2) - Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Maxxam — Maxxam Analytics International Corporation o/a Maxxam Analytics

4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 Tel (604) 734 7276 Toll-free (604) 734 7276 Fax (604) 731 2386 www.maxxam.ca

CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE INFORMATION:		COPY OF REPORT INFORMATION (if differs from invoice):		PROJECT INFORMATION:	
Company Name	#10630 GOLDEN PREDATOR CORP.	Company Name	Laberge Environmental Services	Quotation #	B20563
Contact Name	Jillian Chown	Contact Name	Bonnie Burns	P.O. #	
Address	1 LINDEMAN ROAD	Address	P.O. Box 21072	Project #	
	WHITEHORSE YT Y1A 5Z7		Whitehorse, Yukon, Y1A 6P7	Project Name	Baseline Survey
Phone	(867)633-4653 Fax (867)633-3011	Phone	867-668-6838 Fax 867-667-6956	Site #	
Email	jchown@goldenpredator.com	Email	bonnieburns@northwestel.net	Sampled By	Bonnie Burns

Laboratory Use Only:

MAXXAM JOB #:	BOTTLE ORDER #:
B270943	310066
CHAIN OF CUSTODY #:	PROJECT MANAGER:
C#310066-02-01	Shaheeza Mohamed

REGULATORY CRITERIA:

- [ ] CSR
- [x] CCME
- [ ] BC Water Quality
- [ ] Other ______

SPECIAL INSTRUCTIONS: Please send copy of data - excel & PDF to: bonnieburns@northwestel.net

TURNAROUND TIME (TAT) REQUIRED:

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Regular (Standard) TAT: ☐
(will be applied if Rush TAT is not specified)
Standard TAT = 5 working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission) ☐
1 Day ☐ 2 Day ☐ 3 Day ☐ Date Required ______

Rush Confirmation Number: ______ (call lab for #)

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

ANALYSIS REQUESTED (Please be specific)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered ? (Y/N)	Alkalinity, Conductivity, pH	Ammonia, TOC	Cl, F, SO4, NO2, NO3	Cyanide WAD	DOC	LL TSS, TDS	Low Level Dissolved Metals	Low Level Total Metals			# of Bottles	Comments
1	EE1786	GP-1 Lee Creek	2012 Aug 7	17:30	H2O	Y	✓	✓	✓	✓	✓	✓	✓	✓			7	all samples
2	87	GP-2 Lee Cr @ bridge	Aug 7	14:30	"	Y	✓	✓	✓	✓	✓	✓	✓	✓			7	preserved in field
3	88	GP-3 Laura Cr	Aug 8	09:30	"	Y	✓	✓	✓	✓	✓	✓	✓	✓			7	according to protocols
4	89	GP-5 Classic Cr	Aug 8	11:45	"	Y	✓	✓	✓	✓	✓	✓	✓	✓			7	& indicated on labels.
5	90	GP-6 Lucky Cr	Aug 9	11:30	"	Y	✓	✓	✓	✓	✓	✓	✓	✓			7	
6	91	GP-7 Golden Creek	Aug 8	16:30	"	Y	✓	✓	✓	✓	✓	✓	✓	✓			7	
7	92	GP-8 Golden Cr d/s Lucky	Aug 8	15:30	"	Y	✓	✓	✓	✓	✓	✓	✓	✓			7	
8	93	GP-10 Golden Cr mouth	Aug 8	13:15	"	Y	✓	✓	✓	✓	✓	✓	✓	✓			7	B270943
9	94	GP-11 Brewery Cr	Aug 9	9:15	"	Y	✓	✓	✓	✓	✓	✓	✓	✓			7	
10																		

*RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time:	# Jars Used and Not Submitted
[signature]			[signature] ANDY LEUNG	2012/08/11	12:18	

Laboratory Use Only

Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
☐	7, 6, 7 / 6, 5, 6	☐ Yes ☐ No — NA

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Maxxam Yellow: Client

Maxxam Analytics International Corporation o/a Maxxam Analytics

APPENDIX D

STREAM SEDIMENT CHARACTERIZATION

TABLE 6-2	HISTORIC CONCENTRATIONS OF ARSENIC ug/g					
Year	**GP-1**	**GP-2**	**GP-3**	**GP-6**	**GP-10**	**GP-11**
1991 (N)	15	12	69		85	56
1991 (EC)	8	8	15.3		52.3	41
1995	6.3	8	21.1	70.6		
1996	10	10	41	106.7		
1997	10.7	9.4	66.4	101.9		
1998	13.2	10.2	73.4	326.5		
1999	12.2	**	65.8	191		
2000	17.1	9.1	121.6	132.9		
2001	12.8	11.9	71.4	157.9		
2002	7.5	7.5	43.1	96.6		
2003	11.5	11.8	47.5	141.5		
2004	6.9	8	52.7	79.7		
2005	9	9.2	40.9	69.8		
2007	6.5	6.2	27.7	33.9		
2008	6.5	8	16.4	223		
2009	8.9	8.9	28.2	195		
2012	7.39	8.05	15.5	27.1	13.3	39.4
Mean	10.0	9.1	48.1	130.3	50.2	45.5
SD	3.2	1.7	28.0	79.3	35.9	9.2
N = Norecol data						
EC = Environment Canada data						

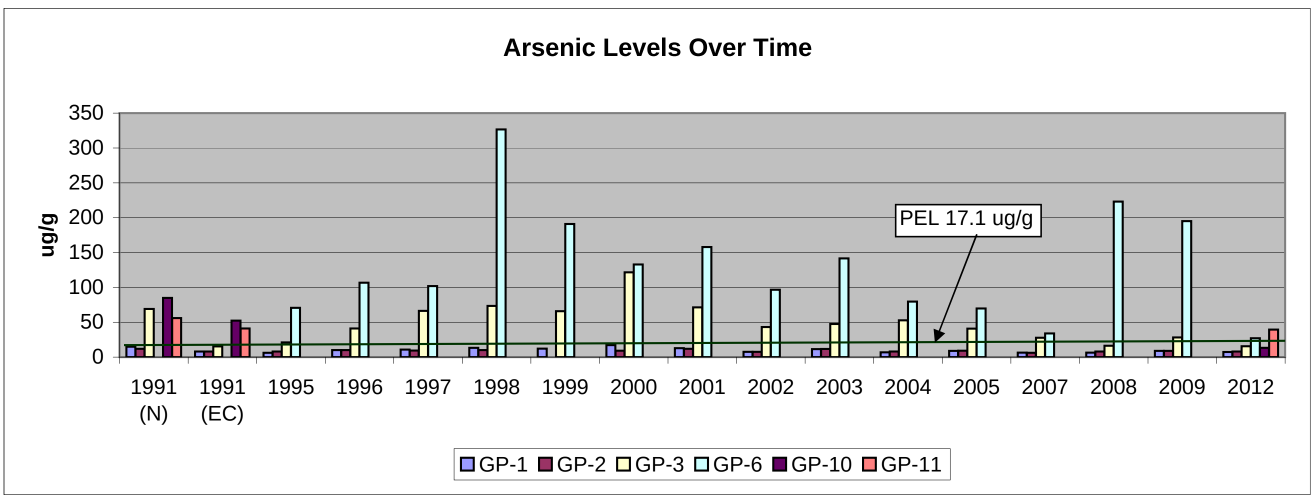
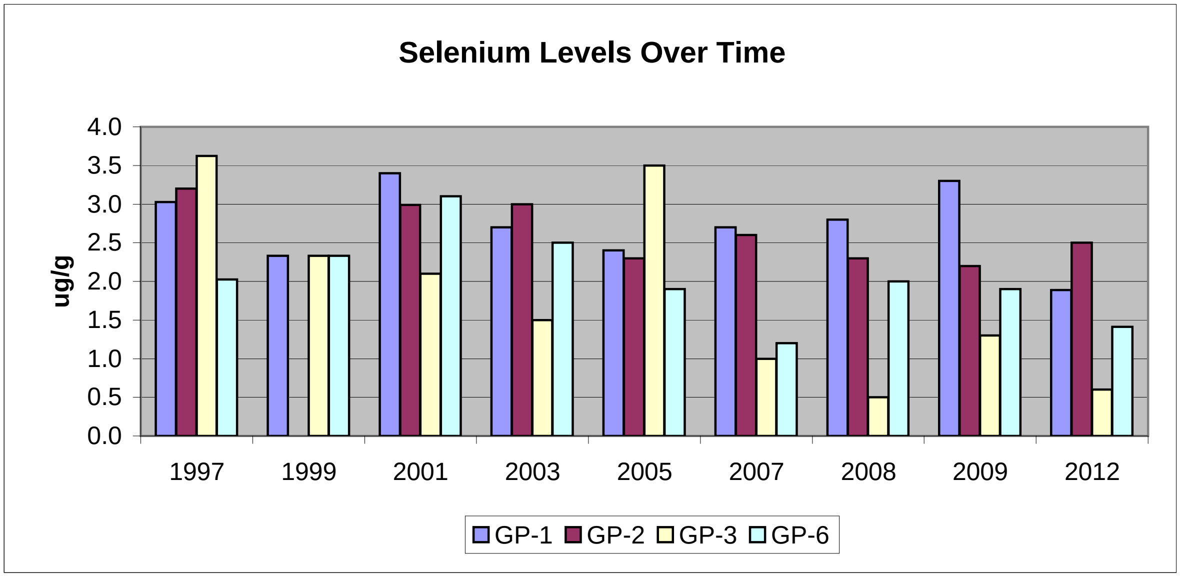


TABLE 6-3	HISTORIC CONCENTRATIONS OF SELENIUM ug/g			
Year	**GP-1**	**GP-2**	**GP-3**	**GP-6**
1997	3.0	3.2	3.6	2.0
1999	2.3		2.3	2.3
2001	3.4	2.99	2.1	3.1
2003	2.7	3	1.5	2.5
2005	2.4	2.3	3.5	1.9
2007	2.7	2.6	1.0	1.2
2008	2.8	2.3	0.5	2.0
2009	3.3	2.2	1.3	1.9
2012	1.89	2.5	0.6	1.41
Mean	2.7	2.6	1.8	2.0
SD	0.5	0.4	1.2	0.6



Your Project #: BASELINE STREAM SEDIMENTS, BRE
Site Location: BREWERY CREEK, YUKON
Your C.O.C. #: 08355743

Attention: Bonnie Burns
LABERGE ENVIRONMENTAL SERVICES
WHITEHORSE
405 Ogilvie Street
PO Box 21072
Whitehorse, YT
CANADA Y1A 6P7

Report Date: 2012/08/21
This report supersedes all previous reports with the same Maxxam job number

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B271523
Received: 2012/08/14, 09:40

Sample Matrix: Soil
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
GS Special Analysis	8	N/A	2012/08/18		
Elements by ICPMS (total)	8	2012/08/18	2012/08/20	BBY7SOP-00001	EPA 6020A
pH (2:1 DI Water Extract)	8	2012/08/18	2012/08/18	BBY6SOP-00028	Carter, SSMA 16.2

* Results relate only to the items tested.

Encryption Key

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

Tabitha Rudkin, Burnaby Project Manager
Email: TRudkin@maxxam.ca
Phone# (604) 638-2639

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

Total cover pages: 1

Maxxam Job #: B271523
Report Date: 2012/08/21

LABERGE ENVIRONMENTAL SERVICES
Client Project #: BASELINE STREAM SEDIMENTS, BRE
Site Location: BREWERY CREEK, YUKON
Sampler Initials: BB

MULTRPTNVTITLE

Maxxam ID		EE5446	EE5447	EE5448	EE5449	EE5450	EE5451	EE5452	EE5453		
Sampling Date		2012/08/07 17:30	2012/08/07 14:30	2012/08/08 09:30	2012/08/08 11:45	2012/08/09 11:30	2012/08/08 15:30	2012/08/08 13:15	2012/08/09 09:15		
COC#		08355743	08355743	08355743	08355743	08355743	08355743	08355743	08355743		
	UNITS	**GP-1 LEE CR U/S PACIFIC CR**	**GP-2 LEE CR U/S DITCH ROAD**	**GP-3 LAURA CREEK**	**GP-5 CLASSIC CREEK**	**GP-6 LUCKY CREEK**	**GP-8 GOLDEN CR D/S LUCKY CR**	**GP-10 GOLDEN CR AT MOUTH**	**GP-11 BREWERY CR AT MOUTH**	**RDL**	**QC Batch**
Parameter											
Special Analysis	N/A	SEE NOTE(1)	SEE NOTE(1)	SEE NOTE(1)	SEE NOTE(1)	SEE NOTE(1)	SEE NOTE(1)	SEE NOTE(1)	SEE NOTE(1)	N/A	6096761

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) - dried and passed through 100 mesh

Success Through Science®

Maxxam Job #: B271523
Report Date: 2012/08/21

LABERGE ENVIRONMENTAL SERVICES
Client Project #: BASELINE STREAM SEDIMENTS, BRE
Site Location: BREWERY CREEK, YUKON
Sampler Initials: BB

CSR/CCME METALS IN SOIL (SOIL)

Maxxam ID		EE5446	EE5447	EE5448	EE5449	EE5450	EE5451	EE5452	EE5453		
Sampling Date		2012/08/07 17:30	2012/08/07 14:30	2012/08/08 09:30	2012/08/08 11:45	2012/08/09 11:30	2012/08/08 15:30	2012/08/08 13:15	2012/08/09 09:15		
COC#		08355743	08355743	08355743	08355743	08355743	08355743	08355743	08355743		
	UNITS	**GP-1 LEE CR U/S PACIFIC CR**	**GP-2 LEE CR U/S DITCH ROAD**	**GP-3 LAURA CREEK**	**GP-5 CLASSIC CREEK**	**GP-6 LUCKY CREEK**	**GP-8 GOLDEN CR D/S LUCKY CR**	**GP-10 GOLDEN CR AT MOUTH**	**GP-11 BREWERY CR AT MOUTH**	**RDL**	**QC Batch**
Physical Properties											
Soluble (2:1) pH	pH Units	7.67	8.07	7.92	7.98	7.25	8.05	7.46	7.81	0.010	6094715
Total Metals by ICPMS											
Total Aluminum (Al)	mg/kg	11400	12600	9670	14100	9960	11200	10400	11600	100	6094709
Total Antimony (Sb)	mg/kg	1.95	2.17	1.61	1.89	9.13	3.38	3.45	1.70	0.10	6094709
Total Arsenic (As)	mg/kg	7.39	8.05	15.5	343	27.1	14.7	13.3	39.4	0.50	6094709
Total Barium (Ba)	mg/kg	698	730	368	632	523	415	672	322	0.10	6094709
Total Beryllium (Be)	mg/kg	0.52	0.72	0.40	1.17	<0.40	0.46	0.50	0.64	0.40	6094709
Total Bismuth (Bi)	mg/kg	<0.10	0.12	0.10	1.26	0.12	0.13	0.14	0.28	0.10	6094709
Total Cadmium (Cd)	mg/kg	2.09	3.25	0.516	3.44	1.08	1.29	1.22	0.732	0.050	6094709
Total Calcium (Ca)	mg/kg	7980	9940	5540	12000	4190	8470	5930	6440	100	6094709
Total Chromium (Cr)	mg/kg	30.2	34.2	19.9	53.8	19.1	25.0	23.4	24.2	1.0	6094709
Total Cobalt (Co)	mg/kg	9.90	12.0	7.43	14.6	7.75	8.86	8.95	9.76	0.30	6094709
Total Copper (Cu)	mg/kg	42.3	52.2	16.2	57.8	16.2	32.4	27.6	31.4	0.50	6094709
Total Iron (Fe)	mg/kg	25000	27700	19100	30900	19000	23000	21400	26400	100	6094709
Total Lead (Pb)	mg/kg	8.48	9.51	7.30	14.3	10.4	9.66	9.83	14.7	0.10	6094709
Total Magnesium (Mg)	mg/kg	6290	6700	4210	9550	3510	5550	4810	5180	100	6094709
Total Manganese (Mn)	mg/kg	410	635	303	883	221	379	227	403	0.20	6094709
Total Mercury (Hg)	mg/kg	0.183	0.269	0.058	<0.050	0.257	0.247	0.182	0.107	0.050	6094709
Total Molybdenum (Mo)	mg/kg	3.83	3.84	0.92	1.99	1.90	2.04	1.64	1.55	0.10	6094709
Total Nickel (Ni)	mg/kg	47.9	62.1	21.9	45.4	30.2	34.0	34.3	27.9	0.80	6094709
Total Phosphorus (P)	mg/kg	1160	1120	595	1640	592	724	855	783	10	6094709
Total Potassium (K)	mg/kg	1520	1750	695	3250	755	1080	1080	1160	100	6094709
Total Selenium (Se)	mg/kg	1.89	2.50	0.60	1.23	1.41	1.06	1.21	0.79	0.50	6094709
Total Silver (Ag)	mg/kg	0.456	0.580	0.344	0.383	0.182	0.339	0.261	0.199	0.050	6094709
Total Sodium (Na)	mg/kg	<100	<100	101	154	<100	125	<100	128	100	6094709
Total Strontium (Sr)	mg/kg	69.2	79.8	43.7	153	52.6	62.8	55.3	52.2	0.10	6094709
Total Thallium (Tl)	mg/kg	0.218	0.275	0.090	0.356	0.212	0.195	0.162	0.149	0.050	6094709
Total Tin (Sn)	mg/kg	0.33	0.39	0.30	0.98	0.31	0.37	0.35	0.49	0.10	6094709
Total Titanium (Ti)	mg/kg	388	311	345	329	135	324	224	374	1.0	6094709
Total Vanadium (V)	mg/kg	115	124	40.1	129	48.0	69.3	62.8	53.0	2.0	6094709
Total Zinc (Zn)	mg/kg	285	345	71.9	251	145	152	162	95.5	1.0	6094709
Total Zirconium (Zr)	mg/kg	2.17	1.95	2.55	3.12	0.72	1.80	1.70	1.94	0.50	6094709

