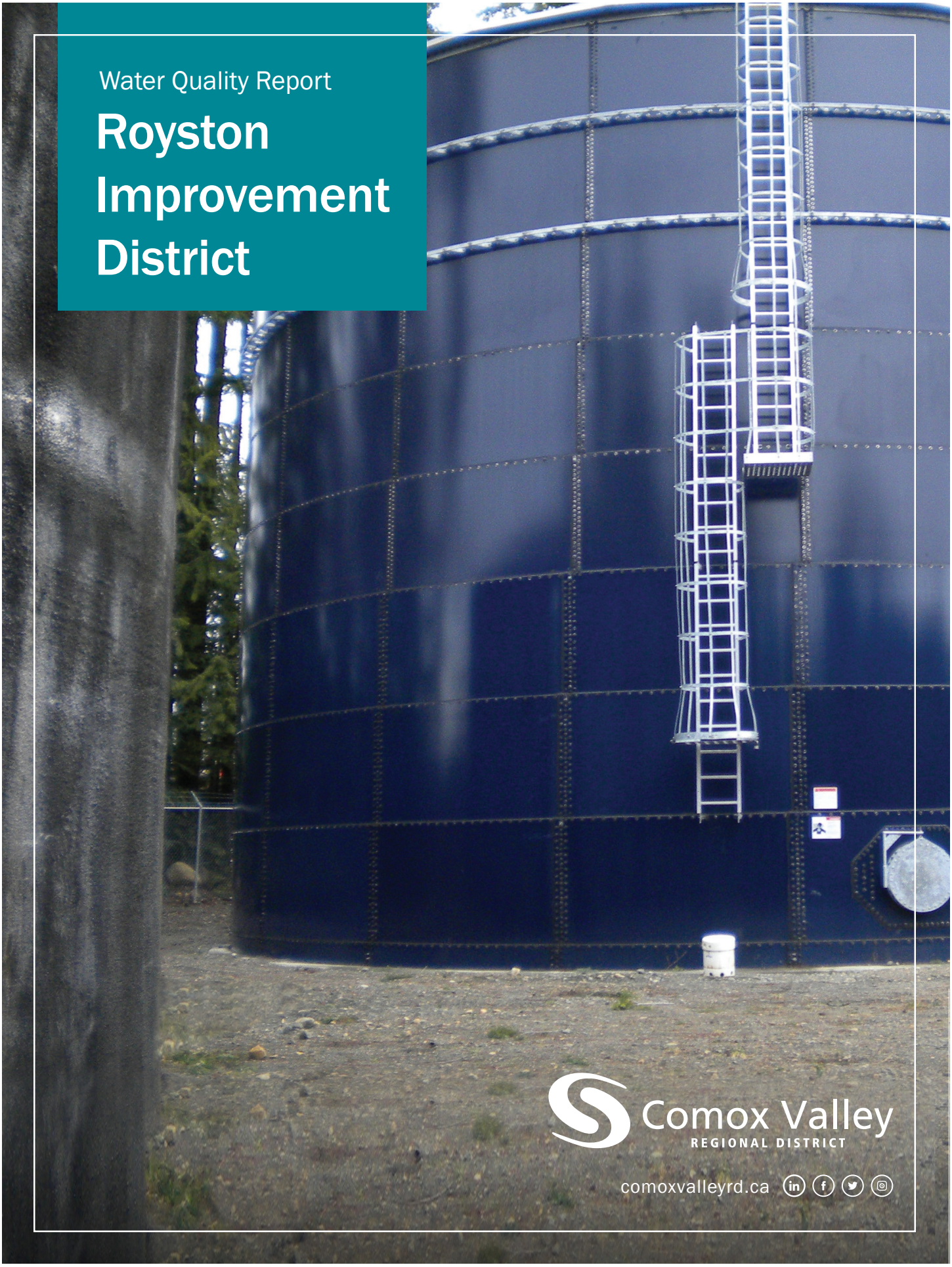
Water Quality Report

Royston Improvement District



Comox Valley
REGIONAL DISTRICT

comoxvalleyrd.ca

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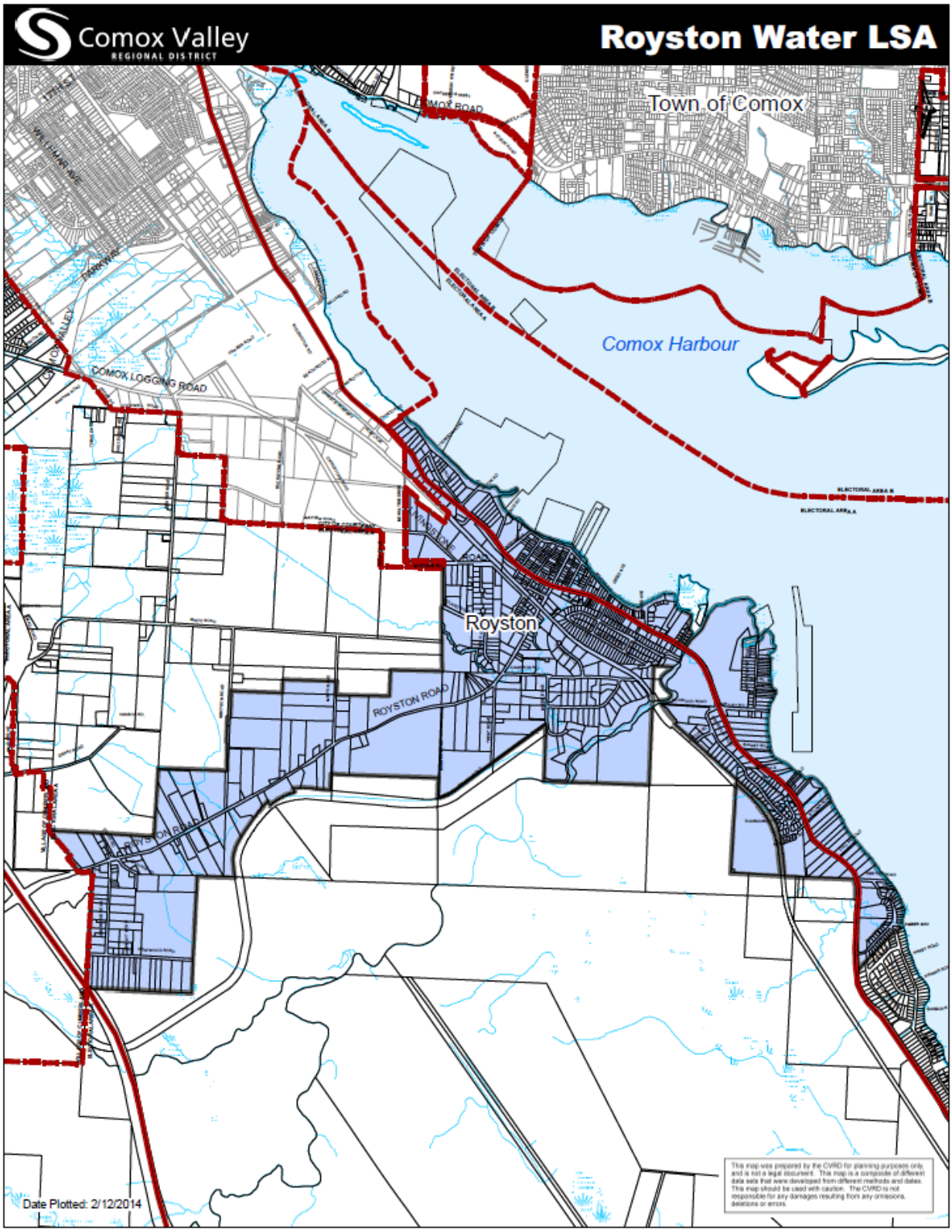
"The CVRD's role is to provide a reliable source of safe, high quality drinking water to homes and businesses. This includes acquiring and maintaining the water supply, treating it to ensure quality and delivering it - all at a reasonable cost"

-Mike Herschmiller, Manager of Water Services

Map of Service Area



Introduction

The Comox Valley Regional District (CVRD) strives to provide high quality drinking water to the Royston Water Local Service Area, through responsible operation, monitoring, and management of the water system. The CVRD is regulated by Island Health as part of the Ministry of Health for its activities as a potable water supplier. Under the *Drinking Water Protection Act* (DWP Act), the CVRD is now required to report annually on water quality for the Royston Drinking Water System. This report covers the period from January 1 to December 31, 2016 and includes information on water quality, consumption, maintenance and capital projects.

