2023 Annual Drinking Water Quality Report
Facility No. 12-098-00001

May 21, 2024

Well 7 Drilling Set-up

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1.0 Introduction

The purpose of this report is to provide information on the monitoring and maintenance of the Town of Golden's water distribution system over the course of the last calendar year, as directed in the municipality's Interior Health Water System Operating Permit and mandated by the Drinking Water Protection Act.

The Drinking Water Quality Monitoring program generates data for the continuous trending of the community's water quality, as well as the performance of the entire distribution system in a reliable and systematic way. The program allows for potential health hazards to be quickly identified and corrected and for consumer enquiries to be accurately addressed in a timely manner.

Included in this document is:

- A brief introduction to the Town of Golden's water distribution system;
- 2023 consumption information;
- Drinking water monitoring and testing program information;
- A description of any major improvements made to the system within the last calendar year;
- A brief summary of planned initiatives for the current year;
- A summary of all water sample results collected in 2023.

The information contained herein collectively serves to confirm and verify the water system's continued performance in delivering a safe and sufficient supply of drinking water to the community.

2.0 Water Distribution System Overview

Groundwater Wells:
Currently there are four production wells in operation with a rated total (100% or 24 hour) pumping capacity of 1358 Imperial Gallons per Minute (Igpm) or 103 Litres per second (Lps) providing water to a common distribution system. One well is located on the north side of the Kicking Horse River and three are located on the south side.

Best practices in well pump operation suggest that wells be designed to operate at a maximum of eighteen hours per day allowing for maintenance over the workday to occur for example. Based on this premise, the current actual total (75% or 18 hour) pumping capacity that should be relied upon is 1019 Igpm or 77 Lps.

Reservoirs:
There are five reservoirs located at three distinct reservoir sites within the municipality. The total available reservoir storage capacity is 1,530,000 Igal or 6.96 Mega Litres (ML). The first site is located on the Northeast Bench, the second and third sites are both located on the Southeast Bench.

Pressure Zones:
There are four pressure zones throughout the system. Two pressure zones service the NE Bench, one services the SE Bench, and the remainder of the community comprises the fourth pressure zone.

Distribution System:
Pipe sizes range from 150mm to 300mm. The pipe network includes asbestos cement (AC), polyvinylchloride (PVC), yellow jacket ductile iron (YJDI), ductile iron (DI), cast iron (CI) and polyethylene (PE) types.

There are about 170 fire hydrants included in an annual spring and fall maintenance program. Hydrant reports are required to be forwarded to operations staff each time a hydrant is used by the fire department to ensure those hydrants are rechecked and maintained as necessary. Hydrants are not typically used for filling tankards other than fire trucks; however occasionally select hydrants are used for the purposes of fire department training or filling the municipal water truck and street sweeper for street cleaning purposes.

13th Street Well:
This well is not connected to the distribution system. It is used for non-potable water use by the municipality as well as authorized contractors.

Potable Bulk Water Filling Station:
This facility serves as a potable filling station for authorized potable water haulers and is supplied by the water distribution system.

Consumption Stats:
For overall annual system demand values refer to Section 11.0. For a visual representation of consumption by sector refer to Figure 1 following.

In 2023, Maximum Day Demand (MDD) decreased by 12.8%, while overall consumption also decreased by 16.2% from 2022. The 2023 MDD figure is typically assumed to be reflective of residential and municipal irrigating as extensive irrigating on a given day would be a main contributor to this demand type. Weather conditions leading up to and occurring on the maximum consumption day are thought to be a main factor influencing this demand figure as well. Given the notable decrease in 2023 MMD over 2022 MDD, communications on conservation and Bylaw support will have played a important role in terms of education and enforcement of bylaw sprinkling regulations to reduce off hour/off day residential irrigating.

