

APPENDIX G

Environment Canada Hydrometric Station Flow Statistics

Project Name: Joyce Lake Iron Ore Direct Shipping Project
Job No: 121010649:100:103
Subject: Environment Canada Hydrometric Stations Flow Statistics
Date: 8-Nov-12
Updated By: SP

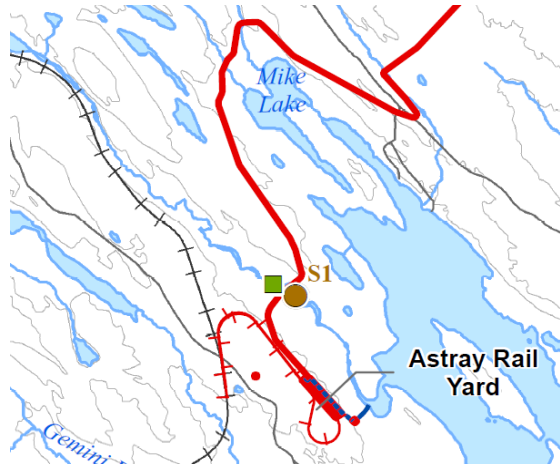
Station Number	Station Name	Province	Drainage Area (km ²)	Monthly Flows (m ³ /s)												Mean Annual Flow			Mean Peak Flow	
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	m ³ /s	m ³ /s/km ²	Runoff Depth (mm)	m ³ /s	m ³ /s/km ²
03LD004	SWAMPY BAY (RIVIERE)	QC	8,990	60.5	46.4	37.6	33.2	176	591	288	178	150	184	137	89.3	165	0.0184	580	875	0.0974
03MB001	FALSE (RIVIERE)	QC	2,140	6.57	4.43	3.50	3.27	83.5	104	36.9	26.5	31.5	37.9	22.8	11.2	30.8	0.0144	454	233	0.1089
03MC001	TUNULIC (RIVIERE) PRES DE L'EMBOUCHURE	QC	3,680	10.8	6.60	4.70	7.21	116	289	100	66.5	81.2	89.5	47.5	21.5	70.2	0.0191	601	578	0.1571
03NF001	UGJOKTOK RIVER BELOW HARP LAKE	NL	7,570	31.0	22.4	17.8	23.6	318	617	269	160	152	162	94.8	51.6	159	0.0211	664	1112	0.1469
03NG001	KANAIRIKTOK RIVER BELOW SNEGAMOOK LAKE	NL	8,930	41.1	32.2	27.5	38.7	375	643	277	192	193	207	119	61.3	184	0.0206	651	1169	0.1310
03PB002	NASKAUPI RIVER BELOW NASKAUPI LAKE	NL	4,480	31.3	24.9	21.9	27.4	201	282	136	92.3	75.5	82.3	67.0	44.4	89.9	0.0201	633	473	0.1056
03OE010	BIG POND BROOK BELOW BIG POND	NL	71.4	0.338	0.267	0.270	1.22	7.43	2.73	1.72	1.30	1.31	1.76	1.61	0.615	1.74	0.0244	769	14.5	0.2028
03NE001	REID BROOK AT OUTLET OF REID POND	NL	75.7	0.248	0.246	0.180	0.243	5.38	8.97	4.00	1.57	1.57	1.88	0.984	0.556	2.18	0.0289	910	19.1	0.2523
03NE002	CAMP POND BROOK BELOW CAMP POND	NL	24.3	0.150	0.170	0.153	0.141	1.59	1.86	0.79	0.40	0.38	0.48	0.319	0.229	0.559	0.0230	725	3.99	0.1641
02XA004	RIVIERE JOIR NEAR PROVINCIAL BORDER	NL	2,060	8.28	6.00	4.92	18.1	151	99.8	51.6	39.1	40.5	49.9	33.8	14.4	42.9	0.0208	657	339	0.1648
03OD007	EAST METCHIN RIVER	NL	1,750	4.50	3.27	2.60	5.56	78.5	54.2	25.7	18.8	16.1	22.1	17.0	8.43	21.4	0.0122	386	179	0.1024
03QC002	ALEXIS RIVER NEAR PORT HOPE SIMPSON	NL	2,310	11.7	8.64	8.05	29.7	213	113	51.9	36.8	38.1	47.9	43.6	21.0	52.2	0.0226	713	494	0.2139

APPENDIX H

Summary of Hydrometric Monitoring Stations and Monitoring
Results

Hydrometric Monitoring Station S1 Summary

Station ID	S1	Instruments Serial #	Levellogger 2012735, Barologger 2012828
Location	Gilling River near Astray Lake inlet; near proposed road crossing	Various Measurements	Temperature, Water Level, Atmospheric Pressure
Installation Date	24-Aug-12	Spot Measurements	Water Quality, Flow
Coordinates	651828.883 E 6059334.877 N	Main Channel:	Clean Winding
Access	Helicopter	Channel Bottom:	Cobblers, Boulders
Landing Point	651790 E 6059278 N	Flood Plain:	Medium to dense bush
Drainage Area	102 km ²	Comments	This station is located near the proposed road crossing and provide baseline flow and water quality data. This station will also continue to provide data during construction and operation of the road. Data downloaded on October 3, 2012 and on July 8, 2013.
Period of Record	August 24th, 2012 - July 8, 2013		
Active	Year Round		



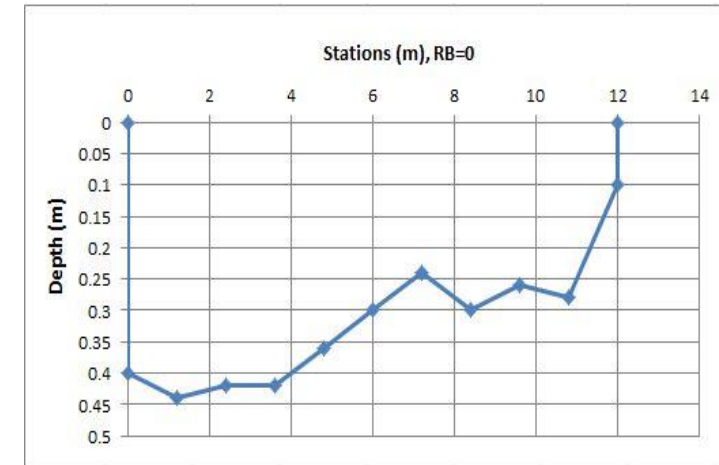
Map: S1 location



Photo 1: Looking Upstream

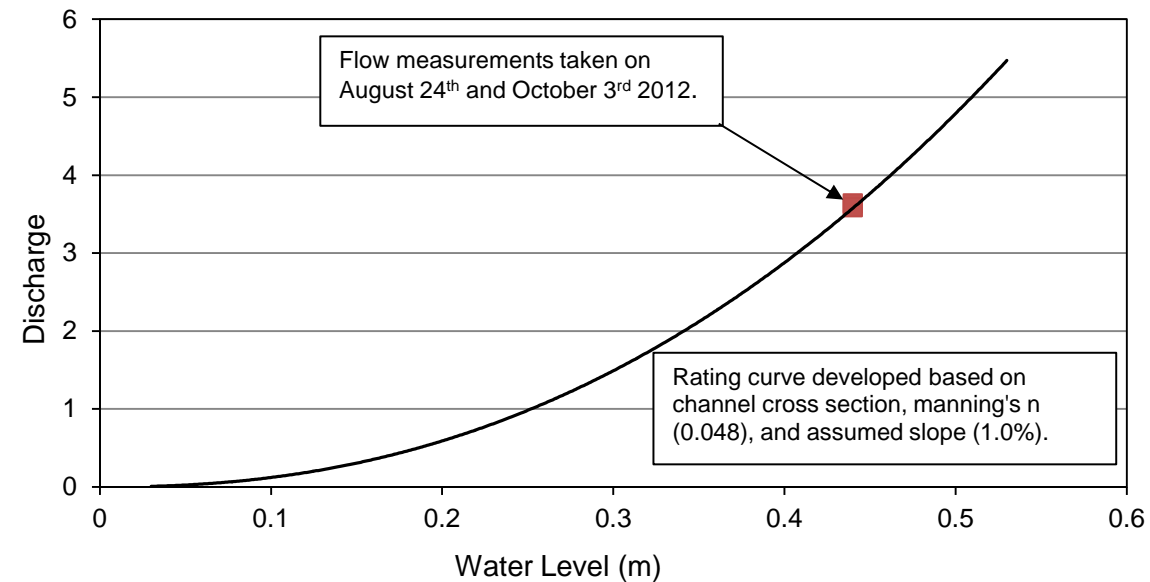


Photo 2: Looking Downstream

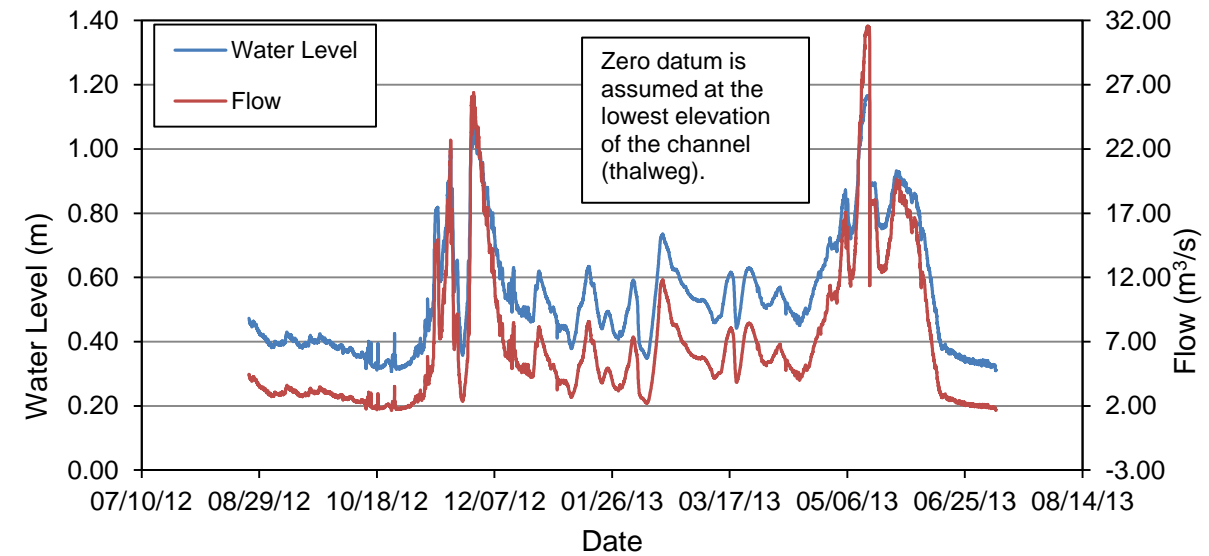


Cross Section Profile

Rating Curve - Station S1

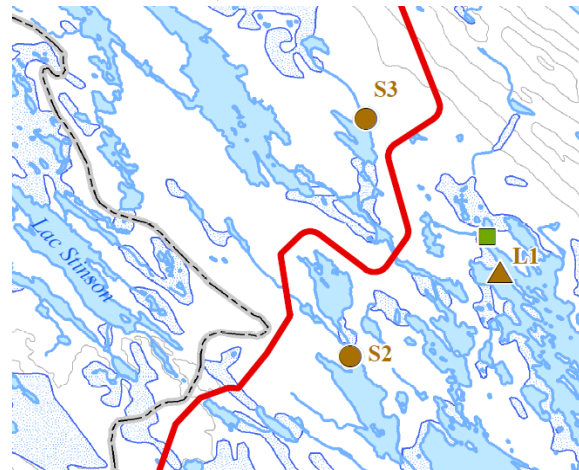


Monitored Water Level and Flow at Station S1



Hydrometric Monitoring Station S2 Summary

Station ID	S2	Instruments Serial #	Levellogger 2012733
Location	Unnamed Creek 1 discharge to Petitsikapau Lake, near proposed road crossing	Various Measurements	Temperature, Water Level
Installation Date	24-Aug-12	Spot Measurements	Water Quality, Flow
Coordinates	656166.885 E 6076159.921 N	Main Channel:	Clean, straight
Access	Helicopter	Channel Bottom:	Boulders, rocky
Landing Point	656122 E 6076296 N	Flood Plain:	Medium bush, short grass
Drainage Area	3.27 km ²	Comments	This station is located near proposed road crossing and provide baseline flow and water quality data. This station will also continue to provide data during construction and operation of the road. Data downloaded on October 3, 2012. Unable to download on July 8, 2013 due to connection error.
Period of Record	August 24th, 2012 - October 3rd 2012		
Active	Year Round		



