

October 25, 2019

File: 5620-55

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

Dear Environmental Health Officer

**Re: Chemainus Water System Water Quality Report  
Premises Number 1310823  
Report for the Period Jan 1/18 to Dec 31/18**

Please find the Municipality of North Cowichan's Water quality report for the Chemainus Water System attached.

Sincerely

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

[clay.reitsma@northcowichan.ca](mailto:clay.reitsma@northcowichan.ca)

c: Robert Bell- Assistant Operations Manager – Utilities



## 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](http://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	<a href="mailto:Clay.Reitsma@NorthCowichan.ca">Clay.Reitsma@NorthCowichan.ca</a>

## 3 System Description

This water system has two water supplies.

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

Starting on Oct 15/10 Chemainus can be seasonally supplied from the well site. The water is chlorinated at the well site prior to distribution. Water is then pumped from the well site into the Chemainus distribution system. Pumped well water in excess of the town's demand is delivered to two concrete reservoirs located on Copper Canyon Road.

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.

## 4 Boil Advisories

None

## 5 Results

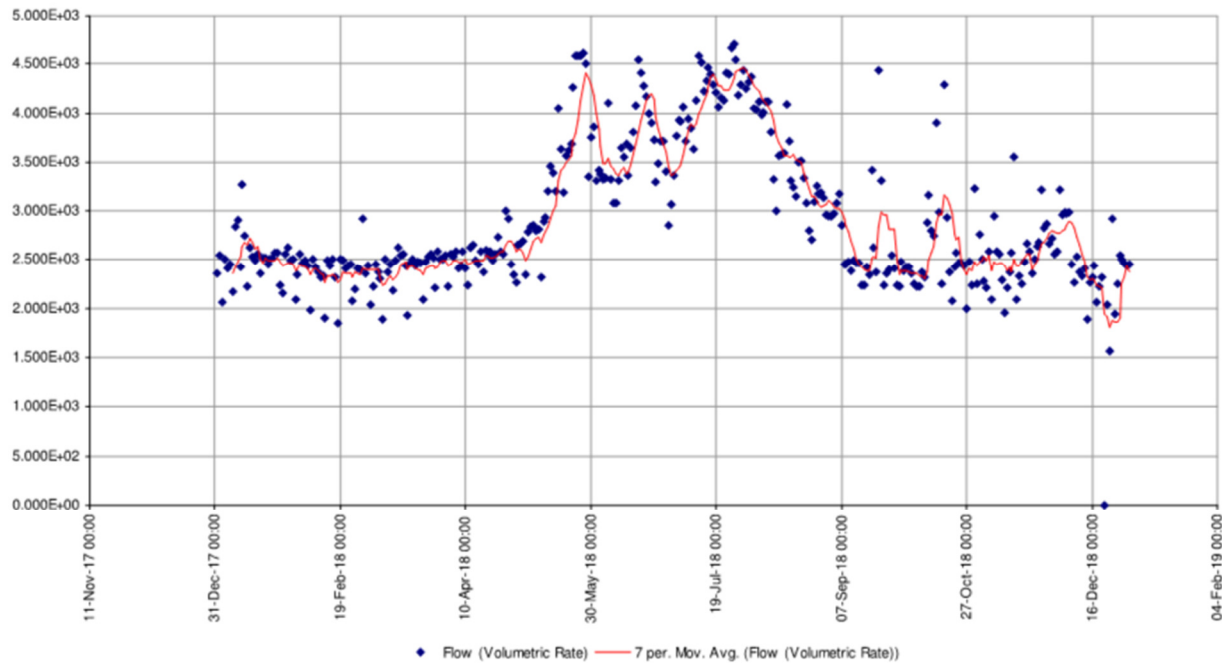
### 5.1 Water Consumption

**Table 1: Average daily water consumption by month and quarter.**

<b>Item</b>	<b>Average Daily Consumption (m<sup>3</sup>/d)</b>
<b>Observed</b>	
- Jan	2508
- Feb	2365
- Mar	2389
- Quarter 1	2422
<b>Observed</b>	
- Apr	2530
- May	3412
- Jun	3632
- Quarter 2	3194
<b>Observed</b>	
- Jul	4148
- Aug	3556
- Sep	2667
- Quarter 3	3467
<b>Observed</b>	
- Oct	2596
- Nov	2546
- Dec	2365
- Quarter 4	2502
<b>Observed</b>	
- Annual	2898