RDL = Reportable Detection Limit

Maxxam Job #: B271523
Report Date: 2012/08/21

LABERGE ENVIRONMENTAL SERVICES
Client Project #: BASELINE STREAM SEDIMENTS, BRE
Site Location: BREWERY CREEK, YUKON
Sampler Initials: BB

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
6094709	Total Antimony (Sb)	2012/08/20	88	75 - 125	95	75 - 125	<0.10	mg/kg	NC	30	71	70 - 130
6094709	Total Arsenic (As)	2012/08/20	91	75 - 125	94	75 - 125	<0.50	mg/kg	14.1	30	87	70 - 130
6094709	Total Barium (Ba)	2012/08/20	NC	75 - 125	101	75 - 125	<0.10	mg/kg	4.5	35	98	70 - 130
6094709	Total Beryllium (Be)	2012/08/20	97	75 - 125	96	75 - 125	<0.40	mg/kg	NC	30		
6094709	Total Cadmium (Cd)	2012/08/20	97	75 - 125	99	75 - 125	<0.050	mg/kg	NC	30	102	70 - 130
6094709	Total Chromium (Cr)	2012/08/20	104	75 - 125	103	75 - 125	<1.0	mg/kg	20.5	30	110	70 - 130
6094709	Total Cobalt (Co)	2012/08/20	104	75 - 125	104	75 - 125	<0.30	mg/kg	7.7	30	95	70 - 130
6094709	Total Copper (Cu)	2012/08/20	NC	75 - 125	104	75 - 125	<0.50	mg/kg	0.7	30	92	70 - 130
6094709	Total Lead (Pb)	2012/08/20	102	75 - 125	104	75 - 125	<0.10	mg/kg	0.3	35	98	70 - 130
6094709	Total Manganese (Mn)	2012/08/20	NC	75 - 125	104	75 - 125	<0.20	mg/kg	1.2	30	102	70 - 130
6094709	Total Mercury (Hg)	2012/08/20	97	75 - 125	103	75 - 125	<0.050	mg/kg	NC	35	79	70 - 130
6094709	Total Molybdenum (Mo)	2012/08/20	99	75 - 125	98	75 - 125	<0.10	mg/kg	NC	35	97	70 - 130
6094709	Total Nickel (Ni)	2012/08/20	99	75 - 125	102	75 - 125	<0.80	mg/kg	10.2	30	91	70 - 130
6094709	Total Selenium (Se)	2012/08/20	88	75 - 125	91	75 - 125	<0.50	mg/kg	NC	30		
6094709	Total Silver (Ag)	2012/08/20	93	75 - 125	81	75 - 125	<0.050	mg/kg	NC	35		
6094709	Total Strontium (Sr)	2012/08/20	NC	75 - 125	105	75 - 125	<0.10	mg/kg	3.4	35	104	70 - 130
6094709	Total Thallium (Tl)	2012/08/20	97	75 - 125	98	75 - 125	<0.050	mg/kg	NC	30	88	70 - 130
6094709	Total Tin (Sn)	2012/08/20	91	75 - 125	93	75 - 125	<0.10	mg/kg	NC	35		
6094709	Total Titanium (Ti)	2012/08/20	NC	75 - 125	102	75 - 125	<1.0	mg/kg	5.0	35	80	70 - 130
6094709	Total Vanadium (V)	2012/08/20	NC	75 - 125	100	75 - 125	<2.0	mg/kg	3.0	30	100	70 - 130
6094709	Total Zinc (Zn)	2012/08/20	NC	75 - 125	93	75 - 125	<1.0	mg/kg	2.0	30	86	70 - 130
6094709	Total Aluminum (Al)	2012/08/20					<100	mg/kg	4.1	35	99	70 - 130
6094709	Total Calcium (Ca)	2012/08/20					<100	mg/kg	1.6	30	98	70 - 130
6094709	Total Iron (Fe)	2012/08/20					<100	mg/kg	4.0	30	106	70 - 130
6094709	Total Magnesium (Mg)	2012/08/20					<100	mg/kg	6.8	30	93	70 - 130
6094709	Total Phosphorus (P)	2012/08/20					<10	mg/kg	0.6	30	64 (1, 2)	70 - 130
6094709	Total Bismuth (Bi)	2012/08/20					<0.10	mg/kg	NC	30		
6094709	Total Potassium (K)	2012/08/20					<100	mg/kg	6.8	35		
6094709	Total Sodium (Na)	2012/08/20					<100	mg/kg	NC	35		

Maxxam Job #: B271523
Report Date: 2012/08/21

LABERGE ENVIRONMENTAL SERVICES
Client Project #: BASELINE STREAM SEDIMENTS, BRE
Site Location: BREWERY CREEK, YUKON
Sampler Initials: BB

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
6094709	Total Zirconium (Zr)	2012/08/20					<0.50	mg/kg	9.2	30		
6094715	Soluble (2:1) pH	2012/08/18			102	96 - 104			0.1	20		

N/A = Not Applicable
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) - REF MAT outside acceptance criteria (10% of analytes failure allowed).

Validation Signature Page

Maxxam Job #: B271523

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

Rob Reinert, Data Validation Coordinator

==

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

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5 Ph: (604) 734-7276 Fax: (604) 731-2386, Toll Free: (800) 665-8566

CHAIN OF CUSTODY RECORD

Click here to get the COC number

Maxxam Job #: B271523

COC #: 08355743

Page: 1 of 1

Invoice To: Require Report? Yes ☑ No ☐

Report To:

Invoice To		Report To	
Company Name:	Laberge Environmental Services	Company Name:	
Contact Name:	Bonnie Burns	Contact Name:	
Address:	P.O. Box 21072	Address:	
	Whitehorse, YT PC: Y1A 6P7		PC:
Phone / Fax#:	Ph: 867-668-6838 Fax: 867-667-6956	Phone / Fax#:	Ph: Fax:
E-mail	bonnieburns@northwestel.net	E-mail	

PO #:	
Quotation #:	
Project #:	
Proj. Name:	Baseline Stream Sediments, Brewery Creek
Location:	Brewery Creek, Yukon
Sampled by:	Bonnie Burns

REGULATORY REQUIREMENTS:

- ☐ CSR
- ☑ CCME
- ☐ BC Water Quality
- ☐ Other
- ☐ DRINKING WATER

SERVICE REQUESTED:

- ◉ Regular Turn Around Time (TAT) (5 days for most tests)
- **RUSH** (Please contact the lab)
- ○ 1 Day ○ 2 Day ○ 3 Day
- Date Required:

SPECIAL INSTRUCTIONS:

Return Cooler ☐ **Ship Sample Bottles (please specify)** ☐

ANALYSIS REQUESTED

#	Sample Identification	Lab Identification (Lab Use Only)	Sample Type	Date/Time(24hr) Sampled	Field Filtered? Y/N; Dissolved Metals (DM)	Field Acidified? Y/N	Field Acidified? Y/N; Total Metals	dry and thorougly mix	sieve through a 100 mesh screen (siz	analyze portion passing sieve for meta	Number of Containers
1	GP-1 Lee Cr u/s Pacific Cr	EE5446		12/08/07 17:30				X	X	X	1
2	GP-2 Lee Cr u/s Ditch Road	447		12/08/07 14:30				X	X	X	1
3	GP-3 Laura Creek	448		12/08/08 09:30				X	X	X	1
4	GP-5 Classic Creek	449		12/08/08 11:45				X	X	X	1
5	GP-6 Lucky Creek	450		12/08/09 11:30				X	X	X	1
6	GP-8 Golden Cr d/s Lucky Cr	451		12/08/08 15:30				X	X	X	1
7	GP-10 Golden Cr at mouth	452		12/08/08 13:15				X	X	X	1
8	GP-11 Brewery Cr at mouth	453		12/08/09 09:15				X	X	X	1
9											
10	NOTE THESE ARE SOIL SAMPLES BUT THERE IS NO DESIGNATION FOR THAT.										
11											
12											

B271523

*Relinquished By: (Print name and sign)	Date (yy/mm/dd):	Time (24hr):	Received by: (Print name and sign)	Date (yy/mm/dd):	Time (24 hr):	Time Sensitive	Temperature on Receipt (°C) (Laboratory Use Only)	Custody Seal	Yes	No
			Wellbert Pascual	2012-08-14	09:40	☐	A) 12 B) 14 C) 13	Present? N/A	☐	☐
							Just sampled & rec'd on ice: ☐	Intact?	☐	☐

*IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORDS. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

APPENDIX E

BENTHIC INVERTEBRATES SURVEY

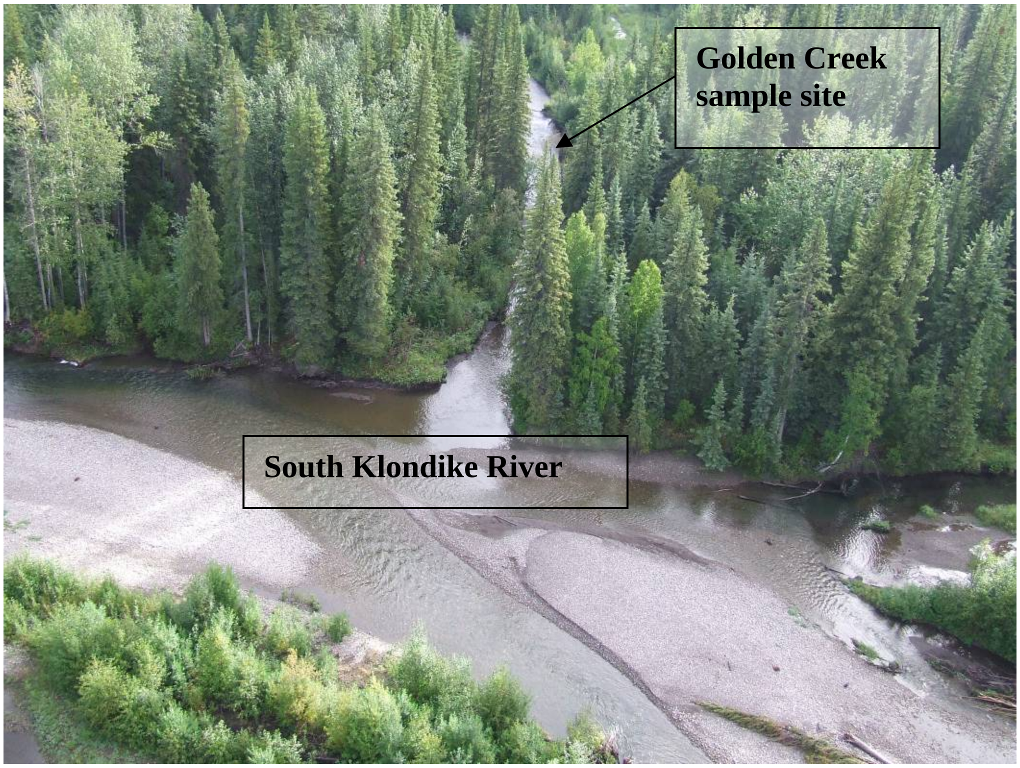
PHOTOS, DATA, TABLES AND FIGURES, 2012

GP5, Classic Creek near the mouth looking upstream, August 8th, 2012.

GP5, Looking downstream from the sampling area, August 8th, 2012.

GP8, Golden Creek upstream of Lucky Creek, looking upstream from site. Aug 8, 2012.

GP8, looking downstream from benthic sampling site, August 8, 2012.



GP10, Golden Creek at confluence with the South Klondike River, August 9th, 2012.

GP10 looking upstream from the benthic invertebrate sampling site, August 8th, 2012.

Cordillera Consulting

Project: Brewery Creek
Laberge Environmental, Bonnie Burns
Taxonomist: Sue Salter
suesalter@shaw.ca
250-494-7553
Date Prepared: 11/8/2012

Site:	Lee Cr u/s Pacific	Lee Cr u/s Pacific	Lee Cr u/s Pacific	Lee Cr @ ditch	Lee Cr @ ditch	Lee Cr @ ditch	Laura Cr	Laura Cr	Laura Cr	Classic Cr near mouth	Classic Cr near mouth	Classic Cr near mouth
Sample:	GP1A	GP1B	GP1C	GP2A	GP2B	GP2C	GP3A	GP3B	GP3C	GP5A	GP5B	GP5C
CC#:	CC130082	CC130083	CC130084	CC130085	CC130086	CC130087	CC130088	CC130089	CC130090	CC130091	CC130092	CC130093
	0		0		0		0		0		0	
Phylum: Arthropoda	0		0		0		0		0		0	
Subphylum: Hexapoda	0		0		0		0		0		0	
| Class: Insecta	0		0		0		0		0		0	
| Order: Ephemeroptera	0		0		0		0		0		0	
| Family: Ameletidae	0		0		0		0		0		0	
Ameletus sp.	0	3	0		0		1	1	0	4	0	
| Family: Baetidae	0		0		0		0	1	0		0	
Acentrella sp.	1	3	1	6	0	8	0		0		0	
Baetis bicaudatus	0	6	6	10	20	16	3	6	3	4	3	4
Baetis sp.	0	3	2	3	0		1		0		0	
| Family: Ephemerellidae	0	13	11		4	4	0		0		0	
Drunella coloradensis	0		2		8	4	0		0		0	
Drunella doddsii	0		7		8		0		0		0	
Serratella sp.	0		0		0		0		0		0	
| Family: Heptageniidae	1		8	3	4		1		0	2	0	
Cinygmula sp.	1	48	9	13	20	12	17	29	16		0	
Epeorus sp.	14	48	32	61	104	88	0		0		0	
	0		0		0		0		0		0	
| Order: Plecoptera	4		2		0	4	0	1	0	2	0	
| Family: Capniidae	3	29	19	6	8	20	0	1	8	18	14	18
| Family: Chloroperlidae	1		3		0		0		0		0	
Alloperla fraterna	1	29	10	10	8	8	0		0		0	
Suwallia sp.	4	19	30	13	16	8	0		0		0	
Sweltsa sp.	0		0		0		0		0	4	2	2
| Family: Leuctridae	0		0	6	0		0		0		0	
| Family: Nemouridae	0		0		0		3	6	6		0	
Podmosta sp.	0		0		0		0		0	2	2	
Zapada cinctipes	1		0		0		0		0		0	
Zapada columbiana	0		0		0		0		0	4	0	4
Zapada oregonensis group	2	6	11	6	0	4	0		0	20	48	12
Zapada sp.	0		0	3	0		0	2	0	76	75	46
| Family: Perlodidae	0		3	3	0		0		0		0	
Kogotus nonus	0		0		0		0		0		0	
Skwala sp.	0		0		0		0		0		0	
| Family: Taeniopterygidae	0		3		0		0		0		0	
Taenionema sp.	0		0		0		0		0		0	
	0		0		0		0		0		0	
| Order: Trichoptera	0	3	0		4		2		0		0	2
| Family: Apataniidae	0		0		0		0		0		0	
Allomyia sp.	0		0		0		0		0	4	0	
| Family: Limnephilidae	0	10	0		0	8	0		0	6	2	4
Dicosmoecus sp.	0		0		0		0		0		0	
Ecclisomyia sp.	0		1	6	4		0		0		0	
| Family: Rhyacophilidae	0		0		0		0		0		0	
Rhyacophila sp.	0		0		0		0		0		0	
Rhyacophila vofixa group	0		2		0		0		0		0	
	0		0		0		0		0		0	
| Order: Diptera	0		0		0		0		1		3	2
| Family: Ceratopogonidae	0		0		0		0		0		0	
Probezzia sp.	0		0		0		0		0		0	
Sphaeromias sp.	0		0		0		0		0		0	
| Family: Chironomidae	0		0		0		0		0		0	
| Subfamily: Chironominae	0		0		0		0		0		0	
Zavreliella marmorata	0		0		0		0		0		0	
| Tribe: Tanytarsini	0		0		0		0		0		0	
Tanytarsus sp.	0		0		0		0		0		0	
| Subfamily: Diamesinae	0		0		0		0		0		0	
| Tribe: Diamesini	0		0		0		0		0		0	

