



MONTHLY REPORTING PERIOD - NOVEMBER, 2020

1. SUMMARY

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

Source	Total (US Gals)	Total (Mega Litres)
Mission Creek	57,863,157	219.01
Well 4	2,048,000	7.75
Well 5	0	0
Well 6 (Irrigation Only)	0	0
Scotty Creek (Irrigation Only)	0	0
Total	59,911,157	226.76

1. 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 has showed minor variations in groundwater levels, but no substantial changes. The hillside is being monitored for surface movement on a monthly basis and groundwater levels as required.
2. The Water Treatment Plant started full operations in April, 2020, and the plant operated periodically through early November until it was placed on stand-by on November 18. Raw water was of sufficient quality to bypass treatment for most of the month except for seven days where treatment was required;
3. Raw water turbidity levels in Mission Creek peaked at 7.13 NTU on November 5, 2020. Turbidity levels at the Distribution Intake (end of Hadden Reservoir) high reading was 0.65 NTU on November 27, 2020. Average turbidity for November was 0.43 NTU at the Distribution Intake at the lower end of Hadden Reservoir;
4. The highest recorded monthly turbidity level at the first customer (Booster #1) was 0.45 NTU on November 24, 2020. Average monthly turbidity at the first customer was 0.33 NTU for the month;
5. BMID's Ultraviolet Treatment Facility treated 227,825 m³ of water, none of which was "Off-Spec" (0%). Average UV Transmissivity was 89.5%. The average inlet chlorine residual level at the UV site was 1.27 mg/L. The average outgoing chlorine was 1.36 mg/L after the sodium hypochlorite top-up system;
6. BMID's Scotty Creek source, used for irrigation in the north-end, was placed on Stand-by in September 2020;
7. Well # 4 resumed operations as the primary domestic water source for the north-end on October 11, 2020. Well #4 will continue to operate until spring 2021;
8. Well #5, used as the primary domestic water source in the north-end of the system for both irrigation and domestic consumption was turned off for the year on October 11, 2020. Well #5 is began undergoing maintenance in October and the maintenance will continue throughout November;

9. Well #6, which supplies irrigation water to the twinned north-end water distribution systems, was placed in stand-by for the year in October. Well #6 will remain in stand-by mode for fire protection only until flows increase in spring 2021;
10. *E.Coli* levels at Mission Creek's Point-of-Diversion (creek intake prior to WTP) had low counts for fall with a peak count of 22 on November 18, 2020. The average *E.Coli* count was 2.44 for the month based on 9 samples;
11. *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. Peak *E.Coli* counts of 1 were found on samples taken on November 5. The remaining samples were found to contain no *E.Coli* Bacteria. The reduction in *E.Coli* levels is credited to the settling of particles in the water in Stevens and Hadden Reservoirs;
12. No *E.Coli* or *Total Coliforms* 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;
13. Disinfection by-products (Haloacetic acids and Trihalomethanes) were monitored at four sites throughout the distribution system. Both THMs and HAAs were slightly above the Canadian Drinking Water Guidelines resulting from the WTP being placed in bypass mode. THMs averaged 0.1077 mg/L which is over the guideline of 0.100 mg/L. HAAs averaged 0.0861 mg/L which is above the suggested level of 0.0800 mg/L. When the Water Treatment Plant resumes operations, the organics in the raw water will be reduced;

1.0 FLOWS - NOVEMBER, 2020

The Maximum Daily Flow was on November 24, at 2,261,512 US gallons (8.56 ML)

The Minimum Daily Flow was on November 20, at 1,839,860 US gallons (6.96 ML)

Mission Creek provided 97% of domestic and irrigation flow throughout November.