### Chart (CH-004)

Start Date: 01-Jan-2018 00:00:00  
End Date: 31-Dec-2018 23:59:59  
System: Chemainus Drinking Water  
Project: Regular Sampling  
Parameter Class: Physical  
Parameters: Flow (Volumetric Rate) [m3/d]



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Page 1 of 1

Figure 1: Average daily water consumption.

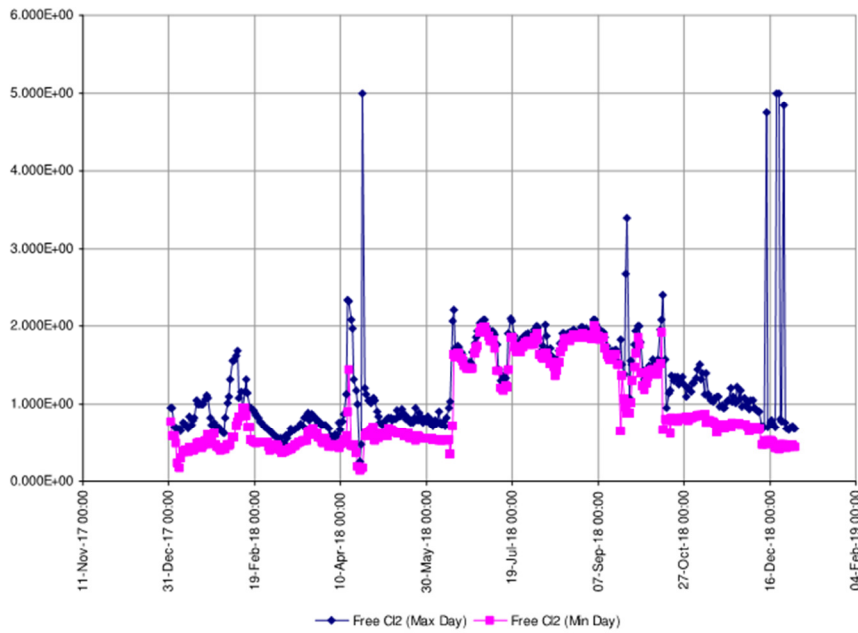
**5.2 Residual Chlorine**

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

Item	Minimum (mg/L)	Maximum (mg/L)	Percent of Samples in Compliance (%)	
			100 % >= 0.20 mg/L	100 % <= 4.00 mg/L
Compliance Requirement			100 % >= 0.20 mg/L	100 % <= 4.00 mg/L
<b>Observed</b>				
- Quarter 1	0.475	1.667	98.89	100.00
- Quarter 2	0.262	5.003	95.60	98.80
- Quarter 3	1.086	3.389	100.00	100.00
- Quarter 4	0.673	5.002	100.00	96.65
<b>Observed</b>				
- Annual	0.262	5.003	98.63	98.63

### Chart (CH-001)

Start Date: 01-Jan-2018 00:00:00  
End Date: 31-Dec-2018 23:59:59  
System: Chemainus Drinking Water  
Project: Regular Sampling  
Treatment Levels: Water - Finished  
Parameter Class: Chlorine  
Parameters: Free Cl2 (Max Day) [mg/L], Free Cl2 (Min Day) [mg/L]



