

Annual Water Quality Report

2021

EXECUTIVE SUMMARY

The City of Abbotsford and City of Mission receive domestic water from the Abbotsford Mission Water & Sewer Commission (AMWSC). The primary source of water is Norrish Creek, supplemented by Cannell Lake and several groundwater wells within the Abbotsford-Sumas Aquifer. The Norrish Creek source is filtered, either by slow sand or ultrafiltration membranes, and chloraminated prior to distribution. Cannell Lake water is treated by ultraviolet (UV) disinfection and chloramination. Chloramination is also practiced at most wells.

During 2021, the Norrish Creek Water Treatment Plant consistently delivered high quality water, within the limits recommended by the Guidelines for Canadian Drinking Water Quality (GCDWQ). Well water also met all health-related GCDWQ requirements. Although some taste & odour complaints were received during the summer for the areas supplied by Cannell water treatment system, distributed water met all GCDWQ requirements.

The AMWSC, Abbotsford and Mission tested more than 2000 treated water samples for microbiological parameters in 2021 as shown in Appendix H. *Total Coliforms* were detected in 26 of the regular weekly distribution samples as listed in Table 3-3. Each site was re-sampled for until no detectable coliforms were found in the follow-up samples.

Flooding of the Sumas Prairie in mid-November 2021 led to several water main breaks. While there was no evidence of floodwaters contaminating Sumas Prairie drinking water, the City was proactive and isolated the flooded areas. The City issued a “Boil Water Advisory” on November 18 and “Do Not Use” advisory on November 24. Enhanced disinfection and flushing of the Sumas Prairie area took place during the second week of December with the approval of Fraser Health. Both advisories were rescinded by December 20 once all biological and chemical water quality tests were confirmed to meet the Guidelines for Canadian Drinking Water Quality.

In addition to the flooding described above, the November 2021 storms caused two landslides along Norrish Creek Forestry Service Road. This resulted in the Norrish Creek water supply being offline for 6 weeks. During this time, Cannell Lake and the groundwater wells were used to supply the region.

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1 INTRODUCTION

The British Columbia Drinking Water Protection Act requires that all water suppliers produce an annual water quality report that is reviewed by the local Drinking Water Officer and published for public access. This report has been prepared for the Abbotsford Mission Water and Sewer Commission (AMWSC) and Ministry of Health for this purpose.

2 WATER SYSTEM DESCRIPTION

Abbotsford & Mission receive treated water from the Abbotsford Mission Water & Sewer Commission (AMWSC). The AMWSC draws water from three sources, provides treatment, and transmits the treated water to Abbotsford and Mission. The two municipalities then distribute the water to consumers directly from transmission pipeline take-off points or through transmission end-point reservoirs. This water supply strategy is illustrated as Figure 2-1.

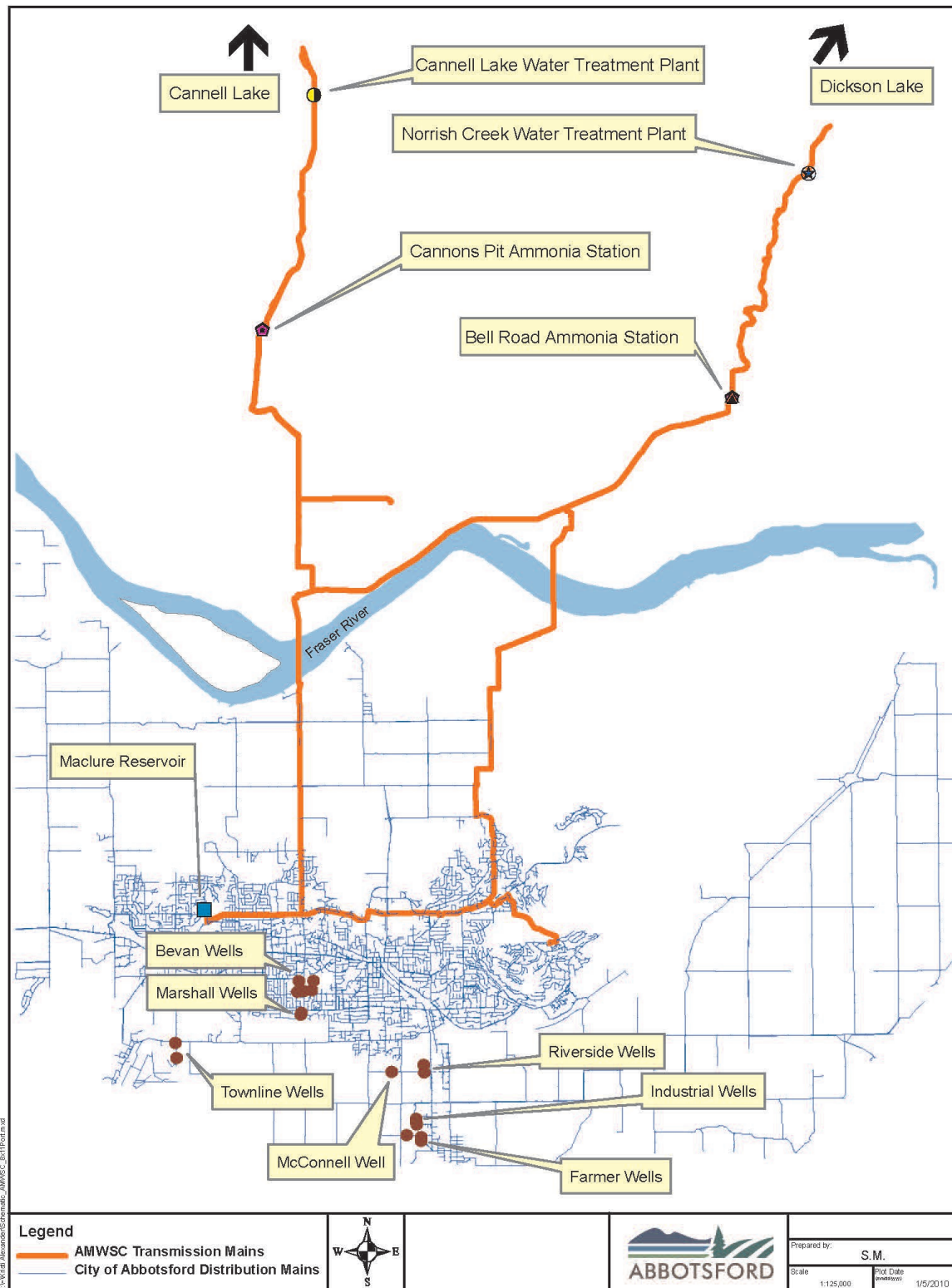


Figure 2-1: AMWSC Water Supply

2.1 Water Sources & Treatment

Norrish Creek

Norrish Creek, located northeast of Mission, provides the bulk of Abbotsford and Mission's drinking water. Norrish water is filtered by slow sand or ultrafiltration membranes at the Norrish Creek Water Treatment Plant (NCWTP). The water is chlorinated at the plant outlet and then flows 7.5 km to the Bell Road Ammonia, where aqueous ammonia is added to form chloramines for distribution system residual disinfection.



Norrish Creek Water Treatment Plant

Cannell Lake

Cannell Lake, located north of Mission, supplies water to consumers located in the higher elevations of Mission. It also supplements lower parts of Mission and Abbotsford when demand is high or when the Norrish supply is off-line. Cannell Lake water is treated by ultraviolet (UV) disinfection and chlorinated 1 km downstream of the intake, then travels 7 km to the Cannons Pit Ammonia Station to form residual chloramines prior to entering the distribution networks.



Cannell Lake

Groundwater Wells

The AMWSC supplements times of high demand with groundwater from the Abbotsford-Sumas aquifer. Most well water is chloraminated prior to distribution.



Groundwater Well Head

Treated water travels through more than 95 km of pipeline from the water sources to Abbotsford and Mission. The water then enters the municipalities' distribution systems via direct take-off points or after feeding through the Maclure and Mt. Mary Ann reservoirs. The volumes of water produced by Norrish, Cannell and the wells in 2021 (and the two year's prior) are summarized in Table 2.1.

Table 2-1: Annual Water Production in Megaliters (ML)

Source ¹	2019 Total	2020 Total	2021 Total
Norrish Creek	16,864	16,305	16,530
Cannell Lake	3,385	3,745	4,575
Farmer #1 Well	419	47	278
Farmer #3 Well	2	0	145
Industrial Well "A"	0	121	183
Industrial Well "B"	180	140	259
Industrial Well "C"	20	494	468
Marshall #1 Well	581	350	360
Marshall #3 Well	0	223	1412
McConnell Well	48	139	2
Riverside #1 Well	133	7	9
Townline #1 Well	662	478	0
Townline #2 Well	212	552	434
Bevan #1 Well	425	487	294
Bevan #2 Well	280	439	294
Bevan #3 Well	601	564	342
Bevan #4 Well	629	744	464
Overall Total	24,444	24,843	26,050
Total Surface Water	20,249	20,050	21,105
Total Groundwater	4,195	4,793	4,945

1 – The following wells have been removed from the table since they are no longer in service: Pine, Marshall 2 & Riverside 2 and Farmer 2. If any water quality results exist for these inactive wells, such can be obtained by contacting: eng-info@abbotsford.ca

2.2 Distribution System

The Abbotsford distribution system includes 12 pump stations, 10 reservoirs, 24 pressure reducing stations (PRVs), and over 850 km of pipelines as shown in Figure 2-2. The Mission distribution system includes 23 PRVs and over 170 km of pipelines as shown in Figure 2-3.

