



# CERTIFICATE OF ANALYSIS

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**Date:** September 26, 2005

**ALS File No.** W4421

**Report On:** 40692 Water Analysis

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

**Attention:** **Mr. Martin Guilbeault**

**Received:** September 13, 2005

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**ALS ENVIRONMENTAL**

per:

Heather A. Ross-Easton, B.Sc. - Project Chemist  
Leanne Harris, B.Sc. - Project Chemist

File No. W4421

**REMARKS**



The detection limits for some of the metals have been increased for some of the samples reported in the following data tables due to sample matrix interferences.

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# **RESULTS OF ANALYSIS - Water**



Sample ID	P01-02A	P01-02B	X16A	X16B	P01-03
Sample Date	05-09-09	05-09-09	05-09-09	05-09-09	05-09-09
Sample Time	11:14	12:11	12:50	14:12	15:25
ALS ID	1	2	3	4	5

## **Physical Tests**

Conductivity	(uS/cm)	647	510	338	411	2420
Hardness	CaCO3	348	273	183	245	1600
pH		5.83	6.34	7.18	8.03	7.35

## **Dissolved Anions**

Alkalinity-Total		CaCO3	217	193	172	206	324
Sulphate	SO4		127	92.3	24.1	26.3	1230

Remarks regarding the analyses appear at the beginning of this report.  
 Results are expressed as milligrams per litre except where noted.  
 < = Less than the detection limit indicated.

**RESULTS OF ANALYSIS - Water**

Sample ID	P01-02A	P01-02B	X16A	X16B	P01-03
Sample Date	05-09-09	05-09-09	05-09-09	05-09-09	05-09-09
Sample Time	11:14	12:11	12:50	14:12	15:25
ALS ID	1	2	3	4	5

**Dissolved Metals**

Aluminum	D-Al	<0.010	<0.010	<0.010	<0.010	<0.10
Antimony	D-Sb	<0.00050	<0.00050	<0.00050	<0.00050	<0.0050
Arsenic	D-As	<0.0010	0.0035	<0.0010	<0.0010	<0.010
Barium	D-Ba	0.059	0.032	0.097	0.142	<0.020
Beryllium	D-Be	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Boron	D-B	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	D-Cd	0.000085	<0.000050	0.000072	<0.000050	0.00176
Calcium	D-Ca	100	67.6	52.0	68.5	473
Chromium	D-Cr	<0.00050	<0.00050	<0.00050	<0.00050	<0.0050
Cobalt	D-Co	<0.00050	<0.00050	<0.00050	<0.00050	0.0518
Copper	D-Cu	<0.0010	<0.0010	<0.0010	<0.0010	<0.010
Iron	D-Fe	<0.030	0.493	<0.030	<0.030	0.149
Lead	D-Pb	<0.0010	<0.0010	<0.0010	<0.0010	<0.010
Lithium	D-Li	<0.050	<0.050	<0.050	<0.050	<0.050
Magnesium	D-Mg	23.7	25.3	12.8	17.9	103
Manganese	D-Mn	1.00	0.141	<0.010	<0.010	37.7
Mercury	D-Hg	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Molybdenum	D-Mo	0.0019	<0.0010	0.0026	0.0019	<0.010
Nickel	D-Ni	<0.0050	<0.0050	<0.0050	<0.0050	0.093
Selenium	D-Se	<0.0010	<0.0010	<0.0010	0.0021	<0.010
Silver	D-Ag	<0.000050	<0.000050	<0.000050	<0.000050	<0.00050
Sodium	D-Na	12.2	12.3	<2.0	<2.0	45.3
Thallium	D-Tl	<0.00020	<0.00020	<0.00020	<0.00020	<0.0020
Titanium	D-Ti	<0.050	<0.050	<0.050	<0.050	<0.050
Uranium	D-U	0.00231	0.00232	0.00185	0.00218	0.0059
Vanadium	D-V	<0.030	<0.030	<0.030	<0.030	<0.030
Zinc	D-Zn	0.0081	0.0087	0.0108	<0.0050	0.0172

