

Municipality of **NORTH COWICHAN**



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January 20, 2015

File No: 5620-55

Environmental Health Officer
Central Vancouver Island Health Region
1665 Grant Avenue
NANAIMO, BC V9S 5K7

Re: **Chemainus Water System Water Quality Report**
Premises Number 1310823
Report for the Period Jan 1/14 to Dec 31/14

1 General

This report is comprised of two parts.

- The first part, provides a summary of the data along with a compliance assessment. This part is provided to the VIHA and is also published on the Municipality's website at www.northcowichan.ca on an annual basis.
- The second part includes all of the relevant data tables and charts that back up the summary report. This part is provided to the VIHA only but is available to the public upon request.

2 Operator Information

Contact Name	Clay Reitsma, M.Eng. P.Eng.
Phone	250-746-3100
Email	Clay.Reitsma@NorthCowichan.ca

3 System Description

This water system has two water supplies.

Water can be supplied to Chemainus from the Banon Creek watershed. The watershed has two natural storage reservoirs; Holyoak Lake and Banon Creek Reservoir. Runoff from the watershed is collected and stored in Banon Creek Reservoir. During wetter months there is sufficient runoff to ensure that Banon Creek Reservoir is full. During drier months water that has been collecting in Holyoak Lake is released to supplement runoff flows. Just downstream of Banon Creek Reservoir, the water is chlorinated to kill any pathogens that may be in the water.

Starting on Oct 15/10 Chemainus can be supplied from the well site. The water is chlorinated at the well site prior to distribution. Water is then pumped from the well site through a forcemain to two reservoirs. The town is then fed from the reservoirs. Some water is fed off the forcemain near Poplar and the TCH.

The wells are permitted to operate between Oct 15 and Jun 15. From Jun 16 to Oct 14 the town is fed from the surface water supply.

During 2014 the water supply started on the surface supply (Banon) on June 16 and changed back to the well supply on Oct 15, 2014.

4 Boil Advisories

None.

5 Discussion of Results

5.1 Residual Chlorine

Compliance requires that 100% of free chlorine readings for finished water are less than or equal to 4.00 mg/L and greater than or equal to 0.20 mg/L. Residuals more than 4.00 mg/l are thought to be due to instrumentation errors that register spikes at the maximum 20 mA signal generating spikes close to 5.00 mg/L which is maximum scaled engineering value.

The overall compliance rate for finished water was in compliance 98% of the time for maximum free chlorine levels and 98% of the time for minimum free chlorine levels.

Compliance requires that 100% of free chlorine readings for the distribution system must be less than or equal to 4 mg/L. For this reporting period free chlorine residual in the distribution system was in compliance 100% of the time.

Compliance requires that 100% of total chlorine readings for the distribution system must be greater than or equal to 0.05 mg/L. For this reporting period free chlorine residual in the distribution system was in compliance 99% of the time.

5.2 Turbidity

Compliance requires that 100% of readings for turbidity are less than or equal to 5 NTU and that 95% of readings are less than or equal to 1 NTU for a given month. For this reporting period turbidity was in compliance 99% of the time for the lower limit and 100% of the time for the upper limit.

5.3 Coliforms

Compliance requires that 100% of total coliform samples are less than 10 CFU/100mL and that 90% are less than 1 CFU/100mL. For this reporting period total coliforms were in compliance 100% of the time for the upper limit and 99% of the time for the lower limit.

Compliance requires that 100% of *Escherichia* coliform samples are less than 1 CFU/100mL. For this reporting period *Escherichia* coliform were in compliance 100% of the time.

5.4 Cysts

Compliance requires that 100% of samples have no more than zero *Giardia* or *Cryptosporidium* cysts per 100 mL. For the current reporting period there was one instance where a raw water sample had 0.850 *Cryptosporidium* cysts/100L. There were no samples found with *Giardia* cysts during this reporting period.

Compliance requirements vary for log reduction of *Giardia* cysts depending on the whether the source water is from the ground or surface supply. While on the surface water supply compliance requires that the log reduction of *Giardia* cysts must be greater than or equal to 3 log and greater than or equal to 1.5 log while on the well supply. For the current reporting period log reduction of *Giardia* was in compliance 92% of the time.

5.5 pH

The pH limits are not minimum or maximum acceptable limits; rather they are aesthetic objectives. The pH is typically low for this water supply. The lower pH is usually associated with the Banon supply.

For the current reporting period pH was in compliance with the aesthetic objectives 90% of the time.

5.6 THMs

Compliance requires that 100% of the samples testing for Trihalomethanes (THMs) are less than or equal to 100ug/L.

The THMs for this water supply can be high when on the surface supply. This is caused by the relatively high chlorine dosing rate required to ensure that the required log reduction of *giardia* and *cryptosporidium* cysts is achieved; however, when on the well supply the THMs drop significantly and are well within CDWQG limits.

For the current reporting period THMs were in compliance 100% of the time.

5.7 Miscellaneous Parameters

Compliance standards for miscellaneous metals and chemicals vary depending on the substance. For this reporting period miscellaneous metals, Polycyclic Aromatic Hydrocarbons (PAHs) and chemical parameters were in compliance 100% of the time with the exception of the pH levels noted above.