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Page 1 of 1

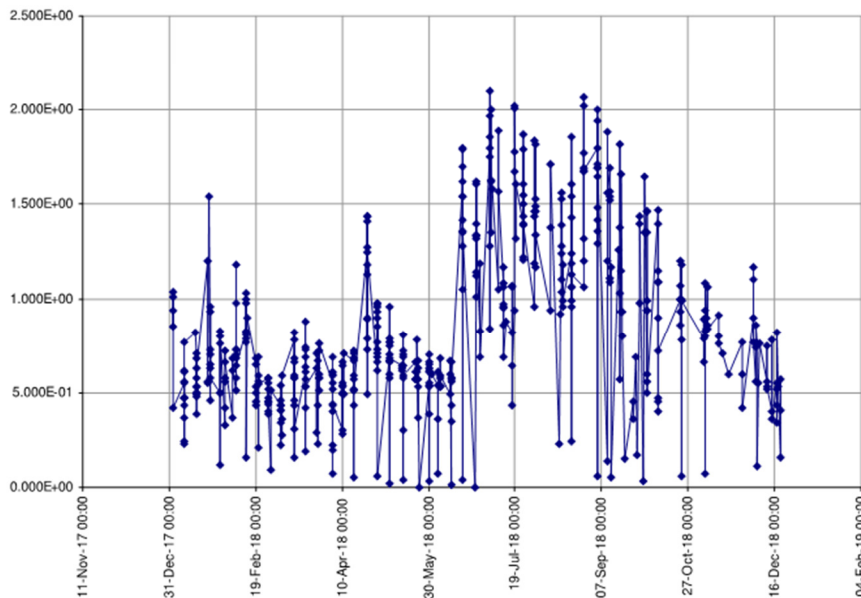
**Figure 2: Finished water daily minimum and maximum free chlorine residual.**

**Table 3: Distribution system minimum total chlorine residual by quarter.**

Item	Minimum (mg/L)	Percent of Samples in Compliance (%)
Compliance Requirements		100 % $\geq$ 0.05 mg/L
<b>Observed</b>		
- Quarter 1	0.090	100.00
- Quarter 2	0.0000	95.57
- Quarter 3	0.050	100.00
- Quarter 4	0.030	98.78
<b>Observed</b>		
- Annual	0.000	98.47

**Chart (CH-001)**

Start Date: 01-Jan-2018 00:00:00  
 End Date: 31-Dec-2018 23:59:59  
 System: Chemainus Drinking Water  
 Treatment Levels: Water - Distribution System  
 Parameter Class: Chlorine  
 Parameters: Total Cl2 (Instantaneous) [mg/L]



**Figure 3: Distribution system minimum total chlorine residual.**

**Figure 3: Distribution system total chlorine residual by quarter.**

**Table 4(a): Distribution system maximum free chlorine residual by quarter.**

Item	Maximum (mg/L)	Percent of Samples in Compliance (%)
Compliance Requirement		100% $\leq$ 4.00 mg/L
<b>Observed</b>		
- Quarter 1	1.560	100.00
- Quarter 2	1.640	100.00
- Quarter 3	1.990	100.00
- Quarter 4	1.660	100.00
<b>Observed</b>		
- Annual	1.990	100.00