Figure 1.1 - Domestic Water System Flow

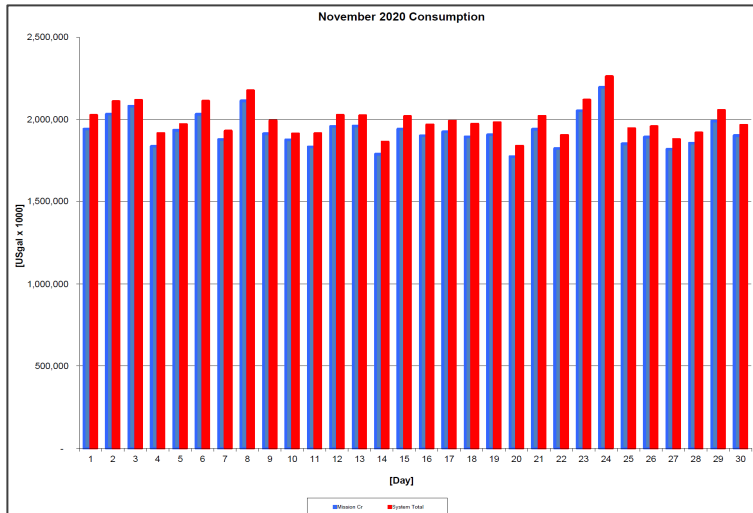


Table 1.2 - November 2020 - Daily Consumption Report

Year	Mission Cr	Well #4	Well #5	System Total	System Total
2020	Usgpd	Usgpd	Usgpd	Usgpd	ML/Day
1-Nov	1,942,085	84,000	-	2,026,085	7.67
2-Nov	2,032,864	77,000	-	2,109,864	7.99
3-Nov	2,080,873	37,000	-	2,117,873	8.02
4-Nov	1,837,156	80,000	-	1,917,156	7.26
5-Nov	1,934,884	36,000	-	1,970,884	7.46
6-Nov	2,031,917	80,000	-	2,111,917	7.99
7-Nov	1,878,899	52,000	-	1,930,899	7.31
8-Nov	2,112,937	63,000	-	2,175,937	8.24
9-Nov	1,913,983	80,000	-	1,993,983	7.55
10-Nov	1,877,187	37,000	-	1,914,187	7.25
11-Nov	1,834,372	81,000	-	1,915,372	7.25
12-Nov	1,958,125	69,000	-	2,027,125	7.67
13-Nov	1,960,422	64,000	-	2,024,422	7.66
14-Nov	1,789,445	75,000	-	1,864,445	7.06
15-Nov	1,941,815	78,000	-	2,019,815	7.64
16-Nov	1,901,185	68,000	-	1,969,185	7.45
17-Nov	1,925,608	66,000	-	1,991,608	7.54
18-Nov	1,895,316	78,000	-	1,973,316	7.47
19-Nov	1,907,695	75,000	-	1,982,695	7.50
20-Nov	1,774,860	65,000	-	1,839,860	6.96
21-Nov	1,941,604	79,000	-	2,020,604	7.65
22-Nov	1,824,743	81,000	-	1,905,743	7.21
23-Nov	2,053,257	66,000	-	2,119,257	8.02
24-Nov	2,195,512	66,000	-	2,261,512	8.56
25-Nov	1,852,977	93,000	-	1,945,977	7.37
26-Nov	1,893,492	65,000	-	1,958,492	7.41
27-Nov	1,819,674	61,000	-	1,880,674	7.12
28-Nov	1,856,669	63,000	-	1,919,669	7.27
29-Nov	1,990,581	66,000	-	2,056,581	7.78
30-Nov	1,903,020	63,000	-	1,966,020	7.44
Totals Usgpd	57,863,157	2,048,000	-	59,911,157	226.76
Totals ML	219.01	7.75	0.00		
Avg's	1928771.9	7.30		1997038.6	7.56
Max	2195512.0	8.31		2261512.0	8.56
Min	1774860.0	6.72		1839860.0	6.96

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) October 2019 -November 2020