6 Future Improvements

None proposed at this time

7 Data Review

7.1 Water Consumption

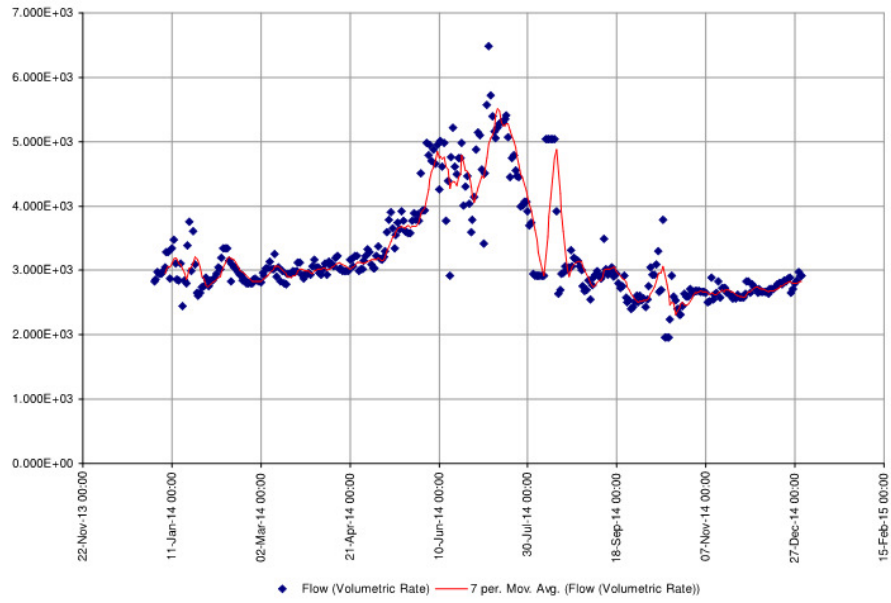
Table 1 Average daily water consumption by month and quarter.

Item	Average Daily Consumption (m ³ /d)
Observed	
- Jan	2,996
- Feb	2,969
- Mar	2,972
- Quarter 1	2,979
Observed	
- Apr	3,078
- May	3,553
- Jun	4,454
- Quarter 2	3,693
Observed	
- Jul	4,812
- Aug	3,424
- Sep	2,801
- Quarter 3	3,688
Observed	
- Oct	2,626
- Nov	2,649
- Dec	2,766
- Quarter 4	2,681



Chart (CH-004)

Start Date: 01-Jan-2014 00:00:00
End Date: 31-Dec-2014 23:59:59
System: Chemainus Drinking Water
Project: Regular Sampling
Parameter Class: Physical
Parameters: Flow (Volumetric Rate) [m3/d]



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Figure 1 Average daily water consumption.

7.2 Residual Chlorine

Table 2 Finished water minimum and maximum free chlorine residual by quarter.

Item	Minimum (mg/L)	Maximum (mg/L)	Percent of Samples in Compliance (%)	
Permit Requirements			100 % >= 0.20 mg/L	100 % <= 4.00 mg/L
Observed				
- Quarter 1	0.011	2.161	96.67	100.00
- Quarter 2	0.000	2.400	96.70	100.00
- Quarter 3	0.000	5.002	98.91	95.65
- Quarter 4	0.244	2.251	100.00	100.00