Site:	Lee Cr u/s Pacific	Lee Cr u/s Pacific	Lee Cr u/s Pacific	Lee Cr @ ditch	Lee Cr @ ditch	Lee Cr @ ditch	Laura Cr	Laura Cr	Laura Cr	Classic Cr near mouth	Classic Cr near mouth	Classic Cr near mouth
Sample:	GP1A	GP1B	GP1C	GP2A	GP2B	GP2C	GP3A	GP3B	GP3C	GP5A	GP5B	GP5C
CC#:	CC130082	CC130083	CC130084	CC130085	CC130086	CC130087	CC130088	CC130089	CC130090	CC130091	CC130092	CC130093
Diamesa sp.	0		0	112	100	192	5	13	3	242	234	226
Pagastia sp.	0	10	7	29	16	68	2		0		0	
Pseudodiamesa sp.	0		0		0		4	2	0		5	
| Subfamily: Orthocladiinae	0		0		0		0		0		0	
Brillia sp.	0		0		0		0		0		0	
Eukiefferiella sp.	84	634	174	800	1220	1024	6	12	1	20	21	28
Orthocladius sp.	5	45	4	29	20	28	1		0		0	
Parorthocladius sp.	0	16	4		0		0		2		0	8
Rheocricotopus sp.	0		0		0		0		4		0	
Tvetenia sp.	0		0		0		0		3		0	
| Tribe: Orthocladiini	0		0		0		0		0		0	
Chaetocladius sp.	0		0		0		0		2		0	
| Subfamily: Tanypodinae	0		0		0		0		0		0	
| Tribe: Procladiini	0		0		0		0		0		0	
Procladius sp.	0		0		0		0		0		6	30
| Family: Deuterophlebiidae	0		0		0		0		0		0	
Deuterophlebia sp.	0		0		0		0		0		0	
| Family: Empididae	0		0		0		0		0		0	
Chelifera/ Metachela	0		0		0		0		0		2	2
Clinocera sp.	0		0		0		0		0		0	
| Family: Muscidae	0		0		0		0		0		0	
Limnophora sp.	0		0		0		0	1	0		0	
| Family: Psychodidae	1	3	0		0		0		0	4	5	20
Pericoma sp.	0		0		0		0		0		0	
| Family: Simuliidae	0	6	1		0		1	1	0	4	5	10
Prosimulium sp.	1	3	1	3	0	4	6	21	19	44	40	38
Simulium sp.	0		0	3	12		0		0		0	
| Family: Tipulidae	0		0		0		0		0		0	
Dicranota sp.	0	3	1		0		3	2	1	8	3	2
Rhabdomastix sp.	1		0		0		0		0		0	
Tipula sp.	0		0		0		1		0		0	
	0		0		0		0		0		0	
| Order: Hemiptera	0		0		0		0		0		0	
| Family: Mesoveliidae	0		0		0		0		0		0	
Mesovelia sp.	1		0		0		0		0		0	
	0		0		0		0		0		0	
| Order: Lepidoptera	0		0		0		0		0		0	
| Family: Crambidae	0		0		0		0		0		0	
| Family: Noctuidae	0		0	3	0		0		0		0	
	0		0		0		0		0		0	
| Class: Entognatha	0		0		0		0		0		0	
| Order: Collembola	0		0		0		0		0		0	
| Family: Poduridae	0		0		0		0	1	0	10	2	42
| Family: Sminthuridae	0		0		0		0	1	0		0	
	0		0		0		0		0		0	
Subphylum: Crustacea	0		0		0		0		0		0	
| Class: Ostracoda	2	6	1	3	0	8	0		0		0	
| Class: Branchiopoda	0		0		0		0		0		0	
| Order: Cladocera	0		0		0		0		0		0	
| Family: Daphniidae	0		0		0		0		0		0	
Daphnia sp.	0		0	3	0		0		0		0	
	0		0		0		0		0		0	
| Class: Copepoda	0		0		0		0		0		0	
| Order: Cyclopoida	0		1		0	4	2	2	0		0	6
| Order: Harpacticoida	1		0		0		0	4	0	2	0	
	0		0		0		0		0		0	
| Class: Malacostraca	0		0		0		0		0		0	
| Order: Amphipoda	0		0		0		0		0		0	
| Family: Gammaridae	0		0		0		0		0		0	
Gammarus sp.	0		0		0		0		1		0	
	0		0		0		0		0		0	
Subphylum: Chelicerata	0		0		0		0		0		0	
| Class: Arachnida	0		0		0		0		0		0	
| Order: Trombidiformes	2		3		0	4	0		0		0	6
| Family: Aturidae	0		0		0		0		0		0	
Aturus sp.	1		0		0	12	0		0		0	
| Family: Feltriidae	0		0		0		0		0		0	
Feltria sp.	10	16	4	3	4	12	0		0	8	18	8

Site: Sample: CC#:	Lee Cr u/s Pacific GP1A CC130082	Lee Cr u/s Pacific GP1B CC130083	Lee Cr u/s Pacific GP1C CC130084	Lee Cr @ ditch GP2A CC130085	Lee Cr @ ditch GP2B CC130086	Lee Cr @ ditch GP2C CC130087	Laura Cr GP3A CC130088	Laura Cr GP3B CC130089	Laura Cr GP3C CC130090	Classic Cr near mouth GP5A CC130091	Classic Cr near mouth GP5B CC130092	Classic Cr near mouth GP5C CC130093
| Family: Hygrobatidae	0		0		0		0		0		0	
Hygrobates sp.	0		0		0		0		0		0	
| Family: Lebertiidae	0		0		0		0		0		0	
Lebertia sp.	1	6	1		0		0		0	2	0	
| Family: Sperchontidae	0		0		0		0		0		0	
Sperchon sp.	0	3	1	6	0	4	0		0		0	
	0		0		0		0		0		0	
| Order: Sarcoptiformes	0		0		0		0		0		0	
| Family: Hydrozetidae	0		1	3	0		10	1	0	4	0	8
	0		0		0		0		0		0	
Phylum: Mollusca	0		0		0		0		0		0	
| Class: Gastropoda	0		0		0		0		0		0	
| Order: Heterostropha	0		0		0		0		0		0	
| Family: Valvatidae	0		0		0		0		0		0	
Valvata sp.	0		0		0		0		0		0	
	0		0		0		0		0		0	
| Order: Hypsogastropoda	0		0		0		0		0		0	
| Family: Hydrobiidae	0		0		0		1		0		0	
	0		0		0		0		0		0	
Phylum: Annelida	0		0		0		0		0		0	
Subphylum: Clitellata	0		0		0		0		0		0	
| Class: Oligochaeta	0		0		0		0		0		0	
| Order: Haplotaxida	0		0		0		0		0		0	
| Family: Haplotaxidae	0		0		0		0		0		0	
Haplotaxis sp.	0		0		0		0		0		0	
	0		0		0		0		0		0	
| Order: Lumbriculida	0		0		0		0		0		0	
| Family: Lumbriculidae	166	67	194	51	0	96	32	33	21	10	0	2
Rhynchelmis sp.	0	16	0		0		3	1	0		0	
	0		0		0		0		0		0	
| Order: Tubificida	0		0		0		0		0		0	
| Family: Enchytraeidae	0		0		0		0		0		0	
Enchytraeus	0		0		0	20	0		10		0	
| Family: Naididae	0		0		80		0		0	196	75	118
	0		0		0		0		0		0	
Phylum: Nemata	8	6	5	13	0	12	0	2	3	48	13	24
Phylum: Platyhelminthes	0		0		0		0		0		0	
| Class: Turbellaria	0		0		0		0	2	0		0	
Terrestrials	0		0		0		7		0		0	
Totals:	**317**	**1060**	**565**	**1210**	**1660**	**1672**	**105**	**146**	**104**	**748**	**578**	**672**

Cordillera Consulting

Project: Brewery Creek
Laberge Environmental, Bonnie Bu
Taxonomist: Sue Salter
suesalter@shaw.ca
250-494-7553
Date Prepared: 11/8/2012

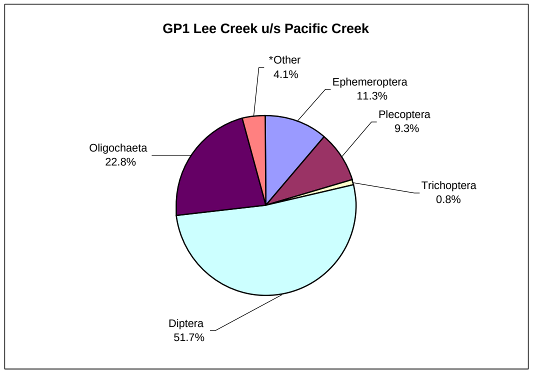
Site: Sample: CC#:	Lucky Cr GP6A CC130094	Lucky Cr GP6B CC130095	Lucky Cr GP6C CC130096	Golden Cr d/s Lucky GP8A CC130097	Golden Cr d/s Lucky GP8B CC130098	Golden Cr d/s Lucky GP8C CC130099	Golden Cr @ mouth GP10A CC130100	Golden Cr @ mouth GP10B CC130101	Golden Cr @ mouth GP10C CC130102	Brewery Cr @ mouth GP11A CC130103	Brewery Cr @ mouth GP11B CC130104	Brewery Cr @ mouth GP11C CC130105
	0		0		0		0		0		0	
Phylum: Arthropoda	0		0		0		0		0		0	
Subphylum: Hexapoda	0		0		0		0		0		0	
| Class: Insecta	0		0		0		0		0		0	
| Order: Ephemeroptera	0		0		0		4		0	6	0	
| Family: Ameletidae	0		0		0		0		0		0	
Ameletus sp.	0		0		1	3	0		5	10	1	3
| Family: Baetidae	0		0		0		0		0		0	
Acentrella sp.	0		0		0		0		0	42	27	35
Baetis bicaudatus	0		0	3	7	1	0	2	0	2	3	3
Baetis sp.	0		0		0		0		0		1	
| Family: Ephemerellidae	0		0		0		28	2	0	22	18	8
Drunella coloradensis	0		0		0		0		0	4	0	
Drunella doddsii	0		0		0		0		0	18	15	3
Serratella sp.	0		0		0		0		0	2	1	5
| Family: Heptageniidae	0		0	4	5	3	16	2	53		3	
Cinygmula sp.	0		0	14	16	6	4	3	27	30	19	35
Epeorus sp.	0		0		1		4	2	21	24	31	37
	0		0		0		0		0		0	
| Order: Plecoptera	0		1		9		8		0	4	6	13
| Family: Capniidae	2		2	3	7	5	24	29	53	16	23	5
| Family: Chloroperlidae	0		0	4	9		0		0		0	
Alloperla fraterna	0		0	6	0		0		0		0	
Suwallia sp.	0		0	49	25	29	0		0	8	13	8
Sweltsa sp.	0		0		0		0		0		0	
| Family: Leuctridae	0		0		0		0		0	2	0	3
| Family: Nemouridae	0		0		0		0		0		0	
Podmosta sp.	0		0		0		0		0		0	
Zapada cinctipes	0		0		0		0		0		0	
Zapada columbiana	0		0		0		0		0		0	
Zapada oregonensis group	0		0	2	2		0		27		2	8
Zapada sp.	0		0	16	10	5	28	21	48	6	2	
| Family: Perlodidae	0		0	2	4		0	5	5	12	7	
Kogotus nonus	0		0		0		0		0		0	5
Skwala sp.	0		0		0		4		0		0	
| Family: Taeniopterygidae	0		0		2		0		0		0	
Taenionema sp.	0		0		0		0		0		1	
	0		0		0		0		0		0	
| Order: Trichoptera	0		0		0		0		0		0	
| Family: Apataniidae	0		0		0		0		0		0	
Allomyia sp.	0		0		0		0		0		0	
| Family: Limnephilidae	0		1	1	2		0	2	0		1	
Dicosmoecus sp.	0		0		0		0		0	2	0	
Ecclisomyia sp.	0		0		1	2	0		0		0	
| Family: Rhyacophilidae	0		0		0		0		0		0	
Rhyacophila sp.	0		0		0		0		0	4	0	
Rhyacophila vofixa group	0		0		0		0		0		0	3
	0		0		0		0		0		0	
| Order: Diptera	2	7	7	1	0	3	0		0		2	3
| Family: Ceratopogonidae	0		0		0		0		0		0	
Probezzia sp.	0		0		0		0		0	2	2	
Sphaeromias sp.	0		0		0		0		0	4	1	
| Family: Chironomidae	0		0		0		0		0		0	
| Subfamily: Chironominae	0		0		0		0		0		0	
Zavreliella marmorata	0		0		0		0		0		0	5
| Tribe: Tanytarsini	0		0		0		0		0		0	
Tanytarsus sp.	0	1	0		0		0		0		0	
| Subfamily: Diamesinae	0		0		0		0		0		0	
| Tribe: Diamesini	0		0		0		0		0		0	