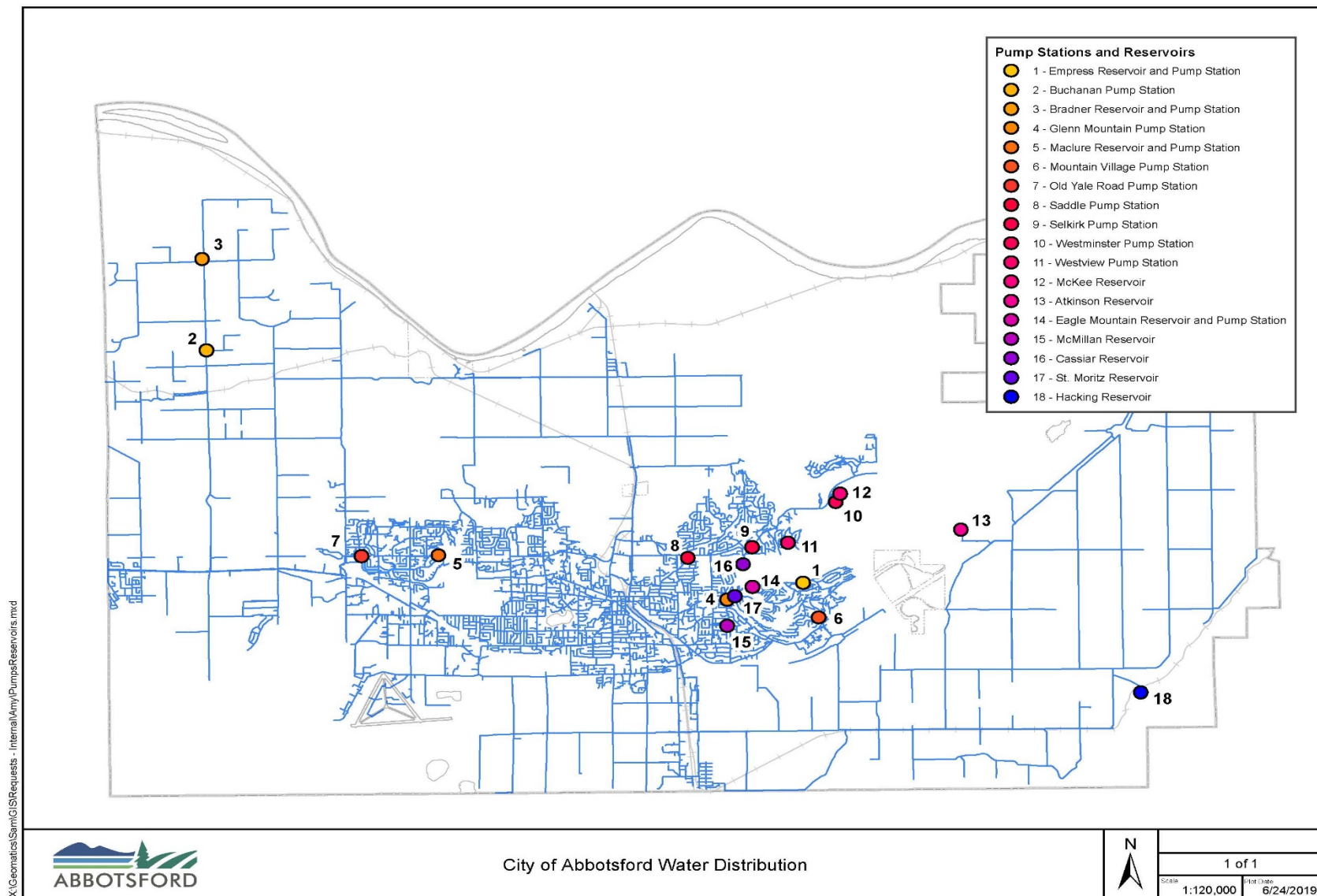


Figure 2-2: City of Abbotsford Water Distribution System

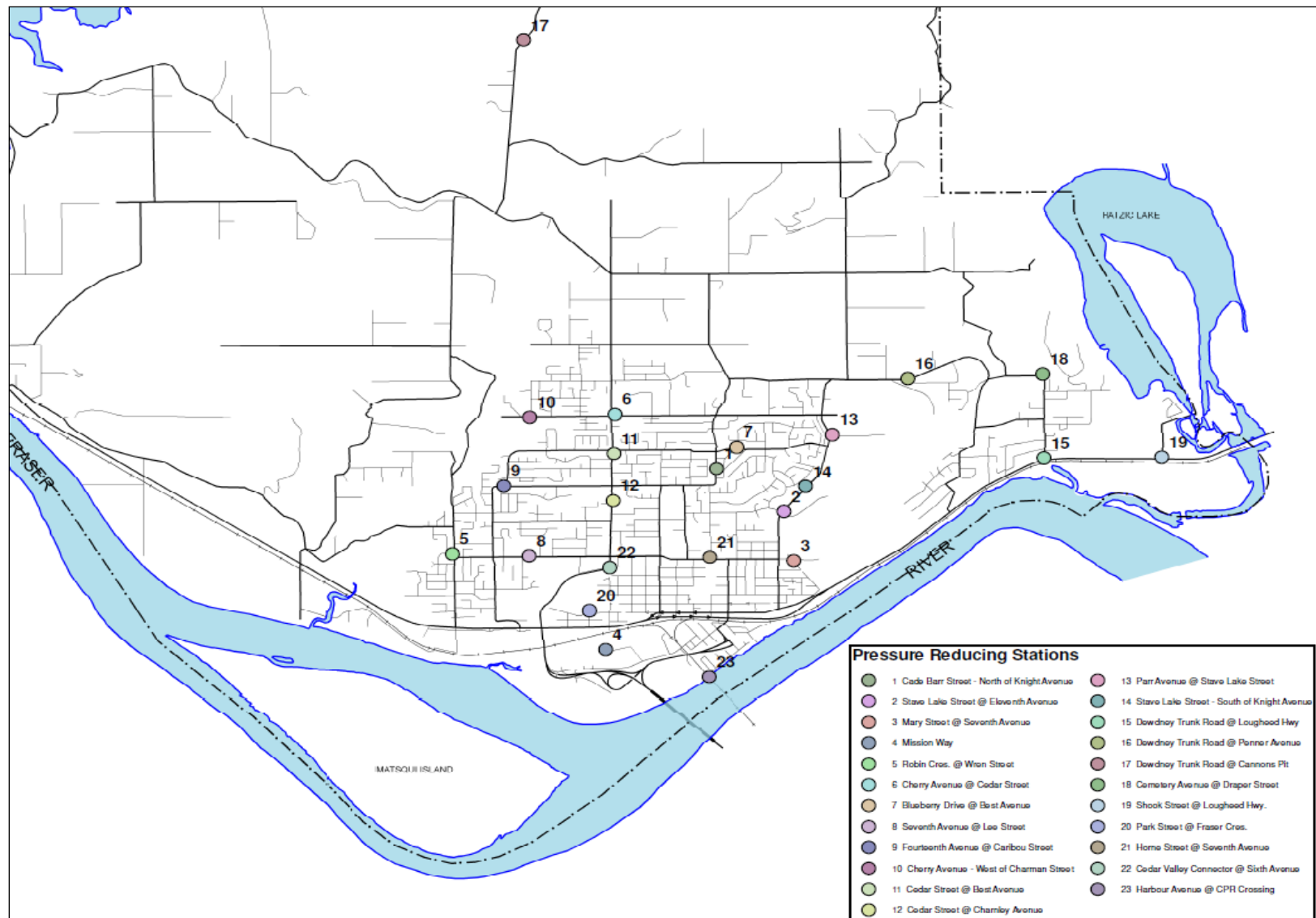


Figure 2-3: City of Mission Water Distribution System

3 WATER SAMPLING AND TESTING PROGRAM

Abbotsford and Mission work together to monitor drinking water quality according to the requirements of the BC Drinking Water Protection Act and Guidelines for Canadian Drinking Water Quality (GCDWQ). The AMWSC monitors source and transmission system water quality to confirm effective water treatment. Mission and Abbotsford monitor their distribution network water quality to ensure water quality delivered to end users meets requirements. Table 3-1 summarizes the monitoring program and the following sections describe key water quality results from 2021 sampling programs.

Table 3-1: AMWSC, Abbotsford & Mission Water Quality Monitoring

Program or Parameters	Raw Surface Water	Raw Well Water	Treated Water	Monitoring Purpose
Potability Scan ⁽¹⁾	Bi-annually ⁽²⁾	Annually	Quarterly	To characterize source and treated water quality and to track fundamental shifts in quality.
Nitrates & Metals ⁽³⁾	-	Monthly	-	To proactively screen for aquifer contamination and naturally occurring mineral trends.
Pesticides/Herbicides		Annually		To proactively screen for aquifer contamination.
Various ⁽⁴⁾	On-Line	On-Line	On-Line	Data required for effective control of the water treatment processes.
Coliforms	-	-	Weekly (42 locations)	To proactively screen for biological contamination of the distributed water.
Disinfection Monitoring ⁽⁴⁾	-	-	Weekly ⁽⁵⁾ (>40 locations)	To ensure that a disinfection residual is maintained through the distribution system.
Disinfection By-Products	-	-	Quarterly (4-5 locations)	To ensure that disinfection by-product levels remain below recommended limits.
Limnology	Monthly (Cannell)			To provide early indication of lake water quality changes arising from disturbances in the watershed, particularly those associated with climate change.
Various ⁽⁶⁾	-	-	Annually ⁽⁶⁾	Proactively screening for pipe deterioration.
<p>(1) The raw water potability scans includes those parameters listed in Appendix C & D. The treated water scans include parameters shown in Appendix I.</p> <p>(2) For Cannell Lake raw water, there are some additional parameters being monitored weekly (e.g. coliforms, colour, pH, UV-absorbance, iron and manganese) and monthly (e.g. organic carbon & protozoa) to manage the treatment process and to comply with filtration exemption.</p> <p>(3) Monthly metal testing at the wells is not normally part of the water quality monitoring program. This data is being collected under a separate program related to an AMWSC environmental assessment certificate.</p> <p>(4) There are various on-line water quality instruments throughout the system (e.g. for turbidity, chlorine, pH, and ultraviolet transmittance).</p> <p>(5) Disinfection monitoring includes analyses of total chlorine, monochloramine, free ammonia, nitrite, pH, and temperature. Conductivity is also monitored at Abbotsford locations. On a monthly basis, alkalinity is checked at all locations.</p> <p>(6) In addition to weekly & quarterly treated water sampling, parameters such as benzo(a)pyrene, asbestos and vinyl chloride are checked annually or bi-annually at select points in the distribution systems to monitor for pipe deterioration.</p>				

The GCDWQ sets standards for safe levels of contaminants commonly found in municipal drinking water. However, some people with significantly weakened immune systems may be more vulnerable to contaminants in drinking water than the general population. These people are urged to review the HealthLinkBC information sheet attached as Appendix A.

All customers are encouraged to read Fraser Health's message about flushing taps that have not been used for six hours or longer. Please refer to Appendix B.

3.1 Raw Source Water Quality Monitoring

3.1.1 Surface Water

The quality of raw source water influences the level of treatment required to produce domestic water suitable for consumption. Outside of analytical measurements for managing the water treatment processes, both Norrish Creek and Cannell Lake raw water are tested annually for various physical and chemical characteristics in order to monitor if there are any fundamental changes. In general, the raw source water quality has remained consistent for the past three years (please see 2020 and 2019 annual reports here: <https://www.ourwatermatters.ca/water-quality>.)

Cannell Lake raw water is also monitored weekly and monthly for certain additional parameters, which is further discussed in Section 3.2.

3.1.2 Groundwater

Well water quality results from 2019 to 2021 are provided in Appendices D through G. Parameters of particular note are further discussed below.

Arsenic

Arsenic can be found in both surface water and groundwater sources, with levels generally higher in groundwater. Most provinces and territories across Canada report some areas where arsenic can be detected in drinking water supplies. Although levels are generally below the guideline, elevated arsenic concentrations have been found in areas with natural sources.¹ The Maximum Allowable Concentration (MAC) is 10 µg/L. Industrial B and C are the only two wells that have historically contained arsenic that has been at or above the MAC. In 2021, neither well exceeded the MAC. Industrial B's average arsenic concentration was 7.37 µg/L and the maximum concentration was 9.88 µg/L. Similarly, for Industrial C, the average and maximum concentrations were 7.65 & 8.85 µg/L, respectively.

¹ Health Canada, May 2006. Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Arsenic Retrieved from: <http://healthycanadians.gc.ca/publications/healthy-living-vie-saine/water-arsenic-eau/index-eng.php>

Iron

The presence of iron in natural waters can be attributed to the weathering of rocks and minerals, acidic mine water drainage, landfill leachates, sewage effluents and iron-related industries². Elevated iron can lead to aesthetic issues such as coloured water or objectionable taste. The GCDWQ specifies an aesthetic objective (AO) of 300 µg/L. Some AMWSC wells periodically produce samples above this threshold for short durations if they have been idle for prolonged periods. Despite these events, there have never been any known 'red water' or iron-related customer concerns. All distribution results for iron in 2021 were well below the AO or not detectable as shown in Appendix I.

Manganese

Manganese is a naturally occurring element in most water sources. Moderate levels of manganese may cause fixture and laundry staining; high levels have been correlated to [insert wording from manganese guidance document and footnote reference]. The GCDWQ specifies an aesthetic guideline of 20 µg/L for manganese and a health based MAC of 120 µg/L. Five AMWSC wells (Farmer 1, Industrial B, Industrial C, Pine and Townline 1) regularly produce water with manganese above the aesthetic guideline, but significantly below the MAC.

Nitrate & Nitrite

Nitrate itself is a relatively non-toxic substance. However, bacteria can convert nitrate to nitrite in the environment, in foods and in the human body. Nitrite can then interfere with the ability of red blood cells to carry oxygen to the tissues of the body, producing a condition called methemoglobinemia. It is of greatest concern in infants.

Water naturally contains less than 1 milligram of nitrate-nitrogen³; higher levels may indicate contamination. The Abbotsford-Sumas aquifer is known to contain elevated levels of nitrate stemming from the application of agricultural fertilizer to the land above. The AMWSC thus monitors for nitrates and nitrites on a monthly basis in all wells. 2021 results are shown in Appendix E. No wells had nitrates in excess of the 10 mg/L MAC during 2021 and the last ten-years of data suggest a general downward trend in most wells.

² Health Canada, December, 1978. Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Iron Retrieved from: <http://healthycanadians.gc.ca/publications/healthy-living-vie-saine/water-iron-fer-eau/index-eng.php>

³ Health Canada, June, 2013. Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Nitrate and Nitrite Retrieved from: <https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidelines-canadian-drinking-water-quality-guideline-technical-document-nitrate-nitrite/page-2-guidelines-canadian-drinking-water-quality-guideline-technical-document-nitrate-nitrite.html#a2>

Pesticides & Herbicides

Pesticides and herbicides are tested annually in select wells. In 2021, 12 wells were tested and all results were non-detect. The parameters tested are listed in Appendix G.

3.2 Cannell Filtration Exemption Monitoring

In 2005, Fraser Health adopted the “Drinking Water Treatment Objectives (Microbiological) for Surface Water Supplies in British Columbia”. These standards generally require filtration for drinking water supplied from surface water sources. However, authorities may exclude such sources from filtration assuming compliance with four criteria. Fraser Health granted such ‘filtration exemption’ for Cannell Lake in 2013, under the conditions that (i) UV-disinfection be added to the treatment process to comply with Criterion #1, (ii) raw water quality continues to satisfy Criteria #2 & #3, and (iii) a watershed control program is maintained as per Criterion #4. The following describes the four filtration exemption criteria and notes how the AMWSC complied with each during 2021.

1. *Overall inactivation is met using a minimum of two disinfection processes, providing 4-log reduction of viruses and 3-log reduction of Cryptosporidium and Giardia.*

AMWSC Compliance: As of December 2016, Cannell Lake water is treated with 2 disinfection processes: UV-disinfection and chlorination. In 2021, Cannell Lake’s raw water was sampled for Cryptosporidium and Giardia 11 times. There were no viable counts in any of the samples.

2. *The number of E. coli in raw water does not exceed 20 counts/100 mL (or if E. coli data are not available, less than 100 counts/100 mL of Total Coliform) in at least 90% of the weekly samples from the previous six months. The treatment target for all water systems is to contain no detectable E. coli or Fecal Coliform per 100 ml. Total Coliform objectives are also zero based on one sample in a 30-day period. For more than one sample in a 30-day period, at least 90% of the samples should have no detectable Total Coliform bacteria per 100 ml and no sample should have more than 10 total coliform bacteria per 100 ml.*

AMWSC Compliance: In 2021, Cannell raw water was tested weekly for *E. coli*. *E. coli* was detected two times (August 10, August 24), but the counts were only 1/100mL for each sample, therefore the AMWSC remained in compliance with Criterion #2.

3. *Average daily turbidity levels measured at equal intervals (at least every four hours) immediately before the disinfectant is applied are around 1 NTU, but do not exceed 5 NTU for more than two days in a 12-month period.*

AMWSC Compliance: The average daily turbidity reading at Cannell Lake was 0.38 NTU and the highest recorded value was 0.91 NTU in 2021.

4. *A watershed control program is maintained that minimizes the potential for fecal contamination in the source water.*

AMWSC Compliance: Since 2014, the AMWSC has maintained a watershed program plan that monitors and mitigates the risk of lake fecal contamination. This program includes the following key components:

- Completing weekly visual checks at the lake for any signs of watershed contamination (e.g. human trespass, etc). During 2021, no signs of contamination were observed.
- Conducting limnology monitoring to assess if any lake water quality changes may be arising from watershed disturbances, particularly those associated with climate change.
- Maintaining watershed access gates & fences to discourage vehicular entry into the watershed. In 2021, there was no evidence of intrusion.
- Completing an annual helicopter inspection of the watershed to identify any changes that may increase contamination risk. In 2021, the helicopter inspection occurred on April 14. No changes of concern were noted.
- Maintaining signs at watershed access points to alert the public that entry is restricted. There are two signs in place for this purpose as shown in the photographs below.
- Maintaining electronic surveillance devices to monitor human entry into the watershed. In December 2016, a camera was installed at the Cannell Lake WTP that monitors entry to the lake access road.

Cannell Lake Sign



Cannell Lake Gate Sign



3.3 Distribution Water Quality Monitoring

Abbotsford and Mission's distribution systems are tested weekly for *E. coli*, *Total Coliforms*, chlorine residuals, turbidity, temperature and pH at strategic locations. The AMWSC analyzes these parameters at further locations along the transmission lines. A list of sample location codes is provided in Table 3-2. Maps of Abbotsford and Mission sampling sites are provided as Figure 3-1 and 3-2, respectively.

Table 3-2 Weekly Water Distribution Test Sites

City of Abbotsford Distribution Network	
W1 - 35041 Harris Rd.	E2 – Old Yale & Arnold Rd.
W2 - Sandy Hill School	E3 - 39189 Marion Rd. @ Wellsline Rd.
W3 - 35944 McKee Rd.	E4 - Campbell Rd. & Tolmie Rd.
W4 - Bateman Park	E5 - #3 Rd. @ South Parallel Rd.
W5 - 3315 Gladwin Rd.	E6 - Cole Rd. Across from 1024
W6 - 32961 South Fraser Way	E7 - #1 Rd. @ Tolmie Rd.
W7 - 32111 Joyce Ave.	E8 - 3434 McDermott Rd.
W8 - King Works Yard	E9 - Lower Sumas Mtn. Rd.
W9 - 515 Gladwin Rd.	E10 - 36101 Regal Parkway
W11 - 5030 Lefevre Rd.	E11 - St. Moritz North of Glen Mtn. Dr.
W13 - 7942 Bradner Rd.	E12 - Beck Rd. @ Larch Park
W14 - Dunach School	E13 - 2092 McMillan Rd.
W15 - 3154 Clearbrook Rd.	E14 - Victory Blvd. @ Moulstade Rd.
W16 – 27875 Swensson Rd.	E15 - 2195 Orchard Dr.
City of Mission Distribution Network	
M1 – Israel Avenue	M8 – Laminman Avenue
M2 – Balsam Avenue	M9 – Shook Street
M3 – Penner Avenue	M10 – Miller Crescent
M5 – Hillcrest Avenue	
M6 – Cannell Booster Station	
M7 – Mary St. @ 4 th Avenue	
AMWSC Transmission Pipelines	
Bell Rd.	Cannon Pit 400 & Cannon Pit 600
Ainsworth St.	Maclure Reservoir

Schedule B of the BC Drinking Water Protection Regulation establishes the guideline for water sampling frequency of microbiological contaminants. For water utilities of 5,000 to 90,000, 1 sample per 1000 of population is required. For systems serving more than 90,000 consumers, 90 samples plus 1 sample for every additional 10,000 persons is required per month. For Mission, which has a serviced population of approximately 34,000, 34 samples per month are required. More than 38 samples were tested monthly, thus exceeding the requirement. Abbotsford has a serviced population of approximately 142,000, a minimum of 96 samples per month are required. In 2021, Abbotsford tested more than 120 samples per month, again exceeding the requirement.

