Municipality of
NORTH COWICHAN

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Apr 29, 2015

File No: 5610-55

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

Re: **Crofton Water System Water Quality Report**
Premises Number 1310822
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. Any data points that are non-compliant with the Canadian Drinking Water Quality Guidelines (CDWQGs) are flagged in red. 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 is a surface water supply. Water is pumped from the Cowichan River to Catalyst's water treatment plant. The water treatment plant consists of a coagulation and flocculation process, followed by sedimentation and filtration. The water is chlorinated at the water treatment plant and pumped to the Robert Street Reservoir where a small amount of additional chlorine is added to ensure adequate reduction of *Giardia* cysts.

A new puck-type chlorine disinfection system was installed at the Robert Street Reservoir station. The system was operational on June 25, 2014.

4 Boil Advisories

None.

5 Discussion of Results

5.1 Finished Water Free Residual Chlorine

The analyzer will occasionally register low and high spikes. Chlorine residual data is logged every 1 to 5 minutes continuously. The way the data is processed for this report is as follows: for each day the maximum and minimum free chlorine residuals over a 24 hour period are extracted from the data reported as the maximum or minimum instantaneous free chlorine residual. This is a very stringent application of the compliance criteria since any spike or dip detected will be reported as the maximum or minimum and may differ greatly from the bulk of the data.

When we observe spikes or dips of this nature it is normally caused by instrument error. Spikes and dips can also occur when staff undertakes maintenance on the analyzer equipment. It has been concluded that the spikes and dips reported do not reflect the true concentration of free chlorine in the finished water.

Compliance requires that 100% of readings must be less than or equal to 4 mg/L and greater than or equal to 0.2 mg/L free chlorine. For this reporting period the finished water free chlorine residual was in compliance 99.7% of the time for the upper limit and was in compliance 99% of the time for the lower limit.

5.2 Distribution System Total Residual Chlorine

Compliance requires that 100% of readings are greater than 0.05 mg/L total chlorine for the distribution system. For this reporting period total chlorine in the distribution system was in compliance 100% of the time.

Compliance requires that 100% of readings are less than or equal to 4.00 mg/L for free chlorine in the distribution system. For this reporting period free chlorine residual was in compliance 100% of the time for the distribution system.

5.3 Turbidity

Compliance requires that 100% of readings for turbidity are less than or equal to 5 NTU's. Greater than 95% of readings within a month must also be less than or equal to 1 NTU. For this reporting period turbidity was in compliance 100% of the time for the 5 NTU limit and 99% of the time with respect to the 1 NTU limit.

5.4 Coliforms

Compliance requires that 100% of samples must be less than 10 CFU/100ml and that greater than 90% of samples are less than 1 CFU/100ml for total coliforms. For this reporting period total coliforms were in compliance 100% of the time.

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

5.5 Cysts

Compliance requires that 100% of samples testing for *Cryptosporidium* and *Giardia* must have 0 cysts /100L. For this reporting period *Giardia* cysts were not detected; however, one sample detected 1.350 *Cryptosporidium* cysts /100L on February 5, 2014 at the Robert St. Chlorinator site. The compliance rate for *Cryptosporidium* cysts was 50% for this reporting period.

Compliance requires that *Giardia* log reduction be greater than or equal to 1.5 log 100% of the time. For this reporting period *Giardia* log reduction was in compliance 100% of the time.

5.6 pH

The pH limits are not minimum or maximum acceptable limits; rather they are aesthetic objectives. The pH can be low, particularly where the water has limited buffering capacity and alum is used as a flocculent, as is the case for this water supply.

For this reporting period the pH was in compliance with the aesthetic objectives only 81% of the time as 11 readings registered below the 6.5 pH limit.

5.7 THMs

THMs are typically not an issue in this system as the water is filtered.

THMs were not sampled for this reporting period.

5.8 Miscellaneous Items

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

5.9 Future Improvements

No future improvements are contemplated at this time.

6 Data Review

6.1 Water Consumption

Table 1 Average daily water consumption by month and quarter.

Item	Average Daily Consumption (m^3/d)
Observed	
- Jan	592
- Feb	537
- Mar	547
- Quarter 1	560
Observed	
- Apr	649
- May	578
- Jun	1208
- Quarter 2	809
Observed	
- Jul	1,102
- Aug	817
- Sep	625
- Quarter 3	850
Observed	
- Oct	551
- Nov	551
- Dec	547
- Quarter 4	550