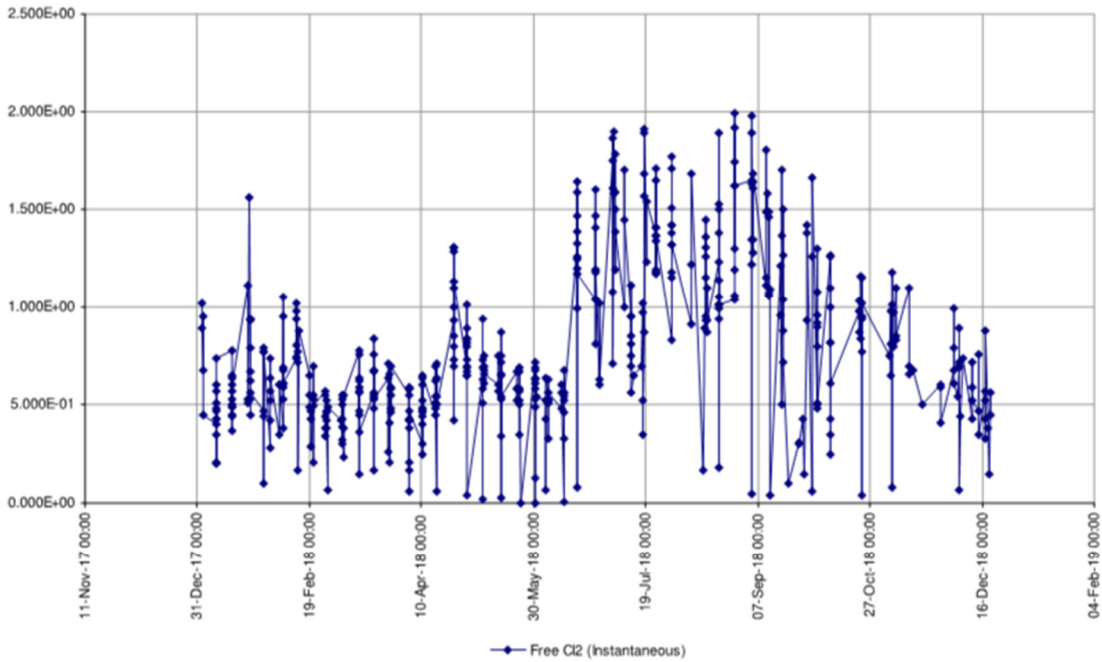
**Table 4(b): Distribution system minimum free chlorine residual by quarter (VIHA Proposed Standard).**

Item	Minimum (mg/L)	Percent of Samples in Compliance (%)
Compliance Requirements		100 % $\geq$ 0.2 mg/L 100% $\leq$ 4.0
<b>Observed</b>		
- Quarter 1	0.060	95.92
- Quarter 2	0.000	92.31
- Quarter 3	0.040	95.56
- Quarter 4	0.040	94.05
<b>Annual</b>	0.000	94.44



### Chart (CH-001)

Start Date: 01-Jan-2018 00:00:00  
End Date: 31-Dec-2018 23:59:59  
System: Chemainus Drinking Water  
Treatment Levels: Water - Distribution System  
Parameter Class: Chlorine  
Parameters: Free Cl2 (Instantaneous) [mg/L]



10/25/2019 1:41:03 PM

Page 1 of 1

Figure 4: Distribution system maximum free chlorine residual.

