



The Municipality of the Village of Lions Bay

DRINKING WATER QUALITY

ANNUAL REPORT

2009

**Works
Department**



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GENERAL DESCRIPTION

The Village of Lions Bay supplies potable water to approximately 1500 residents with 500 service connections. Water is sourced from two local creeks, treated with chlorine and then distributed via eight storage tanks and thirteen kilometres of water mains to the residents. This report provides an overview of the water quality at the Village of Lions Bay during 2009.

SOURCE WATER

The community’s watershed lands include Magnesia Creek drainage (421 hectares), Alberta Creek drainage (51 hectares), Harvey Creek drainage (635 hectares), and Rundle Creek drainage (20 hectares). Water is normally drawn from the intakes on Harvey Creek and Magnesia Creek. Two additional water intakes exist, one at lower Magnesia Creek, and one at Alberta Creek; however, these intakes are considered as ‘reserve intakes’ and were not used during 2009.

Challenges

The Village draws its water from surface sources that are subject to fluctuating turbidity levels. This fluctuation in raw water turbidity, presents a challenge to ensure that distributed water turbidity and residual chlorine levels, are not adversely affected. Water intakes are typically checked every second or third day, and several times a day when the weather dictates. Chlorine injections sites (Chlorinators) are checked once daily from Monday to Friday.

Test Results

The Village tests untreated source water for turbidity once daily from Monday to Friday, and performs more extensive testing Quart-yearly for general water chemistry, hardness, metals and contaminants including organic compounds. The results for source water during 2009 are presented and discussed below.

Turbidity

	RAW WATER 2009	
	Harvey Creek	Magnesia Creek
Count	241	242
Maximum Result (NTU)	5.91	8.52
Minimum Result (NTU)	0.18	0.20
Average (NTU)	0.37	0.45
Number of samples < 1 NTU	236	236
Number of samples > 1 NTU but < 5 NTU	4	5
Number of samples > 5 NTU	1	1
Percentage of samples < 1 NTU	97.93	97.52
Percentage of samples > 1 NTU but < 5 NTU	1.66	2.07
Percentage of samples > 5 NTU	0.41	0.41



The Canadian Drinking Water Guidelines (and the US Environmental Protection Agency) state that the turbidity of an unfiltered raw water supply should generally be around 1 NTU, and should not exceed 5 NTU. As can be seen from the above summary table, raw water turbidity during 2009 was generally acceptable for unfiltered source water, and ranged below 1.0 NTU most of the time. During 2009 Harvey raw water exceeded once the Canadian Drinking Water Guidelines: On December 21 (5.91 NTU) and Magnesia raw water exceeded the Guidelines once, too: On December 21 (8.52 NTU). This problem was solved following the procedures explained in the Appendix "D" in the section "Turbidity Events". Currently, the Village is working along with a Designer Company in order to build the new Water Treatment Plants for Harvey and Magnesia Creeks. These Plants are having a Pressure Reducing Valve Chamber previous to the Water Plant, UV Reactors, and Chlorination System.

Metals and General Chemistry

See results in appendix "C"

WATER TREATMENT

Treatment

Currently no filtration is applied to the water in Lions Bay, disinfection using chlorine is the only treatment applied. The Village maintain two chlorination stations for Harvey and Magnesia creeks using gas chlorine injectors. Turbidity and residual chlorine tests are performed at these locations and downstream of the treated water tanks. There are also two standby water treatment stations, one liquid hypochlorite injector at Brunswick Beach and another one at Alberta Creek; however, these facilities were not operated during 2009.

Challenges

In times of severe weather, the Village water system operators increase the frequency of testing and adjustment of the injector rates in order to compensate for any fluctuating chlorine demand caused by varying turbidity levels. Residual chlorine levels in treated water exiting the storage tanks are tested sometimes two to four times per day to ensure that sufficient chlorine residuals levels are maintained during raw water turbidity variations.

Test Results

The Village tests treated water exiting the storage tanks for turbidity and residual chlorine daily from Monday to Friday. These results are presented and discussed below.



Turbidity

	TREATED WATER 2009	
	HARVEY	MAGNESIA
Count	220	247
Maximum Result (NTU)	1.08	1.47
Minimum Result (NTU)	0.22	0.20
Average (NTU)	0.41	0.42
Number of samples < 1 NTU	218	242
Number of samples > 1 NTU but < 5 NTU	2	5
Number of samples > 5 NTU	0	0
Percentage of samples < 1 NTU	99.09	97.98
Percentage of samples > 1 NTU but < 5 NTU	0.91	2.02
Percentage of samples > 5 NTU	0.00	0.00

The Canadian Drinking Water Guidelines (and the US Environmental Protection Agency) state that the turbidity of an unfiltered treated water supply should generally be around 1 NTU, and should not exceed 5 NTU. As can be seen from the above summary table, treated water turbidity during 2009 was generally acceptable for unfiltered treated water, and ranged around 0.41 NTU in Harvey and 0.42 NTU in Magnesia. During 2009 no samples with more than 5 NTU were obtained, which indicates the good quality of the water that the Village had during this year.

Residual Chlorine

	TREATED WATER 2009	
	HARVEY	MAGNESIA
Count	229	229
Maximum Result (PPM)	1.31	1.01
Minimum Result (PPM)	0.18	0.37
Average (PPM)	0.73	0.69
No. of Samples Outside Limits	1	0
% Samples Outside Limits	0.44	0.00

The generally agreed Minimum Acceptable Residual Chlorine level in treated drinking water is 0.2 mg/l, as recommended by Vancouver Coastal Health. The generally agreed Maximum Acceptable Residual Chlorine level in treated drinking water is 4.0 mg/l as recommended by the US Environmental Protection Agency.

As shown in the above analysis, just one sample (around 0.44% for Harvey system) had a result less than 0.2 mg/l. This indicates that 99.56% of samples in Harvey and 100.00% of samples in Magnesia had acceptable levels of residual chlorine (greater than 0.2 mg/l but less than 4 mg/l).



When less than 0.2 mg/l chlorine residual is noted in the Distribution System, some hydrants in the system are flushed until a minimum chlorine residual of 0.2 mg/l or more is obtained.

WATER DISTRIBUTION SYSTEM

Storage

Approximately 450,000 imperial gallons (IG) of water are consumed per day for the whole system. There are currently 8 water storage tanks throughout the system. These include: Harvey (400,000 IG), Ocean view (100,000 IG, out of service during 2009), Magnesia (100,000 IG), Upper Bayview Phase 4 (20,000 IG), Upper Bayview Phase 5 (25,000 IG, out of service during 2009), Highway (21,000 IG), South Sunset (40,000 IG, out of service during 2009), and Brunswick Beach (35,000 IG, out of service during 2009).

Distribution

The Village of Lions Bay's location on the side of a mountain requires that water pressures be controlled with eleven (11) PRV stations, six (6) for Harvey System, and five (5) for Magnesia System.

Approximately 13 kilometres of water mains of a variety of ages and constructed from a variety of materials including asbestos cement, ductile iron, cast iron, and PVC make up the Village's distribution system.

Test Results

Samples are taken daily from Monday to Friday from five quality sampling sites in the middle and end of the distribution system and tested for turbidity and residual chlorine. On Mondays, samples from these sites are sent to the laboratory to be tested for Total and Fecal Coliforms, and E. Coli.

In addition, metals levels and general chemistry are tested Quarter-yearly at up to eleven locations in the distribution system. The results of the Quarter-yearly samples are presented in appendix "C".

Harvey Turbidity

	W.D.S. HARVEY 2009		
	PRV-3	CAFE	KELVIN G.
Count	245	247	247
Maximum Result (NTU)	3.72	1.79	5.11
Minimum Result (NTU)	0.10	0.23	0.20
Average (NTU)	0.51	0.41	0.45
Number of samples < 1 NTU	238	246	241
Number of samples > 1 NTU but < 5 NTU	7	1	5
Number of samples > 5 NTU	0	0	1
Percentage of samples < 1 NTU	97.14	99.60	97.57
Percentage of samples > 1 NTU but < 5 NTU	2.86	0.40	2.02
Percentage of samples > 5 NTU	0.00	0.00	0.40



The Canadian Drinking Water Guidelines (and the US Environmental Protection Agency) state that the turbidity of an unfiltered treated water supply should generally be around 1 NTU, and should not exceed 5 NTU. As can be seen from the above summary table, treated water turbidity from Harvey during 2009 was generally acceptable for unfiltered treated water, and ranged around 0.46 NTU most of the time. During 2009, only one sample with more than 5 NTU was obtained (Kelvin Grove with 5.11 NTU on November 2), which indicates the good quality of the water sent to the Harvey System during this year.

Magnesia Turbidity

	W.D.S. MAGNESIA 2009	
	PRV-5	B. B.
Count	247	242
Maximum Result (NTU)	1.34	5.52
Minimum Result (NTU)	0.22	0.20
Average (NTU)	0.43	0.46
Number of samples < 1 NTU	244	236
Number of samples > 1 NTU but < 5 NTU	3	7
Number of samples > 5 NTU	0	1
Percentage of samples < 1 NTU	98.79	97.52
Percentage of samples > 1 NTU but < 5 NTU	1.21	2.89
Percentage of samples > 5 NTU	0.00	0.41

The Canadian Drinking Water Guidelines (and the US Environmental Protection Agency) state that the turbidity of an unfiltered treated water supply should generally be around 1 NTU, and should not exceed 5 NTU. As can be seen from the above summary table, treated water turbidity from Magnesia during 2009 was generally acceptable for unfiltered treated water, and ranged around 0.45 NTU most of the time. During 2009, only one sample with more than 5 NTU was obtained (Brunswick Beach with 5.52 on November 26), which indicates the good quality of the water sent to the Magnesia system during this year.

Harvey Residual Chlorine

	TREATED WATER 2009		
	PRV-3	CAFE	KELVIN G.
Count	245	246	246
Maximum Result (mg/l)	1.30	1.03	1.05
Minimum Result (mg/l)	0.12	0.10	0.06
Average (mg/l)	0.72	0.57	0.44
No. of Samples Outside Limits	1	1	2
% Samples Outside Limits	0.41	0.41	0.81



The generally agreed Minimum Acceptable Residual Chlorine level in treated drinking water is 0.2 mg/l, as recommended by Vancouver Coastal Health. The generally agreed Maximum Acceptable Residual Chlorine level in treated drinking water is 4.0 mg/l as recommended by the US Environmental Protection Agency.

As shown in the above analysis, a small number of samples (around 0.41% in PRV-3, 0.41% in the Cafe, and 0.81% in Kelvin Grove) had levels less than 0.2 mg/l. This indicates that 99.59% of samples in PRV-3, 99.59% in the Cafe, and 99.19% of samples in Kelvin Grove, had acceptable levels of residual chlorine during 2009 (greater than 0.2 mg/l but less than 4 mg/l).

Magnesia Residual Chlorine

	TREATED WATER 2009	
	PRV-5	B. B.
Count	247	244
Maximum Result (mg/l)	1.01	0.76
Minimum Result (mg/l)	0.34	0.14
Average (mg/l)	0.67	0.39
No. of Samples Outside Limits	0	1
% Samples Outside Limits	0.00	0.41

The generally agreed Minimum Acceptable Residual Chlorine level in treated drinking water is 0.2 mg/l, as recommended by Vancouver Coastal Health. The generally agreed Maximum Acceptable Residual Chlorine level in treated drinking water is 4.0 mg/l as recommended by the US Environmental Protection Agency.

As shown in the above analysis, just one sample (0.41% in Brunswick Beach) had a level less than 0.2 mg/l. This indicates that 100.00% of samples in PRV-5, and 99.59% of samples in Brunswick Beach, had acceptable levels of residual chlorine during 2009 (greater than 0.2 mg/l but less than 4 mg/l).

Fecal and Total Coliforms

	PRV-3	STORE/CAFE	KELVIN G.	PRV-5	BRUNSWICK B
Count	52	52	52	52	52
Max Result (mg/l)	N	N	N	N	N
Min Result (mg/l)	N	N	N	N	N
Average (mg/l)	N	N	N	N	N
No. Outside Limits	0	0	0	0	0
% Outside Limits	0%	0%	0%	0%	0%



In the Total and Fecal Coliform tests, the result is either Positive (P) or Negative (N), where a Positive result is not acceptable as it indicates the presence of coliforms. There were not Positive results in 2009.

Metals and General Chemistry

See results in Appendix "C"

UPGRADING WORK IN 2009

Start the construction of the Water Treatment Plants to replace Harvey and Magnesia Chlorinators.

These two plants will consist of:

- ❖ Pressure Reducing Valve Chambers before the UV Reactor Rooms
- ❖ UV Reactors Rooms
- ❖ Liquid Chlorine Injection Rooms
- ❖ Turbidity Analysers
- ❖ Chlorine Analyzers
- ❖ SCADA System

UPGRADING WORK PLANNED FOR 2010

Finish the construction of the Water Treatment Plants to replace Harvey and Magnesia Chlorinators.

These two plants will consist of:

- ❖ Pressure Reducing Valve Chambers before the UV Reactor Rooms
- ❖ UV Reactors Rooms
- ❖ Liquid Chlorine Injection Rooms
- ❖ Turbidity Analysers
- ❖ Chlorine Analyzers
- ❖ SCADA System

OPERATOR TRAINING

The Village's Water Treatment/Distribution System has been evaluated as "Village of Lions Bay Water System Class II" by the Environmental Operators Certification Program (EOCP). The Operator for the Village's Water System is Alberto Urrutia.



Alberto Urrutia has completed the following courses:

- ❖ Instrumentation 1
- ❖ Electrical Principles Level 1
- ❖ Hydrant Maintenance and Testing
- ❖ Water Sources
- ❖ Water Treatment 2
- ❖ Confined Space Workshop
- ❖ Water Treatment I
- ❖ Chlorine Handling
- ❖ Utility Management
- ❖ Water Treatment Plant Operation II
- ❖ Water Treatment Plant Operation I
- ❖ Water Distribution System Operation and Maintenance
- ❖ Small Water System Operation and Maintenance
- ❖ Small Water Systems
- ❖ Waterworks Technology.

EOCP Certificates obtained by Alberto Urrutia:

- ❖ Water Distribution Level 2 on July 12, 2006
- ❖ Chlorine Handler on May 6, 2005
- ❖ Water Distribution Level 1 on April 6, 2005
- ❖ Water Distribution Operator-In-Training on July 21, 2004.