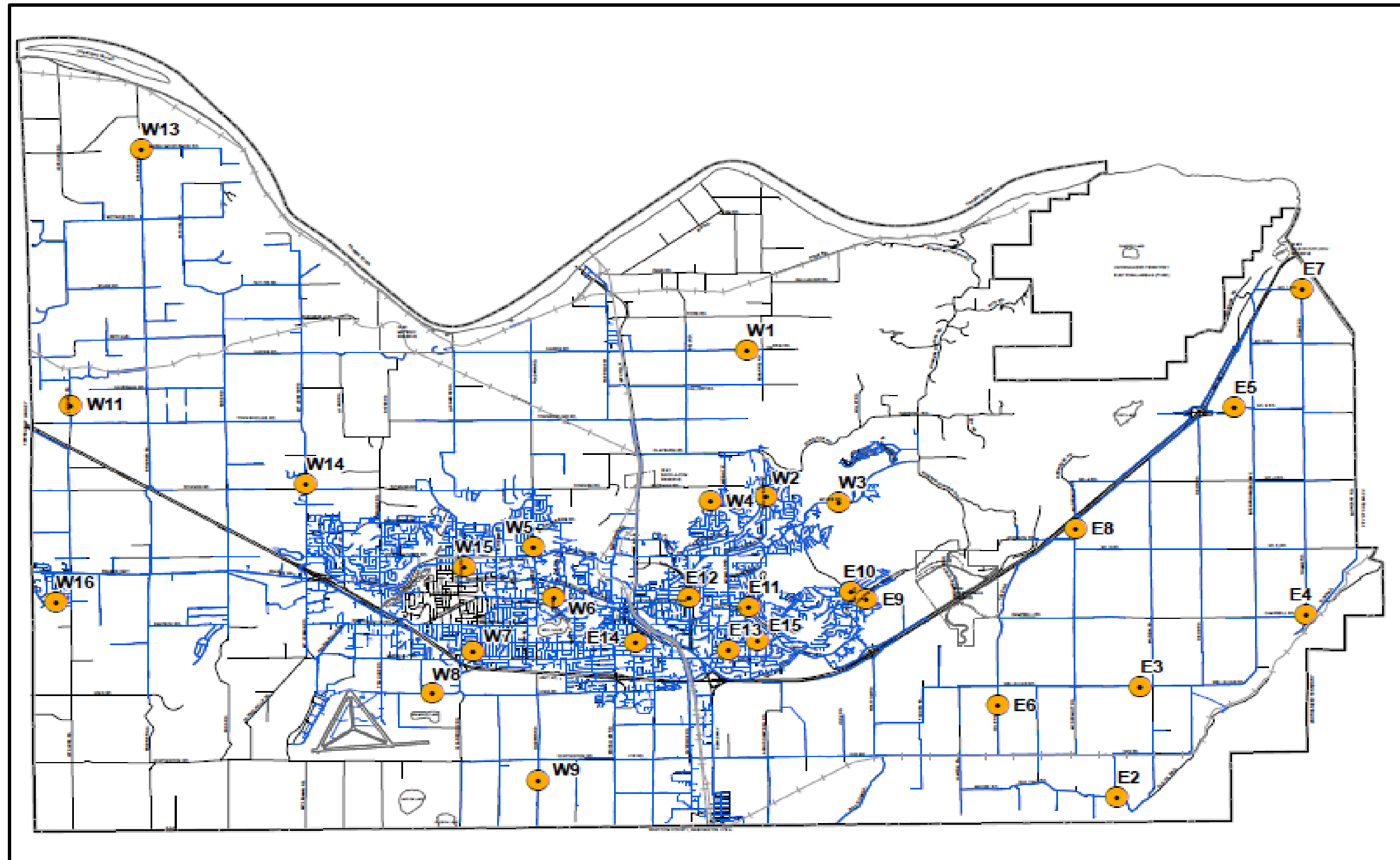


Figure 3-1: Abbotsford Water Distribution Network Sampling Locations

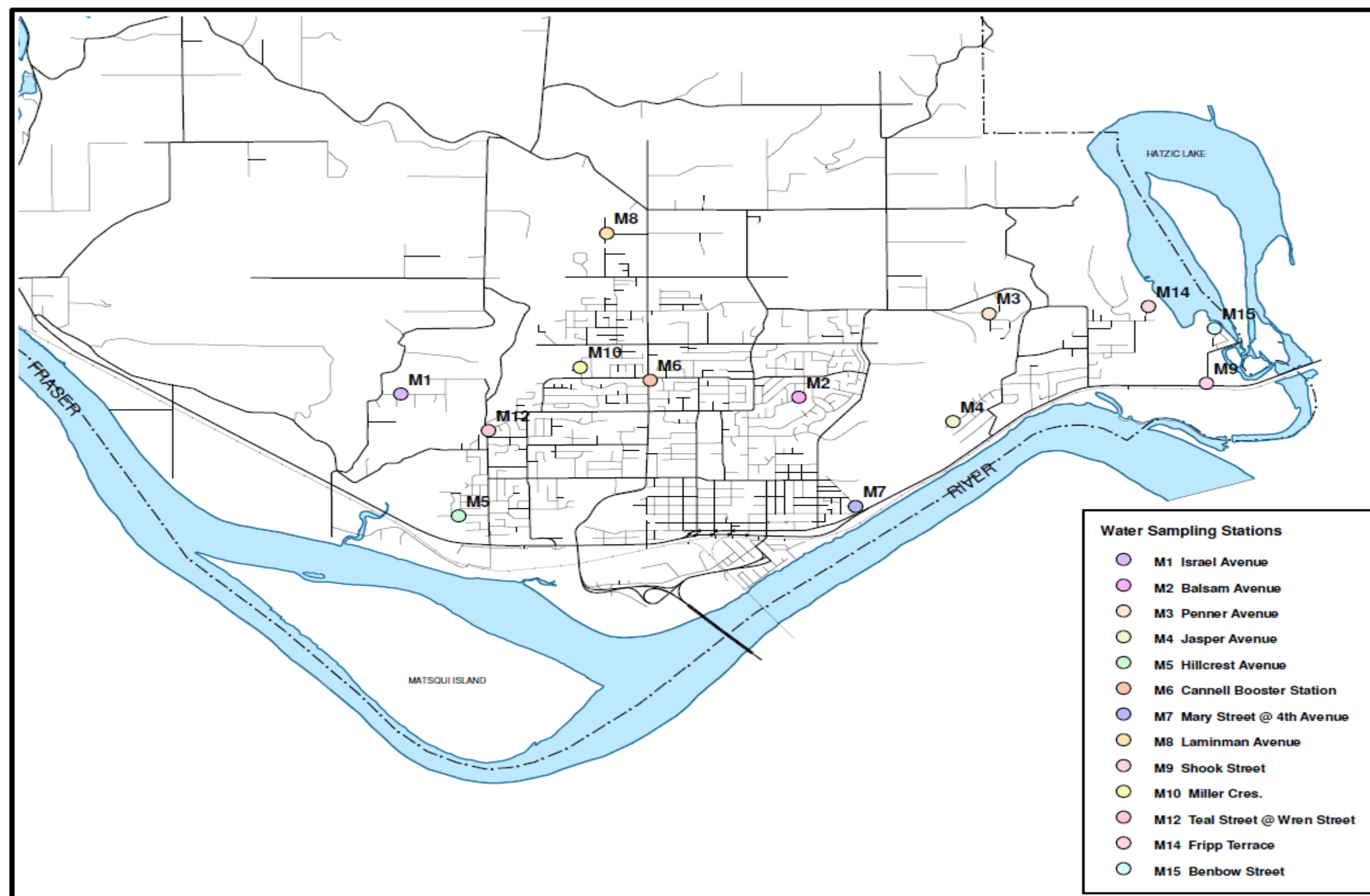


Figure 3-2: Mission Water Distribution Network Sampling Locations

3.3.1 *E. coli* and Total Coliform

Schedule A of the BC Drinking Water Protection Regulation contains standards for the bacteriological quality of potable water in the province:

- No sample should be positive for *E. coli*;
- No more than 10% of the samples in a 30-day period should be positive for *Total Coliform*; and
- No sample should contain more than 10 *Total Coliform* per 100 ml.

Total Coliforms are a group of bacteria that are generally free-living in the environment, but are also present in water contaminated with human and animal faeces. They generally do not cause human disease, but their presence in a water distribution system may indicate that the system is vulnerable to contamination or is experiencing bacterial re-growth.

E. coli is a member of the *Total Coliform* group and is found exclusively in the faeces of humans and other animals. Its presence in water indicates faecal contamination of the water and possible presence of intestinal disease-causing bacteria, viruses, and protozoa. The detection of *E. coli* triggers a protocol which involves immediate notification of health and municipal officials, re-sampling and a thorough investigation into the possible causes.

The AMWSC, Abbotsford and Mission tested more than 2000 treated water samples for microbiological parameters in 2021 as shown in Appendix H. No sample contained *E. Coli*. *Total Coliforms* were detected in 20 of the regular weekly distribution sample sites as listed in Table 3-3. All 2021 monthly water quality reports with detailed results can be found here: [2021 Abbotsford Monthly Water Quality \(ourwatermatters.ca\)](https://ourwatermatters.ca)

Table 3-3 – Detectable Coliform Results in Weekly Distribution Monitoring

Date	Location	Total Coliforms (ct/100 ml)
Jan-5	M6	1
Mar-30	W9	1
Apr-27	E3	1
Jun-8	E8	1
Aug-4	E2	2
Aug-17	E5	1
Nov-16	M7	2
	M9	1
Nov-23	M9	1
	M6	1
Nov-30	M5	1
Dec-7	M5	1
	E12	1
Dec-14	M2	1
	M6	1
	E12	1
Dec-21	M5	1
	M10	1
	E10	1
Dec-29	M6	1

3.3.2 Disinfection Residuals

Disinfectants are added to potable water supplies to inactivate microorganisms, such as bacteria and viruses, which may be present in the water sources. Chlorine-based chemicals are the most widely used disinfecting agents. The AMWSC uses chloramines for residual disinfection. Chloramination has two distinct advantages over free chlorine: (i) the residual lasts longer, which ensures that disinfection is maintained to the extreme ends of Mission and Abbotsford's large distribution networks, (ii) research suggests that chloramines produce less disinfection by-products than chlorine.

Health Canada's proposed guideline states that "it is not considered necessary to establish a guideline for chloramines in drinking water based on low toxicity of monochloramine at concentrations found in drinking water, but most Canadian drinking water supplies maintain a chloramine residual below 4 mg/L in the distribution system."⁴ As the water travels through the distribution system, the concentration of chloramines declines. The AMWSC typically doses chloramines so that the water initially contains a total chlorine residual between 1.5 and 2.5 mg/L. This initial concentration range generally ensures that there are trace amounts of disinfectant at the far reaches of the pipe network.

The AMWSC, Abbotsford and Mission tested more than 2000 samples for total chlorine in 2021. The maximum total chlorine concentration detected in the Abbotsford distribution system was 2.20 mg/L⁵ with an average of 1.16 mg/L. In Mission, the maximum total chlorine results was 2.41 mg/L and the system averaged at 1.51 mg/L. Appendix H provides 2021 total chlorine residual statistics for the system and individual sampling locations.

3.3.3 Turbidity

Turbidity is a principal physical characteristic of water. It is caused by suspended matter or impurities that interfere with the clarity of the water. Excessive turbidity in drinking water is aesthetically unappealing, and may represent a health concern since it can provide food and shelter for pathogens. Although turbidity is not a direct indicator of health risk, studies show a strong relationship between removal of turbidity and removal of pathogens.

The Guidelines for Canadian Drinking Water Quality (GCDWQ) specify that water membrane filtration systems should target a treated water turbidity of less than 0.1 NTU immediately leaving the filter. However, for slow sand filters, this guideline is 1.0 NTU⁶. Since the primary AMWSC source, Norrish Creek, is filtered by a combination of ultrafiltration and slow sand filters, it is expected this source will always provide a treated turbidity well less than 1.0 NTU. Similarly, as discussed earlier, Cannell Lake's natural turbidity is typically well below 1.0 NTU. All AMWSC wells also consistently produce water with

⁴ Health Canada, January, 2019. Guidelines for Canadian Drinking Water Quality - Chloramines. Retrieved from: <https://www.canada.ca/content/dam/hc-sc/documents/programs/consultation-chloramines-drinking-water/chloramines-drinking-water-2018-eng.pdf>

⁵ The above statistics do not include results from the Sumas Prairie from the period it was under the "Do Not Use" advisory.

⁶ Health Canada, June 2019. Guidelines for Canadian Drinking Water Quality Summary Table. Retrieved from: <https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html>

very low turbidity. Considering all three sources, Abbotsford and Mission distribution systems should have turbidity consistently below 1.0 NTU. Higher values typically indicate a disturbance in the distribution system (e.g. a main break, etc).

In 2021, one Mission distribution site had a result above 1.0 NTU and the average turbidity was 0.30 NTU. In Abbotsford, two sites had samples that exceeded 1.0 NTU and the average turbidity was 0.18 NTU ⁷. Appendix H includes more detailed turbidity results.

3.3.4 pH

The AMWSC monitors pH on-line following water treatment at Bell Road and Cannell Lake. The average pH at these locations in 2021 was 6.6 and 7.3, respectively. Additionally, field testing for pH occurs weekly at each distribution system sample location. In Abbotsford, the 2021 median pH was 6.9. In Mission, the median pH was 7.4.

3.3.5 Metals Testing

In 2021, the Abbotsford and Mission distribution systems were tested quarterly for metals to monitor for pipe corrosion and variations in treated water quality relative to that at the sources. Appendix I provides maximum and average values for total metals results collected under this program. In 2021, all distribution sampling locations met the GCDWQ requirements.

3.3.6 Disinfection By-Products

Trihalomethanes (THMs) and Haloacetic Acids (HAAs) are by-products of disinfection, created when chlorine reacts with organic matter dissolved in water. THMs and HAAs are suspected carcinogens and thus a human health concern. The GCDWQ limits 100 µg/L for Trihalomethanes and 80 µg/L for Haloacetic Acids⁸.

The AMWSC tests quarterly for THMs and HAAs at the locations shown in Appendix J. All results were well below the limits, with the highest results being 26 and 39 µg/L for total THMs and HAAs, respectively. These excellent results are partly attributed to the low organic content in the source waters. Chloramination also helps to suppress the level of disinfection by-products (i.e. chlorine preferentially bonds with the dosed ammonia rather than the organic matter).

⁷ The above statistics do not include results from the Sumas Prairie from the period it was under the "Do Not Use" advisory.