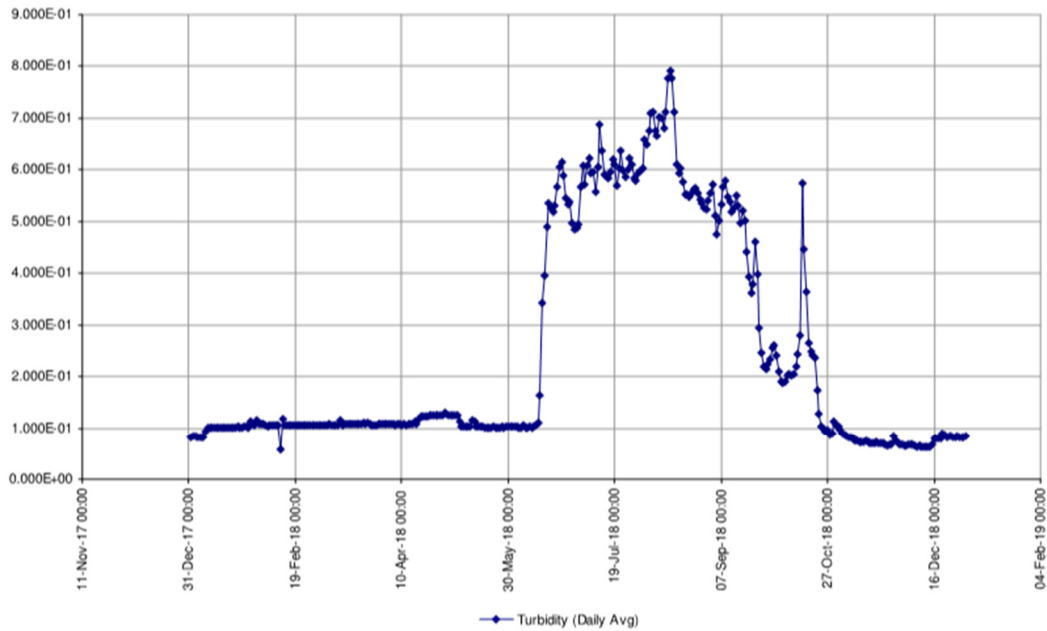
### 5.3 Turbidity

**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)
Compliance Requirement			
<b>Observed</b>			
- Jan	0.127	100.00	100.00
- Feb	0.139	100.00	100.00
- Mar	0.131	100.00	100.00
- Quarter 1	0.139	100.00	100.00
<b>Observed</b>			
- Apr	0.138	100.00	100.00
- May	0.138	100.00	100.00
- Jun	0.616	100.00	100.00
- Quarter 2	0.616	100.00	100.00
<b>Observed</b>			
- Jul	0.687	100.00	100.00
- Aug	0.792	100.00	100.00
- Sep	0.579	100.00	100.00
- Quarter 3	0.792	100.00	100.00
<b>Observed</b>			
- Oct	0.619	100.00	100.00
- Nov	0.141	100.00	100.00
- Dec	0.100	100.00	100.00
- Quarter 4	0.619	100.00	100.00
<b>Observed</b>			
- Annual	0.792	100.00	100.00

### Chart (CH-001)

Start Date: 01-Jan-2018 00:00:00  
End Date: 31-Dec-2018 23:59:59  
System: Chemainus Drinking Water  
Project: Regular Sampling  
Treatment Levels: Water - Finished  
Parameter Class: Physical  
Parameters: Turbidity (Daily Avg) [NTU]



10/10/2019 2:46:32 PM

Page 1 of 1

Figure 5: Finished water turbidity.

### 5.4 Coliforms

**Table 6: Distribution system maximum total coliforms by quarter.**

Item	Maximum (CFU/100 mL)	Percentage of Samples in Compliance (%)	
		100% < 10 MPN/100 mL	>90% < 1 MPN/100 mL
Compliance Requirement		100% < 10 MPN/100 mL	>90% < 1 MPN/100 mL
<b>Observed</b>			
- Quarter 1	0.000	100.00	100.00
- Quarter 2	1.000	100.00	96.97
- Quarter 3	0.000	100.00	100.00
- Quarter 4	0.000	100.00	100.00
<b>Observed</b>			
- Annual	1.000	100.00	100.00

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

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

## 5.5 Cysts

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

<b>Item</b>	<b>Maximum (Cysts/100 L)</b>
Compliance Requirement	0 Cysts / 100 L
<b>Observed</b>	
- Quarter 1	No Data
- Quarter 2	No Data
- Quarter 3	0.000
- Quarter 4	No Data
<b>- Annual</b>	0.000

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

<b>Item</b>	<b>Maximum (Cysts/100 L)</b>
Compliance Requirement	0 Cysts / 100 L
<b>Observed</b>	
- Quarter 1	No Data
- Quarter 2	No Data
- Quarter 3	0.000
- Quarter 4	No Data
<b>- Annual</b>	0.000

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

Item	Minimum (Log Reduction)	Percent of Samples in Compliance (%)
Compliance Requirement [1]		Jan 1 -- Jun 13 100 % $\geq$ 1.5 Log Jun 14 – Oct 15 100 % $\geq$ 3.0 Log Oct 16 – Dec 31 100% > 1.5 Log
<b>Observed</b> - Quarter 1	1.300	99.65
- Quarter 2	1.340	99.52
- Quarter 3	25.40	100.00
- Quarter 4	1.560	100.00
<b>Observed</b> - Annual	1.300	99.82

[1] Compliance requirements vary for log reduction of *Giardia* cysts depending on the whether the source water is from the ground or surface supply.

