



MONTHLY REPORTING PERIOD - FEBRUARY, 2020

1. SUMMARY

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

Source	Total (US Gals)	Total (Mega Litres)
Mission Creek	18,604,902	70.42
Well 4	2,4001,000	9.09
Well 5	0	0
Well 6 (Irrigation Only)	0	0
Scotty Creek (Irrigation Only)	0	0
Estimated RWW supply	35,814,427	135.56
Total (estimated)	56,218,082	205.51

1. Beginning on February 10 and lasting throughout the remainder of the month, 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;
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 steady decline in groundwater levels in the winter of 2018 and spring of 2019, but has since remained level. The hillside is being monitored for surface movement on a monthly basis and groundwater levels as required.
3. It is noted that the WTP is not running over the winter. Raw water turbidity levels in Mission Creek peaked at 2.83 on February 1, 2020. Turbidity levels at the Distribution Intake (end of Hadden Reservoir) peaked at 0.66 NTU on February 10, 2020. Average turbidity for February was 0.50 NTU at the Distribution Intake;
4. The highest monthly turbidity level recorded at the first customer (Booster #1) was 0.53 NTU on February 12. Average monthly turbidity was 0.22 NTU for February;
5. BMID's Ultraviolet Treatment Facility treated 85,070.8 m³ of water. 59.8 m³ was "Off-Spec". Average UV Transmissivity was 82.4%. The average inlet chlorine residual level at the UV site was 1.33 mg/L. The average outgoing chlorine was 1.50 mg/L after the sodium hypochlorite top-up system. The UV plant was only in use for the first 10 days of the month;
6. BMID's Scotty Creek source, used for irrigation in the north-end, was shut off for the year in September, 2019;
7. 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 February 2020;

8. Well # 5 was shut-off for the season in September but remains on stand-by until consumption rises in the spring of 2020;
9. Well #6, which supplies irrigation water to the dual north-end water distribution systems was not used throughout February;
10. *E.Coli* levels at Mission Creek's Point-of-Diversion (creek intake prior to WTP) had low counts throughout February with a peak count of 5.2 on February 12, 2020. The average *E.Coli* count was 2.05 for February;
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 the three samples taken before the pond was drained for the planned upgrades. The peak *E.Coli* count for the month was 1 on February 3 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;
12. 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;
13. Disinfection by-products (Haloacetic acids and Trihalomethanes) were both higher than typically experienced in BMID's distribution system because the Water Treatment Plant remained in winter bypass mode. HAA and THM values will typically decrease when the WTP resumes operations in the spring;
14. The Water Treatment Plant was on stand-by for the majority of February 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 two days in February, on February 1 and 2, 2020, due to high turbidity in the creek;

1.0 FLOWS - FEBRUARY, 2020

The known Maximum Daily Flow was on February 6, at 2,372,422 US gallons (8.98 ML)

The known Minimum Daily Flow was on February 3, at 1,896,425 US gallons (7.18 ML)

Mission Creek provided 34% of domestic flow throughout February. 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