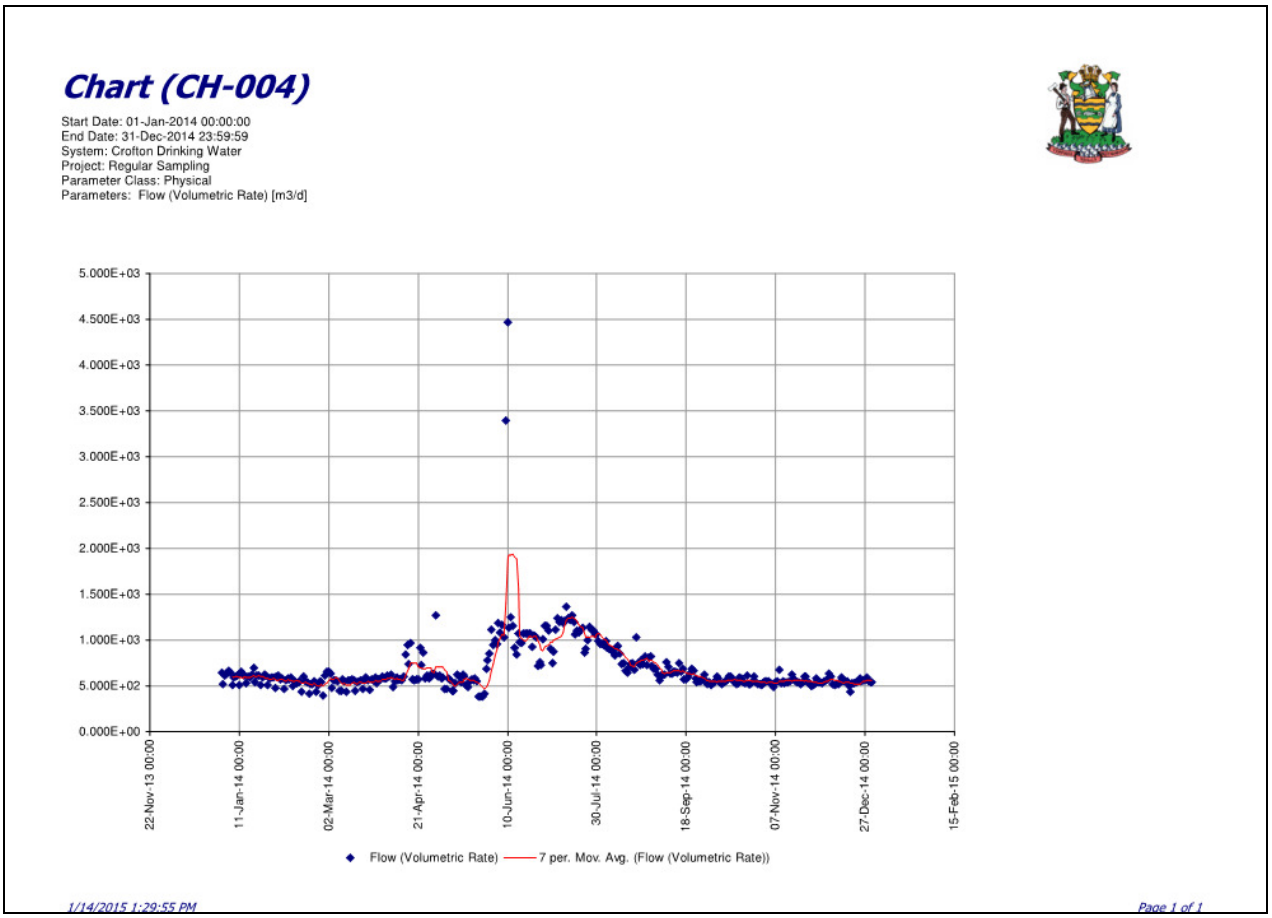

Figure 1 Average daily water consumption.

6.2 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	0.732	1.165	100.00	100.00
- Quarter 2	0.000	2.787	98.90	100.00
- Quarter 3	0.257	1.310	100.00	98.91
- Quarter 4	0.142	2.334	98.91	100.00