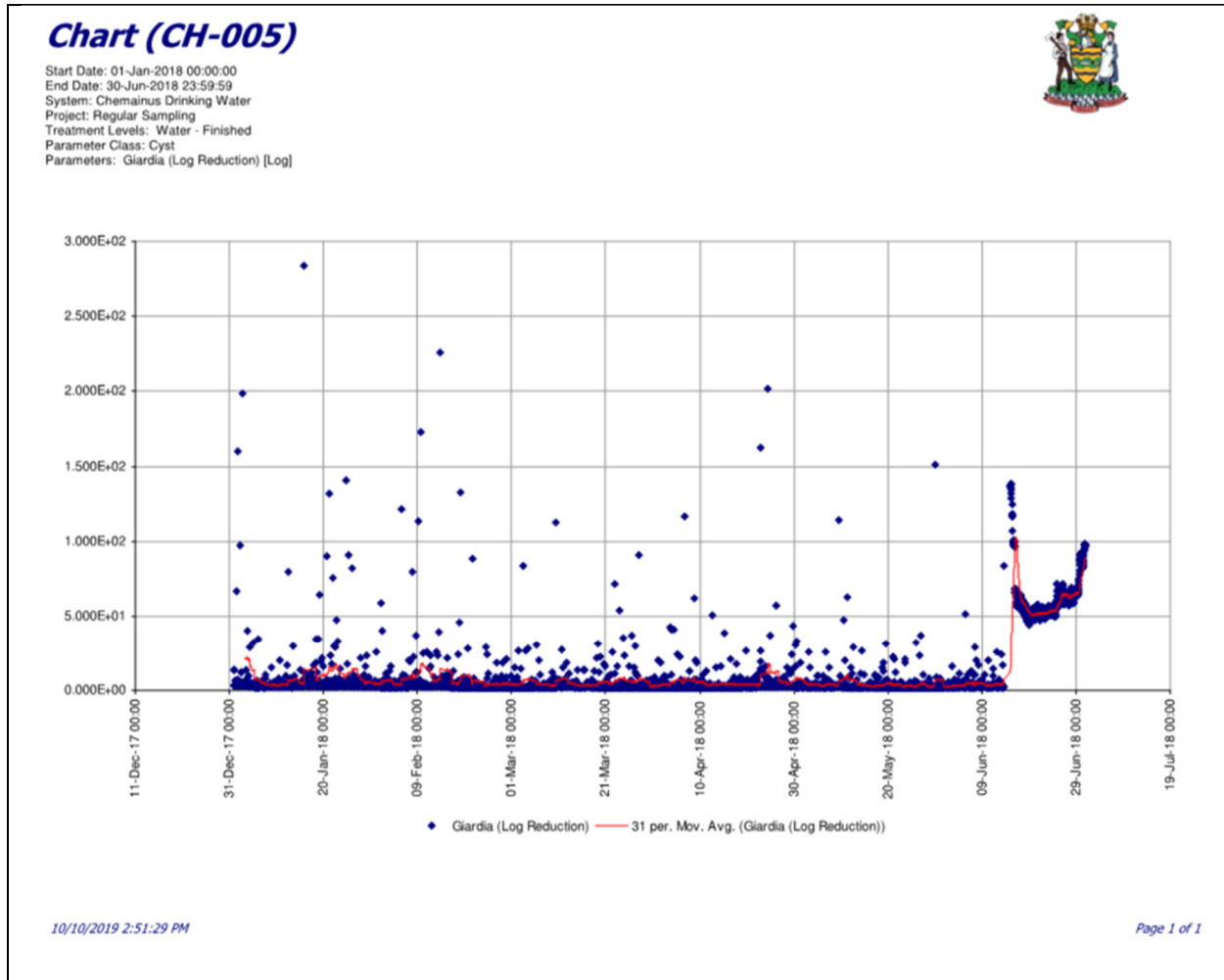


Figure 6: Giardia log reduction (Jan 1 to Jun 30).