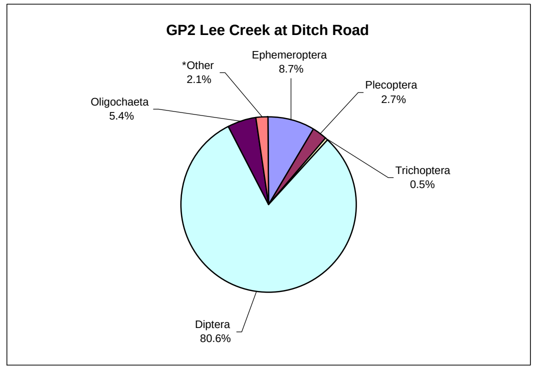
Site: Sample: CC#:	Lucky Cr GP6A CC130094	Lucky Cr GP6B CC130095	Lucky Cr GP6C CC130096	Golden Cr d/s Lucky GP8A CC130097	Golden Cr d/s Lucky GP8B CC130098	Golden Cr d/s Lucky GP8C CC130099	Golden Cr @ mouth GP10A CC130100	Golden Cr @ mouth GP10B CC130101	Golden Cr @ mouth GP10C CC130102	Brewery Cr @ mouth GP11A CC130103	Brewery Cr @ mouth GP11B CC130104	Brewery Cr @ mouth GP11C CC130105
Diamesa sp.	78	33	25	103	112	35	64		80		0	
Pagastia sp.	0		0		0		0		0	18	24	37
Pseudodiamesa sp.	0		0		0		0		0		0	
| Subfamily: Orthocladiinae	0		0		0	3	0		0		0	
Brillia sp.	0		0		0		0		0		5	
Eukiefferiella sp.	17	35	23	16	10		2192	402	1392	48	0	
Orthocladius sp.	0		0	2	0		44	18	0	290	81	579
Parorthocladius sp.	0		2		0		24	11	32		0	
Rheocricotopus sp.	0		0		0		0		0		0	
Tvetenia sp.	0		2		0		0		0		0	
| Tribe: Orthocladiini	0		0		0		0		0		0	
Chaetocladius sp.	0		0		0		0		0		0	
| Subfamily: Tanypodinae	0		0		0		0		0		0	
| Tribe: Procladiini	0		0		0		0		0		0	
Procladius sp.	55	11	0	14	0	2	0		16		0	
| Family: Deuterophlebiidae	0		0		0		0		0		0	
Deuterophlebia sp.	0		0		0		0		0		1	
| Family: Empididae	0		0		0		0		0		0	
Chelifera/ Metachela	0		0		0		8	3	0	8	2	11
Clinocera sp.	0		0		0		0		0		0	3
| Family: Muscidae	0		0		0		0		0		0	
Limnophora sp.	0		0		0		0		0		0	
| Family: Psychodidae	1		0		1	2	8	3	5		0	
Pericoma sp.	0		0		0		0		0	2	0	3
| Family: Simuliidae	0		0		0		0		5		0	
Prosimulium sp.	0		1	4	4	1	0		0	2	0	
Simulium sp.	0		0		0		0	6	0	2	2	3
| Family: Tipulidae	1	1	0	1	0		0		0		0	
Dicranota sp.	2		1		0		0		0		0	
Rhabdomastix sp.	0		0		0		0		0		0	
Tipula sp.	0	2	0	3	0		0		0		0	
	0		0		0		0		0		0	
| Order: Hemiptera	0		0		0		0		0		0	
| Family: Mesoveliidae	0		0		0		0		0		0	
Mesovelia sp.	0		0		0		0		0		0	
	0		0		0		0		0		0	
| Order: Lepidoptera	0		1		2		0		0		0	
| Family: Crambidae	0		0		1		0		0		0	
| Family: Noctuidae	0		1		0		0		0		0	
	0		0		0		0		0		0	
| Class: Entognatha	0		0		0		0		0		0	
| Order: Collembola	0		0		0		0		0		0	
| Family: Poduridae	2	2	2	1	3		0		0		0	
| Family: Sminthuridae	0		0		0		0		0		0	
	0		0		0		0		0		0	
Subphylum: Crustacea	0		0		0		0		0		0	
| Class: Ostracoda	0	1	1		0		4		0	4	0	
| Class: Branchiopoda	0		0		0		0		0		0	
| Order: Cladocera	0		0		0		0		0		0	
| Family: Daphniidae	0		0		0		0		0		0	
Daphnia sp.	0		0		0		12		11		0	
	0		0		0		0		0		0	
| Class: Copepoda	0		0		0		0		0		0	
| Order: Cyclopoida	0	1	0		0		0		0		0	
| Order: Harpacticoida	0		3		0		0		0		0	
	0		0		0		0		0		0	
| Class: Malacostraca	0		0		0		0		0		0	
| Order: Amphipoda	0		0		0		0		0		0	
| Family: Gammaridae	0		0		0		0		0		0	
Gammarus sp.	0		0		0		0		0		0	
	0		0		0		0		0		0	
Subphylum: Chelicerata	0		0		0		0		0		0	
| Class: Arachnida	0		0		0		0		0		0	
| Order: Trombidiformes	0		0		0		0		0	8	4	3
| Family: Aturidae	0		0		0		0		0		0	
Aturus sp.	1		0	1	0		8		0	14	9	21
| Family: Feltriidae	0		0		0		0		0		0	
Feltria sp.	0		0	1	1	2	0		0	6	0	

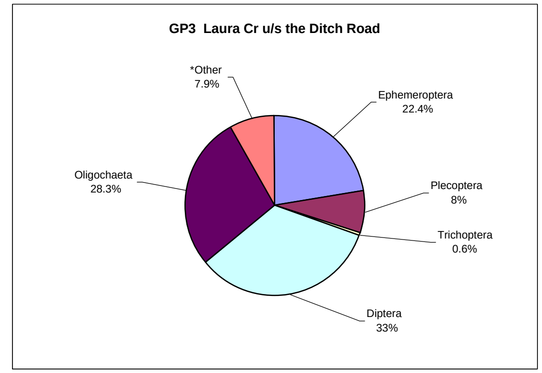
Site: Sample: CC#:	Lucky Cr GP6A CC130094	Lucky Cr GP6B CC130095	Lucky Cr GP6C CC130096	Golden Cr d/s Lucky GP8A CC130097	Golden Cr d/s Lucky GP8B CC130098	Golden Cr d/s Lucky GP8C CC130099	Golden Cr @ mouth GP10A CC130100	Golden Cr @ mouth GP10B CC130101	Golden Cr @ mouth GP10C CC130102	Brewery Cr @ mouth GP11A CC130103	Brewery Cr @ mouth GP11B CC130104	Brewery Cr @ mouth GP11C CC130105
| Family: Hygrobatidae	0		0		0		0		0		0	
Hygrobates sp.	0		0		0		0		0	2	2	
| Family: Lebertiidae	0		0		0		0		0		0	
Lebertia sp.	0		0	1	0		4		5	2	1	11
| Family: Sperchontidae	0		0		0		0		0		0	
Sperchon sp.	0		0		0		0		0	10	6	35
	0		0		0		0		0		0	
| Order: Sarcoptiformes	0		0		0		0		0		0	
| Family: Hydrozetidae	4		1	3	1	2	0		0		1	
	0		0		0		0		0		0	
Phylum: Mollusca	0		0		0		0		0		0	
| Class: Gastropoda	0		0		0		0		0		0	
| Order: Heterostropha	0		0		0		0		0		0	
| Family: Valvatidae	0		0		0		0		0		0	
Valvata sp.	1		0		0		0		0		0	
	0		0		0		0		0		0	
| Order: Hypsogastropoda	0		0		0		0		0		0	
| Family: Hydrobiidae	0		0		1		4		0		0	
	0		0		0		0		0		0	
Phylum: Annelida	0		0		0		0		0		0	
Subphylum: Clitellata	0		0		0		0		0		0	
| Class: Oligochaeta	0		0		0		0		0		0	
| Order: Haplotaxida	0		0		0		0		0		0	
| Family: Haplotaxidae	0		0		0		0		0		0	
Haplotaxis sp.	0		0	2	0		0		0		0	
	0		0		0		0		0		0	
| Order: Lumbriculida	0		0		0		0		0		0	
| Family: Lumbriculidae	0		0	80	37	71	4	24	0		0	
Rhynchelmis sp.	0		1		0		8	2	0		0	
	0		0		0		0		0		0	
| Order: Tubificida	0		0		0		0		0		0	
| Family: Enchytraeidae	0		0		0		0		0		0	
Enchytraeus	4		3		0		0		0	2	0	
| Family: Naididae	4	3	0		0		44	3	0		0	5
	0		0		0		0		0		0	
Phylum: Nemata	4	2	2	2	0	2	36		0	4	1	
Phylum: Platyhelminthes	0		0		0		0		0		0	
| Class: Turbellaria	0		0		0	3	0		0		0	
Terrestrials	0		0		0		0		0		0	
Totals:	**178**	**99**	**80**	**339**	**274**	**180**	**2584**	**540**	**1785**	**642**	**318**	**893**

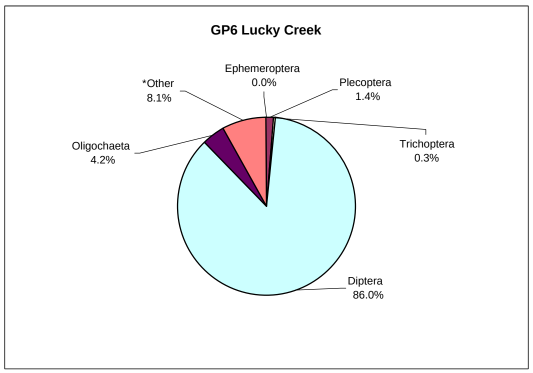
FIGURE 7-1

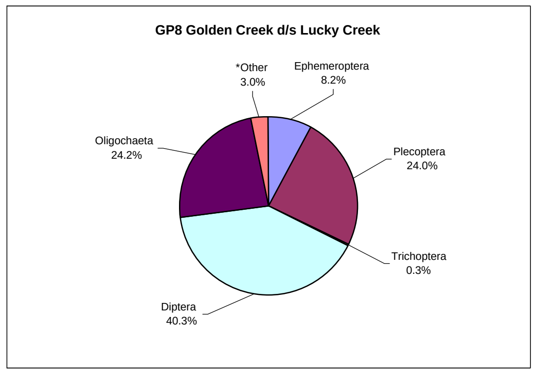
COMPOSITION OF THE BENTHIC COMMUNITY AT EACH SITE, BREWERY CREEK, AUGUST 2012

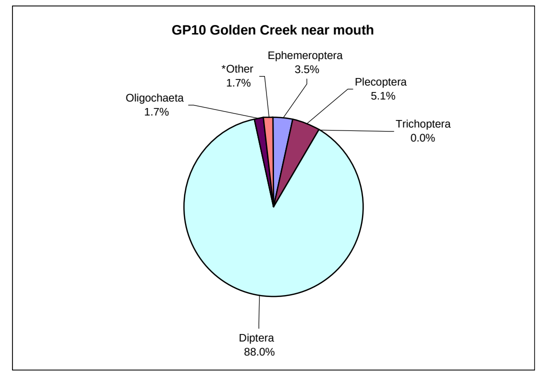


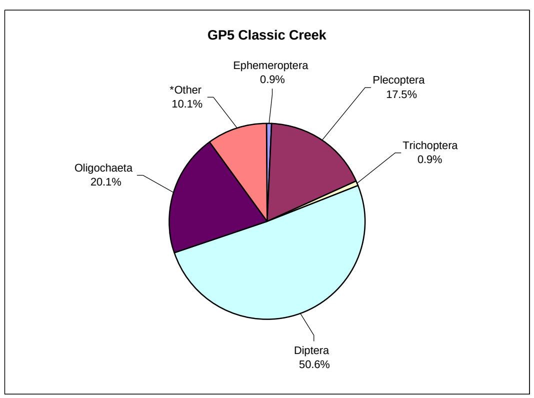


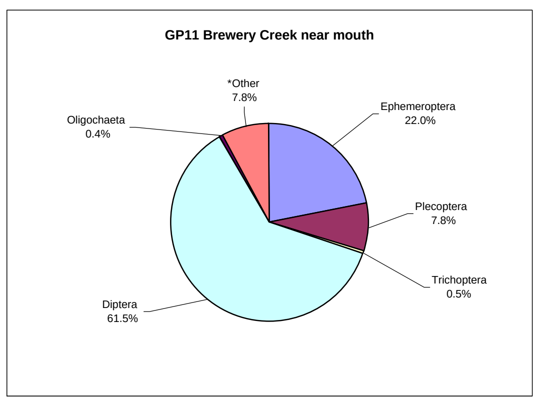












Other includes one or more of the following taxonomic group:
Hemiptera
Lepidoptera
Collembola
Ostracoda
Copepoda
Amphipoda
Arachnida
Gastropoda
Nemata
Platyhelminthes

TABLE 7-5, APPENDIX E

VARIOUS MEASURES, RICHNESS AND INDICES FOR EACH BENTHIC INVERTEBRATE SAMPLE, BREWERY CREEK 2012

Site: Sample:	Lee Cr u/s Pacific GP1A	Lee Cr u/s Pacific GP1B	Lee Cr u/s Pacific GP1C	Lee Cr @ ditch GP2A	Lee Cr @ ditch GP2B	Lee Cr @ ditch GP2C	Laura Cr GP3A	Laura Cr GP3B	Laura Cr GP3C	Classic Cr near mouth GP5A	Classic Cr near mouth GP5B	Classic Cr near mouth GP5C
Richness Measures												
Species Richness	25	28	35	28	19	26	22	24	17	26	21	26
EPT Richness	11	13	19	14	12	12	7	8	4	12	7	8
Ephemeroptera Richness	4	7	9	6	7	6	5	4	2	3	1	1
Plecoptera Richness	7	4	8	7	3	5	1	4	2	7	5	5
Trichoptera Richness	0	2	2	1	2	1	1	0	0	2	1	2
Chironomidae Richness	2	4	4	4	4	4	5	3	6	2	4	4
Oligochaeta Richness	1	2	1	1	1	2	2	2	2	2	1	2
Abundance Measures												
Corrected Abundance	317	1060	565	1210	1660	1672	112	146	104	748	578	672
EPT Abundance	33	220	162	149	208	184	28	47	33	146	146	92
Dominance Measures												
1st Dominant Taxon	Lumbriculidae	Eukiefferiella sp.	Lumbriculidae	Eukiefferiella sp.	Eukiefferiella sp.	Eukiefferiella sp.	Lumbriculidae	Lumbriculidae	Lumbriculidae	Diamesa sp.	Diamesa sp.	Diamesa sp.
1st Dominant Abundance	166	634	194	800	1220	1024	32	33	21	242	234	226
2nd Dominant Taxon	Eukiefferiella sp.	Lumbriculidae	Eukiefferiella sp.	Diamesa sp.	Epeorus sp.	Diamesa sp.	Cinygmula sp.	Cinygmula sp.	Prosimulium sp.	Naididae	Naididae	Naididae
2nd Dominant Abundance	84	67	174	112	104	192	17	29	19	196	75	118
3rd Dominant Taxon	Epeorus sp.	Cinygmula sp.	Epeorus sp.	Epeorus sp.	Diamesa sp.	Lumbriculidae	Hydrozetidae	Prosimulium sp.	Cinygmula sp.	Zapada sp.	Zapada sp.	Zapada sp.
3rd Dominant Abundance	14	48	32	61	100	96	10	21	16	76	75	46
% 1 Dominant Taxon	52.37%	59.81%	34.34%	66.12%	73.49%	61.24%	28.57%	22.60%	20.19%	32.35%	40.48%	33.63%
% 2 Dominant Taxa	26.50%	6.32%	30.80%	9.26%	6.27%	11.48%	15.18%	19.86%	18.27%	26.20%	12.98%	17.56%
% 3 Dominant Taxa	4.42%	4.53%	5.66%	5.04%	6.02%	5.74%	8.93%	14.38%	15.38%	10.16%	12.98%	6.85%
Community Composition												
% Ephemeroptera	5.36%	11.70%	13.81%	7.93%	10.12%	7.89%	20.54%	25.34%	18.27%	1.34%	0.52%	0.60%
% Plecoptera	5.05%	7.83%	14.34%	3.88%	1.93%	2.63%	2.68%	6.85%	13.46%	16.84%	24.39%	12.20%
% Trichoptera	0.00%	1.23%	0.53%	0.50%	0.48%	0.48%	1.79%	0.00%	0.00%	1.34%	0.35%	0.89%
% EPT	10.41%	20.75%	28.67%	12.31%	12.53%	11.00%	25.00%	32.19%	31.73%	19.52%	25.26%	13.69%
% Diptera	29.02%	67.92%	33.98%	80.66%	82.41%	78.71%	25.89%	35.62%	34.62%	43.05%	56.06%	54.46%
% Oligochaeta	52.37%	7.83%	34.34%	4.21%	4.82%	6.94%	31.25%	23.29%	29.81%	27.54%	12.98%	17.86%
% Baetidae	0.32%	1.13%	1.59%	1.57%	1.20%	1.44%	3.57%	4.79%	2.88%	0.53%	0.52%	0.60%
% Chironomidae	28.08%	66.51%	33.45%	80.17%	81.69%	78.47%	16.07%	18.49%	14.42%	35.03%	46.02%	43.45%
% Odonata	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Functional Group Composition												
% Predators	6.62%	7.17%	9.73%	2.89%	2.17%	3.11%	11.61%	4.11%	0.96%	3.48%	5.36%	8.63%
% Shredder-Herbivores	0.95%	0.57%	1.95%	0.99%		0.24%		1.37%		13.64%	21.63%	9.23%
% Collector-Gatherers	55.21%	16.51%	40.00%	20.33%	14.70%	26.08%	46.43%	41.10%	43.27%	61.23%	54.84%	53.27%
% Scrapers	4.73%	9.06%	7.26%	6.12%	7.47%	5.98%	16.07%	19.86%	15.38%	0.53%		
% CF	0.32%	0.28%	0.18%	0.50%	0.72%	0.24%	5.36%	14.38%	18.27%	5.88%	6.92%	5.65%
% OM	26.50%	59.81%	30.97%	66.61%	73.73%	61.24%	6.25%	8.22%	4.81%	2.67%	3.63%	4.17%
% Unclassified	5.68%	6.60%	9.91%	2.56%	1.20%	3.11%	14.29%	10.96%	17.31%	12.57%	7.61%	19.05%
Functional Group Richness												
Predators Richness	8	6	10	5	4	7	2	4	1	5	5	7
Shredder-Herbivores Richness	2	1	1	3		1		1		4	3	3
Collector-Gatherers Richness	5	10	9	9	6	8	9	7	8	6	4	5
Scrapers Richness	2	2	2	2	2	2	2	1	1	1		
CF Richness	1	1	1	2	1	1	1	1	1	1	1	1
OM Richness	1	1	2	2	2	1	2	1	2	1	1	1
Unclassified	6	7	10	5	4	6	6	9	4	8	7	9
Diversity/Evenness Measures												
Shannon-Weaver H' (log 10)	0.20	0.26	0.33	0.18	0.07	0.20	0.40	0.38	0.38	0.33	0.31	0.37
Shannon-Weaver H' (log 2)	0.66	0.85	1.08	0.59	0.23	0.68	1.32	1.27	1.25	1.09	1.03	1.24
Shannon-Weaver H' (log e)	0.46	0.59	0.75	0.41	0.16	0.47	0.92	0.88	0.86	0.76	0.71	0.86
Simpson's Index (D)	0.35	0.37	0.22	0.45	0.55	0.40	0.12	0.13	0.11	0.19	0.21	0.16
Simpson's Index of Diversity (1 - D)	0.65	0.63	0.78	0.55	0.45	0.60	0.88	0.87	0.89	0.81	0.79	0.84
Simpson's Reciprocal Index (1/D)	2.88	2.70	4.53	2.22	1.82	2.52	8.19	7.96	8.79	5.18	4.72	6.16
Biotic Indices												
Hilsenhoff Biotic Index	6.79	6.26	5.68	6.54	6.92	6.44	4.92	4.86	4.77	5.19	4.61	4.84