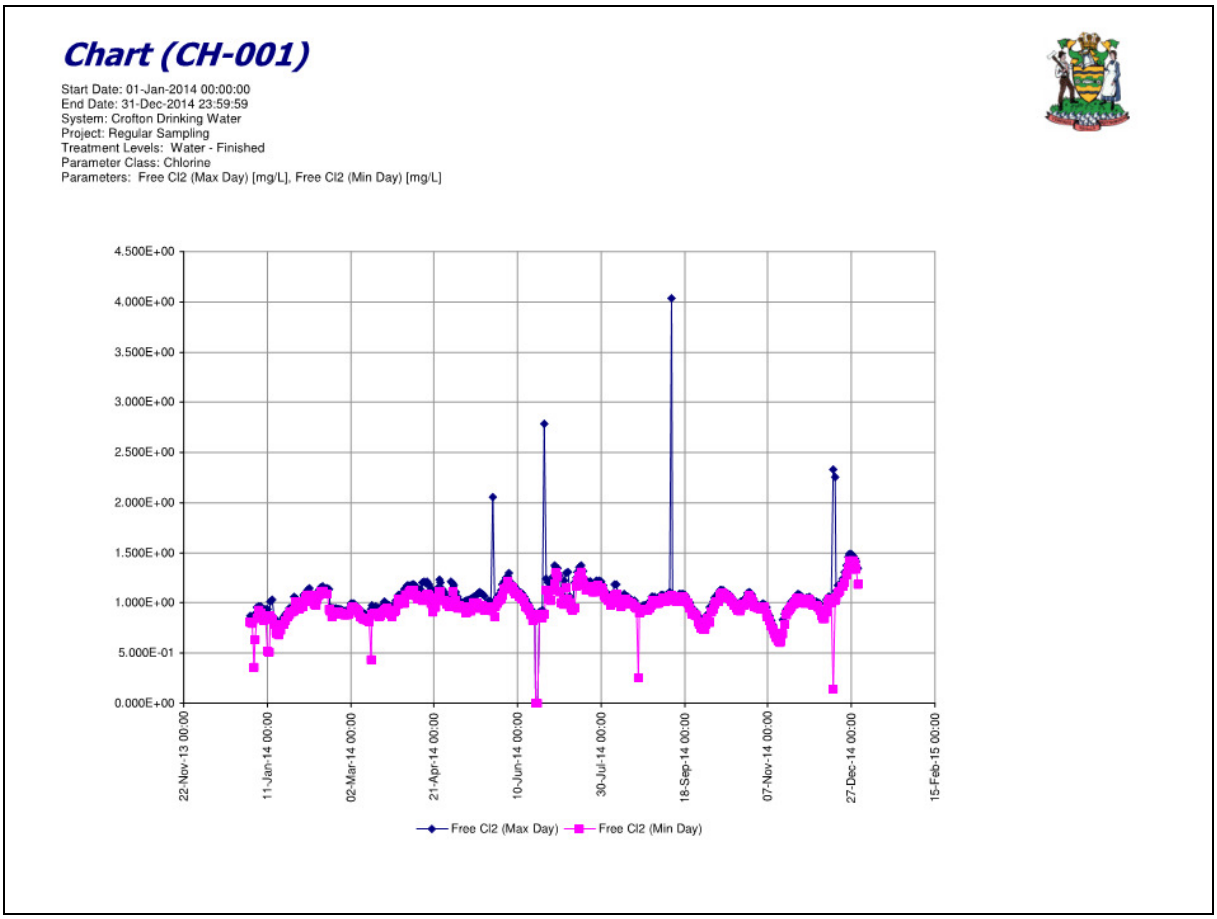

Figure 2 Finished water daily minimum and maximum free chlorine residual.

Table 3 Distribution system minimum total chlorine residual by quarter.

Item	Minimum (mg/L)	Percent of Samples in Compliance (%)
Permit Requirements		100 % >= 0.05 mg/L
Observed		
- Quarter 1	0.390	100.00
- Quarter 2	0.320	100.00
- Quarter 3	0.570	100.00
- Quarter 4	0.180	100.00

