



MONTHLY REPORTING PERIOD - MARCH, 2020

1. SUMMARY

The list below provides a summary of the water quality information collected by BMID in March, 2020. Documentation and figures are provided on the following pages to support this submission.

Source	Total (US Gals)	Total (Mega Litres)
Mission Creek	32,783,882	124.09
Well 4	2,452,000	9.28
Well 5	0	0
Well 6 (Irrigation Only)	0	0
Scotty Creek (Irrigation Only)	0	0
Estimated RWW supply	24,025,337	90.94
Total (estimated)	59,261,219	224.30

1. Beginning on February 10 and lasting until March 13, BMID utilized domestic water supply provided by cross-ties from Rutland Water Works (RWW) District to allow for infrastructure improvements. These improvements will provide additional flow capacity and pressures to the north part of the distribution system. After March 13, 2020 BMID resumed normal operations relying on the Mission Creek source for the majority of the domestic water consumed;
2. 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 has been minimal over the past 12 months. Monitoring showed a slight increase in the groundwater levels but this is to be expected as the snow accumulation continued to melt. The hillside is being monitored for surface movement on a monthly basis and groundwater levels as required.
3. The March 16 bacterial sample collected at Tower Ranch Reservoir was found to have background bacterial colonies present. However, no *E. Coli* and no *Total Coliforms* were found in the analysis. Subsequent testing on a second sample taken on March 19 was found to be free of bacteria;
4. It is noted that the WTP is not running over the winter. Raw water turbidity levels in Mission Creek peaked at 1.21 on March 25, 2020. Turbidity levels at the Distribution Intake (end of Hadden Reservoir) peaked at 0.63 NTU on March 27, 2020. Average turbidity for March was 0.61 NTU at the Distribution Intake;
5. The highest monthly turbidity level recorded at the first customer (Booster #1) was 1.22 NTU on March 20. However, this was a result of refilling and flushing BMID's primary transmission water main following the scheduled upgrades, and the duration of the turbidity spike was less than 24 hours. Average monthly turbidity was 0.39 NTU for March;
6. BMID's Ultraviolet Treatment Facility treated 147,159 m³ of water. None of which was "Off-Spec". Average UV Transmissivity was 84.6%. The average inlet chlorine residual level at the UV site was 1.41 mg/L. The average outgoing chlorine was 1.57

- mg/L after the sodium hypochlorite top-up system. The UV plant was only in use for the last 19 days of the month due to the temporary supply from Rutland Waterworks;
7. BMID's Scotty Creek source, used for irrigation in the north-end, was shut off for the year in September, 2019. BMID crews are undertaking a change in the disinfection system from chlorine gas to hypochlorite as a way to reduce any potential safety concerns associated with chlorine gas;
 8. Well # 4 was used as the primary domestic water source in the north-end of the system starting on September 1, 2019. Well # 4 provided domestic water throughout March 2020;
 9. Well # 5 was shut-off for the season in September but remains on stand-by until consumption rises in the spring of 2020;
 10. Well #6, which supplies irrigation water to the dual north-end water distribution systems was not used throughout March;
 11. *E.Coli* levels at Mission Creek's Point-of-Diversion (creek intake prior to WTP) had low counts throughout March with a peak count of 20.1 on March 18, 2020. The average *E.Coli* count was 2.76 for March;
 12. *E.Coli* levels in the raw water at the water distribution system intake down-stream of the WTP, immediately prior to disinfection, had low counts on all samples taken after the pond was refilled for the planned upgrades. The peak *E.Coli* count for the month was 1 on March 6 with a monthly average of 0.33 per sample. The reduction in *E.Coli* levels is credited to the settling of particles in the water in Stevens and Hadden Reservoirs;
 13. No *E.Coli* or *Total Coliforms* or were found in treated water in the distribution system through third-party analysis. In addition, no positive samples were detected by BMID's in-house presence/absence testing;
 14. Disinfection by-products (Haloacetic acids and Trihalomethanes) were both much lower than typically found due to the prolonged period of time where BMID's distribution system was supplied from Rutland Water Works ground-water sources;
 15. The Water Treatment Plant was on stand-by for the majority of March as water quality in Mission Creek was high for the majority of the month and treatment would not significantly improve the raw water quality. The WTP ran for one day in March, on March 10, 2020, due to high turbidity in the creek;