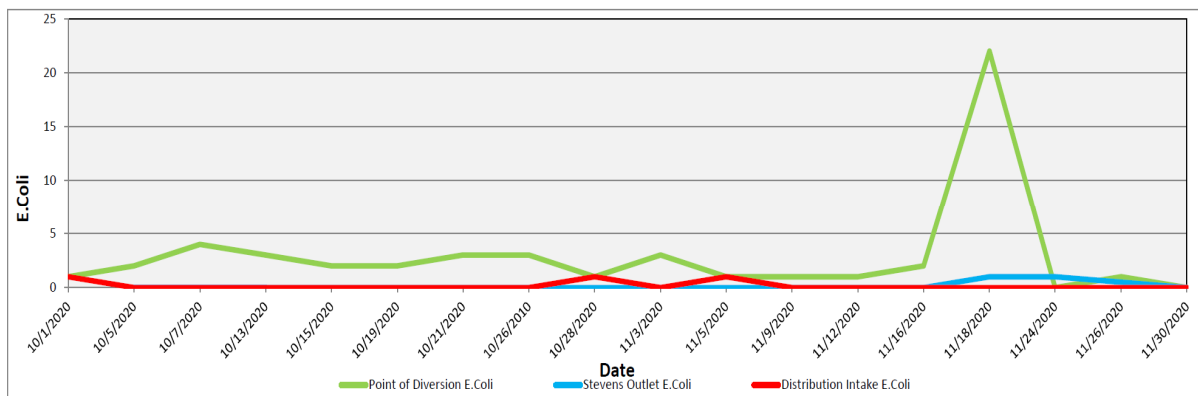


Table 2.1 - *E. Coli* Readings (CARO Labs)

Date	Point of Diversion E. Coli	Stevens Outlet E. Coli	Distribution Intake E. Coli
1-Oct-20	1		1
5-Oct-20	2	0	0
7-Oct-20	4		0
13-Oct-20	3	0	0
15-Oct-20	2		0
19-Oct-20	2	0	0
21-Oct-20	3		0
26-Oct-20	3	0	0
28-Oct-20	1		1
3-Nov-20	3	0	0
5-Nov-20	1		1
9-Nov-20	1	0	0
12-Nov-20	1		0
16-Nov-20	2	0	0
18-Nov-20	22	1	0
24-Nov-20	0	1	0
26-Nov-20	1		0
30-Nov-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 November 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 0.45 NTU on November 24.

The distribution intake is where the water leaves Hadden Reservoir. 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 (Distribution Intake and Booster Station 1)

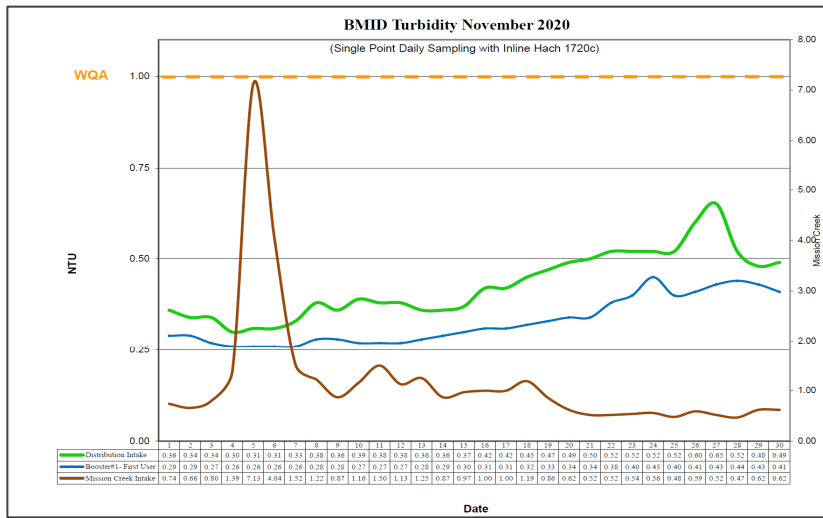


Table 3.1 - Daily Monitoring Record – Turbidity at Distribution Intake & Bst Stn 1