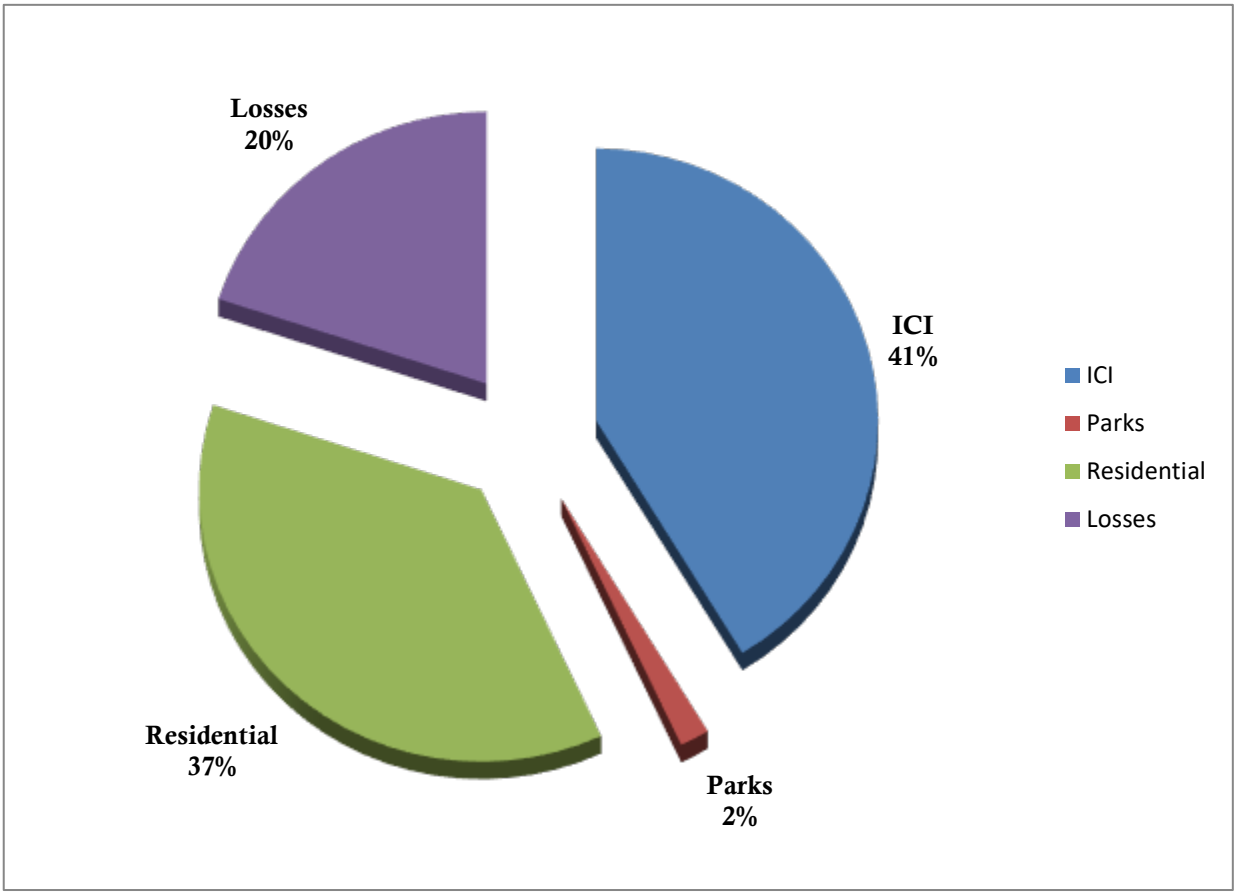
In 2023, Industrial, Commercial, Institutional (ICI) demand accounted for about 41.4% of the total water pumped, increasing by 2.7% over 2022 (in 2022 ICI demand was recorded as 38.7% of the total water pumped).

Municipal parks demand accounted for about 1.5% of the total water pumped, a reduction of 0.2% over 2022 (in 2022 municipal irrigation demand was recorded as 1.7% of the total water pumped).

The remaining portion of the total volume pumped, represented as 57.1%, is in large part residential demand; of that percentage about 20%[1] is considered attributable to system losses through leakage and other unaccounted for water usage (such as fire flow demand or municipal and contractor usage from hydrants for example). Therefore, approximately 37.1% of the total water pumped is assumed to be residential demand, which is a reduction of 2.5% over 2022 (in 2022 residential demand was reported as being approximately 39.6% of the total water pumped).

[1] Based on the 2023 Total Pumped volume, 20% represents about 113,930 Igpd or about 79 Igpm. There should be an opportunity to reduce this number through the ongoing community-wide public infrastructure leak detection program. Environment Canada estimates that an average of 13% of municipal water is unaccounted for.

Figure 1 – 2023 Water Use by Sector



3.0 Testing and Monitoring Program

The water quality monitoring program includes source and distribution system monitoring with tabulated results shown in Section 12.

Routine weekly samples are collected at each well head and at alternating reservoir sites. These samples are collected by Town of Golden staff and forwarded to a private lab for microbiological testing. Lab results along with consumption and turbidity are reported to the Public Health inspector on a monthly basis.

In 2023 a total of 172 samples were analyzed for total coliforms and E.coli. with two samples testing positive with total coliform counts of one or more. Both positive Total Coliform samples were related to samples taken from the NE Yellow Reservoir, with clear resampling being the result.

As per schedule B of the Drinking Water Protection Act, the Town of Golden is required to analyze four samples per month (population less than 5000). To emphasize the commitment to providing safe drinking water the number of samples analyzed in 2023 averaged fourteen per month.

The Town of Golden also conducts full spectrum analyses on each well source on an annual basis for physical and chemical parameters; these results are summarized in the appended tables.

4.0 System Maintenance and Repairs

Groundwater Wells:
During the first quarter of 2023, Well 2 was offline for a motor replacement. In fall 2023, based on operational vibration levels, Well 2 was again taken offline and the pump was removed for replacement.

Well 4's main building isolation valve was found to be leaking in late fall 2022 at the bonnet packing gland. The packing gland has been tightened to eliminate leakage and replacement of the valve will be deferred pending ongoing performance of the valve.

Well 5 has been experiencing hydro service voltage fluctuations resulting in protective automatic shut-down. BC Hydro has since discontinued actively monitoring power supply at this location after having installed a voltage monitoring/recording device with no apparent cause of the infrequent fluctuations determined. Protective shut-down controls are in-place and functioning, however periodic voltage related shut-downs can result in nuisance call-outs for pump resetting.

Reservoirs:
The Town of Golden has adopted an operations and maintenance (O&M) program that includes reservoir disinfections, draining, cleaning and inspections on an approximate 5-year cycle.

In 2023 no reservoir inspections were undertaken as all reservoirs with the exception of the Hypalon were inspected with a Remotely Operated Vehicle (ROV) in 2021. A new liner was installed in the Hypalon reservoir in 2019.

Distribution System:
Hydrant inspections and maintenance, valve exercising, and dead-end main flushing occur on an annual basis.

Current and historic maintenance records are available. The Town of Golden has a GIS Mapserver which is under continuous development and is intended to be used to access maintenance information by Systems staff.

All of the Town's visible water infrastructure (i.e. water main valves, fire hydrant service valves and fire hydrants) were surveyed by Global Position Satellite (GPS) and added to the mapping data base.