Figure 1: Royston Chlorination Station.

The Royston Water Service provides domestic water to approximately 2,100 residents located in the CVRD Electoral Area 'A'. The service is owned and operated by the CVRD and is funded through a combination of frontage tax and user rates.

Treated water is supplied for the service via a transmission main from the Village of Cumberland. Once water enters the Royston system it is given a secondary dose of chlorine prior to distribution. The system consists of two reservoirs and five pressure reducing valve chambers.

Operations

Goals

To provide high quality drinking water to all customers through efficient and effective disinfection and distribution operations.

Water Quality Summary

	2015	2016	Target
Water Disinfection			
Chlorine Residual (mg/L)-Kentwood	0.61	0.89	<2.0
Chlorine Residual (mg/L)- Royston Reservoir	0.68	1.08	<2.0
Trihalomethanes (mg/L)	0.075	0.034	<0.1
Residual Disinfection			
Chlorine residual- distribution system (mg/L)	0.47	0.84	>0.20
Total Coliforms (positive samples)	1	0	0
E.Coli (positive samples)	0	0	0
Canadian Drinking Water Quality Guidelines			
Source Water Turbidity (average NTU)	0.55	0.56	<1.0
Distribution Water Temperature (Celsius)	14.3	10.7	15
Distribution Water pH	7.10	7.01	6.5-8.5

The Ministry of Health regulates municipal drinking water quality through the DWP Act and the *Drinking Water Protection Regulation* (the Regulation). The DWP Act and Regulation are administered by regional health authorities, and for the CVRD, the administering authority is Island Health. Both the DWP Act and Regulation set out certain requirements for drinking water operators and suppliers to ensure the provision of safe drinking water to their customers.

In the Royston system, treated water is received via a transmission main from the Village of Cumberland and is given a secondary dose of chlorine prior to distribution. After the water is re-chlorinated it proceeds into the distribution system, either directly to the Kentwood Road area or via a series of reservoirs and pressure reducing valves. The CVRD takes weekly water quality samples at five fixed locations within the distribution system, to ensure that water is meeting provincial objectives. Annual testing for distribution by-products is taken from the Royston reservoir and an annual water chemistry report is completed. A summary and description of water quality results are described below.

Disinfection

All water supply systems governed by Island Health that are using surface water are required to adhere to provincial 4-3-2-1-0 surface water treatment objectives to ensure that the water treatment process is effectively killing disease causing viruses, bacteria and parasites.

Currently the source water for the Royston system is already treated by the Village of Cumberland and is compliant with provincial regulations. However for water quality assurance purposes, prior to the water entering the Royston system, water is given a secondary dose of chlorine.

By dosing the water with chlorine, a free chlorine residual is established throughout the distribution network to help prevent bacteriological regrowth and cross contamination during storage. The free chlorine residual is an indicator of the effectiveness of disinfection within the distribution system. The CVRD strives to maintain a free chlorine residual above 0.2mg/L at the end of the system. The CVRD regularly monitors the chlorine residual throughout the distribution network at five fixed locations. The average results shown in Figure 3 below.

Figure 2: Chlorine Injection at the Royston Chlorination Station.

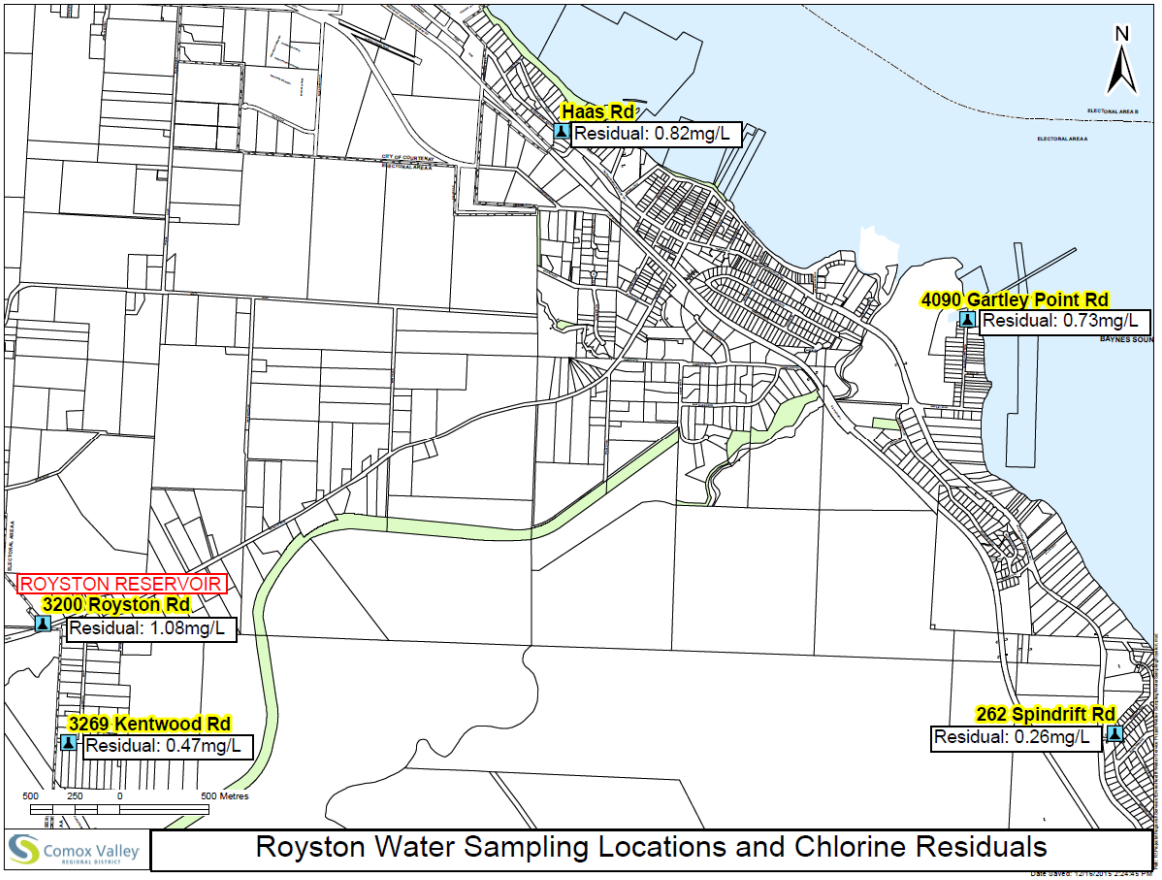


Figure 3: Average Chlorine Residual at the Royston Sampling Locations

A by-product of chlorination can be Trihalomethanes (THM). There are four types of THM's that contribute to the total THM's. Chloroform is the most common THM and is formed when natural organic matter reacts with chlorine and/or bromine in disinfected water. The guidelines require that the total THM's for drinking water must be less than 0.1mg/L, Table No. 1 below shows the total THM's at the Royston reservoir.

Table No. 1: Total THM Concentration at the Royston Reservoir

Trihalomethanes	Royston Reservoir
Chloroform	0.034
Bromodichloromethane	<0.001
Dibromochlromethane	<0.001
Bromoform	<0.001
Total THMs (mg/L)	**0.034**

Bacteria

E.Coli and total coliform bacteria are microorganisms that if present in water samples indicate possible contamination with sewage or animal wastes. Chlorination helps to remove harmful pathogens within the water supply network. Table No. 2 below shows that within the Royston water distribution system for 2016, there were zero positive results found for E.Coli and total coliforms.

Table No. 2: Bacteriological Standards and Sampling Results

Parameter	Standard	Result
E.Coli	No detectable E.Coli per 100mL	0 exceedances per 36 samples
Total Coliform Bacteria	At least 90% of samples have no detectable total coliform bacteria per 100 ml and no sample has more than 10 total coliform bacteria per 100 ml	0 exceedances per 36 samples

Canadian Drinking Water Guidelines

Health Canada develops the *Canadian Drinking Water Guidelines*. These are guidelines for limits on microbial, chemical, physical and radiological substances in drinking water. In the guidelines, health-based limits are identified for each substance as maximum allowable concentrations. The guidelines also assign aesthetic objectives to substances that do not cause risk to human health, but will influence consumer acceptance of the water based on factors such as taste, odour and colour. Table No. 3 shows the Royston reservoir drinking water concentration averages for multiple parameters compared to the guideline concentrations. In 2016, the system was below all maximum allowable concentrations and aesthetic objectives as illustrated in Table No. 3.

