

# **Annual Water Quality Report**

## 2022

## 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, disinfected with free chlorine and chloraminated prior to distribution. Cannell Lake water is disinfected by ultraviolet (UV) and free chlorine and chloramination prior to distribution. Chloramination is also practiced at most wells.

During 2022, 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.

The AMWSC, Abbotsford and Mission tested more than 2000 routine distribution system water samples for microbiological parameters in 2022 as shown in Appendix H. *Total Coliforms* were detected in 17 of the regular weekly distribution samples as listed in Table 3-3. Each site was re-sampled and corrective actions were taken until no detectable coliforms were found in the follow-up samples.

## Table of Contents

<b>Executive Summary .....</b>	<b>i</b>
<b>1 Introduction.....</b>	<b>1</b>
<b>2 Water System Description .....</b>	<b>2</b>
2.1 Water Sources & Treatment .....	4
2.2 Distribution System .....	5
<b>3 Water Sampling and Testing Program.....</b>	<b>8</b>
3.1 Raw Source Water Quality Monitoring.....	9
3.2 Cannell Filtration Exemption Monitoring.....	11
3.3 Distribution Water Quality Monitoring .....	13
<b>4 System Maintenance .....</b>	<b>20</b>
4.1 Staff Certification & Training.....	20
4.2 Water System Events of Note in 2022.....	21
4.3 Operational Highlights for 2022 .....	21
4.4 Works Planned for 2023.....	22
4.5 Emergency Response.....	22
<b>5 Conclusions .....</b>	<b>24</b>
<b>Appendix A – Fraser Health Healthlink .....</b>	<b>26</b>
<b>Appendix B – Metals in Drinking Water.....</b>	<b>28</b>
<b>Appendix C – Annual Raw Water Scan (Surface Water).....</b>	<b>29</b>
<b>Appendix D – Annual Raw Water Scan (Wells).....</b>	<b>30</b>
<b>Appendix E – Monthly Well Monitoring (Nitrates) .....</b>	<b>33</b>
<b>Appendix F – Monthly Well Monitoring (Total Metals) .....</b>	<b>34</b>
<b>Appendix G – Well Pesticides, Herbicides, &amp; Hydrocarbons Scan.....</b>	<b>35</b>
<b>Appendix H – Weekly Distribution System Monitoring.....</b>	<b>37</b>
<b>Appendix I – Quarterly Distribution System Monitoring (Total Metals).....</b>	<b>41</b>
<b>Appendix J – Quarterly Distribution System Monitoring (DBP).....</b>	<b>44</b>

## 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 Fraser 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 finished 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.

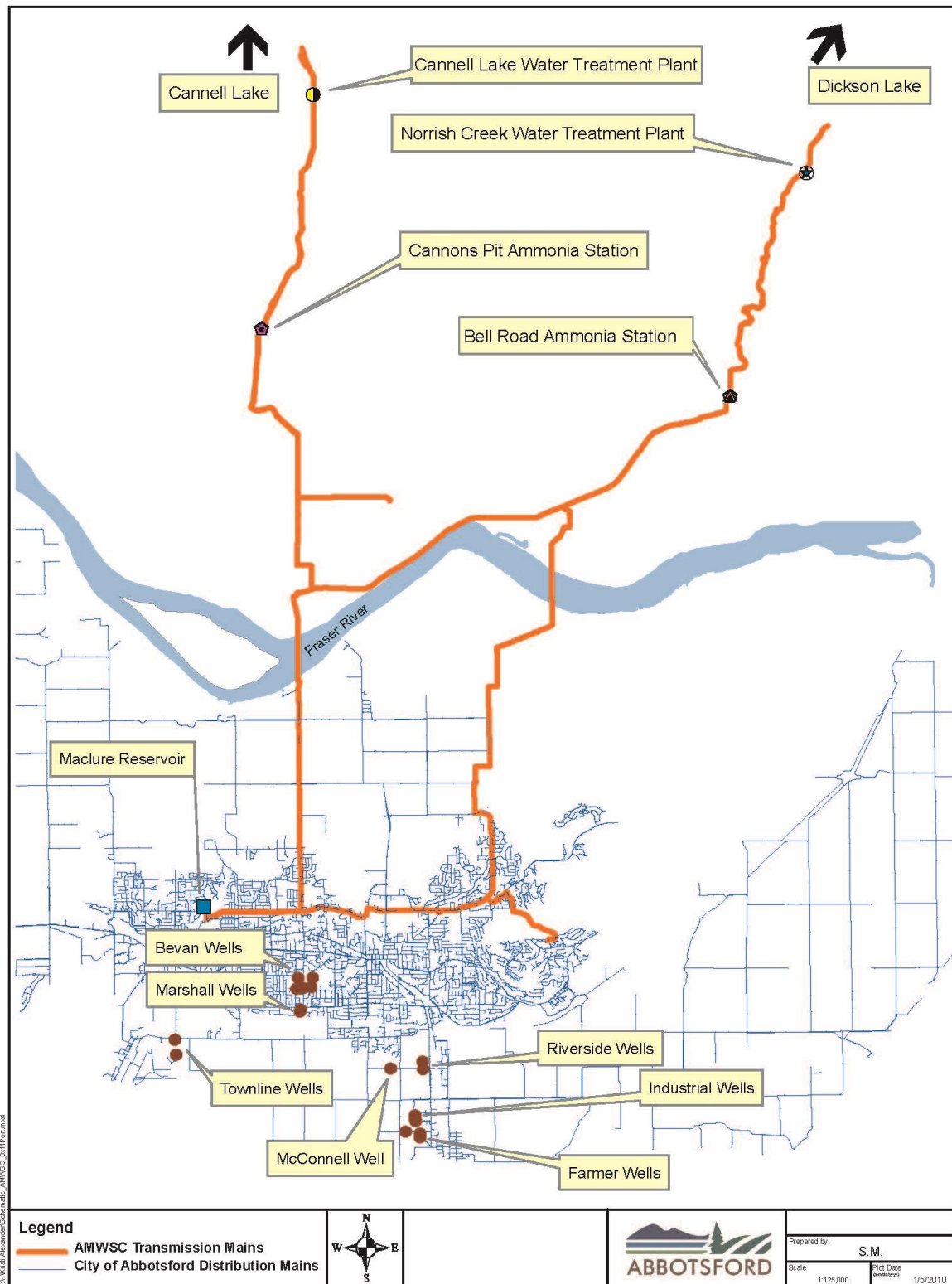


Figure 2-1: AMWSC Water Supply

## 2.1 Water Sources & Treatment

### Norrish Creek

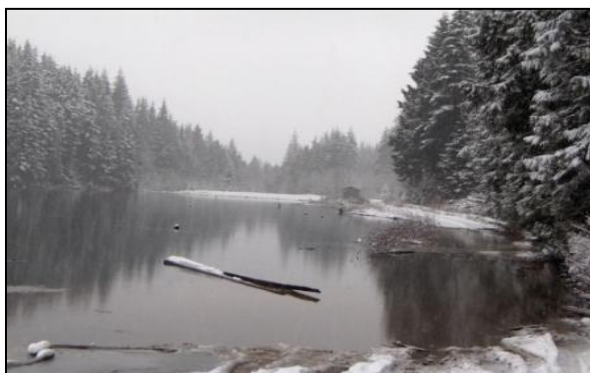
Norrish Creek, located northeast of Mission, provides the bulk of Abbotsford and Mission's drinking water. Norrish water is filtered by slow sand or ultrafiltration membranes at the Norrish Creek Water Treatment Plant (NCWTP). The water is chlorinated at the plant outlet and then flows 7.5 km to the Bell Road Ammonia Station, 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 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 2022 (and the two year's prior) are summarized in Table 2.1.

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

Source <sup>1</sup>	2020 Total	2021 Total	2022 Total
Norrish Creek	16,305	16,530	16,892
Cannell Lake	3,745	4,575	3,556
Farmer #1 Well	47	278	1,056
Farmer #3 Well	0	145	0
Industrial Well "A"	121	183	18
Industrial Well "B"	140	259	205
Industrial Well "C"	494	468	486
Marshall #1 Well	350	360	547
Marshall #3 Well	223	1412	1119
McConnell Well	139	2	0
Riverside #1 Well	7	9	1
Townline #1 Well	478	0	0
Townline #2 Well	552	434	514
Bevan #1 Well	487	294	324
Bevan #2 Well	439	294	236
Bevan #3 Well	564	342	430
Bevan #4 Well	744	464	358
<b>Overall Total</b>	<b>24,843</b>	<b>26,050</b>	<b>25,742</b>
<b>Total Surface Water</b>	<b>20,050</b>	<b>21,105</b>	<b>20,448</b>
<b>Total Groundwater</b>	<b>4,793</b>	<b>4,945</b>	<b>5,294</b>

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](mailto: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.