1.0 FLOWS - MARCH, 2020

The known Maximum Daily Flow was on March 20, at 2,574,854 US gallons (9.75 ML)

The known Minimum Daily Flow was on March 17, at 1,707,041 US gallons (6.46 ML)

Mission Creek provided 55% of domestic flow throughout March. A five-year average was used to represent an estimate of the water consumed for the remainder of the month while Mission Creek was bypassed. Rutland Water Works provided the domestic water supply that would have typically come from Mission Creek

Figure 1.1 - Domestic Water System Flow

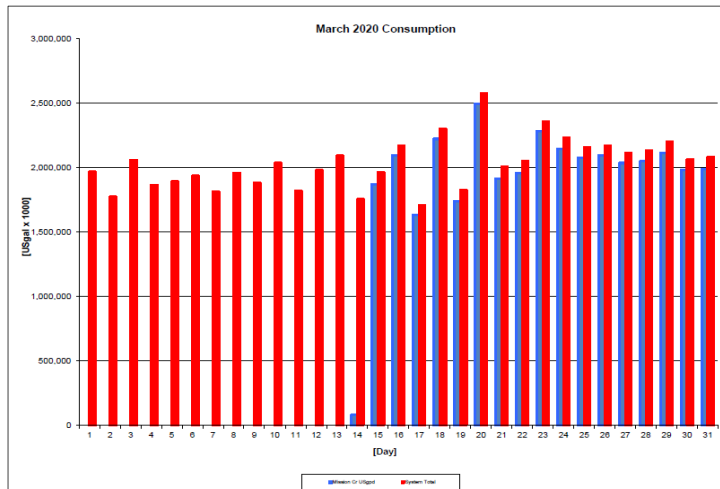


Table 1.2 - March 2020 - Daily Consumption Report

Year	Mission Cr	5 Year Average	Well #4	Well #5	System Total	System Total
2020	Usqpd	Usqpd	Usqpd	Usqpd	Usqpd (estimate)	ML/Day (estimate)
1-Mar	RWW	1,881,787	86,000	0.0	1,967,787	7.45
2-Mar	RWW	1,701,030	72,000	0.0	1,773,030	6.71
3-Mar	RWW	1,969,099	90,000	0.0	2,059,099	7.79
4-Mar	RWW	1,786,761	77,000	0.0	1,863,761	7.05
5-Mar	RWW	1,816,965	76,000	0.0	1,892,965	7.16
6-Mar	RWW	1,861,391	75,000	0.0	1,936,391	7.33
7-Mar	RWW	1,721,708	92,000	0.0	1,813,708	6.86
8-Mar	RWW	1,878,343	80,000	0.0	1,958,343	7.41
9-Mar	RWW	1,801,958	80,000	0.0	1,881,958	7.12
10-Mar	RWW	1,953,540	83,000	0.0	2,036,540	7.71
11-Mar	RWW	1,735,012	83,000	0.0	1,818,012	6.88
12-Mar	RWW	1,904,947	75,000	0.0	1,979,947	7.49
13-Mar	RWW	2,012,796	80,000	0.0	2,092,796	7.92
14-Mar	81,000	1,673,901	81,000	0.0	1,754,901	6.64
15-Mar	1,869,838	1,804,997	93,000	0.0	1,962,838	7.43
16-Mar	2,094,062	1,942,122	76,000	0.0	2,170,062	8.21
17-Mar	1,632,041	1,885,513	75,000	0.0	1,707,041	6.46
18-Mar	2,223,520	1,771,685	76,000	0.0	2,299,520	8.70
19-Mar	1,737,792	2,022,731	87,000	0.0	1,824,792	6.91
20-Mar	2,493,854	1,868,637	81,000	0.0	2,574,854	9.75
21-Mar	1,913,545	1,961,485	96,000	0.0	2,009,545	7.61
22-Mar	1,959,288	1,855,126	93,000	0.0	2,052,288	7.77
23-Mar	2,280,772	1,780,917	75,000	0.0	2,355,772	8.92
24-Mar	2,143,618	1,863,145	91,000	0.0	2,234,618	8.46
25-Mar	2,077,110	1,797,186	78,000	0.0	2,155,110	8.16
26-Mar	2,094,679	2,086,690	75,000	0.0	2,169,679	8.21
27-Mar	2,035,386	1,621,084	77,000	0.0	2,112,386	8.00
28-Mar	2,049,077	1,897,151	82,000	0.0	2,131,077	8.07
29-Mar	2,113,015	1,994,721	90,000	0.0	2,203,015	8.34
30-Mar	1,985,285	1,872,296	77,000	0.0	2,062,285	7.81
31-Mar	1,989,385	2,004,026	92,000	0.0	2,081,385	7.88
Totals Usqpd	32,783,882	24,025,337	2,452,000	0	59,261,219	224.30
Totals ML	124.09	90.94	9.28	0.00	224.30	
Avg's	1,928,464		7.30		2,028,471	7.68
Max	2,493,854		9.44		2,574,854	9.75
Min	81,000		0.31		1,707,041	6.46