⁸ Health Canada, July 2008. Guidelines for Canadian Drinking Water. Retrieved from: <https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidelines-canadian-drinking-water-quality-guideline-technical-document-haloacetic-acids.html>

In 2020, the AMWSC started testing for N-Nitrosodimethylamine (NDMA). NDMA is considered highly likely to be carcinogenic to humans. The GCDWQ recommend limits of 40 ng/L⁹. All results for 2021 were non-detect.

3.3.7 Pipe Deterioration Monitoring

The AMWSC tests for various indicators of pipe degradation through its quarterly metals monitoring (as per above) and via some additional parameters on annual or bi-annual intervals at applicable system locations. No additional parameters were tested in 2021. In 2020, all benzo(a)pyrene and vinyl chloride results were non-detect. The asbestos count was zero for all sites and the concentration was non-detect.

⁹ Health Canada, January, 2011. *Guidelines for Canadian Drinking Water*. Retrieved from:
<https://www.canada.ca/content/dam/canada/health-canada/migration/healthy-canadians/publications/healthy-living-vie-saine/water-nitrosodimethylamine-eau/alt/water-nitrosodimethylamine-eau-eng.pdf>

4 SYSTEM MAINTENANCE

The AMWSC, City of Abbotsford, and City of Mission have more than 40 staff assigned to engineering, operations management, maintenance, and construction of the water utility system.

To maintain the quality of the water throughout the distribution system, Abbotsford and Mission utilize regular flushing programs. Flushing watermain is an integral part of a comprehensive water management program to prevent bacterial re-growth and stagnation in low circulation areas of the distribution system. Both Abbotsford and Mission have annual programs to replace aging pipe. Priority is given to pipes that are made of asbestos cement (AC), ductile iron in a known corrosive soil, and those that are approaching the end of their service life or have a history of problems. Abbotsford began using its new smart meters to identify leaks in its distribution system in 2010. Mission has developed a leak detection program, which identifies system areas in need of upgrades or replacement.

4.1 Staff Certification & Training

The BC Environmental Operators Certification Program (EOCP) classifies water systems and certifies operators using ratings of I through IV. Higher numbers correspond to greater operational complexity and Operators with more advanced training.

The AMWSC's Norrish Water Treatment Plant is classified as Level IV¹ and the transmission system is classified as Level IV. Abbotsford's water distribution system is classified as Level IV and Mission's is Level II. Abbotsford staff maintain and operate the sources, water treatment facilities, transmission system and Abbotsford's distribution system. The City of Mission operates the Mission distribution system.

The AMWSC Water Supply operations team includes eight Operators. Of these, all have water treatment certificates including one Operator with Level IV. All eight Operators also have water distribution certificates including one with Level IV.

The Abbotsford Water Distribution department consists of 14 full time positions. They all have Water Distribution Certificates. Three Operators have their Level IV.

The City of Mission's team includes 13 Operators with water distribution certificates; seven have their Level II and two have Level IV Water Distribution and Water Treatment certifications.

¹ The WTP classification was increased from III to IV during 2020 based on new EOCP criteria.

4.2 Water System Events of Note in 2021

Two water quality events of note occurred in 2021:

- Flooding of Abbotsford's Sumas Prairie in mid-November 2021 led to several water main breaks. While there was no evidence of floodwaters contaminating Sumas Prairie drinking water, the City was proactive and isolated the flooded areas. The City issued a "Boil Water Advisory" on November 18 and "Do Not Use" advisory on November 24. Enhanced disinfection and flushing of the Sumas Prairie area took place during the second week of December with the approval of Fraser Health. All advisories were rescinded by December 20 once all biological and chemical water quality tests were confirmed to meet Guidelines for Canadian Drinking Water Quality.

In addition to the flooding described above, the November 2021 storms caused two landslides along Norrish Creek Forestry Service Road. This resulted in the Norrish Creek water supply being offline for 6 weeks. During this time, Cannell Lake and the groundwater wells were used to supply the region.

- In the summer, some areas of Mission noticed a metallic, fishy taste and odour in their water supplied from Cannell Lake. While not a health concern, these taste and odours have been attributed to a specific golden algae (*Uroglena*).

4.3 Operational Highlights for 2021

In 2021, the AMWSC, Abbotsford and Mission achieved the following significant projects related to water quality:

AMWSC

- Continued with investigative level studies for a future water source;
- Continued planning studies for future pH control facilities; and
- Began evaluating options for a new water quality database software provider.

Abbotsford

- Upgraded the Saddle Booster/PRV;
- Started the replacement of the Bradner Booster Station;
- Reservoir cleaning (St. Moritz, McMillan, and McKee);and
- Replaced 3.8km of old AC water main.

Mission

- Continued annual dead-end water main flushing;
- Continued annual backflow testing on all municipal owned backflow preventers;
- Continued annual UDF program to maintain water quality throughout the distribution system;
- Performed preventative system maintenance including: PRV maintenance, air valve maintenance, leak detection, etc; and
- The City replaced 700 meters of old AC water main.

4.4 Works Planned for 2022

Key water system projects and programs related to water quality scheduled for 2021 include the following:

AMWSC

- Continue new source investigative studies;
- Continue planning studies for pH control facilities;
- Complete the transition to a new water quality software provider;
- Begin a Norrish Creek WTP process review for future facility capital improvements;
- Procure and install additional online water quality analyzers for improved real-time monitoring of both raw source water and supplied treated water;
- Drill a replacement Townline 1 Well and begin design for Townline Wells' pump station renewal;
- Begin hydrogeological and engineering studies to renew aging eastern wellfields' infrastructure and improve water quality supplied from these sources; and
- Clean Mt. Mary Ann Reservoir.

Abbotsford

- Begin first phase of water quality sampling station network improvements, including installation of some new sampling locations and removal of redundant locations;
- Continue the AC water main replacement program, anticipating 4.5 km of replacement;
- Complete the replacement of the Bradner Booster Station; and
- Reservoir cleaning (Eagle Mountain and Atkinson)

Mission

- Continue the AC water main replacement program, anticipating 1 km of replacement;
- Continue leak detection, on 10% of the water distribution system;
- Continue the unidirectional flushing program, completing 20% of the system annually;
- SCADA system upgrade;
- Pressure reducing station upgrades;
- Installation of 5 new water quality sampling stations; and
- Installation and operation of a new water booster station on Nelson Street.

4.5 Emergency Response

The AMWSC completed an Emergency Response Procedures Manual in 2009. The Emergency Response Plan (ERP) has been developed to address potential hazards such as earthquakes, floods, severe storms, volcanic eruption, and pandemic/staff illnesses. The ERP outlines procedures regarding the effect of hazards, including loss of water supply, loss of power, contamination/turbidity in the water system, or damage to water infrastructure. The ERP may be implemented as:

1. Part of a joint emergency between the City of Abbotsford and the City of Mission, where all engineering resources would be coordinated by the City's Emergency Operations Centre; the Plan is premised on Abbotsford staff taking the lead role on all emergencies related to the joint water system.
2. A stand-alone plan to deal with a water emergency, managed by water utility staff; or
3. In a limited response to a City wide emergency, involving water utility staff as part of an emergency resource to address a specific situation.

Activation of the ERP occurs when information is received that an emergency exists, either through staff, public, media, or police/fire communications. Staff are directed to determine the location and nature of the event, eliminate the hazard, and ultimately restore normal water service. The ERP contains checklists to prioritize risks and responses, indicators of problems, and restoration plans.

In the event of a positive test for contaminated water, or a case of field evidence indicating that the quality of the water system may be compromised, the City first isolates the affected section of the system to reduce the impact and then contacts Fraser Health to advise them of the situation. The City and the Medical Health Officer (MHO) then evaluate the need for a "Boil Water" or "Do Not Use" advisory. If such an advisory is to be issued, the City will inform the public. The MHO determines when the advisory can be rescinded.

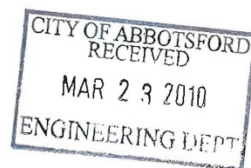
Hard copies of the ERP manual are available for public perusal at Abbotsford's Engineering Department Reception (City Hall, 4th floor) and Mission's City Hall Reception.

5 CONCLUSIONS

Results from 2021 water quality monitoring demonstrate that the City of Abbotsford and City of Mission's drinking water is potable under the definition of the Drinking Water Protection Act and Regulation. AMWSC and municipal water engineers and operators continuously pursue water system improvements to provide high-quality potable water to customers. Monitoring and maintenance programs are designed to meet the challenges of distributing water while preserving public health and the environment and meeting all regulatory requirements.

APPENDICES

APPENDIX A – FRASER HEALTH HEALTHLINK



March 16, 2010

Water Suppliers:

Re: HealthlinkBC File #56 - Persons with Compromised or Weakened Immune systems

In the Ombudsman's Special Report No. 32, June 2008, entitled "Fit to Drink: Challenges in Providing Safe Drinking Water in British Columbia", the Ombudsman recommended that adequate procedures need to be established by Fraser Health to notify people with compromised or weakened immune systems about the potential health risks associated with drinking water.

As part of our ongoing efforts to comply with the Ombudsman's recommendation, we are requesting all water suppliers to include the attached HealthlinkBC File # 56 with their annual report. Please make the report available to all your users. The information can also be found on the following web link:
www.healthlinkbc.ca/healthfiles/pdf/hfile56.pdf

If you have any questions about the above, please contact our office at 604-870-7900 (toll free: 1-866-749-7900) and one of our environmental health officers will gladly assist you.

Sincerely

Marc Zubel, P.Eng.
Manager, Drinking Water Program
Health Protection

Enc.

MZ/cs

Public Health Protection
Fraser Health Authority

#207 - 2776 Bourquin Crescent West
Abbotsford BC
V2S 6A4 Canada

Tel (604) 870-7900
Fax (604) 870-7901
www.fraserhealth.ca



HealthLinkBC



Number 56
August 2009

Drinking Water and Those with Weakened Immune Systems

Some people with very weak immune systems may be at higher risk of water-borne infections. This file provides information about how to help prevent water-borne infections.

People who have significantly weakened immune systems and who are at higher risk of certain water-borne diseases include:

- People with HIV infection who have a CD4+ count of < 100 cells/mm³.
- People with hematological malignancies (lymphoma or leukemia) who are being actively treated or have been in remission and off treatment for less than 1 year.
- Hematopoietic stem cell transplant recipients.
- People born with diseases that severely affect their immune systems.

Some people with weakened immune systems, such as those with certain types of cancers or taking certain medications, may not be at higher risk of severe water-borne diseases. These people do not need to take extra precautions with their drinking water.

Ask your doctor or specialist how weak your immune system is, and whether you need to take extra precautions.

Diseases from drinking water

Drinking water can contain different organisms, including bacteria, viruses and parasites, which can cause disease. These organisms can exist in the source water such as lake water and survive through treatment, or they can enter the water supply in the distribution system. Well water can be contaminated if the well is not built properly or if it draws on water from the surface of the

ground, such as shallow wells or wells drilled in fractured rock. Surface water, such as rivers, lakes and streams, can also contain disease-causing organisms from animal feces.

If you have a weak immune system, you should not drink water from surface sources or wells potentially contaminated by surface water (for example, dug wells), unless the water has been treated to remove or inactivate at least 99.9% of parasites (protozoa), 99.99% of viruses and 100% of harmful bacteria.

Most community water systems in B.C. have effective treatment, such as disinfection or chlorination, against bacteria and viruses. However, in many cases, treatment may not provide a 99.9% reduction in infectious parasites. Furthermore, some water systems and many private supplies have no treatment at all. If the water you drink has not been disinfected, please refer to HealthLink BC File #49b [How to Disinfect Drinking Water](#).

To further treat drinking water that has been disinfected, consider the methods listed below.

Options for water treatment

Boiling: If your water supply is disinfected you need only bring the water to a full boil to inactivate any *Cryptosporidium* parasites - a major concern for immunocompromised people, as there is no medical treatment for this parasite.

If the water is not yet disinfected, it's recommended you bring water to a full boil for at least one minute as the best way to kill or inactivate bacteria, viruses and parasites.

At elevations over 2,000 meters [6,500 feet], you should boil water for at least two minutes to disinfect it. In this situation, you should not drink or use tap water to brush your teeth, rinse your mouth, mix drinks or make ice cubes without boiling it first.

If you are preparing infant formula, please see HealthLink BC File [#69b Formula Feeding Your Baby: Safely Preparing and Storing Formula](#). Please note that boiling water will get rid of viruses, bacteria and parasites but not chemicals which may be found in the water. For more information, please contact the environmental health officer or drinking water officer at your nearest public health unit.

Filters: If you plan to install a drinking water filter in your home, you will need a system labeled as "Absolute" 1 micron or smaller, and labeled as meeting ANSI/NSF International Standard #53 for removal of parasites. These are *not* suitable for removing bacteria and viruses and should *not* be used *unless* the water supply is at least disinfected first.

Jug-type filters, which sit in a jug and allow water to trickle through, and some tap-mounted and built-in devices are not an appropriate solution. The jug filter models are *not* effective in removing many disease-causing organisms.

Reverse Osmosis (RO): RO is effective against all disease-causing organisms and many chemical contaminants. Unless it has a high capacity, it will only produce small amounts of water and waste a large volume. Speak to a water treatment specialist to see if this is the best option for you.

Ultraviolet (UV) Treatment: UV light will kill many disease-causing organisms, and it is effective against almost all parasites. UV will not kill some bacterial spores and some viruses, so it should *not* be used *unless* the water supply is at least disinfected. UV

treatment units should meet NSF Standard #55A.

Bottled water

If you do not want to drink water from the tap, you may also choose to buy bottled water that has been treated adequately. Most bottled water in B.C. has had RO treatment, but not all has been treated. You should check with the water bottler to find out what treatment it has had. You can still use tap water for cooking as long as you boil it. You can use bottled water treated by reverse osmosis for drinking, brushing teeth, making ice cubes and for recipes where water is used but not boiled such as cold soups or salad dressings.

For more information, including the level of treatment in your local water system, please contact your drinking water purveyor or supplier or the local environmental health officer or drinking water officer. Please also see the following HealthLink BC Files.

[#49a Water-borne Diseases in BC](#)

[#49b How to Disinfect Drinking Water](#)



BC Centre for Disease Control
AN AGENCY OF THE PROVINCIAL HEALTH SERVICES AUTHORITY

For more HealthLink BC File topics, visit www.HealthLinkBC.ca/healthfiles/index.stm or your local public health unit.

Click on www.HealthLinkBC.ca or call 8-1-1 for non-emergency health information and services in B.C.

For deaf and hearing-impaired assistance, call 7-1-1 in B.C.

Translation services are available in more than 130 languages on request.

APPENDIX B – METALS IN DRINKING WATER



February 26, 2016

Water System Operators

Re: Metals in Drinking Water – “Flush” Message in Annual Reports

Fraser Health has recently revised its metals at the tap “Flush” message and we are asking all water systems to please include the following health message with your next annual reports to your users.

Anytime the water in a particular faucet has not been used for six hours or longer, “flush” your cold-water pipes by running the water until you notice a change in temperature. (This could take as little as five to thirty seconds if there has been recent heavy water use such as showering or toilet flushing. Otherwise, it could take two minutes or longer.) The more time water has been sitting in your home’s pipes, the more lead it may contain.

Use only water from the cold-tap for drinking, cooking, and especially making baby formula. Hot water is likely to contain higher levels of lead.