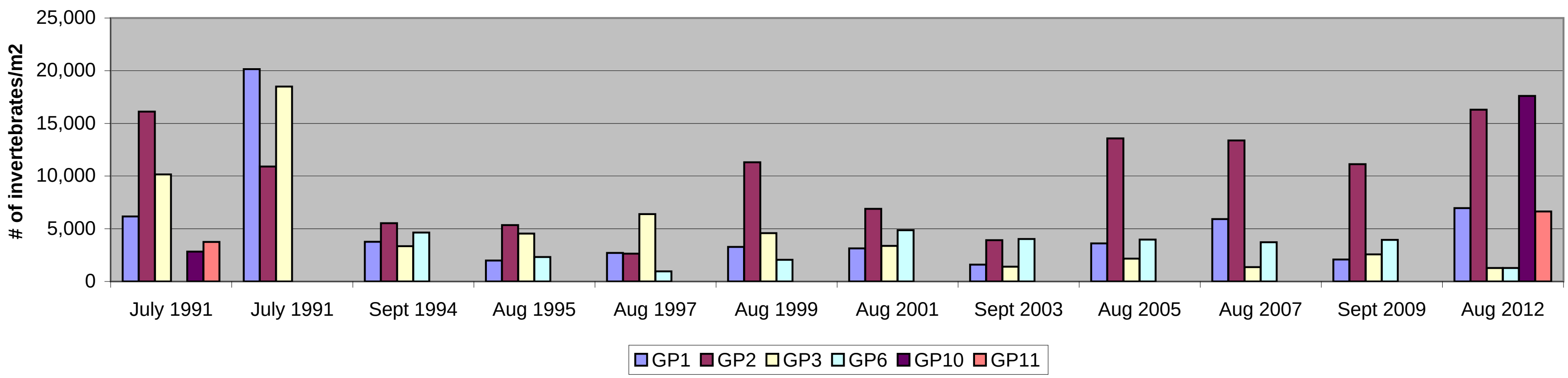
TABLE 7-5, APPENDIX E

VARIOUS MEASURES, RICHNESS AND INDICES FOR EACH BENTHIC INVERTEBRATE SAMPLE, BREWERY CREEK 2012

Site: Sample:	Lucky Cr GP6A	Lucky Cr GP6B	Lucky Cr GP6C	Golden Cr d/s Lucky GP8A	Golden Cr d/s Lucky GP8B	Golden Cr d/s Lucky GP8C	Golden Cr @ mouth GP10A	Golden Cr @ mouth GP10B	Golden Cr @ mouth GP10C	Brewery Cr @ mouth GP11A	Brewery Cr @ mouth GP11B	Brewery Cr @ mouth GP11C
Richness Measures												
Species Richness	15	12	19	27	26	19	24	18	16	36	34	28
EPT Richness	1	0	3	11	15	8	9	9	8	18	18	15
Ephemeroptera Richness	0	0	0	3	5	4	5	5	4	10	10	8
Plecoptera Richness	1	0	2	7	8	3	4	3	4	6	7	6
Trichoptera Richness	0	0	1	1	2	1	0	1	0	2	1	1
Chironomidae Richness	3	4	4	4	2	3	4	3	4	3	3	3
Oligochaeta Richness	2	1	2	2	1	1	3	3	0	1	0	1
Abundance Measures												
Corrected Abundance	178	99	80	339	274	180	2584	540	1785	642	318	893
EPT Abundance	2	0	4	104	101	54	120	68	239	214	174	174
Dominance Measures												
1st Dominant Taxon	Diamesa sp.	Eukiefferiella sp.	Diamesa sp.	Diamesa sp.	Diamesa sp.	Lumbriculidae	Eukiefferiella sp.	Eukiefferiella sp.	Eukiefferiella sp.	Orthocladius sp.	Orthocladius sp.	Orthocladius sp.
1st Dominant Abundance	78	35	25	103	112	71	2192	402	1392	290	81	579
2nd Dominant Taxon	Procladius sp.	Diamesa sp.	Eukiefferiella sp.	Lumbriculidae	Lumbriculidae	Diamesa sp.	Diamesa sp.	Capniidae	Diamesa sp.	Eukiefferiella sp.	Epeorus sp.	Epeorus sp.
2nd Dominant Abundance	55	33	23	80	37	35	64	29	80	48	31	37
3rd Dominant Taxon	Eukiefferiella sp.	Procladius sp.	Diptera	Suwallia sp.	Suwallia sp.	Suwallia sp.	Naididae	Lumbriculidae	Capniidae	Acentrella sp.	Acentrella sp.	Pagastia sp.
3rd Dominant Abundance	17	11	7	49	25	29	44	24	53	42	27	37
% 1 Dominant Taxon	43.82%	35.35%	31.25%	30.38%	40.88%	39.44%	84.83%	74.44%	77.98%	45.17%	25.47%	64.84%
% 2 Dominant Taxa	30.90%	33.33%	28.75%	23.60%	13.50%	19.44%	2.48%	5.37%	4.48%	7.48%	9.75%	4.14%
% 3 Dominant Taxa	9.55%	11.11%	8.75%	14.45%	9.12%	16.11%	1.70%	4.44%	2.97%	6.54%	8.49%	4.14%
Community Composition												
% Ephemeroptera	0.00%	0.00%	0.00%	6.19%	10.95%	7.22%	2.17%	2.04%	5.94%	24.92%	37.42%	14.45%
% Plecoptera	1.12%	0.00%	3.75%	24.19%	24.82%	21.67%	2.48%	10.19%	7.45%	7.48%	16.98%	4.70%
% Trichoptera	0.00%	0.00%	1.25%	0.29%	1.09%	1.11%	0.00%	0.37%	0.00%	0.93%	0.31%	0.34%
% EPT	1.12%	0.00%	5.00%	30.68%	36.86%	30.00%	4.64%	12.59%	13.39%	33.33%	54.72%	19.48%
% Diptera	87.64%	90.91%	76.25%	42.48%	46.35%	25.56%	90.56%	82.04%	85.71%	58.57%	37.74%	72.12%
% Oligochaeta	4.49%	3.03%	5.00%	24.19%	13.50%	39.44%	2.17%	5.37%	0.00%	0.31%	0.00%	0.56%
% Baetidae	0.00%	0.00%	0.00%	0.88%	2.55%	0.56%	0.00%	0.37%	0.00%	6.85%	9.75%	4.26%
% Chironomidae	84.27%	80.81%	65.00%	39.82%	44.53%	22.22%	89.94%	79.81%	85.15%	55.45%	34.59%	69.54%
% Odonata	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Functional Group Composition												
% Predators	34.83%	11.11%	2.50%	22.12%	9.85%	21.11%	0.93%	0.56%	1.18%	11.21%	12.89%	11.20%
% Shredder-Herbivores			1.25%	5.31%	4.74%	2.78%	1.08%	3.89%	4.20%	0.93%	2.83%	0.90%
% Collector-Gatherers	48.31%	37.37%	46.25%	55.46%	57.30%	61.11%	7.89%	11.11%	7.17%	60.75%	48.11%	75.92%
% Scrapers	0.56%			4.13%	6.57%	3.33%	0.46%	0.93%	2.69%	8.41%	16.04%	8.06%
% CF		1.01%	1.25%	1.18%	1.46%	0.56%		1.11%		0.62%	0.63%	0.34%
% OM	9.55%	37.37%	28.75%	5.60%	4.01%	1.11%	84.83%	74.44%	77.98%	7.79%	0.31%	
% Unclassified	6.74%	13.13%	20.00%	6.19%	16.06%	10.00%	4.80%	7.96%	6.78%	10.28%	19.18%	3.58%
Functional Group Richness												
Predators Richness	4	1	2	7	3	5	4	1	2	12	10	9
Shredder-Herbivores Richness			1	2	3	1	1	1	2	1	3	1
Collector-Gatherers Richness	3	3	7	4	4	4	8	6	4	10	8	10
Scrapers Richness	1			1	3	1	3	2	2	2	3	2
CF Richness		1	1	1	1	1		1		2	1	1
OM Richness	1	2	1	2	2	1	1	1	1	2	1	
Unclassified	6	5	7	10	10	6	7	6	5	7	8	5
Diversity/Evenness Measures												
Shannon-Weaver H' (log 10)	0.21	0.23	0.33	0.34	0.35	0.30	-0.08	0.07	0.02	0.38	0.44	0.22
Shannon-Weaver H' (log 2)	0.69	0.76	1.09	1.14	1.16	0.99	-0.25	0.22	0.07	1.25	1.45	0.72
Shannon-Weaver H' (log e)	0.48	0.53	0.76	0.79	0.80	0.69	-0.17	0.15	0.05	0.87	1.00	0.50
Simpson's Index (D)	0.30	0.25	0.19	0.18	0.20	0.22	0.72	0.56	0.61	0.22	0.10	0.43
Simpson's Index of Diversity (1 - D)	0.70	0.75	0.81	0.82	0.80	0.78	0.28	0.44	0.39	0.78	0.90	0.57
Simpson's Reciprocal Index (1/D)	3.39	4.03	5.40	5.69	4.96	4.55	1.39	1.78	1.63	4.50	9.68	2.33
Biotic Indices												
Hilsenhoff Biotic Index	6.40	6.02	5.15	4.83	4.02	4.82	7.40	6.93	6.87	4.48	2.97	5.04

TABLE 7-6	DENSITIES (# of invertebrates/m2) OVER TIME AT SELECTED SITES							
Sampler	**Year**	**GP1**	**GP2**	**GP3**	**GP6**	**GP10**	**GP11**	**Average/Year:**
EP	July 1991	6,167	16,117	10,153		2,834	3,747	**7,804**
NORECOL	July 1991	20,151	10,911	18,494				**16,519**
LES	Sept 1994	3,761	5,532	3,350	4,646			**4,322**
LES	Aug 1995	1,988	5,346	4,539	2,321			**3,549**
LES	Aug 1997	2,709	2,637	6,390	954			**3,173**
LES	Aug 1999	3,276	11,310	4,582	2,063			**5,308**
LES	Aug 2001	3,147	6,886	3,373	4,862			**4,567**
LES	Sept 2003	1,597	3,914	1,406	4,026			**2,736**
LES	Aug 2005	3,613	13,574	2,171	3,979			**5,834**
LES	Aug 2007	5,920	13,387	1,363	3,728			**6,100**
LES	Sept 2009	2085	11134	2569	3943			**4,933**
LES	Aug 2012	6,968	16,297	1,274	1,281	17,614	6,649	**8,347**
	Average/ Site:	**5,115**	**9,754**	**4,972**	**3,180**	**10,224**	**5,198**	

FIGURE 7-2 DENSITY (#/m2) OVER TIME PER SAMPLING DATE



APPENDIX F

FISHERIES

PHOTOS OF FISH SAMPLING SITES, AUGUST 2012

Photo #1 Brewery Creek sampling site GP-11, August 2012.

Photo #2 Dry channel of Laura Creek at the confluence with the South Klondike River, August 2012.

Photo #3 Laura Creek flow becoming subsurface downstream of the Ditch Road, August 2012.

Photo #4 Laura Creek sampling site GP-3, August 2012.

Photo #5 Lee Creek sampling site GP-2, August 2012.

Photo #6 Lee Creek sampling site PC-2, August 2012.

Photo #7 Golden Creek sampling site GP-10, August 2012.

Photo #8 Lucky Creek sampling site GP-6, August 2012.

Table 1 Aquatic habitat descriptions of assessed sites within the major drainages of the Golden Predator baseline study area, August 2012.

Parameter		Brewery Creek	Laura Creek	Lee Creek			Golden Creek
Site Characteristics	**Site Code**	**GP-11**	**GP-3**	**F-1**	**GP-2**	**GP-1**	**GP-10**
	Survey Date	Aug. 9, 2012	Aug. 7, 2012	Aug. 7, 2012	Aug. 7, 2012	Aug. 8, 2012	Aug. 9, 2012
	Site Elevation (m)	573	530	503	529	534	554
	Site Survey Length (m)	150	50	150	100	100	100
Channel	**Ave. Channel Width (m)**	31.2	3.2	11.8	14.1	11.3	8.7
	Ave. Wetted Width (m)	22.5	3.2	10.5	11.6	11.1	8.0
	Ave. Residual Pool Depth (m)	n/a	0.4	0.4	0.5	0.6	0.5
	Stage	moderate	moderate	moderate	moderate	moderate	moderate
	Gradient (%)	1.0	1.1	0.4	1.1	0.4	0.7

Parameter		Brewery Creek	Laura Creek	Lee Creek			Golden Creek
Cover	**Cover Abundance (%)**	abundant (~30)	trace (<5)	abundant (~30)	abundant (~30)	abundant (~25)	abundant (~25)
	Dominant Cover Type	small woody debris and deep pools	o/h vegetation and small woody debris	small woody debris and undercut banks	o/h vegetation	o/h vegetation and small woody debris	small woody debris
	Subdominant Cover Type	large woody debris, undercut banks and o/h vegetation	deep pools and undercut banks	o/h vegetation and deep pools	small woody debris, undercut banks and deep pools	undercut banks and deep pools	undercut banks, deep pools and overhanging vegetation
	Trace Cover Types	undercut banks, small and large woody debris	large woody debris	large woody debris	large woody debris and boulders	large woody debris	large woody debris
	LWD Frequency	few	few	few	few	few	few
	Crown Closure (%)	1-20	71-90	1-20	1-20	1-20	1-20
	Left Bank Shape	sloping (<45°)	vertical (>45°)	vertical (>45°)	vertical (>45°)	vertical (>45°)	vertical (>45°)
	Texture	fines	fines	fines	fines	fines	fines
	Riparian Vegetation	mixed forest	shrubs	grasses and shrubs	grasses and deciduous trees	grasses and shrubs	grasses, shrubs and conifers
	Riparian Stage	mature forest	shrubs	shrub	young forest	shrub	shrub
	Right Bank Shape	sloping (<45°)	vertical (>45°)	vertical (>45°)	sloping (<45°)	vertical (>45°)	vertical (>45°)
	Texture	fines	fines	fines	fines	fines	fines
	Riparian Vegetation	grasses and shrubs	shrubs	grasses and shrubs	shrubs	grasses and shrubs	grasses, shrubs and conifers
	Riparian Stage	shrub	shrub	shrub	young forest	shrub	shrub
	Instream Vegetation	algae	none	algae and moss	algae and moss	moss	none

Parameter		Brewery Creek	Laura Creek	Lee Creek			Golden Creek
Morphology	**Dominant Bed Material**	cobble	fines	cobble	gravel	gravel	cobble
	Subdominant Bed Material	gravel	gravel	gravel	cobble	fines	gravel
	D_{95} (cm)	21	12	15	19	14	28
	Morphology	riffle-pool	step-pool	riffle-pool	riffle-pool	riffle-pool	riffle-pool
	Meander Pattern	sinuous	tortuous	sinuous	regular	sinuous	irregular
	Islands	infrequent	none	none	none	occasional	none
	Bars	side	side	side	side	side	side
	Confinement	unconfined	unconfined	unconfined	unconfined	unconfined	unconfined

Table 2 Summary of fish captures in drainages associated with the Golden Predator baseline study area, August 2012.