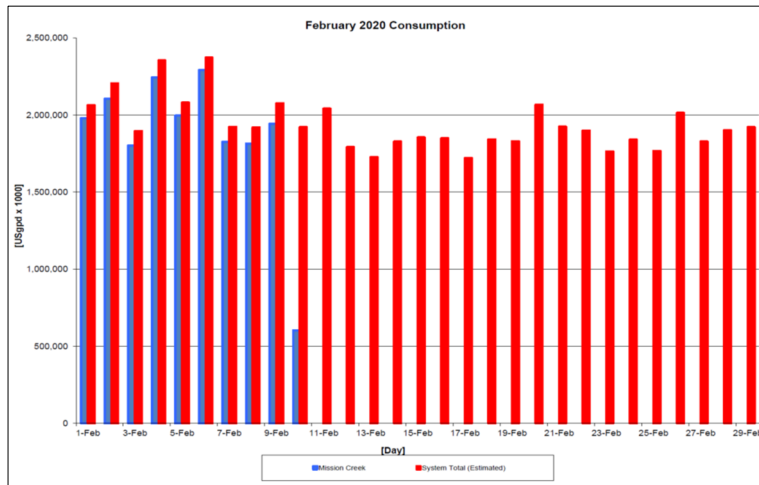


Table 1.2 - February 2020 - Daily Consumption Report

Year	Mission Creek	5 Year Average	Well #4	Well #5	Well #6	System Total	System Total (Estimated)
2020	Usgpd	Usgpd	Usgpd	Usgpd	Usgpd	Usgpd	ML/Day
1-Feb	1,980,063	1,898,822	83,000	0	0	2,063,063	7.81
2-Feb	2,104,765	1,726,551	100,000	0	0	2,204,765	8.35
3-Feb	1,802,425	1,659,906	94,000	0	0	1,896,425	7.18
4-Feb	2,242,617	1,980,656	111,000	0	0	2,353,617	8.91
5-Feb	1,996,425	1,646,281	84,000	0	0	2,080,425	7.87
6-Feb	2,291,422	1,777,015	81,000	0	0	2,372,422	8.98
7-Feb	1,826,856	1,777,283	96,000	0	0	1,922,856	7.28
8-Feb	1,814,816	1,732,482	104,000	0	0	1,918,816	7.26
9-Feb	1,943,266	1,715,919	133,000	0	0	2,076,266	7.86
10-Feb	602,247	1,819,062	102,000	0	0	1,921,062	7.27
11-Feb	RWW	1,951,146	90,000	0	0	2,041,146	7.73
12-Feb	RWW	1,697,813	94,000	0	0	1,791,813	6.78
13-Feb	RWW	1,659,123	68,000	0	0	1,727,123	6.54
14-Feb	RWW	1,762,248	66,000	0	0	1,828,248	6.92
15-Feb	RWW	1,797,840	57,000	0	0	1,854,840	7.02
16-Feb	RWW	1,763,565	85,000	0	0	1,848,565	7.00
17-Feb	RWW	1,650,528	70,000	0	0	1,720,528	6.51
18-Feb	RWW	1,773,957	68,000	0	0	1,841,957	6.97
19-Feb	RWW	1,760,759	69,000	0	0	1,829,759	6.93
20-Feb	RWW	1,985,659	81,000	0	0	2,066,659	7.82
21-Feb	RWW	1,856,596	68,000	0	0	1,924,596	7.28
22-Feb	RWW	1,828,011	70,000	0	0	1,898,011	7.18
23-Feb	RWW	1,679,488	84,000	0	0	1,763,488	6.67
24-Feb	RWW	1,770,384	70,000	0	0	1,840,384	6.97
25-Feb	RWW	1,697,951	69,000	0	0	1,766,951	6.69
26-Feb	RWW	1,933,912	80,000	0	0	2,013,912	7.62
27-Feb	RWW	1,759,928	68,000	0	0	1,827,928	6.92
28-Feb	RWW	1,832,109	69,000	0	0	1,901,109	7.20
29-Feb	RWW	1,834,347	87,000	0	0	1,921,347	0.00
Totals Usgpd	18,604,902	RWW	2,401,000	0	0	56,218,082	205.51
Totals ML	70.42	35,814,427	9.09	0.00	0.00		
Avg's	1,860,490	135.56	7.04			1,938,555	7.09
Max	2,291,422		8.67			2,372,422	8.98
Min	602,247		2.28			1,896,425	7.18

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) January 2019 -February 2020