Table No. 3: Chemical and Physical Parameters at Royston Reservoir Compared to Guideline Concentrations

Parameter	Royston Reservoir (mg/L)	Guideline Concentration (mg/L)
Aluminum	0.271	≤0.1
Arsenic	<0.001	≤0.01
Barium	0.0006	≤1.0
Boron	0.025	≤5.0
Chloride	4.40	250
Chromium	<0.00005	≤0.05
Copper	0.0033	1
Fluoride	0.028	≤1.5
Iron	0.107	≤0.30
Lead	0.000132	≤0.01
Manganese	0.003	≤0.05
Nitrite (as N)	0.070	10
Selenium	<0.00001	≤0.05
Sodium	3.4	≤200
Sulphate	1.4	<500
Zinc	0.0065	≤5

Turbidity

The *Canadian Drinking Water Guidelines* also require the turbidity to be below 1 NTU. Turbidity is the measure of relative clarity of a liquid. Clarity is important when producing drinking water for human consumption and in many manufacturing uses. The average turbidity at the Royston reservoir was 0.56 NTU.

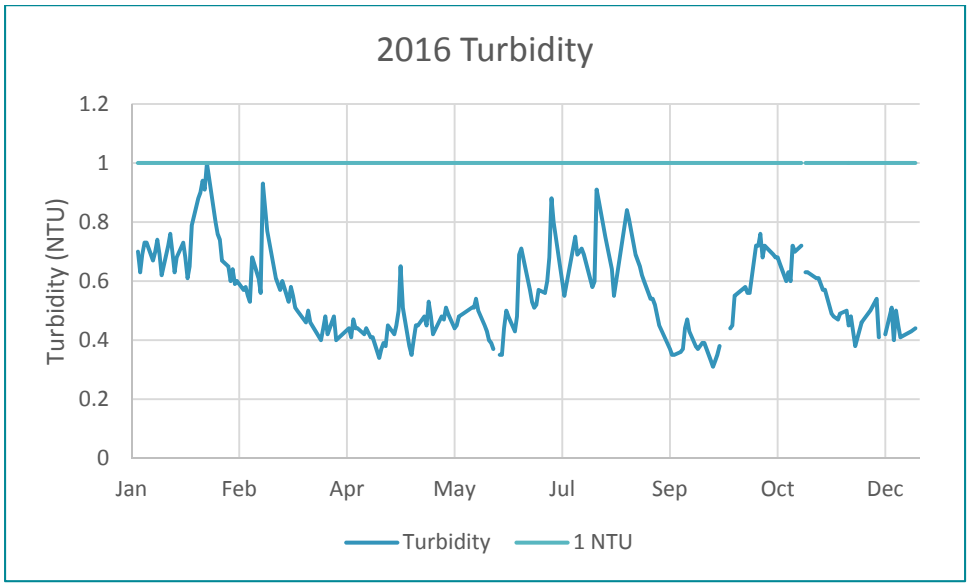


Figure 4: Source Water Turbidity

Temperature

Temperature is described as an aesthetic objective (a parameter that may impair the taste, smell or colour of water) and physical characteristic of water. Gradual variations in water temperature occur throughout the seasons, however signifcant changes in water temperature can upset chlorination and chemical water treatment processess. The guidelines recommend water temperature to be less than 15˚C. The average temperature for the distribution water was 10.7˚C.

pH

The pH of water is a measure it water acidity. pH has minimal impact for water consumers and varies greatly depending on the water source. However, pH is very important for many operational water quality parameters. The *Canadian Drinking Water Guidelines* recommend the pH ranging between 6.5-8.5. in 2016, the the average pH within the distribution system was 7.01.

Planning

Goals

To ensure effective long-term planning and management programs are in place to meet the needs of all users groups while minimizing operation and infrastructure costs.

Consumption

The average daily water consumption for the system was 745m^3/day. A comparison of demands from in the past ten years reveal a decrease in the average daily demand while the maximum daily

demand has remained almost unchanged. Over the past ten years the highest daily demand has occurred within June, July or August, illustrating that water consumption increases in the summer months. Figure 5 shows the total yearly consumption for Royston from 2010 to present.

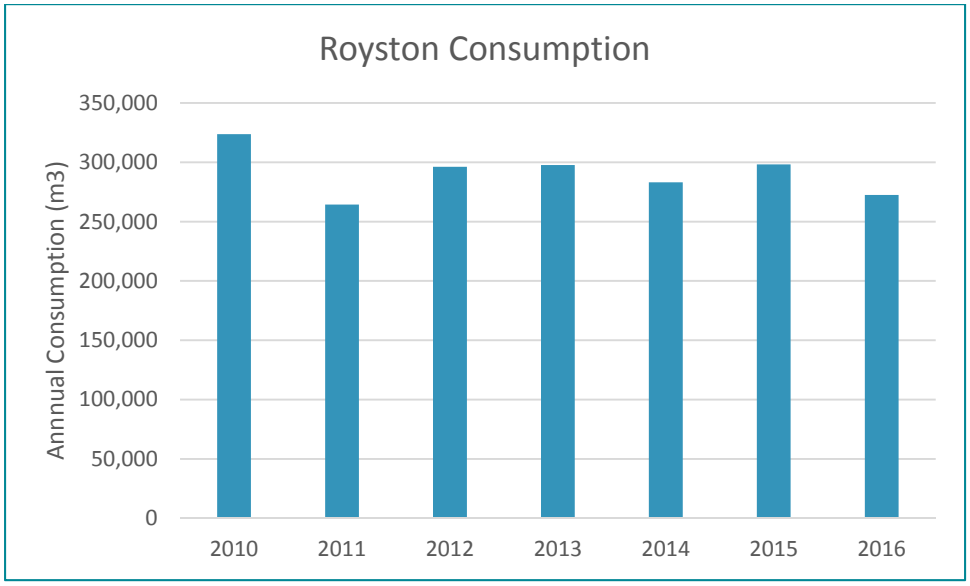


Figure 5: Royston Yearly Consumption

Maintenance

The Royston Water System is owned and operated by the CVRD. Water services staff consists of seven operators with varying ranges of certification. Each operator is registered with the environmental operator's certification program within BC and is required to remain in good standing by taking yearly continuing education courses.

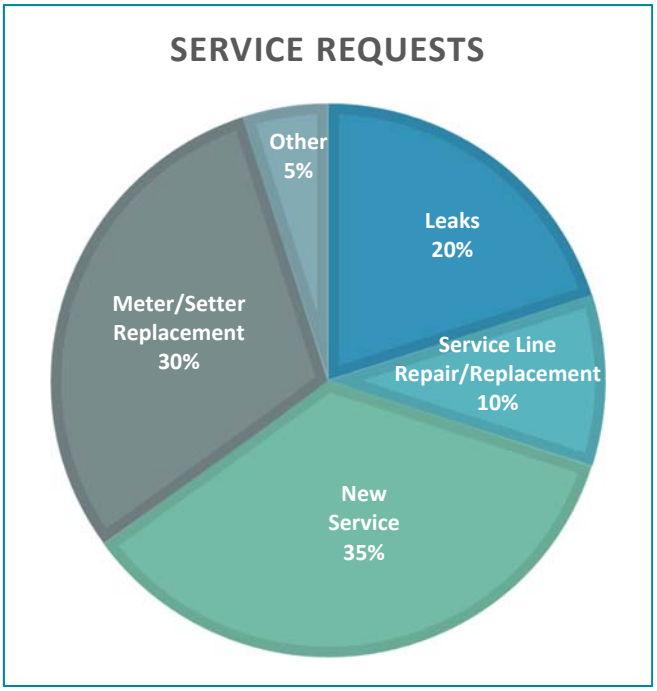


Figure 6: Service Requests by Category

The CVRD carries out regular and routine maintenance of the entire Royston system, to ensure continued operation and supply of safe and clean water to all users. The chlorination facility, distribution lines and reservoirs are regularly inspected and maintained.

