



MONTHLY REPORTING PERIOD - MAY, 2019

1. SUMMARY

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

Source	Total (US Gals)	Total (Mega Litres)
Mission Creek	437,136,308	1,654.56
Well 4	0	0
Well 5	26,855,736	101.65
Well 6 (Irrigation Only)	6,355	0.02
Scotty Creek (Irrigation Only)	514,000	1.95
Total	464,512,399	1,758.18

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 throughout May, continuing the trend seen in the previous months. Groundwater monitoring is showing a steady decline in groundwater levels since the fall. The hillside is being monitored for movement and groundwater movement every second week and on alternate weeks for these two parameters.
2. BMID has 300m of flexible 900mm diameter High-density Polyethylene (HDPE) pipe on-site. As a contingency plan, the pipe has been fused into longer sections and is stored on location where it can be assembled in a fairly short period of time, should a slope failure occur;
3. Turbidity levels at the Distribution Intake peaked at 0.66 NTU on May 14, 2019. Average turbidity for May was 0.46 NTU. Raw water in the creek was above 20 NTU several times during this period of time;
4. The highest monthly turbidity level recorded at the first customer (Booster #1) was 0.75 NTU on May 03. Average monthly turbidity was 0.43 NTU for May;
5. BMID's Ultraviolet Treatment Facility treated 1,469,579m³ of water, none of which was "Off-Spec". Average UVT% was 89.3%. The average inlet chlorine residual was 1.41 mg/L compared to an average of 1.37 mg/L for the outlet after UV treatment;
6. Mission Creek had slightly below average flows for spring freshet during May with below average rainfall contributing to the reduced peak flows. The melting of the upper-elevation snow pack in the watershed began earlier than usual, however the snow pack will continue to be monitored;
7. BMID's Scotty Creek source, used for irrigation in the north-end, had limited usage as a supplementary source throughout May 2019;
8. Well # 5 was the primary source of domestic water for the north-end for most of May;
9. Well #6 which supplies irrigation water to the twinned north-end of the system, was used throughout May to supplement flows from Well 5 and Mission Creek;

10. *E.Coli* levels at Mission Creek's Point of Diversion had average counts throughout May with a peak count of 8 on May 31, 2019. The Point of Diversion had an average count of 3.1 CFU/100ml per sample based on the 9 samples taken throughout the last month;
11. *E.Coli* levels in the raw water at the distribution system intake, down-stream of the WTP, prior to disinfection, had low counts throughout most of May, 2019 with a peak counts of 7 *E-Coli* on May 7. Average *E.Coli* counts for the month were 1.6 CFU/100ml based of the 9 samples taken;
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 ran throughout May, 2019 as water quality conditions in Mission Creek required chemical treatment to reduce turbidity and colour levels associated with spring runoff.

1.0 FLOWS - MAY, 2019

Maximum Daily Flow was on May 13, 2019 at 22,020,891 US gallons (83.35 ML)

Minimum Daily Flow was on May 1, 2019 at 8,029,403 US gallons (30.39 ML)

Mission Creek provided 94% of domestic flow throughout May.