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# RESULTS OF ANALYSIS - Water



Sample ID	P05-02	X25A	X25B	X24A	X24C
Sample Date	05-09-09	05-09-09	05-09-09	05-09-09	05-09-09
Sample Time	10:20	16:30	16:45	14:54	16:07
ALS ID	6	7	8	9	10

## **Physical Tests**

Conductivity	(uS/cm)	2010	970	1100	2310	2340
Hardness	CaCO3	1200	503	542	1410	1570
pH		7.42	7.67	8.01	7.10	7.10

## **Dissolved Anions**

Alkalinity-Total		CaCO3	317	250	267	317	325
Sulphate	SO4		895	295	335	1170	1180

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**RESULTS OF ANALYSIS - Water**

Sample ID	P05-02	X25A	X25B	X24A	X24C
Sample Date	05-09-09	05-09-09	05-09-09	05-09-09	05-09-09
Sample Time	10:20	16:30	16:45	14:54	16:07
ALS ID	6	7	8	9	10

**Dissolved Metals**

Aluminum	D-Al	<0.050	<0.020	<0.020	<0.050	<0.10
Antimony	D-Sb	<0.0025	<0.0010	<0.0010	<0.0025	<0.0050
Arsenic	D-As	0.0124	<0.0020	<0.0020	<0.0050	<0.010
Barium	D-Ba	0.069	0.040	0.025	0.021	<0.020
Beryllium	D-Be	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Boron	D-B	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	D-Cd	<0.00025	0.00043	<0.00010	0.00089	<0.00050
Calcium	D-Ca	369	146	170	414	462
Chromium	D-Cr	<0.0025	<0.0010	<0.0010	<0.0025	<0.0050
Cobalt	D-Co	0.0066	0.0084	<0.0010	0.0386	0.0565
Copper	D-Cu	<0.0050	0.0027	<0.0020	<0.0050	<0.010
Iron	D-Fe	5.94	0.038	0.620	0.438	0.164
Lead	D-Pb	<0.0050	<0.0020	<0.0020	<0.0050	<0.010
Lithium	D-Li	<0.050	<0.050	<0.050	<0.050	<0.050
Magnesium	D-Mg	68.1	33.4	28.6	90.6	102
Manganese	D-Mn	12.5	5.58	0.160	30.8	38.5
Mercury	D-Hg	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Molybdenum	D-Mo	<0.0050	<0.0020	<0.0020	<0.0050	<0.010
Nickel	D-Ni	<0.025	0.012	<0.010	0.111	0.120
Selenium	D-Se	<0.0050	<0.0020	<0.0020	<0.0050	<0.010
Silver	D-Ag	<0.00025	<0.00010	<0.00010	<0.00025	<0.00050
Sodium	D-Na	50.5	27.2	50.5	35.9	40.3
Thallium	D-Tl	<0.0010	<0.00040	<0.00040	<0.0010	<0.0020
Titanium	D-Ti	<0.050	<0.050	<0.050	<0.050	<0.050
Uranium	D-U	0.0034	0.00866	0.00522	0.0067	0.0067
Vanadium	D-V	<0.030	<0.030	<0.030	<0.030	<0.030
Zinc	D-Zn	0.0264	0.0057	<0.0050	0.0118	0.0175

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# **RESULTS OF ANALYSIS - Water**



Sample ID	X24D	P01-11	P96-8A-R	P96-8A	P01-01B
Sample Date	05-09-09	05-09-09	05-09-10	05-09-10	05-09-10
Sample Time	15:41	11:40	16:55	16:55	09:50
ALS ID	11	12	13	14	15

## **Physical Tests**

Conductivity	(uS/cm)	2670	1970	6390	6370	1100
Hardness	CaCO3	1890	1110	4440	4240	515
pH		7.14	7.52	6.46	6.50	7.15

## **Dissolved Anions**

Alkalinity-Total		CaCO3	358	316	106	108	255
Sulphate	SO4		1390	904	4920	5040	377

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**RESULTS OF ANALYSIS - Water**