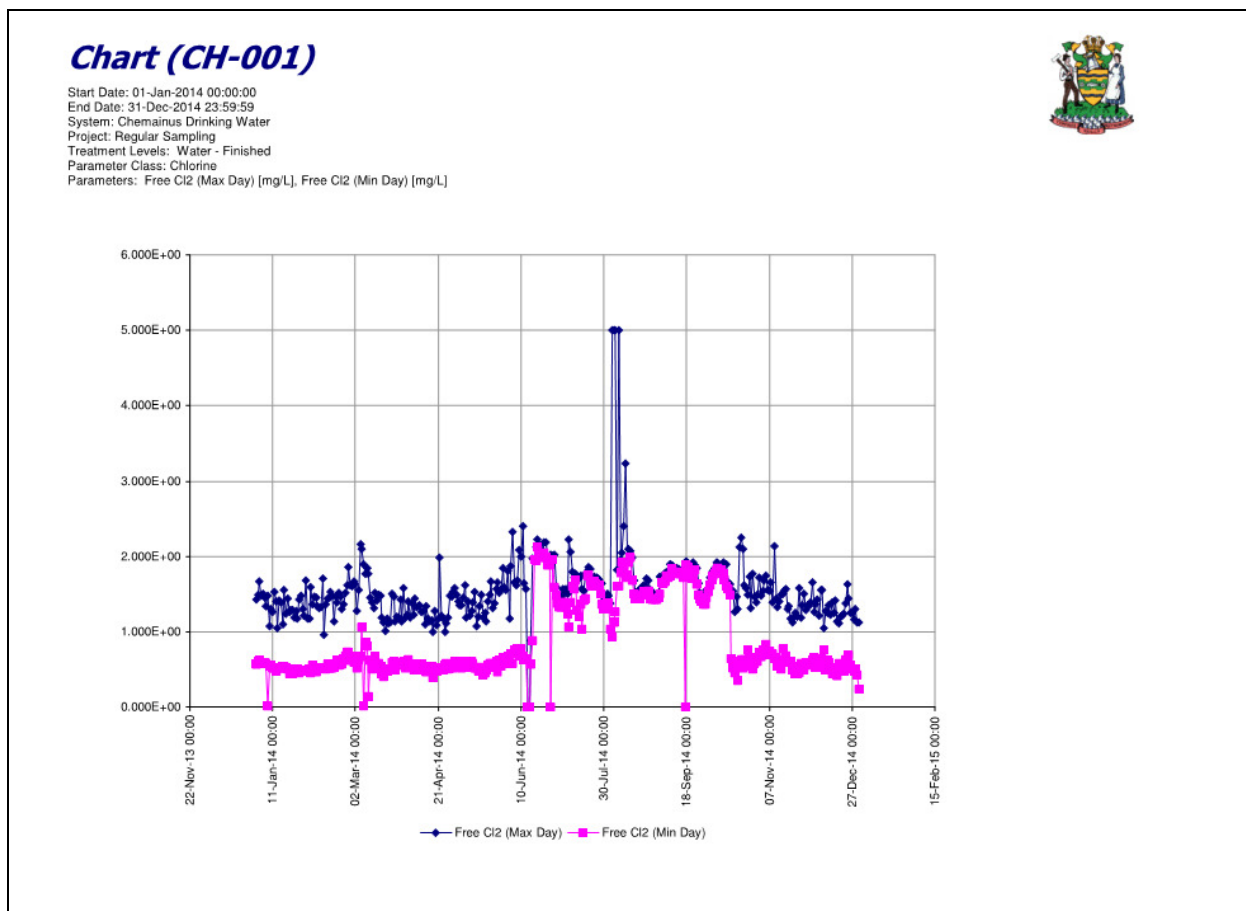


Figure 2 Finished water daily minimum and maximum free chlorine residual.

Table 3 Distribution system minimum total chlorine residual by quarter.

Item	Minimum (mg/L)	Percent of Samples in Compliance (%)
Permit Requirements		100 % \geq 0.05 mg/L
Observed		
- Quarter 1	0.050	100.00
- Quarter 2	0.040	99.38
- Quarter 3	0.000	96.79
- Quarter 4	0.040	99.44