Drainage	Sample Site	Capture Method	Sample Effort	Catch				Comments
				Arctic Grayling	Burbot	Chinook Salmon	Slimy Sculpin	
Lee Creek	F-1	Angling	30 min	0	0	0	0	
	F-1	Electro	678 sec	0	0	2	8	
	F-1	MNT (6)	26.5 hrs	0	0	2	4	
	GP-1	Angling	15 min	0	0	0	0	
	GP-1	Electro	643 sec	0	0	0	5	1 SS observed
	GP-1	MNT (6)	16 hrs	0	0	0	1	
	GP-2	Angling	30 min	4	0	0	0	4 AG strikes
	GP-2	Electro	651 sec	0	0	0	11	4 SS observed
	GP-2	MNT (6)	21 hrs	0	0	0	8	
	GP-2	Seine	105 m^2	0	0	0	0	
	PC-1	MNT (6)	23 hrs	0	0	0	0	Pacific Creek at mouth
	PC-2	Electro	157 sec	0	0	0	0	Pacific Creek
	PC-2	MNT (6)	23 hrs	0	0	0	0	Pacific Creek
Golden Creek	GP-6	Electro	163 sec	0	0	0	0	Lucky Creek
	GP-6	MNT (6)	24.5 hrs	0	0	0	0	Lucky Creek
	GP-10	Electro	428 sec	0	0	5	23	1CN and 7 SS observed
	GP-10	MNT (6)	23.0 hrs	0	1	1	3	
Laura Creek	GP-3	Electro	612 sec	0	0	0	0	
	GP-3	MNT (6)	19 hrs	0	0	0	0	
Brewery Creek	GP-11	Angling	45 min	0	0	0	0	
	GP-11	Electro	707 sec	0	0	5	12	2 CN and 7 SS observed
	GP-11	MNT (6)	20.5 hrs	0	1	1	1	

Legend: MNT(#) = Minnow trap; Electro = Electroshocker; AG = Arctic grayling; CN = juvenile Chinook salmon; SS = slimy sculpin

Table 3 Arctic grayling tissue metal concentrations (ug/g wet weight) from Lee Creek site GP-2 in the Golden Predator baseline study area, August 2012.

Drainage	Site	Arsenic	Cadmium	Copper	Lead	Mercury	Selenium	Zinc
Lee Creek	**GP-2**	0.029	0.017	0.630	0.006	0.073	1.31	8.01
	GP-2	0.026	0.021	0.586	0.006	0.049	1.74	6.86
	GP-2	0.021	0.022	0.510	0.022	0.048	2.03	7.69
	GP-2	0.013	0.004	0.346	0.008	0.051	1.52	6.02
	Mean	0.022	0.016	0.518	0.010	0.055	1.65	7.15
	SD	0.007	0.008	0.125	0.007	0.012	0.31	0.89

Table 4 Slimy sculpin whole body metal concentrations (ug/g wet weight) from three watersheds in the Golden Predator baseline study area, August 2012.

Drainage	Site	Arsenic	Cadmium	Copper	Lead	Mercury	Selenium	Zinc
Lee Creek	**GP-2**	0.132	0.198	0.888	0.030	0.041	2.84	32.7
	GP-2	0.113	0.152	1.050	0.024	0.033	2.16	36.2
	GP-2	0.075	0.097	0.817	0.030	0.028	1.76	26.7
	GP-2	0.076	0.120	0.796	0.039	0.032	1.86	26.4
	GP-2	0.117	0.113	1.170	0.024	0.029	2.42	28.5
	GP-2	0.128	0.171	1.200	0.046	0.032	2.03	30.8
	Mean	0.107	0.142	0.987	0.032	0.032	2.18	30.2
	SD	0.025	0.039	0.178	0.009	0.005	0.40	3.8
Golden Creek	**GP-10**	0.233	0.109	0.951	0.042	0.034	1.81	31.3
	GP-10	0.175	0.111	0.851	0.030	0.039	1.64	30.4
	GP-10	0.321	0.119	1.280	0.073	0.041	1.34	31.6
	GP-10	0.171	0.091	0.911	0.058	0.049	1.45	29.6
	GP-10	0.247	0.142	1.130	0.056	0.047	1.83	36.4
	GP-10	0.190	0.107	1.080	0.050	0.043	2.04	33.0
	Mean	0.223	0.113	1.034	0.051	0.042	1.69	32.1
	SD	0.057	0.017	0.160	0.015	0.006	0.26	2.4
Brewery Creek	**GP-11**	0.176	0.052	0.872	0.017	0.039	1.47	28.8
	GP-11	0.298	0.044	0.883	0.037	0.026	1.90	27.1
	GP-11	0.479	0.058	0.974	0.049	0.026	1.95	22.1
	GP-11	0.391	0.078	0.972	0.045	0.022	1.58	22.7
	GP-11	0470	0.057	1.100	0.053	0.026	1.49	25.6
	GP-11	0.770	0.059	1.160	0.156	0.028	1.41	25.3
	Mean	0.431	0.058	0.994	0.059	0.028	1.63	25.3
	SD	0.202	0.011	0.116	0.049	0.006	0.23	2.6

Table 5 Summary of fish metal concentrations (ug/g wet weight) in fish from sites in the Golden Predator baseline study area, August 2012.

Drainage	Site	Species	Arsenic	Cadmium	Copper	Lead	Mercury	Selenium	Zinc
Lee Creek	GP-2	Arctic grayling	0.022	0.016	0.518	0.010	0.055	1.65	7.15
	GP-2	Slimy sculpin	0.107	0.142	0.987	0.032	0.032	2.18	30.2
Golden Creek	GP-10	Slimy sculpin	0.223	0.113	1.034	0.051	0.042	1.69	32.1
Brewery Creek	GP-11	Slimy sculpin	0.431	0.058	0.994	0.059	0.028	1.63	25.3
CCME guideline			-	-	-	-	0.033[a]	-	-
CFIA guideline			3.50	-	-	0.50	0.50[b]	-	-
NCP Yukon Database Slimy Sculpin	Maximum		10.2	1.03	27.6	29.4	0.17	9.0	187.1
	Average (N)		1.9 (72)	0.16 (72)	1.6 (72)	2.4 (72)	0.02 (62)	1.7 (57)	42.2 (72)
USGS Yukon River Database Freshwater Fish	Maximum		1.95	1.49	1.49	-	0.65	0.85	56.4
	Average (N)		2.1 (31)	0.07 (9)	0.7 (31)	<0.27	0.24 (31)	0.51 (31)	34.8 (31)

CCME = Canadian Council of Ministers of the Environment, Canadian Guidelines for the Protection of Wildlife Consumers of Aquatic Biota – [a] MeHg Tissue Residue Guideline; CFIA = Canadian Food Inspection Agency, Canadian Guidelines for Chemical Contaminants and Toxins in Fish and Fish Products – [b] for all freshwater fish products; NCP = DIAND, Northern Contaminants Program Yukon Database for slimy sculpin; USGS = US Geological Survey – Biomonitoring of Environmental Status and Trends (BEST) Large Rivers Monitoring Network – Database for freshwater fish.

Your Project #: BASELINE FISHERIES ASSESSSMENT
Site Location: BREWERY CREEK, YUKON
Your C.O.C. #: 08357110, 08357111

Attention: Nick de Graff
LABERGE ENVIRONMENTAL SERVICES
WHITEHORSE
405 Ogilvie Street
PO Box 21072
Whitehorse, YT
CANADA Y1A 6P7

Report Date: 2012/10/18

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B279201
Received: 2012/09/05, 13:57

Sample Matrix: TISSUE
Samples Received: 22

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Mercury in Tissue by CVAF-Dry Wt	12	N/A	2012/10/02	65-A-002	EPA 1631B
Mercury in Tissue by CVAF-Wet Wt	22	N/A	2012/10/01	BBY7SOP-00014	EPA 1631B
Elements by CRC ICPMS - Tissue Dry Wt	12	2012/09/06	2012/09/25	BBY7SOP-00002	EPA 6020A
Elements by CRC ICPMS - Tissue Wet Wt	5	2012/09/17	2012/09/22	BBY7SOP-00002	EPA 6020A
Elements by CRC ICPMS - Tissue Wet Wt	17	2012/09/17	2012/09/25	BBY7SOP-00002	EPA 6020A
Moisture	12	N/A	2012/09/19	BBY8SOP-00017	Ont MOE -E 3139

* Results relate only to the items tested.

Encryption Key

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

Tabitha Rudkin, Burnaby Project Manager
Email: TRudkin@maxxam.ca
Phone# (604) 638-2639

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Report Date: 2012/10/18

LABERGE ENVIRONMENTAL SERVICES
Client Project #: BASELINE FISHERIES ASSESSSMENT
Site Location: BREWERY CREEK, YUKON
Sampler Initials: BB

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		EJ7322	EJ7323	EJ7329	EJ7331	EJ7332	EJ7333	EJ7344		
Sampling Date		2012/08/09	2012/08/09	2012/08/09	2012/08/09	2012/08/09	2012/08/09	2012/08/07		
COC#		08357110	08357110	08357110	08357110	08357110	08357110	08357111		
	UNITS	**BC1-SLIMY SCULPIN**	**BC2-SLIMY SCULPIN**	**GC2-SLIMY SCULPIN**	**GC4-SLIMY SCULPIN**	**GC5-SLIMY SCULPIN**	**GC6-SLIMY SCULPIN**	**LC1-SLIMY SCULPIN**	**RDL**	**QC Batch**
Mercury by CVAA										
Total Mercury (Hg)	mg/kg	0.151	0.104	0.182	0.205	0.186	0.176	0.142	0.010	6144335
Total Metals by ICPMS										
Total Aluminum (Al)	mg/kg	10.3	66.6	42.4	128	176	165	76.6	2.0	6144337
Total Antimony (Sb)	mg/kg	0.012	0.032	0.060	0.113	0.117	0.102	0.018	0.010	6144337
Total Arsenic (As)	mg/kg	0.68	1.22	0.83	0.72	0.97	0.77	0.46	0.10	6144337
Total Barium (Ba)	mg/kg	7.17	12.9	17.0	20.2	24.6	18.9	11.2	0.20	6144337
Total Beryllium (Be)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	6144337
Total Bismuth (Bi)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	6144337
Total Boron (B)	mg/kg	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	4.0	6144337
Total Cadmium (Cd)	mg/kg	0.202	0.180	0.524	0.384	0.556	0.434	0.684	0.020	6144337
Total Calcium (Ca)	mg/kg	29900	52000	63800	54500	58300	47300	34100	20	6144337
Total Chromium (Cr)	mg/kg	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.40	6144337
Total Cobalt (Co)	mg/kg	0.183	0.146	0.206	0.200	0.304	0.232	0.136	0.040	6144337
Total Copper (Cu)	mg/kg	3.39	3.60	4.01	3.83	4.43	4.38	3.06	0.10	6144337
Total Iron (Fe)	mg/kg	57	164	156	298	414	315	175	20	6144337
Total Lead (Pb)	mg/kg	0.067	0.149	0.140	0.243	0.221	0.200	0.103	0.020	6144337
Total Magnesium (Mg)	mg/kg	1350	1570	1880	1660	1760	1550	1240	20	6144337
Total Manganese (Mn)	mg/kg	15.2	25.2	40.0	35.8	55.9	30.3	22.6	0.20	6144337
Total Molybdenum (Mo)	mg/kg	<0.10	<0.10	<0.10	0.12	0.12	0.11	<0.10	0.10	6144337
Total Nickel (Ni)	mg/kg	0.30	0.36	0.57	0.83	0.90	0.77	1.03	0.10	6144337
Total Phosphorus (P)	mg/kg	24000	36900	43700	37300	39000	34100	25900	20	6144337
Total Potassium (K)	mg/kg	12500	12600	14300	12400	11400	12500	10500	20	6144337
Total Selenium (Se)	mg/kg	5.71	7.76	7.74	6.10	7.19	8.28	9.81	0.10	6144337
Total Silver (Ag)	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	0.040	6144337
Total Sodium (Na)	mg/kg	4320	4850	5620	5070	4380	4330	3690	20	6144337
Total Strontium (Sr)	mg/kg	43.9	75.1	108	102	89.8	71.7	48.6	0.20	6144337
Total Thallium (Tl)	mg/kg	0.0309	0.0263	0.0276	0.0305	0.0339	0.0305	0.0348	0.0040	6144337
Total Tin (Sn)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	6144337
Total Titanium (Ti)	mg/kg	2.3	5.3	4.7	7.7	8.5	7.5	5.1	2.0	6144337
Total Uranium (U)	mg/kg	0.0214	0.0299	0.0461	0.108	0.0634	0.0551	0.0218	0.0040	6144337
Total Vanadium (V)	mg/kg	<0.40	0.46	0.78	1.37	1.68	1.41	0.74	0.40	6144337
Total Zinc (Zn)	mg/kg	112	111	144	124	143	134	113	0.40	6144337

RDL = Reportable Detection Limit

Success Through Science®

Maxxam Job #: B279201
Report Date: 2012/10/18

LABERGE ENVIRONMENTAL SERVICES
Client Project #: BASELINE FISHERIES ASSESSSMENT
Site Location: BREWERY CREEK, YUKON
Sampler Initials: BB

ELEMENTS BY ATOMIC SPECTROSCOPY - DRY WT (TISSUE)

Maxxam ID		EJ7345		EJ7350	EJ7351	EJ7352	EJ7353		
Sampling Date		2012/08/07		2012/08/07	2012/08/07	2012/08/07	2012/08/07		
COC#		08357111		08357111	08357111	08357111	08357111		
	UNITS	**LC2-SLIMY SCULPIN**	**RDL**	**LC7-SLIMY SCULPIN**	**LC8-SLIMY SCULPIN**	**LC9-SLIMY SCULPIN**	**LC10-SLIMY SCULPIN**	**RDL**	**QC Batch**
Mercury by CVAA									
Total Mercury (Hg)	mg/kg	0.131	0.010	0.332	0.221	0.176	0.184	0.010	6144335
Total Metals by ICPMS									
Total Aluminum (Al)	mg/kg	76.1	2.0	1.7	2.3	2.3	1.6	1.0	6144337
Total Antimony (Sb)	mg/kg	0.019	0.010	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	6144337
Total Arsenic (As)	mg/kg	0.45	0.10	0.132	0.116	0.078	<0.050	0.050	6144337
Total Barium (Ba)	mg/kg	12.7	0.20	0.76	1.42	0.33	0.35	0.10	6144337
Total Beryllium (Be)	mg/kg	<0.20	0.20	<0.10	<0.10	<0.10	<0.10	0.10	6144337
Total Bismuth (Bi)	mg/kg	<0.20	0.20	<0.10	<0.10	<0.10	<0.10	0.10	6144337
Total Boron (B)	mg/kg	<4.0	4.0	<2.0	<2.0	<2.0	<2.0	2.0	6144337
Total Cadmium (Cd)	mg/kg	0.609	0.020	0.076	0.096	0.079	0.015	0.010	6144337
Total Calcium (Ca)	mg/kg	48300	20	5310	5480	2810	2560	10	6144337
Total Chromium (Cr)	mg/kg	<0.40	0.40	0.22	<0.20	<0.20	<0.20	0.20	6144337
Total Cobalt (Co)	mg/kg	0.145	0.040	0.107	0.248	0.112	0.070	0.020	6144337
Total Copper (Cu)	mg/kg	4.20	0.10	2.85	2.63	1.87	1.25	0.050	6144337
Total Iron (Fe)	mg/kg	193	20	46	37	35	24	10	6144337
Total Lead (Pb)	mg/kg	0.097	0.020	0.028	0.028	0.079	0.029	0.010	6144337
Total Magnesium (Mg)	mg/kg	1500	20	1270	1280	1080	1060	10	6144337
Total Manganese (Mn)	mg/kg	30.1	0.20	2.78	4.83	1.82	1.29	0.10	6144337
Total Molybdenum (Mo)	mg/kg	<0.10	0.10	<0.050	<0.050	<0.050	<0.050	0.050	6144337
Total Nickel (Ni)	mg/kg	0.72	0.10	0.138	0.103	0.191	0.343	0.050	6144337
Total Phosphorus (P)	mg/kg	34900	20	13600	14100	10400	10500	10	6144337
Total Potassium (K)	mg/kg	12100	20	19300	19800	15100	16100	10	6144337
Total Selenium (Se)	mg/kg	8.62	0.10	5.93	7.82	7.44	5.52	0.050	6144337
Total Silver (Ag)	mg/kg	<0.040	0.040	<0.020	<0.020	<0.020	<0.020	0.020	6144337
Total Sodium (Na)	mg/kg	4410	20	3010	2870	2180	1850	10	6144337
Total Strontium (Sr)	mg/kg	66.0	0.20	6.67	7.16	3.08	2.77	0.10	6144337
Total Thallium (Tl)	mg/kg	0.0370	0.0040	0.0350	0.0239	0.0275	0.0238	0.0020	6144337
Total Tin (Sn)	mg/kg	<0.20	0.20	<0.10	<0.10	<0.10	<0.10	0.10	6144337
Total Titanium (Ti)	mg/kg	5.9	2.0	<1.0	<1.0	<1.0	<1.0	1.0	6144337
Total Uranium (U)	mg/kg	0.0260	0.0040	<0.0020	0.0026	0.0021	0.0024	0.0020	6144337
Total Vanadium (V)	mg/kg	1.07	0.40	<0.20	<0.20	<0.20	<0.20	0.20	6144337
Total Zinc (Zn)	mg/kg	145	0.40	36.3	30.8	28.2	21.8	0.20	6144337