Every service request within the system is investigated by the regional districts waterworks operations staff and appropriate action is taken. Figure 6 identifies the breakdown of the various types of service requests received by waterworks staff.

Financial

In 2016, the CVRD supplied a total of 272,500m^3 of water. The sale of bulk water by the Village of Cumberland and the purchase of bulk water by the CVRD, are included in a water agreement. On February 24, 2015 the Village of Cumberland and the CVRD signed a new water agreement. The bulk water rate is to remain at $0.73 per cubic meter until the end of 2017 when the current water agreement expires. Within the agreement the CVRD acknowledged that the Village of Cumberland has water capacity limitations and agreed to actively investigate switching to an alternative water source for the Royston Water Local Service Area, with the goal of disconnecting from the Village of Cumberland water supply.

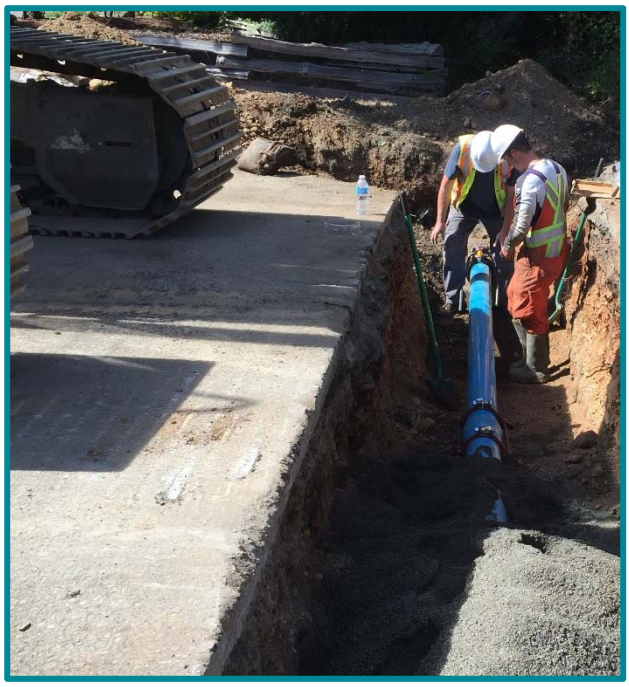


Figure 7: Watermain Replacement

In 2016, the Royston alternate water supply study was completed and the study identified possible alternate sources for water for the system. Further work in 2017 is required prior to determining the future water source for the service.

Projects for 2016 included demolition of the old concrete reservoir at 3200 Royston Rd. Completion of a pressure zone study and construction of a chlorination building on the site are required pending the outcomes of the alternate source water study work to help improve system operations.

Planned projects for 2017 include further work on identifying an alternate water source for Royston, development of an asset management plan for the service and replacement of a water main on Gartley and Gartley Point Rd. to improve fire flows.

2016 Accomplishments

- ✓ Completion of the initial Royston Alternate Source Water Study
- ✓ Removal of the old Royston reservoir

2017 Objectives

- Gartley fire flow improvements
- Further alternate source water and pressure zone work
- Complete asset management planning for the service

Date	SOURCE WATER	DISTRIBUTION SYSTEM													
		Chlorine Residual (mg/L)						E.Coli				Total Coliforms			
	Turbidity (NTU)	Reservoir Outlet	Kentwood Outlet	3269 Kentwood	262 Spindrift	3771 Haas	4090 Gartley	4098 Gartley Pt.	250 Spindrift	3269 Kentwood	Haas Road	4098 Gartley Pt.	250 Spindrift	3269 Kentwod	Haas Road
01-Jan-16															
02-Jan-16															
03-Jan-16															
04-Jan-16	0.7	1.19	0.33			0.69					<1				<1
05-Jan-16	0.63	1.1	0.96												
06-Jan-16	0.69		0.86												
07-Jan-16	0.73	0.96	0.65												
08-Jan-16	0.73	0.95	0.55												
09-Jan-16															
10-Jan-16															
11-Jan-16	0.67	1	1.1	0.46						<1				<1	
12-Jan-16	0.7	0.95	1.57												
13-Jan-16	0.74	1.08	0.59												
14-Jan-16	0.69		0.9												
15-Jan-16	0.62	0.95	0.8												
16-Jan-16															
17-Jan-16															
18-Jan-16	0.72	0.99	1.28		0.18				<1				<1		
19-Jan-16	0.76	0.91	0.85												
20-Jan-16	0.7	0.99	0.86												
21-Jan-16	0.63	0.95	0.9												
22-Jan-16	0.68	0.98	0.89												
23-Jan-16															
24-Jan-16															
25-Jan-16	0.73	0.93	0.86				0.41	<1				<1			
26-Jan-16	0.68	1.02	0.88												
27-Jan-16	0.61	1.04	1.06												
28-Jan-16	0.65	1.02	0.91												
29-Jan-16	0.79	1.05	0.69												
30-Jan-16															
31-Jan-16															
01-Feb-16	0.88	0.96	0.96			0.74					<1				<1
02-Feb-16	0.9	0.92	0.94												
03-Feb-16	0.94	1.04	0.88												
04-Feb-16	0.91	1.08	1.11												
05-Feb-16	1	1.13	1.01												
06-Feb-16															
07-Feb-16															

Date	SOURCE WATER	DISTRIBUTION SYSTEM													
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08-Feb-16															
09-Feb-16	0.8	1.1	0.97	0.39						<1				<1	
10-Feb-16	0.76	1.17	0.98												
11-Feb-16	0.74	1.19	0.82												
12-Feb-16	0.67	1.15	0.94												
13-Feb-16															
14-Feb-16															
15-Feb-16	0.65	1.03	0.89												
16-Feb-16	0.6	1.04	0.87		0.21				<1				<1		
17-Feb-16	0.64	1.16	0.87												
18-Feb-16	0.59	0.93	0.9												
19-Feb-16	0.6	0.97	0.89												
20-Feb-16															
21-Feb-16															
22-Feb-16	0.57	0.92	0.84				0.78	<1				<1			
23-Feb-16	0.58	1.07	0.8												
24-Feb-16	0.55	1	0.82												
25-Feb-16	0.53	1.02	0.94												
26-Feb-16	0.68	1.24	1												
27-Feb-16															
28-Feb-16															
29-Feb-16	0.61	1	0.69												
01-Mar-16	0.56	1	0.74												
02-Mar-16	0.93	1.46	0.75			0.35					<1				<1
03-Mar-16															
04-Mar-16	0.77	1.05	0.87												
05-Mar-16															
06-Mar-16															
07-Mar-16				0.44						<1				<1	
08-Mar-16	0.61	1.05	1.06												
09-Mar-16															
10-Mar-16	0.57	0.97	1.22												
11-Mar-16	0.6	0.88	0.9												
12-Mar-16															
13-Mar-16															
14-Mar-16	0.53	0.93	1.22		0.49				<1				<1		
15-Mar-16	0.58	0.94	0.6												
16-Mar-16	0.55	0.92	0.85												