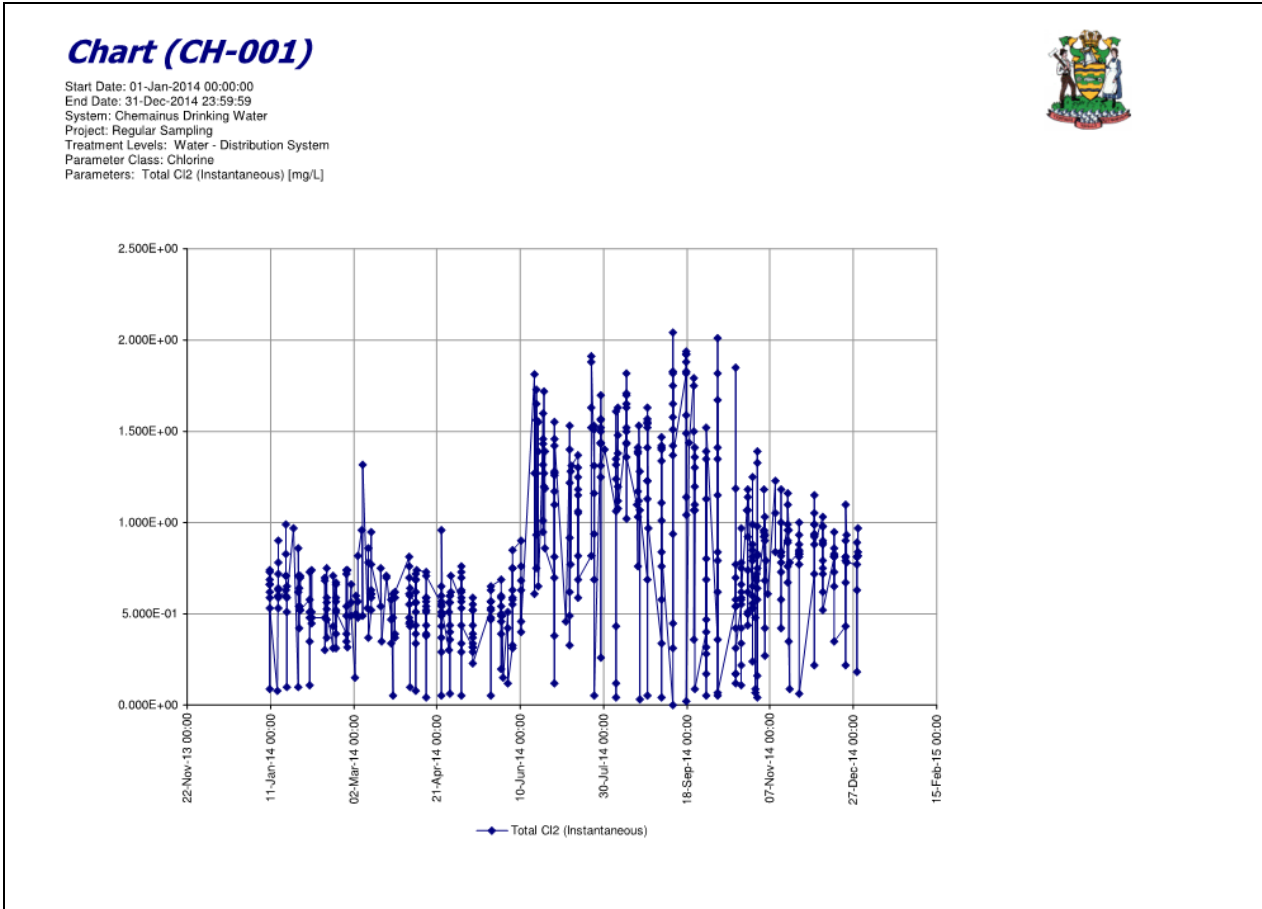


Figure 3 Distribution system minimum total chlorine residual.

Table 4 Distribution system maximum free chlorine residual by quarter.

Item	Maximum (mg/L)	Percent of Samples in Compliance (%)
Permit Requirements		100% <= 4.00 mg/L
Observed		
- Quarter 1	1.250	100.00
- Quarter 2	1.700	100.00
- Quarter 3	1.780	100.00
- Quarter 4	1.770	100.00

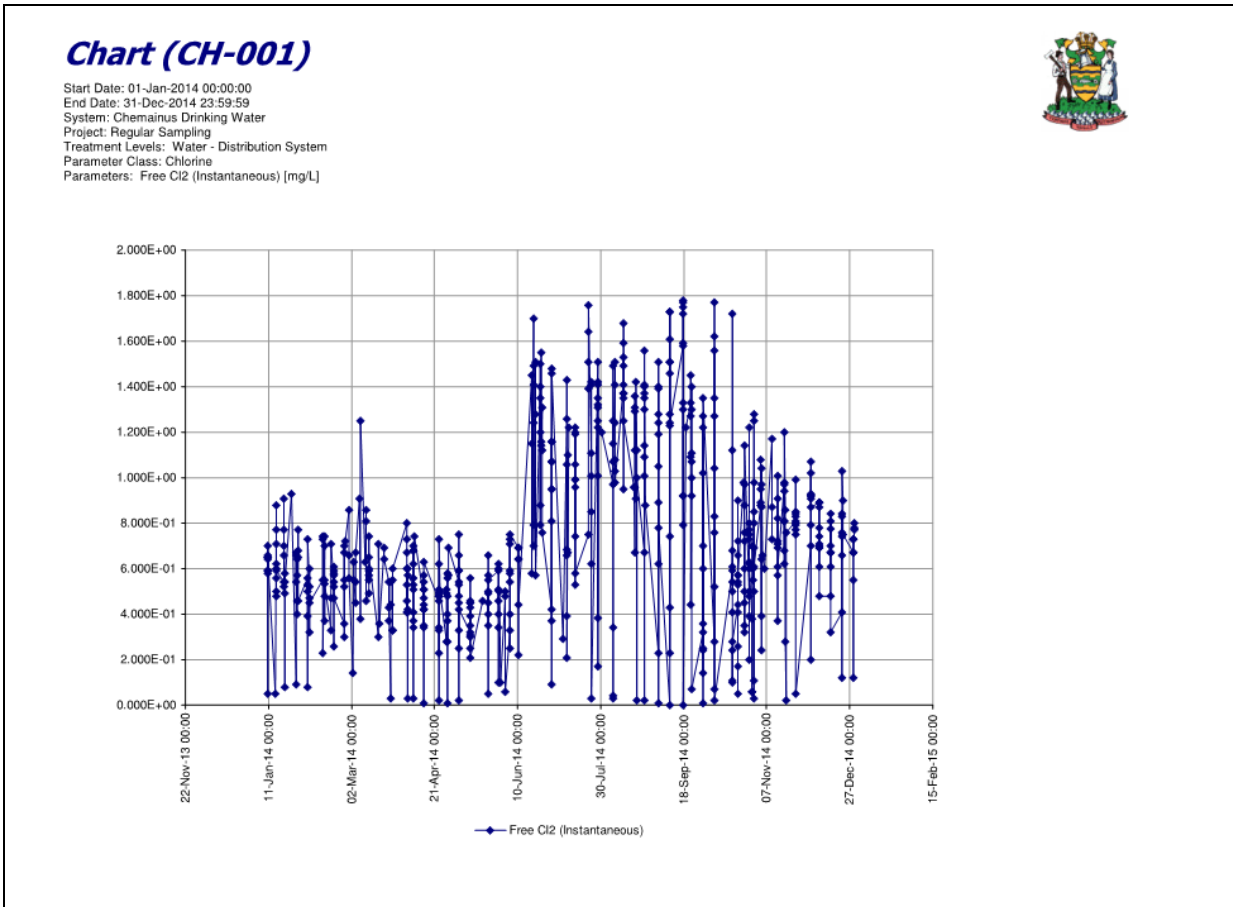


Figure 4: Distribution system maximum free chlorine residual.