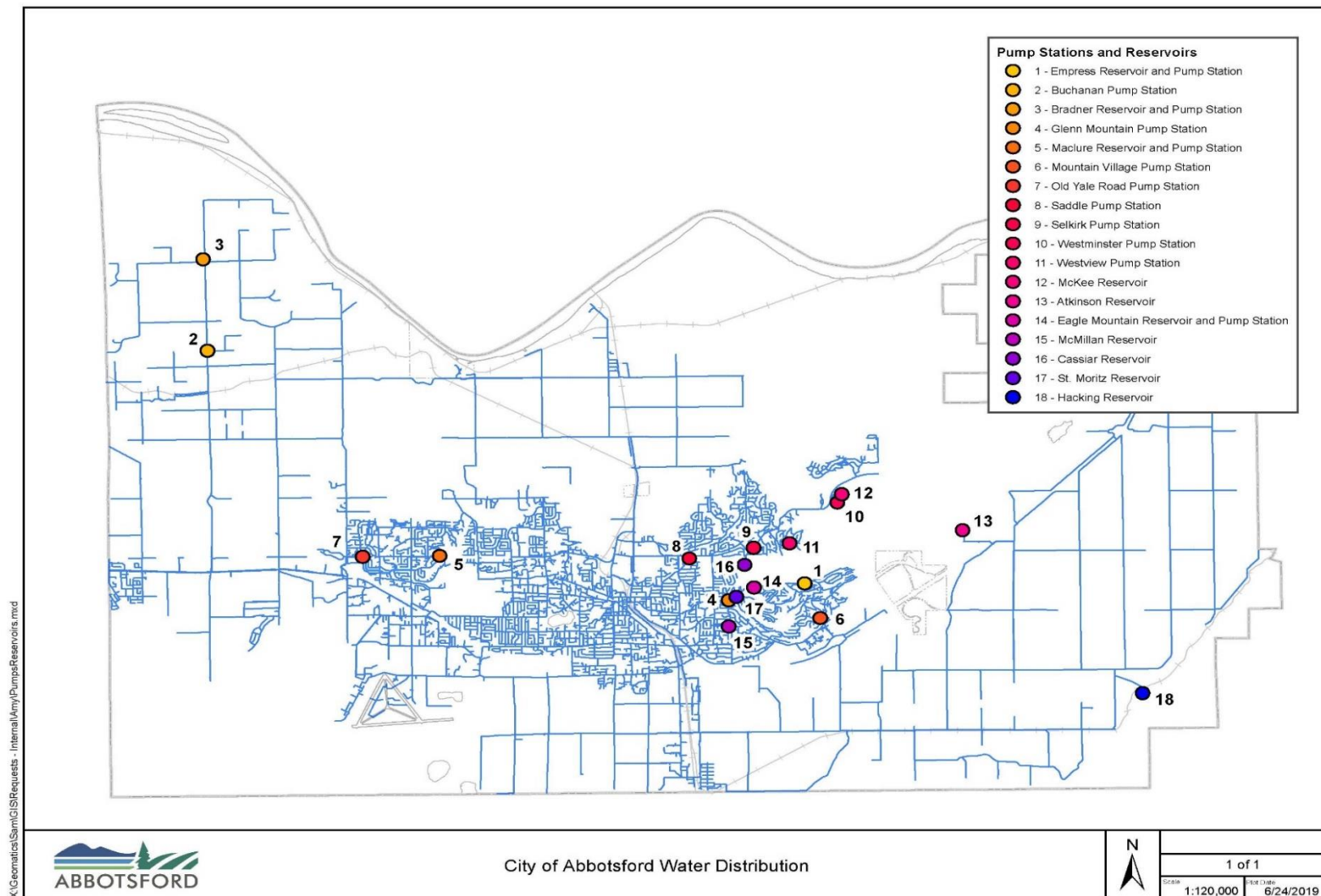


Figure 2-2: City of Abbotsford Water Distribution System

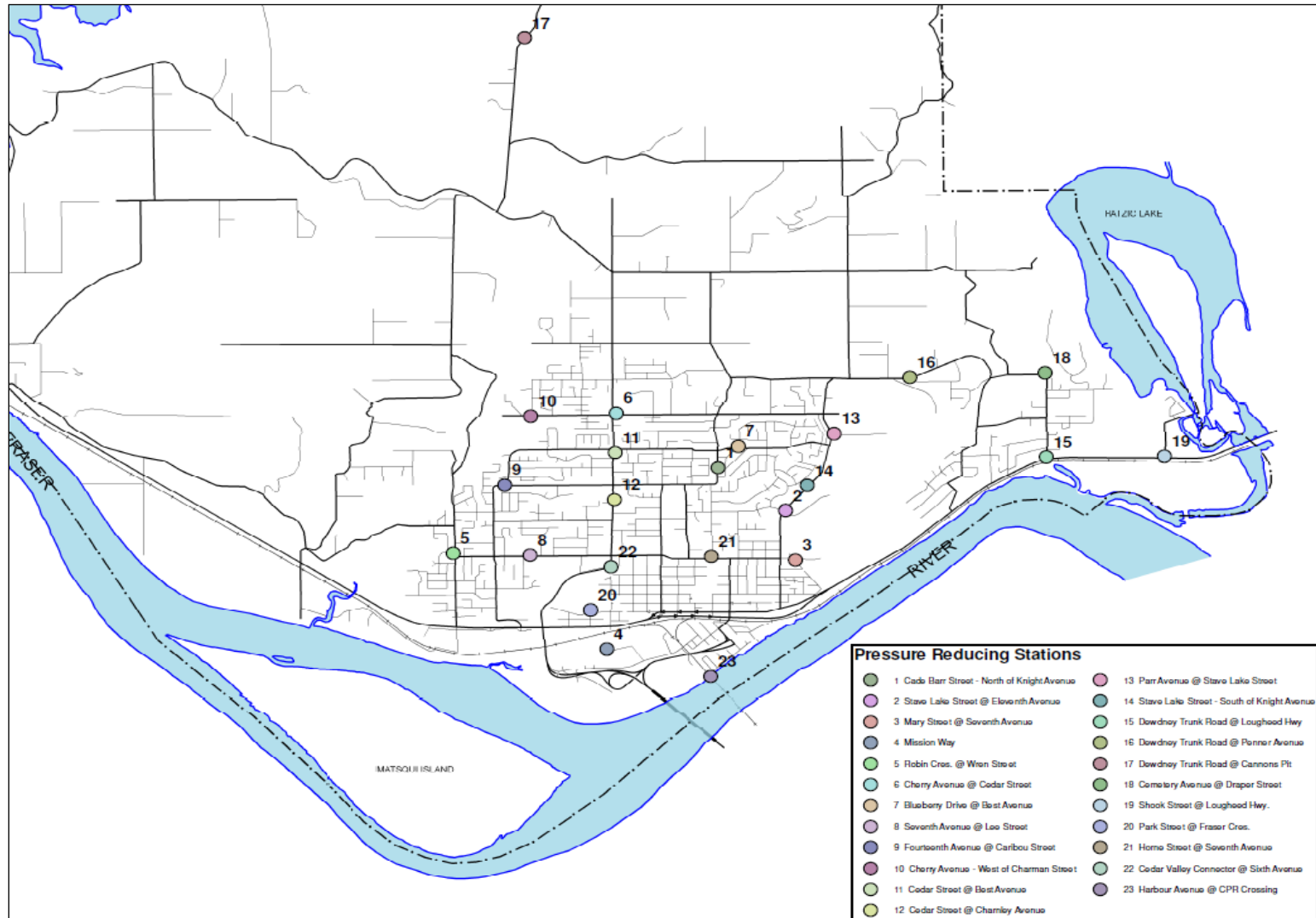


Figure 2-3: City of Mission Water Distribution System

### 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 2022 sampling programs.

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

Program or Parameters	Raw Surface Water	Raw Well Water	Treated Water	Monitoring Purpose
<b>Potability Scan</b> <sup>(1)</sup>	Bi-annually <sup>(2)</sup>	Annually	Quarterly	To characterize source and treated water quality and to track fundamental shifts in quality.
<b>Nitrates &amp; Metals</b> <sup>(3)</sup>	-	Monthly	-	To proactively screen for aquifer contamination and naturally occurring mineral trends.
<b>Pesticides/Herbicides</b>		Annually		To proactively screen for aquifer contamination.
<b>Various</b> <sup>(4)</sup>	On-Line	On-Line	On-Line	Data required for effective control of the water treatment processes.
<b>Coliforms</b>	-	-	Weekly (42 locations)	To proactively screen for biological contamination of the distributed water.
<b>Disinfection Monitoring</b> <sup>(4)</sup>	-	-	Weekly <sup>(5)</sup> (>40 locations)	To ensure that a disinfection residual is maintained through the distribution system.
<b>Disinfection By-Products</b>	-	-	Quarterly (4-5 locations)	To ensure that disinfection by-product levels remain below recommended limits.
<b>Limnology</b>	Monthly (Cannell)			To provide early indication of lake water quality changes arising from disturbances in the watershed, particularly those associated with climate change.
<b>Various</b> <sup>(6)</sup>	-	-	Annually <sup>(6)</sup>	Proactively screening for pipe deterioration.
<p>(1) The raw water potability scans includes those parameters listed in Appendix C &amp; 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 &amp; 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 &amp; 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 2021 and 2020 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 2020 to 2022 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.<sup>1</sup> 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 2022, neither well exceeded the MAC. Industrial B's average arsenic concentration was 6.18 µg/L and the maximum concentration was 7.58 µg/L. Similarly, for Industrial C, the average and maximum concentrations were 8.33 & 8.70 µg/L, respectively.

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<sup>1</sup> 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 industries<sup>2</sup>. 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 2022 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 high levels have been correlated to neurological effects in children<sup>3</sup>. The GCDWQ specifies an aesthetic guideline of 20 µg/L for manganese and a health-based MAC of 120 µg/L. Four AMWSC wells (Farmer 1, Industrial B, Industrial C, 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-nitrogen<sup>4</sup>; 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. 2022 results are shown in Appendix E. No wells had nitrates in excess of the 10 mg/L MAC during 2022 and the last ten-years of data suggest a general downward trend in most wells.

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<sup>2</sup> 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>

<sup>3</sup> Health Canada, May, 2019. Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Manganese Retrieved from: [pub-manganese-0212-2019-eng.pdf](http://pub-manganese-0212-2019-eng.pdf) (canada.ca)

<sup>4</sup> 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 2022, 10 wells were tested and all results were below detection limits. The parameters tested are listed in Appendix G.

## 3.2 Cannell Filtration Exemption Monitoring

In 2005, Fraser Health adopted the Ministry of Health's "Drinking Water Treatment Objectives (Microbiological) for Surface Water Supplies in British Columbia". These guidelines generally require filtration for drinking water supplied from surface water sources. However, authorities may exempt such sources from filtration conditional upon compliance with four specific 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 2022.

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 2022, Cannell Lake's raw water was sampled for *Cryptosporidium* and *Giardia* 10 times. There were no viable counts detected 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 2022, Cannell raw water was tested weekly for *E. coli*. *E. coli* was detected one time (November 1), but the count was only 6/100mL, 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 2022.

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 2022, 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 2022, there was no evidence of intrusion.
- Completing an annual helicopter inspection of the watershed to identify any changes that may increase contamination risk. In 2022, the helicopter inspection occurred on September 22. 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 additional 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	
<b>W1</b> - 35041 Harris Rd.	<b>E2</b> – Old Yale & Arnold Rd.
<b>W2</b> - Sandy Hill School	<b>E3</b> - 39189 Marion Rd. @ Wellsline Rd.
<b>W3</b> - 35944 McKee Rd.	<b>E4</b> - Campbell Rd. & Tolmie Rd.
<b>W4</b> - Bateman Park	<b>E5</b> - #3 Rd. @ South Parallel Rd.
<b>W5</b> - 3315 Gladwin Rd.	<b>E6</b> - Cole Rd. Across from 1024
<b>W6</b> - 32961 South Fraser Way	<b>E7</b> - #1 Rd. @ Tolmie Rd.
<b>W7</b> - 32111 Joyce Ave.	<b>E8</b> - 3434 McDermott Rd.
<b>W8</b> - King Works Yard	<b>E9</b> - Lower Sumas Mtn. Rd.
<b>W9</b> - 515 Gladwin Rd.	<b>E10</b> - 36101 Regal Parkway
<b>W11</b> - 5030 Lefeuve Rd.	<b>E11</b> - St. Moritz North of Glen Mtn. Dr.
<b>W13</b> - 7942 Bradner Rd.	<b>E12</b> - Beck Rd. @ Larch Park
<b>W14</b> - Dunach School	<b>E13</b> - 2092 McMillan Rd.
<b>W15</b> - 3154 Clearbrook Rd.	<b>E14</b> - Victory Blvd. @ Moulstade Rd.
<b>W16</b> – 27875 Swensson Rd.	<b>E15</b> - 2195 Orchard Dr.
City of Mission Distribution Network	
<b>M1</b> – Israel Avenue	<b>M8</b> – Laminman Avenue
<b>M2</b> – Balsam Avenue	<b>M9</b> – Shook Street
<b>M3</b> – Penner Avenue	<b>M10</b> – Miller Crescent
<b>M5</b> – Hillcrest Avenue	
<b>M6</b> – Cannell Booster Station	
<b>M7</b> – Mary St. @ 4 <sup>th</sup> 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 2022, Abbotsford tested more than 120 samples per month, again exceeding the requirement.