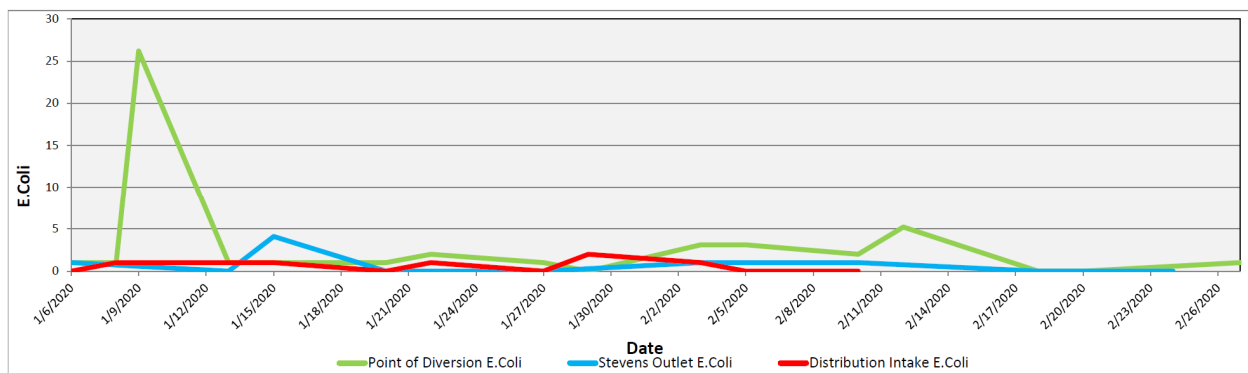


Table 2.1 - *E. Coli* Readings (CARO Labs)

Date	Point of Diversion E.Coli	Stevens Outlet E.Coli	Distribution Intake E.Coli
6-Jan-20	1	1	0
8-Jan-20	1		1
9-Jan-20	26.2		1
13-Jan-20	1	0	1
15-Jan-20		4.1	1
20-Jan-20	1	0	0
22-Jan-20	2		1
27-Jan-20	1	0	0
29-Jan-20	0		2
3-Feb-20	3.1	1	1
5-Feb-20	3.1		0
10-Feb-20	2	1	0
12-Feb-20	5.2		
18-Feb-20	0	0	
20-Feb-20	0		
24-Feb-20		0	
27-Feb-20	1		

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 February 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 0.51 NTU on February 12. The average turbidity for the month was 0.22 NTU during February.

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)

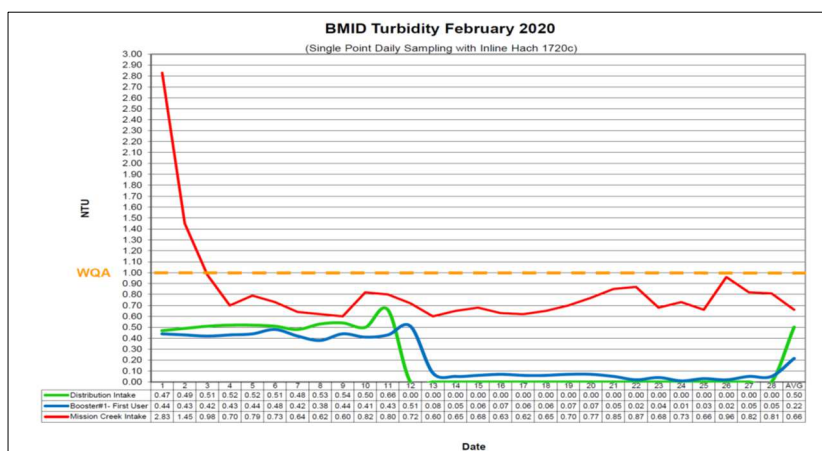


Table 3.1 - Daily Monitoring Record – Turbidity at Distribution Intake & Bst Stn 1

Turbidity Point Sampling for February 2020			
Date	Mission Creek Intake Daily Average [NTU]	Distribution Intake Daily Average NTU	Booster#1- First User Daily Average NTU
1	2.83	0.47	0.44
2	1.45	0.49	0.43
3	0.98	0.51	0.42
4	0.70	0.52	0.43
5	0.79	0.52	0.44
6	0.73	0.51	0.48
7	0.64	0.48	0.42
8	0.62	0.53	0.38
9	0.60	0.54	0.44
10	0.82	0.50	0.41
11	0.80	0.66	0.43
12	0.72	NA	0.51
13	0.60	NA	0.08
14	0.65	NA	0.05
15	0.68	NA	0.06
16	0.63	NA	0.07
17	0.62	NA	0.06
18	0.65	NA	0.06
19	0.70	NA	0.07
20	0.77	NA	0.07
21	0.85	NA	0.05
22	0.87	NA	0.02
23	0.68	NA	0.04
24	0.73	NA	0.01
25	0.66	NA	0.03
26	0.96	NA	0.02
27	0.82	NA	0.05
28	0.81	NA	0.05
29	0.66	NA	0.01
AVG	0.83	0.50	0.22

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 February, 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 – February 2020