7.3 Turbidity

Table 5 Finished water maximum turbidity by month and quarter.

Item	Maximum (NTU)	Percent of Samples in Compliance (%)	
		100% <= 5 NTU	>95% <= 1 NTU (In A Month)
Permit Requirements			
Observed			
- Jan	0.240	100.00	100.00
- Feb	0.211	100.00	100.00
- Mar	0.166	100.00	100.00
- Quarter 1	0.240	100.00	100.00
Observed			
- Apr	0.177	100.00	100.00
- May	0.179	100.00	100.00
- Jun	0.645	100.00	100.00
- Quarter 2	0.645	100.00	100.00
Observed			
- Jul	1.060	100.00	93.33
- Aug	1.093	100.00	87.10
- Sep	1.052	100.00	96.55
- Quarter 3	1.093	100.00	92.22
Observed			
- Oct	0.765	100.00	100.00
- Nov	0.772	100.00	100.00
- Dec	0.775	100.00	100.00
- Quarter 4	0.775	100.00	100.00

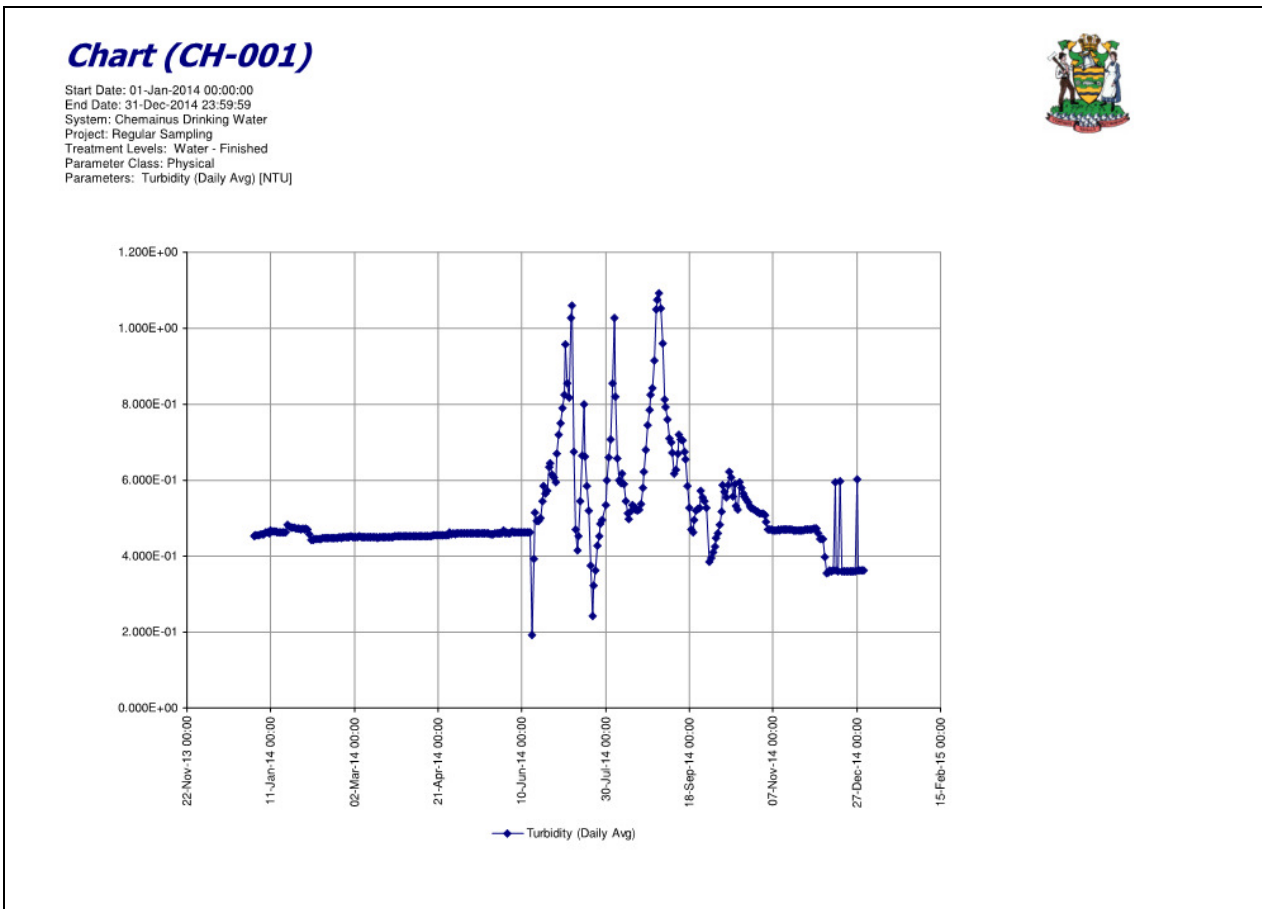


Figure 5 Finished water turbidity.