5.0 System Improvements and Updates

New Infrastructure:
An 80m length of 200mm PVC watermain was installed on 6th Street North between 8th and 9th Avenues North to create a hydraulic system loop for improved fire flow capacity in the north downtown core. Work included the installation of a new 150mm ICI water service connection to a vacant commercial property and one new hydrant installation.

A new production well was completed in Dogwood Park to a depth of 32m using 250mm steel casing and SS screens.

Yard lighting at the NE Reservoir complex was improved for operator safety and dark hours working convenience.

Supervisory Control and Data Acquisition (SCADA) Equipment, Radio Equipment and Programmable Logic Controller (PLC) System Upgrades:
2023 marked the fourth year of a five-year program to undertake upgrades to all water system SCADA infrastructure including associated communications radio equipment, and PLC systems.

Metering:
In 2023 work continued with the replacement of non-radio frequency (RF) compatible water meters with six units replaced and three units installed for new ICI accounts. Work continues with meter updating with priority given to meters which are difficult to access or where high hazard cross connection control can be addressed along with a meter update/retrofit.

Source Protection Plan:
Urban Systems (USL) provides an annual update to the Municipal Water Supply Contingency Plan and provides sentry well monitoring support with lab analysis data review. USL is also available for ongoing contaminated site report reviews/guidance. USL also undertakes development reviews to identify possible impacts to the community groundwater resource and distribution system capacity on an as needed basis.

Emergency Response Plan (ERP):
The ERP is integral to the overarching Water Supply Contingency Plan. Both are reviewed annually with all contacts updated as necessary for delivery with this report to Interior Health.

Integrated Water Plan:
Work commenced on an update to the 2014 Water Distribution System Study (renamed the Integrated Water Plan). With climate change effects contemplated, the plan will include modelling analysis of the complete supply/pumping, storage and distribution network, considering current demands as well as demand related to the 10 and 25-year development horizon for the community.

Leak Detection Work:
In 2023, no main breaks occurred.

One service leak was repaired in the 500 Block of 10th Street South within the public road right-of-way and another, significant private-side leak was repaired on Selkirk Drive.

2023 was the first year of a three-year program to undertake system-wide leak detection through a contracted service.

6.0 Operator Education and Training

The Town of Golden has an established training program that follows Environmental Operator Certification Program (EOCP) guidelines for required training and certification maintenance. Operators maintain EOCP certifications annually through a variety of EOCP accredited and relevant training opportunities typically available from a variety of sources.

EOCP Current Certification:

EMPLOYEE	CERTIFICATION #	CERTIFICATION LEVEL
Alan Taylor - Systems Chief Operator	6101	WD-III, CCC Tester
Ryan Robison – Systems Operator	1000185	WD-II, CCC Tester

7.0 Cross Connection Control (CCC)

Both Systems operators are certified testers and carry out tests on all municipally owned backflow assemblies. The Town of Golden currently tests and tracks 34 backflow assembly devices (all testable devices) located on various Town owned/operated facilities.

The Town is able to confirm the proper device for any new construction according to hazard level. After construction, backflow devices installed in private buildings are added to our database so that we can track and record the testing history of each assembly installed within the Town.

The Town is a client of Maintenance Training Systems (MTS) and is using their FAST software for our CCC program. More information on this software can be found at:
http://www.mtsinc.ca/index.php?m=public&p=software&s=fast&v=features

Work continues with the CCC program with priority given to all high and prioritized medium-hazard ICI service connections.

8.0 SCADA System

Within the Supervisory Control and Data Acquisition (SCADA) system numerous control parameters are in place allowing Town of Golden staff to make changes on an as-needed basis according to ongoing process changes. All trending is done on a daily basis and is in "real time". Trending and reporting continues to be compiled into monthly and yearly reports.

The following lists itemize all currently in-place SCADA control parameters at the various water facilities.

SE Booster Station:
Discharge flow in GPM's as well as total flow
Discharge pressure
Room temperature
Reservoir Levels
Reservoir Hatch Intrusion alarm
Booster Pump Run Times
Flood alarm

NE Booster Station:
Discharge flow in GPM's
Room Temperature
Suction Pressure
Booster Pump Run Times
Reservoir Levels
Reservoir Hatch Intrusion alarm
Discharge Pressure
Flood alarm
Generator Run Status

Well Stations:
Flow totalizers in Gallons
Pump Run Times
Distribution system Pressure Transducers in "psi" at all wells
Level Transducers at Wells 4, 5, and 6
Room Temperatures
Flood alarms
Generator Run Status (where applicable)

Bulk Water Filling Station:
No flow, valve not closing
Room temperature
Flood alarm
Intrusion alarm
Power/communication failure

9.0 Events/Emergency Response

Over the course of 2023 no distribution system main breaks occurred. No water quality issues occurred requiring public notification.

10.0 Recurring and 2024 Initiatives

- Complete second year of a three-year community wide public-infrastructure distribution system leak detection program. Schedule repair work as needed;

- Continue with CCC Program and prioritize installs of back flow devices, concentrating first on those facilities with a high hazard rating. Replace existing water meters with new meters that use e-coders for totalizing and billing;

- Continue with public education campaign relating to source-to-tap education, water conservation tips and tricks, and education and enforcement relating to sprinkling bylaw regulations through proactive communications and active Bylaw patrols;

- Continue with school classroom visits and/or facility tours by staff;

- Undertake extended duration pumping test of new Well 7, proceed with groundwater licensing, design, permitting, and construction of pumphouse;

- Minor system upgrades and service repairs on an as-required basis;

- Continue to advance the Groundwater Protection Program; proceed with recommendations contained within the Groundwater Monitoring Plan, Protection Strategy, and Screening Study for Potential Groundwater at Risk of Pathogens (GARP) where and when practicable to do so;

- Update the existing Water Quality Monitoring Plan per guidance received from IH;

- Complete the final year of a five-year program of updating the current telemetry radio system and SCADA hardware and software systems.