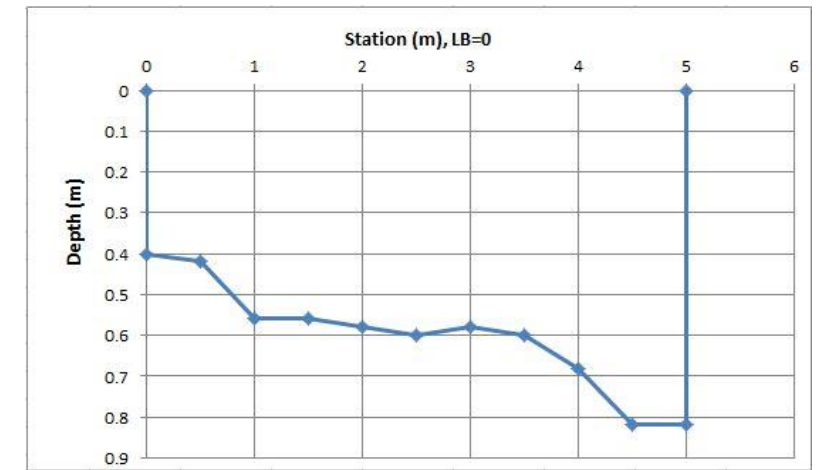
Map: S2 location



Looking Upstream

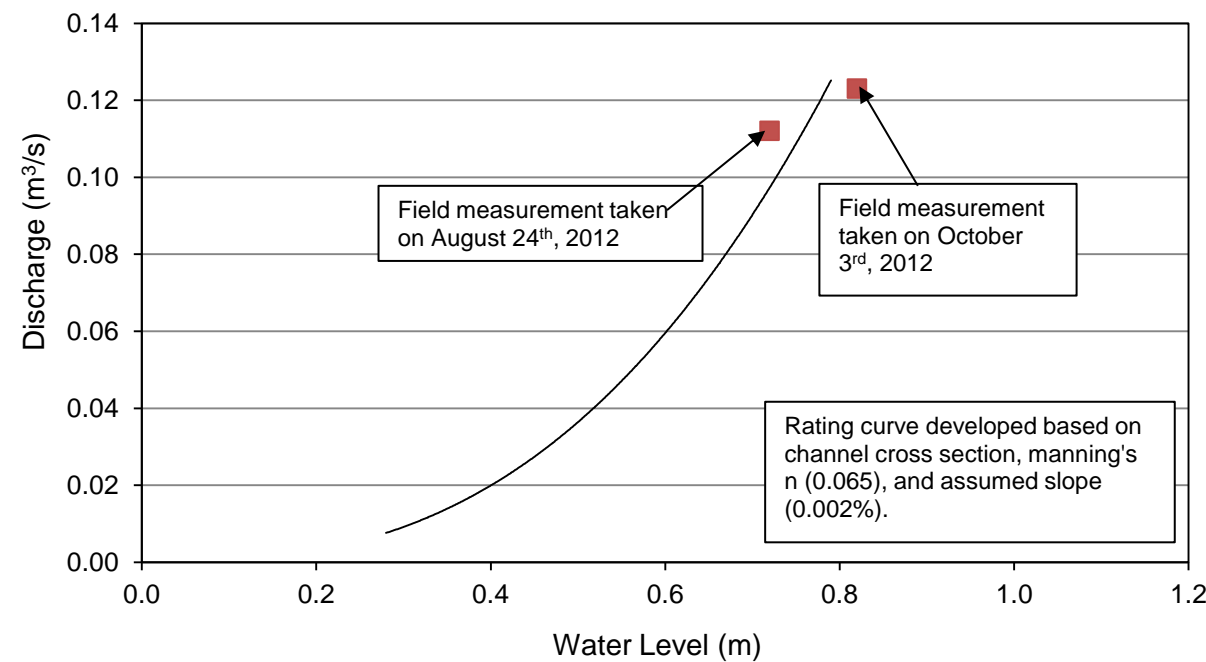


Looking Downstream

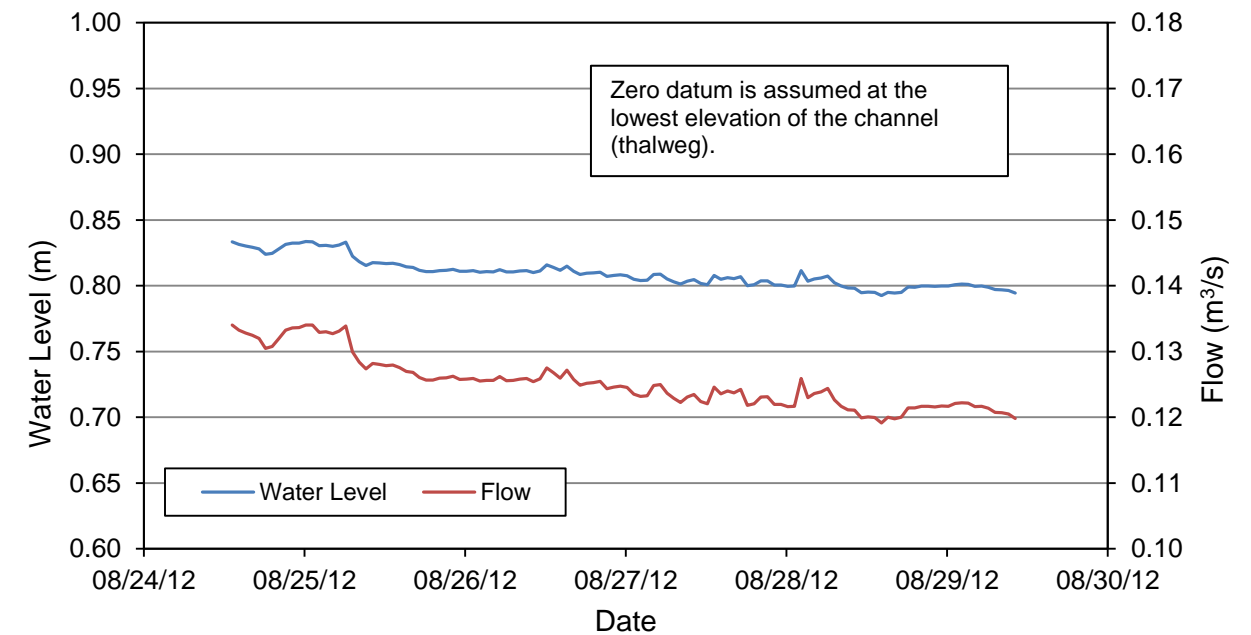


Cross Section Profile

Rating Curve - Station S2

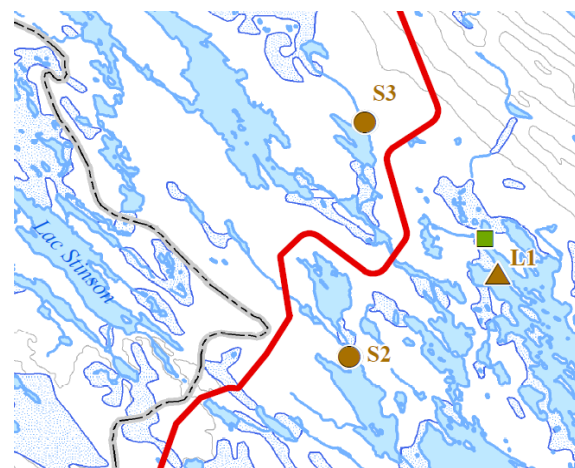


Monitored Water Level and Flow at Station S2



Hydrometric Monitoring Station S3 Summary

Station ID	S3	Instruments Serial #	Levellogger 2012744
Location	Unnamed Creek 2 discharges to Petitsikapau Lake, located west of Tailing Management Facility	Various Measurements	Temperature, Water Level
Installation Date	24-Aug-12	Spot Measurements	Water Quality, Flow
Coordinates	656365.256 E 6079417.511 N	Main Channel:	Clean, Winding
Access	Helicopter	Channel Bottom:	Some weeds, cobbles, boulder
Landing Point	654934 E 6079185 N	Flood Plain:	Medium bush, short grass
Drainage Area	5.06 km ²	Comments	This station is located southwest of tailings management facility and modular beneficiation plant and provide baseline flow and water quality data. This station will also continue to provide data during construction, operation and decommissioning of tailings management facility and beneficiation plants. Station S3 was vandalized around September 22, 2012 (Bear). During the October 3, 2012 field visit, the station was stabilized. Data downloaded on October 3, 2012 and July 8, 2013.
Period of Record	August 24th, 2012 - July 8, 2013		
Active	Year Round		



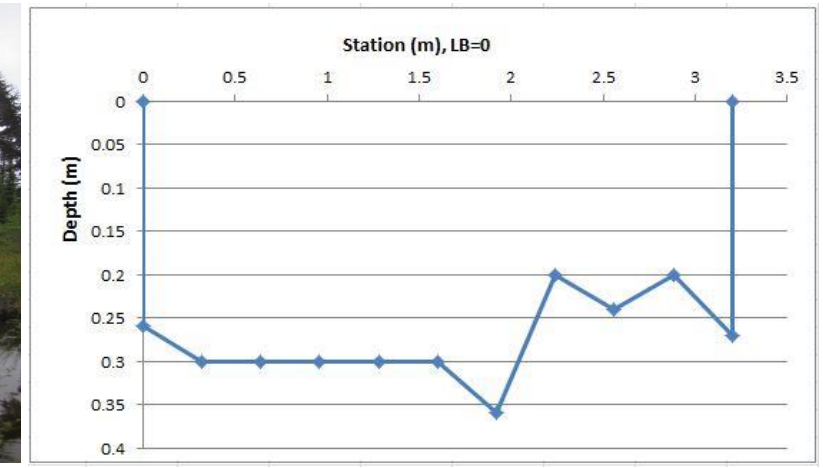
Map: S3 location



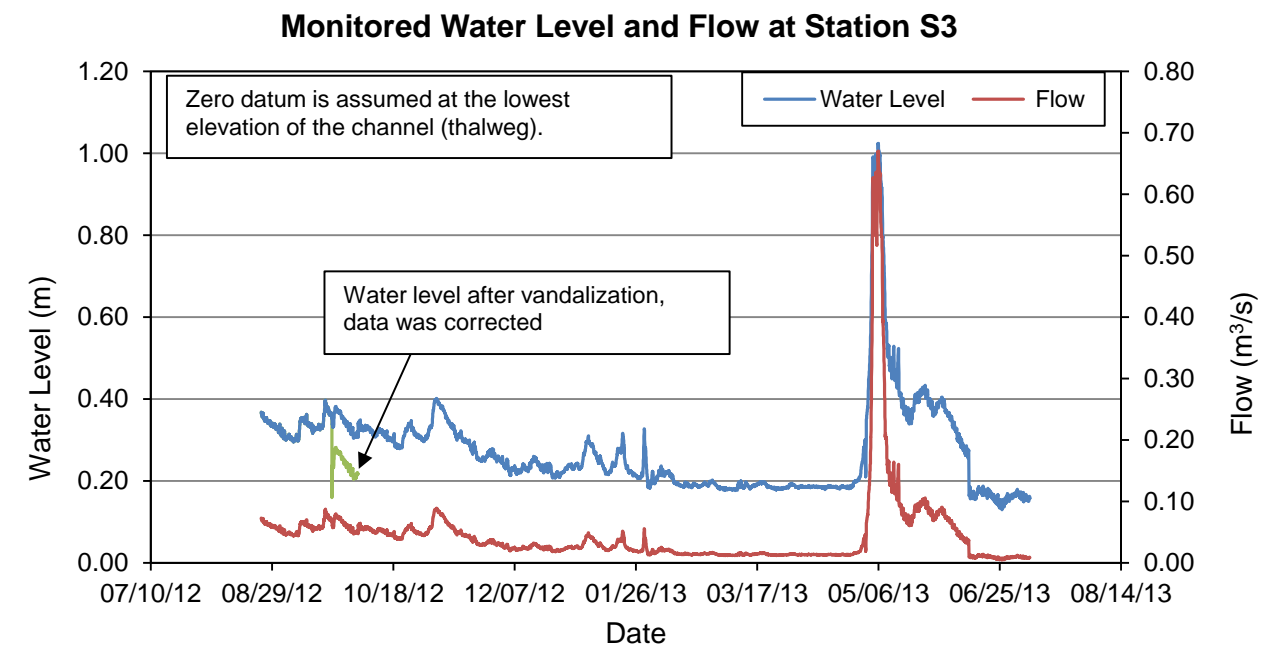
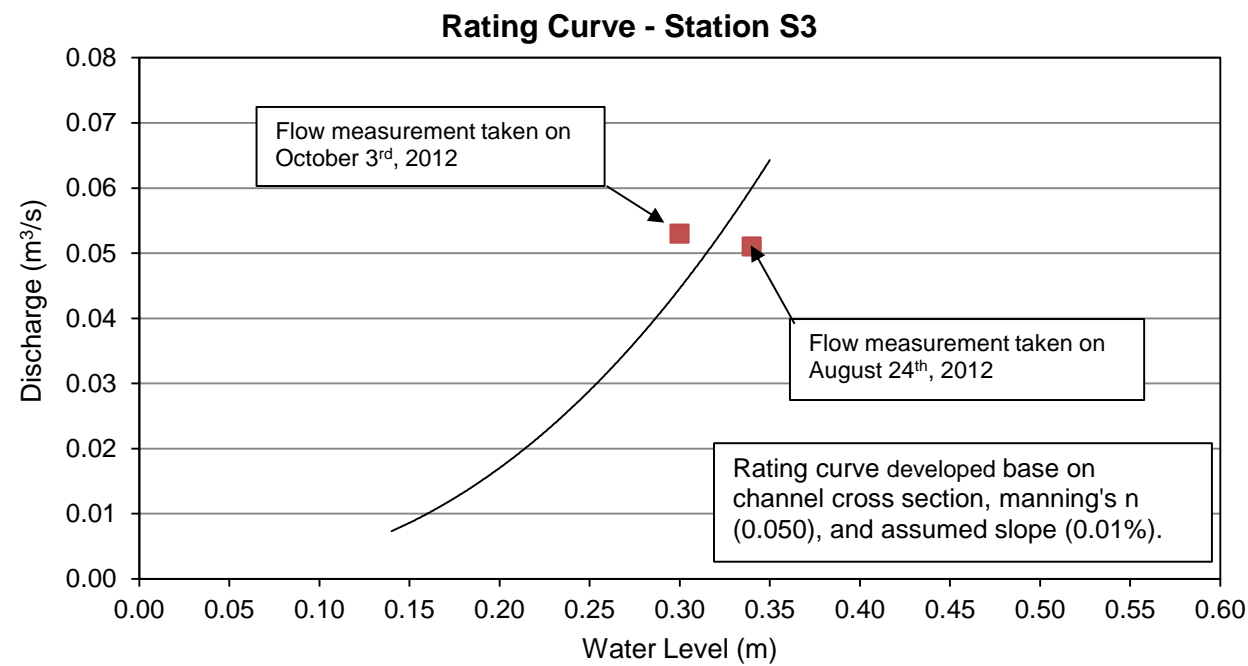
Looking Upstream



Looking Downstream



Cross Section Profile



Hydrometric Monitoring Station S4 Summary

Station ID	S4	Instruments Serial #	Levellogger 2012706, Barologger 2012830
Location	Unnamed Creek 3- outlet of Joyce Lake; 2 km southeast of Joyce Lake outlet	Various Measurements	Temperature, Water Level, Atmospheric Pressure
Installation Date	23-Aug-12	Spot Measurements	Water Quality, Flow
Coordinates	660544.742 E 6084123.33 N	Main Channel:	Clean, Winding
Access	Helicopter	Channel Bottom:	Soft, Fine materials, weeds, debris
Landing Point	660643 E 6084048 N	Flood Plain:	Medium to dense bush, short grass
Drainage Area	3.03 km ²	Comments	This station is located at outlet of Joyce Lake and provide baseline flow and water quality data. This station will also continue to provide data during construction, operation and decommissioning open pits around the Joyce Lake. Data downloaded on October 2, 2012 and on July 7, 2013.
Period of Record	August 23rd, 2012 to July 7, 2013		
Active	Year Round		



