



MONTHLY REPORTING PERIOD - FEBRUARY, 2019

1. SUMMARY

The list below provides a summary of the water quality information collected by BMID in February, 2019. Documentation and figures are provided on the following pages to support this submission.

Source	Total (US Gals)	Total (Mega Litres)
Mission Creek	51,761,728	195.92
Well 4	2,347,000	8.88
Well 5	0	0
Well 6 (Irrigation Only)	0	0
Scotty Creek (Irrigation Only)	0	0
Total	54,108,728	204.80

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 slowed down to minimal movement through February. Groundwater monitoring showed a sharp decrease in groundwater levels since the conduit repair with groundwater levels continuing to fall at a gradual rate. The hillside has not moved in recent weeks and will continue to be monitored. Additionally, new groundwater and slope indicator monitoring stations have been installed during February along with the first well designed to control the groundwater table;
2. The hill side slope immediately below the Kirschner Mountain water booster station has shown some ground stress cracking. The City is taking steps to remediate the slope and ensure the security of infrastructure, including BMID's booster station;
3. Turbidity levels at the Distribution Intake peaked at 0.43 NTU on February 20. Average turbidity for February was 0.34 NTU;
4. The highest monthly turbidity level recorded at the first customer (Booster #1) was 0.32 NTU on February 1 and 2, 2019. Average monthly turbidity was 0.30 NTU for February;
5. BMID's Ultraviolet Treatment Facility treated 208,858.5 m³ of water, with only 0.004% which was Out-of-Spec. Average UVT% was 85.6%. The average inlet chlorine residual was 1.70 mg/L compared to an average of 1.59 mg/L for the outlet post UV treatment. BMID has a discrepancy in flow meters that we are working to resolve;
6. Mission Creek had average flows for February as the upper watershed runoff was limited due to colder than normal conditions;
7. BMID's Scotty Creek source was shut off for the year on August 24, 2018;
8. Well # 4 is currently the primary source of water for the north-end. Well #5 was placed on stand-by until spring;
9. Well #6 supplies irrigation water to the north-end of the system and was placed on stand-by until spring;

10. *E.Coli* levels at Mission Creek's Point of Diversion had low counts throughout February with a peak count of 1 on February 4th, 11th and 19th with an average count of 0.38 per sample during the month;
11. *E.Coli* levels at the system intake, down-stream of the WTP, prior to disinfection, had low counts throughout February, 2019. A peak count of 5 was sampled on February 4;
12. No *E.Coli* or *Total Coliforms* were found in treated water in the distribution system through third-party analysis. In addition, no positive bacteria tests were found from the in-house presence-absence tests during routine testing;
13. The WTP remained in stand-by mode throughout February. The plant remains capable of treating water if poor raw water quality is delivered from Mission Creek;

1.0 FLOWS - FEBRUARY, 2019

Maximum Daily Flow was on February 20, 2019 at 2,222,045 US gallons (8.41 ML)

Minimum Daily Flow was on February 12, 2019 at 1,545,817 US gallons (5.85 ML)

Mission Creek provided 96% of domestic flow throughout February.