11.0 Annual Consumption

Year	Total Annual Pumped			Maximum Day Demand				Average Day Demand (estimated)
	Volume Pumped				Volume Pumped			Volume Pumped
	Imperial Gallons	M3	Increase/Decrease Over Prior Year	Date	Imperial Gallons	M3	Increase/Decrease Over Prior Year	
2014	228,361,075	1,038,150	3.7% increase	Jul-13	1,304,971	5,933	19.4% increase	625,232
2015	223,125,807	1,014,350	2.3% decrease	Jul-05	1,325,686	6,027	1.6% increase	611,394
2016	240,422,993	1,092,985	7.8% increase	Aug-17	1,188,284	5,402	11.6% decrease	658,693
2017	277,272,091	1,260,504	15.3% increase	Jul-09	1,434,451	6,521	20.7% increase	759,650
2018	222,444,280	1,011,252	24.6% decrease	Jul-29	1,244,857	5,659	13.2% decrease	609,436
2019	213,660,331	971,319	4.1% decrease	Aug-11	1,107,329	5,034	12.4% decrease	585,371
2020	212,013,642	963,833	1.1% decrease	Aug-02	1,126,713	5,122	1.0% increase	580,859
2021	235,451,009	1,070,381	11.1% increase	Jun-29	1,373,824	6,246	21.9% increase	645,071
2022	241,672,154	1,098,663	2.6% increase	Aug-19	1,242,672	5,649	10.6% decrease	662,115
2023	207,921,753	945,231	16.2% decrease	Jul-09	1,102,046	5,010	12.8% decrease	569,649

12.0 Bacteriological Sample Analysis Results

DATE	**WELLS**					**RESERVOIRS**		
2023	**#2**	**#3**	**#4**	**#5**	**Future #7**	**NE (yellow)**	**NE (green)**	**BEARS PAW**
Jan 9	Offline	<1	<1	<1			<1	<1
Jan 16	Offline	<1	<1	<1		<1		<1
Jan 23	Offline	<1	<1	<1			<1	<1
Jan 30	Offline	<1	Offline	<1		<1		<1
Feb 6	Offline	<1	<1	<1			<1	<1
Feb 13	Offline	<1	Offline	<1		<1		<1
Feb 27	Offline	<1	<1	<1			<1	<1
Mar 6	Offline	<1	<1	<1		<1		<1
Mar 20	Offline	<1	<1	<1			<1	<1
Mar 27	Offline	<1	<1	<1		<1		<1
Apr 3	Offline	<1	<1	<1			<1	<1
Apr 17	Offline	<1	<1	<1		<1		<1
Apr 24	Offline	<1	<1	<1			<1	<1

May 1	Offline	<1	<1	<1		<1		<1
May 8	<1	<1	<1	<1			<1	<1
May 15	<1	<1	<1	<1		<1		<1
May 29	<1	<1	<1	<1			<1	<1
Jun 5	<1	<1	<1	<1		<1		<1
Jun 12	<1	<1	<1	<1			<1	<1
Jun 19	<1	<1	<1	<1		T-1, E<1		<1
Jun 26	<1	<1	<1	<1		<1	<1	<1
Jul 17	<1	<1	<1	<1		<1		<1
Jul 24	<1	<1	<1	<1			<1	<1
Jul 31	<1	<1	<1	<1		T-6, E<1		<1
Aug 3						<1	<1	
Aug 14	<1	<1	<1	<1			<1	<1
Aug 28	<1	<1	<1	<1		<1		<1
Sep 11	<1	<1	<1	<1			<1	<1
Sep 18	<1	<1	<1	<1		<1		<1
Sep 25	<1	<1	<1	<1			<1	<1
Oct 16	<1	<1	<1	<1		<1		<1
Oct 23	<1	<1	<1	<1			<1	<1
Oct 30	<1	<1	<1	<1		<1		<1
Nov 6	<1	<1	<1	<1			<1	<1
Nov 20	Offline	<1	<1	<1		<1		<1
Nov 27	Offline	<1	<1	<1			<1	<1
Dec 4	Offline	<1	<1	<1		<1		<1
Dec 11	Offline	<1	<1	<1			<1	<1
Dec 18	Offline	<1	<1	<1		<1		<1

13.0 Turbidity Analysis (NTU)

DATE	WELLS				
2023	#2	#3	#4	#5	Future #7
Jan 9	Offline	0.05	0.06	0.06	
Jan 16	Offline	0.06	0.06	0.05	
Feb 6	Offline	0.06	0.06	0.06	
Feb 13	Offline	0.05	0.05	0.06	
Mar 6	Offline	0.05	0.06	0.06	
Mar 20	Offline	0.05	0.06	0.06	
Mar 27	Offline	0.06	0.06	0.06	
Apr 3	Offline	0.06	0.06	0.06	
Apr 17	Offline	0.07	0.06	0.06	
April 24	Offline	0.06	0.06	0.06	
May 1	Offline	0.07	0.06	0.06	
May 8	0.08	0.07	0.07	0.07	
May 15	0.06	0.06	0.06	0.05	
Jun 5	0.07	0.06	0.06	0.06	