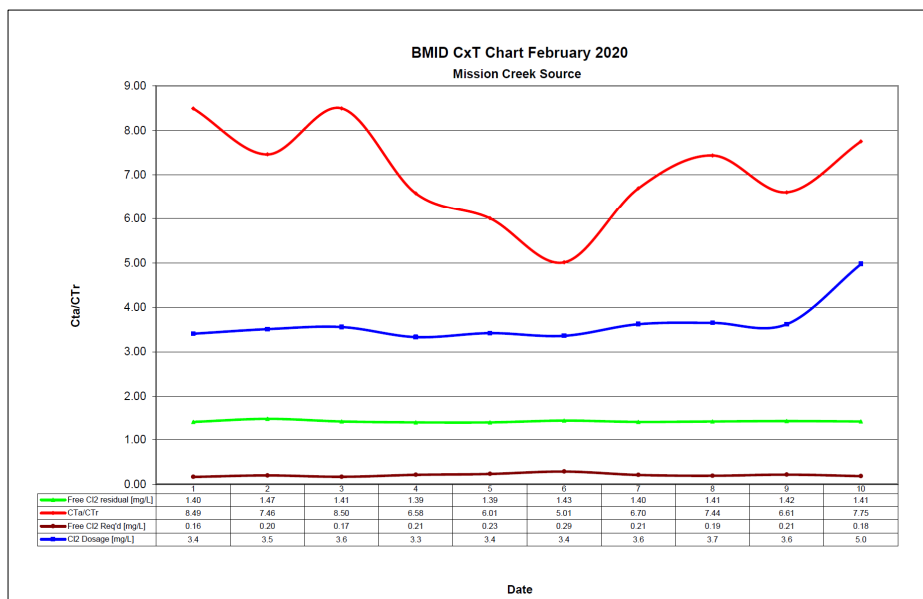


Table 4.2 - CT Table – Mission Creek Source

BMID February 2020													
Mission Creek Source													
DATE	pH	TEMP	PEAK	Free Cl2	CT	CT	CTa/CTr	Free Cl2	Cl2	VOLUME	TIME	FLOW	CL2 DOSAGE
	(Average)	(Present)	FLOW	residual	achieved	req'd		Req'd	Dosage	TOTAL		Daily Average	Average
February		[°C]	[Usgpm]	[mg/L]				[mg/L]	[mg/L]	[USgal]	[mins]	US Gallons	[PPD]
1	7.61	6.5	2312	1.40	1604.4	188.9	8.49	0.16	3.4	2649600	1146	994.11	40.7
2	7.62	5.5	2550	1.47	1527.4	204.7	7.46	0.20	3.5	2649600	1039	924.62	39
3	7.63	5.8	2199	1.41	1698.9	199.9	8.50	0.17	3.6	2649600	1205	900.83	38.5
4	7.64	4.5	2554	1.39	1442.0	219.1	6.58	0.21	3.3	2649600	1037	1056.38	42.3
5	7.62	4.4	2799	1.39	1315.8	219.1	6.01	0.23	3.4	2649600	947	987.93	40.6
6	7.61	4.7	3520	1.43	1076.4	214.7	5.01	0.29	3.4	2649600	753	1032.77	41.7
7	7.59	4.7	2607	1.40	1422.9	212.5	6.70	0.21	3.6	2649600	1016	856.89	37.3
8	7.58	6.1	2611	1.41	1430.8	192.4	7.44	0.19	3.7	2649600	1015	840.75	36.9
9	7.56	5.4	2837	1.42	1326.2	200.7	6.61	0.21	3.6	2649600	934	854.89	37.2
10	7.48	5.8	2542	1.41	1469.7	189.5	7.75	0.18	5.0	2649600	1042	451.55	27
Averages	7.40	5.3	2653	1.41	1431.5	72.9	7.05	0.21	3.6				

5.0 ULTRAVIOLET DISINFECTION

Total Water Treated: 85,070.6 m³ 100.0%
On-Spec Water: 85,010.8 m³ 99.93%
Off-Spec Water: 59.8 m³ 0.07%

BMID's UV Disinfection Treatment Plant was only in use from February 1 to February 10 before the domestic water source was changed to RWW thereby bypassing the UV plant. Average monthly chlorine residual before UV Treatment was 1.33 mg/L. The average monthly chlorine residual after UV treatment and re-chlorination was 1.50 mg/L.