Figure 1.1 - Domestic Water System Flow

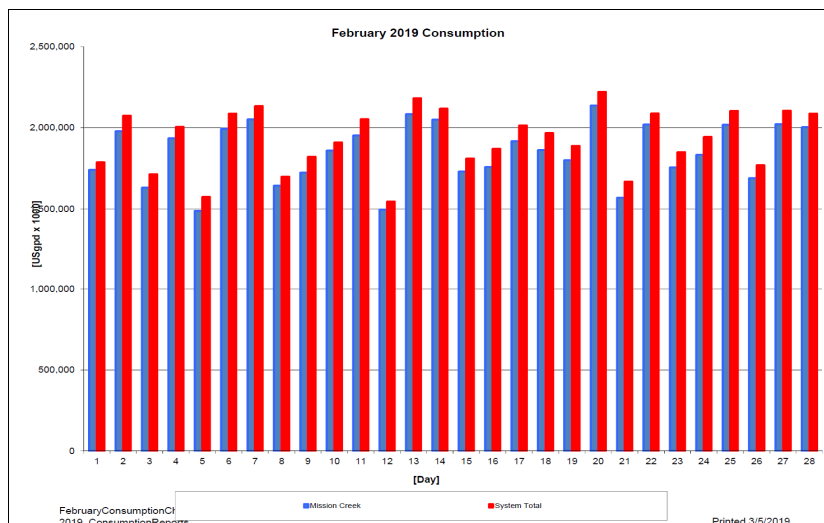


Table 1.2 - February 2019 - Daily Consumption Report

Year	Mission Creek	Well #4	Well #5	System Total	System Total
2019	Usgpd	Usgpd	Usgpd	Usgpd	ML/Day
1-Feb	1,741,610	46,000	0.0	1,787,610	6.77
2-Feb	1,979,253	96,000	0.0	2,075,253	7.85
3-Feb	1,631,031	83,000	0.0	1,714,031	6.49
4-Feb	1,936,030	71,000	0.0	2,007,030	7.60
5-Feb	1,487,907	86,000	0.0	1,573,907	5.96
6-Feb	1,993,827	94,000	0.0	2,087,827	7.90
7-Feb	2,052,413	82,000	0.0	2,134,413	8.08
8-Feb	1,643,660	56,000	0.0	1,699,660	6.43
9-Feb	1,724,594	97,000	0.0	1,821,594	6.89
10-Feb	1,860,312	50,000	0.0	1,910,312	7.23
11-Feb	1,952,980	101,000	0.0	2,053,980	7.77
12-Feb	1,495,817	50,000	0.0	1,545,817	5.85
13-Feb	2,084,617	98,000	0.0	2,182,617	8.26
14-Feb	2,051,240	67,000	0.0	2,118,240	8.02
15-Feb	1,730,450	81,000	0.0	1,811,450	6.86
16-Feb	1,759,075	112,000	0.0	1,871,075	7.08
17-Feb	1,918,139	97,000	0.0	2,015,139	7.63
18-Feb	1,863,037	105,000	0.0	1,968,037	7.45
19-Feb	1,801,043	88,000	0.0	1,889,043	7.15
20-Feb	2,138,045	84,000	0.0	2,222,045	8.41
21-Feb	1,569,481	99,000	0.0	1,668,481	6.32
22-Feb	2,020,556	68,000	0.0	2,088,556	7.91
23-Feb	1,756,188	94,000	0.0	1,850,188	7.00
24-Feb	1,833,920	110,000	0.0	1,943,920	7.36
25-Feb	2,019,507	85,000	0.0	2,104,507	7.97
26-Feb	1,689,812	80,000	0.0	1,769,812	6.70
27-Feb	2,022,889	83,000	0.0	2,105,889	7.97
28-Feb	2,004,295	84,000	0.0	2,088,295	7.90
Totals Usgpd	51,761,728	2,347,000	0	54,108,728	204.80
Totals ML	195.92	8.88	0.00		
Avg's	1,848,633	7.00		1,932,455	7.31
Max	2,138,045	8.09		2,222,045	8.41
Min	1,487,907	5.63		1,545,817	5.85

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 E.Coli readings clearly show the effectiveness in risk reduction from the Water Treatment Plant and extended settling times in Stevens and Hadden Reservoirs.

Figure 2.1 - Raw Water *E.Coli* Readings (CARO Lab results) January-February 2018/2019

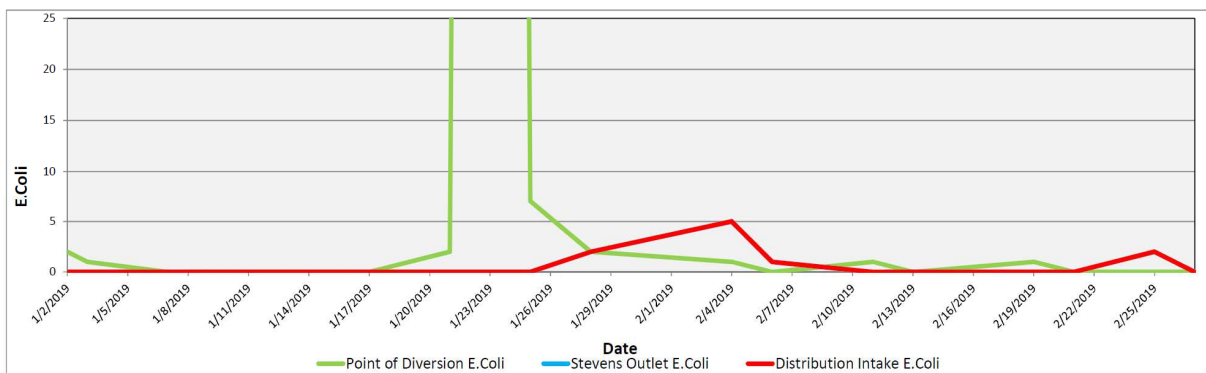


Table 2.1 - *E.Coli* Readings (CARO Labs)