2.0 RAW WATER QUALITY - BACTERIOLOGICAL MONITORING

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

Samples were taken twice per week at the Distribution Intake's Point of Disinfection and at the Mission Creek raw water Point of Diversion; one sample is taken per week 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 WTP lowers colour, turbidity and particle counts in the raw water. The *E. Coli* readings are consistent with the reduction in those other parameters. 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 2019 -March 2020

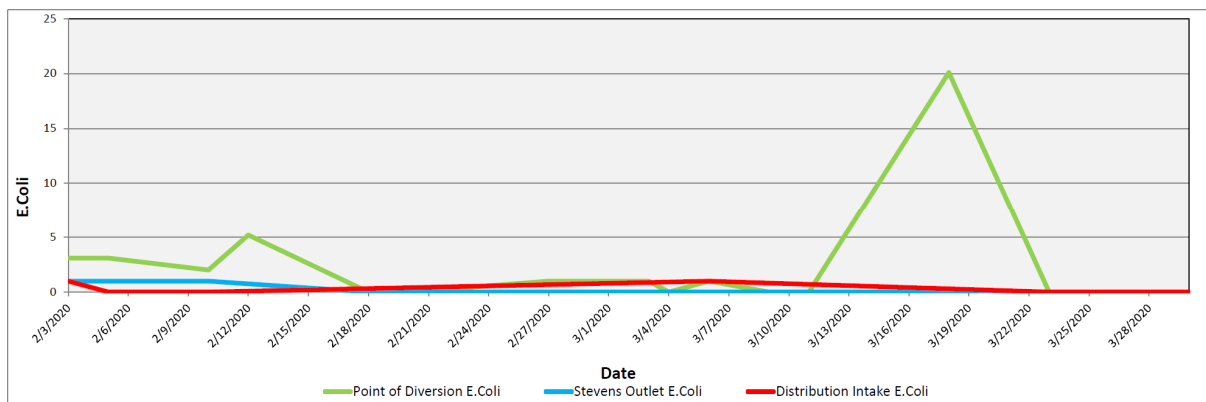


Table 2.1 - *E. Coli* Readings (CARO Labs)

Date	Point of Diversion E.Coli	Stevens Outlet E.Coli	Distribution Intake E.Coli
3-Feb-20	3.1	1	1
5-Feb-20	3.1	0	0
10-Feb-20	2	1	0
12-Feb-20	5.2	0	0
18-Feb-20	0	0	0
20-Feb-20	0	0	0
24-Feb-20	0	0	0
27-Feb-20	1	0	0
3-Mar-20	1	0	0
4-Mar-20	0	0	1
6-Mar-20	1	0	0
9-Mar-20	0	0	0
11-Mar-20	0	0	0
18-Mar-20	20.1	0	0
23-Mar-20	0	0	0
30-Mar-20	0	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 2020, 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 1.22 NTU on March 20, although this event lasted less than 24 hours. The average turbidity for the month was 0.39 NTU during March.

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

Figure 3.1 – Daily Turbidity Readings (Distribution Intake and Booster Station 1)