Sample ID	X24D	P01-11	P96-8A-R	P96-8A	P01-01B
Sample Date	05-09-09	05-09-09	05-09-10	05-09-10	05-09-10
Sample Time	15:41	11:40	16:55	16:55	09:50
ALS ID	11	12	13	14	15

**Dissolved Metals**

Aluminum	D-Al	<0.10	<0.050	<1.0	<1.0	<0.020
Antimony	D-Sb	<0.0050	<0.0025	<0.050	<0.050	<0.0010
Arsenic	D-As	<0.010	0.0292	<0.10	<0.10	0.0033
Barium	D-Ba	0.021	0.048	<0.040	<0.040	0.064
Beryllium	D-Be	<0.0050	<0.0050	<0.010	<0.010	<0.0050
Boron	D-B	<0.10	<0.10	<0.20	<0.20	<0.10
Cadmium	D-Cd	0.00240	<0.00025	0.233	0.220	<0.00010
Calcium	D-Ca	566	347	477	456	162
Chromium	D-Cr	<0.0050	<0.0025	<0.050	<0.050	<0.0010
Cobalt	D-Co	0.0331	<0.0025	0.313	0.312	<0.0010
Copper	D-Cu	<0.010	<0.0050	<0.10	<0.10	<0.0020
Iron	D-Fe	<0.030	22.6	0.082	0.061	0.572
Lead	D-Pb	<0.010	<0.0050	<0.10	<0.10	<0.0020
Lithium	D-Li	0.053	<0.050	0.28	0.26	<0.050
Magnesium	D-Mg	116	60.1	788	752	26.8
Manganese	D-Mn	37.7	12.3	101	98.7	0.089
Mercury	D-Hg	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Molybdenum	D-Mo	<0.010	<0.0050	<0.10	<0.10	<0.0020
Nickel	D-Ni	0.153	<0.025	1.67	1.70	<0.010
Selenium	D-Se	<0.010	<0.0050	<0.10	<0.10	<0.0020
Silver	D-Ag	<0.00050	<0.00025	<0.0050	<0.0050	<0.00010
Sodium	D-Na	51.0	47.8	56.8	54.9	19.0
Thallium	D-Tl	<0.0020	<0.0010	<0.020	<0.020	<0.00040
Titanium	D-Ti	<0.050	<0.050	<0.10	<0.10	<0.050
Uranium	D-U	0.0047	0.0043	<0.020	<0.020	0.00606
Vanadium	D-V	<0.030	<0.030	0.077	0.078	<0.030
Zinc	D-Zn	0.0569	0.0074	618	604	0.0113

Remarks regarding the analyses appear at the beginning of this report.  
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# **RESULTS OF ANALYSIS - Water**



Sample ID	P01-01A	P01-04A	P01-04B	X17A	X17A-R
Sample Date	05-09-10	05-09-10	05-09-10	05-09-10	05-09-10
Sample Time	09:30	14:39	14:56	10:48	10:48
ALS ID	16	17	18	19	20

## **Physical Tests**

Conductivity	(uS/cm)	1410	1290	1350	448	457
Hardness	CaCO3	633	481	808	298	313
pH		7.63	7.28	7.70	8.12	8.20

## **Dissolved Anions**

Alkalinity-Total		CaCO3	254	746	300	230	239
Sulphate	SO4		559	26.0	463	20.1	20.8

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**RESULTS OF ANALYSIS - Water**

