# Clearbrook Waterworks District
# 2022 Water Quality Report

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**Release date: June 30, 2023.**

Cover image: Reservoir C – photo was taken from inside the reservoir; the reservoir is undergoing maintenance work (image courtesy: James Wiens).

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# Foreword

Clearbrook Waterworks District (CWD) proudly presents the 2022 Water Quality Report to our stakeholders in order to provide updates about our water system, including a full spectrum analysis of the makeup of our water, plans to upgrade our water system and clear documentation outlining the ongoing commitment of the CWD Board of Trustees and staff to maintain and deliver our high-quality, award-winning H2O!

This report is an annual effort that is prepared for the stakeholders and required by Fraser Health Authority. The report is prepared in collaboration with Dr. Ineke Kalwij, of Kalwij Water Dynamics Inc. (KWD). The report includes contributions from James Wiens (**CWP**), CWD Field Supervisor and Ryan Federau (**CWP**), the District's Water Quality Technician.

CWD remains in compliance with all provincial and federal regulations relating to the supply and delivery of potable water, at all times. To that end, we maintain a close and collaborative relationship with Fraser Health Authority, and we value their feedback. We remain committed to the protection of public health through the uninterrupted supply of safe and clean drinking water to our ratepayers.

Our highly trained water system operators are certified through the Environmental Operators Certification Program, where constant education and training are necessary to maintain a valid certification. Our operators are skilled, diligent, and dedicated to maintaining and improving the system. CWD employs three Level II Water Distribution System Operators and two Level I Operators.

Maintaining our high standards of water quality requires a comprehensive program utilizing proactive maintenance schedules, consistent asset management, adoption of emerging technologies, and best engineering practices. Our operators work closely with our engineering consultants to ensure all aspects of the system are designed, installed, and maintained in order to maximize the lifespan of our assets. We employ a multitude of security measures and checks to ensure the system remains safe from intrusion or contamination and our expectation is that water quality remains consistent from source to tap. We at CWD also recognize the importance of due diligence and care when it comes to managing and maintaining our production wells and our most important natural asset; the Abbotsford-Sumas Aquifer.

It is a true testament to our due diligence and commitment to excellence that we received a visit from a group of water services regulators from New Zealand (NZ), Tomata Arowai. This group is tasked with rehabilitating water regulations in NZ. Part of this task is to come up with an exemption for systems that may want to avoid using chlorine or disinfection and it was our reputation for consistent and award-winning water quality without disinfection that drew them to visit us. We were happy to meet with this group and review all aspects of our operations. At the end of the visit, the group from NZ informed us that to date, we would be the only system they have visited where they would be comfortable granting the exemption from disinfection!

With the future of the system in mind, we continue to make capital upgrades to the system, which includes the continuation of a main upgrade project on Royal Street this year. The project will see almost 250 meters of aging watermain replaced with larger, more resilient pipe. This project will be completed by our own field crew.

At CWD, our stated mission is ***to provide superior water in sufficient quantity to the residents and businesses of the District and to ensure long-term sustainability of product and service.***

To that end, we believe people are CWD's most valuable asset and water is its greatest resource. We remain committed to looking after the former and safeguarding the latter.

Please accept my warmest thank you, on behalf of the District's Board of Trustees and staff, for your support and interest in the operations of the District. Please read on to learn more about the water quality of your award-winning system.

Respectfully submitted,

Jason Hildebrandt, CWP
*Corporate Administrator*

# Units and Abbreviations

### Units

| | |
|---|---|
| Billion Litres | BL |
| Cubic metres | $m^3$ |
| Hour(s) | hr(s) |
| Inch | in |
| Kilometres | km |
| Litres per second | L/s |
| Litres per capital per day | L/c/d |
| Metres | m |
| Millimetres | mm |
| Million Litres | ML |
| Million cubic metres | $Mm^3$ |
| Milligrams per litre | mg/L |
| Minute | min |
| Percent | % |
| US gallons per minute | US gpm |

### Abbreviations

| | |
|---|---|
| Advanced Metering Infrastructure | AMI |
| Aesthetic Objective | AO |
| Bacteriological Activity Reaction Test | BART |
| Clearbrook Waterworks District | CWD |
| Environmental Operators Certificate Program | EOCP |
| Fraser Health Authority | FHA |
| Heterotrophic Aerobic Bacteria | HAB |
| Iron Related Bacteria | IRB |
| Maximum Acceptable Concentration | MAC |
| Most Probable Number | MPN |
| Nephelometric Turbidity Units | NTU |
| Slime Forming Bacteria | SLYM |
| Sulphate Reducing Bacteria | SRB |
| Supervisory Control and Data Acquisition | SCADA |

# 1. Introduction

The **2022 Annual Water Quality Report** has been prepared for our rate payers and Fraser Health Authority (FHA) and summarizes pertinent water system and water quality information of Clearbrook Waterworks District (CWD). Since 1954, CWD provides potable water and fire flow protection to the area formerly known as "Clearbrook", located within the City of Abbotsford. The water system is supplied, through four production wells, by groundwater from the Abbotsford-Sumas Aquifer. CWD's office and works yard is located at 2889 Grandview Crescent (the reservoir site).

As per regulatory requirements, under the **Drinking Water Protection Act**[1], water purveyors are required to monitor the quality of water supply source(s), the water in the distribution system, and the water supplied to the end users. CWD is working in close collaboration with the Drinking Water Officers of FHA to ensure safe drinking water at all times. A message from the Fraser Health Authority, dated February 1, 2022, regarding metals in drinking water ("*Flush Message*") is included as **Appendix A**.

**CWD's website** (www.clearbrookwaterworks.com) provides information for the rate payers regarding: (i) the water system & history; (ii) water rates and (e-)billing; (iii) bylaws; (iv) selected documents (water quality reports, water system map, leak relief request forms), and (v) the schedule of Board meetings and Annual General Meeting. Rate payer may also submit water meter readings through an online portal on the website. For information about preventing water-borne infections for people with weakened immune systems, please visit: HealthLinkBC-PreventingWaterBorneInfections.

**IMAGE |** CWD'S OFFICE & WORKS YARD (RESERVOIR SITE).

[1] https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/01009_01.

# 2. Water System Overview

## The Water System

CWD's water system provides potable water to residential dwellings and commercial buildings (**1,421 connections** as of the end of 2022), serving an estimated population of about 10,266 people[2]. The water system also provides water for fire flow requirements, and CWD is responsible for installing and maintaining the fire hydrants. The water system is fully metered. CWD is in the process of installing Advanced Metering Infrastructure (AMI) through the entire water system.

A combined length of an approximated 33 km of water mains distributes the water through the district. Water is distributed directly from the source (production wells) and from the reservoirs. The watermain pipe sizes vary between 150-mm (6-in) and 400-mm (16-in), and the reservoirs have a combined storage of 9,050 $m^3$.

**IMAGE | WATER INFRASTRUCTURE AT THE RESERVOIR SITE.**

[2] Population estimates as of Dec. 31, 2022 (a 1.3% annual growth rate is assumed), does not include "in transit population".

CWD's operators are all EOCP-certified[3] Water Distribution System Operators Level 1 (2 operators) and Level 2 (three operators). All operators are cross trained in various aspects of the water system operation and maintenance.

**IMAGE** |FROM LEFT TO RIGHT: Jason Hildebrandt (Corporate Administrator, WDSO II), Cole O'Malley (WDSO I), James Wiens (Field Supervisor, WDSO II), Ryan Federau (Water Quality Technician, WDSO II), and Ryan Allen (WDSO I).

## Our Production Wells

The water system relies on four production wells for water supply, located at our Lynden and Autumn Well Fields at Lynden Street and Autumn Avenue, respectively. The production wells were constructed under CWD's Well Replacement Program (2010-2017) and have replaced aging well infrastructure.

There are two production wells at each well field:

- RW 3-93/11 – in operation since 2011 (Lynden Well Field).
- RW 7-00/13 – in operation since 2013 (Lynden Well Field).
- RW 1-87/14 – in operation since 2014 (Autumn Well Field).
- RW 2-63/17 – in operation since 2017 (Autumn Well Field).

[3] Environmental Operators Certificate Program; for more information: http://eocp.ca.

The production wells are equipped with a submersible pump and motor with a nominal discharge rate of 50 L/s. The wells operate in rotation (between well fields and wells). The combined yield of the production well is sufficient to meet current and future water demand.

**IMAGE | LYNDEN WELL FIELD.**

## Supervisory Control and Data Acquisition

The Supervisory Control and Data Acquisition (SCADA) system CWD has in place is integral to CWD's operation and monitoring of the water system and our natural asset (i.e.: the aquifer). Through SCADA, CWD has real-time access to pertinent operation and monitoring aspects of the water system. Monitoring includes continuous data recording of flow information, water levels in wells, reservoir levels, water system pressure, and water temperature (reservoirs and wells). SCADA data analysis, completed by our hydrogeologist, provides essential information of our supply and distribution system. Also, through SCADA, alarm features are enabled, and CWD's system operators are notified instantaneously (through their hand-held devices) in case there is a problem with the system's operation or in case of unauthorized access.

## Emergency Response Plan

CWD has a comprehensive Emergency Response Plan in place, approved by FHA. Furthermore, at each pump house (Lynden and Autumn well fields), fully functioning emergency chlorinators are installed. These chlorinators are solely used in the event of a water quality related emergency. CWD

is also equipped with emergency water supply provisions, which will enable us to set up temporary mobile water supply stations in the event of an emergency. The idea is that no one should have to walk more than 500 metres to get access to potable water in the event of water system failure due to a catastrophic event.

## Community Outreach

CWD organizes open houses on an annual basis, typically held in July or August. CWD started with this event as an opportunity for our stakeholders to informally meet with CWD staff and Board Members, and to learn more about the water system and groundwater. At the same time, vendors and consultants CWD works with are invited showcase latest technology and educational material.

In 2022, for the first time a combined **Open House** and **Annual General Meeting** was held at the **Reservoir Site** (2889 Grandview Crescent) on **July 21, 2022**.

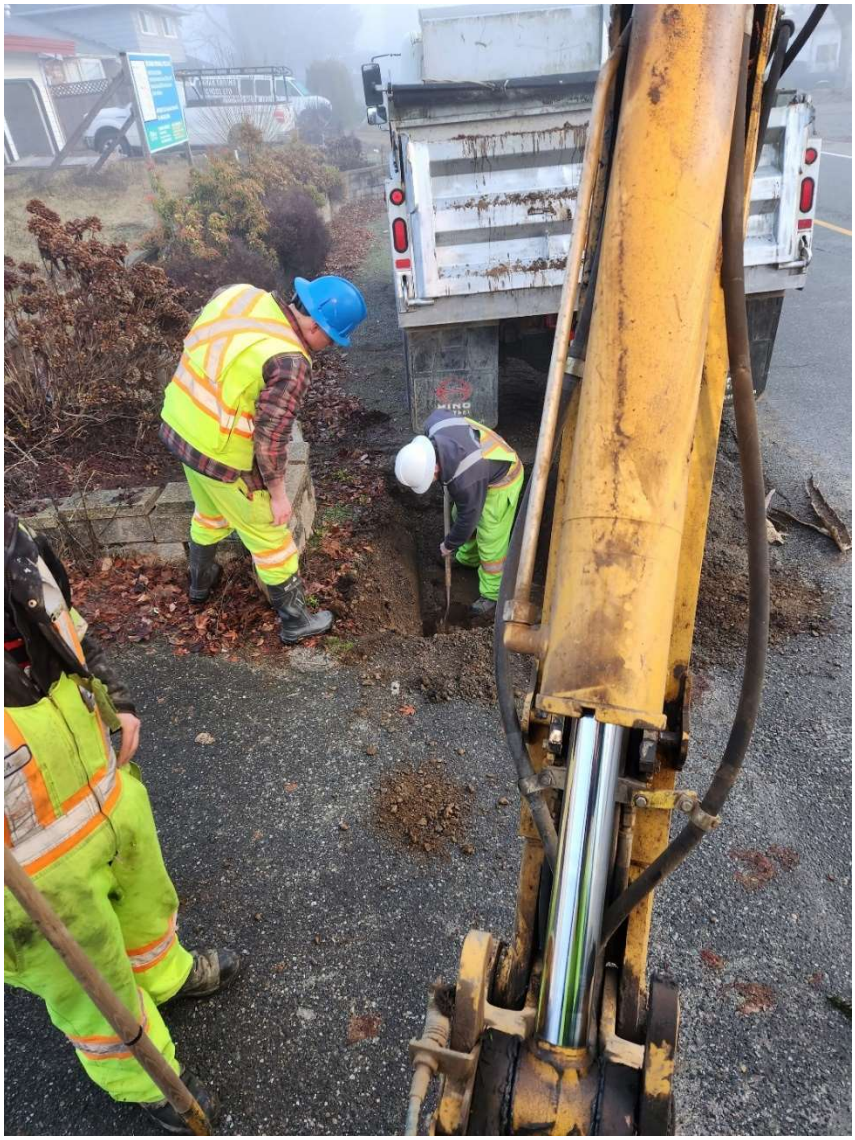

**IMAGE |** SUNNYSIDE LEAK REPAIR.

# 3. Water Supply Source Monitoring

## Our Aquifer

CWD's production wells extract water from the Abbotsford-Sumas Aquifer (**Figure 1**). This trans-boundary aquifer covers an area of approximately 161 km$^2$ and extends from the Fraser Valley into Whatcom County of Washington State, USA. It is an unconsolidated aquifer composed of sands and gravels (glacial outwash deposits). Although the aquifer is classified as an unconfined aquifer, some parts of the aquifer are confined. CWD production wells screen the aquifer at a location characterized by an overlaying confining layer. This confining layer of low permeability consists of silt and clay (also termed an *aquitard*). The presence of such *aquitard* is advantageous from an aquifer protection point of view as the aquitard forms a barrier to possible contamination introduced at the ground surface.

The aquifer is considered high-productive. The City of Abbotsford, CWD, and Fraser Valley Trout Hatchery are the major commercial groundwater users (of the Canadian portion of the aquifer). Furthermore, agriculture relies on the aquifer for water supply. There are also a considerable number of domestic water supply wells extracting water from this aquifer. The Government of B.C. classifies the Abbotsford-Sumas Aquifer as a heavily developed and highly vulnerable aquifer. CWD has a wellhead and aquifer protection program in place to safeguard the groundwater resource.

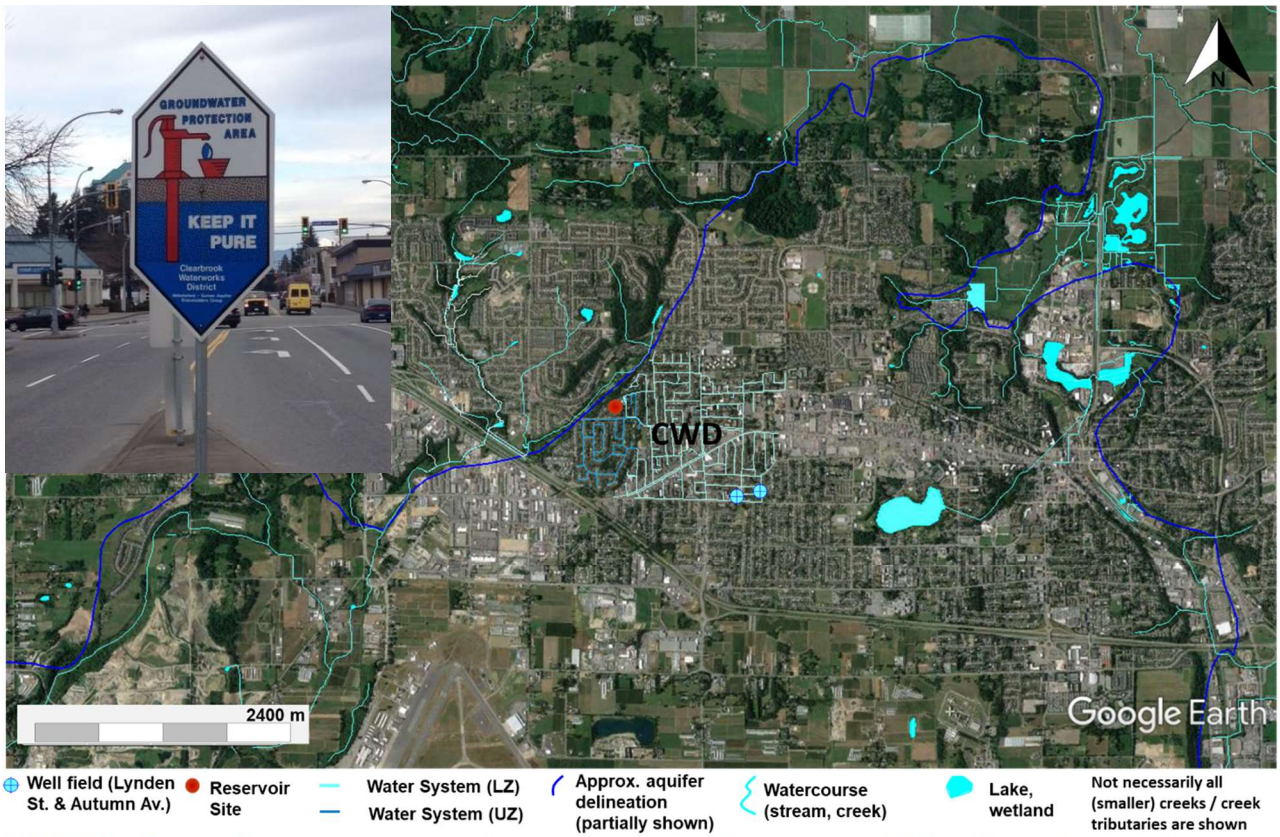


**FIGURE 1** - PARTIAL DELINEATION OF THE ABBOTSFORD-SUMAS AQUIFER AND CWD'S WATER SYSTEM. INSET (PHOTOGRAPH): CLEARBROOK WATERWORKS DISTRICT IS A DESIGNATED GROUNDWATER PROJECTION AREA.