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17-Mar-16	0.51	0.97	0.3												
18-Mar-16	0.5	0.98	0.3												
19-Mar-16															
20-Mar-16															
21-Mar-16							0.83	<1				<1			
22-Mar-16	0.46	0.96	0.88												
23-Mar-16	0.5	1.05	0.97												
24-Mar-16	0.46	0.8	0.44												
25-Mar-16															
26-Mar-16															
27-Mar-16															
28-Mar-16															
29-Mar-16	0.4		0.64												
30-Mar-16	0.44	1	0.72												
31-Mar-16	0.48	1	0.86												
01-Apr-16	0.42	1.36	1												
02-Apr-16															
03-Apr-16															
04-Apr-16	0.48		1.29			0.9					<1				<1
05-Apr-16	0.4	1.43	0.29												
06-Apr-16															
07-Apr-16															
08-Apr-16															
09-Apr-16															
10-Apr-16															
11-Apr-16	0.44	1.44	0.5	0.41						<1				<1	
12-Apr-16	0.41	1.54	0.83												
13-Apr-16	0.47	1.48	0.78												
14-Apr-16	0.44	1.53	0.42												
15-Apr-16	0.44	1.56	0.6												
16-Apr-16															
17-Apr-16															
18-Apr-16	0.42	1.5	0.47		0.14				<1				<1		
19-Apr-16	0.44	1.56	0.73												
21-Apr-16	0.41	1.57	0.51												
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25-Apr-16	0.34	1.14	0.9				0.88	<1				<1			
26-Apr-16	0.37	1.2	0.75												
27-Apr-16	0.39	1.13	0.37												
28-Apr-16	0.38	1.12	0.76												
29-Apr-16	0.45	1.04	1												
30-Apr-16															
01-May-16															
02-May-16	0.42	1.11	1.02			1					<1				<1
03-May-16	0.45	1.14	0.79												
04-May-16	0.5	0.97	0.94												
05-May-16	0.65	0.95	0.94												
06-May-16	0.51	1	0.89												
07-May-16															
08-May-16															
09-May-16	0.38	0.97		0.86						<1				<1	
10-May-16	0.35	0.97	0.87												
11-May-16	0.4	1.07	0.83												
12-May-16	0.45	1.38	1.12												
13-May-16	0.45	1.31	1.23												
14-May-16															
15-May-16															
16-May-16	0.48	1.08	1.51		0.39				<1				<1		
17-May-16	0.45	1.12	1.27												
18-May-16	0.53	1.15	0.83												
19-May-16	0.48	1.1	0.64												
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21-May-16															
22-May-16															
23-May-16															
24-May-16	0.48	1.03	0.62				0.72	<1				<1			
25-May-16	0.47	1.1	1.09												
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27-May-16	0.49	1.01	1.03												
28-May-16															
29-May-16															
30-May-16	0.44	0.99	1.2												
31-May-16	0.45	0.95	0.85												
01-Jun-16	0.48	0.96	1.02												

Date	SOURCE WATER	DISTRIBUTION SYSTEM													
		Chlorine Residual (mg/L)						E.Coli				Total Coliforms			
	Turbidity (NTU)	Reservoir Outlet	Kentwood Outlet	3269 Kentwood	262 Spindrift	3771 Haas	4090 Gartley	4098 Gartley Pt.	250 Spindrift	3269 Kentwood	Haas Road	4098 Gartley Pt.	250 Spindrift	3269 Kentwod	Haas Road
02-Jun-16															
03-Jun-16	0.49	0.97	0.93												
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05-Jun-16															
06-Jun-16						0.74					<1				<1
07-Jun-16	0.51	0.87	1.12												
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09-Jun-16	0.54	1.04	0.85												
10-Jun-16	0.5	0.95	0.29												
11-Jun-16															
12-Jun-16															
13-Jun-16	0.45	0.78	1.05	0.42						<1				<1	
14-Jun-16	0.43	0.65	1.09												
15-Jun-16	0.4	1	1.02												
16-Jun-16	0.39	1.2	0.65		0.15										
17-Jun-16	0.37	1.16	0.92												
18-Jun-16															
19-Jun-16															
20-Jun-16	0.35	1.28	0.84						<1				<1		
21-Jun-16	0.35	1.38	0.81												
22-Jun-16	0.44	1.44	0.85												
23-Jun-16	0.5	1.42	0.66												
24-Jun-16	0.48	1.2	0.94												
25-Jun-16															
26-Jun-16															
27-Jun-16	0.43	0.97	0.98				0.61	<1				<1			
28-Jun-16	0.48	1.03	0.92												
29-Jun-16	0.69	0.99	0.95												
30-Jun-16	0.71	1.19	0.97												
01-Jul-16															
02-Jul-16															
03-Jul-16															
04-Jul-16	0.57	1.39	0.94			1.13					<1				<1
05-Jul-16	0.53	1.37	0.79												
06-Jul-16	0.51	1.38	0.87												
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10-Jul-16															
11-Jul-16	0.56	1.3	0.75	0.67						<1				<1	
12-Jul-16	0.6	1.18	1.07												
13-Jul-16	0.68	1.05	0.9												
14-Jul-16	0.88	0.97	0.91												
15-Jul-16	0.8	1.12	0.8												
16-Jul-16															
17-Jul-16															
18-Jul-16	0.65	1.17	0.84						<1				<1		
19-Jul-16															
20-Jul-16	0.55	1.15	0.84												
21-Jul-16															
22-Jul-16	0.63	1.16	0.99												
23-Jul-16															
24-Jul-16															
25-Jul-16	0.75	1.36	0.85				1	<1				<1			
26-Jul-16	0.69	1.29	0.81												
27-Jul-16	0.7	1.28	0.99												
28-Jul-16	0.71	1.16	0.88												
29-Jul-16	0.69	1.18	0.91												
30-Jul-16															
31-Jul-16															
01-Aug-16											<1				<1
02-Aug-16	0.58	1.25	0.85			0.87									
03-Aug-16	0.6	1.1	0.97												
04-Aug-16	0.91	1.31	0.85												
05-Aug-16	0.87	1.24	1												
06-Aug-16															
07-Aug-16															
08-Aug-16	0.75	1.15	0.84	0.63						<1				<1	
09-Aug-16															
10-Aug-16															
11-Aug-16	0.64	1.11	1.03												
12-Aug-16	0.55	1.13	0.86												
13-Aug-16															
14-Aug-16															
15-Aug-16					0.42				<1				<1		
16-Aug-16															

Date	SOURCE WATER	DISTRIBUTION SYSTEM													
		Chlorine Residual (mg/L)						E.Coli				Total Coliforms			
	Turbidity (NTU)	Reservoir Outlet	Kentwood Outlet	3269 Kentwood	262 Spindrift	3771 Haas	4090 Gartley	4098 Gartley Pt.	250 Spindrift	3269 Kentwood	Haas Road	4098 Gartley Pt.	250 Spindrift	3269 Kentwod	Haas Road
17-Aug-16															
18-Aug-16	0.84	1.17	0.79												
19-Aug-16	0.81	1.12	1.33												
20-Aug-16															
21-Aug-16															
22-Aug-16	0.69	1.19	0.87				0.77	<1				<1			
23-Aug-16															
24-Aug-16	0.65	1.16	0.84												
25-Aug-16	0.62	1.29	1.11												
26-Aug-16	0.6	1.26	1.21												
27-Aug-16															
28-Aug-16															
29-Aug-16	0.54	1.19	0.85												
30-Aug-16	0.54	1.15	0.93												
31-Aug-16	0.52	1.09	0.95												
01-Sep-16															
02-Sep-16	0.45	1.13	0.95												
03-Sep-16															
04-Sep-16															
05-Sep-16															
06-Sep-16						0.74					<1				<1
07-Sep-16	0.37	1.16	0.73												
08-Sep-16	0.35	1.12	0.74												
09-Sep-16	0.35	1.13	0.86												
10-Sep-16															
11-Sep-16															
12-Sep-16	0.36	1.16	0.99	0.67						<1				<1	
13-Sep-16	0.37	1.3	1.12												
14-Sep-16	0.44	1.3	1.23												
15-Sep-16	0.47	1.3	0.95												
16-Sep-16	0.43	1.24	0.84												
17-Sep-16															
18-Sep-16															
19-Sep-16	0.38	1.2	0.96						<1				<1		
20-Sep-16	0.37	1.22	0.85												
21-Sep-16	0.38	1.12	0.85												
22-Sep-16	0.39	1.13	0.98												
23-Sep-16	0.39	1.1	0.81												