Figure 1.1 - Domestic Water System Flow

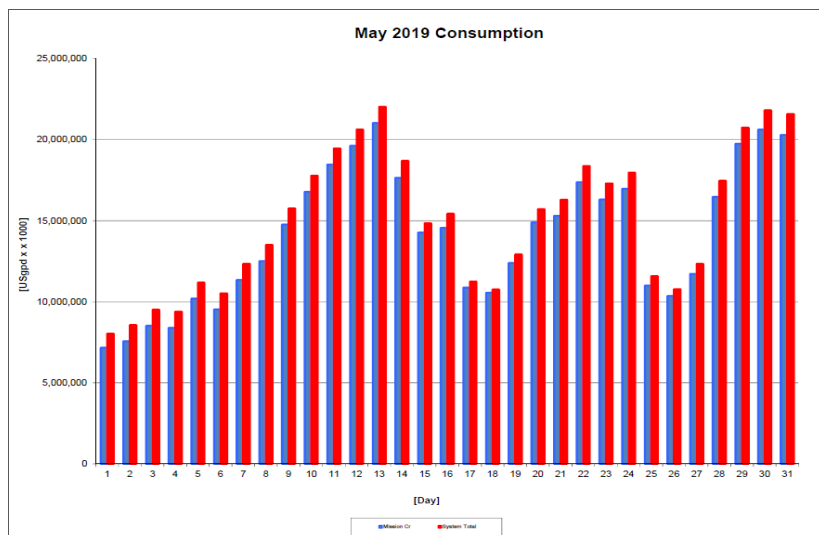


Table 1.2 - May 2019 - Daily Consumption Report

Year	Mission Cr	Well #4	Well #5	Well #6	Scotty Crk	System Total	System Total
2019	Usgpd	Usgpd	Usgpd	Usgpd	Usgpd	Usgpd	ML/Day
1-May	7,166,639	0	862,764.0	18.0	0	8,029,421	30.39
2-May	7,565,160	0	999,241.0	38.0	0	8,564,439	32.42
3-May	8,516,932	0	999,225.0	174.0	0	9,516,331	36.02
4-May	8,388,881	0	999,974.0	12.0	0	9,388,867	35.54
5-May	10,191,231	0	998,605.0	140.0	0	11,189,976	42.35
6-May	9,524,553	0	999,179.0	19.0	0	10,523,751	39.83
7-May	11,348,400	0	999,107.0	0.0	0	12,347,507	46.74
8-May	12,507,301	0	998,785.0	92.0	0	13,506,178	51.12
9-May	14,757,413	0	999,980.0	518.0	0	15,757,911	59.64
10-May	16,774,725	0	999,157.0	494.0	0	17,774,376	67.28
11-May	18,460,600	0	999,663.0	613.0	0	19,460,876	73.66
12-May	19,617,799	0	999,412.0	798.0	0	20,618,009	78.04
13-May	21,021,871	0	999,020.0	555.0	0	22,021,446	83.35
14-May	17,648,547	0	999,973.0	358.0	38,000	18,686,878	70.73
15-May	14,267,572	0	571,648.0	96.0	0	14,839,316	56.17
16-May	14,552,130	0	875,771.0	0.0	0	15,427,901	58.39
17-May	10,868,687	0	381,591.0	0.0	0	11,250,278	42.58
18-May	10,558,602	0	204,628.0	0.0	0	10,763,230	40.74
19-May	12,396,943	0	523,442.0	0.0	0	12,920,385	48.90
20-May	14,886,372	0	832,510.0	41.0	0	15,718,923	59.50
21-May	15,297,119	0	999,618.0	34.0	0	16,296,771	61.68
22-May	17,373,869	0	999,266.0	273.0	0	18,373,408	69.54
23-May	16,303,678	0	999,006.0	29.0	0	17,302,713	65.49
24-May	16,956,953	0	999,382.0	0.0	0	17,956,335	67.96
25-May	11,002,012	0	571,186.0	0.0	0	11,573,198	43.80
26-May	10,357,513	0	427,298.0	0.0	0	10,784,811	40.82
27-May	11,718,579	0	623,166.0	0.0	0	12,341,745	46.71
28-May	16,461,842	0	998,462.0	126.0	0	17,460,430	66.09
29-May	19,734,924	0	998,385.0	423.0	0	20,733,732	78.48
30-May	20,620,119	0	998,714.0	521.0	190,000	21,809,354	82.55
31-May	20,289,342	0	997,578.0	983.0	286,000	21,573,903	81.66
Totals Usgpd	437,136,308	0	26,855,736	6,355	514,000	464,512,399	1758.18
Totals ML	1,654.56	0.00	101.65	0.02	1.95	1,758	
Avg's	14,101,171	53.37				14,984,271	56.72
Max	21,021,871	79.57				22,021,446	83.35
Min	7,166,639	27.13				8,029,421	30.39