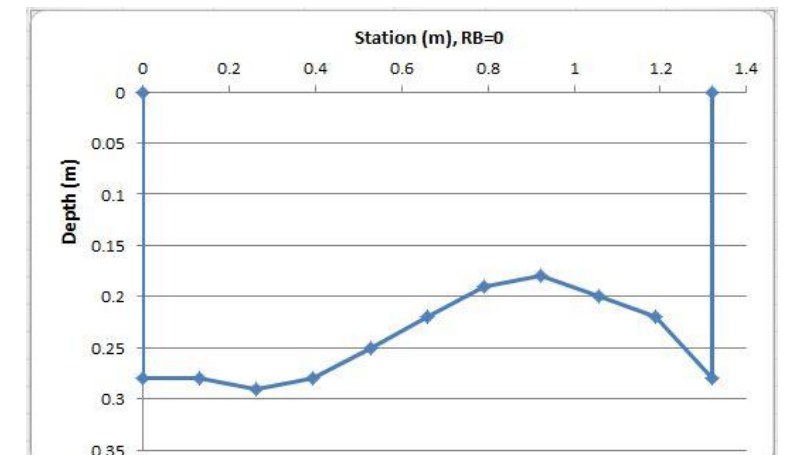
Map: S4 location



Looking Upstream

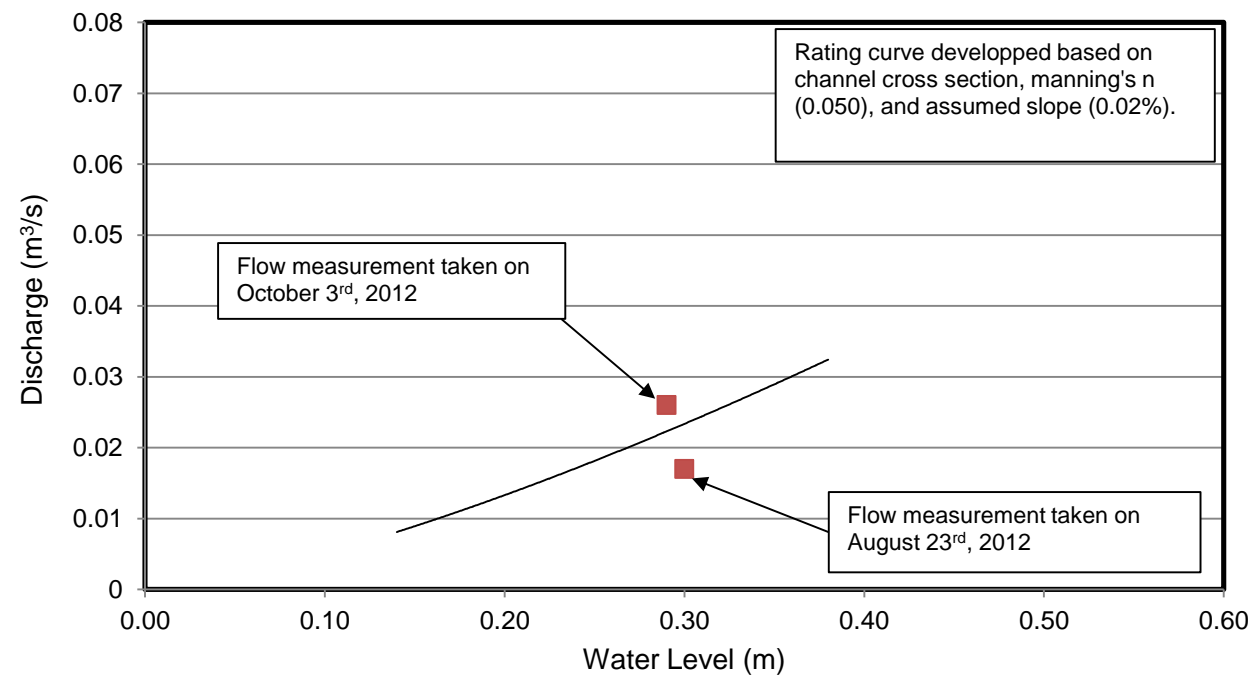


Looking Downstream

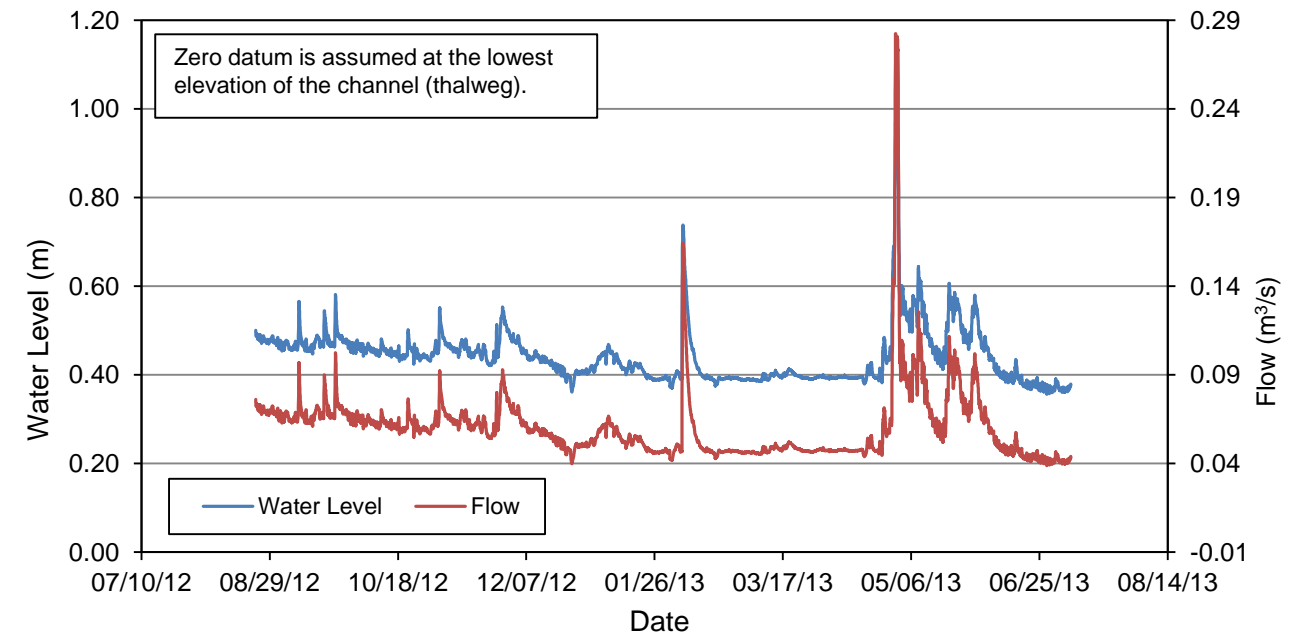


Cross Section Profile

Rating Curve - Station S4

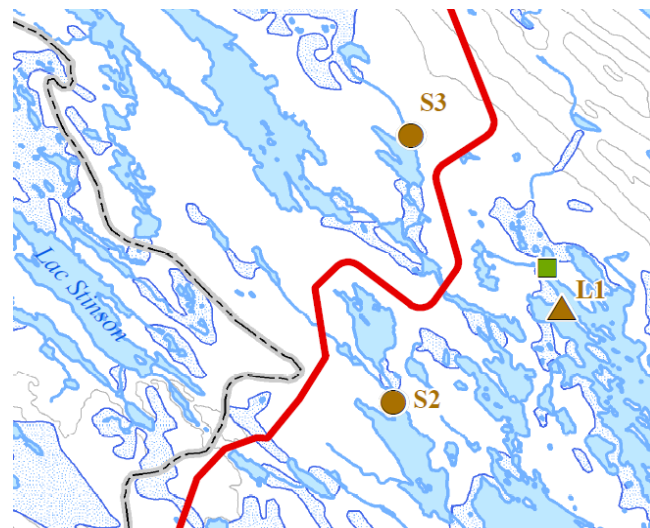


Monitored Water Level and Flow at Station S4



Hydrometric Monitoring Station L1 Summary

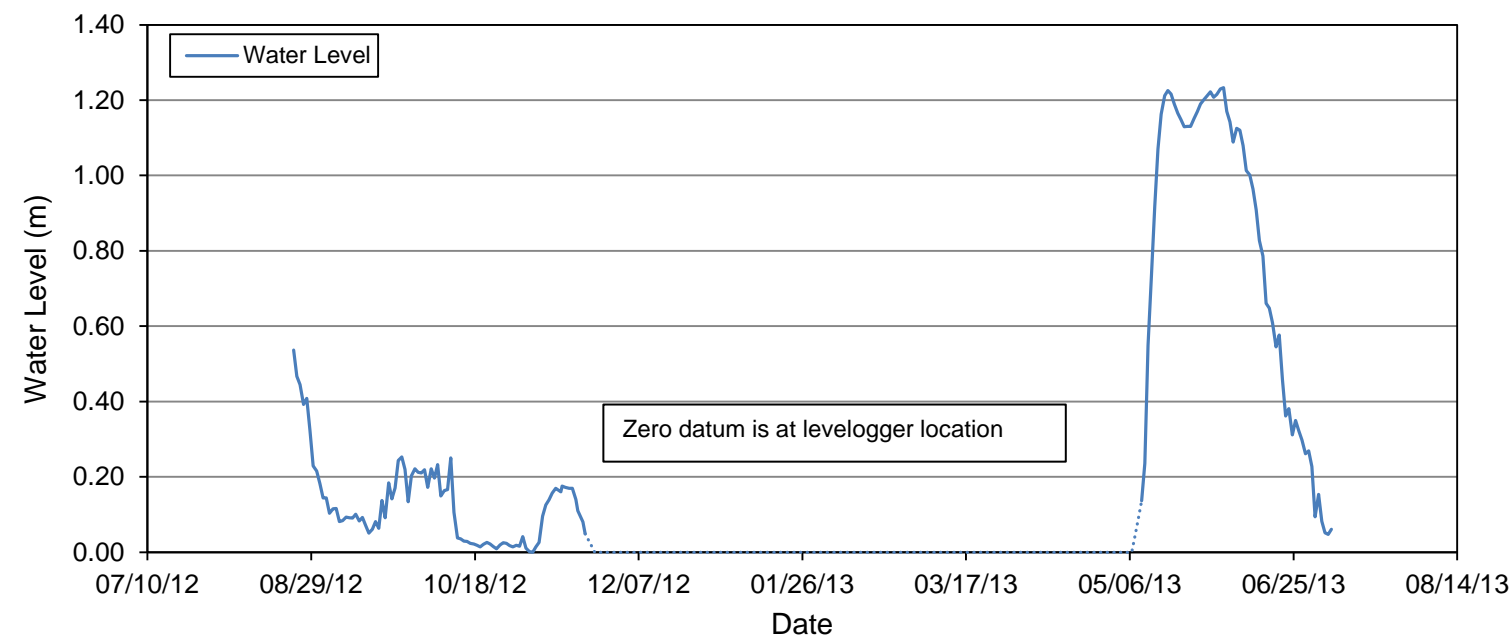
Station ID	L1	Instruments Serial #	Levellogger 2012738
Location	Northwest corner of Petitskapau Lake	Various Measurements	Temperature, Water Level
Installation Date	23-Aug-12	Spot Measurements	Water Quality
Coordinates	658147.151 E 6077322.216 N	Lake Bottom and Surrounding area	Lake bottom filled with boulders, not much vegetation around
Access	Helicopter		
Landing Point	658128 E 6077312 N	Comments	This station located in Petitskapau Lake which will receive potentially discharge from tailings management facility. This station will provide baseline water level and water quality data and will continue to provide data during the construction, operation and decommissioning tailings management facility. Station experienced minor vandalism. ABS pipe bended over slightly from its original set up in August. Data downloaded on October 2, 2012 and July 7, 2013.
Drainage Area	km ²		
Period of Record	August 23rd, 2012 - July 7, 2013		
Active	Year Round		



Map: L1 location



Monitored Water Level at Station L1



Hydrometric Monitoring Station L2 Summary

Station ID	L2	Instruments Serial #	Levellogger 2012708
Location	Unnamed Lake connected to Iron Arm (by a channel); East of Low Grade Stockpile	Various Measurements	Temperature, Water Level
Installation Date	24-Aug-12	Spot Measurements	Water Quality
Coordinates	659177.457 E 6082195.966 N	Lake Bottom and Surrounding area	Surrounded by dense bush and trees, soft lake bottom with fine materials, heavy vegetation on the banks
Access	Helicopter		
Landing Point	658932 E 6082215 N		
Drainage Area	2.79 km ²	Comments	This station located in a small waterbody that will potentially receive discharge from low grade stock pile, this station will provide baseline water level and water quality data and will continue to provide data during construction, operation and rehabilitation of low grade stock pile. Data downloaded on October 2, 2012 and on July 7, 2013.
Period of Record	August 24th, 2012 - July 7, 2013		
Active	Year Round		



Map: L2 location



Station L2 looking southeast



L2 looking towards outlet to Iron Arm



L2 looking southwest

Monitored Water Level at Station L2



Hydrometric Monitoring Station L3 Summary

Station ID	L3	Instruments Serial #	Levellogger 2012701
Location	Joyce Lake, close to pit 2	Various Measurements	Temperature, Water Level
Installation Date	23-Aug-12	Spot Measurements	Water Quality
Coordinates	658970.92 E 6086062.868 N	Lake Bottom and Surrounding area	Surrounded by scattered bush, lake bottom with gravels and cobbles, vegetation on the banks
Access	Helicopter	Comments	This station located in Joyce Lake which will potentially affected by open pit. This station will provide baseline water level and water quality data and continue to provide data during the construction , operation and rehabilitation of open pit. Station L3 moved locations on June 6, 2013. Data downloaded on October 2, 2012 and on July 7, 2013
Landing Point	658943 E 6086096 N		
Drainage Area	1.82 km ²		
Period of Record	August 23rd, 2012 - July 7, 2013		
Active	Year Round		



Map: L3 location

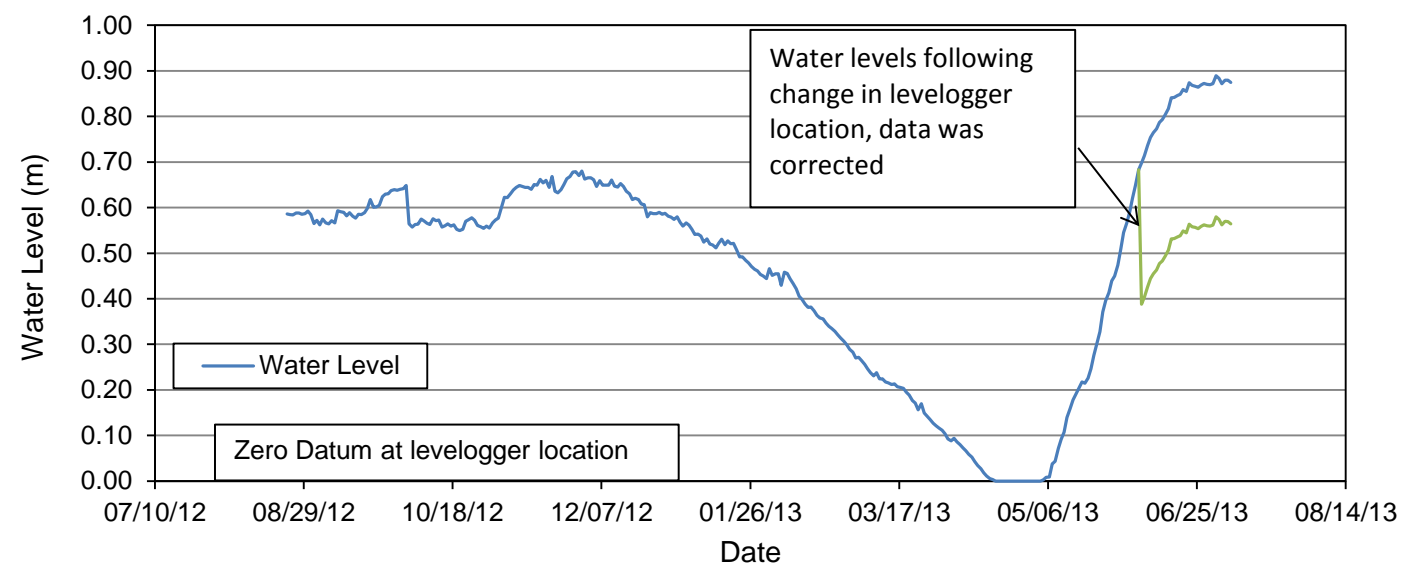


Station L3 looking southeast



L3 looking northwest

Monitored Water Level at Station L3



Hydrometric Monitoring Station L4 Summary

Station ID	L4	Instruments Serial #	Levellogger 2012740
Location	Attikamagen Lake , north of Settling Pond and Waste Rock Stockpile	Various Measurements	Temperature, Water Level
Installation Date	23-Aug-12	Spot Measurements	Water Quality
Coordinates	656837.409 E 6088835.361 N	Lake Bottom and Surrounding area	Surrounded by dense bush, lake bottom with cobbles and boulders, heavy vegetation on the bank
Access	Helicopter		
Landing Point	654835 E 6088824 N	Comments	This station located in Attikamagen Lake and will potentially receiving discharge from waste rock and stock pile. This station will provide baseline water level and water quality data and continue to provide data during the construction , operation and rehabilitation of waste rock and stock pile.Data downloaded on October 2, 2012. Unable to download on July 7, 2013 due to connection error.
Drainage Area	km ²		
Period of Record	August 23rd, 2012 - October 2nd, 2012		
Active	Year Round		