Date	Point of Diversion E.Coli	Stevens Outlet E.Coli	Distribution Intake E.Coli
2-Jan-19	2	0	0
3-Jan-19	1	0	0
7-Jan-19	0	0	0
9-Jan-19	0	0	0
14-Jan-19	0	0	0
17-Jan-19	0	0	0
21-Jan-19	2	0	0
23-Jan-19	590	0	0
25-Jan-19	7	0	0
28-Jan-19	2	5	2
4-Feb-19	1	2	5
6-Feb-19	0	0	1
11-Feb-19	1	2	0
13-Feb-19	0	0	0
19-Feb-19	1	1	0
21-Feb-19	0	0	0
25-Feb-19	0	0	2
27-Feb-19	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

Turbidity for the Mission Creek source was measured at Booster Station No. 1 on Gallagher’s Road, the first-customer, through February 2019. The highest turbidity recorded at this location was 0.32 NTU on February 1 and 2. The average turbidity for the month was 0.30 NTU during February.

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

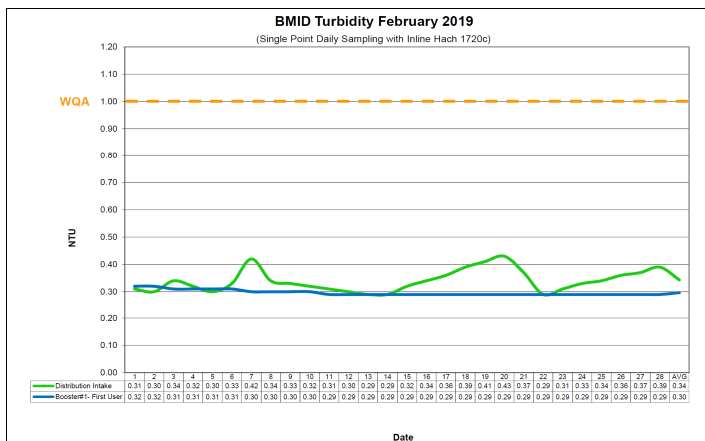


Table 3.1 - Daily Monitoring Record – Turbidity at Distribution Intake & Bst Stn 1

Turbidity Point Sampling for February 2019		
Date	Distribution Intake	Booster#1- First User
	Daily Average NTU	Daily Average NTU
1	0.31	0.32
2	0.30	0.32
3	0.34	0.31
4	0.32	0.31
5	0.30	0.31
6	0.33	0.31
7	0.42	0.30
8	0.34	0.30
9	0.33	0.30
10	0.32	0.30
11	0.31	0.29
12	0.30	0.29
13	0.29	0.29
14	0.29	0.29
15	0.32	0.29
16	0.34	0.29
17	0.36	0.29
18	0.39	0.29
19	0.41	0.29
20	0.43	0.29
21	0.37	0.29
22	0.29	0.29
23	0.31	0.29
24	0.33	0.29
25	0.34	0.29
26	0.36	0.29
27	0.37	0.29
28	0.39	0.29
AVG	0.34	0.30

4.0 CHLORINE CONTACT TIME

Temperature, pH, current 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, 2019.

