

Attachments

Attachment A

ALS Environmental Laboratory Results





CHEMICAL ANALYSIS REPORT

Date: September 14, 2004

ALS File No. R2146

Report On: Hackett River 40655

Report To: **Gartner Lee Ltd.**
2251 2nd Ave
Whitehorse, YT
Y1A 5W1

Attention: **Ms. Lesley Gomm**

Received: August 26, 2004

ALS ENVIRONMENTAL

per:

Bill Chew, B.Sc. - Manager, Client Services
Brent Whitehead, B.Sc. - Operations Supervisor

REMARKS



For some of the submitted water samples, the measured concentration of specific dissolved analytes is greater than the corresponding total analyte concentration. The explanation for these findings is one or a combination of the following:

- laboratory method variability;
- field sampling method variability;
- bias introduced during field sample filtration;
- bias introduced during general handling, storage and/or transportation of the sample;
- field sample grab bias - where separate grab samples are processed to produce total and dissolved samples;
- field sample split bias - where total and dissolved metals samples are produced from the same grab sample.

For further clarification on any of the above information, please contact your ALS representative

RESULTS OF ANALYSIS - Water

Sample ID	Upper Sunken Lake	Boot Lake	Cleaver Lake	Anne Lake	Mara U/S
Sample Date	04-08-21	04-08-21	04-08-21	04-08-21	04-08-21
Sample Time	09:42	13:00	13:20	13:35	13:50
ALS ID	1	2	3	4	5

Physical Tests

Conductivity	(uS/cm)	76.0	50.4	196	158	24.7
Total Dissolved Solids		41	26	108	90	15
Hardness	CaCO ₃	27.0	17.8	81.7	69.2	8.43
pH		6.52	6.74	6.80	7.04	6.86
Total Suspended Solids		<4.0	<4.0	<4.0	<4.0	<4.0
Turbidity	(NTU)	2.03	0.82	0.88	0.44	1.09

Dissolved Anions

Alkalinity-Total	CaCO ₃	3.8	4.0	9.1	17.1	7.6
Alkalinity-Bicarbonate	CaCO ₃	3.8	4.0	9.1	17.1	7.6
Alkalinity-Carbonate	CaCO ₃	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity-Hydroxide	CaCO ₃	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity-Phenolphthalein		<1.0	<1.0	<1.0	<1.0	<1.0
Chloride	Cl	2.94	1.91	16.4	1.25	<0.50
Sulphate	SO ₄	22.3	13.0	50.8	49.8	4.4

Nutrients

Ammonia Nitrogen	N	<0.0050	0.0107	0.0053	<0.012	0.0120
Total Kjeldahl Nitrogen	N	0.109	0.147	0.101	0.111	0.134
Nitrate Nitrogen	N	<0.0050	<0.0050	<0.0050	<0.0050	0.0170
Nitrite Nitrogen	N	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite/Nitrate Nitrogen	N	<0.0050	<0.0050	<0.0050	<0.0050	0.0200
Dissolved ortho-Phosphate	P	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate	P	<0.0020	0.0044	0.0023	0.0034	0.0034

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as mg/L.