Map: L4 location



Station L4 looking northwest

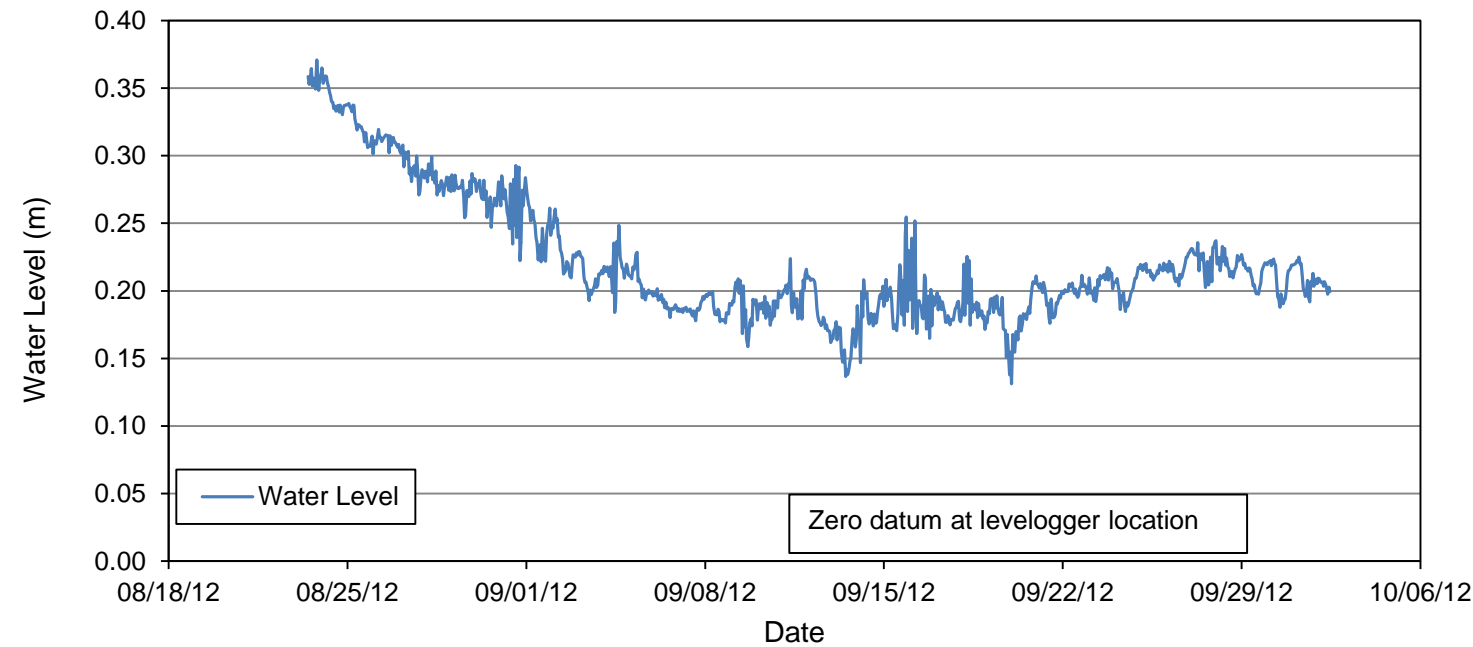


L4 looking northeast



L4 Surrounding area

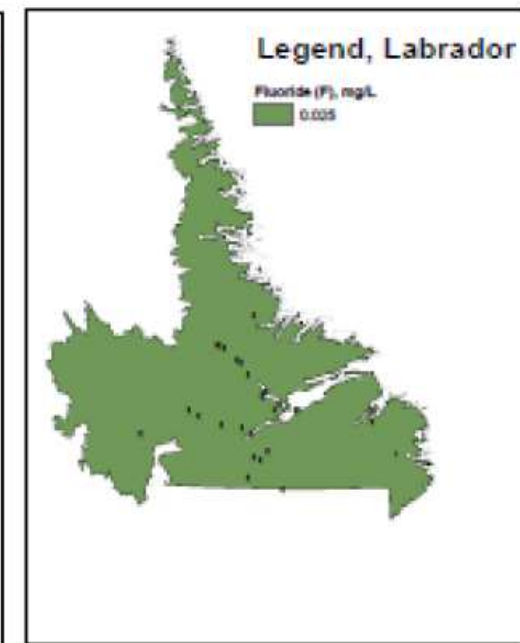
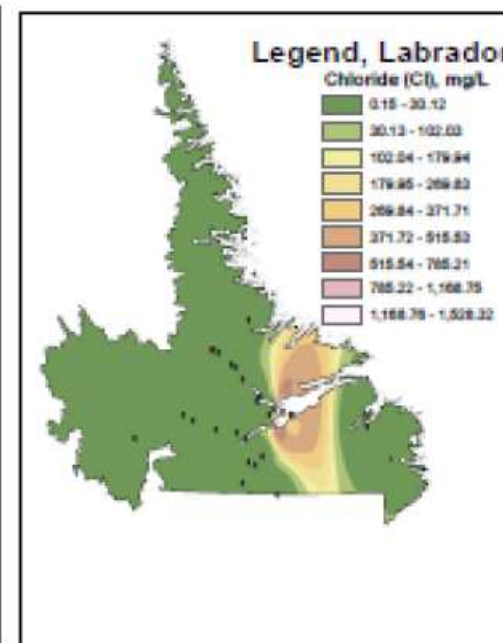
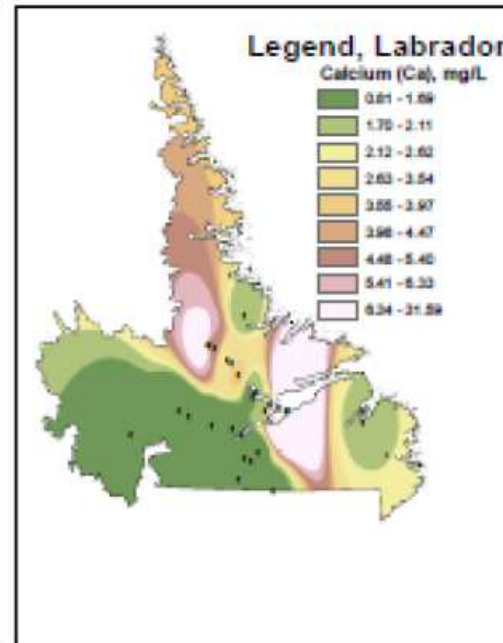
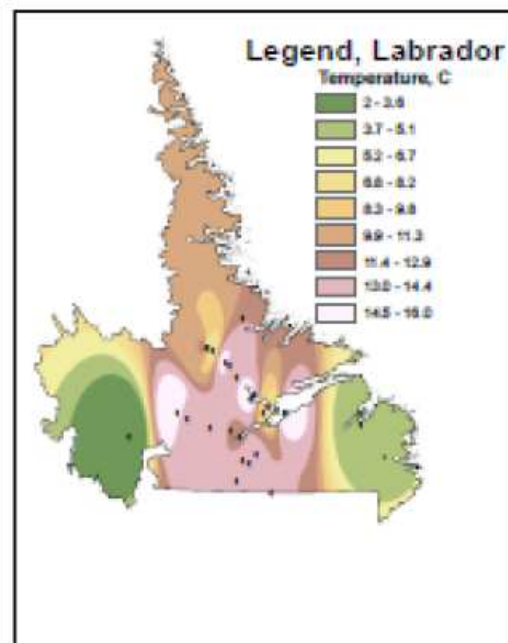
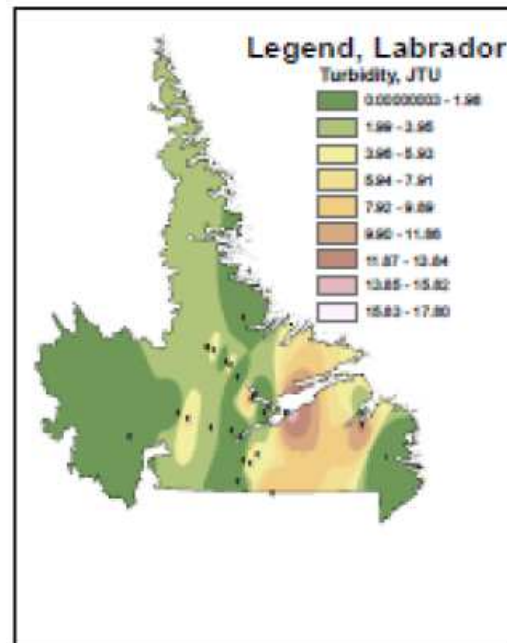
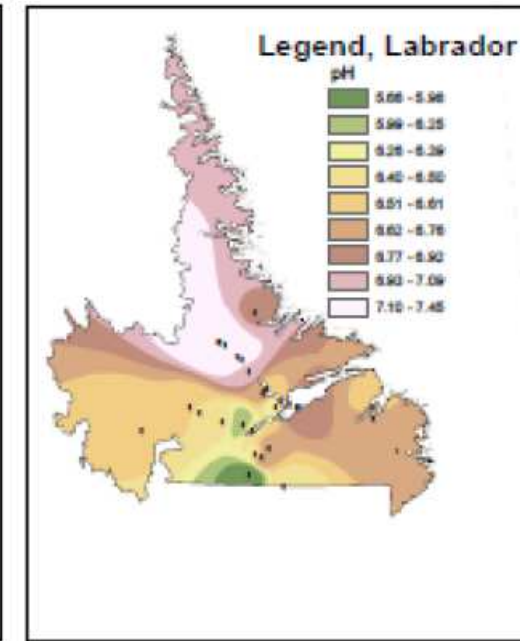
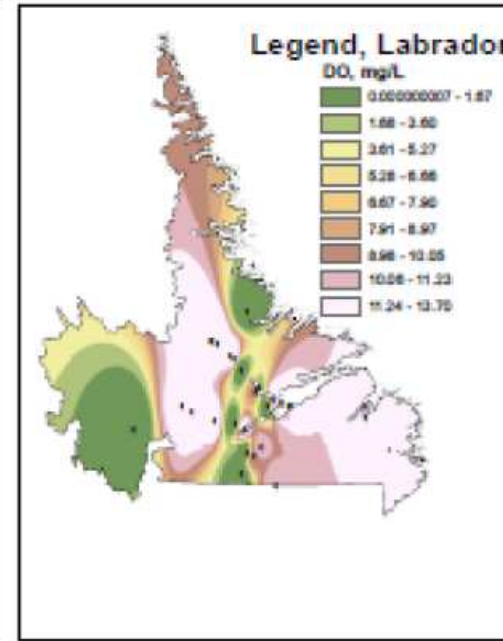
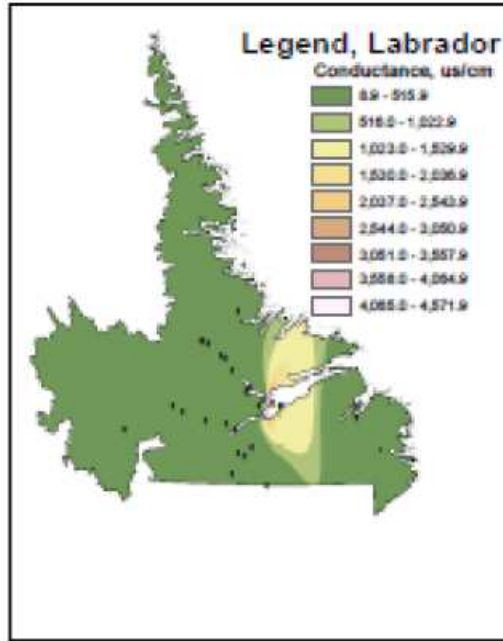
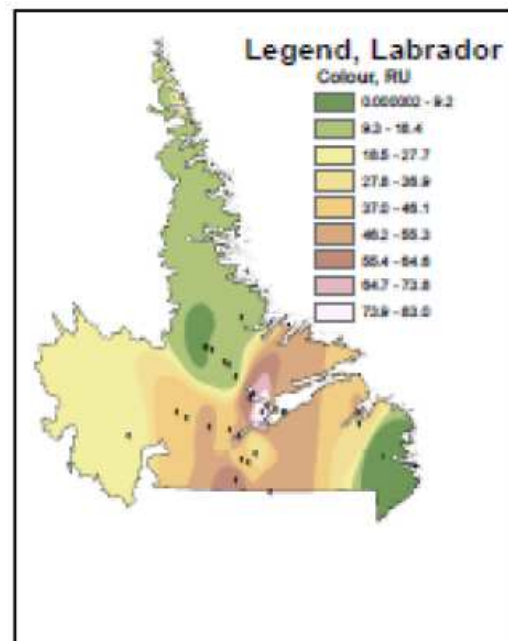
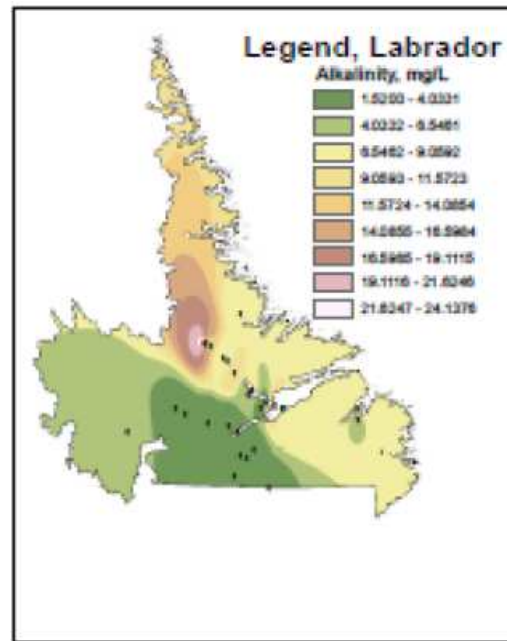
Monitored Water Level at Station L4