Date	SOURCE WATER	DISTRIBUTION SYSTEM													
		Chlorine Residual (mg/L)						E.Coli				Total Coliforms			
	Turbidity (NTU)	Reservoir Outlet	Kentwood Outlet	3269 Kentwood	262 Spindrift	3771 Haas	4090 Gartley	4098 Gartley Pt.	250 Spindrift	3269 Kentwood	Haas Road	4098 Gartley Pt.	250 Spindrift	3269 Kentwod	Haas Road
24-Sep-16															
25-Sep-16															
26-Sep-16	0.33	1.01	0.91				0.51	<1				<1			
27-Sep-16	0.31	0.9	0.9												
28-Sep-16	0.33	0.93	0.99												
29-Sep-16	0.35	0.98	1.05												
30-Sep-16	0.38	0.99	0.89												
01-Oct-16															
02-Oct-16															
03-Oct-16						0.81					<1				<1
04-Oct-16															
05-Oct-16	0.44	0.51	0.79												
06-Oct-16	0.45	63	0.74												
07-Oct-16	0.55	0.73	0.99												
08-Oct-16															
09-Oct-16															
10-Oct-16															
11-Oct-16															
12-Oct-16	0.58	1.32	0.73	0.1						<1				<1	
13-Oct-16	0.56	1.37	1.5												
14-Oct-16	0.56	1.3	0.76												
15-Oct-16															
16-Oct-16															
17-Oct-16	0.72	1.2	0.76		0.12				<1				<1		
18-Oct-16	0.72	0.93	0.96												
19-Oct-16	0.76	1.26	0.86												
20-Oct-16	0.68	1.25	0.8												
21-Oct-16	0.72	1.38	0.8												
22-Oct-16															
23-Oct-16															
24-Oct-16							0.39	<1				<1			
25-Oct-16	0.69	1.28	0.96												
26-Oct-16	0.68	1.27	0.86												
27-Oct-16	0.68	1.19	0.6												
28-Oct-16	0.66	1.15	0.97												
29-Oct-16															
30-Oct-16															
31-Oct-16	0.6	1.33	0.95			0.72					<1				<1

Date	SOURCE WATER	DISTRIBUTION SYSTEM													
		Chlorine Residual (mg/L)						E.Coli				Total Coliforms			
	Turbidity (NTU)	Reservoir Outlet	Kentwood Outlet	3269 Kentwood	262 Spindrift	3771 Haas	4090 Gartley	4098 Gartley Pt.	250 Spindrift	3269 Kentwood	Haas Road	4098 Gartley Pt.	250 Spindrift	3269 Kentwood	Haas Road
01-Nov-16	0.63	1.45	1.04												
02-Nov-16	0.6	1.42	1												
03-Nov-16	0.72	1.41	0.97												
04-Nov-16	0.7	1.28	0.86												
05-Nov-16															
06-Nov-16															
07-Nov-16	0.72	1.64	0.9	0.23						<1				<1	
08-Nov-16															
09-Nov-16	0.63	1.4	0.81												
10-Nov-16	0.63	1.4	1.27												
11-Nov-16															
12-Nov-16															
13-Nov-16															
14-Nov-16	0.61	1.66	0.61						<1				<1		
15-Nov-16	0.61	1.56	1.29												
16-Nov-16															
17-Nov-16	0.57	1.54	0.54												
18-Nov-16	0.57	1.84	0.67												
19-Nov-16															
20-Nov-16															
21-Nov-16	0.49	1.67	0.52				1.18	<1				<1			
22-Nov-16	0.48	1.63	0.44												
23-Nov-16															
24-Nov-16	0.47	1.58	0.84												
25-Nov-16	0.49	1.42	0.73												
26-Nov-16															
27-Nov-16															
28-Nov-16	0.5	1.67	0.9												
29-Nov-16	0.45	1.54	0.81												
30-Nov-16	0.48	1.6	0.88												
01-Dec-16															
02-Dec-16	0.38	1.48	0.69												
03-Dec-16															
04-Dec-16															
05-Dec-16	0.46	1.6	0.5			1.15					<1				<1
06-Dec-16	0.47	1.67	0.54												
07-Dec-16	0.48	1.81	0.7												
08-Dec-16															

Date	SOURCE WATER	DISTRIBUTION SYSTEM													
		Chlorine Residual (mg/L)						E.Coli				Total Coliforms			
	Turbidity (NTU)	Reservoir Outlet	Kentwood Outlet	3269 Kentwood	262 Spindrift	3771 Haas	4090 Gartley	4098 Gartley Pt.	250 Spindrift	3269 Kentwood	Haas Road	4098 Gartley Pt.	250 Spindrift	3269 Kentwod	Haas Road
09-Dec-16	0.5	1.75	0.65												
10-Dec-16															
11-Dec-16															
12-Dec-16	0.54	2	0.54	0.35						<1				<1	
13-Dec-16	0.41	1.96	0.94												
14-Dec-16															
15-Dec-16		1.75	6												
16-Dec-16	0.42	1.56	0.89												
17-Dec-16															
18-Dec-16															
19-Dec-16	0.51	1.74	0.77						<1				<1		
20-Dec-16	0.4	1.71	0.72												
21-Dec-16	0.5	1.57	0.78												
22-Dec-16	0.45	1.53	0.82												
23-Dec-16	0.41	1.42	0.97												
24-Dec-16															
25-Dec-16															
26-Dec-16															
27-Dec-16															
28-Dec-16	0.43	1.32	0.76					<1				<1			
29-Dec-16															
30-Dec-16	0.44	1.44	0.96												
31-Dec-16															

Date	SOURCE WATER	DISTRIBUTION SYSTEM													
		Chlorine Residual (mg/L)						E.Coli				Total Coliforms			
	Turbidity (NTU)	Reservoir Outlet	Kentwood Outlet	3269 Kentwood	262 Spindrift	3771 Haas	4090 Gartley	4098 Gartley Pt.	250 Spindrift	3269 Kentwood	Haas Road	4098 Gartley Pt.	250 Spindrift	3269 Kentwod	Haas Road
01-Jan-16															
02-Jan-16															
03-Jan-16															
04-Jan-16	0.7	1.19	0.33			0.69					<1				<1
05-Jan-16	0.63	1.1	0.96												
06-Jan-16	0.69		0.86												
07-Jan-16	0.73	0.96	0.65												
08-Jan-16	0.73	0.95	0.55												
09-Jan-16															
10-Jan-16															
11-Jan-16	0.67	1	1.1	0.46						<1				<1	
12-Jan-16	0.7	0.95	1.57												
13-Jan-16	0.74	1.08	0.59												
14-Jan-16	0.69		0.9												
15-Jan-16	0.62	0.95	0.8												
16-Jan-16															
17-Jan-16															
18-Jan-16	0.72	0.99	1.28		0.18				<1				<1		
19-Jan-16	0.76	0.91	0.85												
20-Jan-16	0.7	0.99	0.86												
21-Jan-16	0.63	0.95	0.9												
22-Jan-16	0.68	0.98	0.89												
23-Jan-16															
24-Jan-16															
25-Jan-16	0.73	0.93	0.86				0.41	<1				<1			
26-Jan-16	0.68	1.02	0.88												
27-Jan-16	0.61	1.04	1.06												
28-Jan-16	0.65	1.02	0.91												
29-Jan-16	0.79	1.05	0.69												
30-Jan-16															
31-Jan-16															
01-Feb-16	0.88	0.96	0.96			0.74					<1				<1
02-Feb-16	0.9	0.92	0.94												
03-Feb-16	0.94	1.04	0.88												
04-Feb-16	0.91	1.08	1.11												
05-Feb-16	1	1.13	1.01												
06-Feb-16															
07-Feb-16															

Date	SOURCE WATER	DISTRIBUTION SYSTEM													
		Chlorine Residual (mg/L)						E.Coli				Total Coliforms			
	Turbidity (NTU)	Reservoir Outlet	Kentwood Outlet	3269 Kentwood	262 Spindrift	3771 Haas	4090 Gartley	4098 Gartley Pt.	250 Spindrift	3269 Kentwood	Haas Road	4098 Gartley Pt.	250 Spindrift	3269 Kentwood	Haas Road
08-Feb-16															
09-Feb-16	0.8	1.1	0.97	0.39						<1				<1	
10-Feb-16	0.76	1.17	0.98												
11-Feb-16	0.74	1.19	0.82												
12-Feb-16	0.67	1.15	0.94												
13-Feb-16															
14-Feb-16															
15-Feb-16	0.65	1.03	0.89												
16-Feb-16	0.6	1.04	0.87		0.21				<1				<1		
17-Feb-16	0.64	1.16	0.87												
18-Feb-16	0.59	0.93	0.9												
19-Feb-16	0.6	0.97	0.89												
20-Feb-16															
21-Feb-16															
22-Feb-16	0.57	0.92	0.84				0.78	<1				<1			
23-Feb-16	0.58	1.07	0.8												
24-Feb-16	0.55	1	0.82												
25-Feb-16	0.53	1.02	0.94												
26-Feb-16	0.68	1.24	1												
27-Feb-16															
28-Feb-16															
29-Feb-16	0.61	1	0.69												
01-Mar-16	0.56	1	0.74												
02-Mar-16	0.93	1.46	0.75			0.35					<1				<1
03-Mar-16															
04-Mar-16	0.77	1.05	0.87												
05-Mar-16															
06-Mar-16															
07-Mar-16				0.44						<1				<1	
08-Mar-16	0.61	1.05	1.06												
09-Mar-16															
10-Mar-16	0.57	0.97	1.22												
11-Mar-16	0.6	0.88	0.9												
12-Mar-16															
13-Mar-16															
14-Mar-16	0.53	0.93	1.22		0.49				<1				<1		
15-Mar-16	0.58	0.94	0.6												
16-Mar-16	0.55	0.92	0.85												