RESULTS OF ANALYSIS - Water

Sample ID		Upper Sunken Lake	Boot Lake	Cleaver Lake	Anne Lake	Mara U/S
Sample Date		04-08-21	04-08-21	04-08-21	04-08-21	04-08-21
Sample Time		09:42	13:00	13:20	13:35	13:50
ALS ID		1	2	3	4	5
Total Metals						
Aluminum	T-Al	0.0495	0.0083	0.0320	0.0091	0.0099
Antimony	T-Sb	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	T-As	<0.00010	<0.00010	<0.00010	<0.00010	0.00011
Barium	T-Ba	0.00739	0.00455	0.0129	0.00786	0.00241
Beryllium	T-Be	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth	T-Bi	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron	T-B	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium	T-Cd	0.00224	<0.000050	0.00655	0.00110	<0.000050
Calcium	T-Ca	7.18	4.37	24.1	20.6	2.18
Chromium	T-Cr	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt	T-Co	0.00076	0.00011	0.00032	<0.00010	<0.00010
Copper	T-Cu	0.0367	0.00111	0.0194	0.0185	0.00089
Iron	T-Fe	<0.030	<0.030	<0.030	<0.030	<0.030
Lead	T-Pb	0.000569	<0.000050	0.00113	0.000060	<0.000050
Lithium	T-Li	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium	T-Mg	2.44	1.84	4.58	4.56	0.78
Manganese	T-Mn	0.0459	0.00438	0.00594	0.00562	0.00255
Mercury	T-Hg	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum	T-Mo	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel	T-Ni	0.00305	0.00173	0.00369	0.00262	<0.00050
Phosphorus	T-P	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium	T-K	<2.0	<2.0	<2.0	<2.0	<2.0
Selenium	T-Se	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Silicon	T-Si	1.11	0.371	1.84	1.26	0.233
Silver	T-Ag	<0.000010	<0.000010	0.000011	<0.000010	<0.000010
Sodium	T-Na	<2.0	<2.0	<2.0	<2.0	<2.0
Strontium	T-Sr	0.0259	0.0168	0.125	0.0158	0.00530
Thallium	T-Tl	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin	T-Sn	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium	T-Ti	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium	T-U	<0.000010	<0.000010	0.000021	0.000035	0.000038
Vanadium	T-V	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc	T-Zn	0.456	0.0145	0.888	0.194	0.0049

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as mg/L.

RESULTS OF ANALYSIS - Water

Sample ID	Upper Sunken Lake	Boot Lake	Cleaver Lake	Anne Lake	Mara U/S
Sample Date	04-08-21	04-08-21	04-08-21	04-08-21	04-08-21
Sample Time	09:42	13:00	13:20	13:35	13:50
ALS ID	1	2	3	4	5

Dissolved Metals

Aluminum	D-Al	0.0144	0.0050	0.0140	0.0075	0.0065
Antimony	D-Sb	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	D-As	<0.00010	<0.00010	0.00012	<0.00010	0.00011
Barium	D-Ba	0.00717	0.00448	0.0128	0.00769	0.00234
Beryllium	D-Be	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth	D-Bi	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron	D-B	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium	D-Cd	0.00210	<0.000050	0.00652	0.00106	<0.000050
Calcium	D-Ca	6.95	4.20	24.9	20.3	2.07
Chromium	D-Cr	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt	D-Co	0.00072	<0.00010	0.00030	<0.00010	<0.00010
Copper	D-Cu	0.0282	0.00112	0.0165	0.0160	0.00095
Iron	D-Fe	<0.030	<0.030	<0.030	<0.030	<0.030
Lead	D-Pb	0.000099	<0.000050	0.000344	<0.000050	<0.000050
Lithium	D-Li	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium	D-Mg	2.33	1.77	4.74	4.51	0.79
Manganese	D-Mn	0.0450	0.00361	0.00590	0.00547	0.00119
Mercury	D-Hg	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum	D-Mo	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel	D-Ni	0.00293	0.00170	0.00367	0.00261	<0.00050
Phosphorus	D-P	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium	D-K	<2.0	<2.0	2.5	<2.0	<2.0
Selenium	D-Se	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Silicon	D-Si	1.10	0.385	1.93	1.26	0.233
Silver	D-Ag	<0.000010	<0.000010	0.000011	<0.000010	<0.000010
Sodium	D-Na	<2.0	<2.0	<2.0	<2.0	<2.0
Strontium	D-Sr	0.0253	0.0165	0.125	0.0157	0.00509
Thallium	D-Tl	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin	D-Sn	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium	D-Ti	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium	D-U	<0.000010	<0.000010	<0.000010	0.000025	0.000029
Vanadium	D-V	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc	D-Zn	0.437	0.0163	0.936	0.190	0.0032

Organic Parameters

Dissolved Organic Carbon C	2.12	2.31	1.49	2.17	2.20
Total Organic Carbon C	3.73	3.02	2.60	3.27	3.38

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as mg/L.