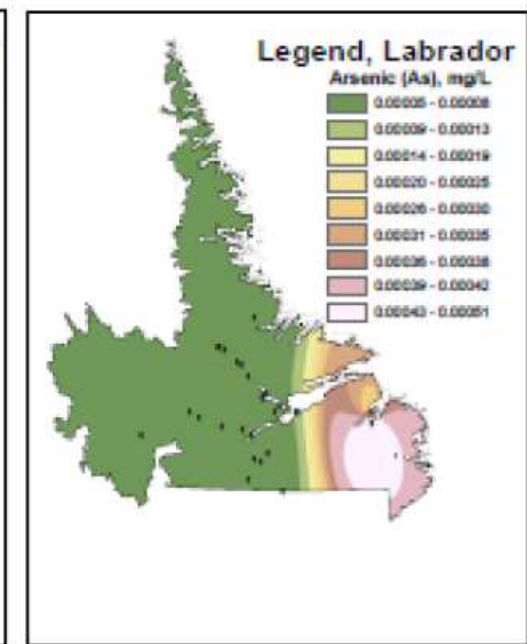
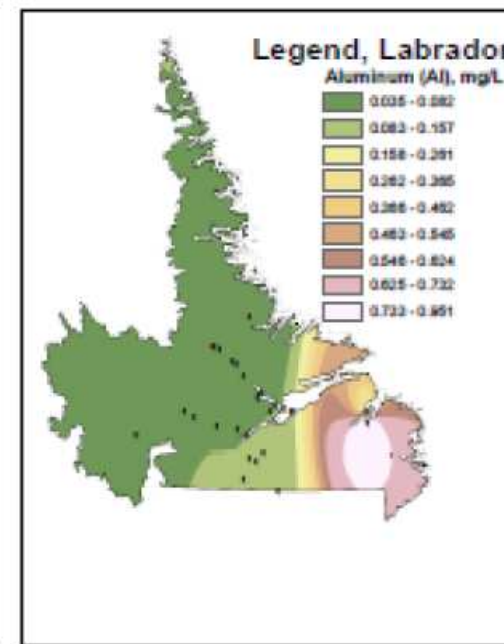
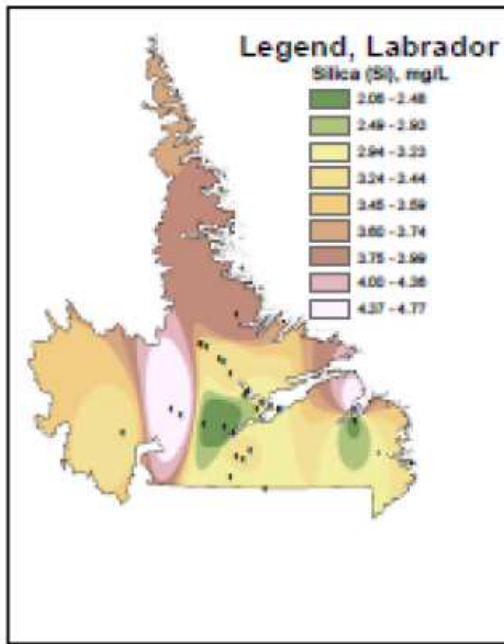
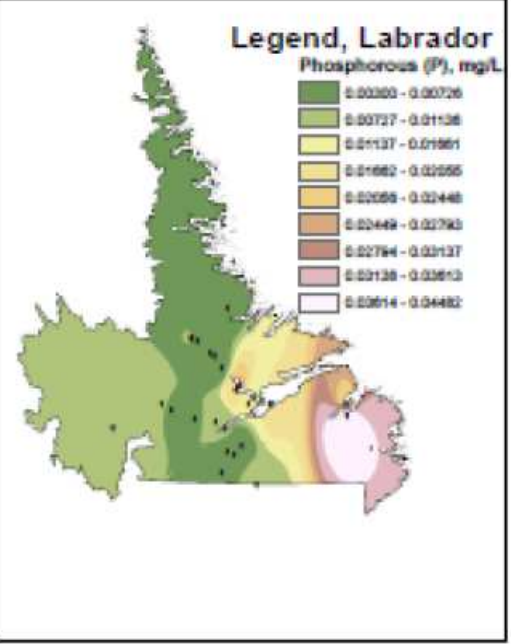
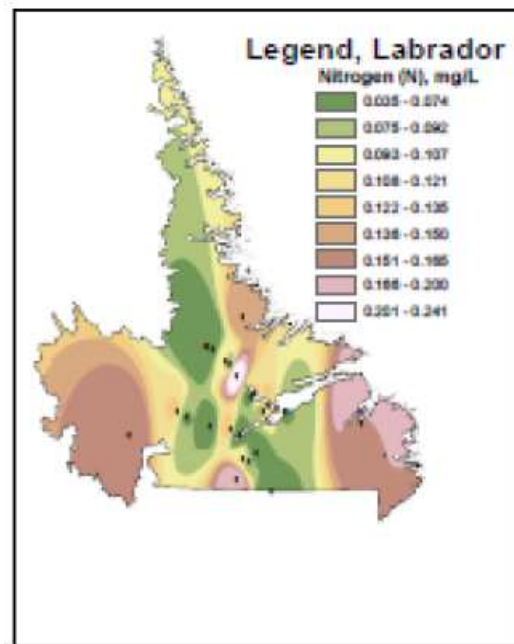
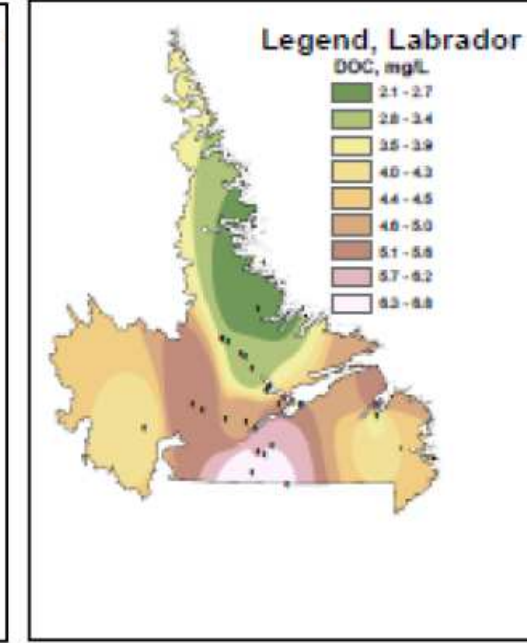
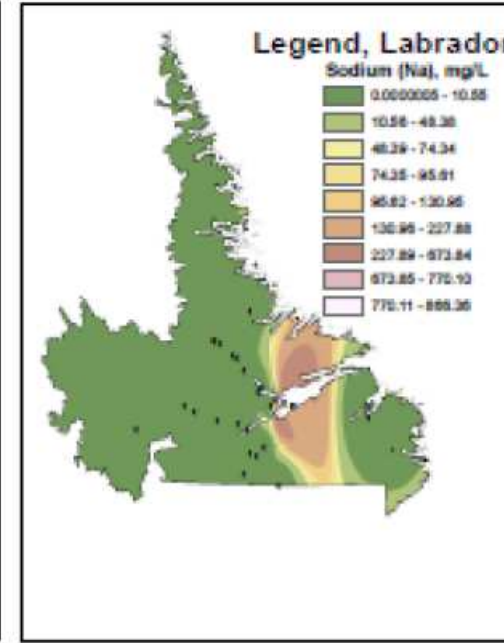
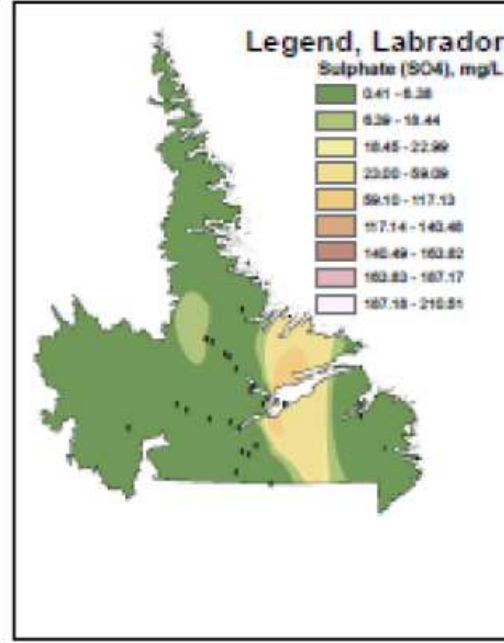
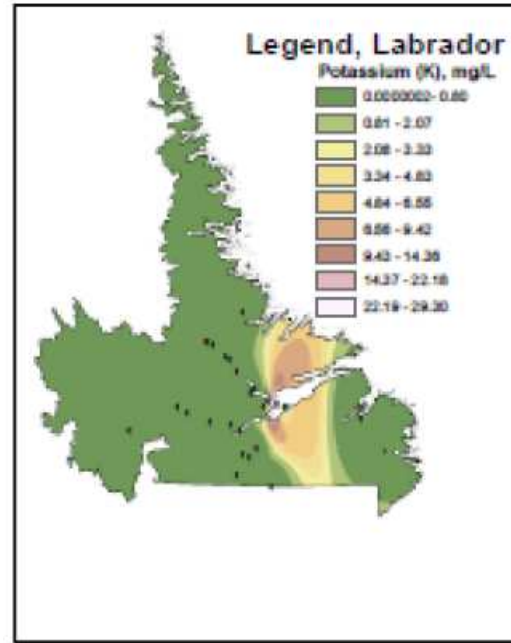
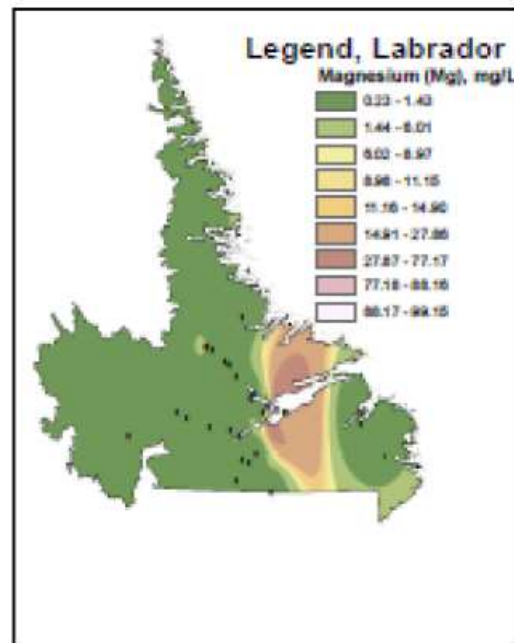
APPENDIX I

Regional Water Quality Concentration Maps

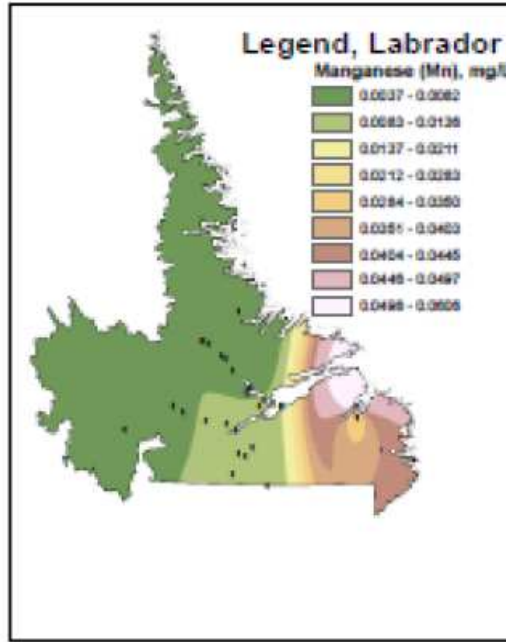
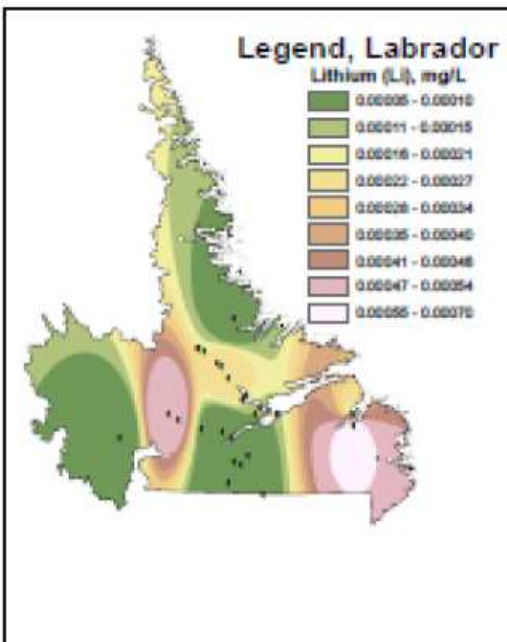
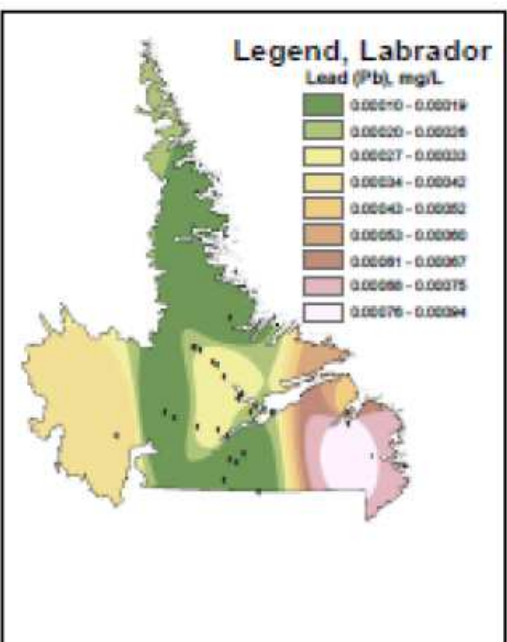
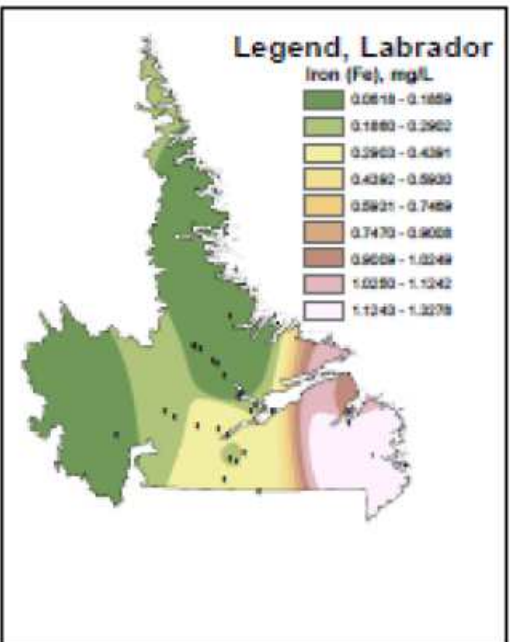
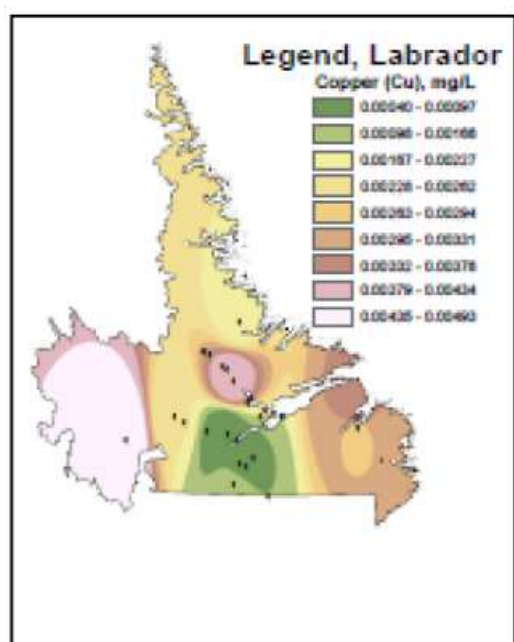
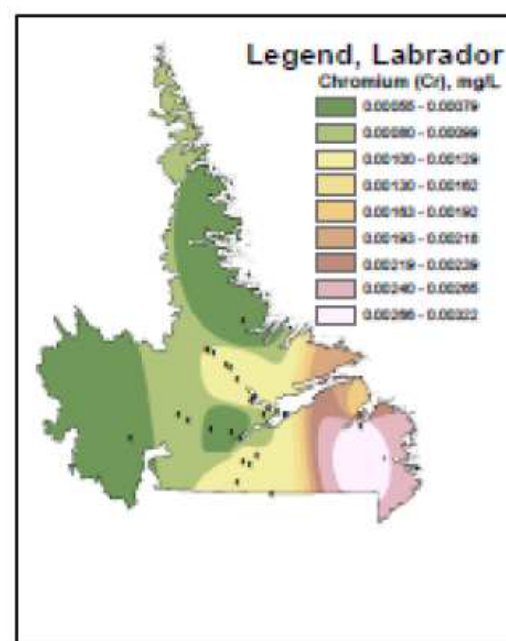
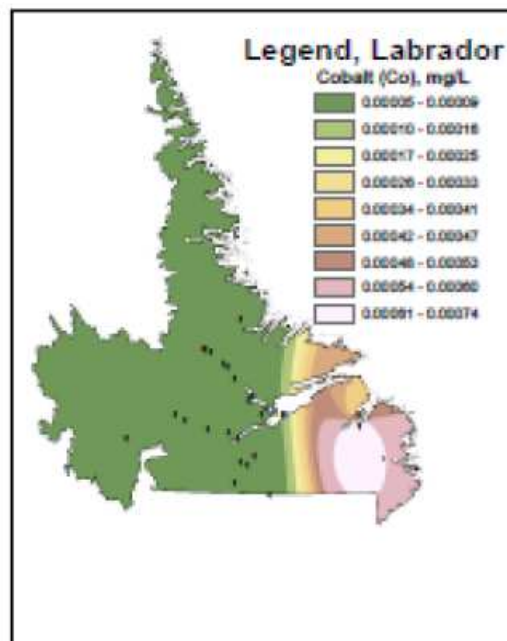
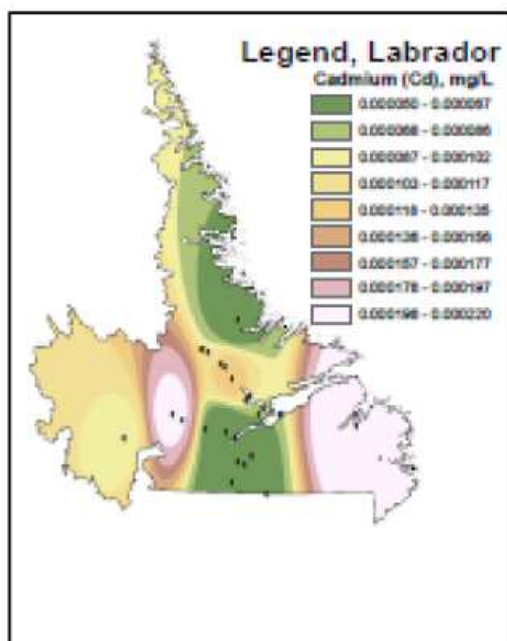
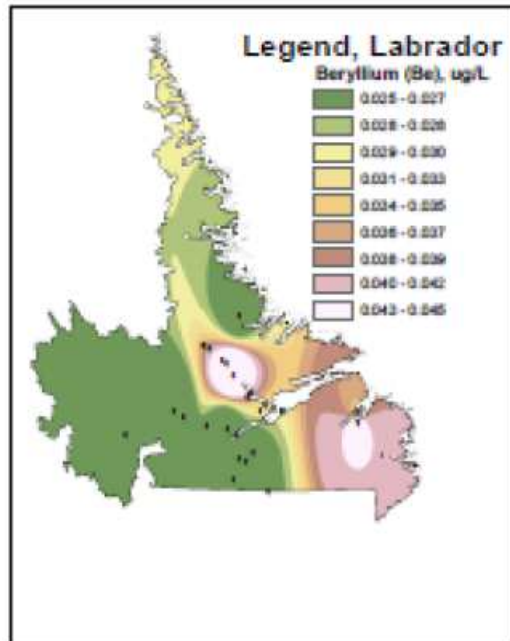
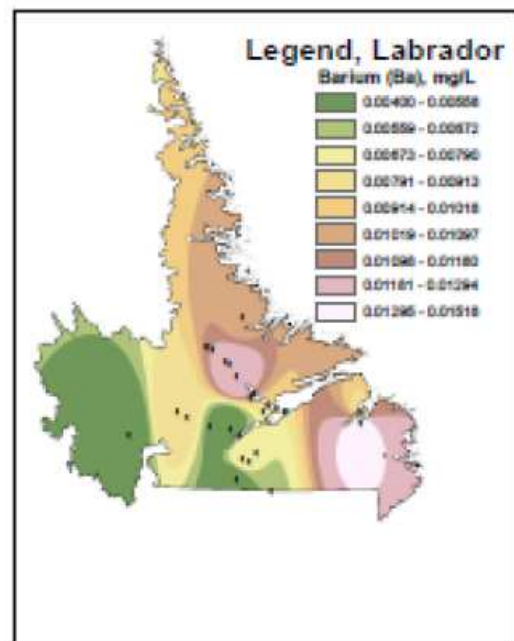
Water Quality Concentration Contours Based on Canda-Newfoundland Water Quality Monitoring Agreement Data