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Appendix A

Water Quality Sampling



LIST OF SAMPLING SITE LOCATIONS

Location	Source	Tests	Frequency
PRV-3	Harvey Creek	CL2 Residual and Turbidity	Daily Monday-Friday
400,000 Gal Harvey Tank	Harvey Creek	CL2 Residual and Turbidity	Daily Monday-Friday
General Store/Cafe	Harvey Creek	CL2 Residual and Turbidity	Daily Monday-Friday
Kelvin Grove	Harvey Creek	CL2 Residual and Turbidity	Daily Monday-Friday
PRV-5	Magnesia Creek	CL2 Residual and Turbidity	Daily Monday-Friday
100,000 Gal Magnesia Tank	Magnesia Creek	CL2 Residual and Turbidity	Daily Monday-Friday
Brunswick Beach	Magnesia Creek	CL2 Residual and Turbidity	Daily Monday-Friday
Harvey Intake	Harvey Creek	Raw Water Turbidity	Daily Monday-Friday
Magnesia Intake	Magnesia Creek	Raw Water Turbidity	Daily Monday-Friday
PRV-3	Harvey Creek	Total/Fecal Coliform, E Coli	Every Monday
400,000 Gal Harvey Tank	Harvey Creek	Total/Fecal Coliform, E Coli	Every Monday
General Store/Cafe	Harvey Creek	Total/Fecal Coliform, E Coli	Every Monday
Kelvin Grove	Harvey Creek	Total/Fecal Coliform, E Coli	Every Monday
PRV-5	Magnesia Creek	Total/Fecal Coliform, E Coli	Every Monday
100,000 Gal Magnesia Tank	Magnesia Creek	Total/Fecal Coliform, E Coli	Every Monday
Brunswick Beach	Magnesia Creek	Total/Fecal Coliform, E Coli	Every Monday
Harvey Intake	Harvey Creek	Total/Fecal Coliform, E Coli	Every Monday
Magnesia Intake	Magnesia Creek	Total/Fecal Coliform, E Coli	Every Monday
PRV-3	At Tap	Metals, THM's, Organics	Four Times a Year
400,000 Gal Harvey Tank	At Tap	Metals, THM's, Organics	Four Times a Year
General Store/Cafe	At Tap	Metals, THM's, Organics	Four Times a Year
Kelvin Grove	At Tap	Metals, THM's, Organics	Four Times a Year
Kiddley Winks Preschool	At Tap	Metals, THM's, Organics	Four Times a Year
Community Centre	At Tap	Metals, THM's, Organics	Four Times a Year
PRV-5	At Tap	Metals, THM's, Organics	Four Times a Year
100,000 Gal Magnesia Tank	At Tap	Metals, THM's, Organics	Four Times a Year
Brunswick Beach	At Tap	Metals, THM's, Organics	Four Times a Year
Elementary School	At Tap	Metals, THM's, Organics	Four Times a Year
Harvey Intake	Harvey Creek	Metals, THM's, Organics	Four Times a Year
Magnesia Intake	Magnesia Creek	Metals, THM's, Organics	Four Times a Year

Bacteria

Sample collection for monitoring bacteria levels (Total Coliforms, Fecal Coliforms, and E. Coli) in the Lions Bay Water Distribution System is performed every Monday at nine sites. Samples are delivered to the Vancouver Coastal Health Authority for analysis and reporting. The sampling locations are listed above and include source, mid, and end systems sites.



In addition, random samples may be taken from areas where water quality complaints have originated or where waterworks construction or maintenance activities are underway.

Bacteriological standards in water distribution systems should meet the requirements of the B.C. Safe Drinking Water Regulations, which stipulates the following criteria for sample test results:

- ❖ Fecal Coliform: 0 fecal coliform / 100ml
- ❖ Total Coliform: 10 or less total coliform / 100 ml
- ❖ Total Coliform: 90% or more of the samples for a given month must have 0 total coliform / 100 ml.

Physical Parameters

Treated Water in the Distribution System is tested for Turbidity daily from Monday to Friday, at seven sites. Raw Water is tested for Turbidity at both intakes daily from Monday to Friday. Taste, Odour, and Turbidity are monitored on a complaint basis.

The Canadian Drinking Water Guidelines (and the US Environmental Protection Agency) state that the turbidity of an unfiltered raw water supply should generally be around 1 NTU, and should not exceed 5 NTU.

Chemical Parameters

- ❖ Free Chlorine Residual: Measured at all sampling sites when bacteriological samples are collected
- ❖ Haloacetic Acids (HAA's): HAA's are disinfection by-products. HAA's are not regulated in Canada but a maximum contaminant level of 60 ppb (based on a running annual average calculated with quarterly results for different locations within the system) has recently been adopted in the USA
- ❖ Trihalomethanes (THM's): THM's are disinfection by-products sampled with HAA's. The Guidelines for Canadian Drinking Water Quality (GCDWQ) list an interim maximum acceptable concentration for THM's at 100 ppb (based on a running annual average calculated with quarterly results for different locations within the system)
- ❖ pH: Measured on samples collected for HAA's / THM's testing. The GCDWQ recommend an aesthetic objective for pH ranging between 6.5 and 8.5
- ❖ Metals: During 2001, the regional Medical Health Officers developed a strategy for sampling metals at the tap. The new requirement is to sample 10% of the sampling metals "at the tap" in a quarterly basis for lead, copper and zinc, with sample locations consisting of a mixture of private homes and public buildings, including schools.



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Appendix B

Source / Distribution Water Test Results

DATE	TREATED WATER MARCH 2009													
	HARVEY								MAGNESIA					
	PRV-3		400 HAR. TANK		STORE / CAFE		KELVIN GROVE		PRV-5		100 MAG. TANK		BRUNSWICK B.	
	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)
1														
2	0.55	0.68	0.63	0.70	0.38	0.65	0.31	0.70	0.84	0.55	0.87	0.56	0.32	0.33
3	0.61	0.66	0.43	0.67	0.47	0.54	0.38	0.47	0.71	0.57	0.56	0.55	0.27	0.42
4	0.48	0.66	0.35	0.69	0.41	0.53	0.30	0.57	1.25	0.57	0.37	0.60	0.34	0.49
5	0.38	0.71	0.30	0.76	0.32	0.57	0.31	0.55	0.38	0.58	0.29	0.62	0.45	0.25
6	0.38	0.84			0.31	0.66	0.30	0.59	0.36	0.60	0.27	0.64	0.43	0.27
7														
8														
9	0.53	0.59			0.47	0.86	0.58	0.37	0.60	0.56	0.48	0.96		
10	0.51	0.57			0.76	0.84	0.49	0.35	0.52	0.62	0.54	0.97	0.92	0.23
11	0.50	1.05			0.36	0.96	0.36	0.91	0.56	0.74	0.72	0.72	0.37	0.43
12	0.40	0.95	0.86	0.96	0.33	0.91	0.31	0.94	0.32	0.65	0.31	0.65	0.31	0.46
13	0.52	1.01			0.38	0.97	0.40	0.94	0.32	0.71	0.31	0.78	0.30	0.43
14														
15														
16	0.35	0.89	0.35	0.90	0.40	0.86	0.31	0.84	0.38	0.66	0.25	0.69	0.37	0.42
17	0.51	0.92	0.23	0.93	0.36	0.78	0.34	0.84	0.28	0.66	0.32	0.67	0.32	0.40
18	0.42	0.88	0.38	0.90	0.35	0.84	0.32	0.80	0.32	0.75	0.22	0.77	0.27	0.42
19	0.29	0.83	0.41	0.84	0.38	0.75	0.26	0.86	0.40	0.75	0.28	0.74	0.35	0.46
20	0.56	0.68	0.35	0.61	0.33	0.57	0.25	0.70	0.31	0.76	0.41	0.75	0.35	0.43
21														
22														
23	0.30	0.66	0.31	0.69	0.93	0.45	0.29	0.39	0.35	0.74	0.30	0.79	0.34	0.44
24	0.45	0.77	0.51	0.78	0.35	0.60	0.29	0.54	0.31	0.68	0.30	0.67	0.38	0.45
25	0.46	0.77	0.34	0.79	0.34	0.66	0.31	0.63	0.39	0.79	0.32	0.78	0.34	0.42
26	0.30	0.84	0.32	0.80	0.41	0.67	1.39	0.66	0.40	0.79	0.28	0.83	0.27	0.56
27	0.35	0.90	0.24	0.90	0.29	0.74	1.07	0.54	0.35	0.89	0.27	0.86	0.31	0.45
28														
29														
30	0.25	0.95	0.29	0.93	0.38	0.86	0.55	0.54	0.25	0.68	0.26	0.68	0.29	0.58
31	0.30	0.87	0.29	0.89	0.37	0.79	0.73	0.61	0.31	0.79	0.29	0.78	0.32	0.57

DATE	TREATED WATER APRIL 2009													
	HARVEY								MAGNESIA					
	PRV-3		400 HAR. TANK		STORE / CAFE		KELVIN GROVE		PRV-5		100 MAG. TANK		BRUNSWICK B.	
	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)
1	0.34	0.93	0.38	0.87	0.37	0.73	0.79	0.62	0.40	0.74	0.28	0.71	0.34	0.48
2	0.31	0.83	0.40	0.80	0.35	0.69	0.32	0.67	0.28	0.89	0.31	0.81	0.44	0.41
3	0.27	0.83	0.28	0.78	0.30	0.74	0.46	0.54	0.30	0.78	0.23	0.78	0.30	0.49
4														
5														
6	0.34	0.75	0.34	0.80	0.43	0.67	0.60	0.38	0.35	0.71	0.27	0.77	0.29	0.52
7	0.36	0.68	0.29	0.68	0.35	0.59	0.40	0.43	0.39	0.72	0.36	0.73	0.33	0.54
8	0.49	0.56	0.36	0.60	0.26	0.45	0.35	0.44	0.40	0.83	0.30	0.85	0.36	0.54
9	0.41	0.58	0.30	0.57	0.31	0.37	0.31	0.45	0.33	0.85	0.35	0.84	0.37	0.53
10														
11														
12														
13														
14	0.63	0.61	0.39	0.60	0.38	0.45	0.44	0.42	0.35	0.57	0.66	0.61	0.43	0.38
15	0.36	0.66	0.36	0.67	0.35	0.42	0.34	0.23	0.38	0.63	0.33	0.63	0.38	0.38
16	0.37	0.70	0.30	0.72	0.34	0.51	0.42	0.22	0.33	0.68	0.30	0.72	0.38	0.22
17	0.33	0.73	0.32	0.74	0.34	0.58	0.25	0.41	0.37	0.73	0.35	0.74	0.29	0.43
18														
19														
20	0.40	0.72	0.36	0.72	0.38	0.57	0.41	0.20	0.35	0.61	0.34	0.61	0.39	0.42
21	0.48	0.64	0.41	0.69	0.31	0.51	0.38	0.21	0.77	0.57	0.39	0.55	0.42	0.25
22	0.45	0.66	0.38	0.68	0.30	0.48	0.26	0.20	0.49	0.52	0.34	0.55	0.33	0.28
23	0.47	0.65	0.35	0.71	0.42	0.43	0.44	0.20	0.35	0.58	0.30	0.62	0.30	0.20
24	0.46	0.71	0.31	0.75	0.36	0.59	0.70	0.40	0.38	0.62	0.33	0.65	0.48	0.21
25														
26														
27	0.45	0.75	0.31	0.71	0.28	0.62	0.44	0.25	0.45	0.65	0.34	0.71	0.31	0.28
28	0.41	0.69	0.33	0.74	0.40	0.54	0.33	0.33	0.33	0.65	0.26	0.65	0.32	0.43
29	0.42	0.70	0.44	0.70	0.34	0.51	0.33	0.33	0.30	0.73	0.26	0.75	0.30	0.45
30	0.31	0.65	0.26	0.67	0.29	0.51	0.30	0.30	0.26	0.74	0.31	0.77	0.44	0.41

DATE	TREATED WATER JUNE 2009													
	HARVEY								MAGNESIA					
	PRV-3		400 HAR. TANK		STORE / CAFE		KELVIN GROVE		PRV-5		100 MAG. TANK		BRUNSWICK B.	
	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)
1	0.57	0.65	0.42	0.64	0.32	0.46	0.34	0.22	0.43	0.62	0.35	0.65	0.34	0.32
2	0.39	0.61	0.34	0.63	0.47	0.36	0.35	0.21	0.35	0.64	0.39	0.65	0.42	0.42
3	0.40	0.61	0.31	0.62	0.38	0.43	0.34	0.20	0.37	0.60	0.46	0.62	0.38	0.32
4	0.38	0.57	0.37	0.59	0.30	0.35	0.35	0.20	0.36	0.70	0.40	0.65	0.33	0.35
5	0.46	0.65	0.34	0.65	0.26	0.45	0.33	0.20	0.44	0.67	0.34	0.72	0.39	0.41
6														
7														
8	0.37	0.79	0.37	0.81	0.39	0.61	0.59	0.23	0.40	0.56	0.40	0.57	0.51	0.28
9	0.47	0.77	0.29	0.73	0.33	0.54	0.45	0.26	0.36	0.53	0.39	0.58	0.56	0.23
10	0.38	0.77	0.35	0.73	0.34	0.67	0.38	0.23	0.37	0.51	0.46	0.51	0.52	0.26
11	0.32	0.71	0.35	0.74	0.37	0.55	0.44	0.20	0.52	0.73	0.34	0.75	0.27	0.33
12	0.44	0.75	0.35	0.80	0.35	0.52	0.34	0.70	0.48	0.69	0.36	0.71	0.48	0.32
13														
14														
15	0.34	0.61	0.35	0.58	0.36	0.38	0.35	0.06	0.48	0.49	0.35	0.60	0.24	0.25
16	0.51	0.64	0.61	0.65	0.33	0.56	0.38	0.20	0.39	0.66	0.36	0.66	0.46	0.47
17	0.49	0.70	0.41	0.71	0.39	0.45	0.33	0.21	0.35	0.63	0.41	0.67	0.33	0.39
18	0.49	0.69	0.31	0.74	0.36	0.63	0.44	0.22	0.29	0.65	0.35	0.68	0.40	0.38
19	0.34	0.59	0.31	0.71	0.39	0.49	0.32	0.20	0.82	0.70	0.35	0.70	0.39	0.33
20														
21														
22	0.40	0.71	0.33	0.76	0.45	0.63	0.37	0.21	0.52	0.66	0.43	0.72	0.47	0.39
23	0.36	0.81	0.97	0.74	0.39	0.58	0.40	0.20	0.33	0.70	0.35	0.75	0.35	0.48
24	0.43	0.76	0.37	0.75	0.39	0.52	0.38	0.43	0.33	0.71	0.45	0.74	0.36	0.59
25	0.49	0.70	0.53	0.73	0.40	0.48	0.37	0.24	0.49	0.59	0.48	0.63	0.35	0.50
26	0.38	0.71	0.41	0.76	0.39	0.66	0.40	0.20	0.42	0.62	0.33	0.68	0.33	0.37
27														
28														
29	0.50	0.71	0.50	0.76	0.41	0.60	0.36	0.66	0.37	0.68	0.34	0.66	0.34	0.51
30	0.40	0.70	0.47	0.70	0.35	0.57	0.43	0.33	0.36	0.64	0.38	0.65	0.36	0.43

