



MONTHLY REPORTING PERIOD - MARCH, 2023

SUMMARY

This document provides a summary of the water quality information collected by BMID in March 2023. Documentation and figures are provided on the following pages to support this submission.

WATER SUPPLY & USAGE SUMMARY

1. Water usage data for March is as follows:

Source	Total (US Gals)	Total (Mega Litres)
Mission Creek	64,026,958	242.34
Well 4	2,419,269	9.16
Well 5	0	0
Well 6 (Irrigation Only)	0	0
Scotty Creek (Irrigation Only)	0	0
Total	66,446,227	251.50

2. BMID's control gates on the high-elevation reservoirs are closed for the winter/spring. The gates will remain closed until summer of 2023;
3. BMID's Scotty Creek source supplying irrigation water to the north-end of the service area, provided water from May 27th, 2022 to September 9th 2022 when irrigation demands in the north-end reduced from peak flows experienced earlier in summer. The Scotty Creek source will resume service in the summer of 2023;
4. Well #4, used as a primary source for domestic water in the north-end of the distribution system, was in operation throughout the month of March;
5. Well #5, used as the primary domestic water source in the north-end of the system for both irrigation and domestic consumption during the summer months, was placed in stand-by mode on October 12th 2022, and will remain in stand-by until flows increase in the spring of 2023;
6. Well #6, which supplies water to the north-end irrigation distribution system, ran from May 26 to September 25, 2022. Well #6 will remain in stand-by mode until irrigation demands increase in the spring/summer of 2023;
7. A portion of the BMID's transmission main west of the Mission Creek Intake and east of the tunnel is located on an unstable slope. Slope movement continues to be monitored. It is currently stable and is not moving;

WATER QUALITY SUMMARY

1. The WTP ran from March 12th until March 30th due to increased turbidity in Mission Creek raw water resulting from increased temperatures. The WTP was then placed back in stand-by mode as turbidity dropped late in the month. The WTP will remain in stand-by until turbidity again rises later in the spring;
2. Raw water turbidity levels in Mission Creek peaked at 3.39 NTU (average daily turbidity) on March 22nd. Average daily raw water turbidity for March was 1.89 NTU at the Mission Creek intake;
3. The highest turbidity level at the Distribution Intake (end of Hadden Reservoir) was 0.87 NTU on March 21st, 2023. Average settled water turbidity for March was 0.60 NTU at the Distribution Intake at the lower end of Hadden Reservoir;
4. The highest turbidity level at the first customer (Booster #1) was 0.49 NTU on March 13th. Average monthly turbidity at the first customer was 0.46 NTU;
5. The highest turbidity daily average at the UV plant was 0.49 NTU on March 3rd. Average monthly turbidity at the UV plant was 0.46 NTU throughout March;
6. BMID's Ultraviolet Treatment Facility treated 242,368.5 m³ of water, none of which was "Off-Spec" (0.00%);
7. Regarding microbiological readings, the Mission Creek watershed was frozen over throughout the month of March resulting in a greater groundwater influence on the raw water quality. However, as rising temperatures melt the lower portions of the watershed, Mission Creek will have greater variability in microbiological conditions as surface water runoff begins to affect creek conditions;
8. *E. Coli* levels at Mission Creek's Point-of-Diversion (creek intake prior to WTP) had average counts for March. The March 20th sample had the peak monthly count of 54 coliforms. The average monthly *E. Coli* was 23.75, based on 4 samples;
9. *E. Coli* levels in the raw water at the water distribution system intake at the east end of Hadden Reservoir, immediately prior to disinfection, had peak counts of 5 coliforms on March 13th. The average monthly *E. Coli* was 1.5, based on 4 samples. Reduction in *E. Coli* levels is due to the settling of particles as water passes through Stevens and Hadden Reservoirs;
10. No *E. Coli* or *Total Coliforms* were found in treated water in the distribution system through third-party analysis. In addition, zero positive samples were detected by BMID's in-house presence/absence testing throughout March;

1.0 FLOWS - MARCH, 2023

The Maximum Daily Flow was on March 9th, at 2,464,962 US gallons (9.33 ML)

The Minimum Daily Flow was on March 29th, at 2,009,714 US gallons (7.61 ML)

Mission Creek provided just over 96% of domestic flow supplied in March.