Jun 12	0.06	0.06	0.06	0.06	
Jun 19	0.07	0.05	0.07	0.06	
Jun 26	0.06	0.06	0.06	0.06	
Jul 17	0.06	0.06	0.06	0.06	
Jul 24	0.05	0.06	0.05	0.05	
Jul 31	0.05	0.06	0.06	0.06	
Aug 14	0.05	0.05	0.05	0.05	
Aug 28	0.05	0.05	0.07	0.05	
Sept 11	0.05	0.06	0.06	0.06	
Sept 18	0.05	0.06	0.06	0.05	
Oct 30	0.06	0.06	0.06	0.06	
Nov 6	0.06	0.05	0.07	0.05	
Nov 20	Offline	0.05	0.06	0.05	
Nov 27	Offline	0.06	0.06	0.06	
Dec 11	Offline	0.06	0.07	0.05	
Dec 18	Offline	0.05	0.05	0.05	
Average	0.06	0.06	0.06	0.06	
Hi	0.08	0.07	0.07	0.07	
Low	0.05	0.05	0.05	0.05	

14.0 Summary

The Town of Golden has worked with Interior Health officials since 2002 to develop and maintain a water quality monitoring program that exceeds the Drinking Water Regulation. The Town will continue with this monitoring program as part of its commitment to deliver a safe potable water supply to the community.

This report will be posted on the Town of Golden's website for public information following receipt by Council.

Respectfully,

Chris Cochran, AScT,
Director of Public Works

Attachment

Drinking Water Package - ALS Environmental

Well #2										
Year	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**RDL**	**Units**	**GCDWQ**
Misc. Inorganics							OFFLINE			
Fluoride (F)	0.09	0.09	0.070	0.068	0.065	0.086		0.02	mg/L	1.5
ANIONS										
Nitrite (N)	<0.005	<0.010	<0.0010	<0.0010	<0.0010	<0.0010		0.001	mg/L	1
Calculated Parameters										
Total Hardness (CaCO3)	142		138	158	153	144		0.50	mg/L	
Nitrate (N)	0.24	0.21	0.22	0.209	0.222	0.252		0.005	mg/L	10
Misc. Inorganics										
Alkalinity (Total as CaCO3)	141	130	142	134	141	144		1.0	mg/L	
Alkalinity (PP as CaCO3)	<1.0	<1.0	<2.0	<2.0	<1.0	<1.0		2.0	mg/L	
Bicarbonate (HCO3)	172	160	142	134	141	144		1.0	mg/L	
Carbonate (CO3)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		0.5	mg/L	
Hydroxide (OH)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		0.5	mg/L	
Anions										
Dissolved Sulphate (SO4)	19.7	20	18.5	18.2	16.4	18.3		0.3	mg/L	500
Dissolved Chloride (Cl)	8.4	11	10.4	8.08	8.75	11.4		0.5	mg/L	250
MISCELLANEOUS										
True Colour	<5	<2	<5	<5.0	<5.0	<5.0		5.0	TCU	15
Nutrients										
Nitrate plus Nitrite (N)	0.24	0.21	0.216	0.209	0.222	0.252		0.005	mg/L	
Physical Properties										
Conductivity	314	310	303	295	306	303		2.0	uS/cm	
pH	8.2	8.2	8.15	8.11	8.09	7.92		0.1	pH Units	7.0-10.5
Physical Properties										
Total Dissolved Solids	156	200	174	189	158	186		20	mg/L	500
Turbidity	0.3	<0.1	<0.1	<0.10	<0.10	<0.10		0.1	NTU	1
Total Metals by Atomic Spectroscopy										
Total Aluminum (Al)	0.012	0.012	0.0041	0.0039	<0.0030	0.0044		0.003	mg/L	0.1
Total Antimony (Sb)	<0.0005	<0.0006	<0.0001	<0.00010	<0.00010	<0.00010		0.0001	mg/L	0.006
Total Arsenic (As)	<0.0001	<0.0002	<0.0001	<0.00010	<0.00010	<0.00010		0.0001	mg/L	0.01
Total Barium (Ba)	0.054		0.0552	0.0553	0.0572	0.0554		0.0001	mg/L	1
Total Boron (B)	<0.05		<0.010	<0.010	<0.010	<0.010		0.01	mg/L	5
Total Cadmium (Cd)	<0.00001	0.00003	<0.000005	<0.0000050	<0.0000050	<0.0000050		0.000005	mg/L	0.005
Total Chromium (Cr)	<0.001	<0.001	0.00019	38.0	<0.00050	<0.00050		0.0001	mg/L	0.05
Total Cobalt (Co)	<0.0002	<0.0003	<0.00010	0.00018	<0.00010	<0.00010		0.00010	mg/L	
Total Copper (Cu)	0.0011	0.0009	0.00112	<0.00010	0.00127	0.00106		0.00050	mg/L	1
Total Iron (Fe)	<0.005		<0.010	0.00108	<0.010	<0.010		0.010	mg/L	0.3
Total Lead (Pb)	<0.0002	<0.0002	0.000056	<0.00005	<0.000050	<0.000050		0.000050	mg/L	0.01
Total Manganese (Mn)	<0.001		<0.00010	<0.00010	<0.00010	<0.00010		0.00010	mg/L	0.05
Total Mercury (Hg)	<0.00001	<0.0020	<0.0000050	<0.0000050	<0.0000050	<0.0000050		0.0000050	mg/L	0.001
Total Molybdenum (Mo)	<0.001	0.00076	0.000575	0.000614	0.000673	0.000651		0.000050	mg/L	
Total Nickel (Ni)	<0.001	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050		0.00050	mg/L	
Total Selenium (Se)	<0.0001	<0.0002	<0.000050	<0.000050	<0.000050	<0.000050		0.000050	mg/L	0.05
Total Silver (Ag)	<0.00002	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010		0.000010	mg/L	
Total Uranium (U)	0.0005	0.00054	0.000481	0.000540	0.000511	0.000453		0.000010	mg/L	0.02
Total Vanadium (V)	<0.005	<0.001	<0.00050	<0.00050	<0.00050	<0.00050		0.00050	mg/L	
Total Zinc (Zn)	<0.005	<0.003	<0.0030	<0.0030	<0.0030	<0.0030		0.0030	mg/L	5
Total Calcium (Ca)	34.9		32.7	38.0	35.9	36.5		0.050	mg/L	
Total Magnesium (Mg)	13.4		13.7	15.2	15.4	13.7		0.0050	mg/L	
Total Potassium (K)	0.55		0.562	0.535	0.572	0.554		0.050	mg/L	
Total Sodium (Na)	5.9		6.74	6.46	7.38	8.26		0.050	mg/L	200
Total Sulphur (S)	6.7		6.01	6.56	6.63	6.87		0.50	mg/L	