DATE	TREATED WATER JULY 2009													
	HARVEY								MAGNESIA					
	PRV-3		400 HAR. TANK		STORE / CAFE		KELVIN GROVE		PRV-5		100 MAG. TANK		BRUNSWICK B.	
	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)
1														
2	2.04	0.61	0.43	0.62	0.31	0.53	0.32	0.20	0.35	0.64	0.37	0.61	0.32	0.46
3	0.33	0.63	0.30	0.65	0.34	0.42	0.47	0.48	0.33	0.64	0.35	0.68	0.35	0.57
4														
5														
6	0.37	0.62	0.38	0.61	0.65	0.44	0.51	0.20	0.42	0.65	0.52	0.67	0.41	0.39
7	0.55	0.65	0.37	0.67	0.35	0.44	0.43	0.23	0.39	0.68	0.49	0.70	0.39	0.43
8	0.50	0.61	0.60	0.63	0.37	0.42	0.44	0.33	0.49	0.60	0.64	0.65	0.43	0.33
9	0.50	0.63	0.35	0.64	0.37	0.39	0.41	0.20	0.38	0.61	0.34	0.61	0.34	0.34
10	0.28	0.68	0.49	0.68	0.69	0.42	0.51	0.57	0.36	0.64	0.39	0.67	0.36	0.21
11														
12														
13	0.45	0.60	0.34	0.59	0.60	0.43	0.31	0.46	0.44	0.62	0.37	0.66	0.34	0.53
14	0.42	0.64	0.35	0.62	0.42	0.47	0.37	0.20	0.45	0.63	0.41	0.65	0.31	0.44
15	0.44	0.67	0.34	0.66	0.38	0.46	0.41	0.25	0.46	0.66	0.40	0.66	0.38	0.54
16	0.37	0.64	0.33	0.62	0.33	0.43	1.14	0.53	0.34	0.65	0.39	0.68	0.38	0.45
17	0.41	0.54	0.38	0.56	0.36	0.38	0.43	0.28	0.38	0.73	0.32	0.76	0.32	0.55
18														
19														
20	0.41	0.81	0.33	0.88	0.36	0.69	0.41	0.40	0.37	0.59	0.39	0.62	0.37	0.41
21	0.49	0.78	0.43	0.80	0.34	0.65	0.42	0.39	0.34	0.57	0.45	0.57	0.34	0.48
22	0.43	0.64	0.33	0.67	0.37	0.56	0.39	0.39	0.35	0.53	0.35	0.57	0.35	0.43
23	0.24	0.61	0.31	0.64	0.36	0.42	0.49	0.24	0.33	0.61	0.52	0.65	0.35	0.32
24	0.44	0.63	0.32	0.64	0.32	0.47	0.34	0.28	0.34	0.61	0.34	0.62	0.54	0.45
25														
26														
27	0.37	0.60	0.31	0.61	0.35	0.38	0.40	0.20	0.38	0.46	0.35	0.51	0.38	0.29
28														
29	0.43	0.56	0.30	0.62	0.26	0.34	0.52	0.48	0.33	0.39	0.31	0.40	0.20	0.35
30	0.33	0.57	0.53	0.61	0.33	0.43	0.28	0.23	0.32	1.01	0.37	1.00	0.26	0.46
31	0.42	0.61	0.34	0.61	0.28	0.38	0.25	0.20	0.27	0.50	0.28	0.54	0.28	0.70

DATE	TREATED WATER AUGUST 2009													
	HARVEY								MAGNESIA					
	PRV-3		400 HAR. TANK		STORE / CAFE		KELVIN GROVE		PRV-5		100 MAG. TANK		BRUNSWICK B.	
	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)
1														
2														
3														
4	0.36	0.57	0.34	0.60	0.30	0.45	0.42	0.20	0.32	0.52	0.33	0.52	0.38	0.44
5	0.43	0.57	0.35	0.59	0.38	0.42	0.68	0.20	0.47	0.66	0.46	0.71	0.41	0.28
6	0.60	0.71	0.48	0.72	0.31	0.50	0.29	0.20	0.30	0.66	0.38	0.69	0.32	0.52
7	0.28	0.73	0.51	0.77	0.35	0.62	0.34	0.33	0.37	0.67	0.35	0.69	0.37	0.43
8														
9														
10	0.55	0.51	0.52	0.50	0.32	0.46	0.31	0.28	0.73	0.66	0.68	0.68	0.40	0.33
11	0.70	0.20	0.54	0.22	0.47		0.42		0.71	0.44	0.63	0.51	0.36	0.38
12	0.47	0.50	0.48	0.54	0.49	0.22	0.41	0.32	0.41	0.61	0.50	0.63	0.52	0.20
13	0.46	0.78	0.37	0.90	0.36	0.71	0.38	0.24	0.43	0.65	0.36	0.67	0.37	0.24
14	0.49	0.60	0.51	0.64	0.46	0.48	0.43	0.35	0.54	0.67	0.49	0.70	0.48	0.21
15														
16														
17	0.55	0.76	0.41	0.84	0.37	0.59	0.49	0.25	0.33	0.59	0.45	0.62	0.32	0.21
18	0.39	0.86	0.31	0.89	0.32	0.68	0.44	0.71	0.63	0.67	0.44	0.67	0.47	0.29
19	0.39	0.87	0.43	0.86	0.31	0.77	0.41	0.45	0.33	0.68	0.36	0.72	0.34	0.26
20	0.37	0.84	0.38	0.87	0.38	0.64	0.27	0.75	0.36	0.66	0.37	0.70	0.33	0.33
21	0.39	0.79	0.31	0.87	0.35	0.65	0.40	0.51	0.42	0.69	0.73	0.74	0.67	0.42
22														
23														
24	0.44	0.88	0.44	0.91	0.42	0.75	0.48	0.35	0.38	0.71	0.33	0.73	0.36	0.34
25	0.48	0.94	0.37	0.95	0.43	0.80	0.52	0.49	0.40	0.69	0.38	0.72	0.41	0.42
26	0.45	0.86	0.50	0.89	0.49	0.77	0.45	0.52	0.42	0.66	0.39	0.67	0.49	0.50
27	0.43	0.88	0.39	0.91	0.38	0.68	0.41	0.51	0.35	0.75	0.38	0.77	0.39	0.43
28	0.44	0.89	0.45	0.89	0.36	0.76	0.39	0.55	0.42	0.77	0.31	0.73	0.37	0.62
29														
30														
31	0.39	0.89	0.35	0.93	0.36	0.79	0.42	0.52	0.45	0.67	0.41	0.74	0.36	0.54

DATE	TREATED WATER SEPTEMBER 2009													
	HARVEY								MAGNESIA					
	PRV-3		400 HAR. TANK		STORE / CAFE		KELVIN GROVE		PRV-5		100 MAG. TANK		BRUNSWICK B.	
	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)
1	0.60	0.81	0.43	0.84	0.36	0.69	0.37	0.59	0.35	0.74	0.44	0.74	0.40	0.52
2	0.42	0.76	0.38	0.80	0.45	0.62	0.35	0.69	0.41	0.74	0.32	0.74	0.31	0.54
3	0.44	0.69	0.45	0.67	0.41	0.60	0.40	0.50	0.88	0.62	0.79	0.63	0.36	0.47
4	0.69	0.64	0.47	0.71	0.47	0.37	0.42	0.28	0.47	0.65	0.45	0.73	0.36	0.49
5														
6														
7														
8	0.72	0.44	0.58	0.48	0.47	0.20	0.61	0.20	0.58	0.56	0.57	0.59	0.65	0.20
9	0.60	0.63	0.59	0.66	0.47	0.36	0.43	0.54	0.43	0.70	0.40	0.69	0.38	0.37
10	0.73	0.63	0.47	0.64	0.59	0.20	0.42	0.21	0.58	0.48	0.64	0.52	0.48	0.31
11	0.50	0.72	0.40	0.70	0.45	0.38	0.45	0.20	0.48	0.65	0.42	0.66	0.82	0.20
12														
13														
14	0.47	0.80	0.38	0.86	0.40	0.59	0.42	0.23	0.52	0.67	0.37	0.71	0.28	0.38
15	0.43	0.79	0.44	0.83	0.40	0.57	0.35	0.40	0.33	0.67	0.32	0.70	0.38	0.34
16	0.44	0.98	0.39	0.95	0.45	0.63	0.37	0.82	0.38	0.70	0.36	0.70	0.30	0.30
17	0.54	0.74	0.41	0.80	0.44	0.62	0.53	0.67	0.48	0.67	0.46	0.74	0.41	0.36
18	0.42	0.71	0.35	0.72	0.35	0.53	0.37	0.44	0.36	0.67	0.46	0.72	0.35	0.31
19														
20														
21	0.47	0.75	0.41	0.78	0.34	0.37	0.49	0.35	0.44	0.72	0.41	0.70	0.41	0.21
22	0.42	0.68	0.48	0.70	0.41	0.43	0.46	0.35	0.32	0.67	0.43	0.68	0.54	0.41
23	0.37	0.62	0.32	0.65	0.34	0.43	0.40	0.30	0.32	0.71	0.33	0.73	0.41	0.32
24	0.48	0.64	0.46	0.67	0.39	0.45	0.35	0.29	0.42	0.68	0.45	0.72	0.41	0.29
25	0.28	0.67	0.39	0.70	0.31	0.47	0.49	0.25	0.43	0.65	0.32	0.67	0.32	0.38
26														
27														
28	0.29	1.13	0.33	1.04	0.34	0.89	0.39	0.24	0.54	0.71	0.31	0.75	0.29	0.31
29			0.70	0.79	0.46	0.78	0.91	0.78	0.48	0.62	0.78	0.68	0.34	0.25
30			0.90	0.74	0.66	0.68	0.39	0.69	0.88	0.56	0.57	0.61	0.46	0.37

DATE	TREATED WATER NOVEMBER 2009													
	HARVEY								MAGNESIA					
	PRV-3		400 HAR. TANK		STORE / CAFE		KELVIN GROVE		PRV-5		100 MAG. TANK		BRUNSWICK B.	
	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)
1														
2	0.52	0.64	0.39	0.68	0.30	0.46	5.11	0.20	0.56	0.76	0.63	0.77	0.38	0.39
3	0.35	0.69	0.29	0.74	0.36	0.47	0.52	0.21	0.28	0.72	0.39	0.72	0.37	0.42
4	0.44	0.75	0.28	0.83	0.39	0.65	0.26	0.56	0.32	0.76	0.30	0.78	0.25	0.48
5	0.58	0.88	0.27	0.91	0.41	0.70	0.35	0.48	0.38	0.79	0.40	0.76	0.39	0.44
6	0.48	0.53	0.45	0.56	0.42	0.54	0.38	0.50	0.71	0.54	0.74	0.56	0.45	0.50
7														
8														
9	0.50	0.64	0.47	0.65	0.34	0.57	0.55	0.23	0.35	0.68	0.44	0.71	0.39	0.24
10	2.69	0.64	0.57	0.64	0.62	0.35	0.35	0.22	0.69	0.59	0.85	0.62	0.56	0.37
11														
12	0.50	0.63	0.36	0.65	0.34	0.45	0.34	0.49	0.47	0.71	0.51	0.74	0.44	0.20
13	0.45	0.64	0.36	0.68	0.36	0.42	0.39	0.22	0.35	0.59	0.32	0.60	0.29	0.26
14														
15														
16	0.74	0.71	0.55	0.71	0.59	0.61	0.40	0.21	0.57	0.62	0.59	0.60	0.48	0.28
17	0.94	0.58	0.78	0.56	0.50	0.42	0.51	0.31	1.34	0.52	1.14	0.55	0.40	0.50
18	1.99	0.63	0.63	0.61	0.69	0.50	0.49	0.20	0.48	0.69	0.42	0.72	0.53	0.23
19	0.78	0.60	0.48	0.64	0.46	0.37	0.50	0.25	0.47	0.75	0.47	0.77	0.57	0.28
20	0.88	0.52	0.72	0.52	0.42	0.43	0.43	0.22	0.76	0.65	0.72	0.65	0.38	0.31
21														
22														
23	0.40	0.80	0.29	0.86	0.45	0.70	0.53	0.20	0.38	0.77	0.44	0.79	0.37	0.50
24	0.36	0.67	0.27	0.74	0.35	0.53	0.58	0.28	0.47	0.70	0.34	0.71	0.33	0.46
25	0.34	0.67	0.34	0.71	0.36	0.52	0.41	0.29	0.27	0.70	0.29	0.69	0.35	0.49
26	0.60	0.23	0.59	0.31	0.42	0.20	0.67	0.28	0.51	0.34	1.01	0.63	5.52	0.36
27	0.61	0.65	0.53	0.69	0.49	0.37	0.42	0.54	0.40	0.61	1.00	0.73	3.19	0.22
28														
29														
30	0.75	0.70	0.28	0.73	0.34	0.53	0.49	0.20	0.31	0.69	0.40	0.98	2.80	0.76

DATE	TREATED WATER DECEMBER 2009													
	HARVEY								MAGNESIA					
	PRV-3		400 HAR. TANK		STORE / CAFE		KELVIN GROVE		PRV-5		100 MAG. TANK		BRUNSWICK B.	
	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)	Turbidity (NTU)	CL Res. (ppm)
1	0.40	0.67	0.39	0.74	0.32	0.49	0.29	0.26	0.32	0.61	0.69	0.95	0.98	0.65
2	0.44	0.75	0.40	0.73	0.43	0.52	0.30	0.21	0.36	0.67	0.43	0.77	0.47	0.64
3	0.42	0.74	0.43	0.73	0.41	0.51	0.32	0.22	0.36	0.69	0.39	0.72	0.45	0.61
4	0.41	0.77	0.49	0.78	0.40	0.52	0.37	0.35	0.39	0.73	0.35	0.70	0.41	0.51
5														
6														
7	0.35	0.74			0.35	0.65	0.34	0.39	0.27	0.73	0.54	0.55	0.36	0.41
8	0.40	0.73			0.40	0.57	0.51	0.47	0.29	0.67	0.31	0.67	0.34	0.32
9	0.28	0.72			0.62	0.59	0.78	0.39	0.28	0.67	0.28	0.67	0.35	0.33
10	0.52	0.75			0.59	0.62	0.34	0.47	0.22	0.71	0.25	0.81	0.40	0.40
11	0.56	0.76			0.35	0.63	0.39	0.55	0.34	0.76	0.27	0.76	0.34	0.45
12														
13														
14	0.52	0.75			0.35	0.66	0.47	0.47	0.55	0.73	0.29	0.63	0.71	0.53
15	0.49	0.76			0.39	0.68	0.44	0.55	0.29	0.77	0.27	0.61	0.31	0.46
16	0.47	0.71			0.51	0.63	0.59	0.55	0.69	0.66	0.66	0.37	0.37	0.40
17	0.62	0.63			0.44	0.48	0.40	0.57	0.63	0.59	0.32	0.71	1.56	0.40
18	0.66	0.62			0.40	0.47	0.43	0.21	0.58	0.57	0.47	0.79	0.40	0.49
19														
20														
21	1.23	0.62			0.66	0.45	0.38	0.20	0.72	0.60	1.00	0.37	0.37	0.22
22	3.72	0.70			1.79	0.43	1.02	0.23	1.09	0.65	1.47	0.58	0.44	0.24
23	0.90	0.80			0.69	0.65	0.93	0.25	0.60	0.78	0.66	0.64	0.34	0.20
24	0.63	0.85			0.60	0.73	0.60	0.45	0.49	0.90	0.47	0.65	1.05	0.20
25														
26														
27														
28														
29	0.59	1.01			0.62	0.88	0.59	0.79	0.45	0.98	0.48	1.01	0.61	0.22
30	0.41	0.98			0.36	0.89	0.41	0.86	0.29	0.96	0.32	0.88	0.38	0.20
31	0.39	0.92			0.41	0.77	0.42	0.80	0.23	0.95	0.29	0.86	0.30	0.68