RESULTS OF ANALYSIS - Water

Sample ID	Mara D/S	Cigar Lake	Banana Lake	Hackett U/S	Hackett D/S
Sample Date	04-08-21	04-08-22	04-08-21	04-08-22	04-08-22
Sample Time	14:10	14:00	16:00	13:00	13:30
ALS ID	6	7	8	9	10

Physical Tests

Conductivity (uS/cm)	17.4	36.1	62.4	33.9	42.4
Total Dissolved Solids	11	21	34	18	30
Hardness CaCO ₃	5.11	13.7	24.2	11.4	35.6
pH	6.81	6.86	6.84	6.72	6.74
Total Suspended Solids	<4.0	<4.0	<4.0	<4.0	<4.0
Turbidity (NTU)	0.43	1.69	0.78	1.09	1.06

Dissolved Anions

Alkalinity-Total	CaCO ₃	6.6	8.0	11.0	5.7	5.3
Alkalinity-Bicarbonate	CaCO ₃	6.6	8.0	11.0	5.7	5.3
Alkalinity-Carbonate	CaCO ₃	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity-Hydroxide	CaCO ₃	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity-Phenolphthalein		<1.0	<1.0	<1.0	<1.0	<1.0
Chloride Cl		<0.50	<0.50	<0.50	<0.50	<0.50
Sulphate SO ₄		2.3	6.9	15.9	7.6	10.8

Nutrients

Ammonia Nitrogen	N	0.0153	<0.083	<0.0050	<0.0050	<0.0050
Total Kjeldahl Nitrogen	N	0.145	0.175	0.187	0.142	0.116
Nitrate Nitrogen	N	0.0130	<0.0050	<0.0050	0.0400	0.0380
Nitrite Nitrogen	N	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite/Nitrate Nitrogen	N	0.0100	<0.0050	<0.0050	0.0400	0.0400
Dissolved ortho-Phosphate	P	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total Phosphate	P	0.0036	<0.0020	0.0024	<0.0020	0.0022

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as mg/L.

RESULTS OF ANALYSIS - Water

Sample ID		Mara D/S	Cigar Lake	Banana Lake	Hackett U/S	Hackett D/S
Sample Date		04-08-21	04-08-22	04-08-21	04-08-22	04-08-22
Sample Time		14:10	14:00	16:00	13:00	13:30
ALS ID		6	7	8	9	10
Total Metals						
Aluminum	T-Al	0.0139	0.0117	0.0102	0.0156	0.0120
Antimony	T-Sb	<0.00010	<0.00010	<0.00010	0.00016	<0.00010
Arsenic	T-As	0.00012	0.00014	<0.00010	<0.00010	<0.00010
Barium	T-Ba	0.00223	0.00301	0.00373	0.00407	0.00469
Beryllium	T-Be	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth	T-Bi	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron	T-B	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium	T-Cd	<0.000050	<0.000050	0.000054	<0.000050	<0.000050
Calcium	T-Ca	1.23	3.37	6.38	2.68	3.29
Chromium	T-Cr	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt	T-Co	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper	T-Cu	0.00119	0.00115	0.0130	0.00194	0.00153
Iron	T-Fe	0.043	<0.030	0.031	0.043	<0.030
Lead	T-Pb	0.000051	<0.000050	<0.000050	0.000167	<0.000050
Lithium	T-Li	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium	T-Mg	0.62	1.41	2.12	1.28	1.61
Manganese	T-Mn	0.00421	0.00106	0.00233	0.00111	0.000910
Mercury	T-Hg	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum	T-Mo	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel	T-Ni	<0.00050	0.00271	<0.00050	0.00135	0.00214
Phosphorus	T-P	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium	T-K	<2.0	<2.0	<2.0	<2.0	<2.0
Selenium	T-Se	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Silicon	T-Si	0.179	0.156	0.478	0.461	0.521
Silver	T-Ag	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium	T-Na	<2.0	<2.0	<2.0	<2.0	<2.0
Strontium	T-Sr	0.00480	0.00674	0.00846	0.00725	0.00845
Thallium	T-Tl	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin	T-Sn	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium	T-Ti	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium	T-U	0.000045	<0.000010	0.000011	0.000015	0.000024
Vanadium	T-V	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc	T-Zn	<0.0010	<0.0010	0.0091	0.0094	0.0144

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as mg/L.