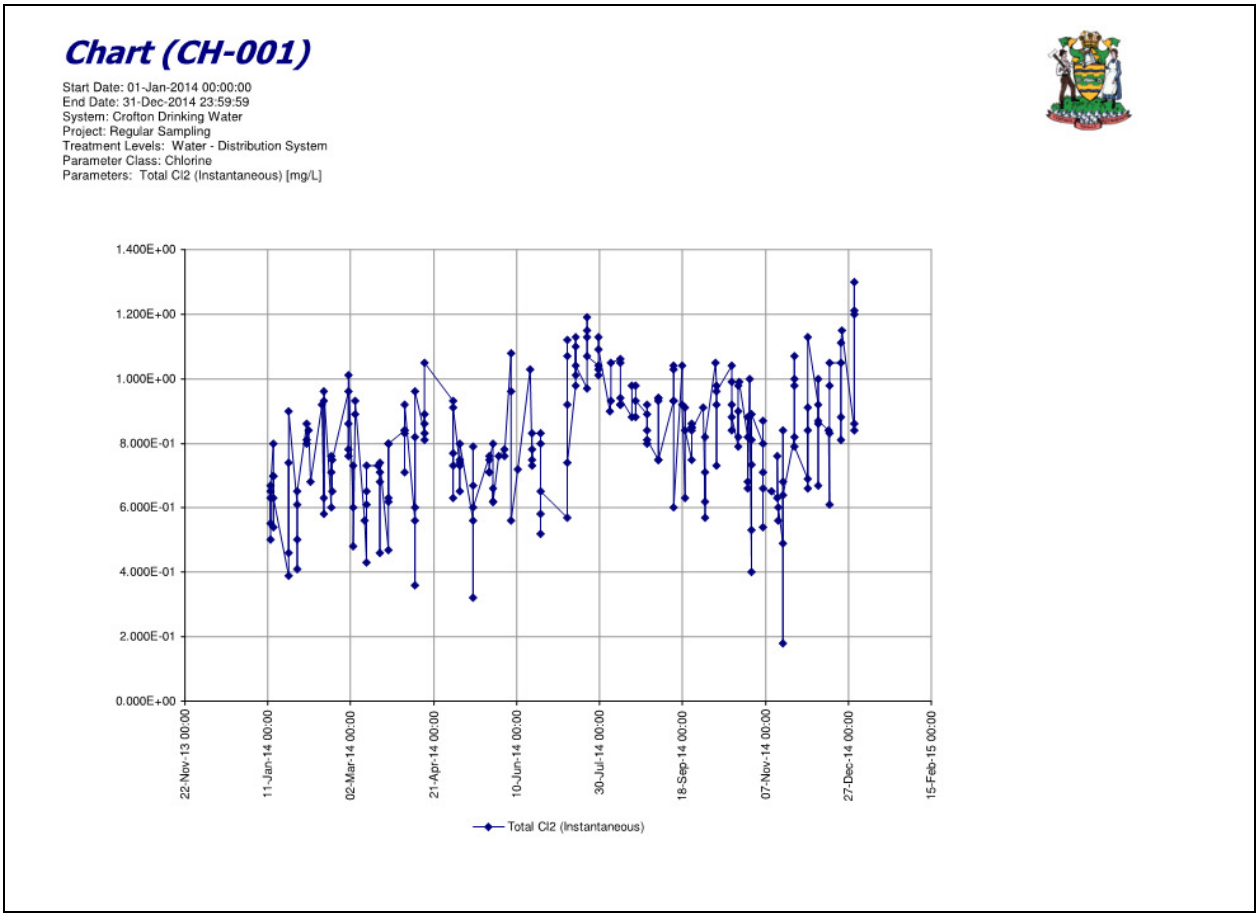

Figure 3 Distribution system minimum total chlorine residual.

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	0.920	100.00
- Quarter 2	1.070	100.00
- Quarter 3	1.100	100.00
- Quarter 4	1.200	100.00