Sample ID		P01-01A	P01-04A	P01-04B	X17A	X17A-R
Sample Date		05-09-10	05-09-10	05-09-10	05-09-10	05-09-10
Sample Time		09:30	14:39	14:56	10:48	10:48
ALS ID		16	17	18	19	20
<b>Dissolved Metals</b>						
Aluminum	D-Al	<0.020	<0.020	<0.020	<0.010	<0.010
Antimony	D-Sb	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050
Arsenic	D-As	<0.0020	<0.0020	<0.0020	<0.0010	<0.0010
Barium	D-Ba	0.069	0.475	0.033	0.170	0.175
Beryllium	D-Be	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Boron	D-B	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium	D-Cd	0.00034	<0.00010	<0.00010	<0.000050	<0.000050
Calcium	D-Ca	203	114	263	83.5	88.2
Chromium	D-Cr	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050
Cobalt	D-Co	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050
Copper	D-Cu	<0.0020	<0.0020	<0.0020	<0.0010	<0.0010
Iron	D-Fe	0.040	0.721	5.29	0.047	0.046
Lead	D-Pb	<0.0020	<0.0020	<0.0020	<0.0010	0.0054
Lithium	D-Li	<0.050	0.175	<0.050	<0.050	<0.050
Magnesium	D-Mg	30.6	47.7	36.9	21.7	22.6
Manganese	D-Mn	2.57	0.248	1.39	<0.010	<0.010
Mercury	D-Hg	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Molybdenum	D-Mo	<0.0020	<0.0020	<0.0020	<0.0010	<0.0010
Nickel	D-Ni	<0.010	<0.010	<0.010	<0.0050	<0.0050
Selenium	D-Se	<0.0020	<0.0020	<0.0020	<0.0010	<0.0010
Silver	D-Ag	<0.00010	0.00036	<0.00010	<0.000050	<0.000050
Sodium	D-Na	15.9	68.6	49.6	3.0	3.1
Thallium	D-Tl	<0.00040	<0.00040	<0.00040	<0.00020	<0.00020
Titanium	D-Ti	<0.050	<0.050	<0.050	<0.050	<0.050
Uranium	D-U	0.00688	<0.00040	0.00324	0.00241	0.00256
Vanadium	D-V	<0.030	<0.030	<0.030	<0.030	<0.030
Zinc	D-Zn	0.0097	<0.0050	0.0056	0.0091	0.0088

Remarks regarding the analyses appear at the beginning of this report.  
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 < = Less than the detection limit indicated.

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## RESULTS OF ANALYSIS - Water



Sample ID	X17B
Sample Date	05-09-10
Sample Time	11:10
ALS ID	21

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### **Physical Tests**

Conductivity	(uS/cm)	530
Hardness	CaCO <sub>3</sub>	359
pH		8.01

### **Dissolved Anions**

Alkalinity-Total		CaCO <sub>3</sub>	271
Sulphate	SO <sub>4</sub>		39.5

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File No. W4421

## RESULTS OF ANALYSIS - Water



Sample ID X17B

Sample Date 05-09-10  
Sample Time 11:10  
ALS ID 21

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### **Dissolved Metals**

Aluminum	D-Al	<0.010
Antimony	D-Sb	<0.00050
Arsenic	D-As	<0.0010
Barium	D-Ba	0.243
Beryllium	D-Be	<0.0050
Boron	D-B	<0.10
Cadmium	D-Cd	<0.000050
Calcium	D-Ca	101
Chromium	D-Cr	<0.00050
Cobalt	D-Co	<0.00050
Copper	D-Cu	<0.0010
Iron	D-Fe	0.956
Lead	D-Pb	<0.0010
Lithium	D-Li	<0.050
Magnesium	D-Mg	25.9
Manganese	D-Mn	0.271
Mercury	D-Hg	<0.00020
Molybdenum	D-Mo	<0.0010
Nickel	D-Ni	<0.0050
Selenium	D-Se	<0.0010
Silver	D-Ag	<0.000050
Sodium	D-Na	7.4
Thallium	D-Tl	<0.00020
Titanium	D-Ti	<0.050
Uranium	D-U	0.00179
Vanadium	D-V	<0.030
Zinc	D-Zn	0.0058

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**Appendix 1 - QUALITY CONTROL - Replicates**

Water	P96-8A-R	P96-8A-R	X17A	X17A
	05-09-10 16:55	QC # 463824	05-09-10 10:48	QC # 463825

**Physical Tests**

Conductivity	(uS/cm)	6390	6380	448	448
Hardness	CaCO <sub>3</sub>	4440	4390	298	302
pH		6.46	6.45	8.12	8.16

**Dissolved Anions**

Alkalinity-Total		CaCO <sub>3</sub>	106	110	230	250
Sulphate	SO <sub>4</sub>		4920	4960	20.1	21.6

Remarks regarding the analyses appear at the beginning of this report.  
 Results are expressed as milligrams per litre except where noted.  
 < = Less than the detection limit indicated.