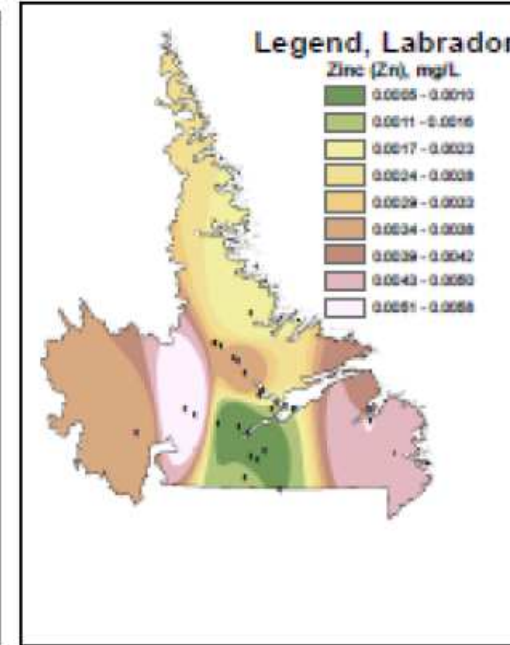
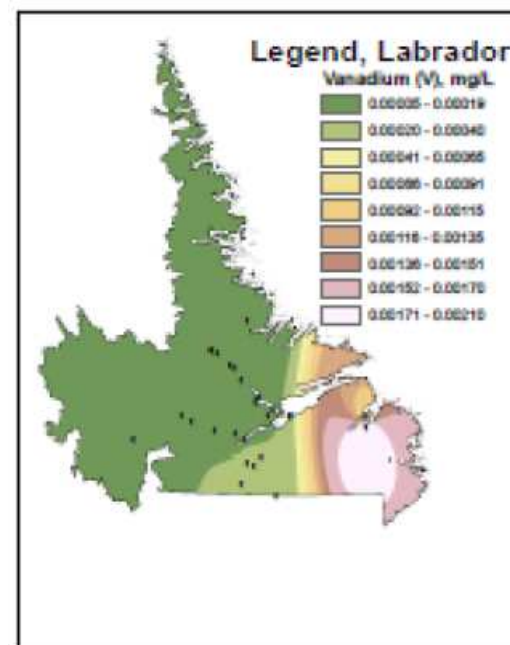
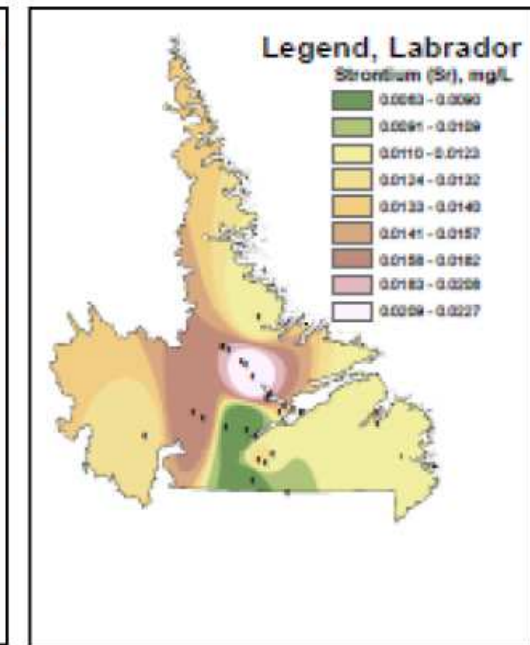
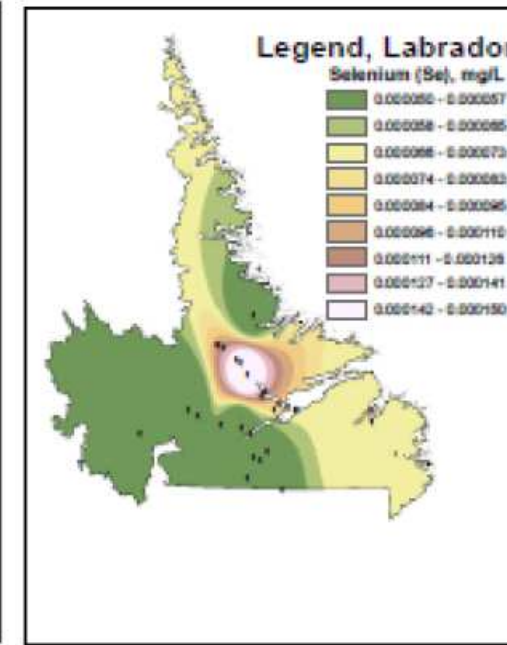
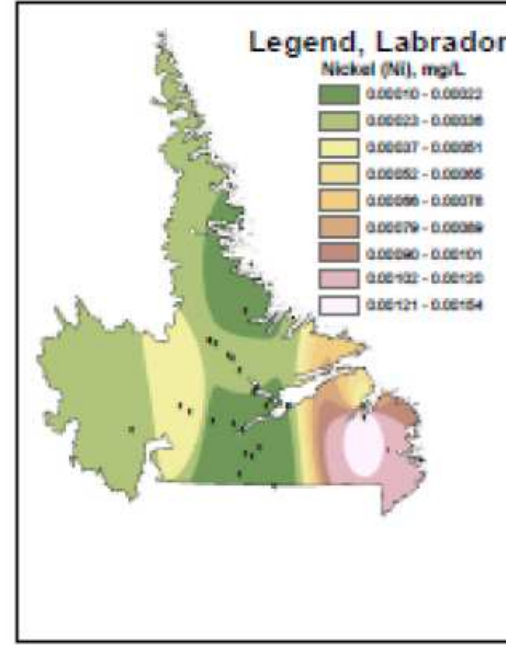
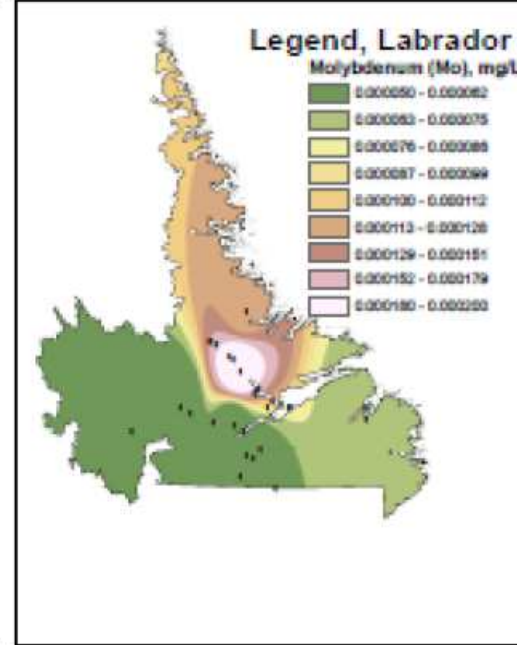
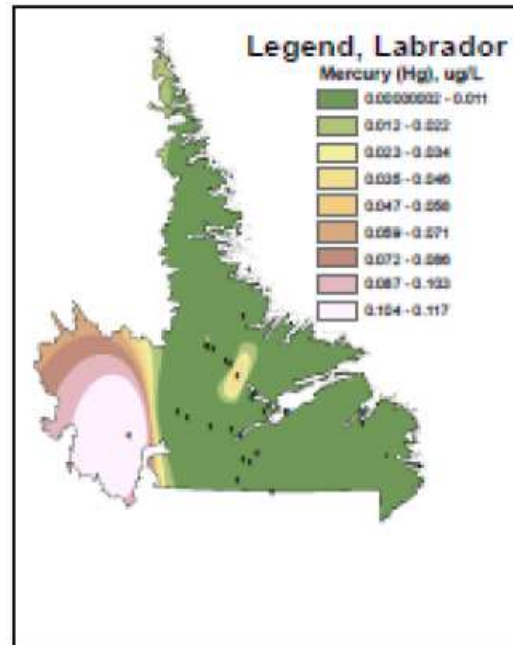
Water Quality Concentration Contours Based on Canda-Newfoundland Water Quality Monitoring Agreement Data



Water Quality Concentration Contours Based on Canda-Newfoundland Water Quality Monitoring Agreement Data



Water Quality Concentration Contours Based on Canada-Newfoundland Water Quality Monitoring Agreement Data



APPENDIX J

Water Quality Monitoring Results

Project Name: Joyce Lake Iron Ore Direct Shipping Project
Job No: 121511139.800.003
Subject: Surface Water Sample Laboratory Analytical Raw Data
Laboratory: Maxxam
Date: 31-Oct-14
Updated By: JA

Parameters	Units	CWQO ¹	MMER (Max in Grab Sample)	L1			L2			L3			L4			L3 Field Dup.	L4 Field Dup.	L1 Lab.Dup.	L1 Lab. Dup.	L3 Lab.Dup.	L3 Lab. Dup.	L4 Lab- Dup
				8/26/2012	10/3/2012	10/4/2013	8/26/2012	10/2/2012	10/4/2013	8/26/2012	10/2/2012	10/4/2013	8/26/2012	10/2/2012	10/4/2013	10/2/2012	10/4/2013	8/26/2012	10/3/2012	8/26/2012	10/4/2013	10/4/2013
Calculated Parameters																						
Anion Sum	me/L			0.230	0.220	0.270	0.310	0.270	0.190	0	0	0	0.210	0.200	0.200	0	0.22					
Bicarb. Alkalinity (calc. as CaCO ₃)	mg/L			11	11	12	16	14	9.6	<1.0	<1.0	<1.0	10	10	8.6	<1.0	9.2					
Calculated TDS	mg/L			14.0	16.0	17.0	19.0	20.0	17.0	2.0	3.0	3.0	12.0	12.0	12.0	3.0	13.0					
Carb. Alkalinity (calc. as CaCO ₃)	mg/L			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0					
Cation Sum	me/L			0.260	0.300	0.300	0.350	0.410	0.430	0.0600	0.0800	0.0700	0.240	0.270	0.270	0.0800	0.2700					
Chromium (+3)	mg/L	0.0089		<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008					
Hardness (CaCO ₃)	mg/L			11	13	13	16	18	18	2.1	3.1	2.4	11	12	11	3.0	12.0					
Ion Balance (% Difference)	%			6.12	15.4	5.26	6.06	20.6	38.7	100	100	100	6.67	14.9	14.9	100	10.2					
Langelier Index (@ 20C)	N/A			-2.58	-2.56	-2.76	-2.26	-2.22	-2.92	NC ⁸	NC ⁸	NC ⁸	-2.66	-2.64	-2.95	NC ⁸	-2.91					
Langelier Index (@ 4C)	N/A			-2.83	-2.82	-3.01	-2.51	-2.47	-3.17	NC ⁸	NC ⁸	NC ⁸	-2.91	-2.90	-3.20	NC ⁸	-3.16					
Nitrite (N)	mg/L	13 (Long Term) ; 550 (Short Term)		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050					
Saturation pH (@ 20C)	N/A			9.83	9.79	9.77	9.57	9.57	9.69	NC ⁸	NC ⁸	NC ⁸	9.89	9.86	9.93	NC ⁸	9.88					
Saturation pH (@ 4C)	N/A			10.1	10.0	10.0	9.82	9.82	9.94	NC ⁸	NC ⁸	NC ⁸	10.1	10.1	10.2	NC ⁸	10.1					
Inorganics																						
Acidity	mg/L			<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0					
Total Alkalinity (Total as CaCO ₃)	mg/L			11	11	12	16	14	9.6	<5.0	<5.0	<5.0	10	10	8.6	<5.0	9.2	12	11			
Dissolved Chloride (Cl)	mg/L			<1.0	<1.0	1.4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	<1.0	1.2	<1.0	<1.0			
Colour	TCU	Narrative		12	36	35	47	44	37	<5.0	<5.0	<5.0	7.4	20	12	<5.0	13	13	33			
Strong Acid Dissoc. Cyanide (CN) ³	mg/L	0.005 (as free CN)	2.0	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020				<0.0020	
Total Dissolved Solids	mg/L			23	34	<10	37	39	11	22	<10	<10	28	29	12	12	11					
Dissolved Fluoride (F-)	mg/L			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10					
Nitrate + Nitrite	mg/L			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050			
Nitrite (N)	mg/L	0.060		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010			
Nitrogen (Ammonia Nitrogen)	mg/L	http://sts.ccme.ca/?lang=en&factsheet=5#aq_fresh_concentration		<0.050	<0.050	<0.050	<0.050	0.055	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.061	0.066	0.11	<0.050				
Total Organic Carbon (C)	mg/L			3.4	4.8	3.9	6.4	5.6	3.6	0.93	0.71	ND (1)	2.6	4.6	2.8	0.66	3.4					
Orthophosphate (P)	mg/L			<0.010	<0.010	<0.010	<0.010	<0.010	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010			

Parameters	Units	CWQO ¹	MMER (Max in Grab Sample)	L1			L2			L3			L4			L3 Field Dup.	L4 Field Dup.	L1 Lab.Dup.	L1 Lab. Dup.	L3 Lab.Dup.	L3 Lab. Dup.	L4 Lab- Dup	
				8/26/2012	10/3/2012	10/4/2013	8/26/2012	10/2/2012	10/4/2013	8/26/2012	10/2/2012	10/4/2013	8/26/2012	10/2/2012	10/4/2013	8/26/2012	10/2/2012	10/4/2013	10/2/2012	10/4/2013	8/26/2012	10/3/2012	8/26/2012
pH	pH	6.5 - 9.0		7.25	7.23	7.01	7.31	7.35	6.77	6.63	6.64	6.32	7.23	7.22	6.98	6.64	6.97	7.25					
Phenols-4AAP	mg/L			<0.0010	0.0022	<0.0010	0.0020	0.0027	<0.0010	0.0010	<0.0010	<0.0010	<0.0010	0.0010	<0.0010	<0.0010	<0.0010				<0.0010		
Total Phosphorous (as P ₂ O ₅)	mg/L			<0.050	<0.050	<0.050	<0.050	<0.050	0.063	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050						
Total Phosphorus	mg/L			<0.0020	0.014	0.011	0.006	0.013	0.027	0.006	0.018	<0.0020	<0.0020	0.010	0.005	0.016	0.008						
Reactive Silica (SiO ₂)	mg/L			2.6	3.9	2.8	4.0	4.4	3.5	1.2	1.2	1.4	1.2	1.6	1.3	1.2	1.3	2.6	3.9				
Total Suspended Solids	mg/L	Narrative ⁹	30	<1.0	1.6	2.7	1.6	9.2	180	6.8	2.6	<1.0	1.8	2.0	4.5	5.0	17.0						
Dissolved Sulphate (SO ₄)	mg/L			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0				
Sulphide	mg/L			<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020					
Turbidity	NTU	Narrative ¹⁰		0.45	0.63	0.73	2.1	1.9	29	0.58	3.1	0.63	0.58	0.75	0.69	1.6	1.2			0.56			
Conductivity	uS/cm			26	27	27	32	32	25	5.6	5.6	6	24	24	22	5.3	22	26					
Petroleum Hydrocarbons																							
Total Oil & Grease	mg/L			<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10	<5.0	<10	<5.0					<5.0	
Metals																							
Total Mercury (Hg)	µg/L	0.026		<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013						
Metals (Total)																							
Total Aluminum (Al)	µg/L	100 µg/L if pH >6.5		16.7	46.1	43	82.2	92.2	560	17.1	13.7	15	18.6	36.3	140	10.2	33					15	
Total Antimony (Sb)	µg/L			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0					<1.0	
Total Arsenic (As)	µg/L	5	1000	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0					<1.0	
Total Barium (Ba)	µg/L			<1.0	1.1	2.2	1.8	2.5	7.5	<1.0	<1.0	1.5	<1.0	<1.0	3.1	<1.0	2.6					1.5	
Total Beryllium (Be)	µg/L			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0					<1.0	
Total Bismuth (Bi)	µg/L			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0					<2.0	
Total Boron (B)	µg/L	1500 µg/L (Long Term) ; 29,000 µg/L (Short Term)		<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50					<50	
Total Cadmium (Cd) ⁴	µg/L	Cadmium concentration = 10 ^{0.86[log10(hardness)]-3.2} µg/L		0.019	0.026	0.048	<0.017	<0.017	0.038	<0.017	<0.017	<0.017	<0.017	<0.017	0.025	<0.017	0.015					0.012	
Total Calcium (Ca)	µg/L			2630	2910	2800	3700	3960	4000	403	609	440	2550	2640	2500	600	2700					400	
Total Chromium (Cr)	µg/L			<1.0	<1.0	<1.0	<1.0	<1.0	1.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0					<1.0	
Total Cobalt (Co)	µg/L			<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40					<0.40	
Total Copper (Cu) ⁵	µg/L	concentration = e ^{0.8545[ln(hardness)]-1.465} * 0.2 µg/L	600	<2.0	2.0	<2.0	<2.0	<2.0	2	<2.0	6.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0					<2.0	
Total Iron (Fe)	µg/L	300		58	155	210	146	265	1000	<50	<50	56	<50	59	320	<50	73					55	
Total Lead (Pb) ⁶	µg/L	concentration = e ^{1.273[ln(hardness)]-4.705} µg/L	400	<0.50	<0.50	<0.50	<0.50	<0.50	0.53	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50					<0.50	
Total Magnesium (Mg)	µg/L			1200	1340	1400	1840	1990	1900	281	379	310	1110	1280	1200	370	1200					290	
Total Manganese (Mn)	µg/L			4.4	10.7	13	4.6	7.4	16	3.0	5.8	25	9.6	8.1	110	5.4	32					24	
Total Molybdenum (Mo)	µg/L	73		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0					<2.0	