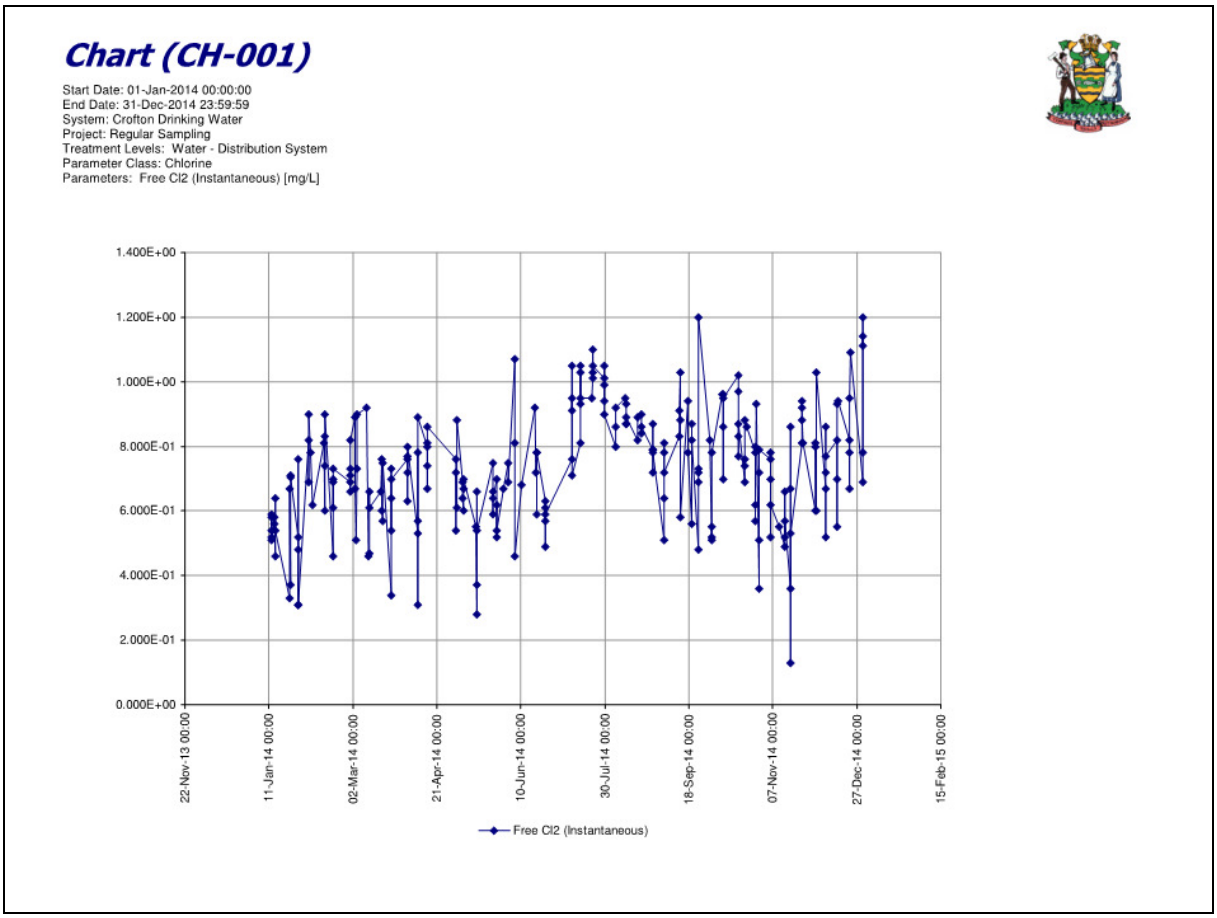

Figure 4 Distribution system maximum free chlorine residual.

6.3 Turbidity

Table 5 Finished water maximum turbidity by month and quarter.

Item	Maximum (NTU)	Percent of Samples in Compliance (%)	
Permit Requirements		100% <= 5 NTU	>95% <= 1 NTU (In A Month)
Observed			
- Jan	0.648	100.00	100.00
- Feb	0.464	100.00	100.00
- Mar	0.262	100.00	100.00
- Quarter 1	0.648	100.00	100.00
Observed			
- Apr	0.230	100.00	100.00
- May	4.120	100.00	96.67
- Jun	3.834	100.00	93.33
- Quarter 2	4.120	100.00	98.33
Observed			
- Jul	0.198	100.00	100.00
- Aug	0.173	100.00	100.00
- Sep	0.158	100.00	100.00
- Quarter 3	0.198	100.00	100.00
Observed			
- Oct	0.251	100.00	100.00
- Nov	0.261	100.00	100.00
- Dec	0.264	100.00	100.00
- Quarter 4	0.264	100.00	100.00