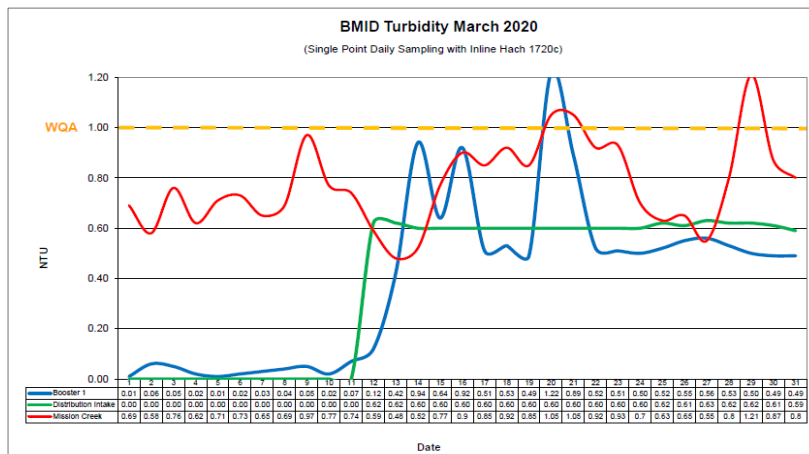


Table 3.1 - Daily Monitoring Record – Turbidity at Distribution Intake & Bst Stn 1

Date	Mission Creek Intake Daily Average [NTU]	Distribution Intake Daily Average NTU	Booster#1- First User Daily Average NTU
1	0.69	NA	0.01
2	0.58	NA	0.06
3	0.76	NA	0.05
4	0.62	NA	0.02
5	0.71	NA	0.01
6	0.73	NA	0.02
7	0.65	NA	0.03
8	0.69	NA	0.04
9	0.97	NA	0.05
10	0.77	NA	0.02
11	0.74	NA	0.07
12	0.59	0.62	0.12
13	0.48	0.62	0.42
14	0.52	0.60	0.94
15	0.77	0.60	0.64
16	0.9	0.60	0.92
17	0.85	0.60	0.51
18	0.92	0.60	0.53
19	0.85	0.60	0.49
20	1.05	0.60	1.22
21	1.05	0.60	0.89
22	0.92	0.60	0.52
23	0.93	0.60	0.51
24	0.7	0.60	0.50
25	0.63	0.62	0.52
26	0.65	0.61	0.55
27	0.55	0.63	0.56
28	0.8	0.62	0.53
29	1.21	0.62	0.50
30	0.87	0.61	0.49
31	0.8	0.59	0.49
AVG	0.77	0.61	0.39

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, 2020. The following information applies only to the period where Mission Creek was the primary supply of domestic water.