Figure 1.1 - Domestic Water System Flow

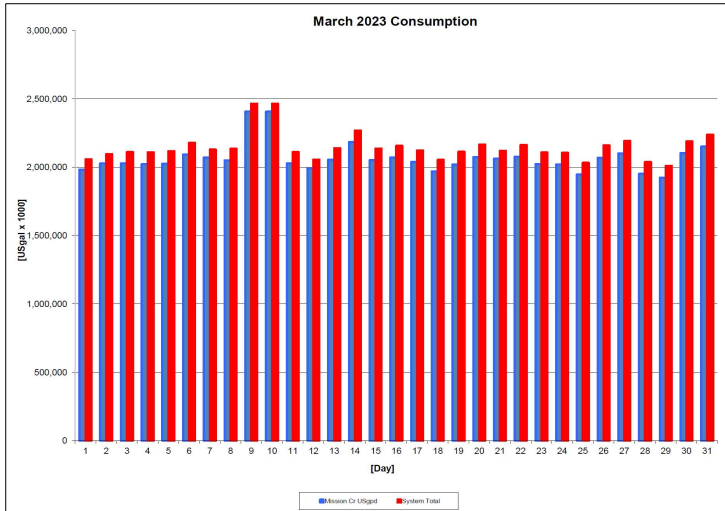


Table 1.2 - March 2023 - Daily Consumption Report

Year	Mission Cr	Well #4	Well #5	System Total	System Total
2023	Usqpd	Usqpd	Usqpd	Usqpd	ML/Day
1-Mar	1,983,298	74,496	0.0	2,057,794	7.79
2-Mar	2,027,784	67,628	0.0	2,095,412	7.93
3-Mar	2,027,837	83,214	0.0	2,111,051	7.99
4-Mar	2,022,448	86,912	0.0	2,109,360	7.98
5-Mar	2,026,094	90,874	0.0	2,116,968	8.01
6-Mar	2,093,231	84,534	0.0	2,177,766	8.24
7-Mar	2,071,548	57,061	0.0	2,128,609	8.06
8-Mar	2,050,503	84,006	0.0	2,134,509	8.08
9-Mar	2,406,316	58,646	0.0	2,464,962	9.33
10-Mar	2,406,369	57,589	0.0	2,463,958	9.33
11-Mar	2,027,758	82,949	0.0	2,110,707	7.99
12-Mar	1,992,887	63,137	0.0	2,056,024	7.78
13-Mar	2,055,919	83,742	0.0	2,139,660	8.10
14-Mar	2,184,412	83,742	0.0	2,268,154	8.58
15-Mar	2,051,084	85,327	0.0	2,136,411	8.09
16-Mar	2,071,610	85,327	0.0	2,156,937	8.16
17-Mar	2,037,268	84,270	0.0	2,121,538	8.03
18-Mar	1,969,112	84,270	0.0	2,053,382	7.77
19-Mar	2,020,308	92,460	0.0	2,112,768	8.00
20-Mar	2,073,750	92,460	0.0	2,166,210	8.20
21-Mar	2,062,761	56,532	0.0	2,119,293	8.02
22-Mar	2,077,000	85,327	0.0	2,162,326	8.18
23-Mar	2,023,003	85,327	0.0	2,108,330	7.98
24-Mar	2,019,648	85,063	0.0	2,104,711	7.97
25-Mar	1,947,185	85,063	0.0	2,032,248	7.69
26-Mar	2,068,467	90,610	0.0	2,159,077	8.17
27-Mar	2,100,960	90,610	0.0	2,191,570	8.30
28-Mar	1,951,465	86,119	0.0	2,037,584	7.71
29-Mar	1,923,595	86,119	0.0	2,009,714	7.61
30-Mar	2,102,133	85,855	0.0	2,187,988	8.28
31-Mar	2,151,205	85,855	0.0	2,237,061	8.47
Totals Usqpd	64,026,958	2,419,269	0	66,446,227	251.50
Totals ML	242.34	9.16	0.00	251.50	
Avg's	2,062,525	7.81		2,143,167	8.11
Max	2,406,369	9.11		2,464,962	9.33
Min	1,923,595	7.28		2,009,714	7.61

2.0 RAW WATER QUALITY - BACTERIOLOGICAL MONITORING

Raw water samples were taken at three points at BMID settling ponds before chlorination.