Date	SOURCE WATER	DISTRIBUTION SYSTEM													
		Chlorine Residual (mg/L)						E.Coli				Total Coliforms			
	Turbidity (NTU)	Reservoir Outlet	Kentwood Outlet	3269 Kentwood	262 Spindrift	3771 Haas	4090 Gartley	4098 Gartley Pt.	250 Spindrift	3269 Kentwood	Haas Road	4098 Gartley Pt.	250 Spindrift	3269 Kentwod	Haas Road
17-Mar-16	0.51	0.97	0.3												
18-Mar-16	0.5	0.98	0.3												
19-Mar-16															
20-Mar-16															
21-Mar-16							0.83	<1				<1			
22-Mar-16	0.46	0.96	0.88												
23-Mar-16	0.5	1.05	0.97												
24-Mar-16	0.46	0.8	0.44												
25-Mar-16															
26-Mar-16															
27-Mar-16															
28-Mar-16															
29-Mar-16	0.4		0.64												
30-Mar-16	0.44	1	0.72												
31-Mar-16	0.48	1	0.86												
01-Apr-16	0.42	1.36	1												
02-Apr-16															
03-Apr-16															
04-Apr-16	0.48		1.29			0.9					<1				<1
05-Apr-16	0.4	1.43	0.29												
06-Apr-16															
07-Apr-16															
08-Apr-16															
09-Apr-16															
10-Apr-16															
11-Apr-16	0.44	1.44	0.5	0.41						<1				<1	
12-Apr-16	0.41	1.54	0.83												
13-Apr-16	0.47	1.48	0.78												
14-Apr-16	0.44	1.53	0.42												
15-Apr-16	0.44	1.56	0.6												
16-Apr-16															
17-Apr-16															
18-Apr-16	0.42	1.5	0.47		0.14				<1				<1		
19-Apr-16	0.44	1.56	0.73												
21-Apr-16	0.41	1.57	0.51												
22-Apr-16	0.41	1.12	1.06												
23-Apr-16															
24-Apr-16															

Date	SOURCE WATER	DISTRIBUTION SYSTEM													
		Chlorine Residual (mg/L)						E.Coli				Total Coliforms			
	Turbidity (NTU)	Reservoir Outlet	Kentwood Outlet	3269 Kentwood	262 Spindrift	3771 Haas	4090 Gartley	4098 Gartley Pt.	250 Spindrift	3269 Kentwood	Haas Road	4098 Gartley Pt.	250 Spindrift	3269 Kentwod	Haas Road
25-Apr-16	0.34	1.14	0.9				0.88	<1				<1			
26-Apr-16	0.37	1.2	0.75												
27-Apr-16	0.39	1.13	0.37												
28-Apr-16	0.38	1.12	0.76												
29-Apr-16	0.45	1.04	1												
30-Apr-16															
01-May-16															
02-May-16	0.42	1.11	1.02			1					<1				<1
03-May-16	0.45	1.14	0.79												
04-May-16	0.5	0.97	0.94												
05-May-16	0.65	0.95	0.94												
06-May-16	0.51	1	0.89												
07-May-16															
08-May-16															
09-May-16	0.38	0.97		0.86						<1				<1	
10-May-16	0.35	0.97	0.87												
11-May-16	0.4	1.07	0.83												
12-May-16	0.45	1.38	1.12												
13-May-16	0.45	1.31	1.23												
14-May-16															
15-May-16															
16-May-16	0.48	1.08	1.51		0.39				<1				<1		
17-May-16	0.45	1.12	1.27												
18-May-16	0.53	1.15	0.83												
19-May-16	0.48	1.1	0.64												
20-May-16	0.42	1.1	0.74												
21-May-16															
22-May-16															
23-May-16															
24-May-16	0.48	1.03	0.62				0.72	<1				<1			
25-May-16	0.47	1.1	1.09												
26-May-16	0.51	1.08	0.93												
27-May-16	0.49	1.01	1.03												
28-May-16															
29-May-16															
30-May-16	0.44	0.99	1.2												
31-May-16	0.45	0.95	0.85												
01-Jun-16	0.48	0.96	1.02												

Date	SOURCE WATER	DISTRIBUTION SYSTEM													
		Chlorine Residual (mg/L)						E.Coli				Total Coliforms			
	Turbidity (NTU)	Reservoir Outlet	Kentwood Outlet	3269 Kentwood	262 Spindrift	3771 Haas	4090 Gartley	4098 Gartley Pt.	250 Spindrift	3269 Kentwood	Haas Road	4098 Gartley Pt.	250 Spindrift	3269 Kentwod	Haas Road
02-Jun-16															
03-Jun-16	0.49	0.97	0.93												
04-Jun-16															
05-Jun-16															
06-Jun-16						0.74					<1				<1
07-Jun-16	0.51	0.87	1.12												
08-Jun-16	0.51	0.99	1.06												
09-Jun-16	0.54	1.04	0.85												
10-Jun-16	0.5	0.95	0.29												
11-Jun-16															
12-Jun-16															
13-Jun-16	0.45	0.78	1.05	0.42						<1				<1	
14-Jun-16	0.43	0.65	1.09												
15-Jun-16	0.4	1	1.02												
16-Jun-16	0.39	1.2	0.65		0.15										
17-Jun-16	0.37	1.16	0.92												
18-Jun-16															
19-Jun-16															
20-Jun-16	0.35	1.28	0.84						<1				<1		
21-Jun-16	0.35	1.38	0.81												
22-Jun-16	0.44	1.44	0.85												
23-Jun-16	0.5	1.42	0.66												
24-Jun-16	0.48	1.2	0.94												
25-Jun-16															
26-Jun-16															
27-Jun-16	0.43	0.97	0.98				0.61	<1				<1			
28-Jun-16	0.48	1.03	0.92												
29-Jun-16	0.69	0.99	0.95												
30-Jun-16	0.71	1.19	0.97												
01-Jul-16															
02-Jul-16															
03-Jul-16															
04-Jul-16	0.57	1.39	0.94			1.13					<1				<1
05-Jul-16	0.53	1.37	0.79												
06-Jul-16	0.51	1.38	0.87												
07-Jul-16	0.52	1.44	0.9												
08-Jul-16	0.57	1.34	0.69												
09-Jul-16															

Date	SOURCE WATER	DISTRIBUTION SYSTEM													
		Chlorine Residual (mg/L)						E.Coli				Total Coliforms			
	Turbidity (NTU)	Reservoir Outlet	Kentwood Outlet	3269 Kentwood	262 Spindrift	3771 Haas	4090 Gartley	4098 Gartley Pt.	250 Spindrift	3269 Kentwood	Haas Road	4098 Gartley Pt.	250 Spindrift	3269 Kentwod	Haas Road
10-Jul-16															
11-Jul-16	0.56	1.3	0.75	0.67						<1				<1	
12-Jul-16	0.6	1.18	1.07												
13-Jul-16	0.68	1.05	0.9												
14-Jul-16	0.88	0.97	0.91												
15-Jul-16	0.8	1.12	0.8												
16-Jul-16															
17-Jul-16															
18-Jul-16	0.65	1.17	0.84						<1				<1		
19-Jul-16															
20-Jul-16	0.55	1.15	0.84												
21-Jul-16															
22-Jul-16	0.63	1.16	0.99												
23-Jul-16															
24-Jul-16															
25-Jul-16	0.75	1.36	0.85				1	<1				<1			
26-Jul-16	0.69	1.29	0.81												
27-Jul-16	0.7	1.28	0.99												
28-Jul-16	0.71	1.16	0.88												
29-Jul-16	0.69	1.18	0.91												
30-Jul-16															
31-Jul-16															
01-Aug-16											<1				<1
02-Aug-16	0.58	1.25	0.85			0.87									
03-Aug-16	0.6	1.1	0.97												
04-Aug-16	0.91	1.31	0.85												
05-Aug-16	0.87	1.24	1												
06-Aug-16															
07-Aug-16															
08-Aug-16	0.75	1.15	0.84	0.63						<1				<1	
09-Aug-16															
10-Aug-16															
11-Aug-16	0.64	1.11	1.03												
12-Aug-16	0.55	1.13	0.86												
13-Aug-16															
14-Aug-16															
15-Aug-16					0.42				<1				<1		
16-Aug-16															