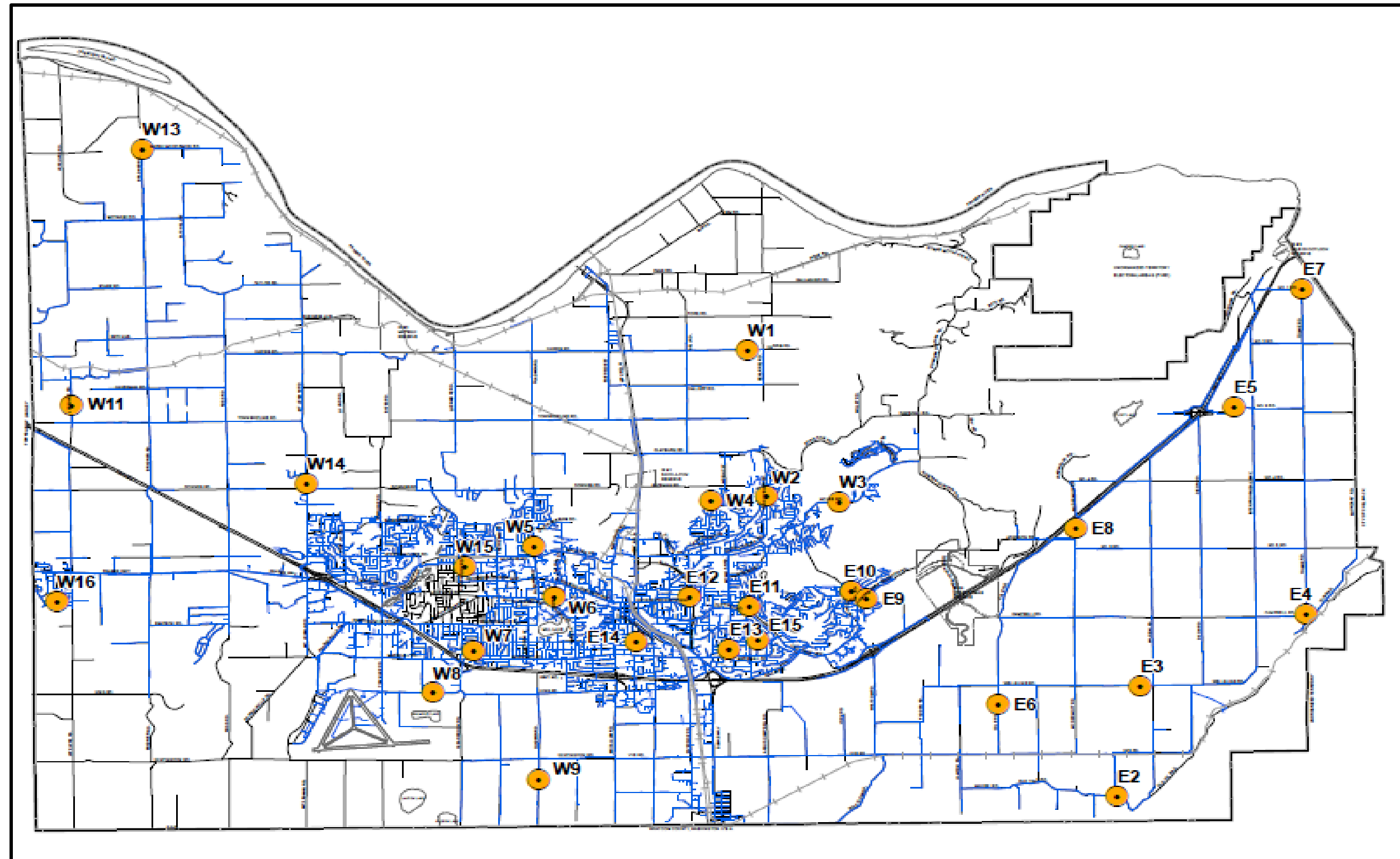


Figure 3-1: Abbotsford Water Distribution Network Sampling Locations

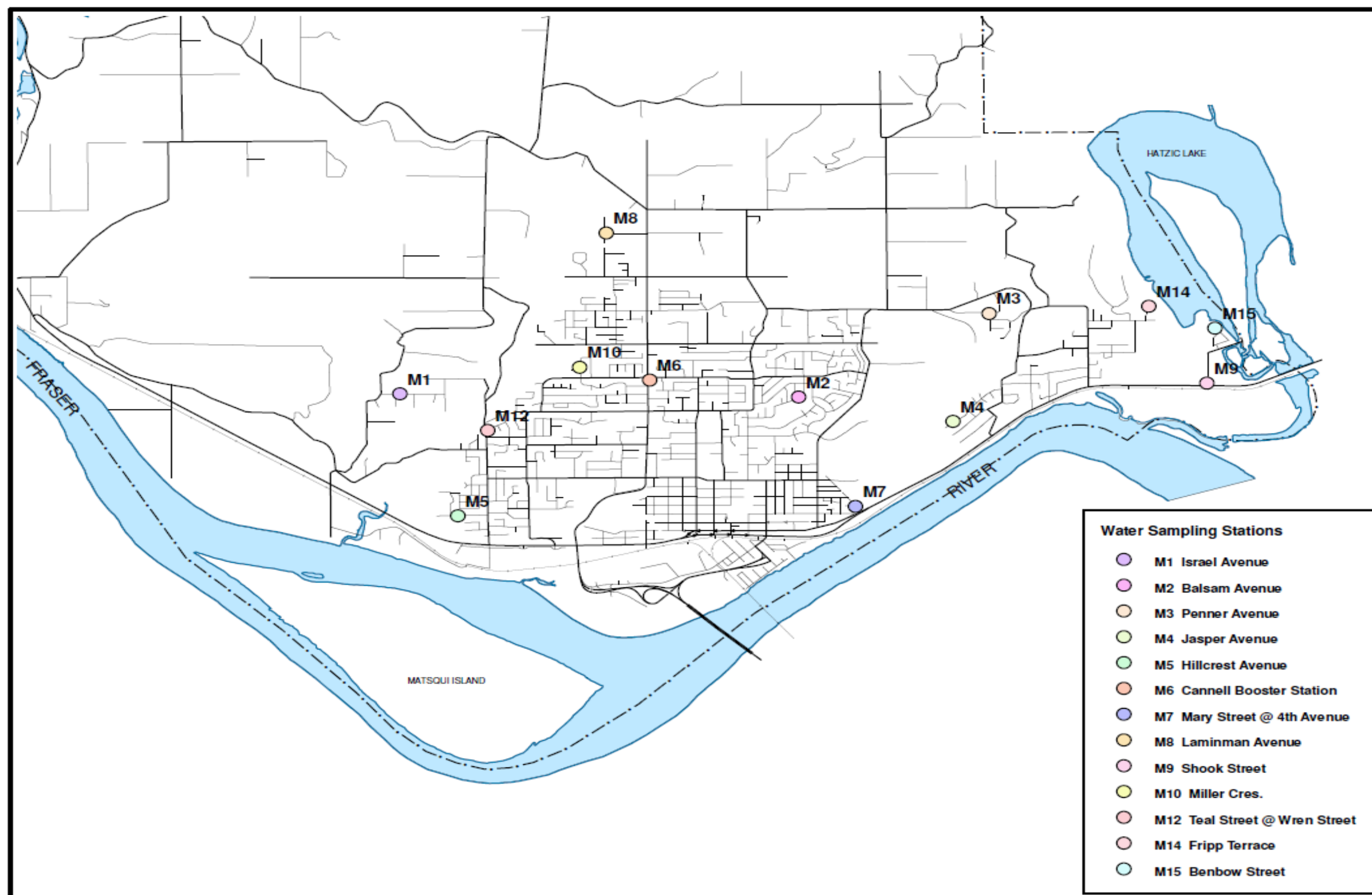


Figure 3-2: Mission Water Distribution Network Sampling Locations

### 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 2022 as shown in Appendix H. No sample contained *E.Coli*. *Total Coliforms* were detected in 17 of the regular weekly distribution sample sites as listed in Table 3-3. All 2022 monthly water quality reports with detailed results can be found here: [Template - Abbotsford Monthly Water Quality for Website - pH removed January 2022.xls \(ourwatermatters.ca\)](#)

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

Date	Location	Total Coliforms (ct/100 ml)
Jan-4	E15	1
Jan-5	Maclure Reservoir	2
Jan-11	E12	1
	M2	1
Jan-25	Maclure Reservoir	1
Feb-15	W3	1
Mar-1	M1	1
Mar-15	E3	1
	W8	1
	Maclure Reservoir	1
June-28	Ainsworth	1
		1
Sept-13	W16	1
Nov-08	M5	1
Nov-08	E12	1
Nov-15	M2	1
Nov-15	M6	1
Dec-28	E4	2

### 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 lower levels of trihalomethanes and haloacetic acids than chlorine, the two most common types of measurable disinfection by-products (see section 3.3.6).

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."<sup>5</sup> 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.

<sup>5</sup> 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>

The AMWSC, Abbotsford and Mission tested more than 2000 samples for total chlorine in 2022. The maximum total chlorine concentration detected in the Abbotsford distribution system was 2.56 mg/L<sup>6</sup> with an average of 1.37mg/L. In Mission, the maximum total chlorine results was 2.87 mg/L and the system averaged at 1.81 mg/L. Appendix H provides 2022 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 NTU<sup>7</sup>. 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 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. resuspension of pipe deposits at high flows).

In 2022, none of the Mission distribution sites had a result above 1.0 NTU and the average turbidity was 0.40 NTU. In Abbotsford, two sites had samples that exceeded 1.0 NTU and the average turbidity was 0.50 NTU. 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 2022 was 6.6 and 7.04, respectively. Additionally, field testing for pH occurs weekly at each distribution system sample location. In Abbotsford, the 2022 median pH was 7.8. In Mission, the median pH was 8.4.

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<sup>6</sup> The above statistics do not include results from the Sumas Prairie from the period it was under the "Do Not Use" advisory.

<sup>7</sup> 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>

### 3.3.5 Metals Testing

In 2022, 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 2022, 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. Their levels also serve as an indicator for the potential presence of other disinfection by-products occurring at lower levels or not easily measurable. The GCDWQ limits 100 µg/L for THMs and 80 µg/L for HAAs<sup>8</sup>.

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 22 and 13 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).

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/L<sup>9</sup>. All results for 2022 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. In 2022, all benzo(a)pyrene results were non-detect.

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<sup>8</sup> 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>

<sup>9</sup> 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 IV 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 two Operators 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 15 Operators with water distribution certificates; eight have their Level II, one Level III, and two have Level IV Water Distribution certificates with EOCP.

## 4.2 Water System Events of Note in 2022

There were no notable water quality events in 2022.

## 4.3 Operational Highlights for 2022

In 2022, the AMWSC, Abbotsford and Mission achieved the following significant projects related to water quality:

### **AMWSC**

- Rebuilt of No. 2 pump at Best Pump Station. Both pumps 1 & 2 are available.
- Rebuilt of Cannell-Best PRV station
- Reservoir cleaning (Mt. Mary Ann)
- Marshall 3 and Industrial Well C motor replacement
- Continued with investigative level studies for a future water source
- Continued planning studies for future pH control facilities
- Started the transition from Watertrax to Compliance 365 water quality software

### **Abbotsford**

- Commissioned Saddle Booster/PRV
- Commissioned Bradner Booster/PRV
- Reservoir cleaning (Eagle Mountain and Atkinson)
- Completed AC water main replacement project (4.5 km)
- Completed the installation of additional 9 water quality sampling stations

### **Mission**

- Annual leak detection program, 10% of the City
- Annual unidirectional water main flushing program, 20% of the City Zone 2
- Annual dead-end water main flushing and repair program
- Upgrade to stainless plumbing
- Annual backflow test done on City owned pressure relief valves and back flow preventers;
- Weekly and quarterly water quality monitoring
- The City of Mission replaced 1.5km of AC Main 14th Ave and Laminman Ave
- Added 9 new water quality sampling stations

## 4.4 Works Planned for 2023

Key water system projects and programs related to water quality scheduled for 2023 include the following:

### AMWSC

- Mt. Mary Ann Reservoir Liner Installation project
- Replacement of NCWTP SSF (4) outlet valves and flowmeters
- Replacement of Chlorine Rotameters (2)
- Reservoir Cleaning (Maclure Reservoir Cell 1, 2 & 3)
- Structural Inspection of Maclure Reservoir Cell 1
- Transmission System WQ Monitoring Project: Installation of On-line WQ analyzers
- Upgrade of NCWTP SCADA System
- Upgrade of Maclure Reservoir PLC Hardware and Programming

### Abbotsford

- Construction of Vicarro Ranch Pump Station
- Continuation of AC water main replacement project (4.46 km)
- Begin 2nd phase of water quality sampling station network improvements, including installation of 11 new sampling locations and removal of redundant locations
- Meter endpoints (AMI) replacement project
- Reservoir cleaning (Bradner, Cassiar and Empress)
- Decommissioning of Farmer PRV station
- Decommissioning of Ledgeview Reservoir

### 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
- Mission Way SCADA
- Mission started 2023 water quality monitoring program

## 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 2022 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



HealthLinkBC



Number 56  
January 2017

### Preventing Water-Borne Infections For People with Weakened Immune Systems

#### Who is at higher risk from water-borne infections?

People with very weak immune systems who are at higher risk of certain water-borne diseases include those with:

- HIV infection who have a CD4+ count of less than 100 cells/mm<sup>3</sup>;
- lymphoma or leukemia (hematological malignancies) who are being actively treated or have been in remission and off treatment for less than 1 year;
- hematopoietic stem cell transplant recipients; and
- 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 nurse practitioner how weak your immune system is, and whether you need to take extra precautions.