7.4 Coliforms

Table 6 Distribution system maximum total coliforms by quarter.

Item	Maximum (MPN/100 mL)	Percentage of Samples in Compliance (%)	
Permit Requirements		100% < 10 MPN/100 mL	>90% < 1 MPN/100 mL
Observed			
- Quarter 1	0.000	100.00	100.00
- Quarter 2	0.000	100.00	100.00
- Quarter 3	1.010	100.00	97.30
- Quarter 4	0.000	100.00	100.00

Table 7 Distribution system maximum *Escherichia* coliforms by quarter.

Item	Maximum (MPN/100 mL)	Percentage of Samples in Compliance (%)
CDWQG Requirements		100 % < 1 MPN/100 mL
Observed		
- Quarter 1	0.000	100.00
- Quarter 2	0.000	100.00
- Quarter 3	0.000	100.00
- Quarter 4	0.000	100.00

7.5 Cysts

Table 8 Raw water maximum number of *Giardia* cysts by quarter.

Item	Maximum (Cysts/100 L)
Observed	
- Quarter 1	No Data
- Quarter 2	0.000
- Quarter 3	0.000
- Quarter 4	0.000

Table 9 Raw water maximum number of *Cryptosporidium* cysts by quarter.

Item	Maximum (Cysts/100 L)
Observed	
- Quarter 1	No Data
- Quarter 2	0.000
- Quarter 3	0.850
- Quarter 4	0.000

Table 10 Finished water *Giardia* cysts minimum log reduction by quarter.

Item	Minimum (Log Reduction)	Percent of Samples in Compliance (%)
Permit Requirement		Jan 1 -- Jun 15 100 % \geq 1.5 Log Jun 16 – Oct 15 100 % \geq 3.0 Log Oct 16 – Dec 31 100% > 1.5 Log
Observed		
- Quarter 1	0.890	83.01
- Quarter 2	0.00	81.89
- Quarter 3	28.373	100.00
- Quarter 4	0.239	99.68



Chart (CH-005)

Start Date: 01-Jan-2014 00:00:00
End Date: 30-Jun-2014 23:59:59
System: Chemainus Drinking Water
Parameter Class: Cyst
Parameters: Giardia (Log Reduction) [Log]

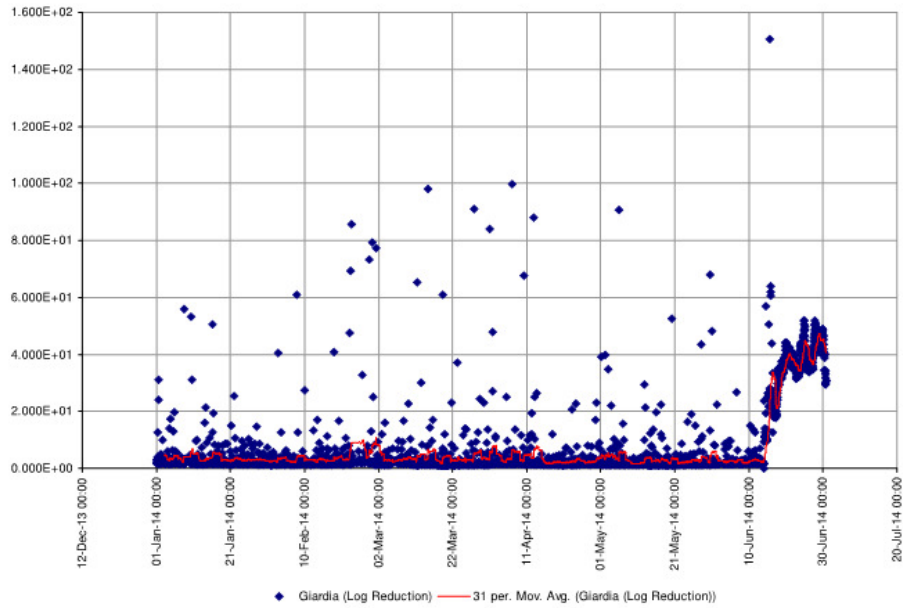


Figure 6 Giardia log reduction (Jan 1 to Jun 30).



Chart (CH-005)

Start Date: 01-Jul-2014 00:00:00
End Date: 31-Dec-2014 23:59:59
System: Chemainus Drinking Water
Project: Regular Sampling
Parameter Class: Cyst
Parameters: Giardia (Log Reduction) [Log]