Raw Water Quality Record January 2009

Date	HARVEY CREEK			MAGNESIA CREEK		
	Time	24 Hr Flow	NTU	Time	24 Hr Flow	NTU
1						
2						
3						
4						
5			0.40			0.44
6			0.28			0.86
7			0.67			0.85
8			0.61			0.80
9			0.40			0.37
10						
11						
12			0.37			0.31
13			0.30			0.31
14			0.27			0.30
15			0.24			0.48
16			0.28			0.33
17						
18						
19			0.23			0.39
20			0.31			0.43
21			0.35			0.43
22			0.41			0.46
23			0.28			0.31
24						
25						
26			0.27			0.31
27			0.39			0.23
28			0.22			0.28
29			0.43			0.40
30			0.26			0.30
31						

Raw Water Quality Record February 2009

Date	HARVEY CREEK			MAGNESIA CREEK		
	Time	24 Hr Flow	NTU	Time	24 Hr Flow	NTU
1						
2			0.42			0.23
3			0.25			0.21
4			0.75			0.33
5			0.38			0.53
6			0.24			0.30
7						
8						
9			0.19			0.32
10			0.21			0.30
11			0.20			0.30
12			0.19			0.23
13			0.26			0.25
14						
15						
16			0.25			0.25
17			0.25			0.20
18			0.43			0.25
19			0.21			0.30
20			0.23			0.22
21						
22						
23			0.39			0.57
24			0.35			0.37
25			0.25			0.31
26			0.31			0.29
27			0.22			0.28
28						
29						

Raw Water Quality Record March 2009

Date	HARVEY CREEK			MAGNESIA CREEK		
	Time	24 Hr Flow	NTU	Time	24 Hr Flow	NTU
1						
2			1.28			1.43
3			0.29			0.35
4			0.22			0.26
5			0.35			0.50
6			0.33			0.29
7						
8						
9						0.46
10						
11			0.22			0.51
12			0.27			0.37
13			0.23			0.57
14						
15						
16			0.18			0.36
17			0.26			0.32
18			0.22			0.22
19			0.34			0.46
20			0.29			0.36
21						
22						
23			0.30			0.37
24			0.24			0.35
25			0.52			0.26
26			0.26			0.31
27			0.28			0.28
28						
29						
30			0.23			0.43
31			0.26			0.27

Raw Water Quality Record April 2009

Date	HARVEY CREEK			MAGNESIA CREEK		
	Time	24 Hr Flow	NTU	Time	24 Hr Flow	NTU
1			0.34			0.25
2			0.23			0.28
3			0.29			0.33
4						
5						
6			0.30			0.34
7			0.29			0.66
8			0.22			0.36
9			0.25			0.54
10						
11						
12						
13						
14			0.37			0.26
15			0.32			0.27
16			0.28			0.27
17			0.41			0.37
18						
19						
20			0.28			0.51
21			0.27			0.37
22			0.38			0.37
23			0.33			0.38
24			0.33			0.30
25						
26						
27			0.35			0.53
28			0.31			0.28
29			0.20			0.42
30			0.28			0.48

Raw Water Quality Record May 2009

Date	HARVEY CREEK			MAGNESIA CREEK		
	Time	24 Hr Flow	NTU	Time	24 Hr Flow	NTU
1			0.21			0.48
2						
3						
4			0.31			0.38
5			0.71			0.75
6			0.42			0.39
7			0.28			0.32
8			0.37			0.29
9						
10						
11			0.39			0.34
12			0.47			0.28
13			0.29			0.28
14			0.59			0.27
15			0.33			0.37
16						
17						
18						
19			0.29			0.32
20			0.27			0.75
21			0.25			0.27
22			0.28			0.28
23						
24						
25			0.23			0.41
26			0.42			0.86
27			0.28			0.42
28			0.33			0.38
29			0.25			0.51
30						
31						

Raw Water Quality Record June 2009

Date	HARVEY CREEK			MAGNESIA CREEK		
	Time	24 Hr Flow	NTU	Time	24 Hr Flow	NTU
1			0.38			0.33
2			0.28			0.27
3			0.25			0.30
4			0.21			0.31
5			0.33			0.32
6						
7						
8			0.37			0.37
9			0.30			0.32
10			0.37			0.45
11			0.31			0.40
12			0.27			0.37
13						
14						
15			0.30			0.35
16			0.30			0.51
17			0.27			0.51
18			0.47			0.35
19			0.29			0.44
20						
21						
22			0.30			0.34
23			0.27			0.31
24			0.43			0.32
25			0.28			0.36
26			0.26			0.38
27						
28						
29			0.24			0.40
30			0.34			0.40

Raw Water Quality Record July 2009

Date	HARVEY CREEK			MAGNESIA CREEK		
	Time	24 Hr Flow	NTU	Time	24 Hr Flow	NTU
1						
2			0.22			0.31
3			0.28			0.35
4						
5						
6			0.39			0.42
7			0.89			0.37
8			0.32			0.45
9			0.31			0.35
10			0.27			0.33
11						
12						
13			0.38			0.43
14			0.25			0.39
15			0.28			0.36
16			0.22			0.38
17			0.33			0.29
18						
19						
20			0.27			0.59
21			0.22			0.32
22			0.28			1.20
23			0.28			0.35
24			0.26			0.42
25						
26						
27			0.44			0.32
28						
29			0.29			0.27
30			0.26			0.29
31			0.21			0.32

Raw Water Quality Record August 2009

Date	HARVEY CREEK			MAGNESIA CREEK		
	Time	24 Hr Flow	NTU	Time	24 Hr Flow	NTU
1						
2						
3						
4			0.30			0.35
5			0.39			0.44
6			0.30			0.33
7			0.23			0.44
8						
9						
10			1.17			0.46
11			0.44			0.50
12			0.25			0.46
13			0.28			0.39
14			0.25			0.40
15						
16						
17			0.29			0.38
18			0.34			0.35
19			0.23			0.36
20			0.23			0.36
21			0.26			0.43
22						
23						
24			0.24			0.68
25			0.25			0.41
26			0.55			0.39
27			0.31			0.39
28			0.26			0.37
29						
30						
31			1.11			0.30

Raw Water Quality Record September 2009

Date	HARVEY CREEK			MAGNESIA CREEK		
	Time	24 Hr Flow	NTU	Time	24 Hr Flow	NTU
1			0.32			0.45
2			0.31			0.37
3			0.82			0.72
4			0.43			0.34
5						
6						
7						
8			0.34			0.60
9			0.34			0.61
10			0.36			0.40
11			0.37			0.42
12						
13						
14			0.32			0.32
15			0.44			0.37
16			0.54			0.39
17			0.36			0.40
18			0.31			0.38
19						
20						
21			0.46			0.37
22			0.31			0.41
23			0.24			0.35
24			0.37			0.42
25			0.23			0.30
26						
27						
28						
29						
30			0.73			1.53

Raw Water Quality Record October 2009

Date	HARVEY CREEK			MAGNESIA CREEK		
	Time	24 Hr Flow	NTU	Time	24 Hr Flow	NTU
1						
2						
3						
4						
5						
6			0.63			0.35
7			0.30			0.35
8			0.26			0.43
9			0.29			0.36
10						
11						
12						
13			0.30			0.37
14			0.29			1.35
15			0.34			0.39
16			0.44			0.86
17						
18						
19			0.63			0.59
20			0.33			0.37
21			0.38			0.59
22			0.33			0.36
23			0.46			0.64
24						
25						
26			0.36			1.18
27			0.22			0.34
28			0.34			0.36
29			0.26			0.28
30			0.30			0.56
31						

Raw Water Quality Record November 2009

Date	HARVEY CREEK			MAGNESIA CREEK		
	Time	24 Hr Flow	NTU	Time	24 Hr Flow	NTU
1						
2			0.21			0.36
3			0.33			0.37
4			0.29			0.38
5			0.45			0.47
6			0.27			0.44
7						
8						
9			0.49			0.77
10			0.30			0.71
11						
12			0.51			0.25
13			0.27			0.44
14						
15						
16			0.76			0.80
17			0.84			0.65
18			0.43			0.72
19			0.34			0.57
20			0.38			0.78
21						
22						
23			0.31			0.48
24			0.28			0.26
25			0.39			0.49
26			0.60			0.86
27			0.35			0.31
28						
29						
30			0.34			0.43

Raw Water Quality Record December 2009

Date	HARVEY CREEK			MAGNESIA CREEK		
	Time	24 Hr Flow	NTU	Time	24 Hr Flow	NTU
1			0.31			0.37
2			0.35			0.46
3			0.36			0.39
4			0.38			0.37
5						
6						
7			0.26			0.26
8			0.27			0.41
9			0.22			0.41
10			0.26			0.32
11			0.27			0.25
12						
13						
14			0.28			0.36
15			0.22			0.24
16			1.01			0.40
17			0.30			0.37
18			0.76			0.44
19						
20						
21			5.91			8.52
22			0.52			0.54
23			0.32			0.69
24			0.40			0.57
25						
26						
27						
28						
29			0.38			0.51
30			0.33			0.31
31			0.21			0.37



The Municipality of the Village of Lions Bay

DRINKING WATER QUALITY

ANNUAL REPORT

2009

Appendix C

Water Chemistry Test Results



Environmental Division

Certificate of Analysis

VILLAGE OF LIONS BAY

ATTN: JOE CANNING

PO BOX 141, 400 CENTER ROAD

LIONS BAY BC V0N 2E0

Reported On: 27-MAR-09 03:18 PM

Lab Work Order #: **L742896**

Date Received: **17-MAR-09**

Project P.O. #:

Job Reference:

Legal Site Desc:

CofC Numbers: 08-054882

Other Information:

Comments: THM could not be analyzed for sample "KELVIN GROVE" as the 40mL P&T vials for this sample were received empty.


LINDSAY JONES
Account Manager

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN AUTHORITY OF THE LABORATORY.
ALL SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS FOLLOWING ANALYSIS. PLEASE CONTACT THE LAB IF YOU
REQUIRE ADDITIONAL SAMPLE STORAGE TIME.

ALS Canada Ltd.

Part of the **ALS Laboratory Group**
1988 Triumph Street, Vancouver, BC V5L 1K5

Phone: +1 604 253 4188 Fax: +1 604 253 6700 www.alsglobal.com

A Campbell Brothers Limited Company

ALS LABORATORY GROUP ANALYTICAL REPORT

		Sample ID	L742896-1	L742896-2	L742896-3	L742896-4	L742896-5
		Description					
		Sampled Date	16-MAR-09	16-MAR-09	16-MAR-09	16-MAR-09	16-MAR-09
		Sampled Time	12:10	11:25	10:00	10:00	11:20
		Client ID	MAGNESIA CREEK INTAKE	HARVEY CREEK INTAKE	PRV-3	PRV-3 AFTER FLUSH	400,000 GAL HARVEY TANK
Grouping	Analyte						
WATER							
Physical Tests	Hardness (as CaCO ₃) (mg/L)		13.4	5.67	5.69	5.74	5.74
	pH (pH)		6.81	6.73	6.51		6.46
	Total Suspended Solids (mg/L)		<3.0	<3.0	<3.0		<3.0
	Turbidity (NTU)		0.15	0.12	0.13		0.16
Anions and Nutrients	Alkalinity, Total (as CaCO ₃) (mg/L)		4.8	4.7	6.0		6.7
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)		0.61	0.92	0.90		0.92
Total Metals	Aluminum (Al)-Total (mg/L)		0.020	0.031	0.032	0.031	0.027
	Antimony (Sb)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)-Total (mg/L)		<0.020	<0.020	<0.020	<0.020	<0.020
	Boron (B)-Total (mg/L)		<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Calcium (Ca)-Total (mg/L)		4.43	1.88	1.89	1.91	1.91
	Chromium (Cr)-Total (mg/L)		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Copper (Cu)-Total (mg/L)		0.0010	0.0019	0.0084	0.0073	0.0172
	Iron (Fe)-Total (mg/L)		<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	0.00070
	Magnesium (Mg)-Total (mg/L)		0.56	0.24	0.24	0.24	0.23
	Manganese (Mn)-Total (mg/L)		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Mercury (Hg)-Total (mg/L)		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Potassium (K)-Total (mg/L)		<0.10	<0.10	<0.10	<0.10	<0.10
	Selenium (Se)-Total (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/L)		<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Zinc (Zn)-Total (mg/L)		<0.050	<0.050	<0.050	<0.050	0.141
Aggregate Organics	BOD (mg/L)		<5	<5	<5		<5
Trihalomethanes	Bromodichloromethane (mg/L)				<0.0010		
	Bromoform (mg/L)				<0.0010		
	Dibromochloromethane (mg/L)				<0.0010		
	Chloroform (mg/L)				0.0042		
	Total THMs (mg/L)				0.0042		

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L742896-6	L742896-7	L742896-8	L742896-9	L742896-10
		16-MAR-09 11:20 400,000 GAL HARVEY TANK AFTER FLUSH	16-MAR-09 12:00 PRV-5	16-MAR-09 12:00 PRV-5 AFTER FLUSH	16-MAR-09 12:15 100,000 GAL MAGNESIA TANK	16-MAR-09 12:15 100,000 GAL MAGNESIA TANK AFTER FLUSH
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	5.69	13.3	13.4	12.9	13.2
	pH (pH)		6.72		6.71	
	Total Suspended Solids (mg/L)		<3.0		<3.0	
	Turbidity (NTU)		0.19		0.15	
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)		6.0		6.1	
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)		0.59		0.56	
Total Metals	Aluminum (Al)-Total (mg/L)	0.031	0.019	0.018	0.013	0.018
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)	<0.00010	0.00010	0.00011	<0.00010	0.00010
	Barium (Ba)-Total (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Calcium (Ca)-Total (mg/L)	1.89	4.46	4.49	4.33	4.41
	Chromium (Cr)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Copper (Cu)-Total (mg/L)	<0.0010	0.0387	0.0066	0.836	0.0159
	Iron (Fe)-Total (mg/L)	<0.030	0.600	<0.030	0.858	<0.030
	Lead (Pb)-Total (mg/L)	<0.00050	0.00173	0.00078	0.00248	<0.00050
	Magnesium (Mg)-Total (mg/L)	0.24	0.53	0.53	0.52	0.53
	Manganese (Mn)-Total (mg/L)	<0.0020	0.0021	<0.0020	0.0024	<0.0020
	Mercury (Hg)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Potassium (K)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Selenium (Se)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Zinc (Zn)-Total (mg/L)	<0.050	<0.050	<0.050	0.140	<0.050
Aggregate Organics	BOD (mg/L)		<5		<5	
Trihalomethanes	Bromodichloromethane (mg/L)					
	Bromoform (mg/L)					
	Dibromochloromethane (mg/L)					
	Chloroform (mg/L)					
	Total THMs (mg/L)					