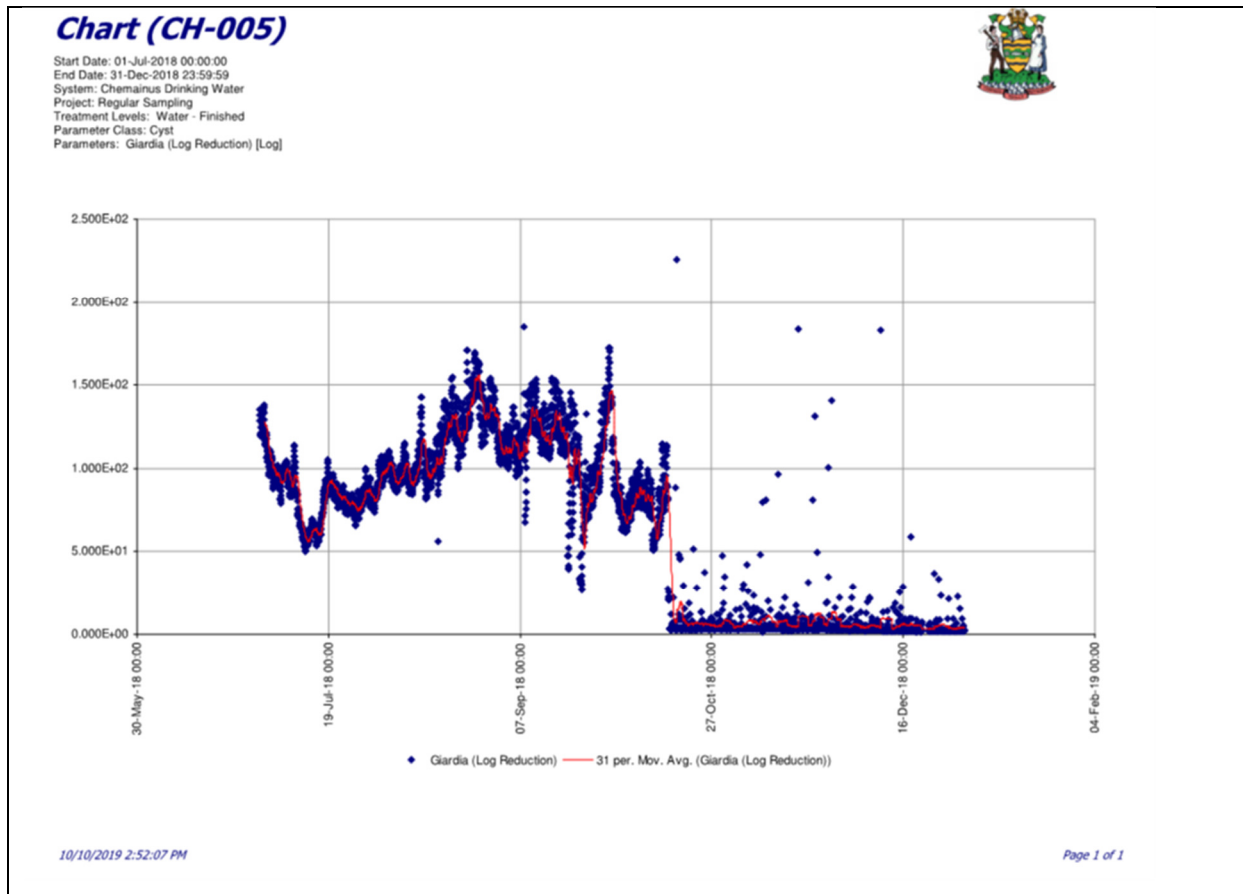


Figure 7: *Giardia* log reduction (July- Dec 31)