**Appendix 1 - QUALITY CONTROL - Replicates**

Water		P96-8A-R	P96-8A-R	X17A	X17A
		05-09-10 16:55	QC # 463824	05-09-10 10:48	QC # 463825
<b>Dissolved Metals</b>					
Aluminum	D-Al	<1.0	<1.0	<0.010	<0.010
Antimony	D-Sb	<0.050	<0.050	<0.00050	<0.00050
Arsenic	D-As	<0.10	<0.10	<0.0010	<0.0010
Barium	D-Ba	<0.040	<0.040	0.170	0.173
Beryllium	D-Be	<0.010	<0.010	<0.0050	<0.0050
Boron	D-B	<0.20	<0.20	<0.10	<0.10
Cadmium	D-Cd	0.233	0.232	<0.000050	<0.000050
Calcium	D-Ca	477	473	83.5	84.8
Chromium	D-Cr	<0.050	<0.050	<0.00050	<0.00050
Cobalt	D-Co	0.313	0.310	<0.00050	<0.00050
Copper	D-Cu	<0.10	<0.10	<0.0010	<0.0010
Iron	D-Fe	0.082	0.064	0.047	<0.030
Lead	D-Pb	<0.10	<0.10	<0.0010	<0.0010
Lithium	D-Li	0.28	0.30	<0.050	<0.050
Magnesium	D-Mg	788	778	21.7	21.9
Manganese	D-Mn	101	105	<0.010	<0.010
Mercury	D-Hg	<0.00020	<0.00020	<0.00020	<0.00020
Molybdenum	D-Mo	<0.10	<0.10	<0.0010	<0.0010
Nickel	D-Ni	1.67	1.72	<0.0050	<0.0050
Selenium	D-Se	<0.10	<0.10	<0.0010	<0.0010
Silver	D-Ag	<0.0050	<0.0050	<0.000050	<0.000050
Sodium	D-Na	56.8	59.8	3.0	3.0
Thallium	D-Tl	<0.020	<0.020	<0.00020	<0.00020
Titanium	D-Ti	<0.10	<0.10	<0.050	<0.050
Uranium	D-U	<0.020	<0.020	0.00241	0.00246
Vanadium	D-V	0.077	0.132	<0.030	<0.030
Zinc	D-Zn	618	651	0.0091	0.0089

Remarks regarding the analyses appear at the beginning of this report.  
 Results are expressed as milligrams per litre except where noted.  
 < = Less than the detection limit indicated.



## **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

Laboratory Location: ALS Environmental, Vancouver

### **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

Laboratory Location: ALS Environmental, Vancouver

### **Alkalinity in Water by Colourimetry**

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

Recommended Holding Time:

Sample: 14 days

Reference: APHA

Laboratory Location: ALS Environmental, Vancouver

### **Sulphate in Water**

This analysis is carried out using procedures adapted from APHA Method 4500-SO<sub>4</sub> "Sulphate". Sulphate is determined using the turbidimetric method.

Recommended Holding Time:

Sample: 28 days

Reference: APHA

Laboratory Location: ALS Environmental, Vancouver

## **Appendix 2 - METHODOLOGY - Continued**



### **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

Laboratory Location: ALS Environmental, Vancouver

### **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

Laboratory Location: ALS Environmental, Vancouver

### **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

Laboratory Location: ALS Environmental, Vancouver



File No. W4421

**Appendix 2 - METHODOLOGY - Continued**



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

**This Certificate Of Analysis shall only be reproduced in full, except with the written approval of ALS Environmental.**

**End of Report**