#### How can drinking water become contaminated?

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 located or constructed in a way that the groundwater it draws from is at risk of containing pathogens (germs) such as a shallow well or a well 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 groundwater at risk of containing pathogens, unless the water has been treated to remove or inactivate at least 99.9 per cent of parasites (protozoa), 99.99 per cent of viruses and all 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 per cent reduction in infectious parasites. Some water systems and many private supplies have no treatment at all. If the water you drink has not been disinfected, please refer to [HealthLinkBC File #49b Disinfecting Drinking Water](#).

#### How can I further treat disinfected water?

People with very weak immune systems should consult with their doctor or nurse practitioner and may need to take extra precautions with their drinking water.

**Boiling:** If your water supply has already been disinfected, bring the water to a full boil to inactivate any *Cryptosporidium* parasites - a major concern for people with weakened

immune systems. For more information, see [HealthLinkBC File #48 \*Cryptosporidium\* Infection](#).

If the water has not already been disinfected, bring the water to a full boil for at least 1 minute. This will kill or inactivate bacteria, viruses and parasites. At elevations over 2,000 meters (6,500 feet), boil water for at least 2 minutes to disinfect it.

Do not drink or use tap water to brush your teeth, rinse your mouth, mix drinks or make ice cubes without boiling it first.

Please note that boiling water will get rid of viruses, bacteria and parasites but not chemicals which may be found in the water.

**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 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.

**Filters:** Filters do not remove bacteria and viruses and should not be used unless the water supply is disinfected first.

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.

Jug-type filters, such as a Brita®, 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.

### Can I drink bottled water?

Bottled water in B.C. may or may not have been treated. If you have a very weak immune system, check with the bottling company to find out what treatment, if any, it has had. Bottled water that has been properly treated using one of the methods listed above can be used for drinking, brushing teeth, making ice cubes and for recipes where water is used but not boiled, such as cold soups.

### For More Information

For more information, including the level of treatment in your local water system, contact your drinking water purveyor or supplier, or the local environmental health officer or drinking water officer. To find your health authority's drinking water contact visit [www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/drinking-water-quality/health-authority-contacts](http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/drinking-water-quality/health-authority-contacts).

For more information about water-borne infections and how to safely disinfect your drinking water, see the following HealthLinkBC Files:

- [HealthLinkBC File #49a Water-borne Infections in British Columbia](#)
- [HealthLinkBC File #49b Disinfecting Drinking Water](#)
- [HealthLinkBC File #69b Feeding Your Baby Formula: Safely Making and Storing Formula](#)

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For more HealthLinkBC File topics, visit [www.HealthLinkBC.ca/healthfiles](http://www.HealthLinkBC.ca/healthfiles) or your local public health unit. For non-emergency health information and advice in B.C. visit [www.HealthLinkBC.ca](http://www.HealthLinkBC.ca) or call **8-1-1** (toll-free). For the deaf and hard of hearing, call **7-1-1**. Translation services are available in more than 130 languages on request.

## APPENDIX B – METALS IN DRINKING WATER



February 1, 2022

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,

Drinking Water Program  
Fraser Health Authority  
HPLand@fraserhealth.ca

Fraser Health Authority  
Health Protection

Suite 400 2777 Gladwin Rd  
Abbotsford BC  
V2T 4V1 Canada

Tel (604) 870-7900  
Fax (604) 852-1558  
www.fraserhealth.ca

## APPENDIX C – ANNUAL RAW WATER SCAN (SURFACE WATER)

Parameter *	Units	GCDWQ <sup>1</sup>	Cannell Lake		Norrish Creek	
			2021 22-Apr	2022 20-Oct	2021 22 - Apr	2022 20-Oct
Alkalinity (as CaCO <sub>3</sub> )	mg/L	-	-	3.80	4.30	7.90
Aluminum (total)	µg/L	200	13.5	13.5	73.5	18.6
Antimony (total)	µg/L	6	ND	ND	ND	ND
Arsenic (total)	µg/L	10	ND	0.120	0.130	0.440
Barium (total)	µg/L	1000	2.60	2.70	4.20	6.60
Bicarbonate (as HCO <sub>3</sub> )	mg/L	-	-	4.70	5.20	9.60
Boron (total)	µg/L	5000	ND	ND	ND	ND
Cadmium (total)	µg/L	5	ND	ND	ND	ND
Calcium (total)	mg/L	-	1.25	ND	1.56	ND
Carbonate (as CO <sub>3</sub> )	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	-	-	8.5	-
Conductivity	microS/cm	-	-	12.0	14.0	23.0
Copper (total)	µg/L	2000	0.880	0.720	ND	ND
Fluoride	mg/L	1.5	-	ND	ND	ND
Glyphosate	µg/L	-	-	-	-	ND
Hardness (as CaCO <sub>3</sub> )	mg/L	-	3.79	4.46	4.72	9.05
Iron (total)	µg/L	≤ 300	ND	22.0	15.0	ND
Lead (total)	µg/L	5	ND	ND	ND	ND
Magnesium (total)	mg/L	-	0.164	0.182	0.198	0.352
Manganese (total)	µg/L	120	2.30	4.00	ND	ND
Mercury (total)	µg/L	1	ND	ND	ND	ND
Nitrate (as N)	mg/L	10	-	ND	0.094	0.108
Nitrite (as N)	mg/L	-	-	ND	ND	ND
pH	-	7 – 10.5	6.44	6.45	6.70	6.59
Potassium (total)	µg/L	-	ND	58.0	69.0	114
Selenium (total)	µg/L	50	ND	ND	ND	ND
Sodium (total)	mg/L	≤ 200	0.681	0.740	0.661	1.34
Sulphate	mg/L	≤ 500	-	ND	-	1.50
Total Dissolved Solids	mg/L	≤ 500	-	12.0	28.0	22.0
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](mailto: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 <sup>1</sup>	Farmer 1			Farmer 3			Industrial A			Industrial B			Industrial C			McConnell		
			2020 17-Sep	2021 16-Sep	2022 20-Oct	2020 17-Sep	2021 16-Sep	2022 20-Oct	2020 17-Sep	2021 16-Sep	2022 20-Oct	2020 17-Sep	2021 16-Sep	2022 20-Oct	2020 17-Sep	2021 16-Sep	2022 20-Oct	2020 17-Sep	2021 16-Sep	2022 20-Oct
Alkalinity (as CaCO <sub>3</sub> )	mg/L	-	60.2	69.0	67.0	Not Tested	95.0	Not Tested	169	160	Not Tested	83.3	110	120	80.6	110	99.0	76.2	89.0	80.0
Aluminum (total)	µg/L	200	ND	ND	ND		ND		ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND
Antimony (total)	µg/L	6	ND	ND	ND		ND		0.310	ND		0.120	ND	ND	0.340	0.560	0.660	0.220	ND	ND
Arsenic (total)	µg/L	10	0.170	0.120	0.140		5.58		1.60	1.55		8.00	6.09	5.61	7.30	7.93	8.48	4.60	6.20	6.29
Barium (total)	µg/L	1000	12.0	11.5	11.2		36.2		38.0	37.8		24.0	33.8	39.3	33.0	42.6	42.1	28.0	28.6	29.5
Bicarbonate (as HCO <sub>3</sub> )	mg/L	-	-	84.0	81.0		120		-	200		-	130	140	-	130	120	-	110	97.0
Boron (total)	µg/L	5000	24.0	ND	ND		ND		22.0	ND		20.0	ND	ND	10.0	ND	ND	23.0	ND	ND
Cadmium (total)	µg/L	5	0.0100	0.0120	0.0110		ND		0.0200	ND		0.0100	ND	ND	ND	ND	ND	0.01	ND	0.0130
Calcium (total)	mg/L	-	32.4	32.4	32.3		45.5		57.1	59.4		27.4	37.9	45.0	36.3	39.6	41.5	35.9	37.2	37.1
Carbonate (as CaCO <sub>3</sub> )	mg/L	-	-	ND	ND		-		-	ND		-	ND	ND	-	ND	ND	-	ND	ND
Chloride	mg/L	≤ 250	11.5	13.0	13.0		11.0		8.72	9.40		12.9	14.0	12.0	12.1	11.0	10.0	12.3	13.0	12.0
Chromium (total)	µg/L	50	0.180	ND	ND		ND		0.760	ND		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	ND
Conductivity	microS/cm	-	303	290	280		330		456	450		264	320	360	306	330	330	339	340	340
Copper (total)	µg/L	≤ 2000	0.780	1.15	0.490		ND		1.54	1.51		0.570	0.240	0.210	0.550	0.730	0.630	2.43	2.32	3.73
Fluoride	mg/L	1.5	0.0500	ND	0.0500		ND		ND	ND		0.0500	ND	ND	0.0400	ND	ND	0.0400	ND	0.0530
Hardness (as CaCO <sub>3</sub> )	mg/L	-	121	121	117		147		208	208		98.0	134	158	125	140	146	124	126	126
Iron (total)	µg/L	≤ 300	ND	ND	ND		13.8		ND	ND		18.0	12.2	8.90	ND	ND	ND	ND	19.3	12.9
Lead (total)	µg/L	5	ND	ND	ND		ND		ND	ND		ND	ND	ND	ND	ND	ND	0.12	ND	0.290
Magnesium (total)	mg/L	-	9.65	9.44	8.87		8.55		15.6	15.6		7.25	9.01	11.0	8.36	10.0	10.3	8.46	8.33	8.16
Manganese (total)	µg/L	≤ 120	62.7	64.6	69.9		1.20		16.9	28.8		43.2	58.2	66.8	52.2	55.0	59.0	16.1	28.2	41.3
Mercury (total)	µg/L	1	ND	ND	ND		ND		ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND
pH	-	7 – 10.5	7.10	6.72	6.98		7.16		8.10	7.68		8.20	7.48	8.04	8.20	7.51	8.06	7.90	7.00	7.91
Potassium (total)	mg/L	-	1.60	1.61	1.41		1.94		2.40	2.41		3.00	3.28	3.13	2.80	3.47	3.25	3.00	3.43	3.18
Selenium (total)	µg/L	10	0.710	0.540	0.380		0.420		0.520	0.560		ND	ND	0.120	ND	ND	0.110	0.500	0.420	0.310
Silicon (total)	µg/L	-	7720	8130	9070		7710		9660	10200		6680	6510	7400	6510	5730	6580	7820	8080	8520
Sodium (total)	mg/L	≤ 200	6.05	6.31	6.71		5.44		6.46	6.72		10.4	9.10	9.28	6.39	8.07	7.89	14.6	15.2	15.3
Sulphate	mg/L	≤ 500	35.7	39.0	31.0		59.0		39.6	43.0		27.4	47.0	44.0	50.2	54.0	49.0	64.1	71.0	65.0
Total Dissolved Solids	mg/L	≤ 500	273	190	160		210		358	280		189	190	210	222	210	180	250	210	180
Turbidity	NTU	-	ND	ND	ND		0.160		ND	0.120		ND	ND	ND	ND	ND	ND	0.140	0.100	ND
Uranium (total)	µg/L	20	0.0380	ND	ND		0.170		0.660	0.760		0.310	0.740	0.740	0.390	1.07	1.07	0.290	0.300	0.280
Zinc (Total)	µg/L	≤ 5000	5.10	6.10	ND		ND		ND	ND		3.40	ND	ND	ND	ND	ND	3.80	5.20	7.60