RESULTS OF ANALYSIS - Water

Sample ID	Mara D/S	Cigar Lake	Banana Lake	Hackett U/S	Hackett D/S
Sample Date	04-08-21	04-08-22	04-08-21	04-08-22	04-08-22
Sample Time	14:10	14:00	16:00	13:00	13:30
ALS ID	6	7	8	9	10

Dissolved Metals

Aluminum	D-Al	0.0070	0.0078	0.0051	0.0077	0.0213
Antimony	D-Sb	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	D-As	0.00011	0.00013	<0.00010	<0.00010	<0.00010
Barium	D-Ba	0.00192	0.00288	0.00359	0.00347	0.00530
Beryllium	D-Be	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth	D-Bi	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron	D-B	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium	D-Cd	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Calcium	D-Ca	1.14	3.23	6.23	2.54	11.4
Chromium	D-Cr	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt	D-Co	<0.00010	<0.00010	0.00010	<0.00010	<0.00010
Copper	D-Cu	0.00078	0.00124	0.0119	0.00120	0.00187
Iron	D-Fe	<0.030	<0.030	<0.030	<0.030	<0.030
Lead	D-Pb	<0.000050	<0.000050	<0.000050	<0.000050	0.000125
Lithium	D-Li	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium	D-Mg	0.55	1.37	2.09	1.23	1.73
Manganese	D-Mn	0.000712	0.000437	0.00200	0.000531	0.00227
Mercury	D-Hg	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum	D-Mo	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Nickel	D-Ni	<0.00050	0.00272	<0.00050	0.00116	0.00208
Phosphorus	D-P	<0.30	<0.30	<0.30	<0.30	<0.30
Potassium	D-K	<2.0	<2.0	<2.0	<2.0	<2.0
Selenium	D-Se	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Silicon	D-Si	0.183	0.147	0.470	0.468	0.559
Silver	D-Ag	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium	D-Na	<2.0	<2.0	<2.0	<2.0	<2.0
Strontium	D-Sr	0.00450	0.00659	0.00830	0.00672	0.0126
Thallium	D-Tl	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin	D-Sn	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium	D-Ti	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium	D-U	0.000027	0.000011	<0.000010	<0.000010	0.000026
Vanadium	D-V	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc	D-Zn	0.0030	0.0034	0.0123	0.0075	0.0191

Organic Parameters

Dissolved Organic Carbon C	2.26	4.13	2.66	1.82	1.80
Total Organic Carbon C	3.31	4.94	3.45	2.88	2.78

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as mg/L.

RESULTS OF ANALYSIS - Water

Sample ID	Camp Lake	Camp Lake Rep	Camp Lk Mid	Camp Lk Bottom
Sample Date	04-08-22	04-08-22	04-08-22	04-08-22
Sample Time	09:00	09:00	09:15	09:15
ALS ID	11	12	13	14

Physical Tests

Conductivity (uS/cm)	80.9	81.2	81.6	80.9
Total Dissolved Solids	43	46	34	34
Hardness CaCO ₃	29.1	29.2	-	-
pH	6.52	6.79	6.80	6.84
Total Suspended Solids	<4.0	<4.0	<4.0	90.9
Turbidity (NTU)	0.85	0.73	0.80	17.8

Dissolved Anions

Alkalinity-Total	CaCO ₃	3.6	7.6	7.0	7.4
Alkalinity-Bicarbonate	CaCO ₃	3.6	7.6	7.0	7.4
Alkalinity-Carbonate	CaCO ₃	<1.0	<1.0	<1.0	<1.0
Alkalinity-Hydroxide	CaCO ₃	<1.0	<1.0	<1.0	<1.0
Alkalinity-Phenolphthalein		<1.0	<1.0	<1.0	<1.0
Chloride Cl		4.40	4.44	4.92	4.40
Sulphate SO ₄		22.8	22.8	23.1	23.0

Nutrients

Ammonia Nitrogen	N	0.0100	<0.0050	-	-
Total Kjeldahl Nitrogen	N	0.077	0.079	-	-
Nitrate Nitrogen	N	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite Nitrogen	N	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite/Nitrate Nitrogen	N	<0.0050	<0.0050	-	-
Dissolved ortho-Phosphate	P	<0.0010	<0.0010	<0.0010	0.0060
Total Phosphate	P	<0.0020	<0.0020	<0.0020	0.0060

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as mg/L.