Date	Mission Creek Intake Daily Average [NTU]	Distribution Intake Daily Average [NTU]	Booster#1- First User Daily Average [NTU]
1	0.74	0.36	0.29
2	0.66	0.34	0.29
3	0.80	0.34	0.27
4	1.39	0.30	0.26
5	7.13	0.31	0.26
6	4.04	0.31	0.26
7	1.52	0.33	0.26
8	1.22	0.38	0.28
9	0.87	0.36	0.28
10	1.16	0.39	0.27
11	1.50	0.38	0.27
12	1.13	0.38	0.27
13	1.25	0.36	0.28
14	0.87	0.36	0.29
15	0.97	0.37	0.30
16	1.00	0.42	0.31
17	1.00	0.42	0.31
18	1.19	0.45	0.32
19	0.86	0.47	0.33
20	0.62	0.49	0.34
21	0.52	0.50	0.34
22	0.52	0.52	0.38
23	0.54	0.52	0.40
24	0.56	0.52	0.45
25	0.48	0.52	0.40
26	0.59	0.60	0.41
27	0.52	0.65	0.43
28	0.47	0.52	0.44
29	0.62	0.48	0.43
30	0.62	0.49	0.41
AVG	1.18	0.43	0.33

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 November, 2020.

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

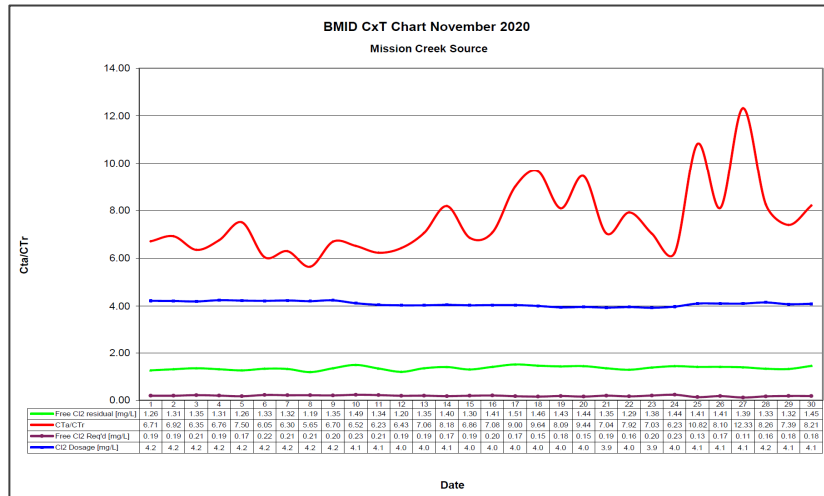


Table 4.2 - CT Table – Mission Creek Source

BMID November 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
November		[°C]	[Usgpm]	[mg/L]				[mg/L]	[mg/L]	[USgal]	[mins]	[USGPM]	[PPD]
1	7.79	8.1	2807	1.26	1189.3	177.2	6.71	0.19	4.2	2649600	944	1337	67.9
2	7.81	7.9	2755	1.31	1259.9	182.0	6.92	0.19	4.2	2649600	962	1415	71.7
3	7.79	6.9	2893	1.35	1236.4	194.6	6.35	0.21	4.2	2649600	916	1441	72.7
4	7.80	6.4	2553	1.31	1359.6	201.3	6.76	0.19	4.2	2649600	1038	1283	65.5
5	7.80	5.9	2148	1.26	1554.2	207.1	7.50	0.17	4.2	2649600	1234	1347	68.5
6	7.80	5.9	2791	1.33	1262.6	208.8	6.05	0.22	4.2	2649600	949	1413	71.7
7	7.80	6.5	2775	1.32	1260.4	200.1	6.30	0.21	4.2	2649600	955	1297	66.1
8	7.81	6.2	2765	1.19	1140.3	201.8	5.65	0.21	4.2	2649600	958	1474	74.6
9	7.82	6.1	2570	1.35	1391.8	207.8	6.70	0.20	4.2	2649600	1031	1329	67.8
10	7.85	5.8	2784	1.49	1418.1	217.6	6.52	0.23	4.1	2649600	952	1307	64.8