Samples were taken at the Distribution Intake's Point of Disinfection and at the Mission Creek raw water Point of Diversion and at Stevens Pond outlet (point halfway between WTP Outlet and Distribution Intake).

Samples from the previous month are also provided to show a two-month trend

The upper watershed is frozen over with snow cover and no overland flow to the creeks in the watershed. However, the lower elevations of the watershed have begun to melt resulting in increased E.Coli levels compared to the previous month. Moreover, The *E.Coli* readings confirm the WTP's effectiveness in reducing raw water quality risks with coagulation, flocculation, and sedimentation process followed by settling times across Stevens and Hadden Reservoirs.

Figure 2.1 - Raw Water *E.Coli* Readings (CARO Lab results) February 2023 - March 2023

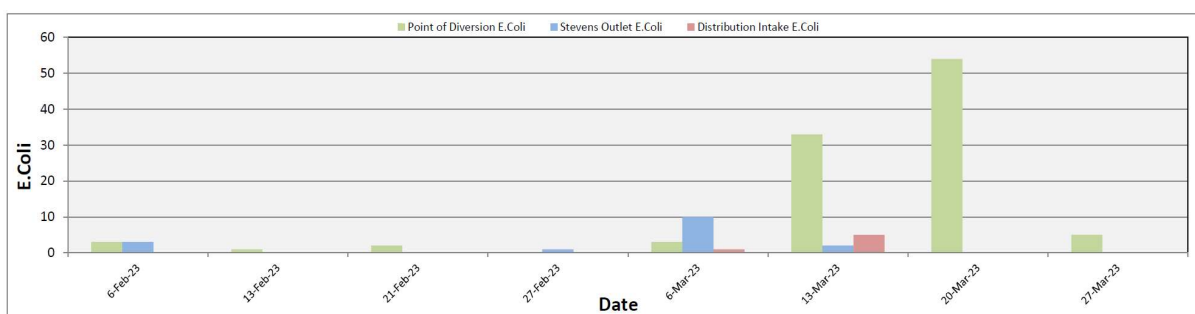


Table 2.1 - *E.Coli* Readings (CARO Labs)

Date	Point of Diversion E.Coli	Stevens Outlet E.Coli	Distribution Intake E.Coli
6-Feb-23	3	3	0
13-Feb-23	1	0	0
21-Feb-23	2	0	0
27-Feb-23	0	1	0
6-Mar-23	3	10	1
13-Mar-23	33	2	5
20-Mar-23	54	0	0
27-Mar-23	5	0	0

Stevens or WTP Intake (Raw) - Sampling of raw water at intake from Mission Creek

Stevens Outlet (Raw) - Sampling point after exiting 142,000 m³ 1st upper balancing reservoir (Stevens Res.)

Hadden Outlet (Raw) - Sampling point after exiting 75,000 m³ 2nd lower balancing reservoir (Hadden Res.)

(Hadden Outlet = Distribution Intake - Point of Disinfection)

3.0 RAW AND TREATED WATER TURBIDITY

Through March 2023, turbidity for the Mission Creek source was measured at Booster Station No. 1 on Gallagher’s Road, which is the approximate location of the first-customer. The highest turbidity level recorded at this location was 0.49 NTU on March 13th, 2023. The lowest turbidity level was 0.41 NTU and the average turbidity was 0.46 NTU.

The distribution intake is where the water leaves Hadden Reservoir and enters a closed conduit. Turbidity levels are greatly reduced through the settling process as Mission Creek treated water makes its way through the reservoirs.