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) April-May 2018/2019

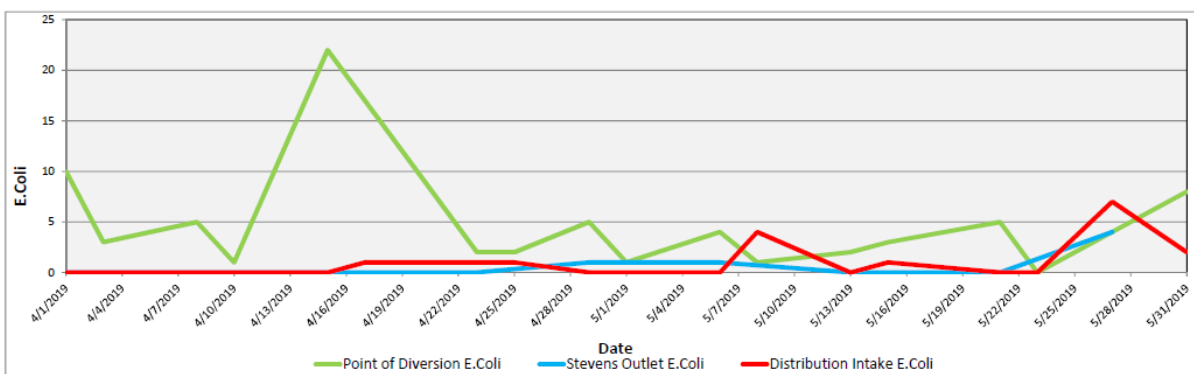


Table 2.1 - E.Coli Readings (CARO Labs)

Date	Point of Diversion E.Coli	Stevens Outlet E.Coli	Distribution Intake E.Coli
1-Apr-19	10	0	0
3-Apr-19	3	0	0
8-Apr-19	5	0	0
10-Apr-19	1	0	0
15-Apr-19	22	0	0
17-Apr-19	17	0	1
23-Apr-19	2	0	1
25-Apr-19	2	0	1
29-Apr-19	5	1	0
1-May-19	1	1	0
6-May-19	4	1	0
8-May-19	1	0	4
13-May-19	2	0	0
15-May-19	3	0	1
21-May-19	5	0	0
23-May-19	0	0	0
27-May-19	4	4	7
31-May-19	8	2	2

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)

2.0 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 May 2019. The highest turbidity recorded at this location was 0.75 NTU on May 3. The average turbidity for the month was 0.43 NTU during May.

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

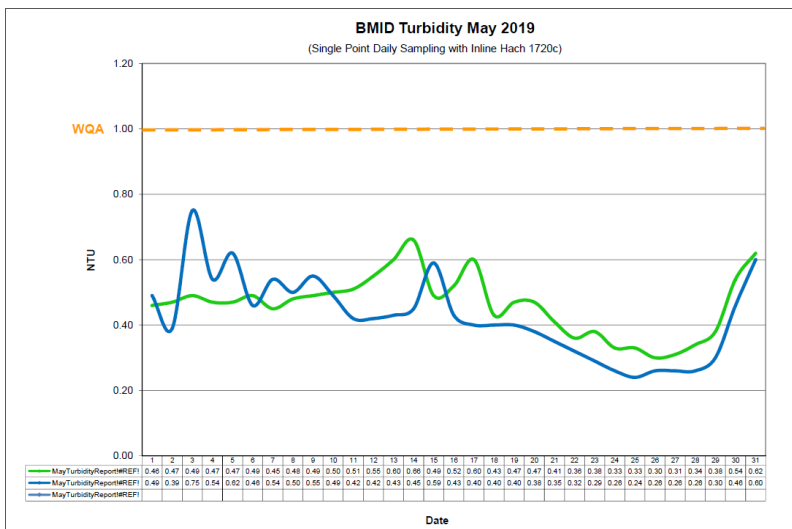


Table 3.1 - Daily Monitoring Record – Turbidity at Distribution Intake & Bst Stn 1