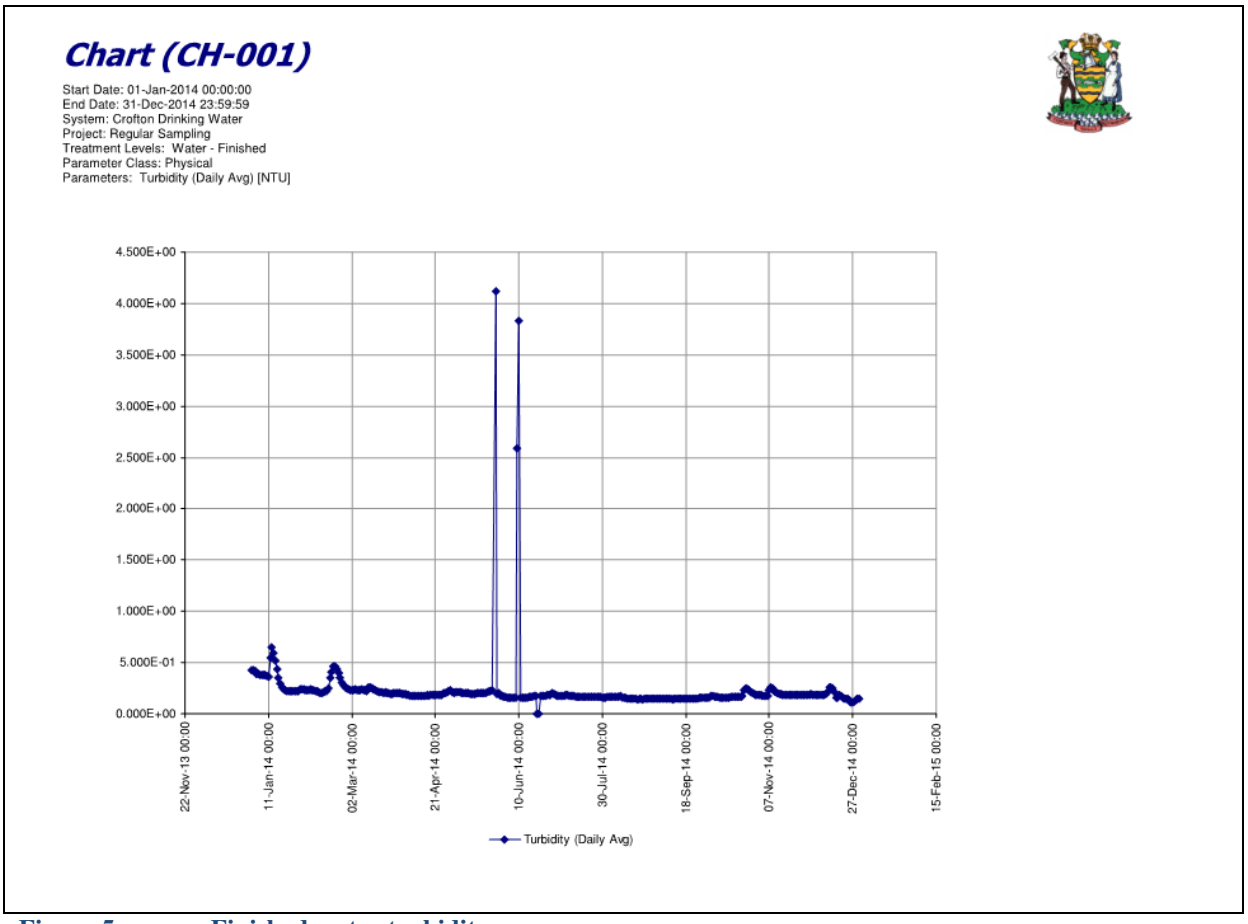

Figure 5 Finished water turbidity.

6.4 Coliforms

Table 6 Distribution system maximum total coliforms by quarter.

Item	Maximum (CFU/100 mL)	Percent of Samples in Compliance (%)	
Permit Requirements		100% < 10 CFU/100 mL	>90% < 1 CFU/100 mL
Observed			
- Quarter 1	0.860	100.00	100.00
- Quarter 2	0.000	100.00	100.00
- Quarter 3	0.000	100.00	100.00
- Quarter 4	0.000	100.00	100.00

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

Item	Maximum (CFU/100 mL)	Percent of Samples in Compliance (%)
CDWQG Requirements		100 % < 1 CFU/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

6.5 Cysts

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

Item	Maximum (Cysts/100 L)
Observed	
- Quarter 1	0.000
- Quarter 2	No Data
- Quarter 3	0.00
- Quarter 4	No Data

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

Item	Maximum (Cysts/100 L)
Observed	
- Quarter 1	1.350
- Quarter 2	No Data
- Quarter 3	0.000
- Quarter 4	No Data

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

Item	Minimum (Log Reduction)	Percent of Samples in Compliance (%)
Permit Requirements		100 > 1.5 Log
Observed		
- Quarter 1	6.446	100.00
- Quarter 2	5.542	100.00
- Quarter 3	3.585	100.00
- Quarter 4	14.109	100.00