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](mailto: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		
			2020 17-Sep	2021 16-Sep	2022 20-Oct	2020 17-Sep	2021 16-Sep	2022 20-Oct	2020 17-Sep	2021 16-Sep	2022 20-Oct	2020 17-Sep	2021 16-Sep	2022 20-Oct	2020 17-Sep	2021 16-Sep	2022 20-Oct
Alkalinity (as CaCO <sub>3</sub> )	mg/L	-	105	120	110	105	110	92.0	69.5	80.0	77.0	Not Tested	Not Tested	Not Tested	44.1	52.0	48.0
Aluminum (total)	µg/L	200	ND	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	ND
Arsenic (total)	µg/L	10	1.00	3.68	4.59	1.10	1.07	1.27	0.590	0.530	0.580				0.620	0.600	0.670
Barium (total)	µg/L	1000	11.0	15.1	15.8	11.0	10.2	10.1	15.0	14.8	15.4				4.90	5.20	5.80
Bicarbonate (as HCO <sub>3</sub> )	mg/L	-	-	150	140	-	130	110	-	97.0	94.0				-	63.0	58.0
Boron (total)	µg/L	5000	16.0	ND	ND	17.0	ND	ND	15.0	ND	ND				21.0	ND	ND
Cadmium (total)	µg/L	5	0.0200	0.0270	0.0330	0.0300	0.0280	0.0240	0.0500	0.0120	0.0130				0.0300	0.0210	0.0250
Calcium (total)	mg/L	-	32.9	44.1	44.1	37.3	36.4	36.9	33.2	36.1	38.7				18.3	19.9	21.5
Carbonate (as CO <sub>3</sub> )	mg/L	-	-	ND	ND	-	ND	ND	-	ND	ND				-	ND	ND
Chloride	mg/L	≤ 250	27.3	27.0	28.0	29.6	22.0	26.0	26.3	26.0	27.0				10.2	11.0	15.0
Chromium (total)	µg/L	50	ND	ND	ND	ND	ND	ND	0.450	ND	ND				0.180	ND	ND
Colour (total)	TCU	≤ 15	ND	ND	ND	ND	ND	ND	ND	ND	ND				ND	ND	ND
Conductivity	microS/cm	-	349	400	400	357	320	330	317	320	340				182	190	200
Copper (total)	µg/L	≤ 2000	7.65	1.39	1.49	0.890	0.630	1.34	9.84	7.03	7.23				3.85	5.35	14.1
Fluoride	mg/L	1.5	0.0400	ND	ND	0.0500	ND	ND	0.0200	ND	ND				0.0200	ND	ND
Hardness (as CaCO <sub>3</sub> )	mg/L	-	117	144	147	132	126	128	124	131	141				63.2	69.5	73.5
Iron (total)	µg/L	≤ 300	27.0	ND	ND	ND	ND	ND	ND	8.40	16.6				ND	13.4	ND
Lead (total)	µg/L	5	0.220	ND	ND	ND	ND	ND	0.290	0.290	0.220				0.0800	ND	ND
Magnesium (total)	mg/L	-	8.40	8.83	8.86	9.50	8.88	8.77	9.99	10.3	10.8				4.22	4.48	4.80
Manganese (total)	µg/L	≤ 120	9.71	7.50	11.9	8.61	11.3	13.9	1.46	ND	ND				4.74	8.80	15.1
Mercury (total)	µg/L	1	ND	ND	ND	ND	ND	ND	ND	ND	ND				ND	ND	ND
pH	-	7 – 10.5	8.14	7.53	7.56	7.68	7.20	7.55	7.39	7.18	7.22				6.98	6.69	6.86
Potassium (total)	mg/L	-	1.80	3.44	3.21	2.10	2.13	1.98	1.70	1.78	1.61				1.10	1.14	1.11
Selenium (total)	µg/L	10	0.100	ND	ND	ND	ND	ND	0.280	0.200	0.220				0.230	0.170	0.170
Silicon (total)	µg/L	-	7680	7710	8560	7360	8240	9090	10300	11200	12200				8690	9590	10500
Sodium (total)	mg/L	≤ 200	1.80	19.6	19.7	14.2	12.4	12.3	7.62	7.94	8.32				7.26	7.20	8.10
Sulphate	mg/L	≤ 500	26.2	43.0	43.0	29.7	36.0	30.0	28.9	40.0	41.0				14.6	15.0	15.0
Total Dissolved Solids	mg/L	≤ 500	230	240	220	243	200	160	269	210	210				154	130	140
Turbidity	NTU	20	0.20	ND	ND	ND	ND	ND	ND	ND	0.16				ND	0.38	0.14
Uranium (total)	µg/L	20	0.500	0.810	0.720	0.800	0.480	0.450	0.0600	ND	ND				0.0800	ND	ND
Zinc (total)	µg/L	≤ 5000	4.80	ND	ND	ND	ND	ND	11.0	11.7	16.0				ND	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.

(Page 3 of 3)

Parameter	Units	GCDWQ	Bevan 1			Bevan 2			Bevan 3			Bevan 4		
			2020 17-Sep	2021 16-Sep	2022 20-Oct	2020 17-Sep	2021 16-Sep	2022 20-Oct	2020 17-Sep	2021 16-Sep	2022 20-Oct	2020 17-Sep	2021 16-Sep	2022 20-Oct
Alkalinity (as CaCO <sub>3</sub> )	mg/L	-	52.4	50.0	45.0	54.6	63.0	45.0	Not Tested	48.0	42.0	38.4	40.0	Not Tested
Aluminum (total)	µg/L	200	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	
Arsenic (total)	µg/L	10	0.260	0.210	0.260	0.250	0.290	0.330		0.230	0.250	0.210	0.170	
Barium (total)	µg/L	1000	6.10	5.60	5.90	6.50	6.50	7.10		5.70	6.10	6.00	5.50	
Bicarbonate (as HCO <sub>3</sub> )	mg/L	-	-	61.0	55.0	-	77.0	55.0		59.0	52.0	-	48.0	
Boron (total)	µg/L	5000	13.0	ND	ND	14.0	ND	ND		ND	ND	12.0	ND	
Cadmium (total)	µg/L	5	0.0300	0.0250	0.0260	0.0300	0.0240	0.0270		0.0210	0.0250	0.0300	0.0260	
Calcium (total)	mg/L	-	25.7	24.7	24.0	29.1	24.2	24.1		23.8	23.7	25.4	22.5	
Carbonate (as CO <sub>3</sub> )	mg/L	-	-	ND	ND	-	ND	ND		ND	ND	-	ND	
Chloride	mg/L	≤ 250	21.9	28.0	30.0	22.8	26.0	32.0		27.0	30.0	26.6	29.0	
Chromium (total)	µg/L	50	0.160	ND	ND	0.170	ND	ND		ND	ND	0.240	ND	
Colour (total)	TCU	≤ 15	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	
Conductivity	microS/cm	-	228	240	240	248	230	240		230	230	217	220	
Copper (total)	µg/L	≤ 2000	4.27	5.99	23.2	4.90	5.61	5.75		10.4	6.23	12.4	7.23	
Fluoride	mg/L	1.5	0.0200	ND	ND	0.0200	ND	ND		ND	ND	ND	ND	
Hardness (as CaCO <sub>3</sub> )	mg/L	-	92.9	87.5	86.9	105	87.2	87.9		85.0	84.7	90.0	78.4	
Iron (total)	µg/L	≤ 300	ND	7.40	28.9	ND	10.1	13.3		ND	19.5	ND	ND	
Lead (total)	µg/L	5	0.0700	ND	ND	0.0600	ND	ND		ND	ND	0.0500	ND	
Magnesium (total)	mg/L	-	6.98	6.71	6.55	7.88	6.69	6.71		6.27	6.18	6.46	5.49	
Manganese (total)	µg/L	≤ 120	1.70	ND	2.80	1.00	ND	1.40		ND	ND	0.150	ND	
Mercury (total)	µg/L	1	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	
pH	-	7 – 10.5	7.31	6.71	6.97	7.18	6.72	6.94		6.65	6.88	7.02	6.58	
Potassium (total)	mg/L	-	1.20	1.11	1.18	1.20	1.14	1.20		1.09	1.18	1.10	1.07	
Selenium (total)	µg/L	10	0.190	0.220	0.170	0.210	0.170	0.170		0.170	0.150	0.180	0.130	
Silicon (total)	µg/L	-	10700	11500	12600	11500	11800	12700		11100	12100	11300	11500	
Sodium (total)	mg/L	≤ 200	7.10	8.30	8.70	8.38	7.24	7.55		7.65	8.16	8.36	7.99	
Sulphate	mg/L	≤ 500	13.0	16.0	12.0	23.0	12.0	9.40		13.0	9.60	12.0	11.0	
Total Dissolved Solids	mg/L	≤ 500	202	190	150	193	170	160		160	170	205	170	
Turbidity	NTU	20	0.100	ND	0.250	ND	ND	0.180		ND	0.230	ND	ND	
Uranium (total)	µg/L	20	0.0200	ND	ND	0.0200	ND	ND		ND	ND	0.0100	ND	
Zinc (total)	µg/L	≤ 5000	8.00	5.40	6.70	6.80	ND	ND		ND	ND	8.80	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
13-Jan	ND	-	7.72	2.22	1.75
10-Feb	-	-	8.31	0.981	-
10-Mar	5.77	-	-	0.408	-
7-Apr	6.31	-	7.00	0.107	-
12-May	5.93	-	-	0.407	-
9-Jun	5.46	-	-	0.151	0.053
20-Jul	5.32	-	-	0.003	ND
11-Aug	5.49	-	-	2.03	0.29
8-Sep	5.70	-	-	0.095	0.003
13-Oct	5.78	-	-	1.80	0.902
17-Nov	5.80	-	-	2.17	1.46
15-Dec	5.57	-	-	0.085	1.50

Date	McConnell	Riverside 1	Marshall 1	Townline 1	Townline 2
13-Jan	ND	2.89	0.016	-	3.36
10-Feb	ND	3.76	0.12	-	3.45
10-Mar	ND	4.22	0.17	-	3.40
7-Apr	ND	4.91	0.16	-	3.80
12-May	2.90	4.65	ND	-	4.53
9-Jun	2.08	4.36	0.009	-	3.61
20-Jul	0.53	3.55	0.008	-	3.65
11-Aug	0.88	2.48	0.029	-	3.40
8-Sep	0.20	2.18	0.005	-	3.37
13-Oct	0.84	2.10	ND	-	3.58
17-Nov	ND	2.16	0.008	-	4.09
15-Dec	ND	2.17	ND	-	-

Date	Bevan 1	Bevan 2	Bevan 3	Bevan 4
13-Jan	2.98	3.13	3.26	3.15
10-Feb	3.86	3.21	3.40	3.39
10-Mar	3.60	3.16	3.47	3.28
7-Apr	3.58	3.35	3.39	3.33
12-May	3.51	3.21	3.33	3.27
9-Jun	3.53	3.19	3.17	3.30
20-Jul	3.09	3.02	3.10	3.23
11-Aug	3.07	3.06	3.11	2.18
8-Sep	3.33	2.85	2.68	3.03
13-Oct	2.82	2.76	2.83	-
17-Nov	3.72	3.21	3.39	-
15-Dec	3.44	3.07	3.20	-