Turbidity Point Sampling for May 2019		
Date	Distribution Intake	Booster#1- First User
	Daily Average [NTU]	Daily Average [NTU]
1	0.46	0.49
2	0.47	0.39
3	0.49	0.75
4	0.47	0.54
5	0.47	0.62
6	0.49	0.46
7	0.45	0.54
8	0.48	0.50
9	0.49	0.55
10	0.50	0.49
11	0.51	0.42
12	0.55	0.42
13	0.60	0.43
14	0.66	0.45
15	0.49	0.59
16	0.52	0.43
17	0.60	0.40
18	0.43	0.40
19	0.47	0.40
20	0.47	0.38
21	0.41	0.35
22	0.36	0.32
23	0.38	0.29
24	0.33	0.26
25	0.33	0.24
26	0.30	0.26
27	0.31	0.26
28	0.34	0.26
29	0.38	0.30
30	0.54	0.46
31	0.62	0.60
AVG	0.46	0.43

3.0 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 May, 2019.

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

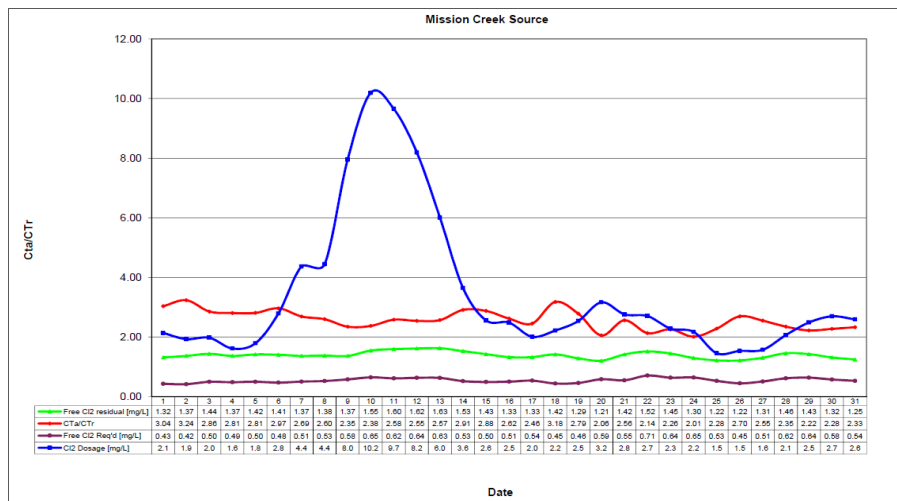


Table 4.2 - CT Table – Mission Creek Source

BMID May 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
	(Average)	(Present)	FLOW	residual	achieved	req'd		Req'd	Dosage	TOTAL		Daily Average	Average
May		[°C]	[Usgpm]	[mg/L]				[mg/L]	[mg/L]	[USgal]	[mins]	[Usgpm]	[PPD]
1	7.50	10.2	8269	1.32	423.0	139.3	3.04	0.43	2.1	2649600	320	4129	106
2	7.47	10.3	8147	1.37	445.6	137.6	3.24	0.42	1.9	2649600	325	5222	121
3	7.43	10.4	9827	1.44	388.3	135.7	2.86	0.50	2.0	2649600	270	5433	129
4	7.39	10.8	10009	1.37	362.7	129.1	2.81	0.49	1.6	2649600	265	6167	120
5	7.35	11.2	10742	1.42	350.3	124.5	2.81	0.50	1.8	2649600	247	6534	141
6	7.30	11.5	10530	1.41	354.8	119.6	2.97	0.48	2.8	2649600	252	7677	258
7	7.27	11.9	11770	1.37	308.4	114.5	2.69	0.51	4.4	2649600	225	6548	344
8	7.24	12.2	12659	1.38	288.8	111.0	2.60	0.53	4.4	2649600	209	6900	369
9	7.22	12.5	14324	1.37	253.4	107.8	2.35	0.58	8.0	2649600	185	4276	409
10	7.16	12.8	16430	1.55	250.0	105.2	2.38	0.65	10.2	2649600	161	3613	442
11	7.08	12.9	16107	1.60	263.2	101.8	2.58	0.62	9.7	2649600	164	4152	482