11	7.86	6.5	2782	1.34	1276.2	204.7	6.23	0.21	4.1	2649600	952	1273	62.1
12	7.88	6.5	2439	1.20	1303.6	202.7	6.43	0.19	4.0	2649600	1086	1375	66.7
13	7.86	6.5	2471	1.35	1447.6	205.0	7.06	0.19	4.0	2649600	1072	1342	65.1
14	7.87	6.9	2254	1.40	1645.7	201.1	8.18	0.17	4.1	2649600	1176	1243	60.6
15	7.87	7.1	2561	1.30	1345.0	196.2	6.86	0.19	4.0	2649600	1035	1352	65.6
16	7.88	7.3	2684	1.41	1391.9	196.5	7.08	0.20	4.0	2649600	987	1322	64.3
17	7.88	7.3	2239	1.51	1786.9	198.5	9.00	0.17	4.0	2649600	1183	1361	66.2
18	7.89	7.6	2067	1.46	1871.5	194.1	9.64	0.15	4.0	2649600	1282	1295	62.4
19	7.89	7.5	2404	1.43	1576.1	194.9	8.09	0.18	4.0	2649600	1102	1325	62.9
20	7.90	7.5	2064	1.44	1848.6	195.7	9.44	0.15	4.0	2649600	1284	1252	59.7
21	7.91	7.3	2576	1.35	1388.6	197.2	7.04	0.19	3.9	2649600	1029	1337	63.3
22	7.91	7.4	2219	1.29	1540.3	194.5	7.92	0.16	4.0	2649600	1194	1268	60.4
23	7.90	7.3	2638	1.38	1386.1	197.2	7.03	0.20	3.9	2649600	1004	1450	66.6
24	7.89	8.8	3436	1.44	1110.4	178.3	6.23	0.23	4.0	2649600	771	1502	71.9
25	7.89	8.1	1851	1.41	2018.3	186.5	10.82	0.13	4.1	2649600	1431	1310	64.7
26	7.88	8.6	2568	1.41	1454.8	179.6	8.10	0.17	4.1	2649600	1032	1293	63.8
27	7.87	10.0	1844	1.39	1997.3	162.0	12.33	0.11	4.1	2649600	1437	1263	62.4
28	7.86	9.2	2517	1.33	1400.1	169.6	8.26	0.16	4.2	2649600	1053	1307	65.3
29	7.85	6.8	2373	1.32	1473.9	199.4	7.39	0.18	4.1	2649600	1117	1363	66.9
30	7.89	6.2	2191	1.45	1753.5	213.7	8.21	0.18	4.1	2649600	1209	1324	65.2
Averages	7.86	7.20	2500.6	1.36	1469.63	195.5	7.56	0.18	4.10			1340	66.0

5.0 ULTRAVIOLET DISINFECTION

Total Water Treated: 227,825 m³ 100.0%
On-Spec Water: 227,825 m³ 100.0%
Off-Spec Water: 0 m³ 0%

Average monthly chlorine residual before UV Treatment was 1.27 mg/L
The average monthly chlorine residual after UV treatment and re-chlorination was 1.36 mg/L.