The two actions recommended above are very important to the health of your family. They will probably be effective in reducing lead levels because most of the lead in household water usually comes from the plumbing in your house, not from the local water supply.

Conserving water is still important. Rather than just running the water down the drain you could use the water for things such as watering your plants.

If you have any questions, please contact our Drinking Water Program at 604-870-7903.

Sincerely,

Marc Zubel
Manager, Drinking Water Program
Health Protection

Public Health Protection
Fraser Health Authority

#207 - 2776 Bourquin Crescent West
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V2S 6A4 Canada

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APPENDIX C – ANNUAL RAW WATER SCAN (SURFACE WATER)

Parameter *	Units	GCDWQ ¹	Cannell Lake		Norrish Creek	
			2021 22-Apr	2021 16-Sept	2021 22 - Apr	2021 16-Sept
Alkalinity (as CaCO ₃)	mg/L	-	-	3.9	4.3	8.4
Aluminum (total)	µg/L	200	13.5	18.2	73.5	26.4
Antimony (total)	µg/L	6	ND	ND	ND	ND
Arsenic (total)	µg/L	10	ND	0.13	0.13	0.31
Barium (total)	µg/L	1000	2.6	2.7	4.2	7
Bicarbonate (as HCO ₃)	mg/L	-	-	4.8	5.2	10
Boron (total)	µg/L	5000	ND	ND	ND	ND
Cadmium (total)	µg/L	5	ND	ND	ND	ND
Calcium (total)	mg/L	-	1.25	1.35	1.56	2.91
Carbonate (as CO ₃)	mg/L	-	-	ND	ND	ND
Chloride	mg/L	≤ 250	-	ND	ND	ND
Chromium (total)	µg/L	50	ND	ND	ND	ND
Colour (total)	TCU	≤ 15	-	ND	8.5	-
Conductivity	microS/cm	-	-	13	14	24
Copper (total)	µg/L	2000	0.88	1.09	ND	ND
Fluoride	mg/L	1.5	-	ND	ND	ND
Glyphosate	µg/L	-	-	-	-	ND
Hardness (as CaCO ₃)	mg/L	-	3.79	4.08	4.72	8.77
Iron (total)	µg/L	≤ 300	ND	35	15	ND
Lead (total)	µg/L	5	ND	ND	ND	ND
Magnesium (total)	mg/L	-	0.164	0.174	0.198	0.366
Manganese (total)	µg/L	120	2.3	5.4	ND	ND
Mercury (total)	µg/L	1	ND	ND	ND	ND
Nitrate (as N)	mg/L	10	-	ND	.0944	0.18
Nitrite (as N)	mg/L	-	-	ND	ND	ND
pH	-	7 – 10.5	6.44	6.17	6.7	6.32
Potassium (total)	µg/L	-	ND	56	69	116
Selenium (total)	µg/L	50	ND	ND	ND	ND
Sodium (total)	mg/L	≤ 200	0.681	0.703	0.661	1.26
Sulphate	mg/L	≤ 500	-	1.5	-	1.8
Total Dissolved Solids	mg/L	≤ 500	-	10	28	18
Uranium (total)	µg/L	20	ND	ND	ND	ND
Zinc (total)	µg/L	≤ 5000	ND	ND	ND	ND

ND = not detectable

- = Not Tested

* Parameters tested may vary slightly from year to year; this table provides results for those with GCDWQ specified limits and those that are more often of interest to certain customers (e.g. industries with processes sensitive to metal concentrations).

Contact eng-info@abbotsford.ca to inquire about other results.

** Glyphosate tested only at Norrish because it is an actively logged watershed. Results are non-detect.

1 - These are treated water criteria and only shown for comparison to raw water results. (i.e. Water treatment will improve quality before water is sent into distribution system). Black text denotes health-based maximum acceptable concentrations (MAC); light grey text denotes aesthetic objectives (AO).

APPENDIX D – ANNUAL RAW WATER SCAN (WELLS)

(Page 1 of 3)

Parameter *	Units	GCDWQ ¹	Farmer 1			Farmer 3			Industrial A			Industrial B			Industrial C			McConnell		
			2019 17-Oct	2020 17-Sep	2021 16-Sep	2019 17-Oct	2020 17-Sep	2021 16-Sep	2019 17-Oct	2020 17-Sep	2021 16-Sep	2019 17-Oct	2020 17-Sep	2021 16-Sep	2019 17-Oct	2020 17-Sep	2021 16-Sep	2019 17-Oct	2020 17-Sep	2021 16-Sep
Alkalinity (as CaCO ₃)	mg/L	-	67.1	60.2	69	Tested, but results not representative. ²	Not Tested	95	Not Tested	169	160	98.6	83.3	110	Not Tested	80.6	110	78.6	76.2	89
Aluminum (total)	µg/L	200	ND	ND	ND			ND		ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
Antimony (total)	µg/L	6	ND	ND	ND			ND		0.31	ND	0.31	0.12	ND		0.34	0.56	0.28	0.22	ND
Arsenic (total)	µg/L	10	0.14	0.17	0.12			5.58		1.6	1.55	6.1	8.0	6.09		7.3	7.93	5.5	4.6	6.2
Barium (total)	µg/L	1000	11	12	11.5			36.2		38	37.8	24	24	33.8		33	42.6	26	28	28.6
Bicarbonate (as HCO ₃)	mg/L	-	-	-	84			120		-	200	-	-	130		-	130	-	-	110
Boron (total)	µg/L	5000	22	24	ND			ND		22	ND	17	20	ND		10	ND	24	23	ND
Cadmium (total)	µg/L	5	0.02	0.01	0.012			ND		0.02	ND	ND	0.01	ND		ND	ND	0.01	0.01	ND
Calcium (total)	mg/L	-	31.8	32.4	32.4			45.5		57.1	59.4	34.1	27.4	37.9		36.3	39.6	33.0	35.9	37.2
Carbonate (as CaCO ₃)	mg/L	-	ND	-	ND			-		-	ND	-	-	ND		-	ND	-	-	ND
Chloride	mg/L	≤ 250	9.85	11.5	13			11		8.72	9.4	13.5	12.9	14		12.1	11	12.6	12.3	13
Chromium (total)	µg/L	50	0.27	0.18	ND			ND		0.76	ND	ND	ND	ND		ND	ND	ND	ND	ND
Colour (Total)	TCU	≤ 15	ND	ND	ND			ND		ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
Conductivity	microS/cm	-	270	303	290			330		456	450	282	264	320		306	330	305	339	340
Copper (total)	µg/L	≤ 2000	6.31	0.780	1.15			ND		1.54	1.51	ND	0.570	0.24		0.550	0.73	2.94	2.43	2.32
Fluoride	mg/L	1.5	0.05	0.05	ND			ND		ND	ND	0.05	0.05	ND		0.04	ND	0.06	0.04	ND
Hardness (as CaCO ₃)	mg/L	-	123	121	121			147		208	208	132	98	134		125	140	119	124	126
Iron (total)	µg/L	≤ 300	ND	ND	ND			13.8		ND	ND	10	18	12.2		ND	ND	29	ND	19.3
Lead (total)	µg/L	5	0.54	ND	ND			ND		ND	ND	ND	ND	ND		ND	ND	0.25	0.12	ND
Magnesium (total)	mg/L	-	9.19	9.65	9.44			8.55		15.6	15.6	8.30	7.25	9.01		8.36	10	7.57	8.46	8.33
Manganese (total)	µg/L	≤ 120	61.1	62.7	64.6			1.2		16.9	28.8	51.0	43.2	58.2		52.2	55	20.6	16.1	28.2
Mercury (total)	µg/L	1	ND	ND	ND			ND		ND	ND	ND	ND	ND		ND	ND	ND	ND	ND
pH	-	7 – 10.5	7.7	7.1	6.72			7.16		8.1	7.68	8.3	8.2	7.48		8.2	7.51	8.1	7.9	7
Potassium (total)	mg/L	-	1.6	1.6	1.61			1.94		2.4	2.41	3.3	3.0	3.28		2.8	3.47	3.0	3.0	3.43
Selenium (total)	µg/L	10	0.62	0.71	0.54			0.42		0.52	0.56	ND	ND	ND		ND	ND	0.25	0.50	0.42
Silicon (total)	µg/L	-	8070	7720	8130			7710		9660	10200	6570	6680	6510		6510	5730	8030	7820	8080
Sodium (total)	mg/L	≤ 200	6.13	6.05	6.31			5.44		6.46	6.72	8.89	10.4	9.1		6.39	8.07	16.2	14.6	15.2
Sulphate	mg/L	≤ 500	40.4	35.7	39			59		39.6	43	38.0	27.4	47		50.2	54	67.2	64.1	71
Total Dissolved Solids	mg/L	≤ 500	199	273	190			210		358	280	184	189	190		222	210	197	250	210
Turbidity	NTU	-	ND	ND	ND			0.16		ND	0.12	ND	ND	ND		ND	ND	0.14	0.14	0.1
Uranium (total)	µg/L	20	0.040	0.038	ND			0.17		0.66	0.76	0.63	0.31	0.74		0.39	1.07	0.31	0.29	0.30
Zinc (Total)	µg/L	≤ 5000	35	5.1	6.1			ND		ND	ND	ND	3.4	ND		ND	ND	4.5	3.8	5.2

ND = not detectable

Not Tested = well pumps were out-of-service, thus sampling could not be completed. Riverside 2 and Marshall 2 results are not shown since the well has been out-of-service since 2010.

- = Not Tested

* Parameters tested may vary slightly from year to year; this table provides results for those with GCDWQ specified limits and those that are more often of interest to certain customers (e.g. industries with processes sensitive to metal concentrations). Contact eng-info@abbotsford.ca to inquire about other results.

1 - These are treated water criteria and only shown for comparison to raw water results. (i.e. Water treatment may improve quality before water is sent into distribution system). Black text denotes health-based maximum acceptable concentrations (MAC); light grey text denotes aesthetic objectives (AO).

2 - Farmer 3 has been out of service since Jul 2017. It is a well that requires extensive flushing after prolonged outages before water quality normalizes and water is sent to distribution. It was not used in 2019 and 2020.

(Page 2 of 3)

Parameter	Units	GCDWQ	Marshall 1			Marshall 3			Riverside 1			Townline 1			Townline 2		
			2019 17-Oct	2020 17-Sep	2021 16-Sep	2019 17-Oct	2020 17-Sep	2021 16-Sep	2019 17-Oct	2020 17-Sep	2021 16-Sep	2019 17-Oct	2020 17-Sep	2021 16-Sep	2019 17-Oct	2020 17-Sep	2021 16-Sep
Alkalinity (as CaCO ₃)	mg/L	-	113	105	120	Not Tested	105	110	Not Tested	69.5	80	46.8	Not Tested	Not Tested	38.4	44.1	52
Aluminum (total)	µg/L	200	ND	ND	ND		ND	ND		ND	ND	ND			ND	ND	ND
Antimony (total)	µg/L	6	0.18	ND	ND		ND	ND		ND	ND	ND			ND	ND	ND
Arsenic (total)	µg/L	10	2.0	1.0	3.68		1.1	1.07		0.59	0.53	0.51			0.28	0.62	0.6
Barium (total)	µg/L	1000	13	11	15.1		11	10.2		15	14.8	20			6.2	4.9	5.2
Bicarbonate (as HCO ₃)	mg/L	-	-	-	150		-	130		-	97	-			-	-	63
Boron (total)	µg/L	5000	18	16	ND		17	ND		15	ND	18			26	21	ND
Cadmium (total)	µg/L	5	0.03	0.02	0.027		0.03	0.028		0.05	0.012	0.03			0.03	0.03	0.021
Calcium (total)	mg/L	-	39.3	32.9	44.1		37.3	36.4		33.2	36.1	21.1			20.1	18.3	19.9
Carbonate (as CO ₃)	mg/L	-	-	-	ND		-	ND		-	ND	-			-	-	ND
Chloride	mg/L	≤ 250	28.7	27.3	27		29.6	22		26.3	26	13.5			7.23	10.2	11
Chromium (total)	µg/L	50	ND	ND	ND		ND	ND		0.45	ND	0.18			0.24	0.18	ND
Colour (total)	TCU	≤ 15	ND	ND	ND		ND	ND		ND	ND	ND			ND	ND	ND
Conductivity	microS/cm	-	326	349	400		357	320		317	320	194			165	182	190
Copper (total)	µg/L	≤ 2000	7.37	7.65	1.39		0.89	0.63		9.84	7.03	10.9			24.8	3.85	5.35
Fluoride	mg/L	1.5	0.03	0.04	ND		0.05	ND		0.02	ND	0.02			ND	0.02	ND
Hardness (as CaCO ₃)	mg/L	-	147	117	144		132	126		124	131	78.3			71.8	63.2	69.5
Iron (total)	µg/L	≤ 300	170	27.0	ND		ND	ND		ND	8.4	14			1630 ³	ND	13.4
Lead (total)	µg/L	5	0.30	0.22	ND		ND	ND		0.29	0.29	0.34			0.69	0.08	ND
Magnesium (total)	mg/L	-	8.82	8.40	8.83		9.50	8.88		9.99	10.3	4.59			4.24	4.22	4.48
Manganese (total)	µg/L	≤ 120	6.53	9.71	7.5		8.61	11.3		1.46	ND	85.2			11.2	4.74	8.8
Mercury (total)	µg/L	1	ND	ND	ND		ND	ND		ND	ND	ND			ND	ND	ND
pH	-	7 – 10.5	8.12	8.14	7.53		7.68	7.2		7.39	7.18	7.45			7.31	6.98	6.69
Potassium (total)	mg/L	-	2.7	1.8	3.44		2.1	2.13		1.7	1.78	2.8			0.95	1.1	1.14
Selenium (total)	µg/L	10	ND	0.10	ND		ND	ND		0.28	0.2	0.13			0.16	0.23	0.17
Silicon (total)	µg/L	-	8010	7680	7710		7360	8240		10300	11200	9550			10600	8690	9590
Sodium (total)	mg/L	≤ 200	14.1	1.80	19.6		14.2	12.4		7.62	7.94	6.89			5.36	7.26	7.2
Sulphate	mg/L	≤ 500	30.4	26.2	43		29.7	36		28.9	40	16.5			13.8	14.6	15
Total Dissolved Solids	mg/L	≤ 500	216	230	240		243	200		269	210	145			130	154	130
Turbidity	NTU	20	0.12	0.20	ND		ND	ND		ND	ND	ND			1.7	ND	0.38
Uranium (total)	µg/L	20	0.60	0.50	0.81		0.80	0.48		0.06	ND	0.02			0.02	0.08	ND
Zinc (total)	µg/L	≤ 5000	18	4.8	ND		ND	ND		11	11.7	18			10	ND	ND

ND = not detectable

- = Not Tested

Not Tested = well pumps were out-of-service, thus sampling could not be completed.

3 – In 2019, this water was blended with other sources. All distribution samples were below the AO.