***Regarding Groundwater Licensing:***

As required under the Provincial *Water Sustainability Act* (WSA)[4] and *Water Sustainability Regulation*[5] CWD has applied for an existing groundwater use license for their four production wells (submitted in January 2017). The groundwater licence application is being processed by the Ministry of Forests (the Ministry responsible for issuing water authorizations).

## Groundwater Monitoring

CWD has a comprehensive well and groundwater monitoring program in place for many years. Under this program, among other, collected data (recorded through SCADA) is analyzed to provide a meaningful interpretation of various data, some of which presented in this report.

### 2022 Groundwater Withdrawal

CWD's production wells have been successfully operating in rotation throughout 2022. **Figure 2** shows the monthly groundwater withdrawal for 2022. The figure shows the monthly volumetric contribution of each well. The total height of each bar reflects combined monthly groundwater withdrawal volume, also indicated by the red circular markers. For comparison purposes, the figure also shows total monthly groundwater withdrawal volumes of 2021 data (shown as white circular markers). (The lines which connect markers in the figure have no meaning.)

Monthly water use exceeded 100,000 $m^3$ in July and August. Prolonged dry weather conditions into fall resulted in higher than usual water consumption in September and October (compared to 2021 data). In 2022, the combined withdrawal volume for the months May through September was similar as in 2021, i.e.: 45.9% and 46.8% of the annual withdrawal volumes in 2022 and 2021, respectively.

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**2022 Groundwater Withdrawal Information and Related Statistics**

- The annual total volume of combined withdrawal is 1,106,615 $m^3$ (1.1 BL).
- Combined average monthly withdrawal volume is 92,218 $m^3$ (92.2 ML).
- The combined average daily withdrawal volume is 3,032 $m^3$ (3.0 ML).
- The average discharge rate is 49.3 L/s (178 $m^3$/hr).
- The combined annual hours of well operation are 6,230 hrs (17.0 hrs per day)
- The combined annual energy cost for extracting water is $39,324 (3.6 ¢ per $m^3$)

[4] http://www.bclaws.ca/civix/document/id/complete/statreg/14015
[5] http://www.bclaws.ca/civix/document/id/complete/statreg/36_2016

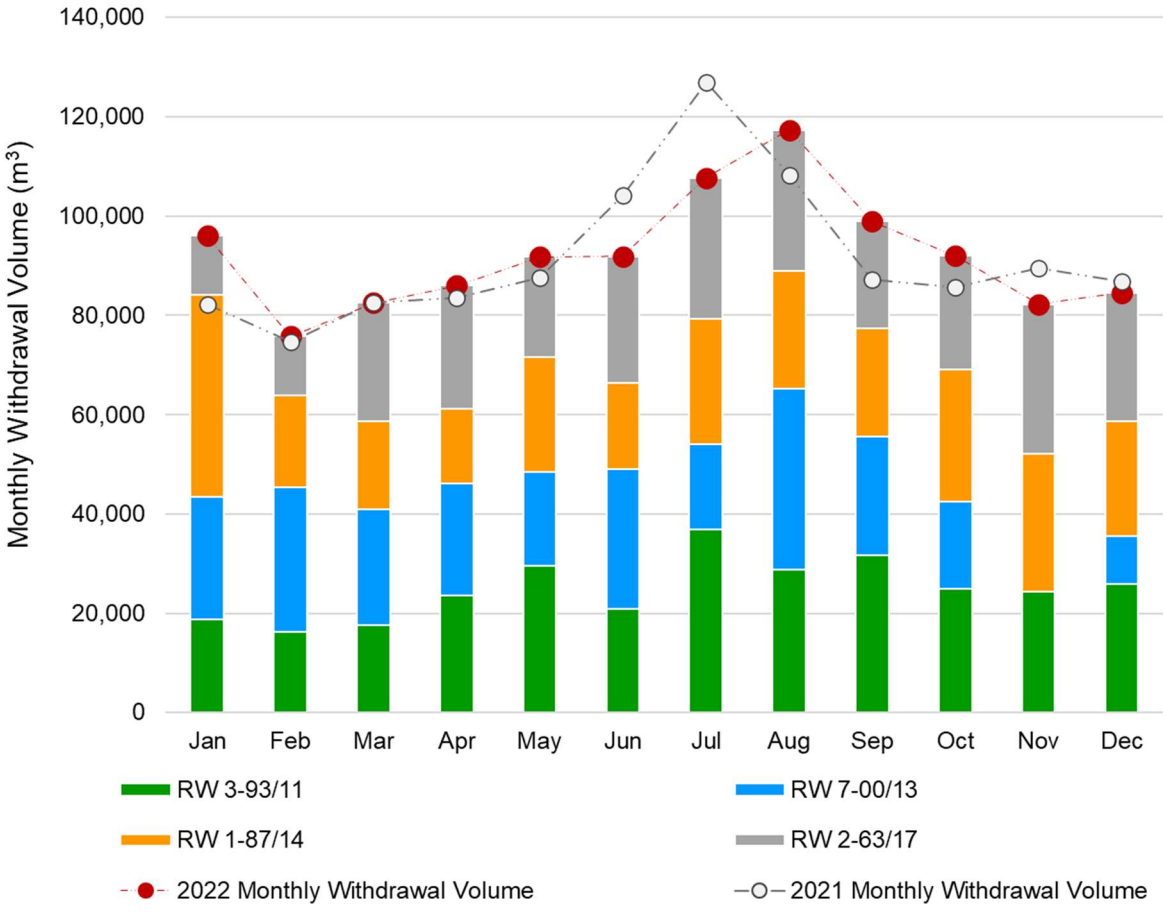



**FIGURE 2** - MONTHLY GROUNDWATER WITHDRAWAL VOLUMES (2022).

## Groundwater levels

CWD has a designated groundwater monitoring well, MW 6-59, at Lynden well field, connected to SCADA for continuous real-time recording of groundwater levels. The groundwater level (elevation) trend, shown in **Figure 3** (for years 2016 to 2022), provides valuable insight in the variation in groundwater levels seasonally, and between years, as observed at the designated monitoring well and representative for the local groundwater level. This is essential information for safeguarding the sustainability of the aquifer.

The sine-shaped data series illustrate seasonal variation in groundwater levels within a year and between years. The observed trend suggest:

- periods of (seasonal) **groundwater recharge** during which groundwater levels rise during **fall and spring** (of the following year), indicated by the upwards blue arrow in the figure; and
- periods of seasonal groundwater level decline (**groundwater discharge***)* which occurs every year from spring to fall, indicated by the downwards blue arrow in the figure.

The figure shows that the fall 2021 to spring 2022 recharge was the highest since the past four years; 2022 seasonal groundwater decline (discharge) from spring to fall was less than the observed recharge (which suggests a positive balance, i.e.: net recharge in 2022). The figure shows a non-recharging water level trend in fall / winter 2022. We suspect that this relates to the overall dry and warm summer and the prolonged dry weather conditions which continued into fall. We will be closely monitoring this unprecedented trend.

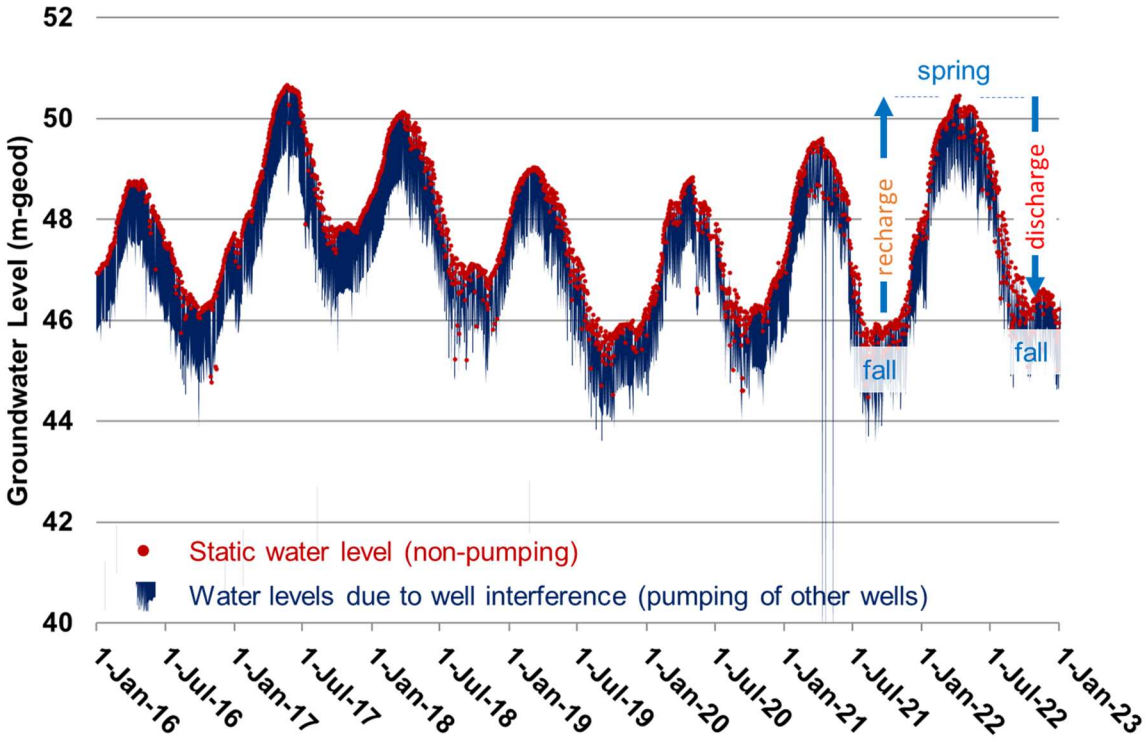



**FIGURE 3** - GROUNDWATER LEVEL TRENDS OBSERVED AT CWD MW 6-59 (2016-2022).

# 4. Selected Work and Projects

## Work and Projects completed in 2022

### Water System Maintenance

Water system maintenance is on-going throughout the year. The following is a list of selected maintenance work (and related task) completed in 2022:

- Completion of the Unidirectional Flushing Program for the entire system in spring; in fall conventional flushing was completed for the entire system.
- Leak detection and repair: (i) repair at 2876 Tims Street (200 mm AC pipe); (ii) water main repair in the Valemont and Morland intersection; (iii) replacement of service lines (2) after leak detection; and (iv) capping of an old service line due to leakage. *Following leak repair water sampling for microbiological analysis is completed prior to putting the water main section back into service*.
- Existing leaks on the customer end of the water meter were checked monthly.
- Following up on 629 work orders, addressing 224 BC 1 Call requests marking out infrastructure, and 6 emergency callouts were responded to.
- Completion of 108 conveyances (final water meter reading) following sale of homes.
- All hydrants were rebuilt in-house.


**IMAGE |** WATER SYSTEM FLUSHING IN PROGRESS.

- Valve exercising was completed on all isolation valves that would be needed to isolate any upcoming water main tie-in work.
- Monthly checks (load testing) of onsite generators; *Pacific Gencare completed the yearly service of the generators.*
- Over 100 48-hour shutoff notices were hand delivered to the properties for unpaid water bills (only 3 were shutoff due to nonpayment).
- In-house servicing of field equipment and most of the general vehicle maintenance.
- Meter testing was conducted for multiple connections (older meters).
- Cedar Park Place Phase 2 was flushed monthly until internal plumbing was completed.
- 15 new 2.54 mm (1 inch) service lines were installed for new residential houses, and 7 new services lines were installed for a 7-unit row home development.


**IMAGE |** TIMS STREET LEAK REPAIR

**IMAGE |** MOORLAND LEAK REPAIR

## Water Quality Monitoring

This is an on-going activity and is addressed in **Section 5** (Water Quality Assurance) and **Section 6** (Water Quality Review).

## Work Pertaining to New Developments

- 21 Capital Expenditure Charges (CEC) were completed.
- 18 fire flow tests were completed for potential future developments and lot split developments.
- Daily inspections were undertaken on two development projects (on Granite Avenue and George Ferguson Way), this also included the final water quality testing (microbiological) before placing the new water main into service.
    - Granite Avenue: 137.8 m of 250 mm Bionax Pipe installed by the developer.
    - George Ferguson Way: 148.4 m of 250 mm Bionax pipe installed by the developer.
- An emergency after work tie-in was completed on Tims Street (Granite Avenue Development) to re-connect an apartment building to the water system.