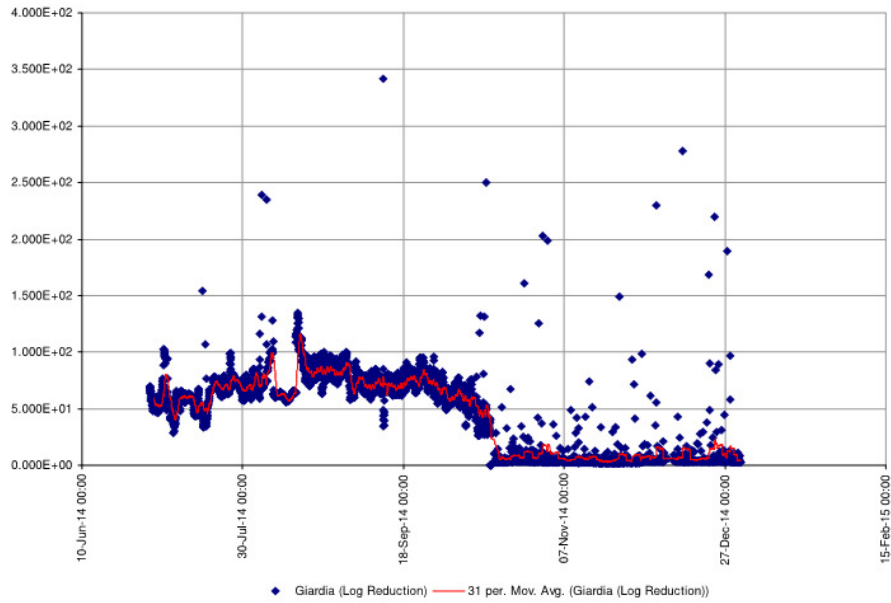


Figure 7 *Giardia* log reduction (July- Dec 31, 2014)

7.6 pH

Table 11 Finished water minimum and maximum pH by quarter (data from sites 027, 101, 102, 103).

Item	Minimum	Maximum	Percent of Samples in Compliance (%)
CDWQG Requirements			100 % \geq 6.5 100 % \leq 8.5
Observed			
- Quarter 1	6.960	7.700	100%
- Quarter 2	6.900	7.560	100%
- Quarter 3	6.900	7.170	100%
- Quarter 4	5.890	7.710	68%

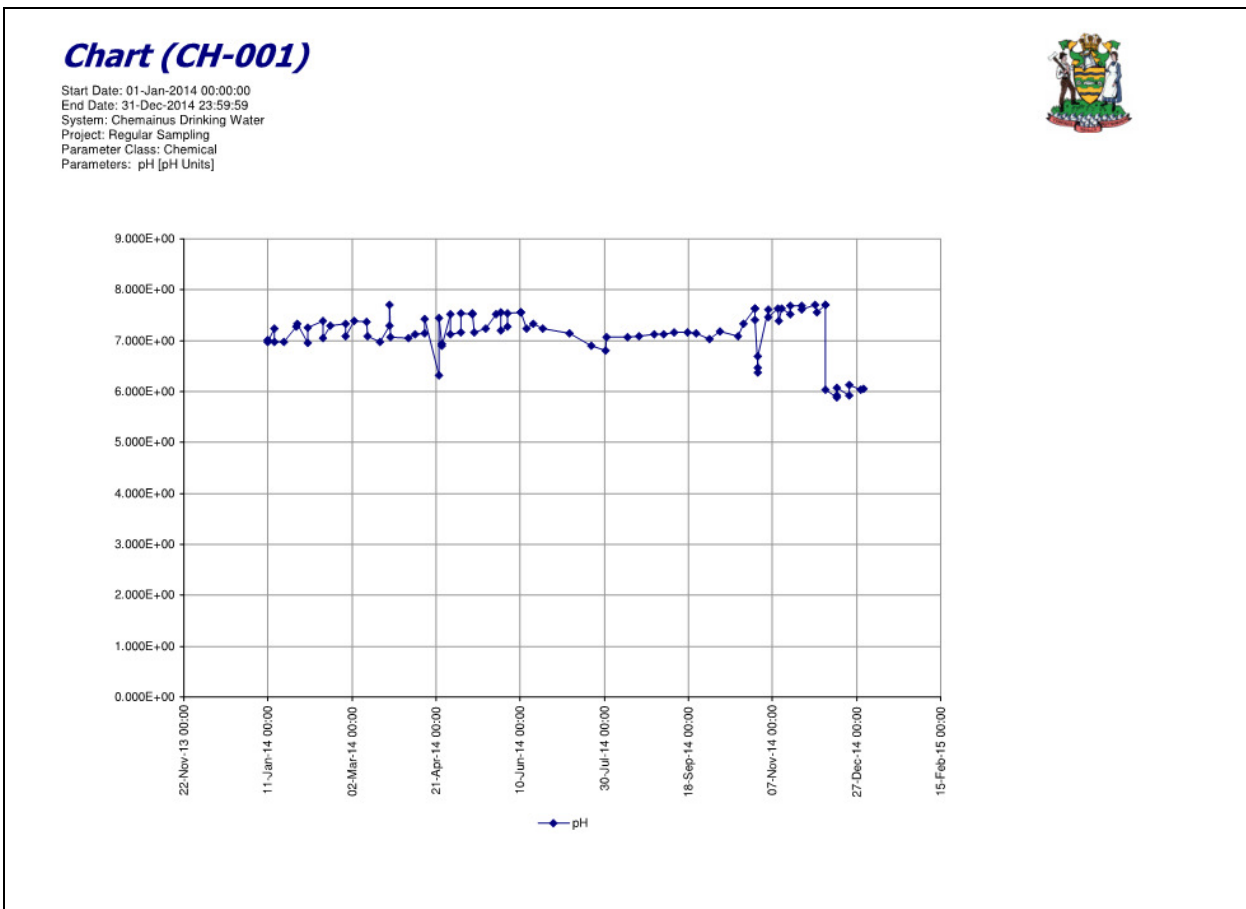


Figure 8 Finished water pH.