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Parameter	Units	GCDWQ	Bevan 1			Bevan 2			Bevan 3			Bevan 4		
			2019 17-Oct	2020 17-Sep	2021 16-Sep	2019 17-Oct	2020 17-Sep	2021 16-Sep	2019 17-Oct	2020 17-Sep	2021 16-Sep	2019 17-Oct	2020 17-Sep	2021 16-Sep
Alkalinity (as CaCO ₃)	mg/L	-	43.6	52.4	50	49.8	54.6	63	43.1	Not Tested	48	39.3	38.4	40
Aluminum (total)	µg/L	200	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
Antimony (total)	µg/L	6	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
Arsenic (total)	µg/L	10	0.23	0.26	0.21	0.23	0.25	0.29	0.32		0.23	0.22	0.21	0.17
Barium (total)	µg/L	1000	5.8	6.1	5.6	5.8	6.5	6.5	5.9		5.7	5.1	6.0	5.5
Bicarbonate (as HCO ₃)	mg/L	-	-	-	61	-	-	77	-		59	-	-	48
Boron (total)	µg/L	5000	17	13	ND	13	14	ND	13		ND	12	12	ND
Cadmium (total)	µg/L	5	ND	0.03	0.025	0.03	0.03	0.024	0.02		0.021	0.02	0.03	0.026
Calcium (total)	mg/L	-	34.1	25.7	24.7	21.0	29.1	24.2	20.5		23.8	20.2	25.4	22.5
Carbonate (as CO ₃)	mg/L	-	-	-	ND	-	-	ND	-		ND	-	-	ND
Chloride	mg/L	≤ 250	24.5	21.9	28	20.2	22.8	26	23.5		27	24.4	26.6	29
Chromium (total)	µg/L	50	ND	0.16	ND	0.20	0.17	ND	0.33		ND	0.20	0.24	ND
Colour (total)	TCU	≤ 15	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
Conductivity	microS/cm	-	202	228	240	194	248	230	197		230	194	217	220
Copper (total)	µg/L	≤ 2000	ND	4.27	5.99	8.15	4.90	5.61	13.1		10.4	6.47	12.4	7.23
Fluoride	mg/L	1.5	0.02	0.02	ND	0.03	0.02	ND	0.02		ND	0.02	ND	ND
Hardness (as CaCO ₃)	mg/L	-	80.3	92.9	87.5	81.3	105	87.2	79.5		85	78.7	90	78.4
Iron (total)	µg/L	≤ 300	10	ND	7.4	52	ND	10.1	49		ND	32	ND	ND
Lead (total)	µg/L	5	ND	0.07	ND	0.12	0.06	ND	0.13		ND	0.06	0.05	ND
Magnesium (total)	mg/L	-	8.30	6.98	6.71	6.03	7.88	6.69	5.91		6.27	5.45	6.46	5.49
Manganese (total)	µg/L	≤ 120	7.6	1.7	ND	2.4	1.0	ND	1.2		ND	1.0	0.15	ND
Mercury (total)	µg/L	1	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
pH	-	7 – 10.5	7.56	7.31	6.71	7.66	7.18	6.72	7.57		6.65	7.47	7.02	6.58
Potassium (total)	mg/L	-	1.1	1.2	1.11	1.1	1.2	1.14	1.1		1.09	1.1	1.1	1.07
Selenium (total)	µg/L	10	0.14	0.19	0.22	0.15	0.21	0.17	0.14		0.17	0.17	0.18	0.13
Silicon (total)	µg/L	-	12700	10700	11500	12400	11500	11800	11600		11100	12100	11300	11500
Sodium (total)	mg/L	≤ 200	7.98	7.1	8.3	6.49	8.38	7.24	6.85		7.65	7.23	8.36	7.99
Sulphate	mg/L	≤ 500	11	13	16	10	23	12	10		13	11	12	11
Total Dissolved Solids	mg/L	≤ 500	159	202	190	148	193	170	151		160	153	205	170
Turbidity	NTU	20	0.62	0.10	ND	0.71	ND	ND	0.45		ND	0.45	ND	ND
Uranium (total)	µg/L	20	0.03	0.02	ND	0.01	0.02	ND	0.03		ND	0.01	0.01	ND
Zinc (total)	µg/L	≤ 5000	18	8.0	5.4	18	6.8	ND	5.1		ND	6.0	8.8	ND

ND = not detectable

- = Not Tested

APPENDIX E – MONTHLY WELL MONITORING (NITRATES)

(All results expressed in mg/L as Nitrogen)

Date	Farmer 1	Farmer 3	Industrial A	Industrial B	Industrial C
7-Jan	7.55	-	5.83	ND	ND
11-Feb	6.46	1.93	-	0.0029	0.0049
11-Mar	6.25	-	-	0.115	ND
9-Apr	-	1.7	-	-	-
6-May	6.45	1.27	5.29	0.0031	ND
10-Jun	6.49	2.97	6.13	0.003	ND
8-Jul	6.56	3.99	7.48	0.0037	0.0067
12-Aug	6.01	3.81	7.81	0.0472	0.628
16-Sep	6.2	2.31	8.22	0.437	1.29
7-Oct	-	-	7.4	0.779	0.168
4-Nov	-	-	7.56	1.71	0.983
9-Dec	-	-	7.7	2.37	1.81

Date	McConnell	Riverside 1	Marshall 1	Townline 1	Townline 2
7-Jan	0.415	3.61	0.136	-	2.99
11-Feb	0.585	3.61	-	-	3.38
11-Mar	2.08	3.86	-	-	3.23
15-Apr	2.35	-	0.184	-	3.21
6-May	2.06	4.23	0.0431	-	3.93
10-Jun	1.16	3.84	0.0198	-	2.96
8-Jul	-	-	0.0183	-	-
12-Aug	-	2.98	0.0372	-	3.22
16-Sep	0.591	2.67	0.0616	-	3.36
07-Oct	-	2.59	0.255	-	-
4-Nov	-	2.66	0.0836	-	4.02
9-Dec	0.149	2.71	0.017	-	3.23

Date	Bevan 1	Bevan 2	Bevan 3	Bevan 4
7-Jan	2.77	2.97	-	2.98
11-Feb	3.93	3.2	-	3.06
11-Mar	3.83	3.19	-	3.1
15-Apr	3.83	3.22	3.36	3.26
6-May	3.61	3.05	3.21	3.22
10-Jun	3.42	2.98	3.23	3.18
8-Jul	3.16	2.83	3.02	3.09
12-Aug	2.9	2.78	2.59	2.98
16-Sep	2.94	2.79	2.8	3.09
7-Oct	3.78	3.03	3.12	3.11
4-Nov	3.03	3.08	-	3.18
9-Dec	3.45	3.00	3.15	3.21

ND = not detectable
- = not tested

APPENDIX F – MONTHLY WELL MONITORING (TOTAL METALS)

Parameter	Units	GCDWQ ¹	Farmer 1		Farmer 3		Industrial B		Industrial C		McConnell		Marshall 1		Townline 1		Townline 2	
			Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg
Aluminum (total)	µg/L	200	ND	ND	3.5	3.5	3.5	3.5	11.7	8.1	3.4	3.4	4	4	-	-	ND	ND
Antimony (total)	µg/L	6	ND	ND	ND	ND	ND	ND	0.57	0.53	ND	ND	ND	ND	-	-	ND	ND
Arsenic (total)	µg/L	10	0.15	0.12	6.87	6.03	9.88	7.50	8.85	7.63	6.37	5.76	3.96	2.88	-	-	0.62	0.59
Barium (total)	µg/L	1000	11.50	10.93	37	36	39.5	29.3	42	34	28.8	27.3	15.2	13.6	-	-	5.5	5.3
Boron (total)	µg/L	5000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	ND	ND
Cadmium (total)	µg/L	5	0.014	0.012	ND	ND	ND	ND	ND	ND	0.012	0.011	0.032	0.028	-	-	0.026	0.022
Chromium	µg/L	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	ND	ND
Copper (total)	µg/L	≤2000	1.24	0.90	0.50	0.33	1.23	0.63	1.18	0.81	3.44	2.68	4.43	1.89	-	-	11.2	7.6
Fluoride	mg/L	1.5	0.059	0.054	0.05	0.05	0.064	0.056	0.05	0.05	0.051	0.051	ND	ND	-	-	ND	ND
Hardness (as CaCO ₃)	mg/L	-	123	117	155	148	152	112	137	129	132	126	143	138	-	-	69.6	67.5
Iron (total)	µg/L	≤300	41	20	48.8	26.7	30.6	18.6	23.1	14.7	31.5	18.4	20	14	-	-	151	52
Lead (total)	µg/L	5	ND	ND	ND	ND	ND	ND	ND	ND	0.23	0.23	ND	ND	-	-	0.45	0.30
Magnesium (total)	mg/L	-	9.68	9.13	8.84	8.44	10.4	7.7	10	8	8.56	8.14	9.01	8.71	-	-	4.55	4.33
Manganese (total)	µg/L	≤120	65.4	53.4	1.9	1.5	64.9	50.3	58.3	51.9	29.1	21.6	10.8	7.8	-	-	9	6.7
Mercury (total)	µg/L	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	ND	ND
Selenium (total)	µg/L	10	1.22	0.86	0.64	0.48	ND	ND	ND	ND	0.57	0.45	ND	ND	-	-	0.28	0.17
Uranium (total)	µg/L	20	ND	ND	0.21	0.17	0.89	0.50	1.08	0.52	0.52	0.41	0.83	0.76	-	-	ND	ND
Zinc (total)	µg/L	≤ 5000	9.3	6.9	5	5	22	11.84	7.6	6.6	8	6.7	5.4	5.4	-	-	26.9	17.0

Parameter	Units	GCDWQ ¹	Bevan 1		Bevan 2		Bevan 3		Bevan 4		Riverside 1	
			Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg
Aluminum (total)	µg/L	200	ND	ND	27.7	27.7	3.4	3.4	ND	ND	ND	ND
Antimony (total)	µg/L	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic (total)	µg/L	10	0.23	0.20	0.33	0.27	0.22	0.20	0.26	0.19	0.63	0.56
Barium (total)	µg/L	1000	6.4	5.7	6.7	6.4	5.9	5.5	6.8	5.5	15.3	14.5
Boron (total)	µg/L	5000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium (total)	µg/L	5	0.038	0.026	0.025	0.021	0.023	0.022	0.033	0.024	0.015	0.013
Chromium	µg/L	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper (total)	µg/L	≤2000	40.7	16.5	20	10.4	94.9	25.4	33.9	13.2	10.7	6.9
Fluoride	mg/L	1.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hardness (as CaCO ₃)	mg/L	-	92	83	93.2	83.7	86.4	78.6	84.2	76.0	134	128
Iron (total)	µg/L	≤300	4750 ²	738 ²	104	37.9	125	37.34	1280 ²	175	36.1	20.1
Lead (total)	µg/L	5	7.17 ³	3.76	ND	ND	5.56 ³	3.00	3.52	1.92	0.5	0.28
Magnesium (total)	mg/L	-	6.87	6.29	7.32	6.35	6.28	5.78	6.34	5.40	10.2	9.8
Manganese (total)	µg/L	≤120	13.2	6.5	2	1.6	8.1	4.6	4.6	3.0	2.30	1.50
Mercury (total)	µg/L	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium (total)	µg/L	10	0.21	0.14	0.21	0.16	0.21	0.15	0.17	0.13	0.23	0.22
Uranium (total)	µg/L	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc (total)	µg/L	≤ 5000	72.7	20.15	10.4	8.2	13.1	8.8	49.3	15.6	16.6	11.8

ND = not detectable
 1 - These are treated water criteria and only shown for comparison to raw water results. (i.e. Water treatment may improve quality before water is sent into distribution system). Black text denotes health-based maximum acceptable concentrations (MAC); light grey text denotes aesthetic objectives (AO).
 2 - Discussed in Section 3.1.2
 3 - These are atypical results and the cause has not been determined. Once alert was received the wells were flushed and the water sent to waste.

APPENDIX G – WELL PESTICIDES, HERBICIDES, & HYDROCARBONS SCAN

Parameters Tested (all results non-detect)		
2,4' + 4,4'-DDD	Benzo(a)anthracene	Fluoranthene
2,4' + 4,4'-DDE	Benzo(a)pyrene	Fluorene
2,4' + 4,4'-DDT	Benzo(b,j)fluoranthene	g-Chlordane
2,4'-DDD (o,p-DDD)	Benzo(g,h,i)perylene	gamma-BHC / Lindane
2,4'-DDE (o,p-DDE)	Benzo(k)fluoranthene	Heptachlor
2,4'-DDT (o,p-DDT)	beta-BHC	Heptachlor epoxide
2-Methylnaphthalene	Chlordane	Hexachlorobenzene
4,4'-DDD (pp-DDD)	Chrysene	Indeno(1,2,3-c,d)pyrene
4,4'-DDE (pp-DDE)	Anthracene	Methoxychlor
4,4'-DDT (pp-DDT)	DDT + metabolites	Mirex
a-Chlordane	delta-BHC	Naphthalene
Acenaphthene	Dibenzo(a,h)anthracene	Octachlorostyrene
Acenaphthylene	Dieldrin	Oxychlordane
Acridine	Endosulfan (total)	Phenanthrene
Aldrin	Endosulfan I	Polychlorinated Biphenyls / PCBs
alpha-BHC	Endosulfan II	Pyrene
Aroclor 1242	Endosulfan sulfate	Quinoline
Aroclor 1248	Endrin	Total HMW PAH
Aroclor 1254	Endrin aldehyde	Total LMW PAH
Aroclor 1260	Endrin ketone	Total PAH

APPENDIX H – WEEKLY DISTRIBUTION SYSTEM MONITORING

System Wide Statistics

	Overall							Transmission							Abbotsford							Mission						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)		# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)		# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)		# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg			Max	Avg	Median	Max	Avg			Max	Avg	Median	Max	Avg			Max	Avg	Median	Max	Avg
2019	2208	7	2.07	1.12	6.97	1.06	0.17	257	4	2.07	1.38	7.00	0.57	0.25	1484	1	1.82	0.98	6.93	1.06	0.14	467	2	1.79	1.12	7.17	0.97	0.24
2020	2172	8	2.55	1.30	6.97	3.17	0.21	248	3	2.55	1.56	7.16	3.17	0.30	1456	4	2.29	1.00	6.91	0.76	0.16	468	1	2.31	1.35	7.14	2.63	0.29
2021	2142	26	2.55	1.46	7.03	1.86	0.22	257	6	2.55	1.77	7.22	1.27	0.31	1421	8	2.2	1.16	6.92	1.86	0.17	464	12	2.41	1.51	7.4	1.68	0.3

Transmission System Sample Locations

	Ainsworth							Cannon 600							Cannon 400							Bell Road						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)		# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)		# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)		# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg			Max	Avg	Median	Max	Avg			Max	Avg	Median	Max	Avg			Max	Avg	Median	Max	Avg
2019	51	1	2.07	1.58	7.10	0.57	0.30	51	0	1.89	1.32	7.39	0.55	0.29	51	3	1.98	1.48	7.35	0.55	0.28	52	0	1.82	1.38	6.66	0.35	0.11
2020	52	0	2.55	2.10	7.16	3.17	0.43	52	1	2.29	1.47	7.32	0.59	0.35	52	2	2.26	1.86	7.32	0.75	0.34	52	0	1.74	1.39	6.72	0.57	0.13
2021	52	2	2.55	2.07	7.18	0.89	0.41	51	2	2.41	1.81	7.56	0.78	0.40	51	2	2.23	1.88	7.62	1.27	0.39	51	0	2.17	1.53	6.68	0.46	0.11

	Maclure						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
2019	52	0	1.62	1.13	7.02	0.64	0.17
2020	52	0	1.44	1.14	7.14	0.44	0.19
2021	49	0	2.08	1.53	6.96	0.55	0.18

*Weekly distribution system monitoring results for sites E2-E8 were removed from November 16 to December 14. Flooding of Abbotsford’s Sumas Prairie in mid-November 2021 led to several water main breaks. While there was no evidence of floodwaters contaminating Sumas Prairie drinking water, the City was proactive and isolated the flooded areas. The City issued a “Boil Water Advisory” on November 18 and “Do Not Use” advisory on November 24. Enhanced disinfection and flushing of the Sumas Prairie area took place during the second week of December with the approval of Fraser Health. All advisories were rescinded by December 20 once all biological and chemical water quality tests were confirmed to meet Canadian Drinking Water Quality Guidelines.