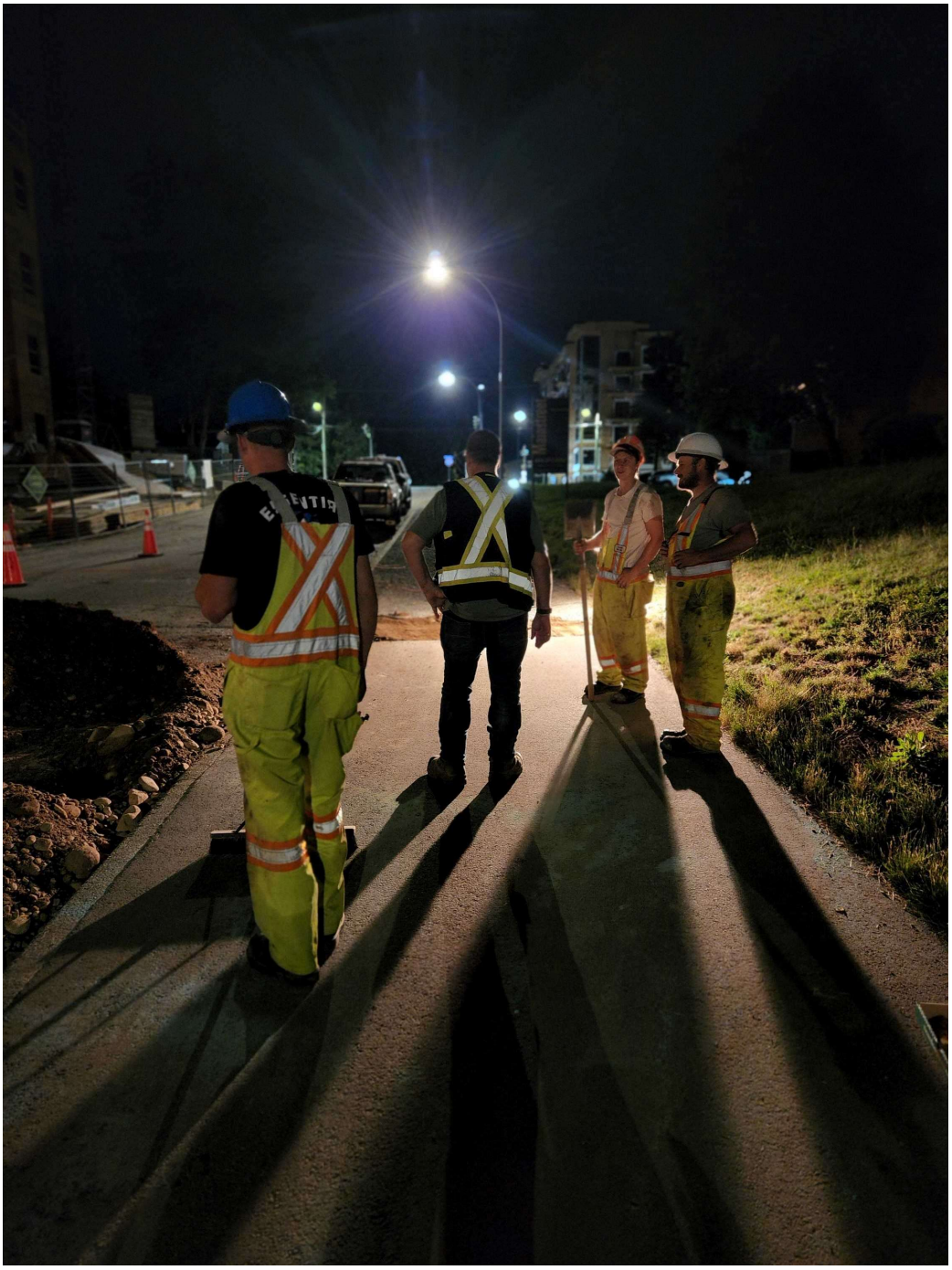


**IMAGE |** MIDNIGHT EMERGENCY TIE-IN – TIMS STREET

## Reservoir Site & Pump Station & Well Fields

- Routine maintenance of the lawn and tidiness of the pump stations.
- Replacement of the air vale on RW 2-63/17.
- Servicing of the air valve for RW 3-93/11.
- Replacement of the digital pressure gauge on the water manifold (Autumn Well Field pump house).
- Instrumentation checks (level transmitters) were completed for all production wells and the designated monitoring well.
- Daily pump checks including recording of discharge rates, system pressure, withdrawal volumes (totalizer), pumping hours, water levels and pH reading.
- Re-paining of the water manifold housed in Autumn Well Field pump house.
- Adding Cat 5 wiring for the alarm system (between reservoir works facility and pump station)
- Plumbing improvements pertaining to site fueling station was completed in-house (Reservoir Site).
- In-house investigation of the overflow pipe elevation for both reservoirs.
- Preparing (draining) the well field standpipes (and hydrant C10) in preparation for anticipated freezing temperatures.

## Advanced Metering Infrastructure (AMI) Replacement Program (2022 Capital Project)

- 23+ meters were replaced.

## Water Main Construction – Pipe Replacement Program (2022 Capital Project)

**Palm Loop Lower Zone Portion** – completed in-house. This includes one new service from a 5-lot subdivision and 2 upgraded services for existing properties. The CWD field crew completed the installation of 130 metres of 200-mm Bionax pipe. The replacement / upgrades are based on the Water Master Plan recommendations.

**IMAGE | PALM LOOP LOWER ZONE PROJECT**

## Additional Work Reservoir B & Site Restoration

The reservoir was commissioned late 2021 with some additional work completed in 2022, including re-testing and re-chlorination of the reservoir, pressure washing the reservoir floor, resolving an inlet control value issue, and general site restoration work such as adding topsoil and hydro seeding. Furthermore, the gravel bins were restocked.

**IMAGE | RESERVOIR B (left) and RESERVOIR C (RIGHT).**

## Groundwater Monitoring & Well Assessments

Pertinent information is recorded through SCADA pertaining to the operations of the wells, groundwater levels and temperature and reservoir operation. In addition to the automatic recording of data through SCADA, field staff completes daily pump checks and manual groundwater readings on a bi-weekly basis for selected monitoring well locations. CWD also monitors sand intake (by the pumps) by means of a sand tester connected to the water manifold.

Furthermore, under the guidance of KWD various tests are completed on the production wells pertaining to well hydraulic performance and pump / motor performance. Step-drawdown pumping tests (for assessing well hydraulic performance) and pump speed tests (submersible pump / motor performance) were completed for all four production wells.

These tests allow for a better understanding of possible changes in well and pumping system performance of time. This information is relevant to the timely scheduling of well maintenance (well rehabilitation) and replacement of the submersible pump and / or motor.

**IMAGE |** WATER LEVELS ARE TAKEN BY CWD STAFF DURING A STEP-DRAWDOWN PUMPING TEST.

## RW 7-00/13 Preventative Well Maintenance

*CWD has a comprehensive well maintenance program in place which entails the implementation of preventative well rehabilitation every 4 to 5 years for each production well (on a rotational basis). During such well rehabilitation specific measures are employed to 'clean' the well of any accumulated materials (e.g., mineral deposits and biomass) which causes clogging of the well screen openings (slots) which may impact well performance. Goals of a consistent and timely implementation of the preventative well maintenance program are to ensure the wells' productivity and longevity.*

**RW 7-00/13**, located at Lynden Well Field was commissioned on October 30, 2013.The first preventative maintenance for this well was completed in December 2017, and the second one was completed in the week of October 24, 2022. The well rehabilitation was completed by Fyfe Well & Water Services. Included in the work was the replacement of the pump (still under manufacturer warranty).

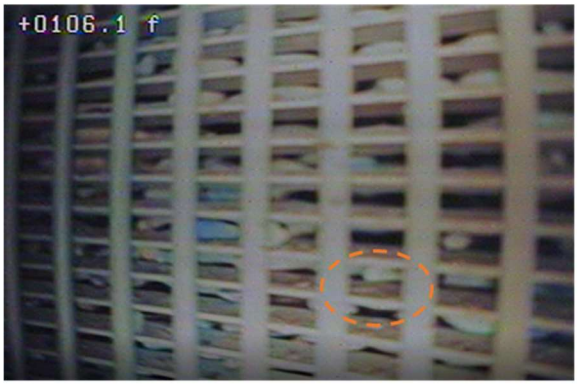
As of October 24, 2022, RW 7-00/13, the well has been in operation for close to 9 years. During that time the well has withdrawn a water volume of **2.9 $Mm^3$**. Based on the operation over the last 9 years, RW 7-00/13 has been contributing, on average, **25.9%** of the water supply.

The well rehabilitation program included:

- Downhole video inspections before and after the rehabilitative efforts.
- Mechanical cleaning (brushing).
- Chemical rehabilitation (application of acid descaler).
- Flushing / removal of dissolved incrustations.
- Inspection of the pumping equipment.

The preventative maintenance for RW 7-00/13 has been successfully implemented. The pre-well-rehabilitation downhole video confirmed occurrences of mild to moderate chemical incrustations (mostly precipitated iron). The implemented well rehabilitation protocol *was effective in removing most of the observed incrustations.* However, in some sections a thin film of incrustation remains on the lower bar of the screen slots, suggesting that scaling is persistent.

Excerpts from the downhole video inspection – the camera is directed towards the well screen and shows the geological (aquifer) formation facing the well screen




Before chemical treatment (shows scaling on the screen slots)


After chemical treatment (*most scaling has been removed*)

**IMAGE |** EXCERPTS FROM THE DOWNHOLE VIDEO INSPECTION.

## Scheduled Capital Projects for 2023

The following projects are scheduled for 2023:

- **Reservoir C Improvement Project**: removal of the iron and manganese buildup on the overflow pipe, followed by coating the pipe with potable-friendly 2-part epoxy and replacing the corroded wall brackets. The work will be carried out by CWD field staff. A confined space entry and rescue procedure is in place. The reservoir was drained in 2022 (see cover).
- **Royal Street Loop Pipe Replacement Project**: Phase 2 - this entails 235 metres of 250 mm Bionax pipe to replace 150 mm A/C (along Royal Street, between Charlotte Avenue and Coral Avenue). The work will be completed by CWD field staff.
- **AMI Meter Replacement Project**: a continuation of 2022, about 200 meters will be installed (i.e.: replacing the old meters). The project is scheduled for completion in 2023.


**IMAGE |** NEW METER, INSTALED UNDER THE AMI REPLACEMENT PROGRAM.

## Scheduled Well Maintenance Project for 2023

Preventative maintenance for **RW 1-87/14** is scheduled for this year. This will be the second well rehabilitation since being commissioned in 2014; the first well rehabilitation was completed in 2019.

# 5. Water Quality Assurance

## Water Quality Monitoring

Providing safe, reliable, and clean water to our rate payers remains CWD's key responsibility. We take pride in providing drinking water of the highest quality at a reasonable cost, thereby meeting water demand, complying with provincial regulations, and working responsibly to protect our aquifer.

According to **Section 15 (b) of the Drinking Water Protection Act**, a water supplier must make available to the public the results of the water quality monitoring, and, **in accordance with Section 11 of the Drinking Water Protection Regulation**[6], that this is done within 6 months of the end of the calendar year.

The Drinking Water Protection Regulation sets water quality standards for potable water (selected microbiological constituents in drinking water). The Drinking Water Act and Regulation are enforced for community water systems in British Columbia[7].

Therefore, as a water purveyor, we are required to have our water analyzed to confirm the absence of selected microbiological parameters by an accredited laboratory. This entails routinely (weekly) monitoring of our water supply and distribution system: CWD has 20 water sampling locations throughout the District, in addition to our four (4) production wells and two (2) reservoirs, which, on a rotating basis, are sampled and analyzed for microbiological parameters: *Total Coliforms* and *Escherichia coli (E. coli)*.

The results of the 2022 microbiological water quality samples submitted to the BC Center for Disease Control (BCCDC) by FHA are included as **Appendix B**. The reports shows that **224 water samples** were analyzed. This includes the samples collected from the Reservoirs and Production Wells. Results suggest that 99.1% showed absence of the tested microbiological parameters (Total Coliforms and Escherichia coli). Only 2 water samples tested positive for Total Coliform (Moorland Street and Reservoir C sample stations) but tested negative for E.coli. Subsequent testing showed zero Total Coliforms.

Furthermore, in July 2022, CWD collected water samples from the source (i.e.: the production wells), from the reservoirs and two sample stations in the District. The water samples were submitted to an accredited water testing laboratory (Element, located in Surrey) for potability analysis (**Section 6**). In January and April, water samples were collected for the Bacteriological Activity Reaction Test (BART).

CWD has installed pH meters connected to the water manifold which allows for continuous monitoring. The pH meters we assembled, installed, and calibrated by CWD's Water Quality Technician.

CWD meets every year with FHA Drinking Water Officer and students for a tour and inspection of the water system.

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[6] http://www.bclaws.ca/civix/document/id/loo71/loo71/10_200_2003

[7] Environmental health officers routinely inspect, sample, and assess community water systems for compliance with the Drinking Water Protection Act and Regulation (www.fraserhealth.ca).


**IMAGE |** IN ADDITION TO WATER TESTING – IN HOUSE MICRO BIOLOGICAL ANALYSIS, WEEKLY COMPLETED BY THE WATER QUALITY TECHNICIAN.

# Water Quality Technician's Report 2022

2022 saw CWD staff undertaking several interesting projects, both planned and unplanned. In February of 2022 we decided to take a year off from our entry to the Berkeley Springs International Water Tasting Competition, failing to place in 2021, and having our entries damaged in transit the year before. After our year off from the contest, we again entered some of our finest water, and took home the gold medal once again. While first place may be somewhat of a commonplace feat for CWD, it is nice to have our hard work and diligence brought into the spotlight again.

Routine sampling was performed, with 224 samples submitted to the BCCDC, and 328 samples processed in house. The extra samples taken in house were for the Moorland leak, work surrounding the Palm Loop project, and the replacement of the pump for Well RW 7-00/11. The real-time pH monitor for RW 7-00/11 was installed in 2022; we now have real-time pH monitoring installed at all our production wells, and the new Reservoir B.

Unidirectional flushing started in late April and was completed in late June. A second flush was not completed, due to ongoing work related to the Palm Loop project.

On June 1st, CWD staff responded to a middle of the night main break on Moorland Street. Upon excavation of the main, it was discovered a large piece of the AC main had broken away. The leak was throttled down and exposed fully before shutdown and subsequent repair (consisting of a new piece of C909 Bionax pipe, and couplings). After the repair was completed and pressure tested, the surrounding area was flushed, and repeated samples in the area came back negative.

The summer months saw CWD staff installing roughly 120 meters of 200mm Bionax pipe on Palm Cres, completing a loop of that portion of the system, and both correcting fire flow issues, and eliminating a significant portion of dead-end water main. All piping was installed according to AWWA C651 guidelines and tied into the system after rigorous bacterial testing and flushing.

In the Autumn of 2022, Well RW 7-00/13 experienced a catastrophic pump failure, and due to supply chain issues, was left out of commission for several months. With RW 7-00/13 being off-line, it was decided to omit the BART testing in its entirety for Q4 2022. Upon installation of the new RW 7-00/13 pump, the well was disinfected, along with the discharge line, and sampled prior to returning to service December 20, 2022. BART sampling resumed as normal at the end of April 2023, with results forthcoming, pending review and analysis.

Given our success in commissioning Reservoir B, CWD will be undertaking reservoir overflow piping maintenance in Reservoir C, again following the stringent procedures laid out in AWWA C652 to ensure a sanitary return to service for that reservoir. We will also be installing roughly 200 meters of water main on Royal Street this summer.

Ryan Federau, CWP
Water Quality
Clearbrook Waterworks District

# 6. Water Quality Review

## Water Quality Review

Water samples were collected by CWD from the supply source (RW 3-93/11, RW 7-00/13, RW 1-87/14, RW 2-63/17), and Reservoir C[8] on July 11, 2022. Furthermore, water samples were collected from two sample stations in the District (2464 Sunnyside and 32350 Diamond Crescent). The water samples were analyzed by Element, an accredited laboratory located in Surrey B.C. **Table 1** summarizes the results of the water quality analysis, which are evaluated towards the most recent edition of the Canadian Drinking Water Guidelines (Health Canada 2022). The report prepared by Element are included as **Appendix C**.

Results of the water analysis for the four replacement wells and the reservoirs suggest that the water quality meets the Canadian Drinking Water Guidelines requirements in terms of Maximum Acceptable Concentrations (MAC) and Aesthetic Objective (AO), with exception of:

- ✓ Manganese concentration of 0.072 mg/L was reported for the water samples collected from **RW 1-87/14**: concentrations value exceeds the AO of 0.02 mg/L - *historically, **RW 1-87/14** shows a tendency toward elevated manganese concentration but has been always below* Maximum Acceptable Concentration (MAC)[9].

The Canadian Drinking Water Guidelines Summary Table (September 2022), available at https://www.canada.ca, provides information for the various analyzed water quality parameters pertaining to guideline limits, common sources (of the parameter), and health considerations.

Based on the reported results for the production wells:

- ✓ pH values range between 7.27 (**RW 7-00/13**) to 7.67 (**RW 1-87/14**) which suggests that the sampled water is overall basic (pH > 7.0) – pH = 7.0 is considered “pH neutral”.
- ✓ Water hardness (as $CaCO_3$)[10] ranges from 89 mg/L (**RW 7-00/13**) to 115 mg/L (**RW 1-87/14**) and suggests moderately hard water at all four production wells (Moderately hard water ranges from 60 mg/L to less than 120 mg/L.)
- ✓ Turbidity values ranges from < 0.10 NTU (RW 7-00/13) to 0.56 NTU (RW 2-63/17).

**Regarding turbidity**: Health Canada has set water treatment limits regarding turbidity (not applicable to CWD’s water system)[11]. Even so, for good operation of the distribution system, it is recommended (for systems that use groundwater) that the water entering the distribution system has turbidity levels of 1.0 NTU or less (Health Canada 2022).

[8] Water samples were collected and submitted to Element by Ryan Federau (CWD Water Quality Technician).
[9] Health (2022) has set AO and MAC guidelines for manganese.
[10] Hardness is evaluated based on the concentration of calcium carbonate ($CaCO_3$) because calcium ($Ca^{-2}$) and carbonate ($CO_3^{-2}$) are the dominant ions in most hard waters.
[11] Guidelines apply to individual filter turbidity for systems using surface water or groundwater under the direct influence of surface water (Health Canada 2019).