ALS LABORATORY GROUP ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L742896-11 16-MAR-09 13:10 KELVIN GROVE	L742896-12 16-MAR-09 13:10 KELVIN GROVE AFTER FLUSH	L742896-13 16-MAR-09 10:35 BRUNSWICK BEACH	L742896-14 16-MAR-09 10:35 BRUNSWICK BEACH AFTER FLUSH	L742896-15 17-MAR-09 07:35 GENERAL STORE/CAFE
Grouping	Analyte						
WATER							
Physical Tests	Hardness (as CaCO ₃) (mg/L)	6.64	6.62	14.0	13.9	6.70	
	pH (pH)	6.68		6.92		6.54	
	Total Suspended Solids (mg/L)	<3.0		<3.0		<3.0	
	Turbidity (NTU)	0.24		0.32		0.20	
Anions and Nutrients	Alkalinity, Total (as CaCO ₃) (mg/L)	6.5		5.9		5.2	
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)	0.97		0.65		1.37	
Total Metals	Aluminum (Al)-Total (mg/L)	0.010	0.031	0.020	0.020	0.015	
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Arsenic (As)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
	Barium (Ba)-Total (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020	
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	
	Cadmium (Cd)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	
	Calcium (Ca)-Total (mg/L)	2.14	2.29	4.78	4.76	2.28	
	Chromium (Cr)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	
	Copper (Cu)-Total (mg/L)	1.68	0.0280	0.0127	0.0124	0.850	
	Iron (Fe)-Total (mg/L)	<0.030	0.036	0.056	0.055	0.033	
	Lead (Pb)-Total (mg/L)	0.138	0.00291	<0.00050	<0.00050	0.00611	
	Magnesium (Mg)-Total (mg/L)	0.31	0.22	0.49	0.49	0.24	
	Manganese (Mn)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	
	Mercury (Hg)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	
	Potassium (K)-Total (mg/L)	<0.10	<0.10	0.11	0.10	<0.10	
	Selenium (Se)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	Sodium (Na)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0	
	Uranium (U)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
	Zinc (Zn)-Total (mg/L)	0.312	<0.050	<0.050	<0.050	0.056	
	Aggregate Organics	BOD (mg/L)	<5		<5		<5
Trihalomethanes	Bromodichloromethane (mg/L)			<0.0010		<0.0010	
	Bromoform (mg/L)			<0.0010		<0.0010	
	Dibromochloromethane (mg/L)			<0.0010		<0.0010	
	Chloroform (mg/L)			0.0142		0.0067	
	Total THMs (mg/L)			0.0142		0.0067	

ALS LABORATORY GROUP ANALYTICAL REPORT

		Sample ID Description	L742896-16	L742896-17	L742896-18	L742896-19	L742896-20
		Sampled Date	17-MAR-09	17-MAR-09	17-MAR-09	17-MAR-09	17-MAR-09
		Sampled Time	07:35	08:00	08:00	07:50	07:50
		Client ID	GENERAL STORE/CAFE AFTER FLUSH	ELEMENTARY SCHOOL	ELEMENTARY SCHOOL AFTER FLUSH	COMMUNITY CENTRE	COMMUNITY CENTRE AFTER FLUSH
Grouping	Analyte						
WATER							
Physical Tests	Hardness (as CaCO ₃) (mg/L)		5.96	9.59	14.2	7.19	6.11
	pH (pH)			6.99		6.44	
	Total Suspended Solids (mg/L)			<3.0		<3.0	
	Turbidity (NTU)			1.24		0.20	
Anions and Nutrients	Alkalinity, Total (as CaCO ₃) (mg/L)			5.7		5.2	
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)			0.65		1.00	
Total Metals	Aluminum (Al)-Total (mg/L)		0.030	0.034	0.025	<0.010	0.029
	Antimony (Sb)-Total (mg/L)		<0.00050	0.00150	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)		<0.00010	0.00140	0.00017	<0.00010	<0.00010
	Barium (Ba)-Total (mg/L)		<0.020	<0.020	<0.020	<0.020	<0.020
	Boron (B)-Total (mg/L)		<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Calcium (Ca)-Total (mg/L)		2.00	3.28	4.70	2.20	2.07
	Chromium (Cr)-Total (mg/L)		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Copper (Cu)-Total (mg/L)		0.0363	0.156	0.268	1.78	0.0652
	Iron (Fe)-Total (mg/L)		0.053	0.047	0.452	<0.030	0.052
	Lead (Pb)-Total (mg/L)		<0.00050	1.14	0.00829	0.0180	0.00078
	Magnesium (Mg)-Total (mg/L)		0.24	0.34	0.61	0.41	0.23
	Manganese (Mn)-Total (mg/L)		<0.0020	<0.0020	0.0033	<0.0020	<0.0020
	Mercury (Hg)-Total (mg/L)		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Potassium (K)-Total (mg/L)		<0.10	<0.10	<0.10	<0.10	<0.10
	Selenium (Se)-Total (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/L)		<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Zinc (Zn)-Total (mg/L)		<0.050	0.247	<0.050	0.069	<0.050
Aggregate Organics	BOD (mg/L)			<5		<5	
Trihalomethanes	Bromodichloromethane (mg/L)			<0.0010		<0.0010	
	Bromoform (mg/L)			<0.0010		<0.0010	
	Dibromochloromethane (mg/L)			<0.0010		<0.0010	
	Chloroform (mg/L)			0.0227		0.0083	
	Total THMs (mg/L)			0.0227		0.0083	

Reference Information

Additional Comments for Sample Listed:

Sample Number	Matrix	Report Remarks	Sample Comments
Methods Listed (if applicable):			
ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
ALK-COL-VA	Water	Alkalinity by Colourimetric (Automated)	APHA 310.2
This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.			
BOD5-VA	Water	Biochemical Oxygen Demand- 5 day	APHA 5210 B- "BIOCHEMICAL OXYGEN DEMAND"
This analysis is carried out using procedures adapted from APHA Method 5210 B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.			
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310 "TOTAL ORGANIC CARBON (TOC)"
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.			
HG-TOT-DW-CVAFS-VA	Water	Total Mercury in Water by CVAFS	EPA 245.7
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 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).			
MET-TOT-DW-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 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 preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
MET-TOT-DW-MS-VA	Water	Total Metals in Water by ICPMS	EPA SW-846 3005A/6020A
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 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 hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).			
PH-MAN-VA	Water	pH by Manual Meter	APHA 4500-H "pH Value"
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.			
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"
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			
THM-PT-MS-VA	Water	VOC (THM) by Purge and Trap with GCMS	EPA SW-846, METHOD 8260
This procedure is suitable for the analysis of trihalomethanes (chloroform, bromodichloromethane, dibromochloromethane, and bromoform) in chlorinated waters that have been treated to prevent the formation of trihalomethanes after sample collection. The analysis involves the purge and trap extraction of the sample prior to analysis by capillary column gas chromatography with mass spectrometric detection (GC/MS). The trihalomethanes analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 8260, published by the United States Environmental Protection Agency (EPA).			

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
THM-SUM-CALC-VA	Water	Total Trihalomethane-THM	CALCULATION
TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.			
TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 "Turbidity"
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies. The last two letters of the above ALS Test Code column indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
VA	ALS LABORATORY GROUP - VANCOUVER, BC, CANADA		

GLOSSARY OF REPORT TERMS

Surr - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in environmental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds.

The reported surrogate recovery value provides a measure of method efficiency.

mg/kg (units) - unit of concentration based on mass, parts per million

mg/L (units) - unit of concentration based on volume, parts per million

N/A - Result not available. Refer to qualifier code and definition for explanation

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.

LS Laboratory Group has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, ALS Laboratory Group assumes no liability for the use or interpretation of the results.



Environmental Division

Certificate of Analysis

VILLAGE OF LIONS BAY
ATTN: JOE CANNING
PO BOX 141, 400 CENTER ROAD
LIONS BAY BC V0N 2E0

Report Date: 02-JUL-09 17:38 (MT)
Version: FINAL

Lab Work Order #: **L781607**

Date Received: **22-JUN-09**

Project P.O. #:
Job Reference:
Legal Site Desc:
CofC Numbers: 09-026491

Other Information:

Comments:

Selam Worku
Account Manager

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN AUTHORITY OF THE LABORATORY.
ALL SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS FOLLOWING ANALYSIS. PLEASE CONTACT THE LAB IF YOU
REQUIRE ADDITIONAL SAMPLE STORAGE TIME.

ALS Canada Ltd.

Part of the **ALS Laboratory Group**
1988 Triumph Street, Vancouver, BC V5L 1K5

Phone: +1 604 253 4188 Fax: +1 604 253 6700 www.alsglobal.com

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ALS LABORATORY GROUP ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L781607-1	L781607-2	L781607-3	L781607-4	L781607-5
		MAGNESIA CREEK INTAKE	HARVEY CREEK INTAKE	PRV-3	400,000 GAL HARVEY TANK	PRV-5
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	8.8	4.2	3.9	3.5	8.2
	pH (pH)	7.40	6.69	6.45	6.40	6.61
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Turbidity (NTU)	0.45	0.48	0.20	0.17	0.57
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	3.7	3.7	3.1	3.9	4.2
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)	0.85	0.85	0.88	0.90	1.09
Total Metals	Aluminum (Al)-Total (mg/L)			0.030	0.034	0.031
	Antimony (Sb)-Total (mg/L)			<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)			<0.00010	<0.00010	<0.00010
	Barium (Ba)-Total (mg/L)			<0.020	<0.020	<0.020
	Boron (B)-Total (mg/L)			<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)			<0.00020	<0.00020	<0.00020
	Calcium (Ca)-Total (mg/L)	2.96	1.43	1.32	1.19	2.78
	Chromium (Cr)-Total (mg/L)			<0.0020	<0.0020	<0.0020
	Copper (Cu)-Total (mg/L)			0.0127	0.0241	0.0181
	Iron (Fe)-Total (mg/L)			<0.030	<0.030	0.059
	Lead (Pb)-Total (mg/L)			<0.00050	0.00127	0.00095
	Magnesium (Mg)-Total (mg/L)	0.35	0.16	0.15	0.13	0.30
	Manganese (Mn)-Total (mg/L)			<0.0020	<0.0020	<0.0020
	Mercury (Hg)-Total (mg/L)			<0.00020	<0.00020	<0.00020
	Potassium (K)-Total (mg/L)			<0.10	<0.10	<0.10
	Selenium (Se)-Total (mg/L)			<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/L)			<2.0	<2.0	<2.0
Uranium (U)-Total (mg/L)			<0.00010	<0.00010	<0.00010	
Zinc (Zn)-Total (mg/L)			<0.050	0.102	<0.050	
Aggregate Organics	BOD (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
Trihalomethanes	Bromodichloromethane (mg/L)			<0.0010	<0.0010	<0.0010
	Bromoform (mg/L)			<0.0010	<0.0010	<0.0010
	Dibromochloromethane (mg/L)			<0.0010	<0.0010	<0.0010
	Chloroform (mg/L)			0.0062	0.0055	0.0034
	Total THMs (mg/L)			0.0062	0.0055	0.0034

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L781607-6	L781607-7	L781607-8	L781607-9	L781607-10
		100,000 GAL MAGNESIA TANK	KELVIN GROVE	BRUNSWICK BEACH	GENERAL STORE/CAFE	ELEMENTARY SCHOOL
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	7.1	7.0	8.3	3.9	6.9
	pH (pH)	6.54	6.92	6.67	6.48	6.41
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Turbidity (NTU)	0.22	0.32	0.21	0.16	0.50
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	4.4	5.0	3.4	3.1	3.3
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)	0.88	0.84	0.82	0.89	0.80
Total Metals	Aluminum (Al)-Total (mg/L)	0.013	0.061	0.025	0.022	<0.010
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)-Total (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Calcium (Ca)-Total (mg/L)	2.40	2.62	2.87	1.34	2.37
	Chromium (Cr)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Copper (Cu)-Total (mg/L)	1.08	0.207	0.0226	0.252	1.55
	Iron (Fe)-Total (mg/L)	0.367	0.097	<0.030	<0.030	<0.030
	Lead (Pb)-Total (mg/L)	0.00301	0.0283	<0.00050	0.0107	0.0341
	Magnesium (Mg)-Total (mg/L)	0.26	0.11	0.28	0.14	0.25
	Manganese (Mn)-Total (mg/L)	0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Mercury (Hg)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Potassium (K)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Selenium (Se)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Zinc (Zn)-Total (mg/L)	0.159	<0.050	<0.050	0.122	0.157	
Aggregate Organics	BOD (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
Trihalomethanes	Bromodichloromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Bromoform (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Dibromochloromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Chloroform (mg/L)	0.0030	0.0447	0.0160	0.0095	0.0292
	Total THMs (mg/L)	0.0030	0.0447	0.0160	0.0095	0.0292

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L781607-11	L781607-12	L781607-13	L781607-14	L781607-15
		COMMUNITY CENTRE	MAGNESIA CREEK INTAKE AFTER FLUSH	HARVEY CREEK INTAKE AFTER FLUSH	PRV-3 AFTER FLUSH	400,000 GAL HARVEY TANK AFTER FLUSH
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	4.4	8.0	3.9	3.9	3.9
	pH (pH)	6.40				
	Total Suspended Solids (mg/L)	<3.0				
	Turbidity (NTU)	0.21				
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	2.4				
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)	0.88				
Total Metals	Aluminum (Al)-Total (mg/L)	<0.010	0.029	0.031	0.029	0.030
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)-Total (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Calcium (Ca)-Total (mg/L)	1.52	2.72	1.30	1.32	1.33
	Chromium (Cr)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Copper (Cu)-Total (mg/L)	1.47	0.0012	0.0016	0.0090	<0.0010
	Iron (Fe)-Total (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)-Total (mg/L)	0.0163	<0.00050	<0.00050	<0.00050	<0.00050
	Magnesium (Mg)-Total (mg/L)	0.13	0.29	0.15	0.15	0.15
	Manganese (Mn)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Mercury (Hg)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Potassium (K)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Selenium (Se)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Zinc (Zn)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	
Aggregate Organics	BOD (mg/L)	<5.0				
Trihalomethanes	Bromodichloromethane (mg/L)	<0.0010				
	Bromoform (mg/L)	<0.0010				
	Dibromochloromethane (mg/L)	<0.0010				
	Chloroform (mg/L)	0.0092				
	Total THMs (mg/L)	0.0092				