Figure 3.1 – Daily Turbidity Readings (Mission Creek Raw - Distribution Intake - Booster Station 1 and UV Plant)

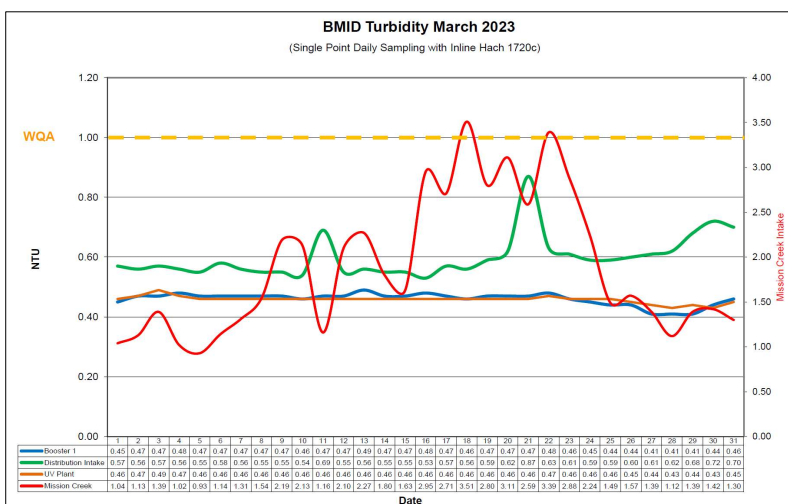


Table 3.1 - Daily Monitoring Record – Turbidity at On-Line Turbidity Analysers

Turbidity Point Sampling for March 2023				
Date	Mission Creek Intake	Distribution Intake	Booster#1- First User	UV Plant
	Daily Average [NTU]	Daily Average NTU	Daily Average NTU	Daily Average [NTU]
1	1.04	0.57	0.45	0.46
2	1.13	0.56	0.47	0.47
3	1.39	0.57	0.47	0.49
4	1.02	0.56	0.48	0.47
5	0.93	0.55	0.47	0.46
6	1.14	0.58	0.47	0.46
7	1.31	0.56	0.47	0.46
8	1.54	0.55	0.47	0.46
9	2.19	0.55	0.47	0.46
10	2.13	0.54	0.46	0.46
11	1.16	0.69	0.47	0.46
12	2.10	0.55	0.47	0.46
13	2.27	0.56	0.49	0.46
14	1.80	0.55	0.47	0.46
15	1.63	0.55	0.47	0.46
16	2.95	0.53	0.48	0.46
17	2.71	0.57	0.47	0.46
18	3.51	0.56	0.46	0.46
19	2.80	0.59	0.47	0.46
20	3.11	0.62	0.47	0.46
21	2.59	0.87	0.47	0.46
22	3.39	0.63	0.48	0.47
23	2.88	0.61	0.46	0.46
24	2.24	0.59	0.45	0.46
25	1.49	0.59	0.44	0.46
26	1.57	0.60	0.44	0.45
27	1.39	0.61	0.41	0.44
28	1.12	0.62	0.41	0.43
29	1.39	0.68	0.41	0.44
30	1.42	0.72	0.44	0.43
31	1.30	0.70	0.46	0.45
AVG	1.89	0.60	0.46	0.46

4.0 CHLORINE CONTACT TIME

Temperature, pH, peak flow and chlorine residual levels are recorded to determine the CT levels that are required to provide 3 log inactivation of *Giardia*. Chlorine Contact times exceeded the CT levels required to provide 3 log (99.9%) inactivation of *Giardia Lamblia* throughout the month of March, 2023.