ND = not detectable  
- = not tested

## APPENDIX F – MONTHLY WELL MONITORING (TOTAL METALS)

Parameter	Units	GCDWQ <sup>1</sup>	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			3.70	3.70	ND	ND	ND	ND	7.60	7.60			ND	ND
Antimony (total)	µg/L	6	ND	ND			ND	ND	1.03	0.696	ND	ND	ND	ND			ND	ND
Arsenic (total)	µg/L	10	2.53	0.353			7.58	6.18	8.70	8.33	6.62	6.43	5.86	4.22			1.00	0.679
Barium (total)	µg/L	1000	35.1	12.7			40.2	34.2	42.1	37.4	32.1	31.1	16.2	14.8			6.90	6.04
Boron (total)	µg/L	5000	ND	ND			ND	ND	ND	ND	ND	ND	ND	ND			ND	ND
Cadmium (total)	µg/L	5	0.0170	0.0129			ND	ND	ND	ND	0.0160	0.0138	0.0350	0.0292			0.0310	0.0248
Chromium	µg/L	50	ND	ND			ND	ND	ND	ND	ND	ND	ND	ND			ND	ND
Copper (total)	µg/L	≤2000	1.89	0.705			2.06	0.622	1.10	0.749	4.61	2.68	4.27	2.02			38.4	10.6
Fluoride	mg/L	1.5	0.0530	0.0522			0.0580	0.0580	ND	ND	0.0540	0.0530	ND	ND			ND	ND
Hardness (as CaCO <sub>3</sub> )	mg/L	-	147	112			159	137	149	134	139	132	154	142			76.1	73.0
Iron (total)	µg/L	≤300	810 <sup>3</sup>	288			26.6	16.1	17.4	12.6	37.8	25.2	159	100			318 <sup>3</sup>	80.6
Lead (total)	µg/L	5	ND	ND			0.520	0.520	ND	ND	0.270	0.227	ND	ND			1.45	0.835
Magnesium (total)	mg/L	-	9.11	8.22			11.0	9.38	10.3	8.94	9.14	8.56	9.21	8.54			4.86	4.61
Manganese (total)	µg/L	≤120	71.3	59.7			67.5	56.8	58.0	51.4	48.4	44.6	13.4	10.1			21.1	13.8
Mercury (total)	µg/L	1	0.00210	0.00210			ND	ND	ND	ND	ND	ND	0.00310	0.00310			ND	ND
Selenium (total)	µg/L	10	0.620	0.404			0.120	0.108	0.130	0.120	0.440	0.312	ND	ND			0.180	0.163
Uranium (total)	µg/L	20	0.130	0.130			0.890	0.682	1.06	0.648	0.500	0.383	0.790	0.712			ND	ND
Zinc (total)	µg/L	≤ 5000	ND	ND			44.4	25.2	ND	ND	8.60	6.88	7.90	6.30			55.5	17.9

Parameter	Units	GCDWQ <sup>1</sup>	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	6.60	6.60	ND	ND	ND	ND	47.2	25.1	ND	ND
Antimony (total)	µg/L	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic (total)	µg/L	10	0.250	0.224	0.330	0.280	0.240	0.224	0.270	0.206	0.690	0.579
Barium (total)	µg/L	1000	6.00	5.77	7.10	6.78	6.00	5.76	5.90	5.68	15.6	15.2
Boron (total)	µg/L	5000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium (total)	µg/L	5	0.0290	0.0265	0.0270	0.0235	0.0240	0.0222	0.0880	0.0332	0.0190	0.0160
Chromium	µg/L	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper (total)	µg/L	≤2000	16.7	10.3	38.5	10.3	20.5	11.2	41.0	15.8	12.4	6.95
Fluoride	mg/L	1.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hardness (as CaCO <sub>3</sub> )	mg/L	-	96.7	85.6	94.7	87.2	88.4	82.0	80.2	77.9	143	135
Iron (total)	µg/L	≤300	73.9	23.2	99.4	35.2	87.2	22.4	220	78.4	91.2	31.7
Lead (total)	µg/L	5	ND	ND	ND	ND	0.260	0.260	ND	ND	0.410	0.341
Magnesium (total)	mg/L	-	7.05	6.44	7.02	6.60	6.38	5.93	5.64	5.39	10.8	10.3
Manganese (total)	µg/L	≤120	4.60	2.98	5.20	2.28	3.50	2.12	3.90	2.58	2.40	1.52
Mercury (total)	µg/L	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium (total)	µg/L	10	0.190	0.144	0.170	0.161	0.180	0.142	0.130	0.121	0.240	0.211
Uranium (total)	µg/L	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc (total)	µg/L	≤ 5000	34.2	17.0	14.3	7.68	10.6	7.57	24.0	10.8	30.4	17.2

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' -DDD (o,p-DDD)	Diazinon	Methoxychlor
2,4' -DDE (o,p-DDE)	Dibenzo(a,h)anthracene	Methyl parathion
2-Methylnaphthalene	Dichlofenthion	Metolachlor
4,4' -DDE (pp-DDE)	Dichlofluanid	Metribuzin
4,4' -DDT (pp-DDT)	Dichloran	Mevinphos
Acenaphthene	Dichlorbenil	Mirex
Acenaphthylene	Dichlorvos and Naled	Naphthalene
a-Chlordane	Diclofop-methyl	Nitrofen
Acridine	Dicofol	Omethoate
Alachlor	Dicrotophos	Parathion
Aldrin	Dieldrin	Pentachloronitrobenzene / PCNB
Alpha-BHC	Dimethoate	Permethrin
Anthracene	Dioxathion	Phenanthrene
Aspon	Diphenylamine	Phorate
Atrazine	Disulfoton	Phosalone
Atrazine-desethyl (DEA)	Endosulfan I	Phosmet
Azinphos-ethyl	Endosulfan II	Pirimicarb
Benfluralin	Endosulfan sulfate	Pirimiphos-ethyl
Benzo(a)anthracene	Endrin	Pirimiphos-methyl
Benzo(a)pyrene	Endrin aldehyde	Potassium (total)
Benzo(b,j)fluoranthene	Endrin ketone	Procymidone
Benzo(g,h,i)perylene	EPN	Profenofos
Benzo(k)fluoranthene	EPTC (EPTAM)	Profluralin
Beta-BHC	Ethalfuralin	Prometryn
Bromacil	Ethion	Pronamide
Bromophos	Fenchlorphos	Propazine
Bromophos-ethyl	Fenitrothion	Propiconazole
Butylate	Fensulfothion	Pyrazophos
Captan	Fenthion	Pyrene
Carbophenothion – solids (dry weight)	Fluoranthene	Quinalphos
Chlorbenside	Fluorene	Quinoline
Chlorfenson	Folpet	Simazine
Chlorfenvinphos	Fonofos	Stirofos
Chlormephos	g-Chlordane	Sulfotep

Chloropropham	Heptachlor	Tecnazene
Chlorothalonil	Heptachlor epoxide	Terbufos
Chlorpyrifos	Hexachlorobenzene	Terbutylazine
Chlorthiophos	Hexazinone	Terbutryn
Chromium (total)	Indeno (1,2,3-c,d)pyrene	Tetradifon
Chrysene	Iodofenphos	Tolylfluanid
Cyanazine	Iprodione	Total HMW PAH
Cyanophos	Isofenphos	Total LMW PAH
DCPA	Lindane	Total PAH
Delta-BHC	Malaoxon	Triadimefon
Demeton-S	Malathion	Triallate
Desmetryn	Metalaxyl	Trifluralin
Diallate	Methidathion	Vinclozolin

## 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		Max	Avg			Max	Avg		Max	Avg			Max	Avg		Max	Avg			Max	Avg		Max	Avg
2020	2172	8	2.55	1.30	6.97	3.17	0.210	248	3	2.55	1.56	7.16	3.17	0.300	1456	4	2.29	1.00	6.91	0.760	0.160	468	1	2.31	1.35	7.14	2.63	0.290
2021	2142	26	2.55	1.46	7.03	1.86	0.220	257	6	2.55	1.77	7.22	1.27	0.310	1421	8	2.20	1.16	6.92	1.86	0.170	464	12	2.41	1.51	7.40	1.68	0.300
2022	2137	17	2.87	1.74	8.46	3.64	0.568	247	1	2.87	2.11	8.33	0.650	0.369	1455	8	2.56	1.37	7.81	3.64	0.504	435	3	2.87	1.81	8.43	0.740	0.403

### 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		Max	Avg			Max	Avg		Max	Avg			Max	Avg		Max	Avg			Max	Avg		Max	Avg
2020	52	0	2.55	2.10	7.16	3.17	0.430	52	1	2.29	1.47	7.32	0.590	0.350	52	2	2.26	1.86	7.32	0.750	0.340	52	0	1.74	1.39	6.72	0.570	0.130
2021	52	2	2.55	2.07	7.18	0.890	0.410	51	2	2.41	1.81	7.56	0.780	0.400	51	2	2.23	1.88	7.62	1.27	0.390	51	0	2.17	1.53	6.68	0.460	0.110
2022	52	1	2.72	2.41	7.44	0.650	0.352	52	0	2.87	2.22	8.25	0.590	0.324	52	0	2.59	2.23	8.30	0.620	0.308	52	0	2.62	1.91	7.30	0.560	0.0846

	Maclure						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg		Max	Avg
2020	52	0	1.44	1.14	7.14	0.440	0.190
2021	49	0	2.08	1.53	6.96	0.550	0.180
2022	52	3	2.36	1.78	7.51	0.450	0.156

Mission Distribution Sample Locations

	M1						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
	2020	52	0	2.14	1.21	7.16	0.590
2021	52	0	1.82	1.37	7.25	0.390	0.200
2022	52	1	2.85	1.71	7.92	0.610	0.181

	M2						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
		52	0	1.83	1.27	7.09	0.670
	51	1	1.92	1.34	7.42	0.820	0.370
	52	1	2.37	1.76	8.09	0.620	0.308

	M3						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
		52	0	1.96	1.54	6.96	0.490
	51	0	2.13	1.51	7.74	0.780	0.380
	52	0	2.60	1.83	8.32	0.550	0.291

	M5						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
		52	0	2.04	1.24	7.13	1.45
	52	3	2.11	1.37	7.36	0.750	0.240
	49	0	2.73	1.72	7.83	0.560	0.161

	M6						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
	2020	52	1	2.31	1.46	7.13	2.63
2021	52	4	2.41	1.63	7.41	0.850	0.380
2022	52	0	2.87	2.00	8.14	0.740	0.317

	M7						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
		52	0	2.27	1.32	6.94	0.490
	51	1	2.32	1.61	7.13	0.480	0.210
	52	0	2.81	1.88	7.49	0.600	0.147

	M8						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
		52	0	2.10	1.62	7.25	0.640
	52	0	2.25	1.75	8.12	1.68	0.410
	22*	0	2.32	1.94	8.43	0.500	0.253

	M9						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
		52	0	2.21	1.41	6.77	0.500
	51	2	2.38	1.70	6.82	0.440	0.190
	52	0	2.49	1.90	7.37	0.540	0.117

	M10						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
	2020	52	0	1.87	1.03	7.36	0.530
2021	52	1	2.02	1.30	7.70	0.880	0.300
2022	52	1	2.12	1.58	8.07	0.620	0.270

	M20						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
	-	-	-	-	-	-	-
-	-	-	-	-	-	-	
30	0	2.53	2.10	7.77	0.96	0.42	

\*M8 was replaced with M20 May 31, 2022.