Figure 4.1 - CT Trending – BMID Mission Creek Source – March 2020

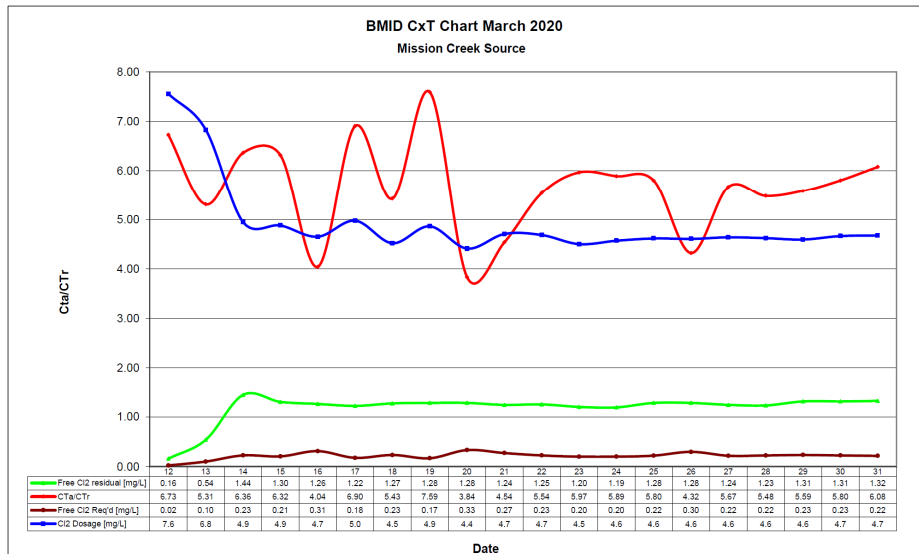


Table 4.2 - CT Table – Mission Creek Source

BMID March 2020 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		Daily Average	Average
March		[°C]	[Usgpm]	[mg/L]				[mg/L]	[mg/L]	[USgal]	[mins]	[USGPM]	[PPD]
12	7.54	8.5	544	0.16	779.3	115.9	6.73	0.02	7.6	2649600	4871	524	47.6
13	7.59	9.1	1985	0.54	720.8	135.8	5.31	0.10	6.8	2649600	1335	747	61.3
14	7.60	4.0	2667	1.44	1430.6	224.8	6.36	0.23	4.9	2649600	993	1313	78.1
15	7.63	3.0	2274	1.30	1514.7	239.8	6.32	0.21	4.9	2649600	1165	1294	75.9
16	7.65	2.7	3364	1.26	992.4	245.5	4.04	0.31	4.7	2649600	788	1453	81.2
17	7.65	2.9	1944	1.22	1662.8	240.9	6.90	0.18	5.0	2649600	1363	1130	67.6
18	7.66	2.8	2532	1.27	1329.0	244.9	5.43	0.23	4.5	2649600	1046	1550	84.2
19	7.67	2.8	1815	1.28	1868.6	246.1	7.59	0.17	4.9	2649600	1460	1208	70.6
20	7.68	3.1	3656	1.28	927.6	241.8	3.84	0.33	4.4	2649600	725	1728	91.6
21	7.69	2.8	2935	1.24	1119.4	246.6	4.54	0.27	4.7	2649600	903	1336	75.6
22	7.64	2.9	2481	1.25	1334.9	240.9	5.54	0.23	4.7	2649600	1068	1366	76.9
23	7.66	2.8	2194	1.20	1449.2	242.8	5.97	0.20	4.5	2649600	1208	1578	85.4
24	7.67	3.1	2245	1.19	1404.5	238.4	5.89	0.20	4.6	2649600	1180	1495	82.1
25	7.69	3.2	2426	1.28	1398.0	241.0	5.80	0.22	4.6	2649600	1092	1442	80
26	7.70	3.2	3244	1.28	1045.5	241.9	4.32	0.30	4.6	2649600	817	1455	80.6
27	7.72	3.4	2424	1.24	1355.4	239.1	5.67	0.22	4.6	2649600	1093	1413	78.8
28	7.72	3.3	2472	1.23	1318.4	240.4	5.48	0.22	4.6	2649600	1072	1424	79.1
29	7.71	3.5	2605	1.31	1332.4	238.5	5.59	0.23	4.6	2649600	1017	1469	81.1
30	7.70	3.4	2499	1.31	1388.9	239.4	5.80	0.23	4.7	2649600	1060	1381	77.4
31	7.71	3.5	2409	1.32	1451.8	238.8	6.08	0.22	4.7	2649600	1100	1379	77.5
Averages	7.54	5.48	1675	0.80	1359.1	181.6	5.63	0.23	4.6				

5.0 ULTRAVIOLET DISINFECTION

Total Water Treated: 147,159 m³ 100.0%
On-Spec Water: 147,159 m³ 100.0%
Off-Spec Water: 0 m³ 0.00%

BMID's UV Disinfection Treatment Plant was only in use after March 13 when the domestic water source was changed from RWW to BMID's Mission Creek source.

Average monthly chlorine residual before UV Treatment was 1.41 mg/L

The average monthly chlorine residual after UV treatment and re-chlorination was 1.57 mg/L.