Clearbrook WATERWORKS DISTRICT

# Table 1

# Water Quality

# Results

| Analyte | Units | Extractable / Dissolved / Other | Guideline Limit | Guideline Type | Analysis | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Raw water (Matrix: Drinking Water) | | | | | | |
| *Sample Description* | | | | | **RW 3-93/11** | **RW 7-00/13** | **RW 1-87/14** | **RW 2-63/17** | **Reservoir C** | **2464 Sunnyside PL** | **32350 Diamond Cres** |
| *Well ID no.* | | | | | 22547 | 22521 | 22595 | 23702 | - | | |
| *Sample date* | | | | | 2022-07-11 | 2022-07-11 | 2022-07-11 | 2022-07-11 | 2022-07-11 | 2022-07-11 | 2022-07-11 |
| *Sample time* | | | | | 1:27 PM | 1:13 PM | 11:45 AM | 12:00 PM | 1:40 PM | 11:32 AM | 1:03 PM |
| *Lot ID (Exova)* | | | | | 1583947 | 1583947 | 1583947 | 1583947 | 1583947 | 1583947 | 1583947 |
| *Report number* | | | | | 2766057 | 2766057 | 2766057 | 2766057 | 2766057 | 2766057 | 2766057 |
| *Report date* | | | | | 2022-07-15 | 2022-07-15 | 2022-07-15 | 2022-07-15 | 2022-07-15 | 2022-07-15 | 2022-07-15 |
| *Ref. number* | | | | | 1583947-3 | 1583947-4 | 1583947-1 | 1583947-2 | 1583947-5 | 1583947-7 | 1583947-6 |
| **Metals Extractable** | | | | | | | | | | | |
| Aluminum | mg/L | Extractable | 0.1 | OG | <0.001 | <0.001 | <0.001 | 0.003 | <0.001 | <0.001 | <0.001 |
| Antimony | mg/L | Extractable | 0.006 | MAC | 0.00005 | 0.00004 | 0.00013 | 0.00009 | 0.00011 | 0.00011 | 0.00012 |
| Arsenic | mg/L | Extractable | 0.010 | MAC | 0.0004 | 0.0003 | 0.0017 | 0.0008 | 0.0011 | 0.0011 | 0.0013 |
| Barium | mg/L | Extractable | 1 | MAC | 0.0081 | 0.0067 | 0.025 | 0.012 | 0.016 | 0.017 | 0.017 |
| Boron | mg/L | Extractable | 5 | MAC | 0.011 | 0.009 | 0.025 | 0.012 | 0.022 | 0.025 | 0.027 |
| Cadmium | mg/L | Extractable | 0.005 | MAC | 0.00003 | 0.00003 | 0.00002 | 0.00002 | 0.00001 | 0.00002 | 0.00001 |
| Chromium | mg/L | Extractable | 0.05 | MAC | 0.00015 | 0.00020 | <0.00005 | 0.00011 | 0.00007 | 0.00006 | 0.00005 |
| Copper | mg/L | Extractable | 1 AO; 2 MAC | | 0.0020 | 0.0023 | <0.0005 | <0.0005 | <0.0005 | 0.0059 | 0.0035 |
| Lead | mg/L | Extractable | 0.01 | MAC | 0.00012 | 0.00018 | <0.00001 | <0.00001 | <0.00001 | 0.00061 | 0.00033 |
| Selenium | mg/L | Extractable | 0.05 | MAC | 0.0003 | 0.0002 | 0.0004 | 0.0006 | 0.0004 | 0.0003 | 0.0004 |
| Strontium | mg/L | Extractable | 7.0 | MAC | 0.14 | 0.11 | 0.10 | 0.087 | 0.11 | 0.13 | 0.11 |
| Uranium | mg/L | Extractable | 0.02 | MAC | 0.00004 | 0.00002 | 0.00022 | 0.00005 | 0.00018 | 0.00025 | 0.00024 |
| Vanadium | mg/L | Extractable | | | 0.00045 | 0.00046 | 0.00049 | 0.00037 | 0.00046 | 0.00051 | 0.00053 |
| Zinc | mg/L | Extractable | 5.0 | AO | 0.026 | 0.021 | <0.0005 | 0.0007 | 0.0006 | 0.012 | 0.0080 |
| **Physical and Aggregate Properties** | | | | | | | | | | | |
| Colour | Colour units | True | 15 | AO | <5 | <5 | <5 | <5 | <5 | <5 | <5 |
| Turbidity | NTU | | 0.1 | OG | 0.11 | <0.10 | 0.21 | 0.56 | 0.11 | 0.12 | <0.10 |
| **Routine Water** | | | | | | | | | | | |
| pH | - | at 25 °C | 7.0-10.5 | | 7.33 | 7.27 | 7.67 | 7.47 | 7.64 | 7.66 | 7.72 |
| Electrical Conductivity | µS/cm at 25 °C | | | | 307 | 248 | 317 | 242 | 320 | 337 | 323 |
| Calcium | mg/L | Extractable | | | 32 | 25 | 33 | 26 | 32 | 35 | 34 |
| Iron | mg/L | Extractable | 0.3 | AO | <0.004 | <0.004 | <0.004 | 0.013 | <0.004 | <0.004 | <0.004 |
| Magnesium | mg/L | Extractable | | | 7.5 | 6.1 | 8.1 | 6.6 | 7.7 | 8.2 | 8.2 |
| Manganese | mg/L | Extractable | 0.02 AO; 0.12 MAC | | 0.001 | 0.002 | **0.072** | 0.009 | 0.011 | 0.014 | 0.011 |
| Potassium | mg/L | Extractable | | | 1.6 | 1.3 | 2.8 | 1.7 | 2.3 | 2.4 | 2.7 |
| Silicon | mg/L | Extractable | | | 11 | 11 | 8.4 | 9.6 | 8.8 | 8.6 | 8.4 |
| Sodium | mg/L | Extractable | 200 | AO | 11 | 8.1 | 15 | 7.8 | 13 | 15 | 15 |
| T-Alkalinity | mg/L | as CaCO3 | | | 53 | 42 | 96 | 65 | 89 | 100 | 99 |
| Chloride | mg/L | Dissolved | 250 | AO | 44.4 | 33.0 | 22.0 | 17.4 | 27.5 | 26.6 | 22.9 |
| Fluoride | mg/L | Dissolved | 1.5 | MAC | 0.05 | 0.05 | 0.05 | 0.06 | 0.05 | 0.05 | 0.06 |
| Nitrate - N | mg/L | Dissolved | 10 | MAC | 2.12 | 2.30 | 0.68 | 1.40 | 0.98 | 0.65 | 0.65 |
| Nitrite - N | mg/L | Dissolved | 1 | MAC | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Sulfate | mg/L | Dissolved | 500 | AO | 16.5 | 14.3 | 22.8 | 19.6 | 21.4 | 22.6 | 22.7 |
| Hardness | mg/L | as CaCO3 | | | 110 | 89 | 115 | 91 | 112 | 121 | 119 |
| Total Dissolved Solids | mg/L | Extractable | 500 | AO | 182 | 152 | 187 | 150 | 186 | 197 | 191 |
| **Microbiology** | | | | | | | | | | | |
| Total Coliform | MPN/ 100 mL | Enzyme Substrate | 0 per 100 mL | MAC | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Escherichia coli | MPN/ 100 mL | | | MAC | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Heterotrophic Count | MPN / mL | SimPlate | - | | <2.0 | <2.0 | <2.0 | 2.0 | 6.0 | 440 | 2.0 |

MAC = Maximum Acceptable Concentration; AO = Aesthetic Objective; OG = Operator Guideline for Water Treatment Plants

**Orange = Exceeding AO**

mg/L = milligrams per litre

MPN = Most Probable Number

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## Summary

- Based on the results of the water quality analysis CWD's drinking water is safe and does not require any treatment.
- Based on the evaluation of hardness, CWD'S drinking water does not require any water softeners.

Contact CWD office for any questions regarding the quality of our drinking water.

## Biological Activity Reaction Test

BART is a method for analyzing several bacterial communities that can cause problems for water quality (e.g.: turbidity), aesthetics (e.g.: odour, discoloration, cloudiness) and water infrastructure (e.g.: corrosion). The following bacterial communities were analyzed this year for each production well:

- **Iron Related Bacteria** (IRB)
- **Sulphate Reducing Bacteria** (SRB)
- **Slime Forming Bacteria** (SLYM)
- **Heterotrophic Aerobic Bacteria** (HAB).

These four indicators are typically used for water supply wells in order to obtain insight into corrosion risk and/or well screen clogging risk (a quantitative diagnostic). High aggressivity of these bacteria could also suggest masking of coliform bacteria[12].

Fall 2021 BART for RW 7-00/13 and RW 2-63/17 was postponed to January 2022 and is therefore included in this report. Also, fall 2022 BART was not completed, primarily because RW 7-00/13 was off-line until December 23, 2022.

**Table 2** summarizes the results using color coding in terms of level of aggressivity of evaluated bacteria for each well: *in the well* (time t = 1 min of pumping), *just outside the well screen* (t = 10 min of pumping), and in the *geological formation* (t = 60 min of pumping). We included orange color coding to reflect the borderline between medium and high aggressivity (applicable for IRB).

BART analysis shows that reactions occurred mostly for **IRB** and **HAB**. Typically, **IRB** was found to be either '**aggressive**' or the borderline of '**moderate and aggressive**'. **HAB** was found to be mostly low in aggressivity. *There is no clear explanation for the observed high aggressivity of SLYM in the geological formation (RW 2-63/17 – Jan. 2022 testing)*.

Overall, and historically, IRB and HAB are the most common bacteria (microbes) identified during the tests (i.e.: show borderline or high aggressivity). Generally speaking, microbes are ever present in a well environment, and based on our long-term implementation of BART, the degree of aggressivity of the various bacterial communities varies over time for each of the wells.

BART results in combination with well hydraulic performance data and the interior condition of the well and well screen (i.e.: degree of plugging), observed during the completion of a downhole video inspections, determine well rehabilitation requirements (timing and approach).

[12] http://www.dbi.ca/BARTs/App-Guide.html

## **Table 2** - BART Results (2022)

| Bacterial communities | RW 3-93/11 | | | RW 3-93/11 - Apr 26, 2022 | | |
|---|---|---|---|---|---|---|
| IRB | BART was not completed in January | | | 4 FO [8.82 T] | 5 BR [2.2 T] | 5 BR [2.2 T] |
| SRB | | | | - | - | - |
| SLYM | | | | - | - | - |
| HAB | | | | 4 DO [7.44 T] | 5 DO [1.59 T] | 5 DO [1.59 T] |
| | | | | | | |
| | RW 7-00/13 - Jan 26, 2022 | | | RW 7-00/13 - May 3, 2022 | | |
| IRB | 5 BR [2.2 T] | 4 FO [8.82 T] | 4 FO [8.82 T] | 5 BR [2.2 T] | 7 BR [137] | - |
| SRB | - | - | - | - | - | - |
| SLYM | - | - | - | - | - | - |
| HAB | 5 DO [1.59 T] | 3 UP [47.8 T] | 9 UP [31] | 5 DO [1.59 T] | - | - |
| | | | | | | |
| | RW 1-87/14 | | | RW 1-87/14 - Apr 26, 2022 | | |
| IRB | BART was not completed in January | | | 4 FO [8.82 T] | - | 5 BR [2.2 T] |
| SRB | | | | - | - | - |
| SLYM | | | | - | - | - |
| HAB | | | | 5 DO [1.59 T] | 8 UP [65] | 8 UP [65] |
| | | | | | | |
| | RW 2-63/17 - Jan 26, 2022 | | | RW 2-63/17 - May 3, 2022 | | |
| IRB | 4 BR FO [8.82 T] | 4 BR FO [8.82 T] | 4 BR FO [8.82 T] | 4 FO [8.82 T] | 4 FO [8.82 T] | 4 FO [8.82 T] |
| SRB | - | - | - | - | - | - |
| SLYM | - | - | 3 CL [70 T] | - | - | - |
| HAB | 5 DO [1.59 T] | 8 UP [65 T] | 8 UP [65 T] | 8 UP [65] | 6 DO [446] | 6 DO [446] |

**Key:**

| | |
|---|---|
| | **High aggressive** |
| | **Borderline moderate- high aggressive** |
| | **Moderate aggressive** |
| | **Low aggressive** |
| - | **No reaction** |

# 7. References

Health Canada. 1979. Hardness - Technical Document, February 1979 (reprinted 1995). Available at: http://www.hc-sc.gc.ca.

Health Canada. 2022. Guidelines for Canadian Drinking Water Quality. Summary table. Drinking Water Guidelines. Prepared by the Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment. Available at http://www.hc-sc.gc.ca (most recent update of on-line version: September 2022).

# Appendices

# Appendix A

Metals in Drinking Water “Flush” Message from Fraser Health Authority

fraserhealth Better health. Best in health care.

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

# Appendix B

Sample Range Report (Fraser Health Authority)

# Sample Range Report

Fraser Health Authority

**Facility Name:** Clearbrook Waterworks District
**Date Range:** Jan 1 2022 to Dec 31 2022

**Operator** Jason Hildebrandt
2889 Grandview Cres
Abbotsford, BC V2T 2R6

| Sampling Site | Date Collected | Total Coliform | E. Coli | Fecal Coliform |
|---|---|---|---|---|
| 31419 Springhill Court, 31419 Springhill Court | | | | |
| | 1-24-2022 9:29:00 AM | LT1 | LT1 | |
| | 2-22-2022 8:14:00 AM | LT1 GTR200 | LT1 GTR200 | |
| | 4-4-2022 8:10:00 AM | LT1 | LT1 | |
| | 5-16-2022 7:45:00 AM | LT1 | LT1 | |
| | 6-27-2022 8:21:00 AM | LT1 | LT1 | |
| | 8-8-2022 8:13:00 AM | LT1 | LT1 | |
| | 9-20-2022 8:42:00 AM | LT1 | LT1 | |
| | 10-31-2022 8:46:00 AM | LT1 | LT1 | |
| | 12-12-2022 8:43:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **0** | **0** | **0** |
| 2940 Clearbrook Rd.(Bible Col), 2940 Clearbrook Road | | | | |
| | 1-4-2022 11:25:00 AM | LT1 | LT1 | |
| | 2-7-2022 9:49:00 AM | LT1 | LT1 | |
| | 3-14-2022 9:00:00 AM | LT1 | LT1 | |
| | 4-11-2022 8:47:00 AM | LT1 | LT1 | |
| | 5-16-2022 8:10:00 AM | LT1 | LT1 | |
| | 6-20-2022 8:52:00 AM | LT1 | LT1 | |
| | 7-18-2022 8:20:00 AM | LT1 | LT1 | |
| | 8-23-2022 7:52:00 | LT1 | LT1 | |

| | | | | |
|---|---|---|---|---|
| | AM | | | |
| | 9-26-2022 8:16:00 AM | LT1 | LT1 | |
| | 10-24-2022 8:29:00 AM | NRLABE | NRLABE | |
| | 11-28-2022 9:09:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **0** | **0** | **0** |
| 3089 Claudia Court, 3089 Claudia Court | | | | |
| | 1-4-2022 11:04:00 AM | LT1 | LT1 | |
| | 2-1-2022 8:29:00 AM | LT1 GTR200 | LT1 GTR200 | |
| | 3-7-2022 8:38:00 AM | LT1 | LT1 | |
| | 4-11-2022 8:40:00 AM | LT1 | LT1 | |
| | 5-9-2022 7:48:00 AM | LT1 | LT1 | |
| | 6-13-2022 9:00:00 AM | LT1 | LT1 | |
| | 7-18-2022 8:12:00 AM | LT1 | LT1 | |
| | 8-15-2022 8:20:00 AM | LT1 | LT1 | |
| | 9-20-2022 9:03:00 AM | LT1 | LT1 | |
| | 10-24-2022 8:22:00 AM | LT1 | LT1 | |
| | 11-22-2022 8:25:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **0** | **0** | **0** |
| 2889 Upland Cres, 2889 Upland Cres | | | | |
| | 1-4-2022 10:56:00 AM | LT1 | LT1 | |
| | 2-15-2022 7:55:00 AM | LT1 | LT1 | |
| | 3-28-2022 8:22:00 AM | LT1 | LT1 | |
| | 5-9-2022 7:28:00 AM | LT1 | LT1 | |
| | 6-20-2022 12:00:00 PM | LT1 | LT1 | |
| | 8-2-2022 7:52:00 AM | LT1 | LT1 | |
| | 9-12-2022 9:48:00 AM | LT1 | LT1 | |
| | 10-24-2022 7:57:00 AM | LT1 | LT1 | |
| | 12-5-2022 7:37:00 | LT1 | LT1 | |