Parameters	Units	CWQO ¹	MMER (Max in Grab Sample)	L1			L2			L3			L4			L3 Field Dup.	L4 Field Dup.	L1 Lab.Dup.	L1 Lab. Dup.	L3 Lab.Dup.	L3 Lab Dup.	L4 Lab- Dup
				8/26/2012	10/3/2012	10/4/2013	8/26/2012	10/2/2012	10/4/2013	8/26/2012	10/2/2012	10/4/2013	8/26/2012	10/2/2012	10/4/2013	10/2/2012	10/4/2013	8/26/2012	10/3/2012	8/26/2012	10/4/2013	10/4/2013
Total Nickel (Ni) ⁷	µg/L	Nickel concentration = $e^{0.76[\ln(\text{hardness})]+1.06}$ µg/L	1000	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0					<2.0	
Total Phosphorus (P)	µg/L			<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100					<100	
Total Potassium (K)	µg/L			165	144	160	106	170	230	132	190	150	118	121	120	161	100				130	
Total Selenium (Se)	µg/L	1		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0					<1.0	
Total Silicon (Si)	µg/L				1650	1300		2150	2500		546	660		750	810	549	660				630	
Total Silver (Ag)	µg/L	0.1		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10					<0.10	
Total Sodium (Na)	µg/L			682	826	830	621	763	720	208	355	260	535	602	560	292	600				250	
Total Strontium (Sr)	µg/L			11.9	12.5	12	26.9	28.0	29.0	<2.0	2.8	1	7.7	8.2	7.4	2.6	7.7				<2.0	
Total Thallium (Tl)	µg/L	0.8		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10					<0.10	
Total Tin (Sn)	µg/L			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0					<2.0	
Total Titanium (Ti)	µg/L			<2.0	<2.0	2.7	<2.0	2.6	11	<2.0	<2.0	<2.0	<2.0	<2.0	4.3	<2.0	<2.0				<2.0	
Total Uranium (U)	µg/L	15 (Long Term) ; 33 (Short Term)		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10					<0.10	
Total Vanadium (V)	µg/L			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0					<2.0	
Total Zinc (Zn)	µg/L	30	1000	<5.0	<5.0	5	<5.0	<5.0	12	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0					<5.0	
Radium 226	Bq/L		1.11			<0.01			<0.01			<0.01			<0.01		<0.01					

Note:

1. CWQG- Canadian Water Quality Guidelines for the Protection of Aquatic Life
2. Color - The mean absorbance of filtered water samples at 456 nm shall not be significantly higher than the seasonally adjusted expected value for the system under consideration.
3. Strong Acid Dissoc. Cyanide (CN)- strong-acid dissociable cyanide
4. Total Cadmium CWQG limit is adjusted by the hardness of the sample, for more information, please go to http://st-ts.ccme.ca/?lang=en&factsheet=20#aql_fresh_concentration
5. Total Copper CWQG limit is adjusted by the hardness of the sample, a minimum CWQG of 2 µg/L regardless of water hardness, for more information please go to http://st-ts.ccme.ca/?lang=en&factsheet=71#aql_fresh_concentration
6. Total Lead CWQG limit is adjusted by the hardness of the sample, a minimum CWQG of 1 µg/L regardless of water hardness, for more information please go to http://st-ts.ccme.ca/?lang=en&factsheet=124#aql_fresh_concentration
7. Total Nickel CWQG limit is adjusted by the hardness of the sample, a minimum CWQG of 25 µg/L regardless of water hardness, for more information please go to http://st-ts.ccme.ca/?lang=en&factsheet=139#aql_fresh_concentration
8. NC- Not Calculated , due to the parameter used for calculation is under detection limit
9. Total Suspended Solids - for clear flow, maximum increase of 25 mg/L from background levels for any short -term exposure(24 hr period), maximum average of 5 mg/L from background levels for longer term exposures (e.g., inputs lasting between 24 hr and 30 days).
10. Turbidity - for clear flow, maximum increase of 8 NTUs from background levels for a short - term exposure (e.g., 24 hr period). Maximum average increase of 2 NTUs from background levels for a long term exposure (e.g., 30 days period)
11. Values in Italic Bold are adjusted to half values of the detection limit in the report for analytical purpose

Parameters	Units	CWQO ¹	MMER (Max in Grab Sample)	S1			S2			S3			S4			S4 (Field Dup.)	S1 Lab. Dup.			S2 Lab. Dup.	S4-Lab. Dup.	L3 Lab. Dup.
				8/26/2012	10/3/2012	10/4/2013	8/26/2012	10/3/2012	10/4/2013	8/26/2012	10/3/2012	10/4/2013	8/26/2012	10/2/2012	10/4/2013	8/26/2012	8/26/2012	10/3/2012	10/4/2013	10/3/2012	10/2/2012	8/26/2012
Calculated Parameters																						
Anion Sum	me/L			1.26	1.25	1.19	0.160	0.160	0.150	0.240	0.190	0.340	0.260	0.210	0.200	0.26						
Bicarb. Alkalinity (calc. as CaCO ₃)	mg/L			57	56	52	8.1	8.1	5.5	12	9.4	15	5.7	<1.0	<1.0	5.6						
Calculated TDS	mg/L			63.0	64.0	61.0	11.0	11.0	10.0	18.0	17.0	21.0	20.0	21.0	20.0	20						
Carb. Alkalinity (calc. as CaCO ₃)	mg/L			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0						
Cation Sum	me/L			1.21	1.27	1.18	0.200	0.220	0.200	0.350	0.350	0.300	0.240	0.280	0.270	0.24						
Chromium (+3)	mg/L	0.0089		<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008						
Hardness (CaCO ₃)	mg/L			59	62	58	7.7	8.9	7.5	14	13	11	9.9	12	11	9.9						
Ion Balance (% Difference)	%			2.02	0.790	0.420	11.1	15.8	14.3	18.6	29.6	6.25	4.00	14.3	14.9	4						
Langelier Index (@ 20C)	N/A			-0.481	-0.453	-0.682	-3.06	-2.98	-3.73	-2.79	-2.94	-3.34	-3.87	NC ⁸	NC ⁸	-3.84						
Langelier Index (@ 4C)	N/A			-0.732	-0.705	-0.934	-3.31	-3.23	-3.98	-3.04	-3.19	-3.6	-4.12	NC ⁸	NC ⁸	-4.1						
Nitrate (N)	mg/L	13 (Long Term) ; 550 (Short Term)		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.091	<0.050						
Saturation pH (@ 20C)	N/A			8.51	8.50	8.53	10.0	9.96	10.2	9.70	9.85	9.7	10.5	NC ⁸	NC ⁸	10.5						
Saturation pH (@ 4C)	N/A			8.76	8.76	8.78	10.3	10.2	10.4	9.95	10.1	9.96	10.7	NC ⁸	NC ⁸	10.7						
Inorganics																						
Acidity	mg/L			<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	5.4	8.4	15	<5.0	<5.0	<5.0	<5.0						
Total Alkalinity (Total as CaCO ₃)	mg/L			58	56	53	8.1	8.1	5.5	12	9.4	15	5.7	<5.0	<5.0	5.6					<5.0	
Dissolved Chloride (Cl)	mg/L			<1.0	<1.0	1.3	<1.0	<1.0	1.5	<1.0	<1.0	1.5	<1.0	<1.0	1	<1.0					<1.0	
Colour	TCU	Narrative ²		<5.0	<5.0	<5.0	53	49	49	120	73	150	8.5	7.8	<5.0	8.2					6.3	
Strong Acid Dissoc. Cyanide (CN) ³	mg/L	0.005 (as free CN)	2.0	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020						
Total Dissolved Solids	mg/L			65	69	39	33	23	11	49	36	28	31	29	13	32						
Dissolved Fluoride (F ⁻)	mg/L			<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10						
Nitrate + Nitrite	mg/L			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.091	<0.050					<0.050	
Nitrite (N)	mg/L	0.060		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010					<0.010	
Nitrogen (Ammonia Nitrogen)	mg/L	http://sts.ccme.ca/?lang=en&factsheet=5#aql_fresh_concentration		0.094	<0.050	<0.050	0.13	<0.050	0.054	<0.050	<0.050	0.066	<0.050	<0.050	0.1	0.054						
Total Organic Carbon (C)	mg/L			1.0	1.0	< 1.0	6.9	7.2	13	13	9.8	7.2	1.1	0.79	< 1.0	0.79						
Orthophosphate (P)	mg/L			<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010					<0.010	
pH	pH	6.5 - 9.0		8.03	8.05	7.85	6.96	6.98	6.45	6.91	6.91	6.36	6.60	6.55	6.25	6.63	8.05		7.87	7.01		
Phenols-4AAP	mg/L			0.0012	<0.0010	<0.0010	0.0015	0.0028	0.011	0.0017	0.0030	0.0010	<0.0010	0.0011	<0.0010	<0.0010	0.0011					
Total Phosphorous (as P ₂ O ₅)	mg/L			<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.060	<0.050	<0.050	<0.050					<0.050	
Total Phosphorus	mg/L			0.006	0.015	<0.0020	<0.0020	0.013	0.015	0.009	0.013	<0.0020	0.012	0.009	0.012	0.021					<0.0020	
Reactive Silica (SiO ₂)	mg/L			3.4	3.9	3.9	2.4	2.4	1.6	4.3	4.3	4.3	5.3	6.0	5.7	5.3					6.0	

Parameters	Units	CWQO ¹	MMER (Max in Grab Sample)	S1			S2			S3			S4			S4 (Field Dup.)	S1 Lab. Dup.			S2 Lab. Dup.	S4-Lab. Dup	L3 Lab. Dup.
				8/26/2012	10/3/2012	10/4/2013	8/26/2012	10/3/2012	10/4/2013	8/26/2012	10/3/2012	10/4/2013	8/26/2012	10/2/2012	10/4/2013	8/26/2012	8/26/2012	10/3/2012	10/4/2013	10/3/2012	10/2/2012	8/26/2012
Total Suspended Solids	mg/L	Narrative ⁹	30	1.2	1.8	<1.0	2.4	1.4	5.2	3.6	3.0	180.0	1.8	<1.0	2.8	1.4						
Dissolved Sulphate (SO ₄)	mg/L			5.1	5.9	4.8	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	7.2	10	8	7.1					10	
Sulphide	mg/L			<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020						
Turbidity	NTU	Narrative ¹⁰		0.50	0.85	0.25	0.66	1.1	1.6	1.3	1.1	58	0.68	0.92	0.81	0.88						0.56
Conductivity	uS/cm			110	110	110	17	17	15	28	24	33	26	29	27	26	110		110	17		
Petroleum Hydrocarbons																						
Total Oil & Grease	mg/L			<5.0	<9.0	< 5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<5.0	<10	<5.0	<5.0						
Metals																						
Total Mercury (Hg)	µg/L	0.026		<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013						
Metals (Total)																						
Total Aluminum (Al)	µg/L	5 µg/L if pH <6.5; 100 µg/L if pH >6.5		10.0	7.2	9.8	94.4	82.7	91	182	201	170	25.3	28.3	31	29.3						
Total Antimony (Sb)	µg/L			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0						
Total Arsenic (As)	µg/L	5	1000	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0						
Total Barium (Ba)	µg/L			1.1	1.3	1.8	1.7	1.5	2.5	2.5	2.6	2.5	1.9	2.2	2.6	1.9						
Total Beryllium (Be)	µg/L			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0						
Total Bismuth (Bi)	µg/L			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0						
Total Boron (B)	µg/L	1500 µg/L (Long Term) ; 29,000 µg/L (Short Term)		<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50						
Total Cadmium (Cd) ⁴	µg/L	Cadmium concentration = $10^{0.86[\log_{10}(\text{hardness})]-3.2}$ µg/L		<0.017	<0.017	<0.017	0.028	0.021	0.035	0.107	0.116	0.11	<0.017	<0.017	<0.017	<0.017						
Total Calcium (Ca)	µg/L			11600	11900	11000	2500	2620	2200	3530	2970	2500	1230	1460	1200	1230						
Total Chromium (Cr)	µg/L			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0						
Total Cobalt (Co)	µg/L			<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.92	0.70	0.67	0.53	1.01	1.2	0.55						
Total Copper (Cu) ⁵	µg/L	Copper concentration = $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$ µg/L	600	<2.0	<2.0	<2.0	2.4	2.3	2.3	4.1	4.1	3.6	<2.0	<2.0	<2.0	<2.0						
Total Iron (Fe)	µg/L	300		52	65	84	201	179	280	1480	1550	1000	549	353	360	625						
Total Lead (Pb) ⁶	µg/L	Lead concentration = $e^{1.273[\ln(\text{hardness})]-4.705}$ µg/L	400	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50						
Total Magnesium (Mg)	µg/L			7070	7800	7200	494	569	470	1350	1260	1200	1620	2070	1900	1690						
Total Manganese (Mn)	µg/L			13.6	19.8	21	6.9	5.5	23	361	205	210	50.2	67.1	75	47.5						
Total Molybdenum (Mo)	µg/L	73		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0						

Parameters	Units	CWQO ¹	MMER (Max in Grab Sample)	S1			S2			S3			S4			S4 (Field Dup.)	S1 Lab. Dup.			S2 Lab. Dup.	S4-Lab. Dup	L3 Lab. Dup.
				8/26/2012	10/3/2012	10/4/2013	8/26/2012	10/3/2012	10/4/2013	8/26/2012	10/3/2012	10/4/2013	8/26/2012	10/2/2012	10/4/2013	8/26/2012	8/26/2012	10/3/2012	10/4/2013	10/3/2012	10/2/2012	8/26/2012
Total Nickel (Ni) ⁷	µg/L	Nickel concentration = $e^{0.76[\ln(\text{hardness})]+1}$.06 µg/L	1000	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	4.0	3.3	2.6	4.4	4.8	5.4	4.2						
Total Phosphorus (P)	µg/L			<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100						
Total Potassium (K)	µg/L			330	379	330	106	143	180	<100	164	100	406	357	430	410						
Total Selenium (Se)	µg/L	1		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0						
Total Silicon (Si)	µg/L				1760	1800		1040	820		1980	1900		2730	2700							
Total Silver (Ag)	µg/L	0.1		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10						
Total Sodium (Na)	µg/L			343	487	410	584	680	640	753	838	790	380	434	410	387						
Total Strontium (Sr)	µg/L			6.9	7.7	6.3	14.9	14.8	13	20.8	17.1	15	4.0	5.5	4.3	4.4						
Total Thallium (Tl)	µg/L	0.8		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10						
Total Tin (Sn)	µg/L			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0						
Total Titanium (Ti)	µg/L			<2.0	<2.0	<2.0	<2.0	<2.0	2.5	<2.0	2.3	2.5	<2.0	2.1	<2.0	<2.0						
Total Uranium (U)	µg/L	15 (Long Term) ; 33 (Short Term)		0.13	0.13	0.13	<0.10	<0.10	0.05	<0.10	<0.10	0.05	<0.10	<0.10	0.05	<0.10						
Total Vanadium (V)	µg/L			<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0						
Total Zinc (Zn)	µg/L	30	1000	<5.0	<5.0	<5.0	9.7	5.1	6.6	15.9	16.2	13	5.3	<5.0	10	6.2						
Radium 226	Bq/L		1.11			< 0.01			< 0.01			< 0.01			< 0.01							