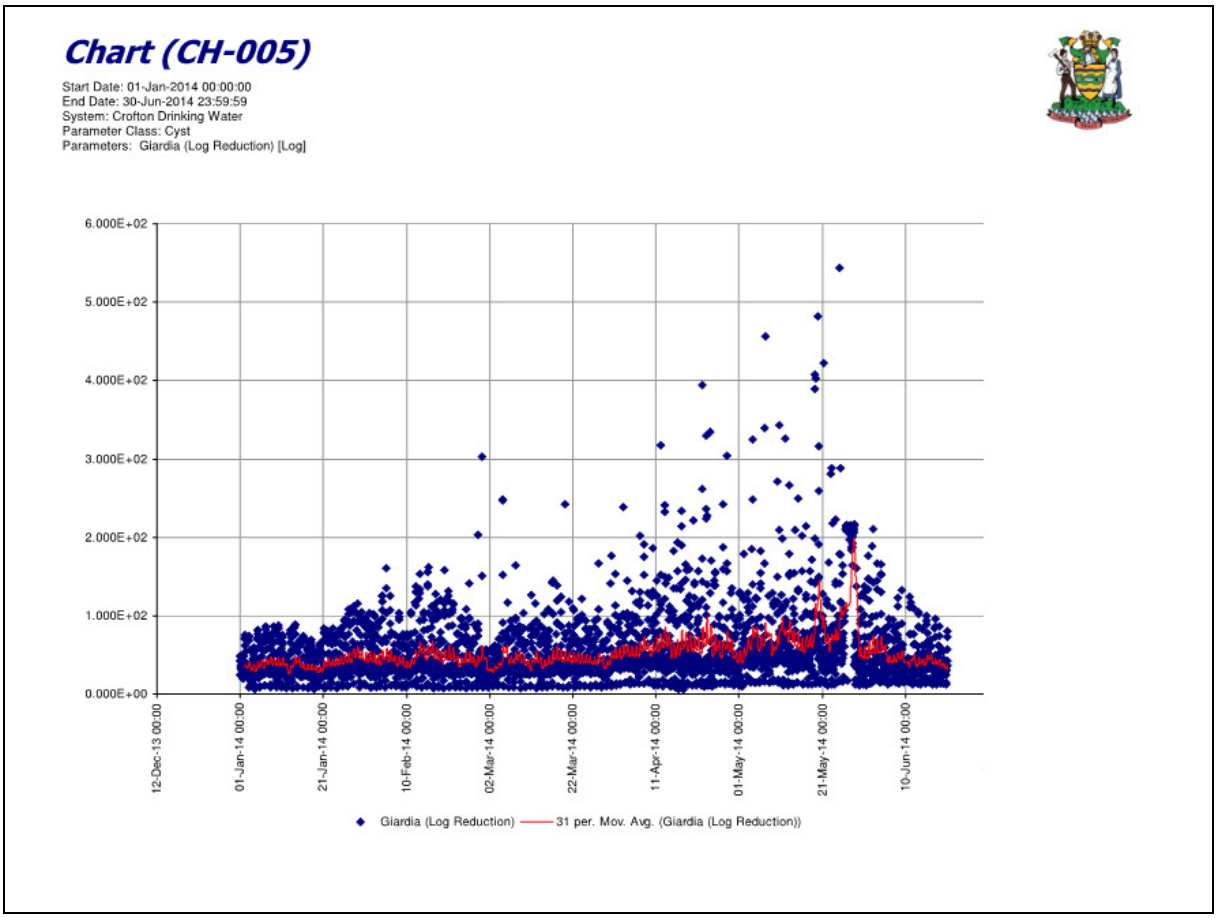

Figure 6 Finished water *Giardia* Log Reduction (Jan 1 to Jun 30).

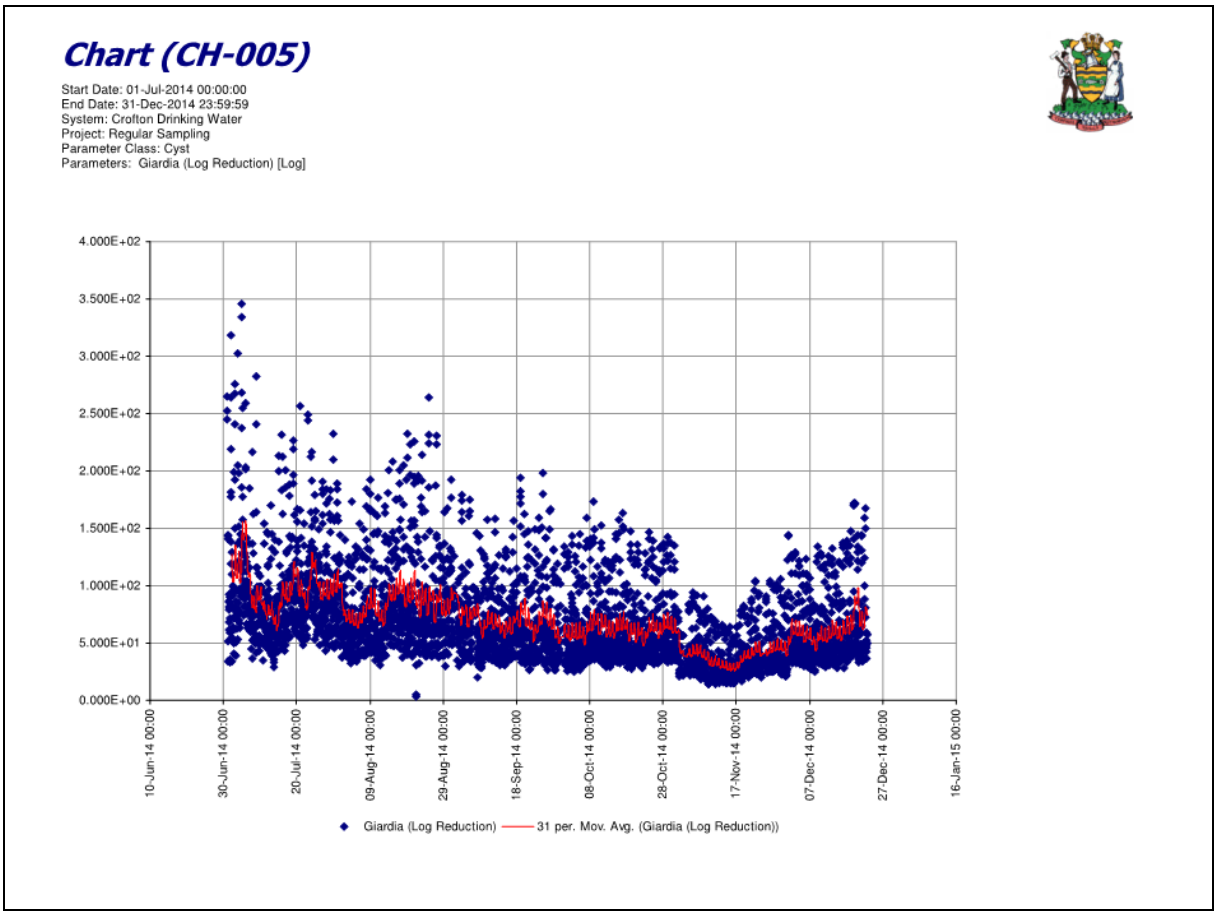

Figure 7 Finished water *Giardia* Log Reduction (Jul 1 to Dec 31).