RESULTS OF ANALYSIS - Water

Sample ID	Camp Lake	Camp Lake Rep	Camp Lk Mid	Camp Lk Bottom
Sample Date	04-08-22	04-08-22	04-08-22	04-08-22
Sample Time	09:00	09:00	09:15	09:15
ALS ID	11	12	13	14

Total Metals

Aluminum	T-Al	0.0588	0.0601	-	-
Antimony	T-Sb	<0.00010	<0.00010	-	-
Arsenic	T-As	<0.00010	<0.00010	-	-
Barium	T-Ba	0.00877	0.00890	-	-
Beryllium	T-Be	<0.00050	<0.00050	-	-
Bismuth	T-Bi	<0.00050	<0.00050	-	-
Boron	T-B	<0.010	<0.010	-	-
Cadmium	T-Cd	0.00236	0.00240	-	-
Calcium	T-Ca	7.98	7.91	3.40	3.00
Chromium	T-Cr	<0.00050	<0.00050	-	-
Cobalt	T-Co	0.00084	0.00085	-	-
Copper	T-Cu	0.0449	0.0457	-	-
Iron	T-Fe	0.043	0.044	<0.10	<0.10
Lead	T-Pb	0.000319	0.000471	-	-
Lithium	T-Li	<0.0050	<0.0050	-	-
Magnesium	T-Mg	2.38	2.41	1.70	1.71
Manganese	T-Mn	0.0527	0.0538	<0.010	<0.010
Mercury	T-Hg	<0.000050	<0.000050	-	-
Molybdenum	T-Mo	<0.000050	<0.000050	-	-
Nickel	T-Ni	0.00329	0.00337	-	-
Phosphorus	T-P	<0.30	<0.30	-	-
Potassium	T-K	<2.0	<2.0	1.00	1.02
Selenium	T-Se	<0.0010	<0.0010	-	-
Silicon	T-Si	1.07	1.06	-	-
Silver	T-Ag	<0.000010	<0.000010	-	-
Sodium	T-Na	<2.0	<2.0	0.87	0.83
Strontium	T-Sr	0.0383	0.0385	-	-
Thallium	T-Tl	<0.00010	<0.00010	-	-
Tin	T-Sn	<0.00010	<0.00010	-	-
Titanium	T-Ti	<0.010	<0.010	-	-
Uranium	T-U	<0.000010	<0.000010	-	-
Vanadium	T-V	<0.0010	<0.0010	-	-
Zinc	T-Zn	0.470	0.475	-	-

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as mg/L.

RESULTS OF ANALYSIS - Water

Sample ID	Camp Lake	Camp Lake Rep
Sample Date	04-08-22	04-08-22
Sample Time	09:00	09:00
ALS ID	11	12

Dissolved Metals

Aluminum	D-Al	0.0128	0.0123
Antimony	D-Sb	<0.00010	<0.00010
Arsenic	D-As	<0.00010	<0.00010
Barium	D-Ba	0.00891	0.00882
Beryllium	D-Be	<0.00050	<0.00050
Bismuth	D-Bi	<0.00050	<0.00050
Boron	D-B	<0.010	<0.010
Cadmium	D-Cd	0.00232	0.00226
Calcium	D-Ca	7.78	7.75
Chromium	D-Cr	<0.00050	<0.00050
Cobalt	D-Co	0.00085	0.00084
Copper	D-Cu	0.0351	0.0349
Iron	D-Fe	<0.030	<0.030
Lead	D-Pb	0.000096	0.000057
Lithium	D-Li	<0.0050	<0.0050
Magnesium	D-Mg	2.36	2.40
Manganese	D-Mn	0.0530	0.0532
Mercury	D-Hg	<0.000050	<0.000050
Molybdenum	D-Mo	<0.000050	<0.000050
Nickel	D-Ni	0.00332	0.00328
Phosphorus	D-P	<0.30	<0.30
Potassium	D-K	<2.0	<2.0
Selenium	D-Se	<0.0010	<0.0010
Silicon	D-Si	1.05	1.07
Silver	D-Ag	<0.000010	<0.000010
Sodium	D-Na	<2.0	<2.0
Strontium	D-Sr	0.0384	0.0384
Thallium	D-Tl	<0.00010	<0.00010
Tin	D-Sn	<0.00010	<0.00010
Titanium	D-Ti	<0.010	<0.010
Uranium	D-U	<0.000010	<0.000010
Vanadium	D-V	<0.0010	<0.0010
Zinc	D-Zn	0.471	0.468