12	6.97	12.9	17239	1.62	249.0	97.8	2.55	0.64	8.2	2649600	154	5097	502
13	6.86	13.0	18029	1.63	239.6	93.2	2.57	0.63	6.0	2649600	147	7165	518
14	6.75	12.7	15424	1.53	262.8	90.2	2.91	0.53	3.6	2649600	172	9973	437
15	6.78	10.8	12763	1.43	296.9	103.1	2.88	0.50	2.6	2649600	208	11444	353
16	6.82	11.3	13434	1.33	262.3	100.1	2.62	0.51	2.5	2649600	197	11893	355
17	6.88	10.5	13240	1.33	266.2	108.3	2.46	0.54	2.0	2649600	200	11568	280
18	6.94	10.2	10351	1.42	363.5	114.3	3.18	0.45	2.2	2649600	256	10761	287
19	6.95	10.7	11229	1.29	304.4	109.3	2.79	0.46	2.5	2649600	236	10760	329
20	6.99	10.9	14375	1.21	223.0	108.4	2.06	0.59	3.2	2649600	184	10160	387
21	7.02	11.0	13153	1.42	286.1	111.5	2.56	0.55	2.8	2649600	201	11859	394
22	7.04	10.5	16041	1.52	251.1	117.5	2.14	0.71	2.7	2649600	165	13215	430
23	7.08	10.8	14647	1.45	262.3	116.1	2.26	0.64	2.3	2649600	181	14402	396
24	7.11	10.9	14905	1.30	231.1	114.7	2.01	0.65	2.2	2649600	178	15199	397
25	7.15	11.6	12877	1.22	251.0	109.9	2.28	0.53	1.5	2649600	206	15240	268
26	7.14	12.0	11257	1.22	287.2	106.5	2.70	0.45	1.5	2649600	235	14824	274
27	7.11	11.8	12602	1.31	275.4	107.9	2.55	0.51	1.6	2649600	210	15815	300
28	7.07	12.5	15988	1.46	242.0	102.9	2.35	0.62	2.1	2649600	166	15684	390
29	7.02	13.3	17895	1.43	211.7	95.2	2.22	0.64	2.5	2649600	148	15060	451
30	7.00	14.3	17629	1.32	198.4	87.1	2.28	0.58	2.7	2649600	150	14023	455
31	6.99	14.1	16267	1.25	203.6	87.2	2.33	0.54	2.6	2649600	163	13932	435

4.0 ULTRAVIOLET DISINFECTION

Total Water Treated: 1,469,579 m³ 100%
 On-Spec Water: 1,469,579 m³ 100%
 Off-Spec Water: 0 m³ 0%

Average monthly chlorine residual before UV Treatment was 1.41 mg/L compared to 1.37 mg/L after UV disinfection and re-chlorination.