Figure 4.1 - CT Trending – BMID Mission Creek Source – March 2023

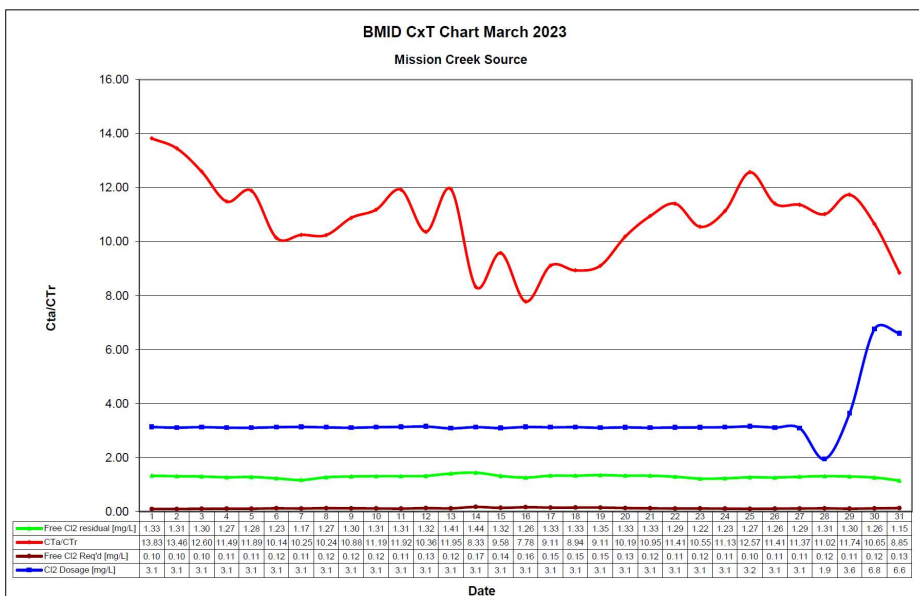


Table 4.2 - CT Table – Mission Creek Source

BMID March 2023 Mission Creek Source													
DATE	pH	TEMP	PEAK	Free Cl ₂	CT	CT	CTa/CTR	Free Cl ₂	Cl ₂	VOLUME	TIME	FLOW	Cl ₂ DOSAGE
	(Average)	(Present)	FLOW	residual	achieved	req'd		Req'd	Dosage	TOTAL	[mins]	Daily Average	Average
March		[°C]	[Usgpm]	[mg/L]				[mg/L]	[mg/L]	[USgal]		[USGPM]	[PPD]
1	7.63	11.2	1870	1.33	1884.1	136.3	13.83	0.10	3.1	2649600	1417	1392	52.4
2	7.63	11.6	1950	1.31	1779.6	132.3	13.46	0.10	3.1	2649600	1358	1434	53.6
3	7.63	11.6	2070	1.30	1664.0	132.1	12.60	0.10	3.1	2649600	1280	1423	53.5
4	7.63	9.6	1937	1.27	1737.3	151.2	11.49	0.11	3.1	2649600	1368	1389	51.9
5	7.63	9.9	1924	1.28	1762.5	148.3	11.89	0.11	3.1	2649600	1377	1433	53.5
6	7.64	8.5	1972	1.23	1652.8	163.0	10.14	0.12	3.1	2649600	1344	1454	54.6
7	7.68	9.5	1976	1.17	1569.0	153.1	10.25	0.11	3.1	2649600	1341	1439	54.2
8	7.68	9.8	2164	1.27	1554.7	151.8	10.24	0.12	3.1	2649600	1224	1439	54.0
9	7.72	9.5	2007	1.30	1715.8	157.7	10.88	0.12	3.1	2649600	1320	1428	53.3
10	7.73	9.3	1931	1.31	1797.2	160.7	11.19	0.12	3.1	2649600	1372	1426	53.6
11	7.71	10.3	1956	1.31	1774.6	148.8	11.92	0.11	3.1	2649600	1355	1396	52.6
12	7.67	8.1	1972	1.32	1773.8	171.2	10.36	0.13	3.1	2649600	1344	1450	54.9
13	7.64	8.8	1919	1.41	1947.1	163.0	11.95	0.12	3.1	2649600	1381	1466	54.3
14	7.68	7.7	2561	1.44	1489.6	178.9	8.33	0.17	3.1	2649600	1034	1527	57.4
15	7.72	7.4	1996	1.32	1751.9	182.8	9.58	0.14	3.1	2649600	1327	1457	54.2
16	7.72	6.3	2190	1.26	1524.6	196.0	7.78	0.16	3.1	2649600	1210	1450	54.6
17	7.72	6.3	1958	1.33	1800.2	197.6	9.11	0.15	3.1	2649600	1354	1431	53.7
18	7.72	6.4	2010	1.33	1753.4	196.2	8.94	0.15	3.1	2649600	1318	1386	52.1
19	7.72	6.2	1969	1.35	1816.3	199.4	9.11	0.15	3.1	2649600	1345	1431	53.4
20	7.70	7.3	1889	1.33	1865.2	183.0	10.19	0.13	3.1	2649600	1402	1457	54.6
21	7.74	8.6	1897	1.33	1857.4	169.6	10.95	0.12	3.1	2649600	1397	1461	54.5
22	7.82	10.2	1929	1.29	1771.9	155.3	11.41	0.11	3.1	2649600	1374	1463	54.8
23	7.82	11.5	2176	1.22	1485.4	140.8	10.55	0.12	3.1	2649600	1218	1428	53.5
24	7.82	11.0	2006	1.23	1624.7	145.9	11.13	0.11	3.1	2649600	1321	1421	53.4
25	7.82	11.8	1930	1.27	1743.7	138.7	12.57	0.10	3.2	2649600	1373	1364	51.7
26	7.81	11.5	2076	1.26	1608.4	141.0	11.41	0.11	3.1	2649600	1277	1459	54.6
27	7.81	10.2	1942	1.29	1759.6	154.8	11.37	0.11	3.1	2649600	1364	1490	55.3
28	7.90	12.0	2230	1.31	1556.4	141.2	11.02	0.12	1.9	2649600	1188	1360	31.8
29	7.99	12.2	2045	1.30	1683.9	143.4	11.74	0.11	3.6	2649600	1295	1362	59.6
30	7.99	12.4	2225	1.26	1500.2	140.8	10.65	0.12	6.8	2649600	1191	1460	118.6
31	8.02	10.3	2122	1.15	1436.2	162.3	8.85	0.13	6.6	2649600	1249	1494	118.5
Averages	7.75	9.58	2026	1.29	1684.2	159.3	10.60	0.12	3.6	2649600	1311.0	1430.95	61.34