Figure 5.1 - UV Disinfection – BMID Mission Creek Source – March 2020

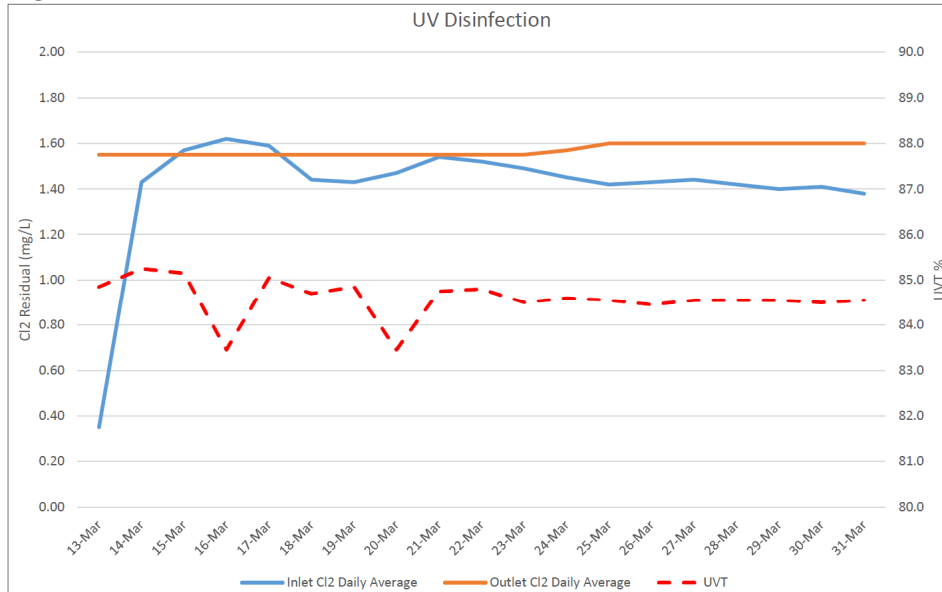


Table 5.2 - UV Disinfection Table – Mission Creek Source

	Inlet Cl2 Daily	Outlet Cl2 Daily	UVT		In Spec Water Volume	Off Spec Water Volume	Off Spec % of Water
Date	mg/L	mg/L	% T		Cubic Meters	Cubic Meters	Percentage
13-Mar	0.35	1.55	84.9		5113.2	0	0.00%
14-Mar	1.43	1.55	85.3		7124.3	0	0.00%
15-Mar	1.57	1.55	85.2		7309.8	0	0.00%
16-Mar	1.62	1.55	83.5		7896.2	0	0.00%
17-Mar	1.59	1.55	85.1		8065.9	0	0.00%
18-Mar	1.44	1.55	84.7		8417.7	0	0.00%
19-Mar	1.43	1.55	84.9		6717.2	0	0.00%
20-Mar	1.47	1.55	83.5		9535.9	0	0.00%
21-Mar	1.54	1.55	84.8		7379.6	0	0.00%
22-Mar	1.52	1.55	84.8		7547.0	0	0.00%
23-Mar	1.49	1.55	84.5		8703.1	0	0.00%
24-Mar	1.45	1.57	84.6		8266.9	0	0.00%
25-Mar	1.42	1.60	84.6		7974.0	0	0.00%
26-Mar	1.43	1.60	84.5		8047.5	0	0.00%
27-Mar	1.44	1.60	84.6		7818.9	0	0.00%
28-Mar	1.42	1.60	84.6		7864.7	0	0.00%
29-Mar	1.40	1.60	84.6		8105.6	0	0.00%
30-Mar	1.41	1.60	84.5		7633.2	0	0.00%
31-Mar	1.38	1.60	84.6		7638.3	0	0.00%
Average	1.41	1.57	84.6	Total	147159	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
- 51 samples were found to be absent of Coliforms.
- 51 samples were found to be absent of *E. Coli*.

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

Date	2921 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
3-Feb-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-Feb-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-Feb-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-Feb-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Mar-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9-Mar-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16-Mar-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-Mar-20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23-Mar-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-Mar-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 6.3 – Disinfection By-Products - THM and HAA Results

March 2 - 2020		
Location	THM (mg/L)	HAA (mg/L)
Kirschner Reservoir		0.095
2921 Belgo Rd	<0.0100	
Pearson School	<0.00450	<0.00200
3976 Highway 97	<0.00450	

In-House Analysis (BMID Staff)

- Presence/Absence samples taken on a three-week cycle at seven sites around the BMID service area.
- All 11 samples were found to be absent of both Total Coliforms and *E. Coli*.

Table 6.4 - BMID In-house Testing – Presence Absence

Location	3/2/2020				3/9/2020				3/16/2020				3/23/2020				3/30/2020			
	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.
Sylvania Cres									0.92	11.2	-	X								
170 Kneller Rd									0.98	10.8	-	X								
2105 Morrison					0.14	9.2	-	X												
Staymen Rd					0.16	9.0	-	X									0.72	11.4	-	X
260 Campion Rd	0.05	11.2	-	X									0.56	9.6	-	X	0.82	10.4	-	X
Fenwick Rd	0.08	10.6	-	X									0.30	1.0	-	X				
Solly Ct									1.02	10.2	-	X								

- BMID Population = 25,000

RECOMMENDED TESTS

- Recommended number of samples per month = 25
(as per Guide for Canadian Drinking Water Quality)

ACTUAL TESTS

- Total tests by BMID staff (presence/absence) = 11
- Total tests sampled by BMID and tested by Caro Labs = 51
- Total tests sampled in BMID treated distribution system = 61 (Zero Positive Samples)