6.6 pH

Table 11 Finished water minimum and maximum pH by quarter.

Item	Minimum	Maximum	Percent of Samples in Compliance (%)
CDWQG Requirements			100 >= 6.5 100 <= 8.5
Observed			
- Quarter 1	6.700	7.200	100.00
- Quarter 2	7.030	7.480	100.00
- Quarter 3	5.580	7.740	50.00
- Quarter 4	5.980	7.710	71.43

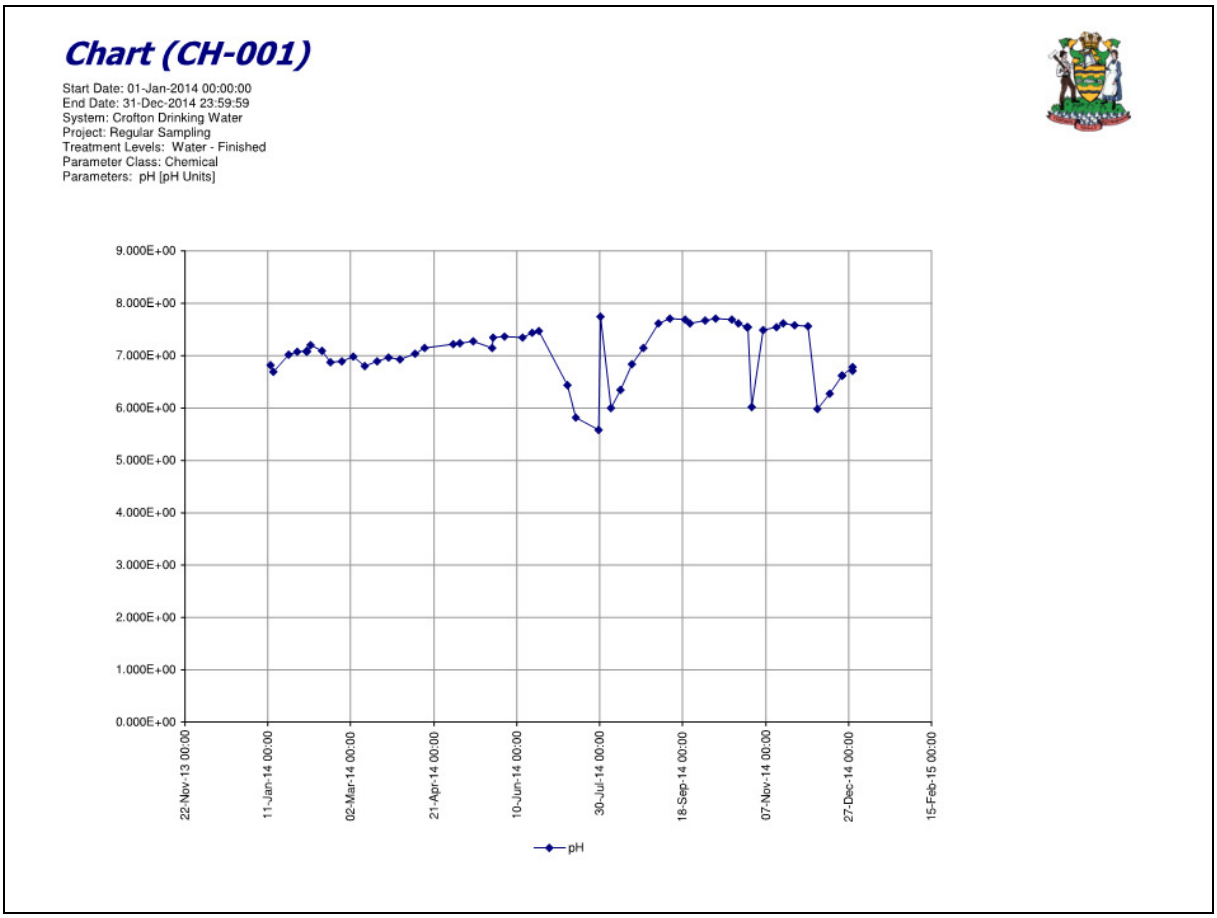

Figure 8 Finished water pH.

6.7 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	No Data	No Data
- Quarter 3	No Data	No Data
- Quarter 4	No Data	No Data

6.8 Miscellaneous Items

Table 13 Finished water miscellaneous parameters.

Item	Compliance Assessment
Metals	All samples met CDWQ guidelines. See attached data.
Microorganisms	No limits exist. See attached data.
Algae	No limits exist. See attached data.
PAH	All samples met CDWQ guidelines. See attached data.
Chemical	All samples met CDWQ guidelines with the exception of pH samples noted above. See attached data.

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.
Assistant Municipal Engineer

cc. Robert Bell, Assistant Manager of Operations
Brian Houle, Catalyst Paper

CR/cr
Enclosures