Mission Distribution Sample Locations

M1							
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg		Max	Avg
2019	52	0	1.59	1.1	7.16	0.41	0.16
2020	52	0	2.14	1.21	7.16	0.59	0.23
2021	52	0	1.82	1.37	7.25	0.39	0.20

M2							
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg		Max	Avg
52	0	1.32	0.97	7.12	0.81	0.31	
52	0	1.83	1.27	7.09	0.67	0.33	
51	1	1.92	1.34	7.42	0.82	0.37	

M3							
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg		Max	Avg
52	0	1.56	1.17	7.16	0.86	0.32	
52	0	1.96	1.54	6.96	0.49	0.31	
51	0	2.13	1.51	7.74	0.78	0.38	

M5							
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg		Max	Avg
52	0	1.58	1.11	7.26	0.48	0.18	
52	0	2.04	1.24	7.13	1.45	0.28	
52	3	2.11	1.37	7.36	0.75	0.24	

M6							
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg		Max	Avg
2019	51	2	1.78	1.11	7.11	0.97	0.30
2020	52	1	2.31	1.46	7.13	2.63	0.40
2021	52	4	2.41	1.63	7.41	0.85	0.38

M7							
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg		Max	Avg
52	0	1.65	1.26	6.95	0.84	0.18	
52	0	2.27	1.32	6.94	0.49	0.21	
51	1	2.32	1.61	7.13	0.48	0.21	

M8							
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg		Max	Avg
52	0	1.50	1.22	7.46	0.82	0.26	
52	0	2.10	1.62	7.25	0.64	0.34	
52	0	2.25	1.75	8.12	1.68	0.41	

M9							
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg		Max	Avg
51	0	1.79	1.32	6.80	0.51	0.17	
52	0	2.21	1.41	6.77	0.50	0.17	
51	2	2.38	1.70	6.82	0.44	0.19	

M10							
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg		Max	Avg
2019	51	0	1.31	0.84	7.55	0.53	0.25
2020	52	0	1.87	1.03	7.36	0.53	0.31
2021	52	1	2.02	1.30	7.70	0.88	0.30

Abbotsford West Distribution Sample Locations

	W1						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
2019	53	0	1.57	1.06	6.95	0.38	0.15
2020	52	0	1.57	1.10	6.98	0.35	0.15
2021	52	0	2.05	1.26	6.88	0.95	0.19

	W2						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
53	0	1.74	1.24	7.10	0.36	0.13	
52	0	1.53	1.18	7.06	0.48	0.15	
52	0	1.96	1.45	7.01	0.56	0.17	

	W3						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
53	0	1.76	1.27	7.02	0.39	0.13	
52	0	1.48	1.14	6.98	0.26	0.15	
52	0	2.19	1.40	6.81	0.73	0.18	

	W4						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
53	0	1.72	1.04	6.86	0.39	0.14	
52	0	1.54	1.00	6.67	0.38	0.14	
52	0	1.43	1.08	6.93	0.83	0.18	

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	W5						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
2019	53	1	1.81	1.35	6.90	0.39	0.13
2020	52	1	2.29	1.38	6.89	0.50	0.15
2021	52	0	1.9	1.39	6.81	0.55	0.15

	W6						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
53	0	1.76	1.24	6.86	0.33	0.13	
52	0	1.63	1.25	6.77	0.29	0.14	
52	0	1.79	1.26	6.75	0.56	0.14	

	W7						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
53	0	1.63	0.86	6.68	0.29	0.11	
52	0	1.21	0.81	6.45	0.26	0.11	
52	0	1.41	0.92	6.82	0.81	0.16	

	W8						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
53	0	1.10	0.51	6.53	1.06	0.23	
52	0	0.92	0.62	6.56	0.40	0.14	
52	0	1.3	0.77	6.77	0.53	0.16	

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	W9						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
2019	53	0	1.26	0.64	6.66	0.40	0.14
2020	52	0	0.96	0.66	6.95	0.64	0.18
2021	52	1	1.36	0.85	6.98	1.15	0.21

	W11						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
53	0	1.47	1.03	7.00	0.25	0.14	
52	0	1.30	0.99	7.01	0.27	0.15	
52	0	1.96	1.37	6.91	0.83	0.22	

	W13						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
53	0	1.43	0.69	6.95	0.27	0.13	
52	1	1.15	0.59	6.90	0.29	0.16	
52	0	1.37	0.83	6.82	0.7	0.19	

	W14						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
53	0	1.56	0.82	6.88	0.57	0.15	
52	0	1.40	0.95	6.66	0.34	0.15	
52	0	1.52	0.83	6.81	0.54	0.17	

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	W15						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
2019	53	0	1.77	1.28	6.90	0.41	0.13
2020	52	0	2.26	1.28	6.83	0.52	0.15
2021	52	0	2.04	1.50	6.86	0.73	0.15

	W16						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
53	0	1.45	0.91	7.00	0.29	0.14	
52	0	1.18	0.87	7.26	0.45	0.17	
52	0	1.56	1.23	7.08	0.89	0.21	

Abbotsford East Distribution Sample Locations

		E2							E3							E4							E5						
		# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)		# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)		# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)		# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
				Max	Avg		Max	Avg			Max	Avg		Max	Avg			Max	Avg		Max	Avg			Max	Avg		Max	Avg
		53	0	1.68	0.97	6.95	0.34	0.14	53	0	1.54	0.89	7.01	0.36	0.14	53*	0	1.30	0.80	7.00	0.31	0.13	53	0	1.13	0.51	6.97	0.27	0.13
2019																													
2020		52	0	1.52	1.15	7.02	0.50	0.18	52	0	1.22	0.93	6.95	0.57	0.17	52	1	1.36	0.94	6.95	0.40	0.18	52	0	0.95	0.55	6.87	0.32	0.15
2021		47	1	1.61	1.18	7.02	0.6	0.14	47	1	1.49	1.03	7.01	0.65	0.15	47	0	1.33	0.89	7.06	0.51	0.14	47	1	1.1	0.61	7.02	0.30	0.15

		E6							E7							E8							E9						
		# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)		# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)		# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)		# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
				Max	Avg		Max	Avg			Max	Avg		Max	Avg			Max	Avg		Max	Avg			Max	Avg		Max	Avg
		53	0	1.44	0.98	7.00	0.47	0.15	53	0	1.06	0.44	6.95	0.25	0.12	53	0	1.40	0.69	7.10	0.43	0.16	53	0	1.61	1.16	7.13	0.31	0.13
2019																													
2020		52	0	1.48	1.15	7.06	0.39	0.20	52	0	0.90	0.45	6.93	0.38	0.17	52	1	1.20	0.84	7.13	0.58	0.26	52	0	1.62	1.14	7.08	0.63	0.17
2021		47	0	1.47	1.16	7.06	1.86	0.20	47	0	0.98	0.54	7.03	0.47	0.15	47	1	1.23	0.77	7.06	0.79	0.19	52	0	2.02	1.36	7.11	0.43	0.15

		E10							E11							E12							E13						
		# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)		# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)		# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)		# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
				Max	Avg		Max	Avg			Max	Avg		Max	Avg			Max	Avg		Max	Avg			Max	Avg		Max	Avg
		53	0	1.57	1.18	7.06	0.26	0.13	53	0	1.78	1.24	6.99	0.23	0.12	53	0	1.81	1.31	6.93	0.44	0.13	53	0	1.82	1.20	6.94	0.26	0.12
2019																													
2020		52	0	1.76	1.19	7.03	0.76	0.18	52	0	1.49	1.19	6.98	0.55	0.18	52	0	2.14	1.29	6.91	0.71	0.16	52	0	1.59	1.17	6.91	0.34	0.16
2021		52	1	1.92	1.44	6.93	0.41	0.16	52	0	1.75	1.37	6.81	0.64	0.17	52	2	2.20	1.62	6.78	0.64	0.18	52	0	2.14	1.39	6.75	0.4	0.17

		E14							E15						
		# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)		# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
				Max	Avg		Max	Avg			Max	Avg		Max	Avg
		53	0	1.75	1.10	6.69	0.25	0.12	53	0	1.56	1.13	6.97	0.28	0.12
2019															
2020		52	0	1.48	0.92	6.61	0.27	0.12	52	0	1.61	1.18	6.92	0.28	0.16
2021		52	0	1.54	1.07	6.96	0.4	0.13	52	0	2.19	1.37	6.76	0.77	0.16

APPENDIX I – QUARTERLY DISTRIBUTION SYSTEM MONITORING (TOTAL METALS)

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Parameter	Units	GCDWQ	W1		W2		W3		W4		W5		W6		W7		W8		W9		W11		W13		W14		W15		W16	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Aluminum (total)	µg/L	100	19.3	57.5	14.6	54.8	16.6	52.8	3.2	51.9	14.6	50.1	12.4	52.6	16.3	44.8	3.2	27.5	4.5	25.9	16	56.5	14	53.4	13.5	56	15.1	51.3	16.3	60.3
Antimony (total)	µg/L	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic (total)	µg/L	10	0.11	0.28	0.11	0.28	0.11	0.28	0.15	0.67	0.11	0.28	0.1	0.29	0.17	0.57	0.21	0.51	0.21	4.85	0.11	0.26	0.13	0.23	0.13	0.28	0.12	0.27	0.1	0.28
Barium (total)	µg/L	1000	4.5	6	4.2	6	4.2	6	3.6	10	4.2	5.5	4.1	4.6	3.5	7.7	3	9.6	2.6	23.9	4.1	5.2	3.4	5.2	3.9	5.6	4.1	6.1	4.1	5.7
Beryllium (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bismuth (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Boron (total)	µg/L	5000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium (total)	µg/L	50	0.013	0.013	ND	ND	ND	ND	0.02	0.02	ND	ND	ND	ND	0.011	0.028	0.02	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium (total)	µg/L	-	2.45	3.45	1.82	2.64	1.82	2.75	2.16	28.4	1.81	3.18	1.82	5.14	2.36	26.9	2.39	25.6	2.36	39.6	1.89	2.82	2.11	2.71	1.84	3.36	1.78	2.69	1.89	2.87
Chromium (total)	µg/L	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.7	9.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper (total)	µg/L	≤2000	1.21	2.33	0.93	1.29	1.25	1.38	0.69	1.24	0.76	0.98	0.63	1.06	1.21	202	60.5	151	0.89	2.31	0.57	0.8	0.39	0.64	1.12	1.41	2.24	3.64	2.1	3.52
Hardness (as CaCO ₃)	mg/L	-	7.03	10.2	5.46	7.84	5.52	8.07	6.5	98.7	5.44	9.78	5.54	16.8	7.04	95.5	7.03	88.7	7.23	139	5.62	8.38	6.33	8.22	5.56	10.6	5.41	8	5.6	8.46
Iron (total)	µg/L	≤300	11.1	17.6	8	8.4	8.4	9.5	6.2	15	7.4	8.2	10.3	13.8	9.2	47.2	12.7	15	13.3	15.5	7.1	9.2	13.3	32.6	10.3	13.8	6.5	7.5	5.7	11.4
Lead (total)	µg/L	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.63	0.63	0.88	0.88	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Magnesium (total)	mg/L	-	0.223	0.377	0.221	0.304	0.221	0.294	0.265	6.73	0.223	0.446	0.241	0.96	0.277	6.87	0.258	6.02	0.327	9.73	0.217	0.325	0.259	0.354	0.232	0.535	0.224	0.311	0.215	0.317
Manganese (total)	µg/L	≤120	ND	ND	ND	ND	ND	ND	4.6	4.6	ND	ND	ND	ND	2.4	5.5	2.4	2.4	1.6	16	ND	ND	2.2	2.6	1.0	3.9	ND	ND	ND	ND
Mercury (total)	µg/L	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Molybdenum (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.7	1.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.5	4.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Potassium (total)	µg/L	-	0.074	0.14	0.075	0.122	0.074	0.123	0.096	1.56	0.075	0.151	0.086	0.268	0.126	1.4	0.125	1.26	0.126	2.6	0.073	0.132	0.082	0.126	0.072	0.178	0.074	0.122	0.075	0.132
Selenium (total)	µg/L	10	ND	ND	ND	ND	ND	ND	0.1	0.1	ND	ND	ND	ND	0.12	0.12	0.15	0.15	0.16	0.16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silicon (total)	µg/L	-	2140	2950	2110	2780	2190	2810	2270	9230	2140	2990	2210	3720	3090	9850	2720	10400	3030	7030	2150	2840	2250	2840	2140	3160	2160	2840	2070	2790
Silver (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium (total)	µg/L	≤200000	0.712	1.2	0.737	1.15	0.747	1.14	0.929	11	0.733	1.35	0.885	2.01	0.94	9.84	0.971	9.02	0.968	9.89	0.746	1.17	0.785	1.14	0.757	1.32	0.734	1.15	0.743	1.15
Strontium (total)	µg/L	-	5.9	9.2	5.3	7.7	5.6	7.8	6.8	129	5.1	10.2	5.8	20.7	7	132	7.5	127	7.8	144	5.5	8.4	6.3	8.1	5.6	11.5	5.3	7.8	5.5	8.4
Sulfur (total)	µg/L	-	ND	ND	ND	ND	ND	ND	5.7	5.7	ND	ND	ND	ND	5.4	5.4	4.2	4.2	12.8	12.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tin (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Titanium (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Uranium (total)	µg/L	20	ND	ND	ND	ND	ND	ND	0.24	0.24	ND	ND	ND	ND	0.16	0.22	ND	ND	0.73	0.73	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc (total)	µg/L	≤5000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.9	5.9	10.3	10.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zirconium (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND = not detectable