| | | | | |
|---|---|---|---|---|
| | AM | | | |
| | **Total Positive:** | **0** | **0** | **0** |
| 2459 Centre Street (at United Rentals), 2459 Centre Street (at United Rentals) | | | | |
| | 1-4-2022 11:51:00 AM | LT1 | LT1 | |
| | 2-15-2022 8:38:00 AM | LT1 GTR200 | LT1 GTR200 | |
| | 3-7-2022 8:21:00 AM | LT1 | LT1 | |
| | 4-11-2022 8:30:00 AM | LT1 | LT1 | |
| | 5-16-2022 7:57:00 AM | LT1 | LT1 | |
| | 6-13-2022 8:48:00 AM | LT1 | LT1 | |
| | 7-18-2022 8:01:00 AM | LT1 | LT1 | |
| | 8-23-2022 7:36:00 AM | LT1 | LT1 | |
| | 9-20-2022 8:51:00 AM | LT1 | LT1 | |
| | 10-24-2022 8:06:00 AM | LT1 | LT1 | |
| | 11-28-2022 8:49:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **0** | **0** | **0** |
| 32171 South Fraser Way (Petro Canada), 32171 South Fraser Way (Petro Canada) | | | | |
| | 1-24-2022 9:20:00 AM | LT1 | LT1 | |
| | 3-7-2022 8:30:00 AM | LT1 | LT1 | |
| | 4-4-2022 8:44:00 AM | LT1 | LT1 | |
| | 5-2-2022 8:36:00 AM | LT1 | LT1 | |
| | 6-13-2022 9:26:00 AM | LT1 | LT1 | |
| | 7-11-2022 9:06:00 AM | LT1 | LT1 | |
| | 8-8-2022 8:32:00 AM | LT1 | LT1 | |
| | 9-12-2022 10:20:00 AM | LT1 | LT1 | |
| | 10-17-2022 8:41:00 AM | LT1 | LT1 | |

| | | | | |
|---|---|---|---|---|
| | 11-14-2022 8:56:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **0** | **0** | **0** |
| 2749 Braeside Street, 2749 Braeside Street | | | | |
| | 2-1-2022 8:13:00 AM | LT1 GTR200 | LT1 GTR200 | |
| | 2-28-2022 10:57:00 AM | LT1 GTR200 | LT1 GTR200 | |
| | 4-11-2022 8:21:00 AM | LT1 | LT1 | |
| | 5-24-2022 8:13:00 AM | LT1 | LT1 | |
| | 7-5-2022 8:49:00 AM | LT1 | LT1 | |
| | 8-15-2022 8:06:00 AM | LT1 | LT1 | |
| | 9-26-2022 8:06:00 AM | LT1 | LT1 | |
| | 11-7-2022 8:12:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **0** | **0** | **0** |
| Reservoir C (1985), 2889 Grandview Cres | | | | |
| | 1-4-2022 10:50:00 AM | LT1 | LT1 | |
| | 2-28-2022 7:56:00 AM | LT1 GTR200 | LT1 GTR200 | |
| | 5-2-2022 9:04:00 AM | 1 | LT1 | |
| | 7-5-2022 8:32:00 AM | LT1 | LT1 | |
| | 9-6-2022 8:30:00 AM | LT1 | LT1 | |
| | 10-31-2022 9:35:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **1** | **0** | **0** |
| 2903 Palm Crescent, 2903 Palm Crescent | | | | |
| | 1-24-2022 9:38:00 AM | LT1 | LT1 | |
| | 2-22-2022 8:24:00 AM | LT1 GTR200 | LT1 GTR200 | |
| | 3-28-2022 8:31:00 AM | LT1 | LT1 | |
| | 5-2-2022 8:45:00 AM | LT1 | LT1 | |
| | 5-30-2022 8:39:00 | LT1 | LT1 | |

| | | | | |
|---|---|---|---|---|
| | AM | | | |
| | 7-5-2022 8:40:00 AM | LT1 | LT1 | |
| | 8-8-2022 8:04:00 AM | LT1 | LT1 | |
| | 9-6-2022 8:38:00 AM | LT1 | LT1 | |
| | 10-11-2022 7:53:00 AM | LT1 | LT1 | |
| | 11-14-2022 8:47:00 AM | LT1 | LT1 | |
| | 12-12-2022 8:53:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **0** | **0** | **0** |
| 2464 Sunnyside Place, 2464 Sunnyside Place | | | | |
| | 1-10-2022 11:06:00 AM | LT1 | LT1 | |
| | 3-14-2022 8:40:00 AM | LT1 | LT1 | |
| | 4-25-2022 8:08:00 AM | LT1 GTR200 | LT1 GTR200 | |
| | 6-7-2022 8:47:00 AM | LT1 | LT1 | |
| | 7-18-2022 7:51:00 AM | LT1 | LT1 | |
| | 8-30-2022 8:35:00 AM | LT1 | LT1 | |
| | 10-11-2022 7:45:00 AM | LT1 | LT1 | |
| | 11-22-2022 8:04:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **0** | **0** | **0** |
| 2664 Albert Way, 2664 Albert Way | | | | |
| | 1-17-2022 8:23:00 AM | LT1 | LT1 | |
| | 3-7-2022 8:13:00 AM | LT1 | LT1 | |
| | 4-19-2022 7:52:00 AM | LT1 | LT1 | |
| | 5-30-2022 8:39:00 AM | LT1 | LT1 | |
| | 7-11-2022 8:46:00 AM | LT1 | LT1 | |
| | 8-23-2022 7:26:00 AM | LT1 | LT1 | |
| | 10-3-2022 9:02:00 AM | LT1 | LT1 | |
| | 11-14-2022 8:38:00 AM | LT1 | LT1 | |

| | | | | |
|---|---|---|---|---|
| | **Total Positive:** | **0** | **0** | **0** |
| 2577 Victoria Street, 2577 Victoria St | | | | |
| | 1-10-2022 11:16:00 AM | LT1 | LT1 | |
| | 2-15-2022 8:27:00 AM | LT1 GTR200 | LT1 GTR200 | |
| | 3-21-2022 8:30:00 AM | LT1 | LT1 | |
| | 4-19-2022 8:02:00 AM | LT1 | LT1 | |
| | 5-24-2022 8:28:00 AM | LT1 | LT1 | |
| | 6-27-2022 8:30:00 AM | LT1 | LT1 | |
| | 7-25-2022 8:26:00 AM | LT1 | LT1 | |
| | 8-30-2022 8:44:00 AM | LT1 | LT1 | |
| | 10-3-2022 9:13:00 AM | LT1 | LT1 | |
| | 10-31-2022 8:54:00 AM | LT1 | LT1 | |
| | 12-5-2022 7:56:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **0** | **0** | **0** |
| 31898 Royal Crescent, 31898 Royal Crescent | | | | |
| | 2-1-2022 8:36:00 AM | LT1 GTR200 | LT1 GTR200 | |
| | 2-28-2022 11:06:00 AM | LT1 GTR200 | LT1 GTR200 | |
| | 4-4-2022 8:21:00 AM | LT1 | LT1 | |
| | 5-9-2022 7:40:00 AM | LT1 | LT1 | |
| | 6-7-2022 10:10:00 AM | LT1 | LT1 | |
| | 7-11-2022 8:55:00 AM | LT1 | LT1 | |
| | 8-15-2022 8:46:00 AM | LT1 | LT1 | |
| | 9-12-2022 10:00:00 AM | LT1 | LT1 | |
| | 10-17-2022 8:32:00 AM | LT1 | LT1 | |
| | 11-22-2022 8:18:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **0** | **0** | **0** |

| | | | | |
|---|---|---|---|---|
| 32073 Mt Waddington Ave, 32073 Mt Waddington Ave | | | | |
| | 1-17-2022 8:39:00 AM | LT1 | LT1 | |
| | 2-22-2022 10:43:00 AM | LT1 | LT1 | |
| | 3-28-2022 8:50:00 AM | LT1 | LT1 | |
| | 4-25-2022 8:39:00 AM | LT1 | LT1 | |
| | 5-30-2022 9:00:00 AM | LT1 | LT1 | |
| | 7-5-2022 9:11:00 AM | LT1 | LT1 | |
| | 8-2-2022 8:08:00 AM | LT1 | LT1 | |
| | 9-6-2022 8:38:00 AM | LT1 | LT1 | |
| | 10-11-2022 8:05:00 AM | LT1 | LT1 | |
| | 11-7-2022 8:35:00 AM | LT1 | LT1 | |
| | 12-12-2022 9:12:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **0** | **0** | **0** |
| 2425 Lynden Street, 2425 Lynden Street | | | | |
| | 1-24-2022 9:12:00 AM | LT1 | LT1 | |
| | 2-28-2022 11:24:00 AM | LT1 | LT1 | |
| | 3-28-2022 8:41:00 AM | LT1 | LT1 | |
| | 5-2-2022 8:23:00 AM | LT1 | LT1 | |
| | 6-7-2022 9:41:00 AM | LT1 | LT1 | |
| | 7-5-2022 9:21:00 AM | LT1 | LT1 | |
| | 8-8-2022 8:27:00 AM | LT1 | LT1 | |
| | 9-12-2022 8:12:00 AM | LT1 | LT1 | |
| | 10-11-2022 8:20:00 AM | LT1 | LT1 | |
| | 11-14-2022 9:49:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **0** | **0** | **0** |
| 32350 Diamond Cres, 32350 | | | | |

| | | | | |
|---|---|---|---|---|
| Diamond Cres | | | | |
| | 1-10-2022 11:27:00 AM | LT1 | LT1 | |
| | 2-7-2022 9:56:00 AM | LT1 | LT1 | |
| | 3-14-2022 9:09:00 AM | LT1 | LT1 | |
| | 4-19-2022 8:30:00 AM | LT1 | LT1 | |
| | 5-16-2022 8:21:00 AM | LT1 | LT1 | |
| | 6-20-2022 9:01:00 AM | LT1 | LT1 | |
| | 7-25-2022 8:46:00 AM | LT1 | LT1 | |
| | 8-23-2022 8:02:00 AM | LT1 | LT1 | |
| | 9-26-2022 8:40:00 AM | LT1 | LT1 | |
| | 10-31-2022 9:53:00 AM | LT1 GTR200 | LT1 GTR200 | |
| | 11-28-2022 8:59:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **0** | **0** | **0** |
| 2580 Langdon St - East end of driveway, 2580 Langdon St - East end of driveway | | | | |
| | 1-17-2022 8:47:00 AM | LT1 | LT1 | |
| | 2-22-2022 8:35:00 AM | LT1 | LT1 | |
| | 3-21-2022 8:48:00 AM | LT1 | LT1 | |
| | 4-25-2022 8:33:00 AM | LT1 | LT1 | |
| | 5-30-2022 8:51:00 AM | LT1 | LT1 | |
| | 6-27-2022 8:48:00 AM | LT1 | LT1 | |
| | 8-2-2022 8:16:00 AM | LT1 | LT1 | |
| | 9-6-2022 9:07:00 AM | LT1 | LT1 | |
| | 10-3-2022 9:28:00 AM | LT1 | LT1 | |
| | 11-7-2022 8:52:00 AM | LT1 | LT1 | |
| | 12-12-2022 9:04:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **0** | **0** | **0** |

| | | | | |
|---|---|---|---|---|
| 2743 Moorland St, 2743 Moorland St | | | | |
| | 2-7-2022 9:28:00 AM | 1 | LT1 | |
| | 3-21-2022 8:18:00 AM | LT1 | LT1 | |
| | 5-2-2022 8:56:00 AM | LT1 | LT1 | |
| | 6-13-2022 8:38:00 AM | LT1 | LT1 | |
| | 7-25-2022 8:14:00 AM | LT1 | LT1 | |
| | 9-6-2022 8:48:00 AM | LT1 | LT1 | |
| | 10-17-2022 8:19:00 AM | LT1 | LT1 | |
| | 11-28-2022 8:34:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **1** | **0** | **0** |
| 31894 Duchess Ave, 31894 Duchess Ave | | | | |
| | 1-17-2022 8:31:00 AM | LT1 | LT1 | |
| | 2-15-2022 8:08:00 AM | LT1 GTR200 | LT1 GTR200 | |
| | 3-21-2022 8:37:00 AM | LT1 | LT1 | |
| | 4-25-2022 8:18:00 AM | LT1 | LT1 | |
| | 5-24-2022 8:20:00 AM | LT1 | LT1 | |
| | 6-27-2022 8:37:00 AM | LT1 | LT1 | |
| | 8-2-2022 8:00:00 AM | LT1 | LT1 | |
| | 8-30-2022 8:52:00 AM | LT1 | LT1 | |
| | 10-3-2022 9:20:00 AM | LT1 | LT1 | |
| | 11-7-2022 8:23:00 AM | LT1 | LT1 | |
| | 12-5-2022 7:47:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **0** | **0** | **0** |
| 32138 George Ferguson Way, 32138 George Ferguson Way | | | | |
| | 2-1-2022 8:43:00 AM | LT1 | LT1 | |
| | 2-28-2022 11:14:00 AM | LT1 GTR200 | LT1 GTR200 | |

| | | | | |
|---|---|---|---|---|
| | 4-4-2022 8:32:00 AM | LT1 | LT1 | |
| | 5-9-2022 7:58:00 AM | LT1 | LT1 | |
| | 6-7-2022 10:19:00 AM | LT1 | LT1 | |
| | 7-11-2022 9:17:00 AM | LT1 | LT1 | |
| | 8-15-2022 8:29:00 AM | LT1 | LT1 | |
| | 9-20-2022 9:12:00 AM | LT1 | LT1 | |
| | 10-17-2022 8:50:00 AM | LT1 | LT1 | |
| | 11-22-2022 8:35:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **0** | **0** | **0** |
| 2548 Clearbrook Rd., 2548 Clearbrook Rd. | | | | |
| | 1-10-2022 11:30:00 AM | LT1 | LT1 | |
| | 2-7-2022 9:40:00 AM | LT1 | LT1 | |
| | 3-14-2022 8:51:00 AM | LT1 GTR200 | LT1 GTR200 | |
| | 4-19-2022 8:19:00 AM | LT1 | LT1 | |
| | 5-24-2022 8:37:00 AM | LT1 | LT1 | |
| | 6-20-2022 8:46:00 AM | LT1 | LT1 | |
| | 7-25-2022 8:36:00 AM | LT1 | LT1 | |
| | 8-30-2022 9:02:00 AM | LT1 | LT1 | |
| | 9-26-2022 8:28:00 AM | LT1 | LT1 | |
| | 10-31-2022 9:27:00 AM | LT1 | LT1 | |
| | 12-5-2022 8:12:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **0** | **0** | **0** |
| Reservoir B (2022), 2889 Grandview Cres | | | | |
| | 2-1-2022 8:30:00 AM | LT1 GTR200 | LT1 GTR200 | |
| | 4-4-2022 7:56:00 AM | LT1 | LT1 | |
| | 6-7-2022 10:31:00 AM | LT1 | LT1 | |

| | | | |
|---|---|---|---|
| 8-2-2022 7:45:00 AM | LT1 | LT1 | |
| 10-3-2022 8:50:00 AM | LT1 | LT1 | |
| 12-5-2022 7:28:00 AM | LT1 | LT1 | |
| **Total Positive:** | **0** | **0** | **0** |

**Result Values:** **E - estimated** **L - less than** **G - greater than**

| | | |
|---|---|---|
| Samples that contain total coliform: | 2 | 0.94% of total |
| Samples that contain e. coli: | 0 | 0.00% of total |
| Samples that contain fecal coliform: | 0 | 0.00% of total |
| Number of consecutive samples that contain total coliform: | 0 | |
| Number of samples that contain total coliform in last 30 days: | 0/0 | |
| Total number of samples: | 212 | |