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

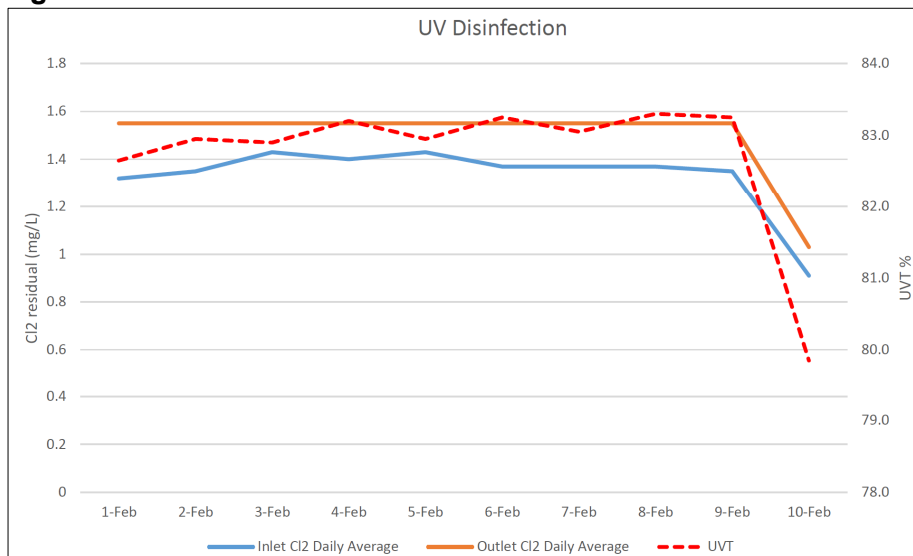


Table 5.2 - UV Disinfection Table – Mission Creek Source

	Inlet Cl2 Daily Average	Outlet Cl2 Daily Average	UVT		In Spec Water Volume	Off Spec Water	Off Spec % of Water
Date	mg/L	mg/L	% T		Cubic Meters	Cubic Meters	Percentage
1-Feb	1.32	1.55	82.7		7629.6	0	0.00%
2-Feb	1.35	1.55	83.0		8133	0	0.00%
3-Feb	1.43	1.55	82.9		6944.1	0	0.00%
4-Feb	1.4	1.55	83.2		17288.4	0	0.00%
5-Feb	1.43	1.55	83.0		9641.7	48	0.50%
6-Feb	1.37	1.55	83.3		11481.9	2.4	0.02%
7-Feb	1.37	1.55	83.1		7058.7	0	0.00%
8-Feb	1.37	1.55	83.3		7001.1	0	0.00%
9-Feb	1.35	1.55	83.3		7484.8	0	0.00%
10-Feb	0.91	1.03	79.9		2347.5	9.4	0.40%
Average	1.33	1.50	82.4	Total	85010.8	59.8	0.070%

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
- 40 samples were found to be absent of Coliforms.
- 40 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
6-Jan-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13-Jan-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-Jan-20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Jan-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-Jan-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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

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

3-Feb-20		
Location	THM (mg/L)	HAA (mg/L)
Kirschner Reservoir		0.147
2921 Belgo Rd	0.0827	
Pearson School	0.0909	0.121
3976 Highway 97	0.1010	

In-House Analysis (BMID Staff)

- Presence/Absence samples taken on a three-week cycle at seven sites around the BMID service area.
- All 10 samples were found to be absent of both Total Coliforms and *E. Coli*.

Table 6.4 - BMID In-house Testing – Presence Absence

Location	2/3/2020				2/10/2020				2/18/2020				2/24/2020			
	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.
Sylvania Cres					0.97	8.6	-	X					0.19	8.2	-	X
170 Kneller Rd					0.95	8.1	-	X					0.17	7.8	-	X
2105 Morrison	0.67	10.2	-	X					0.08	9.8	-	X				
Staymen Rd	0.55	8.4	-	X					0.12	8.8	-	X				
260 Campion Rd																
Fenwick Rd																
Solly Ct					0.26	8.8	-	X					0.16	9.8	-	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 = 40
- Total tests sampled in BMID treated distribution system = 50 (Zero Positive Samples)