### Abbotsford West Distribution Sample Locations

	W1						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
2020	52	0	1.57	1.10	6.98	0.350	0.150
2021	52	0	2.05	1.26	6.88	0.950	0.190
2022	52	0	2.27	1.46	6.98	0.420	0.178

	W2						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
52	0	1.53	1.18	7.06	0.480	0.150	
52	0	1.96	1.45	7.01	0.560	0.170	
52	0	2.39	1.64	7.28	3.64	0.161	

	W3						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
52	0	1.48	1.14	6.98	0.260	0.150	
52	0	2.19	1.40	6.81	0.730	0.180	
52	1	2.33	1.67	6.93	0.550	0.155	

	W4						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
52	0	1.54	1.00	6.67	0.380	0.140	
52	0	1.43	1.08	6.93	0.830	0.180	
52	0	1.94	1.29	7.07	0.440	0.139	

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	W5						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
2020	52	1	2.29	1.38	6.89	0.500	0.150
2021	52	0	1.90	1.39	6.81	0.550	0.150
2022	52	1	2.33	1.64	7.06	0.510	0.180

	W6						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
52	0	1.63	1.25	6.77	0.290	0.140	
52	0	1.79	1.26	6.75	0.560	0.140	
52	0	2.01	1.48	6.89	0.620	0.153	

	W7						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
52	0	1.21	0.810	6.45	0.260	0.110	
52	0	1.41	0.920	6.82	0.810	0.160	
52	0	1.78	1.25	7.17	1.48	0.222	

	W8						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
52	0	0.920	0.620	6.56	0.400	0.140	
52	0	1.30	0.770	6.77	0.530	0.160	
52	0	1.41	0.940	7.14	0.640	0.140	

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	W9						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
2020	52	0	0.960	0.660	6.95	0.640	0.180
2021	52	1	1.36	0.850	6.98	1.15	0.210
2022	52	0	1.67	1.11	7.39	0.760	0.132

	W11						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
52	0	1.30	0.990	7.01	0.270	0.150	
52	0	1.96	1.37	6.91	0.830	0.220	
52	0	2.03	1.55	7.12	0.480	0.135	

	W13						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
52	1	1.15	0.590	6.90	0.290	0.160	
52	0	1.37	0.830	6.82	0.700	0.190	
52	0	1.94	1.12	7.00	0.470	0.130	

	W14						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
52	0	1.40	0.950	6.66	0.340	0.150	
52	0	1.52	0.830	6.81	0.540	0.170	
52	0	2.13	1.04	6.99	0.540	0.110	

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	W15						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
2020	52	0	2.26	1.28	6.83	0.520	0.150
2021	52	0	2.04	1.50	6.86	0.730	0.150
2022	52	0	2.38	1.69	6.97	0.580	0.115

	W16						
	# Micro Samples	# with Tot. Col.	Total Cl (mg/L)		pH	Turbidity (NTU)	
			Max	Avg	Median	Max	Avg
52	0	1.18	0.870	7.26	0.450	0.170	
52	0	1.56	1.23	7.08	0.890	0.210	
52	1	2.07	1.48	7.47	0.720	0.120	

### 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	Median	Max	Avg			Max	Avg	Median	Max	Avg			Max	Avg	Median	Max	Avg			Max	Avg	Median	Max	Avg
2020	52	0	1.52	1.15	7.02	0.500	0.180	52	0	1.22	0.930	6.95	0.570	0.170	52	1	1.36	0.940	6.95	0.400	0.180	52	0	0.950	0.550	6.87	0.320	0.150
2021	47	1	1.61	1.18	7.02	0.600	0.140	47	1	1.49	1.03	7.01	0.650	0.150	47	0	1.33	0.890	7.06	0.510	0.140	47	1	1.10	0.610	7.02	0.300	0.150
2022	52	0	1.99	1.30	7.34	0.890	0.136	52	1	1.73	1.22	7.19	0.810	0.200	52	1	1.70	1.15	7.29	0.690	0.143	52	0	1.47	0.950	7.26	0.570	0.131

	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	Median	Max	Avg			Max	Avg	Median	Max	Avg			Max	Avg	Median	Max	Avg			Max	Avg	Median	Max	Avg
2020	52	0	1.48	1.15	7.06	0.390	0.200	52	0	0.900	0.450	6.93	0.380	0.170	52	1	1.20	0.840	7.13	0.580	0.260	52	0	1.62	1.14	7.08	0.630	0.170
2021	47	0	1.47	1.16	7.06	1.86	0.200	47	0	0.980	0.540	7.03	0.470	0.150	47	1	1.23	0.770	7.06	0.790	0.190	52	0	2.02	1.36	7.11	0.430	0.150
2022	51	1	1.98	1.28	7.22	0.830	0.140	52	0	1.40	0.850	7.33	0.750	0.124	52	0	1.73	1.16	7.25	0.780	0.148	52	0	2.29	1.54	7.43	0.930	0.150

	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	Median	Max	Avg			Max	Avg	Median	Max	Avg			Max	Avg	Median	Max	Avg			Max	Avg	Median	Max	Avg
2020	52	0	1.76	1.19	7.03	0.760	0.180	52	0	1.49	1.19	6.98	0.550	0.180	52	0	2.14	1.29	6.91	0.710	0.160	52	0	1.59	1.17	6.91	0.340	0.160
2021	52	1	1.92	1.44	6.93	0.410	0.160	52	0	1.75	1.37	6.81	0.640	0.170	52	2	2.20	1.62	6.78	0.640	0.180	52	0	2.14	1.39	6.75	0.400	0.170
2022	52	0	2.27	1.67	7.19	0.400	0.190	52	0	2.11	1.55	7.03	0.560	0.183	52	1	2.56	1.73	7.04	0.800	0.146	52	0	2.20	1.65	6.99	0.380	0.134

	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	Median	Max	Avg			Max	Avg	Max	Avg	Max														
2020	52	0	1.48	0.920	6.61	0.270	0.120	52	0	1.61	1.18	6.92	0.280	0.160														
2021	52	0	1.54	1.07	6.96	0.400	0.130	52	0	2.19	1.37	6.76	0.770	0.160														
2022	52	1	1.69	1.27	7.27	0.500	0.142	52	0	2.22	1.58	6.99	0.550	0.176														

## APPENDIX I – QUARTERLY DISTRIBUTION SYSTEM MONITORING (TOTAL METALS)

Abbotsford (page 1 of 2)

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	12.3	39.6	11.9	44.2	11.2	51.3	3.50	37.8	11.7	38.9	5.80	41.2	9.30	9.30	18.7	18.7	19.5	19.5	11.6	42.8	11.8	47.3	9.7	47.8	12.3	38.6	11.7	44.6
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	0.150	0.300	0.160	0.320	0.150	0.310	0.190	2.00	0.170	0.570	0.150	0.900	0.320	1.78	0.400	0.420	0.460	3.74	0.150	0.320	0.130	0.250	0.150	0.280	0.150	0.320	0.150	0.330
Barium (total)	µg/L	1000	4.10	8.30	4.00	5.50	3.80	5.30	3.70	18.4	3.90	8.10	3.70	8.30	6.30	17.4	5.20	7.80	4.90	25.7	3.60	6.00	3.50	5.60	4.00	6.00	3.80	5.60	4.00	5.60
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	0.0120	0.0120	ND	ND	ND	ND	0.0170	0.0200	0.0200	0.0200	0.0140	0.0220	0.0190	0.0260	0.0130	0.0220	0.0200	0.0200	0.366	0.366	ND	ND	ND	ND	ND	ND	ND	ND
Calcium (total)	µg/L	-	2.06	7.80	1.71	2.63	1.80	2.54	3.08	34.7	1.69	25.1	1.73	29.2	19.0	34.6	12.0	25.7	10.0	35.9	1.74	3.94	1.80	2.74	1.91	4.03	1.65	3.75	2.10	2.94
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	0.630	1.47	0.950	1.27	0.780	2.88	0.930	1.48	0.820	1.27	0.730	1.04	4.44	108	128	202	0.970	1.70	0.700	1.30	0.390	0.610	0.720	1.51	2.16	3.24	2.43	6.20
Hardness (as CaCO <sub>3</sub> )	mg/L	-	5.96	25.8	5.10	7.82	5.27	7.64	9.54	122	5.05	88.8	5.19	102	65.4	122	39.2	87.0	33.2	129	5.16	12.4	5.48	8.25	5.80	13.1	4.94	12.3	6.27	8.81
Iron (total)	µg/L	≤300	7.80	14.2	8.40	8.40	9.30	9.30	8.20	21.7	6.30	6.30	5.80	9.60	5.20	12.1	15.6	16.3	9.60	15.5	11.9	19.2	11.5	34.4	12.6	21.9	5.60	7.80	6.10	11.2
Lead (total)	µg/L	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.310	0.310	0.790	1.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.230	0.230
Magnesium (total)	mg/L	-	0.202	1.53	0.200	0.311	0.190	0.314	0.451	8.53	0.199	6.36	0.213	7.10	4.39	8.63	2.23	5.56	1.97	9.58	0.198	0.619	0.240	0.344	0.252	0.735	0.200	0.720	0.249	0.355
Manganese (total)	µg/L	≤120	2.40	2.40	ND	ND	ND	ND	2.70	30.5	2.50	2.50	5.40	5.40	3.20	32.5	6.60	8.30	5.10	60.9	2.90	2.90	2.00	2.70	2.40	4.30	1.60	1.60	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	0.002	0.002	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	1.00	1.00	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	-	0.0860	0.334	0.0870	0.123	0.0820	0.120	0.155	2.10	0.0800	1.31	0.0870	1.63	0.947	2.15	0.614	1.30	0.590	2.40	0.0850	0.133	0.0880	0.127	0.0870	0.223	0.0810	0.181	0.0980	0.130
Selenium (total)	µg/L	10	ND	ND	ND	ND	ND	ND	0.130	0.160	0.120	0.120	ND	ND	0.110	0.150	0.150	0.150	0.150	0.240	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silicon (total)	µg/L	-	2180	4030	2120	3020	2090	3070	2720	9470	2210	11600	2210	10800	8530	10700	5670	10700	5340	10700	2120	2970	2130	2710	2260	2980	2230	3130	2220	2990
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	0.639	3.04	0.687	1.18	0.680	1.20	1.31	10.8	0.757	10.4	0.808	12.0	8.13	12.3	5.78	11.1	4.99	10.8	0.985	2.89	1.03	2.25	0.734	4.45	0.734	2.62	1.03	1.25
Strontium (total)	µg/L	-	5.50	24.3	5.10	7.50	5.40	7.30	12.3	146	5.20	124	5.40	132	104	148	56.5	122	48.9	155	5.50	11.4	5.70	8.00	6.40	14.1	5.20	13.8	6.80	8.90
Sulfur (total)	µg/L	-	ND	ND	ND	ND	ND	ND	4.70	10.7	4.30	4.30	3.10	6.30	3.30	10.6	4.90	4.90	5.40	12.7	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	0.100	0.430	ND	ND	0.210	0.210	0.230	0.390	ND	ND	0.110	0.520	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	7.70	7.70	8.90	11.0	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

Abbotsford (page 2 of 2)