Maximum Acceptable Concentration
Interem Maximum Allowable Concentration
Operation Guidline
Asthetic Objective

RDL - Reported Detection Limit
mg/L - Milligrams Per Litre
TCU - True Colour Unit
mS/cm - Microsiemens Per Centimeter
NTU - Nephelometric Colour Unit

Well #3										
Year	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**RDL**	**Units**	**GCDWQ**
Misc. Inorganics										
Fluoride (F)	0.09	0.10	0.071	0.069	0.064	0.086	0.086	0.02	mg/L	1.5
ANIONS										
Nitrite (N)	<0.005	<0.010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	mg/L	1
Calculated Parameters										
Total Hardness (CaCO3)	165		163	184	178	186	175	0.50	mg/L	
Nitrate (N)	0.55	0.61	0.589	0.636	0.550	0.633	0.564	0.005	mg/L	10
Misc. Inorganics										
Alkalinity (Total as CaCO3)	152	150	159	151	162	156	162	1.0	mg/L	
Alkalinity (PP as CaCO3)	<1.0	<1.0	<2.0	<2.0	<1.0	<1.0	<1.0	2.0	mg/L	
Bicarbonate (HCO3)	185	180	159	151	162	156	162	1.0	mg/L	
Carbonate (CO3)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.5	mg/L	
Hydroxide (OH)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.5	mg/L	
Anions										
Dissolved Sulphate (SO4)	18.1	20.0	18.4	18.9	17.8	19.1	19.7	0.3	mg/L	500
Dissolved Chloride (Cl)	13	19	15.3	15.4	15.2	15.9	14.6	0.5	mg/L	250
MISCELLANEOUS										
True Colour	9.2	<2	<5	<5.0	<5.0	<5.0	<5.0	5.0	TCU	15
Nutrients										
Nitrate plus Nitrite (N)	0.55	0.61	0.589	0.636	0.550	0.633	0.564	0.005	mg/L	
Physical Properties										
Conductivity	349	360	303	347	358	344	315	2.0	uS/cm	
pH	8.3	8.1	8.20	8.18	8.10	7.99	8.10	0.1	pH Units	7.0-10.5
Physical Properties										
Total Dissolved Solids	182	220	189	181	182	195	220	20	mg/L	500
Turbidity	0.26	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	0.1	NTU	1
Total Metals by Atomic Spectroscopy										
Total Aluminum (Al)	0.011	0.004	0.0049	0.0030	<0.0030	0.0038	<0.0030	0.003	mg/L	0.1
Total Antimony (Sb)	<0.0005	<0.0006	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	mg/L	0.006
Total Arsenic (As)	<0.0001	<0.0002	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	mg/L	0.01
Total Barium (Ba)	0.117		0.1290	0.127	0.144	0.126	0.136	0.0001	mg/L	1
Total Boron (B)	<0.05		<0.010	<0.010	<0.010	<0.010	<0.010	0.01	mg/L	5
Total Cadmium (Cd)	<0.00001	<0.00002	<0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000005	mg/L	0.005
Total Chromium (Cr)	<0.001	<0.0010	0.00057	0.00055	0.00050	<0.00050	0.00052	0.0001	mg/L	0.05
Total Cobalt (Co)	<0.0002	<0.0003	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	mg/L	
Total Copper (Cu)	0.0009	0.0009	0.00132	0.00061	0.00097	0.00083	0.00094	0.00050	mg/L	1
Total Iron (Fe)	<0.005		<0.010	<0.010	<0.010	<0.010	<0.010	0.010	mg/L	0.3
Total Lead (Pb)	<0.0002	<0.0002	0.000065	<0.000050	<0.000050	<0.000050	<0.000058	0.000050	mg/L	0.01
Total Manganese (Mn)	<0.001		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	mg/L	0.05
Total Mercury (Hg)	<0.00001	<0.0020	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000050	mg/L	0.001
Total Molybdenum (Mo)	<0.001	0.001	0.000573	0.000590	0.000631	0.000662	0.000618	0.000050	mg/L	
Total Nickel (Ni)	<0.001	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	mg/L	
Total Selenium (Se)	<0.0001	<0.0002	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	mg/L	0.05
Total Silver (Ag)	<0.00002	<0.0001	<0.000010	3.16	<0.000010	<0.000010	<0.000010	0.000010	mg/L	
Total Uranium (U)	0.0007	0.00070	0.000656	0.000693	0.000666	0.000611	0.000662	0.000010	mg/L	0.02
Total Vanadium (V)	<0.005	0.0014	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	mg/L	
Total Zinc (Zn)	<0.005	<0.003	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0030	mg/L	5
Total Calcium (Ca)	31.3		30.8	34.8	33.5	35.7	33.8	0.050	mg/L	
Total Magnesium (Mg)	21.2		20.8	23.6	22.8	23.4	22.0	0.0050	mg/L	
Total Potassium (K)	0.73		0.817	0.852	0.761	0.843	0.784	0.050	mg/L	
Total Sodium (Na)	7.0		9.85	11.0	9.82	10.10	8.50	0.050	mg/L	200
Total Sulphur (S)	6.4		6.17	6.79	7.17	7.93	7.67	0.50	mg/L	