7.7 Total THM

Table 12 Finished water maximum THMs by quarter.

Item	Maximum (ug/L)	Percent of Samples in Compliance (%)
CDWQG Requirements		100 % <= 100 ug/L
Observed		
- Quarter 1	No Data	No Data
- Quarter 2	3.500	100.00
- Quarter 3	88.000	100.00
- Quarter 4	14.00	100.00

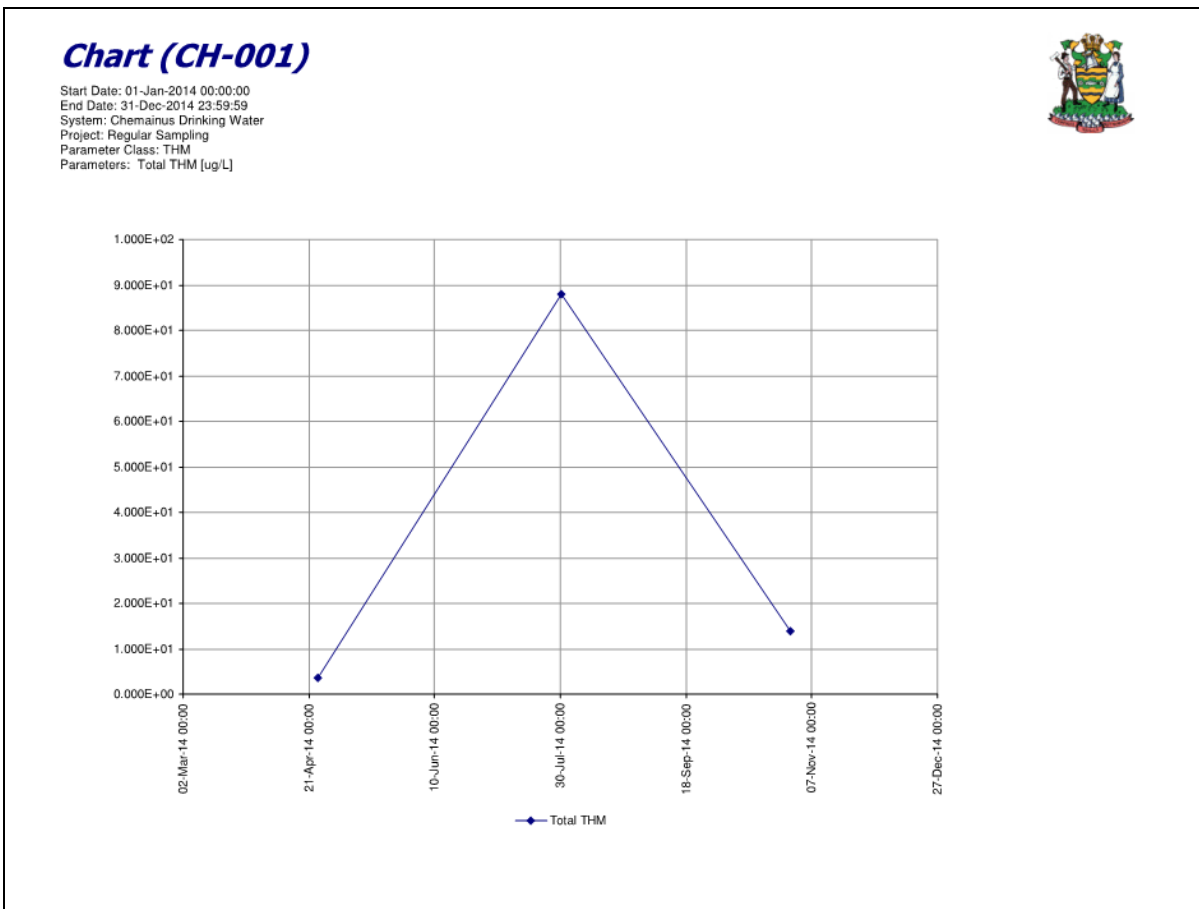


Figure 9 Finished water THMs.

7.8 Miscellaneous Items

Table 13 Finished water miscellaneous parameters.

Item	Compliance Assessment/Comments
Metals	All parameters met CDWQG limits
Microorganisms	No limits exist.
Algae	No limits exist.
PAH	All parameters met CDWQG limits
Chemicals	All parameters met CDWQG limits with the exception of pH

8 Additional Comments

Should you have any questions regarding this report, please do not hesitate to contact the Municipality at (250) 746-3100.

Sincerely



Clay Reitsma, M.Eng., P.Eng.
Manager of Engineering (Infrastructure & Environment)

cc. Robert Bell, Assistant Manager of Operations

CR/cr
Enclosures