Figure 4.1 - CT Trending – BMID Mission Creek Source – February 2019

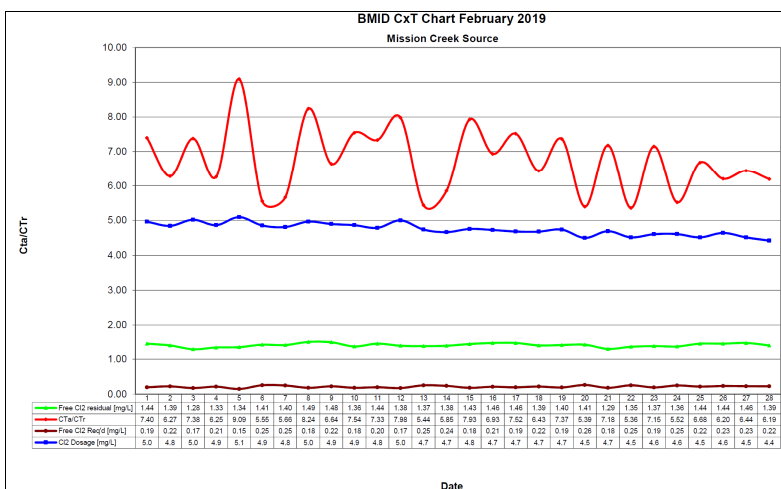


Table 4.2 - CT Table – Mission Creek Source

BMID February 2019 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
	(highest)	(lowest)	FLOW	residual	achieved	req'd		Req'd	Dosage	TOTAL		Daily Average	Daily Average
February		[°C]	[Usgpm]	[mg/L]				[mg/L]	[mg/L]	[USgal]	[mins]	US Gallons	[PPD]
1	7.72	2.6	1996	1.44	1911.5	258.4	7.40	0.19	5.0	2649600	1327	1189.16	70.9
2	7.70	2.8	2332	1.39	1579.3	251.8	6.27	0.22	4.8	2649600	1136	1395.74	81.2
3	7.69	2.5	1817	1.28	1866.5	253.0	7.38	0.17	5.0	2649600	1458	1127.88	68
4	7.69	2.2	2169	1.33	1624.7	259.8	6.25	0.21	4.9	2649600	1222	1350.47	78.9
5	7.68	2.0	1486	1.34	2389.3	262.8	9.09	0.15	5.1	2649600	1783	1034.27	63.3
6	7.68	1.9	2522	1.41	1481.3	266.7	5.55	0.25	4.9	2649600	1051	1366.73	79.7
7	7.68	2.1	2494	1.40	1487.3	262.7	5.66	0.25	4.8	2649600	1062	1446.9	83.6
8	7.67	2.2	1826	1.49	2162.1	262.4	8.24	0.18	5.0	2649600	1451	1145.27	68.3
9	7.67	2.0	2222	1.48	1764.8	265.8	6.64	0.22	4.9	2649600	1192	1222.53	71.9
10	7.66	2.1	1839	1.36	1959.5	259.7	7.54	0.18	4.9	2649600	1441	1268.51	74.1
11	7.66	2.4	2028	1.44	1881.4	256.6	7.33	0.20	4.8	2649600	1307	1358.56	78.1
12	7.65	2.4	1803	1.38	2028.0	254.1	7.98	0.17	5.0	2649600	1470	1043.58	62.7
13	7.65	2.4	2631	1.37	1379.7	253.8	5.44	0.25	4.7	2649600	1007	1425.09	81.1
14	7.65	2.4	2459	1.38	1487.0	254.1	5.85	0.24	4.7	2649600	1078	1453.19	81.4
15	7.65	2.4	1871	1.43	2025.1	255.4	7.93	0.18	4.8	2649600	1416	1192.28	68.1
16	7.65	2.6	2208	1.46	1752.0	252.7	6.93	0.21	4.7	2649600	1200	1243.89	70.6
17	7.66	2.5	2015	1.46	1919.8	255.3	7.52	0.19	4.7	2649600	1315	1305.36	73.4
18	7.66	2.4	2244	1.39	1641.2	255.2	6.43	0.22	4.7	2649600	1181	1316.97	74
19	7.66	2.3	1957	1.40	1895.5	257.3	7.37	0.19	4.7	2649600	1354	1226.87	69.8
20	7.67	2.4	2700	1.41	1383.7	256.7	5.39	0.26	4.5	2649600	981	1488.17	80.4
21	7.67	2.4	1880	1.29	1818.1	253.3	7.18	0.18	4.7	2649600	1409	1114.5	62.8
22	7.67	2.4	2619	1.35	1365.8	255.0	5.36	0.25	4.5	2649600	1012	1383.4	75
23	7.67	2.4	1987	1.37	1826.9	255.6	7.15	0.19	4.6	2649600	1333	1242.18	68.7
24	7.68	2.4	2549	1.36	1413.7	256.2	5.52	0.25	4.6	2649600	1039	1248.49	69.1
25	7.68	2.4	2210	1.44	1726.4	258.4	6.68	0.22	4.5	2649600	1199	1405.37	76.2
26	7.68	2.2	2349	1.44	1624.3	262.0	6.20	0.23	4.6	2649600	1128	1194.63	66.6
27	7.69	2.2	2281	1.46	1695.9	263.5	6.44	0.23	4.5	2649600	1162	1379.81	74.8
28	7.69	2.2	2275	1.39	1618.9	261.5	6.19	0.22	4.4	2649600	1165	1394.06	74
Averages	7.67	2.3	2170	1.40	1739.6	257.8	6.75	0.21	4.7				

5.0 ULTRAVIOLET DISINFECTION

Total Water Treated 208,858.5 100%
 On-Spec Water 208,849.4 m³ 99.996%
 Off-Spec Water 9.1 m³ 0.004%

- February 19-21 water volume discrepancy.

Average monthly chlorine residual before UV Treatment was 1.70 mg/L compared to 1.59 mg/L after UV disinfection.