Organic Parameters

Dissolved Organic Carbon C	1.80	1.88
Total Organic Carbon C	2.84	2.99

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as mg/L.

Appendix 1 - QUALITY CONTROL - Replicates

Water	Cigar Lake	Cigar Lake
	04-08-22 14:00	QC # 9664

Physical Tests

Conductivity	(uS/cm)	36.1	35.6
pH		6.86	6.85
Total Suspended Solids		<4.0	<4.0
Turbidity	(NTU)	1.69	1.57

Dissolved Anions

Alkalinity-Total	CaCO3	8.0	8.0
Alkalinity-Bicarbonate	CaCO3	8.0	8.0
Alkalinity-Carbonate	CaCO3	<1.0	<1.0
Alkalinity-Hydroxide	CaCO3	<1.0	<1.0
Alkalinity-Phenolphthalein		<1.0	<1.0
Chloride	Cl	<0.50	<0.50
Sulphate	SO4	6.9	6.8

Nutrients

Nitrate Nitrogen	N	<0.0050	<0.0050
Nitrite Nitrogen	N	<0.0050	<0.0050
Dissolved ortho-Phosphate	P	<0.0010	<0.0010

Remarks regarding the analyses appear at the beginning of this report.
Results are expressed as mg/L.

Appendix 1 - QUALITY CONTROL - Reference Materials

Water

			Result	Target	Units	DL	ALSQC#	Method
ALSEC Milli-Q water, 1								
<u>Dissolved Anions</u>								
Alkalinity-Total	CaCO3		<1.0	2.0	mg/L	1	10015	a
SPEX Nutrients, 19-8 Nut1								
<u>Nutrients</u>								
Dissolved ortho-Phosphate	P		3.68	3.42	mg/L	0.001	9687	b
SPEX IC Check Standard 6 (10xD), 25-143AS								
<u>Dissolved Anions</u>								
Chloride	Cl		4.83	5.00	mg/L	0.5	9805	c
Chloride	Cl		5.04	5.00	mg/L	0.5	9807	c
Chloride	Cl		5.06	5.00	mg/L	0.5	10266	c
Sulphate	SO4		15.1	15.0	mg/L	1	9805	c
Sulphate	SO4		14.8	15.0	mg/L	1	9807	c
<u>Nutrients</u>								
Nitrate Nitrogen	N		2.57	2.50	mg/L	0.005	9805	c
Nitrate Nitrogen	N		2.59	2.50	mg/L	0.005	9807	c
Nitrite Nitrogen	N		2.63	2.50	mg/L	0.005	9805	c
Nitrite Nitrogen	N		2.58	2.50	mg/L	0.005	9807	c
ERA WasteWatR, P102506								
<u>Dissolved Anions</u>								
Alkalinity-Total	CaCO3		89.3	94.4	mg/L	1	10016	a
EnviroMAT Ground Water HIGH, ES-H-1								
<u>Total Metals</u>								
Calcium	T-Ca		11.8	13.9	mg/L	0.2	10214	d
Magnesium	T-Mg		8.40	9.11	mg/L	0.2	10214	d
Potassium	T-K		6.75	6.45	mg/L	0.1	10214	d
Sodium	T-Na		43.6	43.3	mg/L	0.2	10214	d