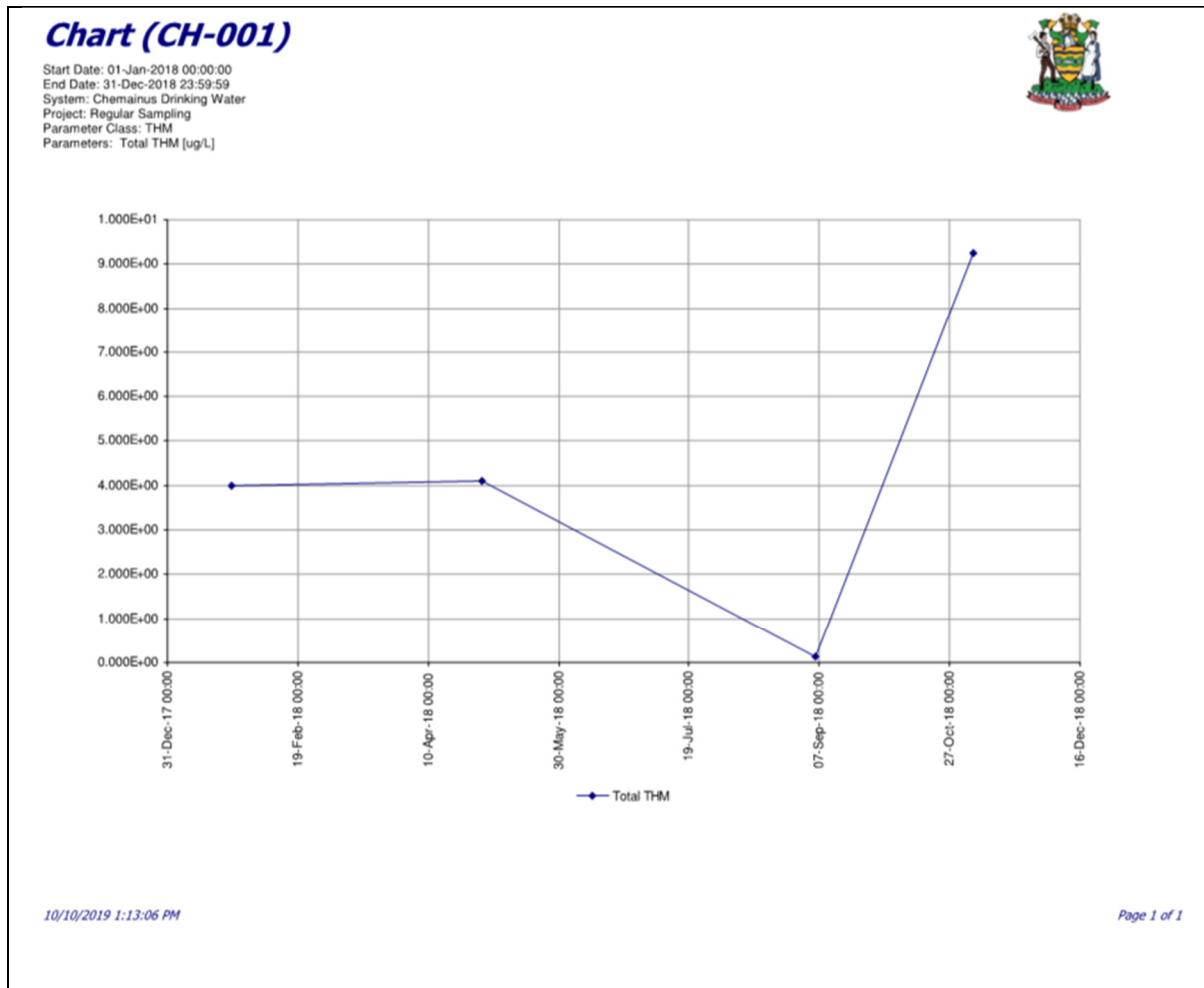


## 5.6 THMs

**Table 11: Finished water maximum THMs by quarter.**

Item	Maximum (ug/L)	Percent of Samples in Compliance (%)
CDWQG Requirements [3]		100 % <= 100 ug/L
<b>Observed</b>		
- Quarter 1	4.00	100.00
- Quarter 2	4.110	100.00
- Quarter 3	0.122	100.00
- Quarter 4	9.260	100.00
<b>Observed</b>		
- Annual	9.260	100.00

[3] 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.



**Figure 8: Finished water THMs.**

### 5.7 Miscellaneous Parameters

**Table 12: 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 [3]	All parameters met CDWQG limits with the exception of pH which did not meet the aesthetic objective.

[3] 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 Bannon supply.

## **6 Future Improvements**

None proposed at this time

## **7 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 Operations Manager - Utilities

CR/cr

Enclosures