RDL = Reportable Detection Limit

Maxxam Job #: B279201
Report Date: 2012/10/18

LABERGE ENVIRONMENTAL SERVICES
Client Project #: BASELINE FISHERIES ASSESSSMENT
Site Location: BREWERY CREEK, YUKON
Sampler Initials: BB

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE)

Maxxam ID		EJ7322	EJ7323		EJ7324	EJ7325		EJ7326		EJ7327		
Sampling Date		2012/08/09	2012/08/09		2012/08/09	2012/08/09		2012/08/09		2012/08/09		
COC#		08357110	08357110		08357110	08357110		08357110		08357110		
	UNITS	**BC1-SLIMY SCULPIN**	**BC2-SLIMY SCULPIN**	**RDL**	**BC3-SLIMY SCULPIN**	**BC4-SLIMY SCULPIN**	**RDL**	**BC5-SLIMY SCULPIN**	**RDL**	**BC6-SLIMY SCULPIN**	**RDL**	**QC Batch**
Mercury by CVAA												
Total Mercury (Hg)	mg/kg	0.0389	0.0256	0.0020	0.0256	0.0219	0.0020	0.0264	0.0020	0.0282	0.0020	6182382
Total Metals by ICPMS												
Total Aluminum (Al)	mg/kg	2.64	16.3	0.40	21.4	24.6	0.30	25.5	0.40	102	0.50	6175836
Total Antimony (Sb)	mg/kg	0.0030	0.0079	0.0020	0.0127	0.0075	0.0015	0.0100	0.0020	0.0279	0.0025	6175836
Total Arsenic (As)	mg/kg	0.176	0.298	0.020	0.479	0.391	0.015	0.470	0.020	0.770	0.025	6175836
Total Barium (Ba)	mg/kg	1.84	3.15	0.040	3.47	3.55	0.030	4.38	0.040	5.22	0.050	6175836
Total Beryllium (Be)	mg/kg	<0.040	<0.040	0.040	<0.030	<0.030	0.030	<0.040	0.040	<0.050	0.050	6175836
Total Bismuth (Bi)	mg/kg	<0.040	<0.040	0.040	<0.030	<0.030	0.030	<0.040	0.040	<0.050	0.050	6175836
Total Boron (B)	mg/kg	<0.80	<0.80	0.80	<0.60	<0.60	0.60	<0.80	0.80	<1.0	1.0	6175836
Total Cadmium (Cd)	mg/kg	0.0518	0.0442	0.0040	0.0577	0.0780	0.0030	0.0565	0.0040	0.0590	0.0050	6175836
Total Calcium (Ca)	mg/kg	7670	12700	4.0	11000	11800	3.0	11500	4.0	10800	5.0	6175836
Total Chromium (Cr)	mg/kg	<0.080	<0.080	0.080	<0.060	0.064	0.060	<0.080	0.080	0.19	0.10	6175836
Total Cobalt (Co)	mg/kg	0.0470	0.0358	0.0080	0.0435	0.0563	0.0060	0.0475	0.0080	0.093	0.010	6175836
Total Copper (Cu)	mg/kg	0.872	0.883	0.020	0.974	0.972	0.015	1.10	0.020	1.16	0.025	6175836
Total Iron (Fe)	mg/kg	14.6	40.1	4.0	58.9	55.7	3.0	58.2	4.0	197	5.0	6175836
Total Lead (Pb)	mg/kg	0.0172	0.0366	0.0040	0.0490	0.0446	0.0030	0.0527	0.0040	0.156	0.0050	6175836
Total Magnesium (Mg)	mg/kg	346	384	4.0	366	406	3.0	419	4.0	448	5.0	6175836
Total Manganese (Mn)	mg/kg	3.91	6.18	0.040	4.87	5.64	0.030	6.19	0.040	7.39	0.050	6175836
Total Molybdenum (Mo)	mg/kg	<0.020	<0.020	0.020	0.019	0.024	0.015	0.022	0.020	0.045	0.025	6175836
Total Nickel (Ni)	mg/kg	0.077	0.089	0.020	0.089	0.119	0.015	0.118	0.020	0.276	0.025	6175836
Total Phosphorus (P)	mg/kg	6170	9040	4.0	6960	7360	3.0	7930	4.0	7090	5.0	6175836
Total Potassium (K)	mg/kg	3200	3080	4.0	3320	3230	3.0	3330	4.0	3440	5.0	6175836
Total Selenium (Se)	mg/kg	1.47	1.90	0.020	1.95	1.58	0.015	1.49	0.020	1.41	0.025	6175836
Total Silver (Ag)	mg/kg	<0.0080	<0.0080	0.0080	<0.0060	<0.0060	0.0060	<0.0080	0.0080	<0.010	0.010	6175836
Total Sodium (Na)	mg/kg	1110	1190	4.0	988	1120	3.0	1090	4.0	1140	5.0	6175836
Total Strontium (Sr)	mg/kg	11.3	18.4	0.040	15.8	16.6	0.030	15.8	0.040	14.4	0.050	6175836
Total Thallium (Tl)	mg/kg	0.00795	0.00644	0.00080	0.00659	0.00547	0.00060	0.00570	0.00080	0.0069	0.0010	6175836
Total Tin (Sn)	mg/kg	0.043	<0.040	0.040	0.042	<0.030	0.030	0.048	0.040	<0.050	0.050	6175836
Total Titanium (Ti)	mg/kg	0.58	1.29	0.40	1.56	1.76	0.30	1.94	0.40	4.97	0.50	6175836
Total Uranium (U)	mg/kg	0.00550	0.00733	0.00080	0.00625	0.00459	0.00060	0.00995	0.00080	0.0211	0.0010	6175836
Total Vanadium (V)	mg/kg	<0.080	0.112	0.080	0.142	0.145	0.060	0.157	0.080	0.45	0.10	6175836
Total Zinc (Zn)	mg/kg	28.8	27.1	0.080	22.1	22.7	0.060	25.6	0.080	25.3	0.10	6175836

RDL = Reportable Detection Limit

LABERGE ENVIRONMENTAL SERVICES
Client Project #: BASELINE FISHERIES ASSESSSMENT
Site Location: BREWERY CREEK, YUKON
Sampler Initials: BB

Maxxam Job #: B279201
Report Date: 2012/10/18

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE)

Maxxam ID		EJ7328	EJ7329	EJ7330	EJ7331	EJ7332	EJ7333	EJ7344	EJ7345	EJ7346		
Sampling Date		2012/08/09	2012/08/09	2012/08/09	2012/08/09	2012/08/09	2012/08/09	2012/08/07	2012/08/07	2012/08/07		
COC#		08357110	08357110	08357110	08357110	08357110	08357110	08357111	08357111	08357111		
	UNITS	**GC1-SLIMY SCULPIN**	**GC2-SLIMY SCULPIN**	**GC3-SLIMY SCULPIN**	**GC4-SLIMY SCULPIN**	**GC5-SLIMY SCULPIN**	**GC6-SLIMY SCULPIN**	**LC1-SLIMY SCULPIN**	**LC2-SLIMY SCULPIN**	**LC3-SLIMY SCULPIN**	**RDL**	**QC Batch**
Mercury by CVAA												
Total Mercury (Hg)	mg/kg	0.0336	0.0386	0.0414	0.0488	0.0474	0.0434	0.0411	0.0327	0.0281	0.0020	6182382
Total Metals by ICPMS												
Total Aluminum (Al)	mg/kg	19.1	8.99	53.9	30.5	44.8	40.6	22.2	19.0	19.2	0.40	6175836
Total Antimony (Sb)	mg/kg	0.0190	0.0127	0.0361	0.0269	0.0299	0.0253	0.0051	0.0047	0.0057	0.0020	6175836
Total Arsenic (As)	mg/kg	0.233	0.175	0.321	0.171	0.247	0.190	0.132	0.113	0.075	0.020	6175836
Total Barium (Ba)	mg/kg	3.64	3.59	8.25	4.81	6.26	4.68	3.24	3.17	2.36	0.040	6175836
Total Beryllium (Be)	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	0.040	6175836
Total Bismuth (Bi)	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	0.040	6175836
Total Boron (B)	mg/kg	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	0.80	6175836
Total Cadmium (Cd)	mg/kg	0.109	0.111	0.119	0.0914	0.142	0.107	0.198	0.152	0.0965	0.0040	6175836
Total Calcium (Ca)	mg/kg	13400	13500	14200	13000	14900	11700	9890	12100	9870	4.0	6175836
Total Chromium (Cr)	mg/kg	<0.080	<0.080	0.121	<0.080	0.095	0.089	<0.080	<0.080	<0.080	0.080	6175836
Total Cobalt (Co)	mg/kg	0.0788	0.0436	0.0775	0.0475	0.0776	0.0573	0.0395	0.0363	0.0302	0.0080	6175836
Total Copper (Cu)	mg/kg	0.951	0.851	1.28	0.911	1.13	1.08	0.888	1.05	0.817	0.020	6175836
Total Iron (Fe)	mg/kg	51.5	33.2	111	71.0	105	77.8	50.8	48.3	49.2	4.0	6175836
Total Lead (Pb)	mg/kg	0.0423	0.0297	0.0726	0.0577	0.0564	0.0495	0.0298	0.0243	0.0298	0.0040	6175836
Total Magnesium (Mg)	mg/kg	443	399	417	395	449	382	359	375	370	4.0	6175836
Total Manganese (Mn)	mg/kg	9.50	8.48	11.2	8.52	14.3	7.48	6.55	7.52	6.73	0.040	6175836
Total Molybdenum (Mo)	mg/kg	0.026	<0.020	0.033	0.027	0.030	0.028	0.023	0.025	0.025	0.020	6175836
Total Nickel (Ni)	mg/kg	0.127	0.120	0.227	0.198	0.229	0.190	0.298	0.179	0.164	0.020	6175836
Total Phosphorus (P)	mg/kg	9180	9270	8930	8870	9950	8420	7520	8720	7130	4.0	6175836
Total Potassium (K)	mg/kg	3270	3030	3000	2940	2920	3080	3060	3030	3010	4.0	6175836
Total Selenium (Se)	mg/kg	1.81	1.64	1.34	1.45	1.83	2.04	2.84	2.16	1.76	0.020	6175836
Total Silver (Ag)	mg/kg	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	<0.0080	0.0080	6175836
Total Sodium (Na)	mg/kg	1190	1190	1220	1210	1120	1070	1070	1100	991	4.0	6175836
Total Strontium (Sr)	mg/kg	20.9	22.8	25.4	24.4	22.9	17.7	14.1	16.5	10.0	0.040	6175836
Total Thallium (Tl)	mg/kg	0.00672	0.00586	0.00598	0.00725	0.00865	0.00754	0.0101	0.00924	0.00710	0.00080	6175836
Total Tin (Sn)	mg/kg	<0.040	<0.040	0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	0.040	6175836
Total Titanium (Ti)	mg/kg	1.50	1.00	2.51	1.84	2.16	1.85	1.48	1.47	1.42	0.40	6175836
Total Uranium (U)	mg/kg	0.00615	0.00977	0.0144	0.0257	0.0162	0.0136	0.00631	0.00649	0.00493	0.00080	6175836
Total Vanadium (V)	mg/kg	0.188	0.165	0.361	0.327	0.429	0.349	0.216	0.268	0.330	0.080	6175836
Total Zinc (Zn)	mg/kg	31.3	30.4	31.6	29.6	36.4	33.0	32.7	36.2	26.7	0.080	6175836

RDL = Reportable Detection Limit

Maxxam Job #: B279201
Report Date: 2012/10/18

LABERGE ENVIRONMENTAL SERVICES
Client Project #: BASELINE FISHERIES ASSESSSMENT
Site Location: BREWERY CREEK, YUKON
Sampler Initials: BB

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE)

Maxxam ID		EJ7347		EJ7348	EJ7349	EJ7350	EJ7351	EJ7352	EJ7353		
Sampling Date		2012/08/07		2012/08/07	2012/08/07	2012/08/07	2012/08/07	2012/08/07	2012/08/07		
COC#		08357111		08357111	08357111	08357111	08357111	08357111	08357111		
	UNITS	**LC4-SLIMY SCULPIN**	**RDL**	**LC5-SLIMY SCULPIN**	**LC6-SLIMY SCULPIN**	**LC7-SLIMY SCULPIN**	**LC8-SLIMY SCULPIN**	**LC9-SLIMY SCULPIN**	**LC10-SLIMY SCULPIN**	**RDL**	**QC Batch**
Mercury by CVAA											
Total Mercury (Hg)	mg/kg	0.0315	0.0020	0.0288	0.0316	0.0733	0.0493	0.0479	0.0509	0.0020	6182382
Total Metals by ICPMS											
Total Aluminum (Al)	mg/kg	26.9	0.40	17.3	20.4	0.37	0.52	0.63	0.45	0.20	6175836
Total Antimony (Sb)	mg/kg	0.0070	0.0020	0.0064	0.0077	<0.0010	<0.0010	<0.0010	<0.0010	0.0010	6175836
Total Arsenic (As)	mg/kg	0.076	0.020	0.117	0.128	0.029	0.026	0.021	0.013(1)	0.010	6175836
Total Barium (Ba)	mg/kg	2.24	0.040	2.41	3.00	0.168	0.318	0.091	0.098(2)	0.020	6175836
Total Beryllium (Be)	mg/kg	<0.040	0.040	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020(1)	0.020	6175836
Total Bismuth (Bi)	mg/kg	<0.040	0.040	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	6175836
Total Boron (B)	mg/kg	<0.80	0.80	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.40	6175836
Total Cadmium (Cd)	mg/kg	0.120	0.0040	0.113	0.171	0.0168	0.0213	0.0216	0.0042	0.0020	6175836
Total Calcium (Ca)	mg/kg	9300	4.0	10400	10700	1170	1220	767	707(2)	2.0	6175836
Total Chromium (Cr)	mg/kg	<0.080	0.080	0.056	0.090	0.049	0.043	<0.040	<0.040	0.040	6175836
Total Cobalt (Co)	mg/kg	0.0334	0.0080	0.0354	0.0452	0.0237	0.0554	0.0306	0.0194	0.0040	6175836
Total Copper (Cu)	mg/kg	0.796	0.020	1.17	1.20	0.630	0.586	0.510	0.346	0.010	6175836
Total Iron (Fe)	mg/kg	57.2	4.0	47.1	53.4	10.1	8.4	9.5	6.6	2.0	6175836
Total Lead (Pb)	mg/kg	0.0392	0.0040	0.0236	0.0455	0.0061	0.0062	0.0215	0.0079	0.0020	6175836
Total Magnesium (Mg)	mg/kg	361	4.0	404	408	281	286	295	292	2.0	6175836
Total Manganese (Mn)	mg/kg	5.95	0.040	6.05	9.28	0.615	1.08	0.496	0.357(2)	0.020	6175836
Total Molybdenum (Mo)	mg/kg	0.027	0.020	0.029	0.031	<0.010	<0.010	<0.010	<0.010	0.010	6175836
Total Nickel (Ni)	mg/kg	0.171	0.020	0.140	0.369	0.030	0.023	0.052	0.095(2)	0.010	6175836
Total Phosphorus (P)	mg/kg	7080	4.0	7010	7180	3020	3130	2840	2910	2.0	6175836
Total Potassium (K)	mg/kg	3250	4.0	3380	3030	4270	4410	4130	4430	2.0	6175836
Total Selenium (Se)	mg/kg	1.86	0.020	2.42	2.03	1.31	1.74	2.03	1.52	0.010	6175836
Total Silver (Ag)	mg/kg	<0.0080	0.0080	0.0064	<0.0040	<0.0040	<0.0040	<0.0040	<0.0040	0.0040	6175836
Total Sodium (Na)	mg/kg	972	4.0	1080	975	664	640	595	510	2.0	6175836
Total Strontium (Sr)	mg/kg	9.43	0.040	11.8	11.9	1.48	1.60	0.840	0.765(2)	0.020	6175836
Total Thallium (Tl)	mg/kg	0.00859	0.00080	0.0109	0.0100	0.00774	0.00532	0.00752	0.00656	0.00040	6175836
Total Tin (Sn)	mg/kg	<0.040	0.040	0.026	0.210	<0.020	<0.020	<0.020	<0.020	0.020	6175836
Total Titanium (Ti)	mg/kg	1.55	0.40	1.21	1.43	<0.20	<0.20	0.22	0.25	0.20	6175836
Total Uranium (U)	mg/kg	0.00694	0.00080	0.00535	0.00583	<0.00040	0.00058	0.00058	0.00065	0.00040	6175836
Total Vanadium (V)	mg/kg	0.487	0.080	0.250	0.469	<0.040	<0.040	<0.040	<0.040(1)	0.040	6175836
Total Zinc (Zn)	mg/kg	26.4	0.080	28.5	30.8	8.01	6.86	7.69	6.02	0.040	6175836