Methods:

a = WA_Alk_Titration
b = WA_Phosphate_Color
c = WA_Anions_IC
d = WA_T_HNO3_FAAS

Appendix 1 - QUALITY CONTROL - Reference Materials

Water

	Result	Target	Units	DL	ALSQC#	Method
ERA Hardness, P107507						
Physical Tests						
Total Suspended Solids	80.2	80.1	mg/L	4	10142	a

Methods:

a = WA_TS_Grav

Appendix 1 - QUALITY CONTROL - Spikes

Water

	Result	Target	Units	DL	ALSQC#	Method
Physical Tests						
Total Suspended Solids	75.6	75.0	mg/L	4	10144	a
Total Suspended Solids	74.9	75.0	mg/L	4	10150	a
Total Suspended Solids	74.9	75.0	mg/L	4	10151	a
Total Suspended Solids	67.6	75.0	mg/L	4	10152	a
Total Suspended Solids	72.9	75.0	mg/L	4	10153	a
Turbidity (NTU)	45.2	40.0	NTU	0.1	9929	b
Turbidity (NTU)	8.00	8.00	NTU	0.1	9930	b

Methods:

a = WA_TS_Grav

b = WA_Turbidity_Meter

Appendix 1 - QUALITY CONTROL - Blanks

Water

		Result	Target	Units	DL	ALSQC#	Method
Physical Tests							
Total Suspended Solids		<4.0	<4.0	mg/L	4	10143	a
Total Suspended Solids		4.0	<4.0	mg/L	4	10145	a
Total Suspended Solids		<4.0	<4.0	mg/L	4	10146	a
Total Suspended Solids		<4.0	<4.0	mg/L	4	10147	a
Total Suspended Solids		<4.0	<4.0	mg/L	4	10148	a
Total Suspended Solids		<4.0	<4.0	mg/L	4	10149	a
Turbidity	(NTU)	<0.10	<0.10	NTU	0.1	9928	b
Dissolved Anions							
Chloride	Cl	<0.50	<0.50	mg/L	0.5	9804	c
Chloride	Cl	<0.50	<0.50	mg/L	0.5	9806	c
Chloride	Cl	<0.50	<0.50	mg/L	0.5	10265	c
Sulphate	SO4	<1.0	<1.0	mg/L	1	9804	c
Sulphate	SO4	<1.0	<1.0	mg/L	1	9806	c
Nutrients							
Nitrate Nitrogen	N	<0.0050	<0.0050	mg/L	0.005	9804	c
Nitrate Nitrogen	N	<0.0050	<0.0050	mg/L	0.005	9806	c
Nitrite Nitrogen	N	<0.0050	<0.0050	mg/L	0.005	9804	c
Nitrite Nitrogen	N	<0.0050	<0.0050	mg/L	0.005	9806	c
Dissolved ortho-Phosphate	P	<0.0010	<0.0010	mg/L	0.001	9686	d
Total Metals							
Calcium	T-Ca	<0.20	<0.20	mg/L	0.2	10213	e
Magnesium	T-Mg	<0.20	<0.20	mg/L	0.2	10213	e
Potassium	T-K	<0.10	<0.10	mg/L	0.1	10213	e
Sodium	T-Na	<0.20	<0.20	mg/L	0.2	10213	e

Methods:

a = WA_TS_Grav

b = WA_Turbidity_Meter

c = WA_Anions_IC

d = WA_Phosphate_Color

e = WA_T_HNO3_FAAS

Bold Targets indicate uncertified targets

Appendix 2 - METHODOLOGY



Outlines of the methodologies utilized for the analysis of the samples submitted are as follows

Conductivity in Water

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

Recommended Holding Time:

Sample: 28 days

Reference: APHA

For more detail see ALS Environmental "Collection & Sampling Guide"

Conventional Parameters in Water

These analyses are carried out in accordance with procedures described in "Methods for Chemical Analysis of Water and Wastes" (USEPA), "Manual for the Chemical Analysis of Water, Wastewaters, Sediments and Biological Tissues" (BCMOE), and/or "Standard Methods for the Examination of Water and Wastewater" (APHA). Further details are available on request.

pH in Water

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

Recommended Holding Time:

Sample: 2 hours

Reference: APHA

For more detail see ALS Environmental "Collection & Sampling Guide"

Solids in Water

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) and total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius, TSS is determined by drying the filter at 104 degrees celsius. Total solids are determined by evaporating a sample to dryness at 104 degrees celsius. Fixed and volatile solids are determined by igniting a dried sample residue at 550 degrees celsius.