**Comments:**

_____
Environmental Health Officer
Jun 8 2023

FOR FURTHER INFORMATION PLEASE CALL: David Fowler

# Sample Range Report

Fraser Health Authority

**Facility Name:** Clearbrook Waterworks District
**Date Range:** Jan 1 2022 to Dec 31 2022

**Operator** Jason Hildebrandt
2889 Grandview Cres
Abbotsford, BC V2T 2R6

| Sampling Site | Date Collected | Total Coliform | E. Coli | Fecal Coliform |
|---|---|---|---|---|
| RW 3-93, Lynden St | | | | |
| | 2-1-2022 7:56:00 AM | LT1 | LT1 | |
| | 6-7-2022 9:51:00 AM | LT1 | LT1 | |
| | 10-3-2022 9:44:00 AM | LT1 | LT1 | |
| | 12-5-2022 8:30:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **0** | **0** | **0** |

**Result Values:** **E - estimated** **L - less than** **G - greater than**

| | | |
|---|---|---|
| Samples that contain total coliform: | 0 | 0.00% of total |
| Samples that contain e. coli: | 0 | 0.00% of total |
| Samples that contain fecal coliform: | 0 | 0.00% of total |
| Number of consecutive samples that contain total coliform: | 0 | |
| Number of samples that contain total coliform in last 30 days: | 0/0 | |
| Total number of samples: | 4 | |

**Comments:**

_____
Environmental Health Officer
Jun 8 2023

FOR FURTHER INFORMATION PLEASE CALL: David Fowler

# Sample Range Report

Fraser Health Authority

**Facility Name:** Clearbrook Waterworks District
**Date Range:** Jan 1 2022 to Dec 31 2022

**Operator** Jason Hildebrandt
2889 Grandview Cres
Abbotsford, BC V2T 2R6

| Sampling Site | Date Collected | Total Coliform | E. Coli | Fecal Coliform |
|---|---|---|---|---|
| Well RW 7 - 00/13, Lynden St | | | | |
| | 4-4-2022 8:53:00 AM | LT1 | LT1 | |
| | 8-2-2022 8:35:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **0** | **0** | **0** |

**Result Values:** **E - estimated** **L - less than** **G - greater than**

| | | |
|---|---|---|
| Samples that contain total coliform: | 0 | 0.00% of total |
| Samples that contain e. coli: | 0 | 0.00% of total |
| Samples that contain fecal coliform: | 0 | 0.00% of total |
| Number of consecutive samples that contain total coliform: | 0 | |
| Number of samples that contain total coliform in last 30 days: | 0/0 | |
| Total number of samples: | 2 | |

**Comments:**

_____
Environmental Health Officer
Jun 8 2023

FOR FURTHER INFORMATION PLEASE CALL: David Fowler

# Sample Range Report

Fraser Health Authority

**Facility Name:** Clearbrook Waterworks District
**Date Range:** Jan 1 2022 to Dec 31 2022

**Operator** Jason Hildebrandt
2889 Grandview Cres
Abbotsford, BC V2T 2R6

| Sampling Site | Date Collected | Total Coliform | E. Coli | Fecal Coliform |
|---|---|---|---|---|
| RW 1-87-14, Autumn Ave | | | | |
| | 1-4-2022 11:42:00 AM | LT1 | LT1 | |
| | 5-2-2022 8:16:00 AM | LT1 | LT1 | |
| | 9-6-2022 9:24:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **0** | **0** | **0** |

**Result Values:** **E - estimated** **L - less than** **G - greater than**

| | | |
|---|---|---|
| Samples that contain total coliform: | 0 | 0.00% of total |
| Samples that contain e. coli: | 0 | 0.00% of total |
| Samples that contain fecal coliform: | 0 | 0.00% of total |
| Number of consecutive samples that contain total coliform: | 0 | |
| Number of samples that contain total coliform in last 30 days: | 0/0 | |
| Total number of samples: | 3 | |

**Comments:**

_____
Environmental Health Officer
Jun 8 2023

FOR FURTHER INFORMATION PLEASE CALL: David Fowler

# Sample Range Report

Fraser Health Authority

**Facility Name:** Clearbrook Waterworks District
**Date Range:** Jan 1 2022 to Dec 31 2022

**Operator** Jason Hildebrandt
2889 Grandview Cres
Abbotsford, BC V2T 2R6

| Sampling Site | Date Collected | Total Coliform | E. Coli | Fecal Coliform |
|---|---|---|---|---|
| Well RW 2 - 63 , Autumn Ave | | | | |
| | 2-28-2022 9:52:00 AM | LT1 | LT1 | |
| | 7-5-2022 9:38:00 AM | LT1 | LT1 | |
| | 10-31-2022 9:01:00 AM | LT1 | LT1 | |
| | **Total Positive:** | **0** | **0** | **0** |

**Result Values:** **E - estimated** **L - less than** **G - greater than**

| | | |
|---|---|---|
| Samples that contain total coliform: | 0 | 0.00% of total |
| Samples that contain e. coli: | 0 | 0.00% of total |
| Samples that contain fecal coliform: | 0 | 0.00% of total |
| Number of consecutive samples that contain total coliform: | 0 | |
| Number of samples that contain total coliform in last 30 days: | 0/0 | |
| Total number of samples: | 3 | |

**Comments:**

_____
Environmental Health Officer
Jun 8 2023

FOR FURTHER INFORMATION PLEASE CALL: David Fowler

# Appendix C

Water Quality Reports – Routine Water Quality Analysis

Element
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

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F: +1 (604) 514-3323
E: info.vancouver@element.com
W: www.element.com

## Report Transmission Cover Page

Bill To: Clearbrook Waterworks District
2889 Grandview Crescent
Abbotsford, BC, Canada
V2T 2R6
Attn: Accounts Payable
Sampled By:
Company:

Project ID:
Project Name:
Project Location:
LSD:
P.O.:
Proj. Acct. code:

Lot ID: **1583947**
Control Number:
Date Received: Jul 11, 2022
Date Reported: Jul 15, 2022
Report Number: 2766057

| Contact | Company | Address |
|---|---|---|
| **Accounts Payable** | **Clearbrook Waterworks District** | 2889 Grandview Crescent<br>Abbotsford, BC V2T 2R6<br>Phone: (604) 850-6621 Fax: (604) 850-7862<br>Email: office@clearbrookwaterworks.com |

| Delivery | Format | Deliverables |
|---|---|---|
| Email - Single Deliverable | PDF | Invoice |

| Contact | Company | Address |
|---|---|---|
| **Ineke Kalwij** | **Kalwij Water Dynamics Inc** | P.O. Box 684 Station Main<br>Port Coquitlam, BC V3B 6H9<br>Phone: (604) 615-4932 Fax: (604) 475-4062<br>Email: ineke@kalwijwaterdynamics.com |

| Delivery | Format | Deliverables |
|---|---|---|
| Email - Multiple Deliverables By Lot | PDF | COC / Test Report |
| Email - Multiple Deliverables By Lot | Standard Crosstab Without Tabs | Test Report |
| Email - Single Deliverable | PDF | COA |
| Email - Single Deliverable | PDF | COR |

| Contact | Company | Address |
|---|---|---|
| **Ryan Federau** | **Clearbrook Waterworks District** | 2889 Grandview Crescent<br>Abbotsford, BC V2T 2R6<br>Phone: (604) 309-3986 Fax: (604) 850-7862<br>Email: ryan@clearbrookwaterworks.com |

| Delivery | Format | Deliverables |
|---|---|---|
| Email - Merge Deliverables | PDF | COC / Test Report |
| Email - Single Deliverable | PDF | COA |
| Email - Single Deliverable | PDF | COR |

**Notes To Clients:**

- Jul 14, 2022 - Reduction of analytical volume was necessary for chloride analysis to bring results within the analytical range for lot 1583947. Detection limits are adjusted accordingly.

Element
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

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## Analytical Report

Bill To: Clearbrook Waterworks District
2889 Grandview Crescent
Abbotsford, BC, Canada
V2T 2R6
Attn: Accounts Payable
Sampled By:
Company:

Project ID:
Project Name:
Project Location:
LSD:
P.O.:
Proj. Acct. code:

Lot ID: **1583947**
Control Number:
Date Received: Jul 11, 2022
Date Reported: Jul 15, 2022
Report Number: 2766057

| | |
|---|---|
| **Reference Number** | 1583947-1 |
| **Sample Date** | July 11, 2022 |
| **Sample Time** | 11:45 |
| **Sample Location** | |
| **Sample Description** | RW 1-87/14 / 8.9 °C |
| **Sample Matrix** | Drinking Water |

| Analyte | | Units | Result | Nominal Detection Limit | Guideline Limit | Guideline Comments |
|---|---|---|---|---|---|---|
| **Metals Extractable** | | | | | | |
| Aluminum | Extractable | mg/L | <0.001 | 0.001 | 0.1 OG; 2.9 MAC | Below OG |
| Antimony | Extractable | mg/L | 0.00013 | 0.00002 | 0.006 | Below MAC |
| Arsenic | Extractable | mg/L | 0.0017 | 0.0001 | 0.010 | Below MAC |
| Barium | Extractable | mg/L | 0.025 | 0.0001 | 2.0 | Below MAC |
| Boron | Extractable | mg/L | 0.025 | 0.002 | 5 | Below MAC |
| Cadmium | Extractable | mg/L | 0.00002 | 0.00001 | 0.007 | Below MAC |
| Chromium | Extractable | mg/L | <0.00005 | 0.00005 | 0.05 | Below MAC |
| Copper | Extractable | mg/L | <0.0005 | 0.0005 | 1 AO; 2 MAC | Below AO |
| Lead | Extractable | mg/L | <0.00001 | 0.00001 | 0.005 | Below MAC |
| Selenium | Extractable | mg/L | 0.0004 | 0.0002 | 0.05 | Below MAC |
| Strontium | Extractable | mg/L | 0.10 | 0.0001 | 7.0 | Below MAC |
| Uranium | Extractable | mg/L | 0.00022 | 0.00001 | 0.02 | Below MAC |
| Vanadium | Extractable | mg/L | 0.00049 | 0.00005 | | |
| Zinc | Extractable | mg/L | <0.0005 | 0.0005 | 5.0 | Below AO |
| **Microbiological Analysis** | | | | | | |
| Total Coliforms | Enzyme Substrate Test | MPN/100 mL | <1.0 | 1.0 | 0 per 100 mL | Below MAC |
| Escherichia coli | Enzyme Substrate Test | MPN/100 mL | <1.0 | 1.0 | 0 per 100 mL | Below MAC |
| Heterotrophic Count - Aerobic | SimPlate | MPN/mL | <2.0 | 2 | | |
| **Physical and Aggregate Properties** | | | | | | |
| Colour | True | Colour units | <5 | 5 | | |
| Turbidity | | NTU | 0.21 | 0.1 | 0.1/0.3/1.0 OG | |
| **Routine Water** | | | | | | |
| pH - Holding Time | | | Exceeded | | | |
| pH | at 25 °C | | 7.67 | 0.01 | 7.0-10.5 | Within Range |
| Electrical Conductivity | | µS/cm at 25 °C | 317 | 1 | | |
| Calcium | Extractable | mg/L | 33 | 0.01 | | |
| Iron | Extractable | mg/L | <0.004 | 0.004 | 0.3 | Below AO |
| Magnesium | Extractable | mg/L | 8.1 | 0.02 | | |
| Manganese | Extractable | mg/L | 0.072 | 0.001 | 0.02 AO; 0.12 MAC | Above AO |
| Potassium | Extractable | mg/L | 2.8 | 0.04 | | |
| Silicon | Extractable | mg/L | 8.4 | 0.005 | | |
| Sodium | Extractable | mg/L | 15 | 0.1 | 200 | Below AO |
| T-Alkalinity | as CaCO3 | mg/L | 96 | 5 | | |
| Chloride | Dissolved | mg/L | 22.0 | 0.05 | 250 | Below AO |
| Fluoride | Dissolved | mg/L | 0.05 | 0.01 | 1.5 | Below MAC |
| Nitrate - N | Dissolved | mg/L | 0.68 | 0.01 | 10 | Below MAC |

Element
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

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W: www.element.com

## Analytical Report

Bill To: Clearbrook Waterworks District
2889 Grandview Crescent
Abbotsford, BC, Canada
V2T 2R6
Attn: Accounts Payable
Sampled By:
Company:

Project ID:
Project Name:
Project Location:
LSD:
P.O.:
Proj. Acct. code:

Lot ID: **1583947**
Control Number:
Date Received: Jul 11, 2022
Date Reported: Jul 15, 2022
Report Number: 2766057

| | |
|---|---|
| **Reference Number** | 1583947-1 |
| **Sample Date** | July 11, 2022 |
| **Sample Time** | 11:45 |
| **Sample Location** | |
| **Sample Description** | RW 1-87/14 / 8.9 °C |
| **Sample Matrix** | Drinking Water |

| Analyte | | Units | Result | Nominal Detection Limit | Guideline Limit | Guideline Comments |
|---|---|---|---|---|---|---|
| **Routine Water - Continued** | | | | | | |
| Nitrite - N | Dissolved | mg/L | <0.01 | 0.01 | 1 | Below MAC |
| Sulfate (SO4) | Dissolved | mg/L | 22.8 | 0.1 | 500 | Below AO |
| Hardness | as CaCO3 (extractable) | mg/L | 115 | 1 | | |
| Total Dissolved Solids | Extractable | mg/L | 187 | 1 | 500 | Below AO |

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## Analytical Report

Bill To: Clearbrook Waterworks District
2889 Grandview Crescent
Abbotsford, BC, Canada
V2T 2R6
Attn: Accounts Payable
Sampled By:
Company:

Project ID:
Project Name:
Project Location:
LSD:
P.O.:
Proj. Acct. code:

Lot ID: **1583947**
Control Number:
Date Received: Jul 11, 2022
Date Reported: Jul 15, 2022
Report Number: 2766057

| | |
|---|---|
| **Reference Number** | 1583947-2 |
| **Sample Date** | July 11, 2022 |
| **Sample Time** | 12:00 |
| **Sample Location** | |
| **Sample Description** | RW 2-63/17 / 8.9 °C |
| **Sample Matrix** | Drinking Water |

| Analyte | | Units | Result | Nominal Detection Limit | Guideline Limit | Guideline Comments |
|---|---|---|---|---|---|---|
| **Metals Extractable** | | | | | | |
| Aluminum | Extractable | mg/L | 0.003 | 0.001 | 0.1 OG; 2.9 MAC | Below OG |
| Antimony | Extractable | mg/L | 0.00009 | 0.00002 | 0.006 | Below MAC |
| Arsenic | Extractable | mg/L | 0.0008 | 0.0001 | 0.010 | Below MAC |
| Barium | Extractable | mg/L | 0.012 | 0.0001 | 2.0 | Below MAC |
| Boron | Extractable | mg/L | 0.012 | 0.002 | 5 | Below MAC |
| Cadmium | Extractable | mg/L | 0.00002 | 0.00001 | 0.007 | Below MAC |
| Chromium | Extractable | mg/L | 0.00011 | 0.00005 | 0.05 | Below MAC |
| Copper | Extractable | mg/L | <0.0005 | 0.0005 | 1 AO; 2 MAC | Below AO |
| Lead | Extractable | mg/L | <0.00001 | 0.00001 | 0.005 | Below MAC |
| Selenium | Extractable | mg/L | 0.0006 | 0.0002 | 0.05 | Below MAC |
| Strontium | Extractable | mg/L | 0.087 | 0.0001 | 7.0 | Below MAC |
| Uranium | Extractable | mg/L | 0.00005 | 0.00001 | 0.02 | Below MAC |
| Vanadium | Extractable | mg/L | 0.00037 | 0.00005 | | |
| Zinc | Extractable | mg/L | 0.0007 | 0.0005 | 5.0 | Below AO |
| **Microbiological Analysis** | | | | | | |
| Total Coliforms | Enzyme Substrate Test | MPN/100 mL | <1.0 | 1.0 | 0 per 100 mL | Below MAC |
| Escherichia coli | Enzyme Substrate Test | MPN/100 mL | <1.0 | 1.0 | 0 per 100 mL | Below MAC |
| Heterotrophic Count - Aerobic | SimPlate | MPN/mL | 2.0 | 2 | | |
| **Physical and Aggregate Properties** | | | | | | |
| Colour | True | Colour units | <5 | 5 | | |
| Turbidity | | NTU | 0.56 | 0.1 | 0.1/0.3/1.0 OG | |
| **Routine Water** | | | | | | |
| pH - Holding Time | | | Exceeded | | | |
| pH | at 25 °C | | 7.47 | 0.01 | 7.0-10.5 | Within Range |
| Electrical Conductivity | | µS/cm at 25 °C | 242 | 1 | | |
| Calcium | Extractable | mg/L | 26 | 0.01 | | |
| Iron | Extractable | mg/L | 0.013 | 0.004 | 0.3 | Below AO |
| Magnesium | Extractable | mg/L | 6.6 | 0.02 | | |
| Manganese | Extractable | mg/L | 0.009 | 0.001 | 0.02 AO; 0.12 MAC | Below AO |
| Potassium | Extractable | mg/L | 1.7 | 0.04 | | |
| Silicon | Extractable | mg/L | 9.6 | 0.005 | | |
| Sodium | Extractable | mg/L | 7.8 | 0.1 | 200 | Below AO |
| T-Alkalinity | as CaCO3 | mg/L | 65 | 5 | | |
| Chloride | Dissolved | mg/L | 17.4 | 0.05 | 250 | Below AO |
| Fluoride | Dissolved | mg/L | 0.06 | 0.01 | 1.5 | Below MAC |
| Nitrate - N | Dissolved | mg/L | 1.40 | 0.01 | 10 | Below MAC |

