

## 2020 Annual Report

### 1.0 - Operator Certification

BMID is administered by Robert Hrasco and has EOCP classified facilities as Water Distribution (WD) level IV and Water Treatment (WT) level IV.

As required, BMID is undertaking an informal program to have level IV operators for both the Water Distribution System and the Water Treatment Plant as required by EOCP facility classifications. Currently, Scott Findlay and Bryan Vig and Jeff Clark are Level IV Water Distribution certified operators. In addition, Chase Elliott and Shayne Ermel are currently level III Water Treatment Plant operators and are both working towards their level IV certification.

#### **Table 1.1 – BMID Operator Certification**

BMID's certified operators are as follows (End of 2020):

Name	WD Level	WT Level	Chlorine Handling
Scott Findlay	IV	I	Yes
Bryan Vig	IV	I	Yes
Chase Elliott	II	III	Yes
Timothy Bauer	II	-	Yes
Geoffrey Caldwell	II	-	Yes
Jeff Clark	IV	I	Yes
Kurt Kover	II	-	Yes
Shayne Ermel	II	III	Yes
Keifer Baranec	II	-	Yes
Scott Alexander	II	-	Yes
Mathew Poynter		-	
Tyler Bateman	I	-	
Dustin Pedherny	I	-	

## **2.0 - Cross-Connection Control Program**

Working in partnership with the City of Kelowna, BMID staff help to ensure that all backflow prevention assemblies installed within our service area are tested annually by an approved tester to limit any potential hazards from entering the distribution system from commercial, industrial and institutional customers. As the program is run out of the City of Kelowna's offices using their Backflow Prevention Monitoring Software, BMID is in contact with the City when a backflow assembly is past-due for testing or when an assembly fails a test. At this point BMID contacts the customer to ensure compliance with the program.

BMID staff are in regular contact with City of Kelowna staff to confirm that all backflow assemblies installed in BMID's service area are tested and functioning. BMID works to maintain 100% compliance within our Cross-Connection program. In addition, new and renovated facilities are inspected by the building and inspection departments at the City of Kelowna to ensure that all backflow prevention assemblies are installed as required. Apart from new and renovated facilities, BMID's cross-connection control program continues to run in the same manner in 2020 as in previous years. There are 821 backflow assemblies currently found in the BMID system including 30 new installations in 2020. In total, there are 262 individual customers with a backflow prevention assembly located in 362 individual facilities.

### **3.0 - Water Monitoring Plan**

BMID's 2020 water monitoring plan has only minor changes from the Monitoring Plan implemented in 2013. Recent changes to the Monitoring Plan are as follows:

1. For all of 2020, sampling only took place at Well No. 4 during the winter when the well provided water for domestic consumption;
2. Sampling took place at Well No. 5 during the spring/summer when the well provided domestic water for the north-end of the system;
3. The newly installed Well #6, used for irrigation in the north-end, is sampled on a monthly basis while in use. The source sampled for both bacteria as well as nitrate levels.
4. Both THM and HAA sampling in the distribution system were taken at the Pearson Rd sample station. For 2020, HAA testing also took place at Kirschner Reservoir, while additional THM samples were taken at 2927 Belgo Rd sample station and 3976 Highway 97 sample station;
5. As in previous years, full parameters were carried out on all raw water sources and in BMID's high elevation drinking water reservoirs. Samples were also collected at the intakes of BMID's drinking water sources. Booster No.1 (first customer) of the primary Mission Creek source was sampled in both June and January. Well water is used as a supplemental drinking water source in the north-end for both domestic use and irrigation use. Well 4, used as the low flow winter source, was sampled in December previously and will now take place in January 2020. Well 5, used as the high-flow summer source, was sampled in June 2020;
6. Weekly raw water samples at the Scotty Creek Intake are no longer being taken as the source is used only for irrigation. All domestic connections in the Scotty Creek subdivision and the north-end of BMID's distribution system are fed off of a combination of Mission Creek system water with supplemented supply well water after the water mains were twinned and separated for domestic and irrigation use in previous years;
7. Weekly raw water samples and comprehensive samples did not take place at the newly commissioned Well 6 as this well is only used as a source for irrigation water. However Well 6 was tested during the months of operation for both bacteria and nitrate levels;