Date	SOURCE WATER	DISTRIBUTION SYSTEM													
		Chlorine Residual (mg/L)						E.Coli				Total Coliforms			
	Turbidity (NTU)	Reservoir Outlet	Kentwood Outlet	3269 Kentwood	262 Spindrift	3771 Haas	4090 Gartley	4098 Gartley Pt.	250 Spindrift	3269 Kentwood	Haas Road	4098 Gartley Pt.	250 Spindrift	3269 Kentwod	Haas Road
17-Aug-16															
18-Aug-16	0.84	1.17	0.79												
19-Aug-16	0.81	1.12	1.33												
20-Aug-16															
21-Aug-16															
22-Aug-16	0.69	1.19	0.87				0.77	<1				<1			
23-Aug-16															
24-Aug-16	0.65	1.16	0.84												
25-Aug-16	0.62	1.29	1.11												
26-Aug-16	0.6	1.26	1.21												
27-Aug-16															
28-Aug-16															
29-Aug-16	0.54	1.19	0.85												
30-Aug-16	0.54	1.15	0.93												
31-Aug-16	0.52	1.09	0.95												
01-Sep-16															
02-Sep-16	0.45	1.13	0.95												
03-Sep-16															
04-Sep-16															
05-Sep-16															
06-Sep-16						0.74					<1				<1
07-Sep-16	0.37	1.16	0.73												
08-Sep-16	0.35	1.12	0.74												
09-Sep-16	0.35	1.13	0.86												
10-Sep-16															
11-Sep-16															
12-Sep-16	0.36	1.16	0.99	0.67						<1				<1	
13-Sep-16	0.37	1.3	1.12												
14-Sep-16	0.44	1.3	1.23												
15-Sep-16	0.47	1.3	0.95												
16-Sep-16	0.43	1.24	0.84												
17-Sep-16															
18-Sep-16															
19-Sep-16	0.38	1.2	0.96						<1				<1		
20-Sep-16	0.37	1.22	0.85												
21-Sep-16	0.38	1.12	0.85												
22-Sep-16	0.39	1.13	0.98												
23-Sep-16	0.39	1.1	0.81												

Date	SOURCE WATER	DISTRIBUTION SYSTEM													
		Chlorine Residual (mg/L)						E.Coli				Total Coliforms			
	Turbidity (NTU)	Reservoir Outlet	Kentwood Outlet	3269 Kentwood	262 Spindrift	3771 Haas	4090 Gartley	4098 Gartley Pt.	250 Spindrift	3269 Kentwood	Haas Road	4098 Gartley Pt.	250 Spindrift	3269 Kentwod	Haas Road
24-Sep-16															
25-Sep-16															
26-Sep-16	0.33	1.01	0.91				0.51	<1				<1			
27-Sep-16	0.31	0.9	0.9												
28-Sep-16	0.33	0.93	0.99												
29-Sep-16	0.35	0.98	1.05												
30-Sep-16	0.38	0.99	0.89												
01-Oct-16															
02-Oct-16															
03-Oct-16						0.81					<1				<1
04-Oct-16															
05-Oct-16	0.44	0.51	0.79												
06-Oct-16	0.45	63	0.74												
07-Oct-16	0.55	0.73	0.99												
08-Oct-16															
09-Oct-16															
10-Oct-16															
11-Oct-16															
12-Oct-16	0.58	1.32	0.73	0.1						<1				<1	
13-Oct-16	0.56	1.37	1.5												
14-Oct-16	0.56	1.3	0.76												
15-Oct-16															
16-Oct-16															
17-Oct-16	0.72	1.2	0.76		0.12				<1				<1		
18-Oct-16	0.72	0.93	0.96												
19-Oct-16	0.76	1.26	0.86												
20-Oct-16	0.68	1.25	0.8												
21-Oct-16	0.72	1.38	0.8												
22-Oct-16															
23-Oct-16															
24-Oct-16							0.39	<1				<1			
25-Oct-16	0.69	1.28	0.96												
26-Oct-16	0.68	1.27	0.86												
27-Oct-16	0.68	1.19	0.6												
28-Oct-16	0.66	1.15	0.97												
29-Oct-16															
30-Oct-16															
31-Oct-16	0.6	1.33	0.95			0.72					<1				<1

Date	SOURCE WATER	DISTRIBUTION SYSTEM													
		Chlorine Residual (mg/L)						E.Coli				Total Coliforms			
	Turbidity (NTU)	Reservoir Outlet	Kentwood Outlet	3269 Kentwood	262 Spindrift	3771 Haas	4090 Gartley	4098 Gartley Pt.	250 Spindrift	3269 Kentwood	Haas Road	4098 Gartley Pt.	250 Spindrift	3269 Kentwood	Haas Road
01-Nov-16	0.63	1.45	1.04												
02-Nov-16	0.6	1.42	1												
03-Nov-16	0.72	1.41	0.97												
04-Nov-16	0.7	1.28	0.86												
05-Nov-16															
06-Nov-16															
07-Nov-16	0.72	1.64	0.9	0.23						<1				<1	
08-Nov-16															
09-Nov-16	0.63	1.4	0.81												
10-Nov-16	0.63	1.4	1.27												
11-Nov-16															
12-Nov-16															
13-Nov-16															
14-Nov-16	0.61	1.66	0.61						<1				<1		
15-Nov-16	0.61	1.56	1.29												
16-Nov-16															
17-Nov-16	0.57	1.54	0.54												
18-Nov-16	0.57	1.84	0.67												
19-Nov-16															
20-Nov-16															
21-Nov-16	0.49	1.67	0.52				1.18	<1				<1			
22-Nov-16	0.48	1.63	0.44												
23-Nov-16															
24-Nov-16	0.47	1.58	0.84												
25-Nov-16	0.49	1.42	0.73												
26-Nov-16															
27-Nov-16															
28-Nov-16	0.5	1.67	0.9												
29-Nov-16	0.45	1.54	0.81												
30-Nov-16	0.48	1.6	0.88												
01-Dec-16															
02-Dec-16	0.38	1.48	0.69												
03-Dec-16															
04-Dec-16															
05-Dec-16	0.46	1.6	0.5			1.15					<1				<1
06-Dec-16	0.47	1.67	0.54												
07-Dec-16	0.48	1.81	0.7												
08-Dec-16															

Date	SOURCE WATER	DISTRIBUTION SYSTEM													
		Chlorine Residual (mg/L)						E.Coli				Total Coliforms			
	Turbidity (NTU)	Reservoir Outlet	Kentwood Outlet	3269 Kentwood	262 Spindrift	3771 Haas	4090 Gartley	4098 Gartley Pt.	250 Spindrift	3269 Kentwood	Haas Road	4098 Gartley Pt.	250 Spindrift	3269 Kentwod	Haas Road
09-Dec-16	0.5	1.75	0.65												
10-Dec-16															
11-Dec-16															
12-Dec-16	0.54	2	0.54	0.35						<1				<1	
13-Dec-16	0.41	1.96	0.94												
14-Dec-16															
15-Dec-16		1.75	6												
16-Dec-16	0.42	1.56	0.89												
17-Dec-16															
18-Dec-16															
19-Dec-16	0.51	1.74	0.77						<1				<1		
20-Dec-16	0.4	1.71	0.72												
21-Dec-16	0.5	1.57	0.78												
22-Dec-16	0.45	1.53	0.82												
23-Dec-16	0.41	1.42	0.97												
24-Dec-16															
25-Dec-16															
26-Dec-16															
27-Dec-16															
28-Dec-16	0.43	1.32	0.76					<1				<1			
29-Dec-16															
30-Dec-16	0.44	1.44	0.96												
31-Dec-16															