Maximum Acceptable Concentration
Interem Maximum Allowable Concentration
Operation Guidline
Asthetic Objective

RDL - Reported Detection Limit
mg/L - Milligrams Per Litre
TCU - True Colour Unit
mS/cm - Microsiemens Per Centimeter
NTU - Nephelometric Colour Unit

Well #4										
Year	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**RDL**	**Units**	**GCDWQ**
Misc. Inorganics										
Fluoride (F)	0.06		0.036	0.041	0.037	0.051	<0.100	0.02	mg/L	1.5
ANIONS										
Nitrite (N)	<0.005	<0.03	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	0.001	mg/L	1
Calculated Parameters										
Total Hardness (CaCO3)	396		420	424	411	434	433	0.50	mg/L	
Nitrate (N)	1.64	7.8	1.76	1.75	1.73	1.74	1.80	0.005	mg/L	10
Misc. Inorganics										
Alkalinity (Total as CaCO3)	356	370	362	351	358	360	382	1.0	mg/L	
Alkalinity (PP as CaCO3)	<1.0	<1.0	<2.0	<2.0	<1.0	<1.0	<1.0	2.0	mg/L	
Bicarbonate (HCO3)	434	450	362	351	358	360	382	1.0	mg/L	
Carbonate (CO3)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.5	mg/L	
Hydroxide (OH)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.5	mg/L	
Anions										
Dissolved Sulphate (SO4)	42.8	41	39.2	39.7	38.1	40.8	41.7	0.3	mg/L	500
Dissolved Chloride (Cl)	110	110	101.0	99.5	98.7	108.0	112.0	0.5	mg/L	250
MISCELLANEOUS										
True Colour	17.3	2.2	<5	<5.0	<5.0	<5.0	<5.0	5.0	TCU	15
Nutrients										
Nitrate plus Nitrite (N)	1.64	1.8	1.760	1.75	1.73	1.74	1.8	0.005	mg/L	
Physical Properties										
Conductivity	1050	1000	968	922	984	980	972	2.0	uS/cm	
pH	8.26	7.9	7.95	8.14	8.04	7.79	7.57	0.1		7.0-10.5
Physical Properties										
Total Dissolved Solids	580	560	544	557	494	585	468	20	mg/L	500
Turbidity	1.03	<0.1	0.17	0.12	<0.10	<0.10	<0.10	0.1	NTU	1
Total Metals by Atomic Spectroscopy										
Total Aluminum (Al)	0.010	0.0035	<0.003	<0.0030	<0.0030	<0.0030	<0.0030	0.003	mg/L	0.1
Total Antimony (Sb)	<0.0005	<0.0006	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	mg/L	0.006
Total Arsenic (As)	<0.0001	<0.0002	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	mg/L	0.01
Total Barium (Ba)	0.24		0.2290	0.209	0.245	0.222	0.254	0.0001	mg/L	1
Total Boron (B)	<0.05		0.014	0.012	0.014	0.013	0.016	0.01	mg/L	5
Total Cadmium (Cd)	<0.00001	<0.00002	<0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000005	mg/L	0.005
Total Chromium (Cr)	<0.001	<0.001	0.00012	0.00012	<0.00050	<0.00050	<0.00050	0.0001	mg/L	0.05
Total Cobalt (Co)	<0.0002	<0.0003	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	mg/L	
Total Copper (Cu)	0.0016	0.0023	0.00654	0.00250	0.00338	0.00304	0.00136	0.00050	mg/L	1
Total Iron (Fe)	<0.005		<0.010	<0.010	<0.010	<0.010	<0.010	0.010	mg/L	0.3
Total Lead (Pb)	<0.0002	<0.0002	0.000697	0.000314	0.000401	0.000263	0.000139	0.000050	mg/L	0.01
Total Manganese (Mn)	<0.001		<0.00010	<0.00010	<0.00010	0.00010	<0.00010	0.00010	mg/L	0.05
Total Mercury (Hg)	<0.00001	<0.0020	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000050	mg/L	0.001
Total Molybdenum (Mo)	<0.001	<0.0002	0.000243	0.000173	0.000235	0.000178	0.000194	0.000050	mg/L	
Total Nickel (Ni)	<0.001	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	mg/L	
Total Selenium (Se)	<0.0001	<0.0002	0.000101	<0.000050	0.000111	0.000069	0.000113	0.000050	mg/L	0.05
Total Silver (Ag)	<0.00002	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	mg/L	
Total Uranium (U)	0.0013	0.0014	0.00128	0.00124	0.00118	0.00111	0.00124	0.000010	mg/L	0.02
Total Vanadium (V)	<0.005	0.001	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	mg/L	
Total Zinc (Zn)	<0.005	0.005	0.0217	0.0121	0.0143	0.0127	0.0046	0.0030	mg/L	5
Total Calcium (Ca)	89.7		95.1	97.8	93.1	100.0	99.3	0.050	mg/L	
Total Magnesium (Mg)	41.7		44.3	43.7	43.4	44.7	44.9	0.0050	mg/L	
Total Potassium (K)	1.96		2.02	1.89	1.91	2.06	2.10	0.050	mg/L	
Total Sodium (Na)	59.0		62.0	59.8	61.0	71.0	67.0	0.050	mg/L	200
Total Sulphur (S)	15.5		14.6	14.8	14.8	17.1	16.4	0.50	mg/L	