**Table 3.1 – BMID Water Sampling Summary**

Watershed & Sources	Biological	Chemical	Full Parameters	Special Testing	Frequency	Sample By
Graystoke Reservoir			X		Annual	LARRATT
Fishhawk Reservoir			X		Annual	LARRATT
Loch Long			X		Annual	LARRATT
Belgo Reservoir			X		Annual	LARRATT
James Lake Reservoir			X		Annual	LARRATT
Mission (Crescent) Lake				X	Varies	BMID
St. Margaret's Lake				X	Varies	BMID
Mission Creek Intake			X		Semi-annual	CARO
Scotty Creek Intake				X	Varies	BMID
Cornish Well				X	Varies	BMID
Well No. 4			X		Annual	CARO
Well No. 5			X		Annual	CARO
Well No. 6				X	Varies	CARO
<b>Raw Water Microbiological Monitoring</b>						
Scotty Creek Intake					Varies	BMID
WTP Intake					Bi-Weekly	CARO-BMID
Stevens – Outlet					Weekly	CARO-BMID
Hadden Outlet (at Screens)					Bi-Weekly	CARO-BMID
<b>Distribution System Monitoring</b>						
Booster No. 1	X		X		Weekly	CARO
Screen Works	X	X			Weekly	CARO
2921 Belgo	X	X		X	Weekly	CARO
Ellison Blow-Off	X				Weekly	CARO
Pearson Rd	X	X		X	Weekly	CARO
3976 Hwy 97	X				Weekly	CARO
Prospect Reservoir	X				Weekly	CARO
Tower's Ranch Reservoir	X				Weekly	CARO
Kirschner Reservoir	X	X		X	Weekly	CARO
Ellison School	X				Weekly	CARO
Well 4	X		X		Weekly	CARO
Well 5	X		X		Weekly	CARO
Well 6	X			X	Monthly	CARO
7 Sites through WD System on a 3 week rotation					Sampled for Presence Absence Rotation	BMID
<b>On-Line Monitoring</b>						
Point of Diversion (Mission Creek Intake)	On-line turbidity meter					
Water Treatment Plant	Parameters of turbidity, water consumption and particle charge (streaming current monitor) are all operating on-line at WTP					
Distribution Intake (Hadden Outlet at Screens)	On-line residual chlorine downstream of dosing location, pH and turbidity					
Surge Tower	On-line residual chlorine					
Booster Station No.1	On-line residual chlorine, pH, and turbidity					
BMID UV Reactor	On-line upstream/downstream chlorine, UV transmissivity, turbidity, pH and pressure					
Towers Reservoir	On-line residual chlorine					
Kirschner Reservoir	On-line residual chlorine					
Prospect Reservoir	On-line residual chlorine					
PRV No. 24	On-line residual chlorine					