Recommended Holding Time:

Sample: 7 days

Reference: APHA

For more detail see ALS Environmental "Collection & Sampling Guide"



Turbidity of Water

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

Recommended Holding Time:

Sample: 2 days

Reference: APHA

For more detail see ALS Environmental "Collection & Sampling Guide"

Alkalinity in Water by Titration

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

Recommended Holding Time:

Sample: 14 days

Reference: APHA

For more detail see ALS Environmental "Collection & Sampling Guide"

Dissolved Anions in Water by Ion Chromatography

This analysis is carried out using procedures adapted from APHA Method 4110 "Determination of Anions by Ion Chromatography" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions are determined by filtering the sample through a 0.45 micron membrane filter and injecting the filtrate onto a Dionex IonPac AG17 anion exchange column with a sodium carbonate and sodium bicarbonate eluent stream. Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

Recommended Holding Time:

Sample: 28 days (bromide, chloride, fluoride, sulphate)

Sample: 2 days (nitrate, nitrite)

Reference: APHA and EPA

For more detail see ALS Environmental "Collection & Sampling Guide"

Ammonia in Water by Colourimetry

This analysis is carried out, on unpreserved samples, using procedures adapted from APHA Method 4500-NH₃ "Nitrogen (Ammonia)". Ammonia is determined using the phenate colourimetric method.

Recommended Holding Time:

Appendix 2 - METHODOLOGY - Continued



Sample: 1 day

Reference: APHA

For more detail see ALS Environmental "Collection & Sampling Guide"

Total Kjeldahl Nitrogen in Water

This analysis is carried out using procedures adapted from APHA Method 4500-Norg "Nitrogen (Organic)". Total kjeldahl nitrogen is determined by sample digestion at 367 celcius with analysis using an ammonia selective electrode.

Recommended Holding Time:

Sample: 28 days

Reference: APHA

For more detail see ALS Environmental "Collection & Sampling Guide"

Phosphate in Water

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

Recommended Holding Time:

Sample: 2 days

Reference: EPA

For more detail see ALS Environmental "Collection & Sampling Guide"

Phosphate in Water

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". All forms of phosphate are determined by the ascorbic acid colourimetric method. Dissolved ortho-phosphate (dissolved reactive phosphorous) is determined by direct measurement. Total phosphate (total phosphorous) is determined after persulphate digestion of a sample. Total dissolved phosphate (total dissolved phosphorous) is determined by filtering a sample through a 0.45 micron membrane filter followed by persulfate digestion of the filtrate.

Recommended Holding Time:

Sample: 2 days

Reference: EPA

For more detail see ALS Environmental "Collection & Sampling Guide"

**Metals in Water**

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotplate or microwave oven, or filtration (EPA Method 3005A). Instrumental analysis is by atomic absorption/emission spectrophotometry (EPA Method 7000 series), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

Recommended Holding Time:

Sample:	6 months
Reference:	EPA
For more detail see:	ALS "Collection & Sampling Guide"

Mercury in Water

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 20th Edition 1998 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

Recommended Holding Time:

Sample:	28 days
Reference:	EPA
For more detail see	ALS Environmental "Collection & Sampling Guide"

Carbon in Water

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". All fractions of carbon are determined by the combustion-infrared method. Total carbon includes organic carbon (covalently bonded in organic molecules) and inorganic carbon (carbonate, bicarbonate and dissolved carbon dioxide). Total organic carbon is the calculated difference between the total carbon and the inorganic carbon determination. Dissolved carbon fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.

Recommended Holding Time:

Sample:	28 days
Reference:	APHA
For more detail see	ALS Environmental "Collection & Sampling Guide"



Results contained within this report relate only to the samples as submitted.

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End of Report