Maximum Acceptable Concentration
Interem Maximum Allowable Concentration
Operation Guidline
Asthetic Objective

RDL - Reported Detection Limit
mg/L - Milligrams Per Litre
TCU - True Colour Unit
mS/cm - Microsiemens Per Centimeter
NTU - Nephelometric Colour Unit

Well #5										
Year	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**RDL**	**Units**	**GCDWQ**
Misc. Inorganics										
Fluoride (F)	0.09		0.065	0.067	0.063	0.083	0.084	0.02	mg/L	1.5
ANIONS										
Nitrite (N)	<0.005	<0.033	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	mg/L	1
Calculated Parameters										
Total Hardness (CaCO3)	174		177	199	199	192	185	0.50	mg/L	
Nitrate (N)	0.52	2.1	0.497	0.520	0.552	0.482	0.440	0.005	mg/L	10
Misc. Inorganics										
Alkalinity (Total as CaCO3)	168	160	174	172	192	174	176	1.0	mg/L	
Alkalinity (PP as CaCO3)	<1.0	<1.0	<2.0	<2.0	<1.0	<1.0	<1.0	2.0	mg/L	
Bicarbonate (HCO3)	205	190	174	172	192	174	176	1.0	mg/L	
Carbonate (CO3)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.5	mg/L	
Hydroxide (OH)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.5	mg/L	
Anions										
Dissolved Sulphate (SO4)	21.2	23	20.8	21.3	20.3	21.6	22.6	0.3	mg/L	500
Dissolved Chloride (Cl)	15	16	17.0	18.0	21.3	16.4	14.5	0.5	mg/L	250
MISCELLANEOUS										
True Colour	5		<5	<5.0	<5.0	<5.0	<5.0	5.0	TCU	15
Nutrients										
Nitrate plus Nitrite (N)	0.52	0.47	0.497	0.52	0.552	0.482	0.44	0.005	mg/L	
Physical Properties										
Conductivity	390	390	391	374	433	369	350	2.0	uS/cm	
pH	8.29	8.13	8.23	8.20	8.16	7.99	8.08	0.1		7.0-10.5
Physical Properties										
Total Dissolved Solids	200	190	222	218	214	216	226	20	mg/L	500
Turbidity	0.3		<0.1	<0.10	<0.10	<0.10	<0.10	0.1	NTU	1
Total Metals by Atomic Spectroscopy										
Total Aluminum (Al)	0.012	0.005	0.0088	0.0036	<0.0030	<0.0030	0.0031	0.003	mg/L	0.1
Total Antimony (Sb)	<0.0005	<0.0006	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	mg/L	0.006
Total Arsenic (As)	<0.0001	<0.0002	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	0.0001	mg/L	0.01
Total Barium (Ba)	0.076		0.0762	0.0796	0.0834	0.0779	0.0772	0.0001	mg/L	1
Total Boron (B)	<0.05		<0.010	<0.010	<0.010	<0.010	<0.010	0.01	mg/L	5
Total Cadmium (Cd)	<0.00001	<0.00002	<0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.000005	mg/L	0.005
Total Chromium (Cr)	<0.001	<0.001	0.00033	0.00038	<0.00050	<0.00050	<0.00050	0.0001	mg/L	0.05
Total Cobalt (Co)	<0.0002	<0.0003	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	mg/L	
Total Copper (Cu)	0.0007	0.0007	0.00142	0.00062	0.00129	0.00054	<0.00050	0.00050	mg/L	1
Total Iron (Fe)	<0.010		0.011	<0.010	<0.010	<0.010	<0.010	0.010	mg/L	0.3
Total Lead (Pb)	<0.0002	<0.0002	0.000057	<0.000050	<0.000050	<0.000050	<0.000050	0.000050	mg/L	0.01
Total Manganese (Mn)	<0.001		0.00012	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	mg/L	0.05
Total Mercury (Hg)	<0.00001	<0.0020	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000050	mg/L	0.001
Total Molybdenum (Mo)	<0.001	0.0005	0.000528	0.000502	0.000773	0.000545	0.000557	0.000050	mg/L	
Total Nickel (Ni)	<0.001	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	mg/L	
Total Selenium (Se)	<0.0001	<0.0002	0.000055	<0.000050	0.000069	<0.000050	0.000063	0.000050	mg/L	0.05
Total Silver (Ag)	<0.00002	<0.0001	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000010	mg/L	
Total Uranium (U)	0.0006	0.00063	0.00058	0.000570	0.000600	0.000542	0.000596	0.000010	mg/L	0.02
Total Vanadium (V)	<0.005	0.002	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00050	mg/L	
Total Zinc (Zn)	<0.005	<0.003	0.0038	<0.0030	<0.0030	<0.0030	<0.0030	0.0030	mg/L	5
Total Calcium (Ca)	41.0		40.9	45.1	45.9	46.0	43.2	0.050	mg/L	
Total Magnesium (Mg)	17.3		18.3	21.1	20.5	18.7	18.8	0.0050	mg/L	
Total Potassium (K)	0.91		0.98	1.01	1.04	0.977	0.935	0.050	mg/L	
Total Sodium (Na)	9.23		10.6	12.1	13.7	12.2	10.2	0.050	mg/L	200
Total Sulphur (S)	6.4		7.04	7.03	8.20	9.04	8.72	0.50	mg/L	

Maximum Acceptable Concentration
Interem Maximum Allowable Concentration
Operation Guidline
Asthetic Objective

RDL - Reported Detection Limit
mg/L - Milligrams Per Litre
TCU - True Colour Unit
mS/cm - Microsiemens Per Centimeter
NTU - Nephelometric Colour Unit