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L781607-16	L781607-17	L781607-18	L781607-19	L781607-20
Grouping	Analyte	PRV-5 AFTER FLUSH	100,000 GAL MAGNESIA TANK AFTER FLUSH	KELVIN GROVE AFTER FLUSH	BRUNSWICK BEACH AFTER FLUSH	GENERAL STORE/CAFE AFTER FLUSH
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	7.8	7.8	7.2	8.1	4.1
	pH (pH)					
	Total Suspended Solids (mg/L)					
	Turbidity (NTU)					
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)					
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)					
Total Metals	Aluminum (Al)-Total (mg/L)	0.043	0.027	0.074	0.025	0.029
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)-Total (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Calcium (Ca)-Total (mg/L)	2.68	2.66	2.70	2.79	1.42
	Chromium (Cr)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Copper (Cu)-Total (mg/L)	0.0086	0.0210	0.0075	0.0210	0.0436
	Iron (Fe)-Total (mg/L)	<0.030	<0.030	0.054	<0.030	<0.030
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050	0.00093	<0.00050	<0.00050
	Magnesium (Mg)-Total (mg/L)	0.28	0.29	0.11	0.26	0.14
	Manganese (Mn)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Mercury (Hg)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Potassium (K)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Selenium (Se)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Zinc (Zn)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Aggregate Organics	BOD (mg/L)					
Trihalomethanes	Bromodichloromethane (mg/L)					
	Bromoform (mg/L)					
	Dibromochloromethane (mg/L)					
	Chloroform (mg/L)					
	Total THMs (mg/L)					

ALS LABORATORY GROUP ANALYTICAL REPORT

		Sample ID	L781607-21	L781607-22		
		Description				
		Sampled Date	22-JUN-09	22-JUN-09		
		Sampled Time				
		Client ID	ELEMENTARY SCHOOL AFTER FLUSH	COMMUNITY CENTRE AFTER FLUSH		
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	7.1	4.0			
	pH (pH)					
	Total Suspended Solids (mg/L)					
	Turbidity (NTU)					
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)					
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)					
Total Metals	Aluminum (Al)-Total (mg/L)	0.023	0.028			
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050			
	Arsenic (As)-Total (mg/L)	<0.00010	<0.00010			
	Barium (Ba)-Total (mg/L)	<0.020	<0.020			
	Boron (B)-Total (mg/L)	<0.10	<0.10			
	Cadmium (Cd)-Total (mg/L)	<0.00020	<0.00020			
	Calcium (Ca)-Total (mg/L)	2.38	1.38			
	Chromium (Cr)-Total (mg/L)	<0.0020	<0.0020			
	Copper (Cu)-Total (mg/L)	0.784	0.0667			
	Iron (Fe)-Total (mg/L)	0.040	<0.030			
	Lead (Pb)-Total (mg/L)	0.00358	0.00110			
	Magnesium (Mg)-Total (mg/L)	0.28	0.14			
	Manganese (Mn)-Total (mg/L)	<0.0020	<0.0020			
	Mercury (Hg)-Total (mg/L)	<0.00020	<0.00020			
	Potassium (K)-Total (mg/L)	<0.10	<0.10			
	Selenium (Se)-Total (mg/L)	<0.0010	<0.0010			
	Sodium (Na)-Total (mg/L)	<2.0	<2.0			
	Uranium (U)-Total (mg/L)	<0.00010	<0.00010			
Zinc (Zn)-Total (mg/L)	<0.050	<0.050				
Aggregate Organics	BOD (mg/L)					
Trihalomethanes	Bromodichloromethane (mg/L)					
	Bromoform (mg/L)					
	Dibromochloromethane (mg/L)					
	Chloroform (mg/L)					
	Total THMs (mg/L)					

Reference Information

Additional Comments for Sample Listed:

Sample Number	Matrix	Report Remarks	Sample Comment
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Qualifiers for Sample Submission Listed:

Qualifier	Description
ISCR:ST	Improper Sample Container Received: Subsamples Taken - Samples #1-2 - 125mL P Total
SPL	Sample was Preserved at the laboratory - Samples #1-2 - Total metals

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
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ALK-COL-VA Water Alkalinity by Colourimetric (Automated) APHA 310.2

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

BOD5-VA Water Biochemical Oxygen Demand- 5 day APHA 5210 B- "BIOCHEMICAL OXYGEN DEMAND"

This analysis is carried out using procedures adapted from APHA Method 5210 B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.

BOD5-VA Water Biochemical Oxygen Demand- 5 day APHA 5210 B- BIOCHEMICAL OXYGEN DEMAND

This analysis is carried out using procedures adapted from APHA Method 5210 B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.

ARBONS-TOC-VA Water Total organic carbon by combustion APHA 5310 "TOTAL ORGANIC CARBON (TOC)"

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CARBONS-TOC-VA Water Total organic carbon by combustion APHA 5310 TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.

HG-TOT-DW-CVAFS-VA Water Total Mercury in Water by CVAFS EPA 245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 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).

MET-TOT-DW-ICP-VA Water Total Metals in Water by ICP OES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 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 preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-TOT-DW-MS-VA Water Total Metals in Water by ICPMS EPA SW-846 3005A/6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 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 hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B
<p>This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 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 hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).</p>			
PH-MAN-VA	Water	pH by Manual Meter	APHA 4500-H "pH Value"
<p>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.</p>			
PH-MAN-VA	Water	pH by Manual Meter	APHA 4500-H pH Value
<p>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.</p>			
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"
<p>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</p>			
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value
<p>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</p>			
THM-PT-MS-VA	Water	VOC (THM) by Purge and Trap with GCMS	EPA SW-846, METHOD 8260
<p>This procedure is suitable for the analysis of trihalomethanes (chloroform, bromodichloromethane, dibromochloromethane, and bromoform) in chlorinated waters that have been treated to prevent the formation of trihalomethanes after sample collection. The analysis involves the purge and trap extraction of the sample prior to analysis by capillary column gas chromatography with mass spectrometric detection (GC/MS). The trihalomethanes analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 8260, published by the United States Environmental Protection Agency (EPA).</p>			
THM-SUM-CALC-VA	Water	Total Trihalomethane-THM	CALCULATION
TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC
<p>This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.</p>			
TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 "Turbidity"
<p>This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.</p>			
TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity
<p>This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.</p>			
<p>** Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies. The last two letters of the above ALS Test Code column indicate the laboratory that performed analytical analysis for that test. Refer to the list below:</p>			
Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
VA	ALS LABORATORY GROUP - VANCOUVER, BC, CANADA		

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
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GLOSSARY OF REPORT TERMS

Surr - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in environmental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds.

The reported surrogate recovery value provides a measure of method efficiency.

mg/kg (units) - unit of concentration based on mass, parts per million

mg/L (units) - unit of concentration based on volume, parts per million

N/A - Result not available. Refer to qualifier code and definition for explanation

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.

ALS Laboratory Group has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, ALS Laboratory Group assumes no liability for the use or interpretation of the results.



Environmental Division

Certificate of Analysis

VILLAGE OF LIONS BAY
ATTN: JOE CANNING
PO BOX 141, 400 CENTER ROAD
LIONS BAY BC V0N 2E0

Report Date: 25-SEP-09 17:15 (MT)
Version: FINAL

Lab Work Order #: L817858

Date Received: 14-SEP-09

Project P.O. #:
Job Reference:
Legal Site Desc:
CofC Numbers: 09-026447

Other Information:

Comments:

Selam Worku
Account Manager

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN AUTHORITY OF THE LABORATORY.
ALL SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS FOLLOWING ANALYSIS. PLEASE CONTACT THE LAB IF YOU
REQUIRE ADDITIONAL SAMPLE STORAGE TIME.

ALS LABORATORY GROUP ANALYTICAL REPORT

		Sample ID Description	L817858-1	L817858-2	L817858-3	L817858-4	L817858-5
		Sampled Date	14-SEP-09	14-SEP-09	14-SEP-09	14-SEP-09	14-SEP-09
		Sampled Time	11:20	10:15	09:20	09:20	10:10
		Client ID	MAGNESIA CREEK INTAKE 'AFTER FLUSH'	HARVEY CREEK INTAKE 'AFTER FLUSH'	PRV-3 'FIRST DRAW'	PRV-3 'AFTER FLUSH'	400,000 GAL HARVEY TANK 'FIRST DRAW'
Grouping	Analyte						
WATER							
Physical Tests	Hardness (as CaCO3) (mg/L)		12.2	5.6	5.5	5.5	5.5
	pH (pH)		7.46	7.19	6.60		6.64
	Total Suspended Solids (mg/L)		<3.0	<3.0	<3.0		<3.0
	Turbidity (NTU)		0.28	0.16	0.18		0.31
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)		4.2	4.9	4.9		5.4
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)		0.87	1.06	1.07		1.15
Total Metals	Aluminum (Al)-Total (mg/L)		0.025	0.027	0.031	0.031	0.031
	Antimony (Sb)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)		0.00011	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)-Total (mg/L)		<0.020	<0.020	<0.020	<0.020	<0.020
	Boron (B)-Total (mg/L)		<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Calcium (Ca)-Total (mg/L)		4.16	1.88	1.86	1.85	1.83
	Chromium (Cr)-Total (mg/L)		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Copper (Cu)-Total (mg/L)		0.0013	0.0014	0.0207	<0.0010	0.0015
	Iron (Fe)-Total (mg/L)		<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Magnesium (Mg)-Total (mg/L)		0.44	0.22	0.21	0.22	0.22
	Manganese (Mn)-Total (mg/L)		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Mercury (Hg)-Total (mg/L)		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Potassium (K)-Total (mg/L)		<0.10	0.11	0.11	0.11	0.12
	Selenium (Se)-Total (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/L)		<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Zinc (Zn)-Total (mg/L)		<0.050	<0.050	<0.050	<0.050	<0.050
	Aggregate Organics	BOD (mg/L)		<5.0	<5.0	<5.0	
Trihalomethanes	Bromodichloromethane (mg/L)				<0.0010		<0.0010
	Bromoform (mg/L)				<0.0010		<0.0010
	Dibromochloromethane (mg/L)				<0.0010		<0.0010
	Chloroform (mg/L)				0.0144		0.0125
	Total THMs (mg/L)				0.0144		0.0125

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L817858-6	L817858-7	L817858-8	L817858-9	L817858-10
		14-SEP-09 10:10 400,000 GAL HARVEY TANK 'AFTER FLUSH'	14-SEP-09 10:50 PRV-5 'FIRST DRAW'	14-SEP-09 10:50 PRV-5 'AFTER FLUSH'	14-SEP-09 11:15 100,000 GAL MAGNESIA TANK 'FIRST DRAW'	14-SEP-09 11:15 100,000 GAL MAGNESIA TANK 'AFTER FLUSH'
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	5.4	11.8	12.2	9.7	12.1
	pH (pH)		6.82		6.76	
	Total Suspended Solids (mg/L)		<3.0		<3.0	
	Turbidity (NTU)		0.36		0.30	
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)		4.5		4.9	
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)		0.91		0.86	
Total Metals	Aluminum (Al)-Total (mg/L)	0.030	0.022	0.026	<0.010	0.022
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)	0.00010	0.00011	0.00012	<0.00010	0.00011
	Barium (Ba)-Total (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Calcium (Ca)-Total (mg/L)	1.83	4.05	4.16	3.32	4.14
	Chromium (Cr)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Copper (Cu)-Total (mg/L)	0.0103	0.0194	0.0083	1.62	0.0260
	Iron (Fe)-Total (mg/L)	<0.030	0.110	<0.030	0.243	<0.030
	Lead (Pb)-Total (mg/L)	<0.00050	0.00087	<0.00050	0.00181	<0.00050
	Magnesium (Mg)-Total (mg/L)	0.21	0.42	0.43	0.36	0.43
	Manganese (Mn)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Mercury (Hg)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Potassium (K)-Total (mg/L)	0.11	<0.10	<0.10	<0.10	<0.10
	Selenium (Se)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Zinc (Zn)-Total (mg/L)	<0.050	<0.050	<0.050	0.165	<0.050
Aggregate Organics	BOD (mg/L)		<5.0		<5.0	
Trihalomethanes	Bromodichloromethane (mg/L)		<0.0010		<0.0010	
	Bromoform (mg/L)		<0.0010		<0.0010	
	Dibromochloromethane (mg/L)		<0.0010		<0.0010	
	Chloroform (mg/L)		0.0048		0.0048	
	Total THMs (mg/L)		0.0048		0.0048	

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L817858-11	L817858-12	L817858-13	L817858-14	L817858-15
		14-SEP-09 11:50 KELVIN GROVE 'FIRST DRAW'	14-SEP-09 11:50 KELVIN GROVE 'AFTER FLUSH'	14-SEP-09 09:40 BRUNSWICK BEACH 'FIRST DRAW'	14-SEP-09 09:40 BRUNSWICK BEACH 'AFTER FLUSH'	14-SEP-09 07:45 GENERAL STORE/CAF 'FIRST DRAW'
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	8.0	8.1	9.7	12.0	5.7
	pH (pH)	6.93		6.41		6.80
	Total Suspended Solids (mg/L)	<3.0		<3.0		<3.0
	Turbidity (NTU)	0.20		0.16		0.17
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	4.7		3.9		3.1
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)	1.27		0.99		1.32
Total Metals	Aluminum (Al)-Total (mg/L)	0.044	0.044	<0.010	0.022	0.035
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)	0.00011	<0.00010	<0.00010	0.00012	<0.00010
	Barium (Ba)-Total (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Calcium (Ca)-Total (mg/L)	2.95	2.97	3.37	4.16	1.96
	Chromium (Cr)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Copper (Cu)-Total (mg/L)	0.0130	0.0129	0.983	0.0157	0.136
	Iron (Fe)-Total (mg/L)	0.068	0.070	<0.030	<0.030	0.057
	Lead (Pb)-Total (mg/L)	0.00268	0.00273	0.0127	<0.00050	0.00060
	Magnesium (Mg)-Total (mg/L)	0.16	0.16	0.32	0.40	0.20
	Manganese (Mn)-Total (mg/L)	<0.0020	<0.0020	0.0021	<0.0020	<0.0020
	Mercury (Hg)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Potassium (K)-Total (mg/L)	0.11	0.11	<0.10	<0.10	0.12
	Selenium (Se)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Zinc (Zn)-Total (mg/L)	<0.050	<0.050	0.142	<0.050	<0.050
Aggregate Organics	BOD (mg/L)	<5.0		<5.0		<5.0
Trihalomethanes	Bromodichloromethane (mg/L)			<0.0010		<0.0010
	Bromoform (mg/L)			<0.0010		<0.0010
	Dibromochloromethane (mg/L)			<0.0010		<0.0010
	Chloroform (mg/L)			0.0197		0.0190
	Total THMs (mg/L)			0.0197		0.0190