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## Analytical Report

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2889 Grandview Crescent
Abbotsford, BC, Canada
V2T 2R6
Attn: Accounts Payable
Sampled By:
Company:

Project ID:
Project Name:
Project Location:
LSD:
P.O.:
Proj. Acct. code:

Lot ID: **1583947**
Control Number:
Date Received: Jul 11, 2022
Date Reported: Jul 15, 2022
Report Number: 2766057

| | |
|---|---|
| **Reference Number** | 1583947-2 |
| **Sample Date** | July 11, 2022 |
| **Sample Time** | 12:00 |
| **Sample Location** | |
| **Sample Description** | RW 2-63/17 / 8.9 °C |
| **Sample Matrix** | Drinking Water |

| Analyte | | Units | Result | Nominal Detection Limit | Guideline Limit | Guideline Comments |
|---|---|---|---|---|---|---|
| **Routine Water - Continued** | | | | | | |
| Nitrite - N | Dissolved | mg/L | <0.01 | 0.01 | 1 | Below MAC |
| Sulfate (SO4) | Dissolved | mg/L | 19.6 | 0.1 | 500 | Below AO |
| Hardness | as CaCO3 (extractable) | mg/L | 91 | 1 | | |
| Total Dissolved Solids | Extractable | mg/L | 150 | 1 | 500 | Below AO |

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Project ID:
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P.O.:
Proj. Acct. code:

Lot ID: **1583947**
Control Number:
Date Received: Jul 11, 2022
Date Reported: Jul 15, 2022
Report Number: 2766057

| | |
|---|---|
| **Reference Number** | 1583947-3 |
| **Sample Date** | July 11, 2022 |
| **Sample Time** | 13:27 |
| **Sample Location** | |
| **Sample Description** | RW 3-13/11 / 8.9 °C |
| **Sample Matrix** | Drinking Water |

| Analyte | | Units | Result | Nominal Detection Limit | Guideline Limit | Guideline Comments |
|---|---|---|---|---|---|---|
| **Metals Extractable** | | | | | | |
| Aluminum | Extractable | mg/L | <0.001 | 0.001 | 0.1 OG; 2.9 MAC | Below OG |
| Antimony | Extractable | mg/L | 0.00005 | 0.00002 | 0.006 | Below MAC |
| Arsenic | Extractable | mg/L | 0.0004 | 0.0001 | 0.010 | Below MAC |
| Barium | Extractable | mg/L | 0.0081 | 0.0001 | 2.0 | Below MAC |
| Boron | Extractable | mg/L | 0.011 | 0.002 | 5 | Below MAC |
| Cadmium | Extractable | mg/L | 0.00003 | 0.00001 | 0.007 | Below MAC |
| Chromium | Extractable | mg/L | 0.00015 | 0.00005 | 0.05 | Below MAC |
| Copper | Extractable | mg/L | 0.0020 | 0.0005 | 1 AO; 2 MAC | Below AO |
| Lead | Extractable | mg/L | 0.00012 | 0.00001 | 0.005 | Below MAC |
| Selenium | Extractable | mg/L | 0.0003 | 0.0002 | 0.05 | Below MAC |
| Strontium | Extractable | mg/L | 0.14 | 0.0001 | 7.0 | Below MAC |
| Uranium | Extractable | mg/L | 0.00004 | 0.00001 | 0.02 | Below MAC |
| Vanadium | Extractable | mg/L | 0.00045 | 0.00005 | | |
| Zinc | Extractable | mg/L | 0.026 | 0.0005 | 5.0 | Below AO |
| **Microbiological Analysis** | | | | | | |
| Total Coliforms | Enzyme Substrate Test | MPN/100 mL | <1.0 | 1.0 | 0 per 100 mL | Below MAC |
| Escherichia coli | Enzyme Substrate Test | MPN/100 mL | <1.0 | 1.0 | 0 per 100 mL | Below MAC |
| Heterotrophic Count - Aerobic | SimPlate | MPN/mL | <2.0 | 2 | | |
| **Physical and Aggregate Properties** | | | | | | |
| Colour | True | Colour units | <5 | 5 | | |
| Turbidity | | NTU | 0.11 | 0.1 | 0.1/0.3/1.0 OG | |
| **Routine Water** | | | | | | |
| pH - Holding Time | | | Exceeded | | | |
| pH | at 25 °C | | 7.33 | 0.01 | 7.0-10.5 | Within Range |
| Electrical Conductivity | | µS/cm at 25 °C | 307 | 1 | | |
| Calcium | Extractable | mg/L | 32 | 0.01 | | |
| Iron | Extractable | mg/L | <0.004 | 0.004 | 0.3 | Below AO |
| Magnesium | Extractable | mg/L | 7.5 | 0.02 | | |
| Manganese | Extractable | mg/L | 0.001 | 0.001 | 0.02 AO; 0.12 MAC | Below AO |
| Potassium | Extractable | mg/L | 1.6 | 0.04 | | |
| Silicon | Extractable | mg/L | 11 | 0.005 | | |
| Sodium | Extractable | mg/L | 11 | 0.1 | 200 | Below AO |
| T-Alkalinity | as CaCO3 | mg/L | 53 | 5 | | |
| Chloride | Dissolved | mg/L | 44.4 | 0.05 | 250 | Below AO |
| Fluoride | Dissolved | mg/L | 0.05 | 0.01 | 1.5 | Below MAC |
| Nitrate - N | Dissolved | mg/L | 2.12 | 0.01 | 10 | Below MAC |

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## Analytical Report

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2889 Grandview Crescent
Abbotsford, BC, Canada
V2T 2R6
Attn: Accounts Payable
Sampled By:
Company:

Project ID:
Project Name:
Project Location:
LSD:
P.O.:
Proj. Acct. code:

Lot ID: **1583947**
Control Number:
Date Received: Jul 11, 2022
Date Reported: Jul 15, 2022
Report Number: 2766057

| | |
|---|---|
| **Reference Number** | 1583947-3 |
| **Sample Date** | July 11, 2022 |
| **Sample Time** | 13:27 |
| **Sample Location** | |
| **Sample Description** | RW 3-13/11 / 8.9 °C |
| **Sample Matrix** | Drinking Water |

| Analyte | | Units | Result | Nominal Detection Limit | Guideline Limit | Guideline Comments |
|---|---|---|---|---|---|---|
| **Routine Water - Continued** | | | | | | |
| Nitrite - N | Dissolved | mg/L | <0.01 | 0.01 | 1 | Below MAC |
| Sulfate (SO4) | Dissolved | mg/L | 16.5 | 0.1 | 500 | Below AO |
| Hardness | as CaCO3 (extractable) | mg/L | 110 | 1 | | |
| Total Dissolved Solids | Extractable | mg/L | 182 | 1 | 500 | Below AO |

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Lot ID: **1583947**
Control Number:
Date Received: Jul 11, 2022
Date Reported: Jul 15, 2022
Report Number: 2766057

| | |
|---|---|
| **Reference Number** | 1583947-4 |
| **Sample Date** | July 11, 2022 |
| **Sample Time** | 13:13 |
| **Sample Location** | |
| **Sample Description** | RW 7-00/13 / 8.9 °C |
| **Sample Matrix** | Drinking Water |

| Analyte | | Units | Result | Nominal Detection Limit | Guideline Limit | Guideline Comments |
|---|---|---|---|---|---|---|
| **Metals Extractable** | | | | | | |
| Aluminum | Extractable | mg/L | <0.001 | 0.001 | 0.1 OG; 2.9 MAC | Below OG |
| Antimony | Extractable | mg/L | 0.00004 | 0.00002 | 0.006 | Below MAC |
| Arsenic | Extractable | mg/L | 0.0003 | 0.0001 | 0.010 | Below MAC |
| Barium | Extractable | mg/L | 0.0067 | 0.0001 | 2.0 | Below MAC |
| Boron | Extractable | mg/L | 0.009 | 0.002 | 5 | Below MAC |
| Cadmium | Extractable | mg/L | 0.00003 | 0.00001 | 0.007 | Below MAC |
| Chromium | Extractable | mg/L | 0.00020 | 0.00005 | 0.05 | Below MAC |
| Copper | Extractable | mg/L | 0.0023 | 0.0005 | 1 AO; 2 MAC | Below AO |
| Lead | Extractable | mg/L | 0.00018 | 0.00001 | 0.005 | Below MAC |
| Selenium | Extractable | mg/L | 0.0002 | 0.0002 | 0.05 | Below MAC |
| Strontium | Extractable | mg/L | 0.11 | 0.0001 | 7.0 | Below MAC |
| Uranium | Extractable | mg/L | 0.00002 | 0.00001 | 0.02 | Below MAC |
| Vanadium | Extractable | mg/L | 0.00046 | 0.00005 | | |
| Zinc | Extractable | mg/L | 0.021 | 0.0005 | 5.0 | Below AO |
| **Microbiological Analysis** | | | | | | |
| Total Coliforms | Enzyme Substrate Test | MPN/100 mL | <1.0 | 1.0 | 0 per 100 mL | Below MAC |
| Escherichia coli | Enzyme Substrate Test | MPN/100 mL | <1.0 | 1.0 | 0 per 100 mL | Below MAC |
| Heterotrophic Count - Aerobic | SimPlate | MPN/mL | <2.0 | 2 | | |
| **Physical and Aggregate Properties** | | | | | | |
| Colour | True | Colour units | <5 | 5 | | |
| Turbidity | | NTU | <0.10 | 0.1 | 0.1/0.3/1.0 OG | |
| **Routine Water** | | | | | | |
| pH - Holding Time | | | Exceeded | | | |
| pH | at 25 °C | | 7.27 | 0.01 | 7.0-10.5 | Within Range |
| Electrical Conductivity | | µS/cm at 25 °C | 248 | 1 | | |
| Calcium | Extractable | mg/L | 25 | 0.01 | | |
| Iron | Extractable | mg/L | <0.004 | 0.004 | 0.3 | Below AO |
| Magnesium | Extractable | mg/L | 6.1 | 0.02 | | |
| Manganese | Extractable | mg/L | 0.002 | 0.001 | 0.02 AO; 0.12 MAC | Below AO |
| Potassium | Extractable | mg/L | 1.3 | 0.04 | | |
| Silicon | Extractable | mg/L | 11 | 0.005 | | |
| Sodium | Extractable | mg/L | 8.1 | 0.1 | 200 | Below AO |
| T-Alkalinity | as CaCO3 | mg/L | 42 | 5 | | |
| Chloride | Dissolved | mg/L | 33.0 | 0.05 | 250 | Below AO |
| Fluoride | Dissolved | mg/L | 0.05 | 0.01 | 1.5 | Below MAC |
| Nitrate - N | Dissolved | mg/L | 2.30 | 0.01 | 10 | Below MAC |

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## Analytical Report

Bill To: Clearbrook Waterworks District
2889 Grandview Crescent
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V2T 2R6
Attn: Accounts Payable
Sampled By:
Company:

Project ID:
Project Name:
Project Location:
LSD:
P.O.:
Proj. Acct. code:

Lot ID: **1583947**
Control Number:
Date Received: Jul 11, 2022
Date Reported: Jul 15, 2022
Report Number: 2766057

| | |
|---|---|
| **Reference Number** | 1583947-4 |
| **Sample Date** | July 11, 2022 |
| **Sample Time** | 13:13 |
| **Sample Location** | |
| **Sample Description** | RW 7-00/13 / 8.9 °C |
| **Sample Matrix** | Drinking Water |

| Analyte | | Units | Result | Nominal Detection Limit | Guideline Limit | Guideline Comments |
|---|---|---|---|---|---|---|
| **Routine Water - Continued** | | | | | | |
| Nitrite - N | Dissolved | mg/L | <0.01 | 0.01 | 1 | Below MAC |
| Sulfate (SO4) | Dissolved | mg/L | 14.3 | 0.1 | 500 | Below AO |
| Hardness | as CaCO3 (extractable) | mg/L | 89 | 1 | | |
| Total Dissolved Solids | Extractable | mg/L | 152 | 1 | 500 | Below AO |

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Proj. Acct. code:

Lot ID: **1583947**
Control Number:
Date Received: Jul 11, 2022
Date Reported: Jul 15, 2022
Report Number: 2766057

| | |
|---|---|
| **Reference Number** | 1583947-5 |
| **Sample Date** | July 11, 2022 |
| **Sample Time** | 13:40 |
| **Sample Location** | |
| **Sample Description** | Reservoir "C" / 8.9 °C |
| **Sample Matrix** | Drinking Water |

| Analyte | | Units | Result | Nominal Detection Limit | Guideline Limit | Guideline Comments |
|---|---|---|---|---|---|---|
| **Metals Extractable** | | | | | | |
| Aluminum | Extractable | mg/L | <0.001 | 0.001 | 0.1 OG; 2.9 MAC | Below OG |
| Antimony | Extractable | mg/L | 0.00011 | 0.00002 | 0.006 | Below MAC |
| Arsenic | Extractable | mg/L | 0.0011 | 0.0001 | 0.010 | Below MAC |
| Barium | Extractable | mg/L | 0.016 | 0.0001 | 2.0 | Below MAC |
| Boron | Extractable | mg/L | 0.022 | 0.002 | 5 | Below MAC |
| Cadmium | Extractable | mg/L | 0.00001 | 0.00001 | 0.007 | Below MAC |
| Chromium | Extractable | mg/L | 0.00007 | 0.00005 | 0.05 | Below MAC |
| Copper | Extractable | mg/L | <0.0005 | 0.0005 | 1 AO; 2 MAC | Below AO |
| Lead | Extractable | mg/L | <0.00001 | 0.00001 | 0.005 | Below MAC |
| Selenium | Extractable | mg/L | 0.0004 | 0.0002 | 0.05 | Below MAC |
| Strontium | Extractable | mg/L | 0.11 | 0.0001 | 7.0 | Below MAC |
| Uranium | Extractable | mg/L | 0.00018 | 0.00001 | 0.02 | Below MAC |
| Vanadium | Extractable | mg/L | 0.00046 | 0.00005 | | |
| Zinc | Extractable | mg/L | 0.0006 | 0.0005 | 5.0 | Below AO |
| **Microbiological Analysis** | | | | | | |
| Total Coliforms | Enzyme Substrate Test | MPN/100 mL | <1.0 | 1.0 | 0 per 100 mL | Below MAC |
| Escherichia coli | Enzyme Substrate Test | MPN/100 mL | <1.0 | 1.0 | 0 per 100 mL | Below MAC |
| Heterotrophic Count - Aerobic | SimPlate | MPN/mL | 6.0 | 2 | | |
| **Physical and Aggregate Properties** | | | | | | |
| Colour | True | Colour units | <5 | 5 | | |
| Turbidity | | NTU | 0.11 | 0.1 | 0.1/0.3/1.0 OG | |
| **Routine Water** | | | | | | |
| pH - Holding Time | | | Exceeded | | | |
| pH | at 25 °C | | 7.64 | 0.01 | 7.0-10.5 | Within Range |
| Electrical Conductivity | | µS/cm at 25 °C | 320 | 1 | | |
| Calcium | Extractable | mg/L | 32 | 0.01 | | |
| Iron | Extractable | mg/L | <0.004 | 0.004 | 0.3 | Below AO |
| Magnesium | Extractable | mg/L | 7.7 | 0.02 | | |
| Manganese | Extractable | mg/L | 0.011 | 0.001 | 0.02 AO; 0.12 MAC | Below AO |
| Potassium | Extractable | mg/L | 2.3 | 0.04 | | |
| Silicon | Extractable | mg/L | 8.8 | 0.005 | | |
| Sodium | Extractable | mg/L | 13 | 0.1 | 200 | Below AO |
| T-Alkalinity | as CaCO3 | mg/L | 89 | 5 | | |
| Chloride | Dissolved | mg/L | 27.5 | 0.05 | 250 | Below AO |
| Fluoride | Dissolved | mg/L | 0.05 | 0.01 | 1.5 | Below MAC |
| Nitrate - N | Dissolved | mg/L | 0.98 | 0.01 | 10 | Below MAC |