Note:

1. CWQG- Canadian Water Quality Guidelines for the Protection of Aquatic Life
2. Color - The mean absorbance of filtered water samples at 456 nm shall not be significantly higher than the seasonally adjusted expected value for the system under consideration.
3. Strong Acid Dissoc. Cyanide (CN)- strong-acid dissociable cyanide
4. Total Cadmium CWQG limit is adjusted by the hardness of the sample, for more information, please go to http://st-ts.ccme.ca/?lang=en&factsheet=20#aql_fresh_concentration
5. Total Copper CWQG limit is adjusted by the hardness of the sample, a minimum CWQG of 2 µg/L regardless of water hardness, for more information please go to http://st-ts.ccme.ca/?lang=en&factsheet=71#aql_fresh_concentration
6. Total Lead CWQG limit is adjusted by the hardness of the sample, a minimum CWQG of 1 µg/L regardless of water hardness, for more information please go to http://st-ts.ccme.ca/?lang=en&factsheet=124#aql_fresh_concentration
7. Total Nickel CWQG limit is adjusted by the hardness of the sample, a minimum CWQG of 25 µg/L regardless of water hardness, for more information please go to http://st-ts.ccme.ca/?lang=en&factsheet=139#aql_fresh_concentration
8. NC- Not Calculated , due to the parameter used for calculation is under detection limit
9. Total Suspended Solids - for clear flow, maximum increase of 25 mg/L from background levels for any short -term exposure(24 hr period), maximum average of 5 mg/L from background levels for longer term exposures (e.g., inputs lasting between 24 hr and 30 days).
10. Turbidity - for clear flow, maximum increase of 8 NTUs from background levels for a short - term exposure (e.g., 24 hr period). Maximum average increase of 2 NTUs from background levels for a long term exposure (e.g., 30 days period)
11. Values in **Italic Bold** are adjusted to half values of the detection limit in the report for analytical purpose

Project Name: Joyce Lake Iron Ore Direct Shipping Project
Job No: 121810649.400.100.103
Subject: Genivar - Surface Water Sample Laboratory Analytical Raw Data
Laboratory: EXOVA
Date: 11-Nov-12
Updated By: MM

Parameters	Units	CWQG ¹	Sample ID					
			Bay 2 - Attikamagen Lake	Joyce Lake	Iron Arm	Bay 3 - Petitsikapau Lake	Giling River	Bay 2 - Attikamagen Lake DUP ¹
Conductivity	µS/cm		25	5	27	24	99	25
pH	mg/L	6.5 - 9.0	7.2	6.5	7.3	6.9	7.9	7.2
Apparent color	ACU		9	2	8	28	10	75
Turbidity	NTU	Narrative ²	0.4	0.4	0.3	1.1	1.7	0.4
Total dissolved solids	mg/L		40	24	36	56	97	38
Suspended solids	mg/L	Narrative ³	<4	<4	<4	<4	8	<4
Alkalinity (CaCO ₃)	mg/L		8	2	8	7	45	7
Hardness (CaCO ₃)	mg/L		39	23.4	16.2	12.6	54.8	9.6
Bicarbonates (CaCO ₃)	mg/L		8	2	8	7	45	7
Bicarbonates (HCO ₃)	mg/L		9	2	10	9	55	9
Carbonates (CO ₃)	mg/L		<1	<1	<1	<1	<1	<1
Chloride	mg/L	120 mg/L (Long Term); 640 mg/L (Short Term)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cyanides (available)	mg/L CN	0.005 (as free CN)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dissolved inorganic carbon	mg/L C		1.1	<0.5	1.3	1.4	5.8	1.1
Dissolved organic carbon	mg/L C		2.1	0.5	2	11.3	<0.5	2.1
Extractable silica	mg/L		<0.02	<0.02	<0.02	1.66	1.31	<0.02
Sulphate	mg/L		2.3	0.9	2.4	1.7	4.5	2.3
Total organic carbon	mg/L C		4.4	1.1	2.3	12.4	<0.5	2.5
Total carbon	mg/L C		4.9	1.4	4.7	15.6	12.3	4.9
Total chlorine	mg/L	120 mg/L (Long Term); 640 mg/L (Short Term)	<0.1	<0.1	<0.1	<0.1	0.2	<0.1
Ammoniac nitrogen (N)	mg/L		0.03	<0.02	<0.02	0.02	0.03	0.05
Nitrates	mg/L	13 (Long Term) ; 550 (Short Term)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Nitrites	mg/L	0.060	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Nitrites-Nitrates	mg/L		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ortho-phosphate	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total phosphorus	mg/L		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Aluminum	mg/L	5 µg/L if pH <6.5; 100 µg/L if pH >6.5	0.12	0.06	0.08	0.17	0.06	0.07
Arsenic	mg/L	0.005	<0.001	<0.001	<0.001	0.004	0.002	0.002
Barium	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Parameters	Units	CWQG ¹	Sample ID					
			Bay 2 - Attikamagen Lake	Joyce Lake	Iron Arm	Bay 3 - Petitsikapau Lake	Giling River	Bay 2 - Attikamagen Lake DUP ¹
Bismuth	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	1500 µg/L (Long Term) ; 29,000 µg/L (Short Term)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cadmium ⁴	mg/L	Cadmium concentration = $10^{0.86[\ln(\text{hardness})]-3.2}$ µg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Calcium	mg/L		13.2	8.47	4.47	2.96	11.7	2.17
Chromium	mg/L		0.001	<0.001	0.001	0.003	0.002	0.003
Cobalt	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper ⁵	mg/L	Copper concentration = $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$ µg/L	0.001	0.001	0.001	0.005	0.002	0.002
Iron	mg/L	0.3	<0.10	<0.10	<0.10	0.3	0.23	<0.10
Lithium	mg/L		0.001	<0.001	0.001	0.001	0.001	0.001
Magnesium	mg/L		1.48	0.56	1.22	1.27	6.21	1.01
Manganese	mg/L		0.017	0.011	0.005	0.012	0.095	0.009
Mercury	mg/L	0.000026	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
Molybdenum	mg/L	0.073	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel ⁶	mg/L	Nickel concentration = $e^{0.76[\ln(\text{hardness})]+1.06}$ µg/L	<0.001	<0.001	<0.001	0.006	0.003	0.001
Lead ⁷	mg/L	Lead concentration = $e^{1.273[\ln(\text{hardness})]-4.705}$ µg/L	0.001	0.001	0.001	0.001	0.001	<0.001
Potassium	mg/L		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Reactive silica	mg/L		1	0.8	1.2	4	3	1.3
Selenium	mg/L	0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001
Silver	mg/L	0.0001	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Sodium	mg/L		1.5	1.1	1.2	1.6	1.2	2.6
Strontium	mg/L		0.01	<0.01	0.01	0.01	<0.01	<0.01
Thallium	mg/L	0.0008	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	mg/L		<0.001	<0.001	<0.001	0.002	0.001	<0.001
Titanium	mg/L		0.001	<0.001	0.001	0.002	0.001	0.001
Vanadium	mg/L		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Zinc	mg/L	0.03	0.16	0.04	0.02	0.02	0.01	0.17
B.O.D. ₅	mg/L O ₂		---	---	<6	---	---	---
Total oil and grease	mg/L		---	---	<5	---	---	---
Fecal coliforms	CFU/100ml		---	---	<10	---	---	---
Total coliforms	CFU/100ml		---	---	<100	---	---	---
Phenols (4AAP)	mg/L		0.002	<0.002	<0.002	0.002	<0.002	<0.002

Chlorine analysis conducted more than 24 hours after sample collection (all samples).

Microbiology: the Iron Arm sample temperature exceeded 12°C when received in laboratory.

Color: DUP analysis was conducted more than 48 hours after sample collection.

Note:

1. CWQG - Canadian Water Quality Guidelines for the Protection of Aquatic Life
2. Turbidity - for clear flow, maximum increase of 8 NTUs from background levels for a short - term exposure (e.g., 24 hr period). Maximum average increase of 2 NTUs from background levels for a long term exposure (e.g., 30 days period)
3. Total Suspended Solids - for clear flow, maximum increase of 25 mg/L from background levels for any short -term exposure(24 hr period), maximum average of 5 mg/L from background levels for longer term exposures (e.g., inputs lasting between 24 hr and 30 days).
4. Cadmium - hardness adjusted CWQG limits, for more information, please go to http://st-ts.ccme.ca/?lang=en&factsheet=20#aql_fresh_concentration
5. Copper - hardness adjusted CWQG limits, for more information, please go to http://st-ts.ccme.ca/?lang=en&factsheet=71#aql_fresh_concentration
6. Nickel - hardness adjusted CWQG limits, for more information, please go to http://st-ts.ccme.ca/?lang=en&factsheet=139#aql_fresh_concentration
7. Lead - hardness adjusted CWQG limits, for more information, please go to http://st-ts.ccme.ca/?lang=en&factsheet=124#aql_fresh_concentration

Project Name: Joyce Lake Iron Ore Direct Shipping Project
Job No: 121810649.400.100.103
Subject: Genivar - Sediment Sample Laboratory Analytical Raw Data
Laboratory: EXOVA
Date: 11-Nov-2012
Updated By: MM

Parameters	Units	CSQG ¹		Sample ID					
		ISQG ²	PEL ³	Bay 2 - Attikamagen Lake	Joyce Lake	Iron Arm	Bay 3 - Petitsikapau Lake	Giling River	Bay 2 - Attikamagen Lake.DUP
Other Constituents									
Moisture	%			86.4	71.8	71.8	27.3	23.7	87.1
Total organic carbon	%			8.43	2.87	3.55	0.64	0.55	8.25
Conductivity	µS/cm			21	14	36	29	28	18
pH				5.7	5.6	5.7	7.2	6.9	5.8
Ammoniacal nitrogen	mg/kg			59	35	36	<5	<5	59
Chloride	mg/kg			<11	<10	<10	<10	<10	<12
Sulphate	mg/kg			319	133	151	<10	48	321
Nitrite-nitrate	mg/kg			<5.2	<2.6	<2.6	<2.0	<2.2	<4.8
Metals									
Aluminum	mg/kg			13,100	13,600	13,700	13,500	3,640	13,300
Antimony	mg/kg			<10	<10	<10	<10	<10	<10
Arsenic	mg/kg	5.9	17	8.9	6.3	12.5	15.1	5.7	7.2
Barium	mg/kg			53	53	66	100	42	50
Beryllium	mg/kg			<1	<1	<1	<1	<1	<1
Bismuth	mg/kg			<10	<10	<10	<10	<10	<10
Boron	mg/kg			<2	<2	<2	<2	<2	<2
Cadmium	mg/kg	0.6	3.5	1.1	1	1.4	3.5	<0.9	0.9
Calcium	mg/kg			1,660	441	1,360	2,420	738	1,660
Chromium	mg/kg	37.3	90	38	32	43	49	13	38
Cobalt	mg/kg			12	9	19	23	9	11
Copper	mg/kg	35.7	197	52	35	53	56	9	52
Iron	mg/kg			30,900	40,500	29,300	46,900	40,900	30,000
Lead	mg/kg	35	91.3	10	11	11	18	<10	<10
Lithium	mg/kg			13	13	17	17	5	14
Magnesium	mg/kg			3,950	3,950	5,330	7,100	1,530	4,000
Manganese	mg/kg			550	634	469	2,030	2,310	455
Molybdenum	mg/kg			4	2	3	3	<2	4
Nickel	mg/kg			53	27	87	61	16	50
Potassium	mg/kg			805	847	1,170	1,380	247	809
Selenium	mg/kg			1.3	1.2	1.2	0.8	0.6	1.1
Silver	mg/kg			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sodium	mg/kg			160	107	135	152	166	117

Parameters	Units	CSQG ¹		Sample ID					
		ISQG ²	PEL ³	Bay 2 - Attikamagen Lake	Joyce Lake	Iron Arm	Bay 3 - Petitsikapau Lake	Giling River	Bay 2 - Attikamagen Lake.DUP
Strontium	mg/kg			<10	<10	<10	24	<10	<10
Thallium	mg/kg			<10	<10	<10	<10	<10	<10
Tin	mg/kg			<5	<5	<5	<5	<5	<5
Titanium	mg/kg			305	458	384	523	55	303
Vanadium	mg/kg			34	42	41	40	17	34
Zinc	mg/kg	123	315	193	132	202	326	42	165
Particle Size									
Gravel	%			6	0	0	0	0	---
Coarse sand	%			2.5	1.7	5.2	30	76.6	---
Fine sand	%			15.2	5.7	20.3	6.6	15.5	---
Silt	%			55.4	67.9	51.4	24.3	4.9	---
Clay and colloids	%			21	24.6	23.1	39.1	3	---
<p>Gravel : >2mm Coarse sand : <2mm and >0.2mm Fine sand : <0.2mm and >0.06mm Silt : <0.06mm and >0.004mm Clay and colloids : <0.004mm</p> <p>Note: 1. Canadian Sediment Quality for the Protection of Aquatic Life 2. Interim Sediment Quality Guidelines 3. Probable Effect Level</p>									

Project Name: Joyce Lake Iron Ore Direct Shipping Project
Job No: 121511139.800.003
Subject: Surface Water In-situ Measurements
Instrument: YSI Sonde
Date: 31-Oct-14
Updated By: JA

Stations	Temperature	Conductivity	TDS	Salinity	DO%	DO	DO _{ch}	pH	pH _{mv}
	°C	µs/cm	g/L	SAL	%	mg/L			
2012 August Trip									
S1	16.62	93	0.072	0.05	80.1	7.54	23.7	6.84	-70.2
S2	17.07	14	0.011	0.01	102.6	10.3	26.7	6.43	-46.4
S3	11.96	18	0.016	0.01	72	7.76	32.9	6.15	-30.1
S4	10.54	20	0.18	0.01	69.3	7.74	35.9	6.69	-58.1
L1	17.08	22	0.017	0.01	87.7	8.42	33.9	6.72	-60.0
L2	16.54	35	0.027	0.02	76.1	7.37	36.9	6.6	-54.1
L3	16.75	5	0.004	0.00	103.5	10.5	38	7.61	-111.2
L4	16.76	27	0.021	0.01	106.7	10.41	41	8.15	-140.2
2012 October Trip									
S1	8.81	74	0.070	0.05	22.5	2.66	12.4	7.42	-100.8
S2	8.12	12	0.012	0.01	28.8	3.42	14.5	7.18	-87.1
S3	7.6	15	0.014	0.01	37.1	4.46	16.5	7.56	-106.2
S4	8.75	20	0.019	0.01	82.3	9.65	25.7	6.94	-76.8
L1	8.21	19	0.018	0.01	33.7	3.98	15.5	7.33	-95.6
L2	10.99	23	0.020	0.01	89.3	9.87	25.7	7.04	-80.1
L3	10.61	5	0.004	0.00	110.6	12.33	30.8	7.45	-102.2
L4	10.17	18	0.016	0.01	119.8	13.49	31.8	7.73	-117.2
2013 October Trip									
S1	6.3	96	0.048					8.18	
S2	7.3	5	0.002					6.93	
S3	6.4	13	0.006					6.67	
S4	4.7	16	0.008					6.17	
L1	6.8	16	0.008					7.37	
L2	6.8	18	0.009					7.16	
L3	7	0	0					6.5	
L4	5.6	12	0.006					7.35	

Note:

*pH_{mv}- pH measured in Millivolts

*Do_{ch}-Dissolved oxygen sensor charge from Rapid Pulse Sensor