ALS LABORATORY GROUP ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L817858-16	L817858-17	L817858-18	L817858-19	L817858-20
Grouping	Analyte		14-SEP-09 07:45 GENERAL STORE/CAF 'AFTER FLUSH'	14-SEP-09 08:25 ELEMENTARY SCHOOL 'FIRST FLUSH'	14-SEP-09 08:25 ELEMENTARY SCHOOL 'AFTER FLUSH'	14-SEP-09 08:05 COMMUNITY CENTRE 'FIRST DRAW'	14-SEP-09 08:05 COMMUNITY CENTRE 'AFTER FLUSH'
WATER							
Physical Tests	Hardness (as CaCO3) (mg/L)		5.6	11.9	9.9	6.2	5.9
	pH (pH)			6.23		6.63	
	Total Suspended Solids (mg/L)			<3.0		<3.0	
	Turbidity (NTU)			0.40		0.29	
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)			4.1		3.1	
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)			1.55		1.19	
Total Metals	Aluminum (Al)-Total (mg/L)		0.030	<0.010	0.017	<0.010	0.030
	Antimony (Sb)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)-Total (mg/L)		<0.020	<0.020	<0.020	<0.020	<0.020
	Boron (B)-Total (mg/L)		<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Calcium (Ca)-Total (mg/L)		1.94	3.74	3.33	2.12	2.07
	Chromium (Cr)-Total (mg/L)		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Copper (Cu)-Total (mg/L)		0.0389	1.18	0.974	1.41	0.115
	Iron (Fe)-Total (mg/L)		0.045	<0.030	0.031	<0.030	0.051
	Lead (Pb)-Total (mg/L)		<0.00050	0.0398	0.00414	0.0178	0.00129
	Magnesium (Mg)-Total (mg/L)		0.20	0.62	0.38	0.22	0.19
	Manganese (Mn)-Total (mg/L)		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Mercury (Hg)-Total (mg/L)		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Potassium (K)-Total (mg/L)		0.11	<0.10	<0.10	0.16	0.11
	Selenium (Se)-Total (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/L)		<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Zinc (Zn)-Total (mg/L)		<0.050	0.669	<0.050	<0.050	<0.050
Aggregate Organics	BOD (mg/L)			<5.0		<5.0	
Trihalomethanes	Bromodichloromethane (mg/L)			<0.0010		<0.0010	
	Bromoform (mg/L)			<0.0010		<0.0010	
	Dibromochloromethane (mg/L)			<0.0010		<0.0010	
	Chloroform (mg/L)			0.0423		0.0277	
	Total THMs (mg/L)			0.0423		0.0277	

Reference Information

Additional Comments for Sample Listed:

Sample Num	Matrix	Report Remarks	Sample Comments
Methods Listed (if applicable):			
ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
ALK-COL-VA	Water	Alkalinity by Colourimetric (Automated)	APHA 310.2
This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.			
BOD5-VA	Water	Biochemical Oxygen Demand- 5 day	APHA 5210 B- "BIOCHEMICAL OXYGEN DEMAND"
This analysis is carried out using procedures adapted from APHA Method 5210 B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.			
BOD5-VA	Water	Biochemical Oxygen Demand- 5 day	APHA 5210 B- BIOCHEMICAL OXYGEN DEMAND
This analysis is carried out using procedures adapted from APHA Method 5210 B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.			
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310 "TOTAL ORGANIC CARBON (TOC)"
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.			
HG-TOT-DW-CVAFS-VA	Water	Total Mercury in Water by CVAFS	EPA 245.7
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 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).			
MET-TOT-DW-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 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 preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
MET-TOT-DW-MS-VA	Water	Total Metals in Water by ICPMS	EPA SW-846 3005A/6020A
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 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 hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).			
PH-MAN-VA	Water	pH by Manual Meter	APHA 4500-H "pH Value"
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.			
		pH by Manual Meter	APHA 4500-H pH Value

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
PH-MAN-VA	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.			
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"
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			
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value
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			
THM-PT-MS-VA	Water	VOC (THM) by Purge and Trap with GCMS	EPA SW-846, METHOD 8260
This procedure is suitable for the analysis of trihalomethanes (chloroform, bromodichloromethane, dibromochloromethane, and bromoform) in chlorinated waters that have been treated to prevent the formation of trihalomethanes after sample collection. The analysis involves the purge and trap extraction of the sample prior to analysis by capillary column gas chromatography with mass spectrometric detection (GC/MS). The trihalomethanes analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 8260, published by the United States Environmental Protection Agency (EPA).			
THM-SUM-CALC-VA	Water	Total Trihalomethane-THM	CALCULATION
TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.			
TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 "Turbidity"
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			
TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			
** Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies. The last two letters of the above ALS Test Code column indicate the laboratory that performed analytical analysis for that test. Refer to the list below:			
Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
VA	ALS LABORATORY GROUP - VANCOUVER, BC, CANADA		

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
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GLOSSARY OF REPORT TERMS

Surr - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in environmental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds.

The reported surrogate recovery value provides a measure of method efficiency.

mg/kg (units) - unit of concentration based on mass, parts per million

mg/L (units) - unit of concentration based on volume, parts per million

N/A - Result not available. Refer to qualifier code and definition for explanation

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.

ALS Laboratory Group has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, ALS Laboratory Group assumes no liability for the use or interpretation of the results.



Environmental Division

Certificate of Analysis

VILLAGE OF LIONS BAY
ATTN: JOE CANNING
PO BOX 141, 400 CENTER ROAD
LIONS BAY BC V0N 2E0

Report Date: 04-JAN-10 16:48 (MT)
Version: FINAL

Lab Work Order #: L849091

Date Received: 16-DEC-09

Project P.O. #: NOT SUBMITTED
Job Reference:
Legal Site Desc:
CofC Numbers: 09-035030

Other Information:

Comments:

Selam Worku
Account Manager

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN AUTHORITY OF THE LABORATORY.
ALL SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS FOLLOWING ANALYSIS. PLEASE CONTACT THE LAB IF YOU
REQUIRE ADDITIONAL SAMPLE STORAGE TIME.

ALS LABORATORY GROUP ANALYTICAL REPORT

		Sample ID	L849091-1	L849091-2	L849091-3	L849091-4	L849091-5
		Description					
		Sampled Date	16-DEC-09	16-DEC-09	16-DEC-09	16-DEC-09	16-DEC-09
		Sampled Time	10:35	11:30	09:05	09:05	09:55
		Client ID	MAGNESIA CRK INTAKE	HARVEY CRK INTAKE	PRV-3	PRV-3 AFTER	PRV-5
Grouping	Analyte						
WATER							
Physical Tests	Hardness (as CaCO3) (mg/L)		11.3	4.0	5.3	5.4	5.8
	pH (pH)		6.75	6.64	7.05		6.40
	Total Suspended Solids (mg/L)		<3.0	3.3	<3.0		<3.0
	Turbidity (NTU)		0.26	0.81	0.56		0.22
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)		4.8	3.1	5.0		5.5
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)		0.83	2.18	1.39		1.24
Total Metals	Aluminum (Al)-Total (mg/L)		0.026	0.175	0.054	0.053	0.047
	Antimony (Sb)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)		0.00012	0.00013	<0.00010	<0.00010	<0.00010
	Barium (Ba)-Total (mg/L)		<0.020	<0.020	<0.020	<0.020	<0.020
	Boron (B)-Total (mg/L)		<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Calcium (Ca)-Total (mg/L)		3.74	1.30	1.75	1.78	1.94
	Chromium (Cr)-Total (mg/L)		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Copper (Cu)-Total (mg/L)		<0.0010	0.0017	0.0063	0.0065	0.0136
	Iron (Fe)-Total (mg/L)		<0.030	0.065	<0.030	<0.030	<0.030
	Lead (Pb)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Magnesium (Mg)-Total (mg/L)		0.47	0.18	0.22	0.22	0.23
	Manganese (Mn)-Total (mg/L)		<0.0020	0.0035	<0.0020	<0.0020	<0.0020
	Mercury (Hg)-Total (mg/L)		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Potassium (K)-Total (mg/L)		<0.10	0.10	<0.10	<0.10	0.10
	Selenium (Se)-Total (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/L)		<2.0	<2.0	<2.0	<2.0	<2.0
	Uranium (U)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Zinc (Zn)-Total (mg/L)		<0.050	<0.050	<0.050	<0.050	<0.050	
Aggregate Organics	BOD (mg/L)		<5.0	<5.0	<5.0		<5.0
Trihalomethanes	Bromodichloromethane (mg/L)				<0.0010		<0.0010
	Bromoform (mg/L)				<0.0010		<0.0010
	Dibromochloromethane (mg/L)				<0.0010		<0.0010
	Chloroform (mg/L)				0.0070		0.0077
	Total THMs (mg/L)				0.0070		0.0077

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L849091-6	L849091-7	L849091-8	L849091-9	L849091-10
		16-DEC-09 09:55 PRV-5 AFTER	16-DEC-09 10:30 100,000 GAL. TANK MAGNESIA	16-DEC-09 10:30 100,000 GAL.TANK MAGNESIA AFTER	16-DEC-09 08:25 KELVIN GROVE	16-DEC-09 08:25 KELVIN GROVE AFTER
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO ₃) (mg/L)	5.8	12.2	12.1	7.5	7.6
	pH (pH)		6.43		6.84	
	Total Suspended Solids (mg/L)		<3.0		<3.0	
	Turbidity (NTU)		0.15		0.24	
Anions and Nutrients	Alkalinity, Total (as CaCO ₃) (mg/L)		6.9		6.3	
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)		0.79		0.89	
Total Metals	Aluminum (Al)-Total (mg/L)	0.049	0.024	0.023	0.032	0.033
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)	<0.00010	<0.00010	0.00011	<0.00010	<0.00010
	Barium (Ba)-Total (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Calcium (Ca)-Total (mg/L)	1.93	4.04	4.00	2.66	2.69
	Chromium (Cr)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Copper (Cu)-Total (mg/L)	0.0108	0.0183	0.0181	0.0150	0.0121
	Iron (Fe)-Total (mg/L)	<0.030	<0.030	<0.030	0.064	0.069
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	0.00226	0.00169
	Magnesium (Mg)-Total (mg/L)	0.24	0.52	0.52	0.22	0.23
	Manganese (Mn)-Total (mg/L)	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Mercury (Hg)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Potassium (K)-Total (mg/L)	0.10	<0.10	<0.10	<0.10	0.10
	Selenium (Se)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
Uranium (U)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
Zinc (Zn)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	
Aggregate Organics	BOD (mg/L)		<5.0		<5.0	
Trihalomethanes	Bromodichloromethane (mg/L)		<0.0010		<0.0010	
	Bromoform (mg/L)		<0.0010		<0.0010	
	Dibromochloromethane (mg/L)		<0.0010		<0.0010	
	Chloroform (mg/L)		0.0029		0.0211	
	Total THMs (mg/L)		0.0029		0.0211	

ALS LABORATORY GROUP ANALYTICAL REPORT

		Sample ID	L849091-11	L849091-12	L849091-13	L849091-14	L849091-15
		Description					
		Sampled Date	16-DEC-09	16-DEC-09	16-DEC-09	16-DEC-09	16-DEC-09
		Sampled Time	09:25	09:25	07:50	07:50	08:10
		Client ID	BRUNSWICK BEACH	BRUNSWICK BEACH AFTER	GENERAL STORE/CAF	GENERAL STORE/CAF AFTER	ELEMENTARY SCHOOL
Grouping	Analyte						
WATER							
Physical Tests	Hardness (as CaCO ₃) (mg/L)		13.1	12.9	6.2	6.2	6.3
	pH (pH)		6.69		6.68		6.39
	Total Suspended Solids (mg/L)		<3.0		<3.0		<3.0
	Turbidity (NTU)		0.18		0.23		0.14
Anions and Nutrients	Alkalinity, Total (as CaCO ₃) (mg/L)		6.0		4.6		3.6
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)		0.68		1.16		0.89
Total Metals	Aluminum (Al)-Total (mg/L)		<0.010	0.018	0.028	0.044	<0.010
	Antimony (Sb)-Total (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Barium (Ba)-Total (mg/L)		<0.020	<0.020	<0.020	<0.020	<0.020
	Boron (B)-Total (mg/L)		<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Calcium (Ca)-Total (mg/L)		4.40	4.32	2.04	2.10	2.03
	Chromium (Cr)-Total (mg/L)		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Copper (Cu)-Total (mg/L)		0.861	0.0122	0.0703	0.0309	1.59
	Iron (Fe)-Total (mg/L)		0.035	0.042	0.030	0.056	0.035
	Lead (Pb)-Total (mg/L)		0.00088	<0.00050	0.00408	<0.00050	0.0532
	Magnesium (Mg)-Total (mg/L)		0.51	0.50	0.27	0.23	0.29
	Manganese (Mn)-Total (mg/L)		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
	Mercury (Hg)-Total (mg/L)		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Potassium (K)-Total (mg/L)		<0.10	<0.10	<0.10	<0.10	<0.10
	Selenium (Se)-Total (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/L)		<2.0	<2.0	<2.0	<2.0	<2.0
Uranium (U)-Total (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
Zinc (Zn)-Total (mg/L)		<0.050	<0.050	<0.050	<0.050	0.347	
Aggregate Organics	BOD (mg/L)		<5.0		<5.0		<5.0
Trihalomethanes	Bromodichloromethane (mg/L)		<0.0010		<0.0010		<0.0010
	Bromoform (mg/L)		<0.0010		<0.0010		<0.0010
	Dibromochloromethane (mg/L)		<0.0010		<0.0010		<0.0010
	Chloroform (mg/L)		0.0125		0.0113		0.0157
	Total THMs (mg/L)		0.0125		0.0113		0.0157

ALS LABORATORY GROUP ANALYTICAL REPORT

		Sample ID Description	L849091-16	L849091-17	L849091-18
		Sampled Date	16-DEC-09	16-DEC-09	16-DEC-09
		Sampled Time	08:10	07:35	07:35
		Client ID	ELEMENTARY SCHOOL AFTER	COMMUNITY CENTER	COMMUNITY CENTER AFTER
Grouping	Analyte				
WATER					
Physical Tests	Hardness (as CaCO ₃) (mg/L)		5.8	6.2	5.9
	pH (pH)			6.49	
	Total Suspended Solids (mg/L)			<3.0	
	Turbidity (NTU)			0.20	
Anions and Nutrients	Alkalinity, Total (as CaCO ₃) (mg/L)			4.1	
Organic / Inorganic Carbon	Total Organic Carbon (mg/L)			1.00	
Total Metals	Aluminum (Al)-Total (mg/L)		0.026	<0.010	0.034
	Antimony (Sb)-Total (mg/L)		<0.00050	<0.00050	<0.00050
	Arsenic (As)-Total (mg/L)		<0.00010	<0.00010	<0.00010
	Barium (Ba)-Total (mg/L)		<0.020	<0.020	<0.020
	Boron (B)-Total (mg/L)		<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)		<0.00020	<0.00020	<0.00020
	Calcium (Ca)-Total (mg/L)		1.94	2.09	2.01
	Chromium (Cr)-Total (mg/L)		<0.0020	<0.0020	<0.0020
	Copper (Cu)-Total (mg/L)		0.147	1.82	0.0742
	Iron (Fe)-Total (mg/L)		<0.030	<0.030	0.045
	Lead (Pb)-Total (mg/L)		0.00178	0.0165	0.00075
	Magnesium (Mg)-Total (mg/L)		0.23	0.23	0.22
	Manganese (Mn)-Total (mg/L)		<0.0020	<0.0020	<0.0020
	Mercury (Hg)-Total (mg/L)		<0.00020	<0.00020	<0.00020
	Potassium (K)-Total (mg/L)		<0.10	<0.10	<0.10
	Selenium (Se)-Total (mg/L)		<0.0010	<0.0010	<0.0010
	Sodium (Na)-Total (mg/L)		<2.0	<2.0	<2.0
	Uranium (U)-Total (mg/L)		<0.00010	<0.00010	<0.00010
	Zinc (Zn)-Total (mg/L)		<0.050	<0.050	<0.050
Aggregate Organics	BOD (mg/L)			<5.0	
Trihalomethanes	Bromodichloromethane (mg/L)			<0.0010	
	Bromoform (mg/L)			<0.0010	
	Dibromochloromethane (mg/L)			<0.0010	
	Chloroform (mg/L)			0.0129	
	Total THMs (mg/L)			0.0129	