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Proj. Acct. code:

Lot ID: **1583947**
Control Number:
Date Received: Jul 11, 2022
Date Reported: Jul 15, 2022
Report Number: 2766057

| | |
|---|---|
| **Reference Number** | 1583947-5 |
| **Sample Date** | July 11, 2022 |
| **Sample Time** | 13:40 |
| **Sample Location** | |
| **Sample Description** | Reservoir "C" / 8.9 °C |
| **Sample Matrix** | Drinking Water |

| Analyte | | Units | Result | Nominal Detection Limit | Guideline Limit | Guideline Comments |
|---|---|---|---|---|---|---|
| **Routine Water - Continued** | | | | | | |
| Nitrite - N | Dissolved | mg/L | <0.01 | 0.01 | 1 | Below MAC |
| Sulfate (SO4) | Dissolved | mg/L | 21.4 | 0.1 | 500 | Below AO |
| Hardness | as CaCO3 (extractable) | mg/L | 112 | 1 | | |
| Total Dissolved Solids | Extractable | mg/L | 186 | 1 | 500 | Below AO |

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Proj. Acct. code:

Lot ID: **1583947**
Control Number:
Date Received: Jul 11, 2022
Date Reported: Jul 15, 2022
Report Number: 2766057

| | |
|---|---|
| **Reference Number** | 1583947-6 |
| **Sample Date** | July 11, 2022 |
| **Sample Time** | 13:03 |
| **Sample Location** | |
| **Sample Description** | 32350 Diamond Cres / 8.9 °C |
| **Sample Matrix** | Drinking Water |

| Analyte | | Units | Result | Nominal Detection Limit | Guideline Limit | Guideline Comments |
|---|---|---|---|---|---|---|
| **Metals Extractable** | | | | | | |
| Aluminum | Extractable | mg/L | <0.001 | 0.001 | 0.1 OG; 2.9 MAC | Below OG |
| Antimony | Extractable | mg/L | 0.00011 | 0.00002 | 0.006 | Below MAC |
| Arsenic | Extractable | mg/L | 0.0011 | 0.0001 | 0.010 | Below MAC |
| Barium | Extractable | mg/L | 0.017 | 0.0001 | 2.0 | Below MAC |
| Boron | Extractable | mg/L | 0.025 | 0.002 | 5 | Below MAC |
| Cadmium | Extractable | mg/L | 0.00002 | 0.00001 | 0.007 | Below MAC |
| Chromium | Extractable | mg/L | 0.00006 | 0.00005 | 0.05 | Below MAC |
| Copper | Extractable | mg/L | 0.0059 | 0.0005 | 1 AO; 2 MAC | Below AO |
| Lead | Extractable | mg/L | 0.00061 | 0.00001 | 0.005 | Below MAC |
| Selenium | Extractable | mg/L | 0.0003 | 0.0002 | 0.05 | Below MAC |
| Strontium | Extractable | mg/L | 0.13 | 0.0001 | 7.0 | Below MAC |
| Uranium | Extractable | mg/L | 0.00025 | 0.00001 | 0.02 | Below MAC |
| Vanadium | Extractable | mg/L | 0.00051 | 0.00005 | | |
| Zinc | Extractable | mg/L | 0.012 | 0.0005 | 5.0 | Below AO |
| **Microbiological Analysis** | | | | | | |
| Total Coliforms | Enzyme Substrate Test | MPN/100 mL | <1.0 | 1.0 | 0 per 100 mL | Below MAC |
| Escherichia coli | Enzyme Substrate Test | MPN/100 mL | <1.0 | 1.0 | 0 per 100 mL | Below MAC |
| Heterotrophic Count - Aerobic | SimPlate | MPN/mL | 440 | 2 | | |
| **Physical and Aggregate Properties** | | | | | | |
| Colour | True | Colour units | <5 | 5 | | |
| Turbidity | | NTU | 0.12 | 0.1 | 0.1/0.3/1.0 OG | |
| **Routine Water** | | | | | | |
| pH - Holding Time | | | Exceeded | | | |
| pH | at 25 °C | | 7.66 | 0.01 | 7.0-10.5 | Within Range |
| Electrical Conductivity | | µS/cm at 25 °C | 337 | 1 | | |
| Calcium | Extractable | mg/L | 35 | 0.01 | | |
| Iron | Extractable | mg/L | <0.004 | 0.004 | 0.3 | Below AO |
| Magnesium | Extractable | mg/L | 8.2 | 0.02 | | |
| Manganese | Extractable | mg/L | 0.014 | 0.001 | 0.02 AO; 0.12 MAC | Below AO |
| Potassium | Extractable | mg/L | 2.4 | 0.04 | | |
| Silicon | Extractable | mg/L | 8.6 | 0.005 | | |
| Sodium | Extractable | mg/L | 15 | 0.1 | 200 | Below AO |
| T-Alkalinity | as CaCO3 | mg/L | 100 | 5 | | |
| Chloride | Dissolved | mg/L | 26.6 | 0.05 | 250 | Below AO |
| Fluoride | Dissolved | mg/L | 0.05 | 0.01 | 1.5 | Below MAC |
| Nitrate - N | Dissolved | mg/L | 0.65 | 0.01 | 10 | Below MAC |

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## Analytical Report

Bill To: Clearbrook Waterworks District
2889 Grandview Crescent
Abbotsford, BC, Canada
V2T 2R6
Attn: Accounts Payable
Sampled By:
Company:

Project ID:
Project Name:
Project Location:
LSD:
P.O.:
Proj. Acct. code:

Lot ID: **1583947**
Control Number:
Date Received: Jul 11, 2022
Date Reported: Jul 15, 2022
Report Number: 2766057

| | |
|---|---|
| **Reference Number** | 1583947-6 |
| **Sample Date** | July 11, 2022 |
| **Sample Time** | 13:03 |
| **Sample Location** | |
| **Sample Description** | 32350 Diamond Cres / 8.9 °C |
| **Sample Matrix** | Drinking Water |

| Analyte | | Units | Result | Nominal Detection Limit | Guideline Limit | Guideline Comments |
|---|---|---|---|---|---|---|
| **Routine Water - Continued** | | | | | | |
| Nitrite - N | Dissolved | mg/L | <0.01 | 0.01 | 1 | Below MAC |
| Sulfate (SO4) | Dissolved | mg/L | 22.6 | 0.1 | 500 | Below AO |
| Hardness | as CaCO3 (extractable) | mg/L | 121 | 1 | | |
| Total Dissolved Solids | Extractable | mg/L | 197 | 1 | 500 | Below AO |

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## Analytical Report

Bill To: Clearbrook Waterworks District
2889 Grandview Crescent
Abbotsford, BC, Canada
V2T 2R6
Attn: Accounts Payable
Sampled By:
Company:

Project ID:
Project Name:
Project Location:
LSD:
P.O.:
Proj. Acct. code:

Lot ID: **1583947**
Control Number:
Date Received: Jul 11, 2022
Date Reported: Jul 15, 2022
Report Number: 2766057

| | |
|---|---|
| **Reference Number** | 1583947-7 |
| **Sample Date** | July 11, 2022 |
| **Sample Time** | 11:32 |
| **Sample Location** | |
| **Sample Description** | 2464 Sunnys, de Pl. / 8.9 °C |
| **Sample Matrix** | Drinking Water |

| Analyte | | Units | Result | Nominal Detection Limit | Guideline Limit | Guideline Comments |
|---|---|---|---|---|---|---|
| **Metals Extractable** | | | | | | |
| Aluminum | Extractable | mg/L | <0.001 | 0.001 | 0.1 OG; 2.9 MAC | Below OG |
| Antimony | Extractable | mg/L | 0.00012 | 0.00002 | 0.006 | Below MAC |
| Arsenic | Extractable | mg/L | 0.0013 | 0.0001 | 0.010 | Below MAC |
| Barium | Extractable | mg/L | 0.017 | 0.0001 | 2.0 | Below MAC |
| Boron | Extractable | mg/L | 0.027 | 0.002 | 5 | Below MAC |
| Cadmium | Extractable | mg/L | 0.00001 | 0.00001 | 0.007 | Below MAC |
| Chromium | Extractable | mg/L | 0.00005 | 0.00005 | 0.05 | Below MAC |
| Copper | Extractable | mg/L | 0.0035 | 0.0005 | 1 AO; 2 MAC | Below AO |
| Lead | Extractable | mg/L | 0.00033 | 0.00001 | 0.005 | Below MAC |
| Selenium | Extractable | mg/L | 0.0004 | 0.0002 | 0.05 | Below MAC |
| Strontium | Extractable | mg/L | 0.11 | 0.0001 | 7.0 | Below MAC |
| Uranium | Extractable | mg/L | 0.00024 | 0.00001 | 0.02 | Below MAC |
| Vanadium | Extractable | mg/L | 0.00053 | 0.00005 | | |
| Zinc | Extractable | mg/L | 0.0080 | 0.0005 | 5.0 | Below AO |
| **Microbiological Analysis** | | | | | | |
| Total Coliforms | Enzyme Substrate Test | MPN/100 mL | <1.0 | 1.0 | 0 per 100 mL | Below MAC |
| Escherichia coli | Enzyme Substrate Test | MPN/100 mL | <1.0 | 1.0 | 0 per 100 mL | Below MAC |
| Heterotrophic Count - Aerobic | SimPlate | MPN/mL | 2.0 | 2 | | |
| **Physical and Aggregate Properties** | | | | | | |
| Colour | True | Colour units | <5 | 5 | | |
| Turbidity | | NTU | <0.10 | 0.1 | 0.1/0.3/1.0 OG | |
| **Routine Water** | | | | | | |
| pH - Holding Time | | | Exceeded | | | |
| pH | at 25 °C | | 7.72 | 0.01 | 7.0-10.5 | Within Range |
| Electrical Conductivity | | µS/cm at 25 °C | 323 | 1 | | |
| Calcium | Extractable | mg/L | 34 | 0.01 | | |
| Iron | Extractable | mg/L | <0.004 | 0.004 | 0.3 | Below AO |
| Magnesium | Extractable | mg/L | 8.2 | 0.02 | | |
| Manganese | Extractable | mg/L | 0.011 | 0.001 | 0.02 AO; 0.12 MAC | Below AO |
| Potassium | Extractable | mg/L | 2.7 | 0.04 | | |
| Silicon | Extractable | mg/L | 8.4 | 0.005 | | |
| Sodium | Extractable | mg/L | 15 | 0.1 | 200 | Below AO |
| T-Alkalinity | as CaCO3 | mg/L | 99 | 5 | | |
| Chloride | Dissolved | mg/L | 22.9 | 0.05 | 250 | Below AO |
| Fluoride | Dissolved | mg/L | 0.06 | 0.01 | 1.5 | Below MAC |
| Nitrate - N | Dissolved | mg/L | 0.65 | 0.01 | 10 | Below MAC |

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## Analytical Report

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2889 Grandview Crescent
Abbotsford, BC, Canada
V2T 2R6
Attn: Accounts Payable
Sampled By:
Company:

Project ID:
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LSD:
P.O.:
Proj. Acct. code:

Lot ID: **1583947**
Control Number:
Date Received: Jul 11, 2022
Date Reported: Jul 15, 2022
Report Number: 2766057

| | |
|---|---|
| **Reference Number** | 1583947-7 |
| **Sample Date** | July 11, 2022 |
| **Sample Time** | 11:32 |
| **Sample Location** | |
| **Sample Description** | 2464 Sunnys, de Pl. / 8.9 °C |
| **Sample Matrix** | Drinking Water |

| Analyte | | Units | Result | Nominal Detection Limit | Guideline Limit | Guideline Comments |
|---|---|---|---|---|---|---|
| **Routine Water - Continued** | | | | | | |
| Nitrite - N | Dissolved | mg/L | <0.01 | 0.01 | 1 | Below MAC |
| Sulfate (SO4) | Dissolved | mg/L | 22.7 | 0.1 | 500 | Below AO |
| Hardness | as CaCO3 (extractable) | mg/L | 119 | 1 | | |
| Total Dissolved Solids | Extractable | mg/L | 191 | 1 | 500 | Below AO |

Approved by:

Max Hewitt
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

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## Methodology and Notes

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2889 Grandview Crescent
Abbotsford, BC, Canada
V2T 2R6
Attn: Accounts Payable
Sampled By:
Company:

Project ID:
Project Name:
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P.O.:
Proj. Acct. code:

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Control Number:
Date Received: Jul 11, 2022
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## Method of Analysis

| Method Name | Reference | | Method | Date Analysis Started | Location |
|---|---|---|---|---|---|
| Alk, pH, EC, Turb in water (BC) | APHA | * | Alkalinity - Titration Method, 2320 B | Jul 12, 2022 | Element Vancouver |
| Alk, pH, EC, Turb in water (BC) | APHA | * | Conductivity, 2510 B | Jul 12, 2022 | Element Vancouver |
| Alk, pH, EC, Turb in water (BC) | APHA | * | pH - Electrometric Method, 4500-H+ B | Jul 12, 2022 | Element Vancouver |
| Anions by IEC in water (VAN) | APHA | * | Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B | Jul 12, 2022 | Element Vancouver |
| Heterotrophic (Standard) Plate Count (Aerobic SP) - VAN | APHA | | Enzyme Substrate Method, 9215 E | Jul 11, 2022 | Element Vancouver |
| Metals SemiTrace (Extractable) in water (VAN) | US EPA | * | Metals & Trace Elements by ICP-AES, 6010C | Jul 12, 2022 | Element Vancouver |
| Total and E-Coli - Colilert - DW (VAN) | APHA | | Enzyme Substrate Test, APHA 9223 B | Jul 11, 2022 | Element Vancouver |
| Trace Metals (extractable) in Water (VAN) | US EPA | * | Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8 | Jul 12, 2022 | Element Vancouver |
| True Color in water (VAN) | APHA | * | Spectrophotometric - Single Wavelength Method, 2120 C | Jul 12, 2022 | Element Vancouver |
| Turbidity - Water (VAN) | APHA | * | Turbidity - Nephelometric Method, 2130 B | Jul 12, 2022 | Element Vancouver |

** Reference Method Modified*

## References

| | |
|---|---|
| APHA | Standard Methods for the Examination of Water and Wastewater |
| US EPA | US Environmental Protection Agency Test Methods |

## Guidelines

| | |
|---|---|
| Guideline Description | Health Canada GCDWQ |
| Guideline Source | Guidelines for Canadian Drinking Water Quality, Health Canada, Sept 2020 |
| Guideline Comments | MAC = Maximum Acceptable Concentration<br>AO = Aesthetic Objective<br>OG = Operational Guideline for Water Treatment Plants<br>(does not apply to private groundwater wells).<br>Refer to Health Canada for complete guidelines at www.hc-sc.gc.ca |

## Comments:

- Jul 14, 2022 - Reduction of analytical volume was necessary for chloride analysis to bring results within the analytical range for lot 1583947. Detection limits are adjusted accordingly.

End of Document