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

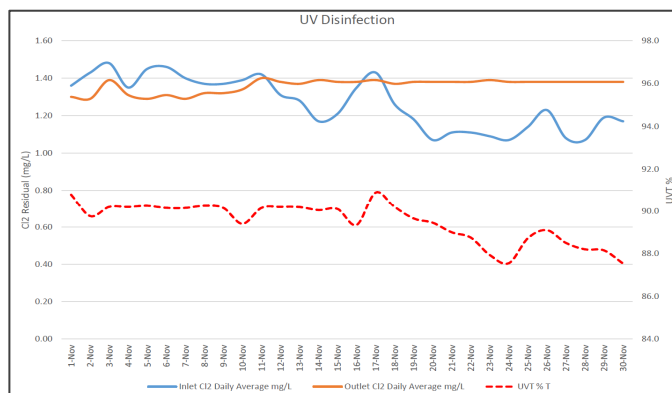


Table 5.2 - UV Disinfection Table – Mission Creek Source

Date	Inlet Cl2 Daily mg/L	Outlet Cl2 Daily mg/L	UVT % T	In Spec Water Cubic Meters	Off Spec Water Cubic Meters	Off Spec % of Water Percentage
1-Nov	1.36	1.30	90.8	7,383	0	0.00%
2-Nov	1.43	1.29	89.8	7,987	0	0.00%
3-Nov	1.48	1.39	90.2	7,902	0	0.00%
4-Nov	1.35	1.31	90.2	7,047	0	0.00%
5-Nov	1.45	1.29	90.3	7,395	0	0.00%
6-Nov	1.46	1.31	90.2	7,747	0	0.00%
7-Nov	1.40	1.29	90.2	7,117	0	0.00%
8-Nov	1.37	1.32	90.3	8,079	0	0.00%
9-Nov	1.37	1.32	90.2	7,281	0	0.00%
10-Nov	1.39	1.34	89.4	7,202	0	0.00%
11-Nov	1.42	1.40	90.2	6,984	0	0.00%
12-Nov	1.31	1.38	90.2	7,550	0	0.00%
13-Nov	1.28	1.37	90.2	7,354	0	0.00%
14-Nov	1.17	1.39	90.1	6,825	0	0.00%
15-Nov	1.21	1.38	90.1	7,413	0	0.00%
16-Nov	1.35	1.38	89.3	7,286	0	0.00%
17-Nov	1.43	1.39	90.9	7,483	0	0.00%
18-Nov	1.26	1.37	90.2	7,119	0	0.00%
19-Nov	1.18	1.38	89.7	11,902	0	0.00%
20-Nov	1.07	1.38	89.5	8,958	0	0.00%
21-Nov	1.11	1.38	89.0	7,331	0	0.00%
22-Nov	1.11	1.38	88.8	7,033	0	0.00%
23-Nov	1.09	1.39	87.9	7,983	0	0.00%
24-Nov	1.07	1.38	87.6	8,247	0	0.00%
25-Nov	1.14	1.38	88.7	7,216	0	0.00%
26-Nov	1.23	1.38	89.1	7,109	0	0.00%
27-Nov	1.08	1.38	88.5	6,949	0	0.00%
28-Nov	1.07	1.38	88.2	7,199	0	0.00%
29-Nov	1.19	1.38	88.2	7,469	0	0.00%
30-Nov	1.17	1.38	87.5	7,277	0	0.00%
Average	1.27	1.36	89.50	Total 227,825	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
- 50 samples were found to be absent of Coliforms.
- 50 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		Ellison 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
5-Oct-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8-Oct-20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13-Oct-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-Oct-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-Oct-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3-Nov-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9-Nov-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16-Nov-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-Nov-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-Nov-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

3-Nov-20		
Location	THM (mg/L)	HAA (mg/L)
Kirschner Reservoir		0.0947
2921 Belgo Rd	0.1060	
Pearson School	0.1050	0.0774
3976 Highway 97	0.1120	

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 6.4 - BMID In-house Testing – Presence Absence

Location	11/3/2020				11/9/2020				11/16/2020				11/25/2020			
	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.
Sylvania Cres	0.69	12.6	-	X									0.69	11.7	-	X
170 Kneller Rd	0.67	13.8	-	X									0.56	11.8	-	X
2105 Morrison									0.59	12.2	-	X				
Staymen Rd									0.29	13.2	-	X				
260 Campion Rd					0.32	14.4	-	X								
Fenwick Rd					0.44	13.4	-	X								
Solly Ct	0.75	12.4	-	X									0.61	12.2	-	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) = 10
- Total tests sampled by BMID and tested by Caro Labs = 50
- Total tests sampled in BMID treated distribution system = 60 (Zero Positive Samples)