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

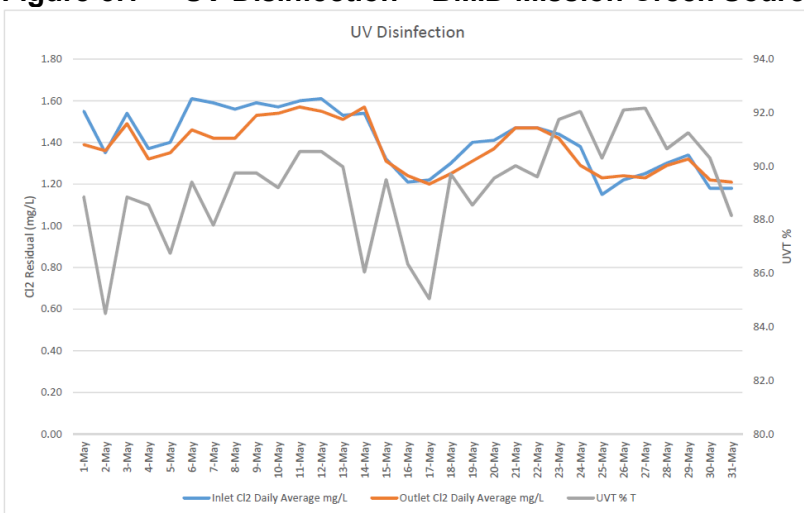


Table 5.2 - UV Disinfection Table – Mission Creek Source

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 Volume Percentage
1-May	1.55	1.39	88.9	22858.1	0	0.00%
2-May	1.35	1.36	84.5	24854.1	0	0.00%
3-May	1.54	1.49	88.9	28049.6	0	0.00%
4-May	1.37	1.32	88.6	26952.5	0	0.00%
5-May	1.40	1.35	86.8	33749.0	0	0.00%
6-May	1.61	1.46	89.4	31359.0	0	0.00%
7-May	1.59	1.42	87.8	37159.6	0	0.00%
8-May	1.56	1.42	89.8	41783.2	0	0.00%
9-May	1.59	1.53	89.8	49367.0	0	0.00%
10-May	1.57	1.54	89.2	55718.3	0	0.00%
11-May	1.60	1.57	90.6	62236.1	0	0.00%
12-May	1.61	1.55	90.6	66282.8	0	0.00%
13-May	1.53	1.51	90.0	70512.4	0	0.00%
14-May	1.54	1.57	86.1	59900.4	0	0.00%
15-May	1.32	1.31	89.5	48554.6	0	0.00%
16-May	1.21	1.24	86.4	48921.4	0	0.00%
17-May	1.22	1.20	85.1	36662.4	0	0.00%
18-May	1.30	1.25	89.7	35417.2	0	0.00%
19-May	1.40	1.31	88.6	41356.6	0	0.00%
20-May	1.41	1.37	89.6	50425.1	0	0.00%
21-May	1.47	1.47	90.0	52200.3	0	0.00%
22-May	1.47	1.47	89.6	58663.9	0	0.00%
23-May	1.44	1.42	91.8	55550.8	0	0.00%
24-May	1.38	1.29	92.1	57709.7	0	0.00%
25-May	1.15	1.23	90.3	36511.3	0	0.00%
26-May	1.22	1.24	92.1	34618.7	0	0.00%
27-May	1.25	1.23	92.2	39140.1	0	0.00%
28-May	1.30	1.29	90.7	55137.8	0	0.00%
29-May	1.34	1.32	91.3	67166.0	0	0.00%
30-May	1.18	1.22	90.3	70379.6	0	0.00%
31-May	1.18	1.21	88.2	70381.4	0	0.00%
Average	1.41	1.37	89.3	Total 1469579.0	0	0.00%

5.0 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	2521 Belgo Rd		Booster 1		Elison Blow-Off		Elison School		3975 Highway 97		Prospect Reservoir		Tower Reservoir		Well #5		Well #4		Kitschner 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	Coliforms	E.coli
1-Apr-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0	0	0
8-Apr-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0	0	0
15-Apr-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0	0	0
23-Apr-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0	0	0
29-Apr-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0	0	0
30-Apr-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-
6-May-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0	0	0
13-May-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0	0	0
21-May-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	0	0	0	0	0
27-May-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

By-Product	19-Nov-18	12-Dec-18	11-Jan-19	5-Feb-19	4-Mar-19	1-Apr-19	6-May-19
THM mg/L	0.132	0.0974	0.131	0.107	0.0921	0.088	0.0736
HAA mg/L	0.0852	0.037	0.0359	0.122	0.0898	0.0726	0.0477

In-House Analysis (BMID Staff)

- Presence/Absence samples taken on a three week cycle at seven 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	5/6/2019				5/13/2019				5/21/2019				5/27/2019			
	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.	Cl2	Temp.	Pres.	Abs.
Sylvania Cres									0.88	14.4	-	X				
170 Kneller Rd									0.93	14.2	-	X				
2105 Morrison					1.26	15.8	-	X								
Staymen Rd					0.92	15.2	-	X								
260 Campion Rd	0.82	12.2	-	X									0.29	16.4	-	X
Fenwick Rd	0.75	15.4	-	X									0.34	18.4	-	X
Solly Ct									0.99	13.4	-	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) = 9
- Total tests sampled by BMID and tested by Caro Labs = 40
- Total tests sampled in BMID treated distribution system = 49 (Zero Positive Samples)