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Parameter	Units	GCDWQ	E2		E3		E4		E5		E6		E7		E8		E9		E10		E11		E12		E13		E14		E15	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Aluminum (total)	µg/L	100	9.6	44.6	15.5	47.3	18.8	44.2	18	49.5	13.5	46.1	12.5	42.6	16.5	47.1	14.7	55.6	15.8	55.9	14.3	57.4	15.2	61.7	15.1	59.7	40	40.2	15.9	48.6
Antimony (total)	µg/L	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic (total)	µg/L	10	0.14	5.89	0.17	5.29	0.16	3.47	0.16	3.81	0.14	3.51	0.17	2.96	0.15	2.28	0.15	0.32	0.11	0.29	0.1	0.28	0.11	0.3	0.1	0.32	0.15	1.04	0.13	0.25
Barium (total)	µg/L	1000	4.1	29	4.2	26.3	3.1	26	4	20.5	3.9	21.6	3.9	24.9	4	15	4.1	6.1	4.1	6.1	4.2	5.8	3.7	6	3.8	6	4	9	3.9	5.7
Beryllium (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bismuth (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Boron (total)	µg/L	5000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium (total)	µg/L	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium (total)	µg/L	-	1.85	41.7	2.01	40.2	2.2	34.5	2.29	31.6	1.87	25.3	2.5	36.3	1.96	12.9	1.78	3.27	1.83	2.77	1.82	2.66	1.59	2.62	1.68	3.34	1.9	31.3	1.87	2.79
Chromium (total)	µg/L	50	ND	ND	ND	ND	5.1	5.1	2.8	2.8	ND	ND	5.80	5.80	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper (total)	µg/L	≤2000	1.21	1.54	1.52	2.02	0.99	1.38	0.7	1.45	1.75	2.2	0.85	1.58	1.1	1.98	1.27	2.18	1.28	1.81	0.84	1.02	3.89	5.37	1.69	1.99	0.8	1.7	1.29	1.9
Hardness (as CaCO3)	mg/L	-	5.59	146	6.04	141	6.59	119	6.98	110	5.66	88.8	7.7	126	5.93	44.7	5.31	9.88	5.45	8.16	5.44	7.89	4.88	7.8	5.03	10.1	5.77	110	5.63	8.18
Iron (total)	µg/L	≤300	8	8.2	7.4	7.7	7.3	31.6	7.6	24.6	7.2	8	29.4	49.3	7.8	13.3	6	10.2	6.9	8.3	7.8	9.1	7	9.4	7.5	9.8	9.6	10.4	8.1	8.3
Lead (total)	µg/L	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Magnesium (total)	mg/L	-	0.234	10.2	0.246	9.81	0.268	8.05	0.307	7.65	0.24	6.22	0.356	8.66	0.249	3.01	0.212	0.419	0.216	0.302	0.217	0.303	0.218	0.307	0.203	0.439	0.253	7.75	0.21	0.293
Manganese (total)	µg/L	≤120	2.7	20.1	3.0	21.3	1.8	15.7	3.0	15.9	2.6	24.5	3.2	32.8	3.2	31.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	5.5	ND	ND
Mercury (total)	µg/L	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0024	0.0024	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Molybdenum (total)	µg/L	-	1.8	1.8	1.7	1.7	1.3	1.3	1.3	1.3	1.2	1.2	1.1	1.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel (total)	µg/L	-	ND	ND	ND	ND	2.3	2.3	1.4	1.4	ND	ND	2.6	2.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Potassium (total)	µg/L	-	0.086	2.82	0.094	2.75	0.102	2.04	0.109	2.05	0.093	1.74	0.118	2.11	0.092	0.877	0.074	0.151	0.073	0.122	0.078	0.124	0.073	0.12	0.074	0.161	0.089	1.83	0.077	0.128
Selenium (total)	µg/L	10	0.18	0.18	0.16	0.16	0.2	0.2	0.16	0.16	0.11	0.11	0.3	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1	0.1	ND	ND
Silicon (total)	µg/L	-	2360	6400	2470	6290	2590	5890	2480	5770	2340	5040	2480	6880	2410	3770	1940	2860	2090	2820	2160	2790	2040	2790	2110	2870	2440	8890	2260	2740
Silver (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium (total)	µg/L	≤200000	0.843	8.74	0.898	8.5	0.96	7.39	0.97	6.96	0.868	5.87	1.04	7.95	0.891	3.42	0.694	1.26	0.712	1.12	0.739	1.14	0.73	1.15	0.723	1.29	0.875	12.4	0.76	1.14
Strontium (total)	µg/L	-	5.5	147	6	139	6.9	130	7.2	116	5.7	91.1	8	144	5.7	45.9	5.3	9.7	5.3	8	5.3	7.7	4.7	7.5	4.8	9.9	5.9	136	5.5	8.5
Sulfur (total)	µg/L	-	13.5	13.5	13.6	13.6	11.1	11.1	10.6	10.6	8.2	8.2	12.1	12.1	3.9	3.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.4	7.4	ND	ND
Thallium (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tin (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Titanium (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Uranium (total)	µg/L	20	0.83	0.83	0.81	0.81	0.57	0.57	0.53	0.53	0.48	0.48	0.37	0.37	0.15	0.15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.17	0.33	ND	ND
Vanadium (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc (total)	µg/L	≤5000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	103	103	ND	ND	ND	ND	ND	ND	ND	ND
Zirconium (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND = not detectable

Mission & Transmission (page 1 of 1)

Parameter	Units	GCDWQ	M1		M2		M3		M5		M6		M7		M8		M9		M10		Ainsworth		Bell Road		Cannon Pit 400		Cannon Pit 600		MacLure Reservoir	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Aluminum (total)	µg/L	100	16.6	53.6	13.9	21.8	13.6	23.3	18.7	55.6	12.7	16.9	14.9	43.5	20.3	42.4	14.3	56.5	17	28.5	12.7	18.3	14.8	53.7	12.9	17.9	12.1	18.1	15	52.7
Antimony (total)	µg/L	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic (total)	µg/L	10	0.13	0.33	0.13	0.13	0.11	0.13	0.13	0.33	0.12	0.12	0.11	0.33	0.1	0.16	0.12	0.36	0.29	0.29	0.15	0.15	0.12	0.37	0.14	0.14	0.13	0.13	0.11	0.36
Barium (total)	µg/L	1000	5.2	7.5	8.9	11.4	5.6	8.2	3.9	6.8	8.1	11.9	3.9	6.7	1.6	1.8	4.1	6.5	7.8	9.4	2.4	2.6	4.1	6.6	2.4	2.6	6.9	9.3	4	6.4
Beryllium (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bismuth (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Boron (total)	µg/L	5000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium (total)	µg/L	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium (total)	µg/L	-	2.17	3.37	1.36	1.65	1.57	1.79	2.42	3.67	1.24	1.38	1.86	3.01	1.77	2.27	1.71	2.89	1.79	3.58	1.21	1.39	1.66	2.93	1.32	1.47	1.21	1.36	1.67	2.86
Chromium (total)	µg/L	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper (total)	µg/L	≤2000	0.91	3.17	0.4	0.7	0.22	0.44	0.44	0.7	0.58	0.87	1.11	1.62	0.2	0.33	7.89	13.3	0.28	1.49	2.39	3.46	0.52	0.84	0.2	0.48	0.49	0.75	1.62	1.93
Hardness (as CaCO3)	mg/L	-	6.15	9.66	4.07	4.83	4.46	5.11	6.78	10.4	3.74	4.21	5.38	8.88	4.79	6.05	5.12	8.63	5.05	10.2	3.67	4.19	4.99	8.74	3.93	4.37	3.69	4.15	5.03	8.54
Iron (total)	µg/L	≤300	8.4	16.1	17.2	50.8	25.8	52.8	6.4	19.9	22.8	46.2	5.5	19.2	15.8	50.6	6	8.3	8.2	37.2	9.4	37.2	6.7	10.2	9.7	30.9	9.9	36	6.1	7.5
Lead (total)	µg/L	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Magnesium (total)	mg/L	-	0.181	0.303	0.156	0.174	0.132	0.156	0.161	0.285	0.159	0.182	0.172	0.332	0.088	0.097	0.208	0.342	0.125	0.303	0.155	0.177	0.201	0.344	0.149	0.171	0.158	0.184	0.208	0.339
Manganese (total)	µg/L	≤120	ND	ND	1.8	4.2	1.4	4.5	ND	ND	1.7	4.6	ND	ND	1	3.8	ND	ND	1.8	1.9	1.2	4.6	ND	ND	1.2	4.2	1.5	4.6	ND	ND
Mercury (total)	µg/L	1	ND	ND	ND	ND	ND	ND	0.002	0.002	ND	ND	0.0021	0.0021	ND	ND	0.002	0.002	0.0021	0.0021	ND	ND	ND	ND	ND	ND	ND	ND	0.002	0.002
Molybdenum (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Potassium (total)	µg/L	-	0.077	0.125	0.05	0.076	0.051	0.075	0.072	0.142	0.07	0.07	0.071	0.118	0.051	0.091	0.075	0.116	0.056	0.12	0.05	0.073	0.071	0.119	0.052	0.074	0.074	0.074	0.115	
Selenium (total)	µg/L	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silicon (total)	µg/L	-	1930	3000	1340	1540	1360	1560	1900	3150	1310	1540	1820	3050	1470	1710	1850	3070	1470	3060	1310	1510	1790	3120	1330	1530	1340	1510	1910	3010
Silver (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium (total)	µg/L	≤200000	0.731	1.28	2.77	5.47	2.77	5.12	0.718	1.26	2.78	4.9	0.806	1.31	2.77	4.74	0.666	1.28	1.34	5.78	2.81	4.63	0.64	1.29	2.74	4.75	2.73	4.69	0.672	1.26
Strontium (total)	µg/L	-	6.2	9.6	4.8	5.6	5.3	5.7	6.4	9.8	4.5	5	5.6	8.3	6	7.5	5.2	8.4	5.5	9.7	4.4	5	5.2	8.4	4.8	5.5	4.4	4.8	5.1	8.4
Sulfur (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tin (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Titanium (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Uranium (total)	µg/L	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc (total)	µg/L	≤5000	ND	ND	ND	ND	ND	ND	ND	ND	5.5	5.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zirconium (total)	µg/L	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND = not detectable

APPENDIX J – QUARTERLY DISTRIBUTION SYSTEM MONITORING (DBP)

Trihalomethanes (µg/L)

Date	Location	A Chloroform	B Bromoform	C Bromodichloro- methane	D Dibromochloro- methane	Total (A + B + C + D)
Feb-9-21	E4	17	ND	ND	ND	17
Feb-9-21	W09	17	ND	ND	ND	17
Feb-9-21	W11	23	ND	ND	ND	23
Mar-25-21	Maclure Reservoir	16	ND	ND	ND	16
Mar-25-21	Cannons Pit 400	14	ND	ND	ND	14
Mar-25-21	Cannons Pit 600	17	ND	ND	ND	17
Mar-25-21	M07	14	ND	ND	ND	14
Mar-25-21	M09	12	ND	ND	ND	12
Jun-8-21	W11	24	ND	ND	ND	24
Jun-8-21	W09	ND	ND	ND	ND	ND
Jun-24-21	Maclure Reservoir	26	ND	ND	ND	26
Jun-24-21	Cannons Pit 400	20	ND	ND	ND	20
Jun-24-21	Cannons Pit 600	16	ND	ND	ND	16
Jun-24-21	M07	20	ND	ND	ND	20
Jun-24-21	M09	ND	ND	ND	ND	ND
Oct-21-21	Maclure Reservoir	14	ND	ND	ND	14
Oct-21-21	Cannons Pit 400	13	ND	ND	ND	13
Oct-21-21	Cannons Pit 600	13	ND	ND	ND	13
Oct-21-21	M07	20	ND	ND	ND	20
Oct-21-21	M09	18	ND	ND	ND	18
Dec 14-21	E4	9.1	ND	4.2	3.1	16.4
Dec14-21	W09	ND	ND	ND	ND	ND
Dec-14-21	W11	13	ND	ND	ND	13
Dec-16-21	Maclure Reservoir	9.1	ND	ND	ND	9.1
Dec-16-21	Cannons Pit 400	17	ND	1	ND	18
Dec-16-21	Cannons Pit 600	8.5	ND	ND	ND	8.5
Dec-16-21	M07	8.6	ND	ND	ND	8.6
Dec-16-21	M09	8.5	ND	ND	ND	8.5

Haloacetic Acids (µg/L)

Date	Location	A Monobromo- acetic acid	B Dibromo- acetic acid	C Monochloro- acetic acid	D Dichloro- acetic acid	E Trichloro acetic acid	Total (A + B + C + D + E)
Feb-9-21	E04	ND	ND	ND	12	12	24
Feb-9-21	W09	ND	ND	ND	12	12	24
Feb-9-21	W11	ND	ND	ND	15	20	35
Mar-25-21	Cannons Pit 400	ND	ND	ND	6.8	8	14.8
Mar-25-21	Cannons Pit 600	ND	ND	ND	6.8	9	15.8
Mar-25-21	M07	ND	ND	ND	6.8	ND	6.8
Mar-25-21	M09	ND	ND	ND	11	6.7	17.7
Mar-25-21	Maclure Reservoir	ND	ND	ND	9.4	7	16.4
Jun-8-21	W09	ND	ND	ND	ND	ND	ND
Jun-8-21	W11	ND	ND	ND	17	13	30
Jun-24-21	Cannons Pit 400	ND	ND	ND	6.5	7.7	14.2
Jun-24-21	Cannons Pit 600	ND	ND	ND	ND	7.7	7.7
Jun-24-21	M07	ND	ND	ND	10	9.3	19.3
Jun-24-21	M09	ND	ND	ND	11	12	23
Jun-24-21	Maclure Reservoir	ND	ND	ND	12	11	23
Oct-21-21	Cannons Pit 400	ND	ND	ND	6.9	8.7	15.6
Oct-21-21	Cannons Pit 600	ND	ND	ND	8.7	13	21.7
Oct-21-21	M07	ND	ND	ND	21	16	37
Oct-21-21	M09	ND	ND	ND	22	17	39
Oct-21-21	Maclure	ND	ND	ND	17	14	31
Dec-14-21	E04	ND	ND	ND	ND	ND	ND
Dec-14-21	W09	ND	ND	ND	ND	ND	ND
Dec-14-21	W11	ND	ND	ND	5.5	5.6	11.1
Dec-16-21	Cannons Pit 400	ND	ND	ND	7.2	11	18.2
Dec-16-21	Cannons Pit 600	ND	ND	ND	ND	ND	ND
Dec-16-21	M07	ND	ND	ND	ND	ND	ND
Dec-16-21	M09	ND	ND	ND	ND	ND	ND
Dec-16-21	Maclure Reservoir	ND	ND	ND	5.5	5	10.5

ND = not detectable, NT = not tested

n-Nitrodimethylamine (ng/L)

Date	Location	NDMA (ng/l)
Jun-24-21	Cannons Pit 400	ND
Jun-24-21	Cannons Pit 600	ND
Jun-24-21	M07	ND
Jun-24-21	M09	ND
Jun-24-21	Maclure Reservoir	ND
Oct-21-21	Cannons Pit 400	ND
Oct-21-21	Cannons Pit 600	ND
Oct-21-21	M07	ND
Oct-21-21	M09	ND
Oct-21-21	Maclure Reservoir	ND
Dec-16-21	Cannons Pit 400	ND
Dec-16-21	Cannons Pit 600	ND
Dec-16-21	M07	ND
Dec-16-21	M09	ND
Dec-16-21	Maclure Reservoir	ND
Dec-14-21	W09	ND
Dec-14-21	W11	ND
Dec-14-21	E04	ND