Figure 5.1 - UV Disinfection – BMID Mission Creek Source – February 2019

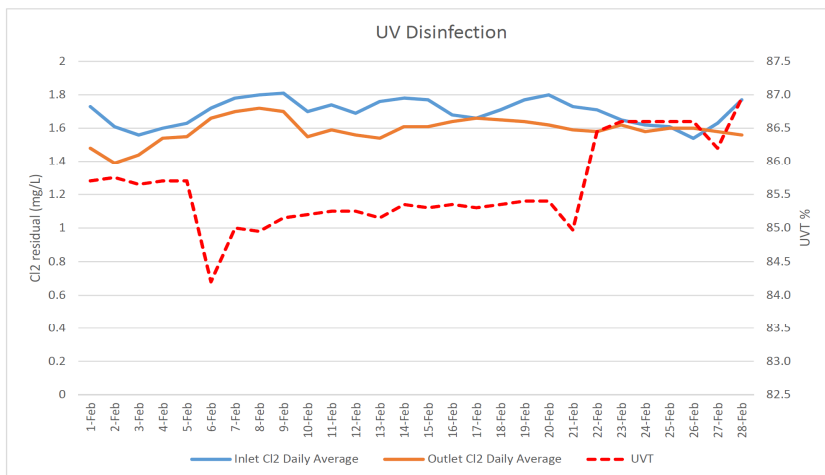


Table 5.2 - UV Disinfection Table – Mission Creek Source

Date	Inlet Cl2 Daily Average mg/L	Outlet Cl2 Daily Average mg/L	UVT % T	In Spec Water Volume Cubic Meters	Off Spec Water Cubic Meters	Off Spec % of Water Percentage
1-Feb	1.73	1.48	85.7	6528.6	0	0.00%
2-Feb	1.61	1.39	85.8	7635.5	0	0.00%
3-Feb	1.56	1.44	85.7	6184.6	0	0.00%
4-Feb	1.6	1.54	85.7	7378.8	0	0.00%
5-Feb	1.63	1.55	85.7	5667	0	0.00%
6-Feb	1.72	1.66	84.2	7479	0	0.00%
7-Feb	1.78	1.7	85.0	7906.8	0	0.00%
8-Feb	1.8	1.72	85.0	6307.9	0	0.00%
9-Feb	1.81	1.7	85.2	6710.1	8.7	0.13%
10-Feb	1.7	1.55	85.2	6928.9	0.4	0.01%
11-Feb	1.74	1.59	85.3	7418.8	0	0.00%
12-Feb	1.69	1.56	85.3	5751.6	0	0.00%
13-Feb	1.76	1.54	85.2	7804.3	0	0.00%
14-Feb	1.78	1.61	85.4	7976.3	0	0.00%
15-Feb	1.77	1.61	85.3	6533.1	0	0.00%
16-Feb	1.68	1.64	85.4	6803.4	0	0.00%
17-Feb	1.66	1.66	85.3	7167.3	0	0.00%
18-Feb	1.71	1.65	85.4	7197.2	0	0.00%
19-Feb	1.77	1.64	85.4	7000	0	0.00%
20-Feb	1.8	1.62	85.4	8000	0	0.00%
21-Feb	1.73	1.59	85.0	6000	0	0.00%
22-Feb	1.71	1.58	86.5	7558.3	0	0.00%
23-Feb	1.65	1.62	86.6	6801	0	0.00%
24-Feb	1.62	1.58	86.6	6829.2	0	0.00%
25-Feb	1.61	1.6	86.6	7692.2	0	0.00%
26-Feb	1.54	1.6	86.6	6561.8	0	0.00%
27-Feb	1.63	1.58	86.2	7574.7	0	0.00%
28-Feb	1.77	1.56	87.0	7622.9	0	0.00%
Average	1.70	1.59	85.6	Total 197019.3	9.1	0.005%

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	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
2-Jan-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7-Jan-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14-Jan-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-Jan-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-Jan-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4-Feb-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5-Feb-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11-Feb-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12-Feb-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Feb-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-Feb-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 6.2 – Disinfection By-Products - THM and HAA Results

	19-Nov-18	12-Dec-18	11-Jan-19	5-Feb-19
THM mg/L	0.132	0.0974	0.131	0.107
HAA mg/L	0.0852	0.037	0.0359	0.122

In-House Analysis (BMID Staff)

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

Table 6.3 - BMID In-house Testing – Presence Absence

Location	2/4/2019				2/11/2019				2/19/2019				2/25/2019			
	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.
Sylvania Cres	0.86	5.4	-	X									1.02	5.8	-	X
170 Kneller Rd	0.52	6.6	-	X									1.07	6.2	-	X
2105 Morrison Staymen Rd									0.56	6.0	-	X				
260 Campion Rd					0.77	1.4	-	X		0.90	3.4	-	X			
Fenwick Rd					0.34	1.4	-	X								
Solly Ct	0.95	2.2	-	X									0.9	4.8	-	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)