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	3.10	32.1	4.00	31.2	4.00	6.20	4.60	8.20	4.10	32.1	4.00	6.90	3.40	31.1	11.0	48.8	11.5	42.3	11.8	44.4	11.6	39.6	12.8	40.2	38.0	38.0	11.5	38.8
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	0.210	3.36	0.220	3.08	0.36	2.60	0.340	1.59	0.210	3.14	0.400	2.57	0.200	3.32	0.150	0.320	0.150	0.330	0.160	0.310	0.140	0.310	0.150	0.340	0.160	3.18	0.150	0.310
Barium (total)	µg/L	1000	3.90	24.1	3.60	22.5	8.00	22.9	8.90	12.0	3.60	22.1	10.8	19.3	3.90	24.7	3.90	5.50	3.90	5.40	3.70	5.70	3.70	5.60	3.80	5.40	3.90	22.8	3.90	5.40
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	0.0100	0.0230	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0520	0.0520	ND	ND	ND	ND	ND	ND	0.0230	0.0400	ND	ND
Calcium (total)	µg/L	-	3.79	33.3	3.96	31.0	13.3	33.8	13.8	25.9	3.94	30.5	19.6	26.0	4.93	34.7	2.01	2.59	1.77	2.52	1.69	2.57	1.69	2.60	1.68	2.64	2.97	36.4	1.67	2.71
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	1.20	1.84	2.24	2.83	1.62	2.33	1.30	2.35	5.49	6.33	2.02	4.43	1.44	1.67	1.29	2.03	1.51	2.27	0.770	1.21	2.15	5.52	0.920	1.42	1.35	1.74	1.16	1.62
Hardness (as CaCO3)	mg/L	-	12.4	118	13.1	110	45.4	119	47.7	93.9	13.3	108	68.7	91.2	16.6	123	6.09	7.73	5.21	7.57	5.02	7.70	5.03	7.75	5.03	7.86	9.60	130	5.02	7.95
Iron (total)	µg/L	≤300	7.70	7.70	7.10	7.10	ND	ND	6.40	9.00	6.70	6.70	11.1	17.9	7.10	7.10	10.2	10.2	5.00	6.70	5.20	7.40	5.40	6.10	5.40	5.40	10.0	10.0	5.90	6.50
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	-	0.720	8.52	0.786	8.01	2.95	8.42	3.19	7.08	0.834	7.76	4.79	6.45	1.05	8.92	0.261	0.309	0.193	0.312	0.197	0.315	0.198	0.320	0.201	0.308	0.528	9.430	0.206	0.289
Manganese (total)	µg/L	≤120	5.20	54.5	6.00	51.8	8.10	46.4	19.6	53.1	5.40	50.3	27.3	51.2	5.50	56.2	1.30	1.30	ND	ND	ND	ND	ND	ND	ND	ND	3.50	48.8	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	ND	ND	ND	ND	ND	ND	ND	ND	1.10	1.10	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	-	0.202	2.17	0.211	2.02	0.701	1.98	0.838	1.38	0.231	1.97	1.08	1.70	0.262	2.24	0.0950	0.110	0.0860	0.118	0.0860	0.125	0.0810	0.122	0.0830	0.127	0.150	2.41	0.0860	0.116
Selenium (total)	µg/L	10	0.230	0.230	0.220	0.220	0.230	0.250	0.120	0.300	0.210	0.210	0.170	0.290	0.250	0.250	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.140	0.220	ND	ND
Silicon (total)	µg/L	-	3060	6710	3140	6570	4910	7900	4380	8100	3200	6430	5310	7700	3380	6930	2140	2950	2240	2830	2150	2990	2280	3050	2280	2980	2820	10400	2210	2870
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	1.46	7.99	1.52	7.60	5.36	8.08	3.84	6.93	1.56	7.43	5.43	6.56	1.77	8.43	0.720	1.15	0.674	1.33	0.698	1.21	0.703	1.18	0.702	1.22	1.24	11.3	0.688	1.23
Strontium (total)	µg/L	-	17.7	142	18.5	134	54.6	143	52.0	135	19.0	131	88.8	127	24.0	149	6.00	7.40	5.40	7.40	5.30	7.70	5.10	7.50	5.30	7.90	11.9	157	5.20	8.40
Sulfur (total)	µg/L	-	3.20	11.2	10.6	10.6	7.40	11.7	4.10	8.50	3.50	10.1	6.10	8.40	12.0	12.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.80	12.4	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	0.110	0.460	0.430	0.430	0.520	0.520	0.160	0.160	0.140	0.410	0.340	0.340	0.490	0.490	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.140	0.490	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	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

Mission & Transmission (page 1 of 1)

Parameter	Units	GCD WQ	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	13.2	54.5	12.7	17.1	14.6	24.1	16.6	54.9	7.70	13.9	12.1	65.0	18.4	18.4	12.4	68.1	22.6	39.1	7.60	16.2	12.5	63.1	8.00	17.2	8.00	17.2	12.4	56.3
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	0.140	0.340	0.110	0.120	0.120	0.150	0.150	0.360	0.100	0.110	0.120	0.330	ND	ND	0.120	0.360	0.100	0.130	0.110	0.120	0.110	0.340	0.130	0.140	0.110	0.140	0.140	0.350
Barium (total)	µg/L	1000	4.60	6.50	7.20	10.0	5.80	6.60	4.00	6.20	6.80	9.80	3.60	6.10	2.10	2.10	3.30	5.70	6.00	8.30	2.40	2.50	3.50	5.70	2.10	2.50	2.10	8.20	3.50	5.60
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	0.0420	0.0420	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	-	2.12	2.89	1.27	1.77	1.48	2.40	2.28	3.38	1.18	1.39	1.63	2.72	2.24	2.24	1.50	2.63	1.72	2.71	1.26	1.44	1.52	2.67	1.32	1.62	1.20	1.36	1.52	2.55
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	0.650	3.20	0.240	0.440	0.210	0.610	0.470	1.79	0.290	0.630	1.74	2.30	0.230	0.230	5.12	8.56	0.220	1.73	1.26	2.36	0.510	0.710	0.250	0.330	0.570	0.920	1.25	1.84
Hardness (as CaCO3)	mg/L	-	5.95	8.31	3.82	5.18	4.33	6.72	6.35	9.48	3.62	4.25	4.83	8.03	6.04	6.04	4.52	7.82	4.91	7.68	3.83	4.34	4.53	7.93	3.90	4.75	3.67	4.10	4.55	7.59
Iron (total)	µg/L	≤300	11.3	27.0	18.4	35.3	29.5	73.3	7.40	21.2	23.0	31.8	12.7	30.8	16.8	16.8	6.10	24.8	17.7	33.7	5.70	16.1	8.40	11.3	5.90	17.4	6.80	19.1	6.00	8.80
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	-	0.162	0.264	0.160	0.183	0.156	0.175	0.161	0.249	0.167	0.193	0.180	0.303	0.109	0.109	0.180	0.306	0.130	0.223	0.164	0.182	0.181	0.308	0.147	0.174	0.149	0.190	0.182	0.293
Manganese (total)	µg/L	≤120	2.70	2.70	2.40	3.30	1.80	3.20	ND	ND	2.20	2.80	ND	ND	1.20	1.20	ND	ND	1.60	2.50	2.10	2.60	ND	ND	1.80	3.20	1.70	3.3	ND	ND
Mercury (total)	µg/L	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00230	0.00230	ND	ND	ND	ND	ND	ND	0.00200	0.00200	ND	ND
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	-	0.0770	0.116	0.0610	0.0910	0.0670	0.0830	0.0750	0.118	0.0620	0.0770	0.0690	0.114	0.0700	0.0700	0.0670	0.115	0.067	0.0850	0.0630	0.0780	0.0670	0.120	0.0630	0.0730	0.0630	0.0750	0.0740	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	-	1690	2730	1130	1360	1160	1370	1820	2790	1120	1330	1720	2690	1430	1430	1690	2720	1360	2220	1110	1380	1680	2720	1130	1340	1110	1350	1710	2700
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	≤2000 00	0.731	3.32	3.77	6.34	2.84	5.92	0.634	1.26	4.21	6.06	0.568	1.15	5.09	5.09	0.572	1.16	1.08	6.19	4.27	6.61	0.568	1.16	4.25	5.71	4.24	5.82	0.588	1.13
Strontium (total)	µg/L	-	6.00	8.10	4.40	5.50	5.20	6.00	5.90	8.60	4.20	4.70	4.50	7.40	7.40	7.40	4.50	7.40	5.40	7.00	4.40	4.90	4.50	7.40	4.70	5.70	4.40	4.80	4.70	7.20
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	5.10	5.10	ND	ND	8.60	8.60	ND	ND	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-8-22	W09	2.6	ND	ND	ND	2.6
Feb-8-22	W11	12	ND	ND	ND	12
Mar-24-22	Cannons Pit 400	20	ND	ND	ND	ND
Mar-24-22	Cannons Pit 600	21	ND	1.1	ND	22.1
Mar-24-22	M07	19	ND	ND	ND	19
Mar-24-22	M09	16	ND	ND	ND	16
Mar-24-22	Maclure Reservoir	14	ND	ND	ND	14
Jun-14-22	Cannons Pit 400	15	ND	ND	ND	15
Jun-14-22	Cannons Pit 600	14	ND	ND	ND	14
Jun-14-22	M09	22	ND	ND	ND	22
Jun-14-22	Maclure Reservoir	19	ND	ND	ND	19
Jun-14-22	M07	22	ND	ND	ND	22
Jul-5-22	E04	ND	ND	ND	ND	ND
Jul-5-22	W09	2.6	ND	ND	ND	2.6
Jul-5-22	W11	15	ND	ND	ND	15
Sep-27-22	E04	5.9	ND	ND	ND	5.9
Sep-27-22	W09	1.3	ND	ND	ND	1.3
Sep-27-22	W11	6.2	ND	ND	ND	6.2
Sep-28-22	Cannons Pit 400	21	ND	ND	ND	21
Sep-28-22	Cannons Pit 600	20	ND	ND	ND	20
Sep-28-22	M07	7.8	ND	ND	ND	7.8
Sep-28-22	M09	7.1	ND	ND	ND	7.1
Sep-28-22	Maclure Reservoir	8.1	ND	ND	ND	8.1
Oct-6-22	M07	7.2	ND	ND	ND	7.2
Oct-6-22	M09	6.7	ND	ND	ND	6.7
Oct-6-22	Maclure Reservoir	7.3	ND	ND	ND	7.3
Dec-15-22	Cannons Pit 400	14	ND	ND	ND	14
Dec-15-22	Cannons Pit 600	11	ND	ND	ND	11
Dec-15-22	M07	7.1	ND	ND	ND	7.1
Dec-15-22	M09	7.4	ND	ND	ND	7.0
Dec-15-22	Maclure Reservoir	8.0	ND	ND	ND	8.0

### 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-8-22	W09	ND	ND	ND	ND	ND	ND
Feb-8-22	W11	ND	ND	ND	12	8.3	20.3
Mar-24-22	Cannons Pit 400	ND	ND	ND	7.7	12	19.7
Mar-24-22	Cannons Pit 600	ND	ND	ND	8.2	14	22.2
Mar-24-22	M07	ND	ND	ND	14	11	25
Mar-24-22	M09	ND	ND	ND	15	11	26
Mar-24-22	Maclure Reservoir	ND	ND	ND	11	8.6	19.6
Jul-5-22	E04	ND	ND	ND	ND	ND	ND
Jul-5-22	W09	ND	ND	ND	ND	ND	ND
Jul-5-22	W11	ND	ND	ND	11	8.3	19.3
Sep-27-22	E04	ND	ND	ND	5.1	ND	5.1
Sep-27-22	W09	ND	ND	ND	ND	ND	ND
Sep-27-22	W11	ND	ND	ND	5	ND	5
Sep-28-22	Cannons Pit 400	ND	ND	ND	7.5	10	17.5
Sep-28-22	Cannons Pit 600	ND	ND	ND	7.4	11	18.4
Sep-28-22	M07	ND	ND	ND	ND	ND	ND
Sep-28-22	M09	ND	ND	ND	ND	ND	ND
Sep-28-22	Maclure Reservoir	ND	ND	ND	ND	ND	ND
Dec-15-22	Cannons Pit 400	ND	ND	ND	ND	6.6	6.6
Dec-15-22	Cannons Pit 600	ND	ND	ND	5.1	8.3	13.4
Dec-15-22	M07	ND	ND	ND	ND	ND	ND
Dec-15-22	M09	ND	ND	ND	5.1	ND	5.1
Dec-15-22	Maclure Reservoir	ND	ND	ND	5.6	5.1	10.7

ND = not detectable, NT = not tested

**n-Nitrodimethylamine (ng/L)**

Date	Location	NDMA (ng/l)
Feb-8-22	W09	ND
Feb-8-22	W11	ND
Mar-24-22	Cannons Pit 400	ND
Mar-24-22	Cannons Pit 600	ND
Mar-24-22	M07	ND
Mar-24-22	M09	ND
Mar-24-22	Maclure Reservoir	ND
Jul-5-22	E04	ND
Jul-5-22	W09	ND
Jul-5-22	W11	ND
Sep-27-22	E04	ND
Sep-27-22	W09	ND
Sep-27-22	W11	ND
Sep-28-22	Cannons Pit 400	ND
Sep-28-22	Cannons Pit 600	ND
Sep-28-22	M07	ND
Sep-28-22	M09	ND
Sep-28-22	Maclure Reservoir	ND
Dec-15-22	Cannons Pit 400	ND
Dec-15-22	Cannons Pit 600	ND
Dec-15-22	M07	ND
Dec-15-22	M09	ND
Dec-15-22	Maclure Reservoir	ND