5.0 ULTRAVIOLET DISINFECTION

Total Water Treated:	242,368.5 m ³	100.00%
On-Spec Water:	242,368.5 m ³	100.00%
Off-Spec Water:	0.0 m ³	0.00%

Average monthly chlorine residual before UV Treatment was 1.39 mg/L
 The average monthly chlorine residual after UV treatment and re-chlorination was 1.46 mg/L.

Figure 5.1 - UV Disinfection – BMID Mission Creek Source – March 2023

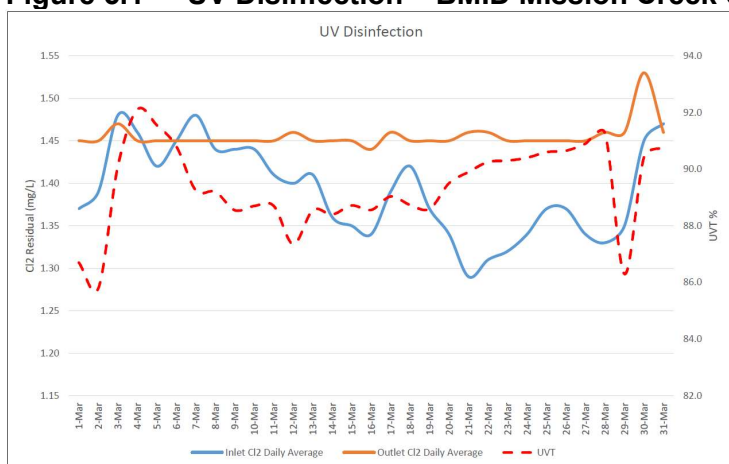


Table 5.2 - UV Disinfection Table – Mission Creek Source

Date	Inlet Cl2 Daily mg/L	Outlet Cl2 Daily mg/L	UVT % T	Turbidity NTU	In Spec Water Volume Cubic Meters	Off Spec Water Volume Cubic Meters	Off Spec % of Water Percentage
1-Mar	1.37	1.45	86.7	0.5	7507.6	0	0.00%
2-Mar	1.39	1.45	85.8	0.5	7676.0	0	0.00%
3-Mar	1.48	1.47	90.1	0.5	7676.2	0	0.00%
4-Mar	1.46	1.45	92.1	0.5	7655.8	0	0.00%
5-Mar	1.42	1.45	91.6	0.5	7669.6	0	0.00%
6-Mar	1.45	1.45	90.8	0.5	7923.7	0	0.00%
7-Mar	1.48	1.45	89.3	0.5	7841.7	0	0.00%
8-Mar	1.44	1.45	89.2	0.5	7762.0	0	0.00%
9-Mar	1.44	1.45	88.6	0.5	9108.9	0	0.00%
10-Mar	1.44	1.45	88.7	0.5	9109.1	0	0.00%
11-Mar	1.41	1.45	88.7	0.5	7675.9	0	0.00%
12-Mar	1.40	1.46	87.4	0.5	7543.9	0	0.00%
13-Mar	1.41	1.45	88.6	0.5	7782.5	0	0.00%
14-Mar	1.36	1.45	88.4	0.5	8268.9	0	0.00%
15-Mar	1.35	1.45	88.7	0.5	7764.2	0	0.00%
16-Mar	1.34	1.44	88.6	0.5	7841.9	0	0.00%
17-Mar	1.39	1.46	89.0	0.5	7711.9	0	0.00%
18-Mar	1.42	1.45	88.7	0.5	7453.9	0	0.00%
19-Mar	1.37	1.45	88.6	0.5	7647.7	0	0.00%
20-Mar	1.34	1.45	89.5	0.5	7850.0	0	0.00%
21-Mar	1.29	1.46	89.9	0.5	7808.4	0	0.00%
22-Mar	1.31	1.46	90.3	0.5	7862.3	0	0.00%
23-Mar	1.32	1.45	90.3	0.5	7657.9	0	0.00%
24-Mar	1.34	1.45	90.4	0.5	7645.2	0	0.00%
25-Mar	1.37	1.45	90.6	0.5	7370.9	0	0.00%
26-Mar	1.37	1.45	90.7	0.5	7830.0	0	0.00%
27-Mar	1.34	1.45	90.9	0.4	7953.0	0	0.00%
28-Mar	1.33	1.46	91.3	0.4	7387.1	0	0.00%
29-Mar	1.35	1.46	86.3	0.4	7281.6	0	0.00%
30-Mar	1.45	1.53	90.4	0.4	7957.4	0	0.00%
31-Mar	1.47	1.46	90.8	0.5	8143.2	0	0.00%
Average	1.39	1.46	89.4		Total 242,368.45	0	0.000%

6.0 WATER DISTRIBUTION SAMPLING (TREATED)

Third Party Analysis (CARO Analytical Services)