Reference Information

Additional Comments for Sample Listed:

Sample Number	Matrix	Report Remarks	Sample Comments
Methods Listed (if applicable):			
ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
ALK-COL-VA	Water	Alkalinity by Colourimetric (Automated)	APHA 310.2
This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.			
BOD5-VA	Water	Biochemical Oxygen Demand- 5 day	APHA 5210 B- "BIOCHEMICAL OXYGEN DEMAND"
This analysis is carried out using procedures adapted from APHA Method 5210 B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.			
BOD5-VA	Water	Biochemical Oxygen Demand- 5 day	APHA 5210 B- BIOCHEMICAL OXYGEN DEMAND
This analysis is carried out using procedures adapted from APHA Method 5210 B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.			
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310 "TOTAL ORGANIC CARBON (TOC)"
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
CARBONS-TOC-VA	Water	Total organic carbon by combustion	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B
Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.			
HG-TOT-DW-CVAFS-VA	Water	Total Mercury in Water by CVAFS	EPA 245.7
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 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).			
MET-TOT-DW-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 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 preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).			
MET-TOT-DW-MS-VA	Water	Total Metals in Water by ICPMS	EPA SW-846 3005A/6020A
This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 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 hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).			
PH-MAN-VA	Water	pH by Manual Meter	APHA 4500-H "pH Value"
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.			
		pH by Manual Meter	APHA 4500-H pH Value

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
PH-MAN-VA	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.			
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"
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			
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value
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			
THM-PT-MS-VA	Water	VOC (THM) by Purge and Trap with GCMS	EPA SW-846, METHOD 8260
This procedure is suitable for the analysis of trihalomethanes (chloroform, bromodichloromethane, dibromochloromethane, and bromoform) in chlorinated waters that have been treated to prevent the formation of trihalomethanes after sample collection. The analysis involves the purge and trap extraction of the sample prior to analysis by capillary column gas chromatography with mass spectrometric detection (GC/MS). The trihalomethanes analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Method 8260, published by the United States Environmental Protection Agency (EPA).			
THM-SUM-CALC-VA	Water	Total Trihalomethane-THM	CALCULATION
TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.			
TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 "Turbidity"
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			
TURBIDITY-VA	Water	Turbidity by Meter	APHA 2130 Turbidity
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			
** Laboratory Methods employed follow in-house procedures, which are generally based on nationally or internationally accepted methodologies. The last two letters of the above ALS Test Code column indicate the laboratory that performed analytical analysis for that test. Refer to the list below:			
Laboratory Definition Code	Laboratory Location	Laboratory Definition Code	Laboratory Location
VA	ALS LABORATORY GROUP - VANCOUVER, BC, CANADA		

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Analytical Method Reference(Based On)
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GLOSSARY OF REPORT TERMS

Surr - A surrogate is an organic compound that is similar to the target analyte(s) in chemical composition and behavior but not normally detected in environmental samples. Prior to sample processing, samples are fortified with one or more surrogate compounds.

The reported surrogate recovery value provides a measure of method efficiency.

mg/kg (units) - unit of concentration based on mass, parts per million

mg/L (units) - unit of concentration based on volume, parts per million

N/A - Result not available. Refer to qualifier code and definition for explanation

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Although test results are generated under strict QA/QC protocols, any unsigned test reports, faxes, or emails are considered preliminary.

ALS Laboratory Group has an extensive QA/QC program where all analytical data reported is analyzed using approved referenced procedures followed by checks and reviews by senior managers and quality assurance personnel. However, since the results are obtained from chemical measurements and thus cannot be guaranteed, ALS Laboratory Group assumes no liability for the use or interpretation of the results.



The Municipality of the Village of Lions Bay

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Appendix D

Emergency Response Plan



CONTENTS

Boil Water Advisory	3D
Power Failures	3D
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Chemical Contamination	4D
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Turbidity Events	5D
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BOIL WATER ADVISORY

If there is a need, or if Vancouver Coastal Health Authority (VCHA) orders the Village to issue a Boil Water Advisory (BWA):

- ❖ Identify the affected area,
- ❖ Report these findings to the person in charge,
- ❖ The person in charge will contact the Public Health Inspector (PHI),
- ❖ The person in charge will copy and have delivered by hand a printed BWA and post a notice at Lions bay School, Lions Bay Post Office, Lions Bay General Store / Café, and Child Care facilities,
- ❖ The person in charge will, when appropriate, notify the radio and television stations that are listed in the plan,
- ❖ When it has been determined that all hazards and problems have been alleviated, the PHI will lift the BWA,
- ❖ The person in charge will reverse the above actions notifying all those concerned, and
- ❖ The person in charge will record all of the pertinent information regarding the event and prepare a report for the Medical Health Officer.

POWER FAILURES

In the event of a Power Failure:

- ❖ Notify the Works Manager or his designate,
- ❖ Determine the extent of the outage,
- ❖ Notify BC Hydro,
- ❖ If an outage of more than 4 (four) hours is suspected, shut down the CL2 and run the system on manual,
- ❖ Monitor the tanks levels,
- ❖ Monitor and record the free CL2 in the system,
- ❖ When the power comes back on, reset the injector and check its function,
- ❖ Reset all alarms, and
- ❖ Reset all the pumps including the STP.

EARTHQUAKES

In the event of an earthquake:

- ❖ Notify the Works Manager or his designate,
- ❖ Begin a system wide check for leaks or any other failures,
- ❖ Shut down any areas that appear to have problems,
- ❖ Notify VCHA if sections have been shut down and if necessary issue a BWA,
- ❖ Repair and flush lines with treated water, and
- ❖ Retest all zones and monitor.



FIRE IN THE WATERSHED

In the event of a forest fire in the watershed:

- ❖ Notify the Works Manager or his designate,
- ❖ Notify BC Department of Forest,
- ❖ Call 911 and let them dispatch the affected Fire Department,
- ❖ Shut down the system at the affected intake,
- ❖ Notify Vancouver Coastal Health Authority,
- ❖ Notify Council,
- ❖ Monitor Raw Water for any contaminants, and
- ❖ Let BC Forest service know that we have an intake below and that we need to know if they are going to water bomb with any chemicals.

WATER PUMP FAILURE

In the event of a pump failure:

- ❖ Shut down the affected pump,
- ❖ Notify the Works Manager or his designate,
- ❖ Notify all affected residents, and
- ❖ Change or repair pump and flush the affected area with treated water.

CHEMICAL CONTAMINATION

In the event of Chemical contamination such as oil, fuel, pesticides or any other type of substance that gets into or threatens to get into our water system including forest fire fighting activities:

- ❖ Shut down the affected intake or line,
- ❖ Begin determining the extent of contamination,
- ❖ Notify Vancouver Coastal Health Authority who will issue a “No Use Order”,
- ❖ Notify the Works Manager or his designate,
- ❖ Call the listed radio and television stations and have them broadcast a “No Use Order” to the affected area,
- ❖ Hand deliver “Do Not Use Water” notices to the affected areas,
- ❖ Remedy the problem to the satisfaction of the Vancouver Coastal Health Authority, and
- ❖ Notify all those affected that the water is now safe to use again.

DISINFECTION INTERRUPTION

In the event of an interruption of CL2 system:

- ❖ Check and record the free CL2 in the affected water tank,
- ❖ Shut down and make safe the CL2 injector,
- ❖ Shut down the intake valve for the water tank,



- ❖ Determine the amount of down time that is available before we need to refill the water tank,
- ❖ Notify the Works Manager or his designate,
- ❖ Begin repairs on the unit,
- ❖ If the downtime is going to be too long and we have to fill the tank, notify Vancouver Coastal Health Authority and issue a BWA (not necessary if do manual feed), and
- ❖ Add chlorine to reservoir manually and check residual on ongoing basis.

LOSS OF PRESSURE

In the event of a system pressure loss due to high demand from high fire flow or a severe leak:

- ❖ Notify the Works Manager or his designate,
- ❖ Determine if there was a negative pressure or if there was always positive pressure,
- ❖ If a negative pressure is suspected, notify Vancouver Coastal Health Authority who will determine if we need to issue a BWA, and
- ❖ Flush the affected area and record the results and give them to the Health Inspector.

TURBIDITY EVENTS

If the Turbidity is in the range of 1-3 NTU, increase monitoring. If the Turbidity reaches 4 NTU prepare to Take Off the system. If the Turbidity reaches 5 NTU or more:

- ❖ Notify the Works Manager or his designate,
- ❖ Contact Vancouver Coastal Health Authority and possibly issue a BWA,
- ❖ Check and record the free CL2 that is present at the same site as the turbidity sample was taken,
- ❖ Adjust the CL2 at the injection point if necessary, and
- ❖ Check with other purveyors like the District of West Vancouver to see at what point high turbidity events correlate with positive water samples.

WATER LINE BREAKS

In the event of a water line break, where water pressure has maintained until the leak has been exposed so that there is no danger of any material flowing back into the break, there will be no need for any special condition to be applied. Flush the repair area with treated water before placing that area back in service.

In the event that the broken line is suspected of having a negative pressure:

- ❖ Notify the Works Manager or his delegate,
- ❖ Notify the Vancouver Coastal Health Authority for a possible BWA,
- ❖ Repair the break and flush the area with treated water, and
- ❖ Rescind the BWA if necessary.



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Appendix E

Sample Boil Water Advisory



THE MUNICIPALITY OF THE VILLAGE OF LIONS BAY

NOTICE TO RESIDENTS

A water sample from a collection site on the Magnesia Creek water system was analyzed and found to contain a total coliform count of 1-6 per 100 ml and a faecal coliform count of 1-3 per 100 ml.

Consequently North Shore Health Region has placed part of Lions Bay on a

BOIL WATER ADVISORY

until further notice.

**The Boil Water Advisory affects residents on:
Sunset Drive, Mountain Drive from 100 – 300,
Bayview Road from 200 – 249,
Stewart Road and Brunswick Beach.**

Residents can disinfect their water by either:

1. Boiling the water for 2 minutes, or
2. Adding 4 drops of household bleach per gallon of water (8 drops if water is cloudy), stirring and waiting for 20 minutes before consumption.

This includes water used for brushing teeth, cooking, washing dishes, and washing ready-to-eat fruit and vegetables.

The Village is required to have 3 negative samples for fecal and total coliform before the Boil Water Advisory will be lifted. The Village will be sending water samples to the lab to be tested on Thursday, Friday and next Tuesday. If they all come back with acceptable results then the Boil Water Advisory will likely be lifted on Wednesday, October 15, 2003. A notice will be posted in the Post Office when the advisory is lifted.

Should you have any questions or have had any symptoms of diarrhea, stomach cramping or nausea, please contact Rod Schluter at 604-904-6254 at North Shore Health.

Village of Lions Bay
October 8, 2003



The Municipality of the Village of Lions Bay

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Appendix F

EOCP Facility Classification

ENVIRONMENTAL OPERATORS CERTIFICATION PROGRAM

Facility Classification

THIS IS TO CERTIFY THAT

Village of Lions Bay Water System

has been classified by the Environmental Operators Certification Program in accordance with the guidelines established in co-operation with the Association of Boards of Certification (A.B.C.) as

Class II

Dated at Burnaby, B.C. on July 28, 2003

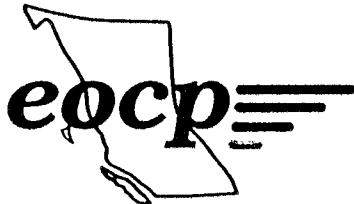


Secretary - Certification Board



Chairman - Certification Board

CERTIFICATE NO.675



MEMBER OF ASSOCIATION OF BOARDS OF CERTIFICATION
AFFILIATE OF B.C. WATER AND WASTE ASSOCIATION
A Society Incorporated under the Society Act, S.B.C. S-28724



The Municipality of the Village of Lions Bay

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Appendix G

EOCP Operator Certificates

ENVIRONMENTAL OPERATORS CERTIFICATION PROGRAM

Certificate of Qualification

This is to certify that:

Alberto Urrutia

By Examination Has Qualified As A

Water Distribution System Operator

and certifies that he/she has met the established qualifications and has the ability to efficiently operate and maintain a specified maximum size and type of water distribution system designated as follows:

Level II



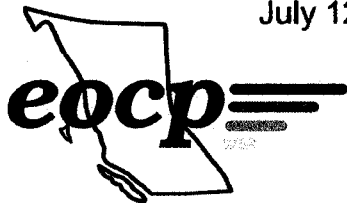
Secretary - Certification Board



Chairman - Certification Board

July 12, 2006

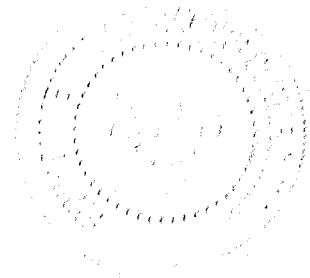
Certificate No: 4766



Member of Association of Boards of Certification
Affiliate of B.C. Water and Waste Association

This certificate shall be in full force and effect when accompanied by an annual renewal seal

A Society Incorporated under the Society Act, S.B.C. S-28724



ENVIRONMENTAL OPERATORS CERTIFICATION PROGRAM

Course Completion Certificate

This is to certify that

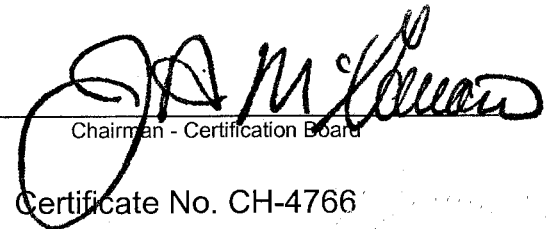
Alberto Urrutia

By Examination Has Qualified As A

Chlorine Handler



Secretary - Certification Board



Chairman - Certification Board

May 6, 2005

Certificate No. CH-4766