RDL = Reportable Detection Limit
(1) - Matrix Spike outside acceptance criteria (10% of analytes failure allowed).
(2) - Duplicate RPD above control limit - Non-homogenous sample - Increased variability of results

PHYSICAL TESTING (TISSUE)

Maxxam ID		EJ7322	EJ7323	EJ7329	EJ7331	EJ7332	EJ7333		
Sampling Date		2012/08/09	2012/08/09	2012/08/09	2012/08/09	2012/08/09	2012/08/09		
COC#		08357110	08357110	08357110	08357110	08357110	08357110		
	UNITS	**BC1-SLIMY SCULPIN**	**BC2-SLIMY SCULPIN**	**GC2-SLIMY SCULPIN**	**GC4-SLIMY SCULPIN**	**GC5-SLIMY SCULPIN**	**GC6-SLIMY SCULPIN**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	74	76	79	76	75	75	0.30	6178875

Maxxam ID		EJ7344	EJ7345	EJ7350	EJ7351	EJ7352	EJ7353		
Sampling Date		2012/08/07	2012/08/07	2012/08/07	2012/08/07	2012/08/07	2012/08/07		
COC#		08357111	08357111	08357111	08357111	08357111	08357111		
	UNITS	**LC1-SLIMY SCULPIN**	**LC2-SLIMY SCULPIN**	**LC7-SLIMY SCULPIN**	**LC8-SLIMY SCULPIN**	**LC9-SLIMY SCULPIN**	**LC10-SLIMY SCULPIN**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	71	75	78	78	73	72	0.30	6178875

RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY - WET WT (TISSUE) Comments

Sample EJ7322-01 Elements by CRC ICPMS - Tissue Wet Wt: Detection limits raised due to matrix interference.

Sample EJ7323-01 Elements by CRC ICPMS - Tissue Wet Wt: Detection limits raised due to matrix interference.

Sample EJ7324-01 Elements by CRC ICPMS - Tissue Wet Wt: Detection limits raised due to insufficient sample.

Sample EJ7325-01 Elements by CRC ICPMS - Tissue Wet Wt: Detection limits raised due to insufficient sample.

Sample EJ7326-01 Elements by CRC ICPMS - Tissue Wet Wt: Detection limits raised due to matrix interference.

Sample EJ7327-01 Elements by CRC ICPMS - Tissue Wet Wt: Detection limits raised due to insufficient sample.

Sample EJ7328-01 Elements by CRC ICPMS - Tissue Wet Wt: Detection limits raised due to matrix interference.

Sample EJ7329-01 Elements by CRC ICPMS - Tissue Wet Wt: Detection limits raised due to matrix interference.

Sample EJ7330-01 Elements by CRC ICPMS - Tissue Wet Wt: Detection limits raised due to matrix interference.

Sample EJ7331-01 Elements by CRC ICPMS - Tissue Wet Wt: Detection limits raised due to matrix interference.

Sample EJ7332-01 Elements by CRC ICPMS - Tissue Wet Wt: Detection limits raised due to matrix interference.

Sample EJ7333-01 Elements by CRC ICPMS - Tissue Wet Wt: Detection limits raised due to matrix interference.

Sample EJ7344-01 Elements by CRC ICPMS - Tissue Wet Wt: Detection limits raised due to matrix interference.

Sample EJ7345-01 Elements by CRC ICPMS - Tissue Wet Wt: Detection limits raised due to matrix interference.

Sample EJ7346-01 Elements by CRC ICPMS - Tissue Wet Wt: Detection limits raised due to matrix interference.

Sample EJ7347-01 Elements by CRC ICPMS - Tissue Wet Wt: Detection limits raised due to matrix interference.

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Maxxam Job #: B279201
Report Date: 2012/10/18

LABERGE ENVIRONMENTAL SERVICES
Client Project #: BASELINE FISHERIES ASSESSSMENT
Site Location: BREWERY CREEK, YUKON
Sampler Initials: BB

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
6175836	Total Arsenic (As)	2012/09/25	128(1)	75 - 125	104	75 - 125	<0.010	mg/kg	NC	35	84	75 - 125
6175836	Total Barium (Ba)	2012/09/25	119	75 - 125	104	75 - 125	<0.020	mg/kg	NC	35		
6175836	Total Beryllium (Be)	2012/09/25	127(1)	75 - 125	106	75 - 125	<0.020	mg/kg	NC	35		
6175836	Total Cadmium (Cd)	2012/09/25	124	75 - 125	105	75 - 125	<0.0020	mg/kg	NC	35	96	75 - 125
6175836	Total Chromium (Cr)	2012/09/25	120	75 - 125	101	75 - 125	<0.040	mg/kg	NC	35		
6175836	Total Cobalt (Co)	2012/09/25	121	75 - 125	104	75 - 125	<0.0040	mg/kg	NC	35		
6175836	Total Copper (Cu)	2012/09/25	118	75 - 125	104	75 - 125	<0.010	mg/kg	20.5	35	95	75 - 125
6175836	Total Lead (Pb)	2012/09/25	122	75 - 125	105	75 - 125	0.0026, RDL=0.0020	mg/kg	NC	35	74(1, 2)	75 - 125
6175836	Total Manganese (Mn)	2012/09/25	104	75 - 125	102	75 - 125	<0.020	mg/kg	46.3(1)	35		
6175836	Total Nickel (Ni)	2012/09/25	121	75 - 125	106	75 - 125	<0.010	mg/kg	NC	35	85	75 - 125
6175836	Total Selenium (Se)	2012/09/25	NC	75 - 125	109	75 - 125	<0.010	mg/kg	4.9	35	96	75 - 125
6175836	Total Silver (Ag)	2012/09/25	118	75 - 125	97	75 - 125	<0.0040	mg/kg	NC	35	91	75 - 125
6175836	Total Strontium (Sr)	2012/09/25	NC	75 - 125	104	75 - 125	<0.020	mg/kg	42.0(1)	35		
6175836	Total Thallium (Tl)	2012/09/25	124	75 - 125	108	75 - 125	<0.00040	mg/kg	8.2	35		
6175836	Total Uranium (U)	2012/09/25	124	75 - 125	104	75 - 125	<0.00040	mg/kg	NC	35		
6175836	Total Vanadium (V)	2012/09/25	126(1)	75 - 125	104	75 - 125	<0.040	mg/kg	NC	35		
6175836	Total Zinc (Zn)	2012/09/25	NC	75 - 125	100	75 - 125	<0.040	mg/kg	11.4	35	101	75 - 125
6175836	Total Iron (Fe)	2012/09/25					<2.0	mg/kg	NC	35	92	75 - 125
6175836	Total Aluminum (Al)	2012/09/25					<0.20	mg/kg	NC	35		
6175836	Total Antimony (Sb)	2012/09/25					<0.0010	mg/kg	NC	35		
6175836	Total Bismuth (Bi)	2012/09/25					<0.020	mg/kg	NC	35		
6175836	Total Boron (B)	2012/09/25					<0.40	mg/kg	NC	35		
6175836	Total Calcium (Ca)	2012/09/25					<2.0	mg/kg	41.2(1)	35		
6175836	Total Magnesium (Mg)	2012/09/25					<2.0	mg/kg	3.0	35		
6175836	Total Molybdenum (Mo)	2012/09/25					<0.010	mg/kg	NC	35		
6175836	Total Phosphorus (P)	2012/09/25					<2.0	mg/kg	5.1	35		
6175836	Total Potassium (K)	2012/09/25					<2.0	mg/kg	2.2	35		
6175836	Total Sodium (Na)	2012/09/25					<2.0	mg/kg	3.1	35		
6175836	Total Tin (Sn)	2012/09/25					<0.020	mg/kg	NC	35		
6175836	Total Titanium (Ti)	2012/09/25					<0.20	mg/kg	NC	35		

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Maxxam Job #: B279201
Report Date: 2012/10/18

LABERGE ENVIRONMENTAL SERVICES
Client Project #: BASELINE FISHERIES ASSESSSMENT
Site Location: BREWERY CREEK, YUKON
Sampler Initials: BB

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
6178875	Moisture	2012/09/19					<0.30	%	0	20		
6182382	Total Mercury (Hg)	2012/10/01	NC	75 - 125	101	75 - 125	<0.0020	mg/kg	5.4	20	96	75 - 125

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) - Reference outside acceptance criteria (10% of analytes failure allowed).

Validation Signature Page

Maxxam Job #: B279201

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

Andy Lu, Data Validation Coordinator

===

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

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5 Ph: (604) 734-7276 Fax: (604) 731-2386, Toll Free: (800) 665-8566

CHAIN OF CUSTODY RECORD

Maxxam Job #: B279201 **COC #:** 08357110 Page: 1 of 2

Invoice To: Require Report? Yes ☒ No ☐

Company Name:	Laberge Environmental Services	PC:	
Contact Name:	Bonnie Burns		
Address:	P.O. Box 21072		
	Whitehorse, YT	PC:	Y1A 6P7
Phone / Fax#:	Ph: 867-668-6838	Fax:	867-667-6956
E-mail	bonnieburns@northwestel.net		

Report To:

Company Name:	Can-nic-a-nick Environmental		
Contact Name:	Nick de Graff		
Address:	Box 10106		
	Whitehorse	PC:	Yukon
Phone / Fax#:	Ph: 867 668 4282	Fax:	867 668 4682
E-mail	trout@nortwestel.net		

PO #:	
Quotation #:	
Project # :	
Proj. Name:	Baseline Fisheries Assessments, Brewery Creek
Location:	Brewery Creek, Yukon
Sampled by:	Bonnie Burns

REGULATORY REQUIREMENTS:

- ☐ CSR
- ☐ CCME
- ☐ BC Water Quality
- ☐ Other
- ☐ DRINKING WATER

SERVICE REQUESTED:

- ● Regular Turn Around Time (TAT) (5 days for most tests)
- RUSH (Please contact the lab) ○ 1 Day ○ 2 Day ○ Day
- Date Required:

SPECIAL INSTRUCTIONS:

Return Cooler ☐ **Ship Sample Bottles (please specify)** ☐

Metals semi trace - Fish tissue samples - % Moisture (dry and wet weight)

Grind whole body for slimy scupin

ANALYSIS REQUESTED

	Sample Identification	Lab Identification (Lab Use Only)	Sample Type	Date/Time(24hr) Sampled	Dissolved Metals (DM) (Field Filtered?)	Total Metals (Field Acidified?)	(Field Acidified?)	Total Mercury	Total Metals	Number of Containers
1	BC1- Slimy Sculpin	EJ7322		12/08/09				X	X	1
2	BC2 - Slimy Sculpin	323		12/08/09				X	X	1
3	BC3 - Slimy Sculpin	324		12/08/09				X	X	1
4	BC4 - Slimy Sculpin	325		12/08/09				X	X	1
5	BC5 - Slimy Sculpin	326		12/08/09				X	X	1
6	BC6 - Slimy Sculpin	327		12/08/09				X	X	1
7	GC1 - Slimy Sculpin	328		12/08/09				X	X	1
8	GC2 - Slimy Sculpin	329		12/08/09				X	X	1
9	GC3 - Slimy Sculpin	330		12/08/09				X	X	1
10	GC4 - Slimy Sculpin	331		12/08/09				X	X	1
11	GC5 - Slimy Sculpin	332		12/08/09				X	X	1
12	GC6 - Slimy Sculpin	333		12/08/09				X	X	1

B279201

*Relinquished By: (Print name and sign)	Date (yy/mm/dd):	Time (24hr):	Received by : (Print name and sign)	Date (yy/mm/dd):	Time (24 hr):	Time Sensitive	Temperature on Receipt (°C) (Laboratory Use Only)	Custody Seal	Yes	No
Nick de Graff	12/09/04	1300	ISAAC WANG	2012/09/05	13:57	☐	A) 7 B) 7 C) 6	Present?	☐	☑
							Just sampled & rec'd on ice: ☐	Intact?	☐	☑

*IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORDS. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

BBY FCD-00077R1_C

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CHAIN OF CUSTODY RECORD

Maxxam Job #: ____ COC #: 08357111 Page: 2 of 2

Invoice To: Require Report? Yes [X] No [ ]

Company Name:	Laberge Environmental Services
Contact Name:	Bonnie Burns
Address:	P.O. Box 21072
	Whitehorse, YT PC: Y1A 6P7
Phone / Fax#:	Ph: 867-668-6838 Fax: 867-667-6956
E-mail	bonnieburns@northwestel.net

Report To:

Company Name:	Can-nic-a-nick Environmental
Contact Name:	Nick de Graff
Address:	Box 10106
	Whitehorse PC: Yukon
Phone / Fax#:	Ph: 867 668 4282 Fax: 867 668 4682
E-mail	trout@nortwestel.net

PO #:	
Quotation #:	
Project #:	
Proj. Name:	Baseline Fisheries Assessments, Brewery Creek
Location:	Brewery Creek, Yukon
Sampled by:	Bonnie Burns

REGULATORY REQUIREMENTS:

- [ ] CSR
- [ ] CCME
- [ ] BC Water Quality
- [ ] Other
- [ ] DRINKING WATER

SERVICE REQUESTED:

- (●) Regular Turn Around Time (TAT) (5 days for most tests)
- RUSH (Please contact the lab) ( ) 1 Day ( ) 2 Day ( ) Day
- Date Required:

SPECIAL INSTRUCTIONS:

Return Cooler [ ] Ship Sample Bottles (please specify) [ ]

Metals semi trace - Fish tissue samples - % Moisture (dry and wet weight)

Grind whole body for slimy sculpin - tissue for arctic grayling

ANALYSIS REQUESTED

#	Sample Identification	Lab Identification (Lab Use Only)	Sample Type	Date/Time(24hr) Sampled	Dissolved Metals (DM) (Field Filtered?)	Total Metals (Field Acidified?)	(Field Acidified?)	Total Mercury	Total Metals	Number of Containers
1	LC1- Slimy Sculpin	EJ7344		12/08/07				X	X	1
2	LC2 - Slimy Sculpin	345		12/08/07				X	X	1
3	LC3 - Slimy Sculpin	346		12/08/07				X	X	1
4	LC4 - Slimy Sculpin	347		12/08/07				X	X	1
5	LC5 - Slimy Sculpin	348		12/08/07				X	X	1
6	LC6 - Slimy Sculpin	349		12/08/07				X	X	1
7	LC7 - Arctic Grayling	350		12/08/07				X	X	1
8	LC8 - Arctic Grayling	351		12/08/07				X	X	1
9	LC9 - Arctic Grayling	352		12/08/07				X	X	1
10	LC10 - Arctic Grayling	353		12/08/07				X	X	1
11										
12										

B279201

*Relinquished By: (Print name and sign)	Date (yy/mm/dd):	Time (24hr):	Received by: (Print name and sign)	Date (yy/mm/dd):	Time (24 hr):	Time Sensitive	Temperature on Receipt (°C) (Laboratory Use Only)	Custody Seal	Yes	No
Nick de Graff	12/09/04	1300	ISAAC WANG	2012/09/05	13:57	[ ]	A) 7 B) 7 C) 6	Present?	[ ]	[✓]
							Just sampled & rec'd on ice: [ ]	Intact?	[ ]	[✓]

*IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORDS. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

BBY FCD-00077R1_C

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