- Samples taken once per week at ten locations around the BMID service area
- 24 samples were found to be absent of Coliforms.
- 24 samples were found to be absent of *E. Coli*.

Table 6.1 - CARO Independent Lab Testing – Total Coliforms – *E. Coli*

Date	2021 Belgo Rd		Booster 1		Elison Blow-Off		Elison School		3976 Highway 97		Prospect Reservoir		Tower Reservoir		Well #4		Kirschner Res		Pearson School	
	Coliforms	E.coli	Coliforms	E.coli	Coliforms	E.coli	Coliforms	E.coli	Coliforms	E.coli	Coliforms	E.coli	Coliforms	E.coli	Coliforms	E.coli	Coliforms	E.coli	Coliforms	E.coli
6-Feb-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13-Feb-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-Feb-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-Feb-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6-Mar-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13-Mar-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-Mar-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-Mar-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

In-House Analysis (BMID Staff)

- Presence/Absence samples taken on a three-week cycle at seven sites around the BMID service area.
- All 9 samples were found to be absent of both *Total Coliforms* and *E. Coli*.

Table 6.2 - BMID In-house Testing – Presence Absence

Location	3/6/2023				3/13/2023				3/20/2023				3/27/2023			
	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.
Sylvania Cres									0.92	10.2	-	X				
170 Kneller Rd									0.96	10.2	-	X				
2105 Morrison Staymen Rd					1.01	8.8	-	X								
260 Campion Rd	0.68	8.4	-	X	0.89	8.8	-	X					0.62	14.6	-	X
Fenwick Rd	0.86	8.8	-	X									0.41	11.2	-	X
Solly Ct									1.05	10.6	-	X				

- BMID Population = 28,000

RECOMMENDED TESTS

- Recommended number of samples per month = 28
(as per Guide for Canadian Drinking Water Quality)

ACTUAL TESTS

- Total tests by BMID staff (presence/absence) = 9
- Total tests sampled by BMID and tested by Caro Labs 24
- Total tests sampled in BMID treated distribution system = 33
- 0 Positive *E. Coli* and Total Coliform Samples