**Table 3.1 – BMID Water Sampling Summary (continued)**

Biological Parameters						
Weekly Tests by CARO	<u>Free Chlorine Residual</u> (field) (mg/L)	<u>Temperature</u> (field) (degrees C)	<u>Total Coliforms</u> Colonies/10 0ml	<u>E.Coli</u> colonies/ 100ml		
Chemical Parameters						
Weekly Tests by CARO	<u>Turbidity</u> (NTU)	<u>Colour</u> (TCU)	<u>pH</u> (pH units)	<u>Alkalinity</u> (mg/L Caco3)	<u>Free Chlorine Residual</u> (field) (mg/L)	<u>Temperature</u> (field) (degrees C)
Monthly Tests By CARO	Disinfection Byproducts	Trihalomethanes	Haloacetic Acids			
Special Water Quality Parameters						
Mission Creek Source	UV Trans					
Mission Creek Source	TOC					
Screen Works	TOC					
Stevens Reservoir	Metals					
Full Parameters						
Carried out at Booster No. 1 on all raw water sources for consumption and on watershed drinking water reservoirs						
Parameter	Units					
Alkalinity (total)	mg/L as CaCO3					
Calcium (total)	mg/L					
Colour (true)	Colour units					
Conductivity	Umhos/cm					
Hardness	mg/L as CaCO3					
Iron (total)	mg/L					
Magnesium (total)	mg/L					
Manganese (total)	mg/L					
Nitrate & Nitrite	mg/L as N					
pH	pH units					
Potassium (total)	mg/L					
Sodium (total)	mg/L					
Sulfate	mg/L					
Total Dissolved Solids	mg/L					
Turbidity	NTU					
Ortho Phosphate	mg/L as P					
Dissolved Phosphorus	mg/L as P					
Total Phosphorus	mg/L as P					
Total Organic Carbon	mg/L					
Total Coliform	MPN/100ml					
E.Coli Coliform	MPN/100ml					
UV Transmissivity @ 254u	%/cm					
Ammonia	mg/L as N					
Total Kjeldahl Nitrogen	mg/L as N					
Chloride	mg/L					
Fluoride	mg/L					
Cyanide	mg/L					
Aluminum	mg/L					
Antimony	mg/L					
Arsenic	mg/L					
Barium	mg/L					
Boron	mg/L					
Cadmium	mg/L					
Calcium	mg/L					
Chromium	mg/L					
Cobalt	mg/L					
Copper	mg/L					
Lead	mg/L					
Mercury	mg/L					
Molybdenum	mg/L					
Nickel	mg/L					
Selenium	mg/L					
Uranium	mg/L					
Zinc	mg/L					
Total Coliforms	CFU/100 MI					
E.Coli Coliforms	CFU/100 MI					

### 3.2 – BMID Water Sampling Summary (continued)

BMID staff take weekly samples from 10 locations in the distribution system. For 2020, 474 samples were collected and taken to CARO Analytical for testing. Of the 474 samples collected all came back negative for *E.Coli* representing 100% of the total samples taken. Of the 474 samples taken for Total Coliforms, 474 came back as negative for Total Coliforms representing 100% of samples. The inactivation of total coliforms and *E.Coli* coliforms in the distribution system demonstrates the effectiveness of the Water Treatment Plant, Primary Chlorination works, Ultraviolet Disinfection Plant and the secondary sodium hypochlorite to up system currently employed by BMID.

In addition to the testing conducted by CARO, BMID staff also sampled for Presence/Absence (PA) of bacteria and incubated the samples in-house. These samples took place throughout the distribution system at 7 locations. In total 121 PA samples were collected and incubated with 100% of the samples coming back as negative for bacteria.

BMID staff also collected raw-water samples from three locations between Mission Creek and the point of chlorination. Samples at the Point of Diversion Intake (WTP intake or Stevens Pond intake depending on time of the year) and the Distribution Intake at Hadden Pond Outlet (just prior to chlorination) are taken twice weekly, whereas samples at Stevens Outlet are only taken once per week. There is a substantive reduction in the number of *E.Coli* colonies present between the Mission Creek Intake and the Distribution Intake demonstrates the effective settling of particles as the water moves through Stevens Reservoir and Hadden Reservoir. Only *E.Coli* results for these samples are as follows:

<b>Location</b>	<b>Average <i>E.Coli</i> counts per sample</b>	<b>Max <i>E.Coli</i> count</b>
Creek Intake	7.28	82
Stevens Outlet	0.43	4.1
Hadden Outlet	0.56	7.5

#### 4.0 – Water Quality Events of Note

Water advisories, positive samples, loss of service, off-spec water and customer complaints were rare throughout 2020. However, BMID noted the following occurrences when water quality issues/changes did arise.

1. On January 7, a precautionary Water Quality Advisory was issued resulting from a leak in the transmission line leading to the UV treatment Plant. Primary chlorination disinfection remained operational throughout the event. The WQA was lifted on January 19, 2020;
2. On February 10, BMID began to utilize Rutland Water Works cross-ties to provide flow to the distribution system while a planned upgrade commenced. BMID remained supplied by RWW until March 13 when normal operations resumed;
3. Background colonies were found on a sample taken on March 16 at the Tower Ranch Reservoir sampling location. No *E.Coli* and no *Total Coliforms* were detected. All subsequent tests came back negative for both *E.Coli* and *Total Coliforms*. A chlorination top-up system was installed at the reservoir to maintain higher free chlorine residual at all times;
4. On August 21, the UV treatment plant lost power while BMID crews were performing routine (cleaning in place) maintenance. This resulted in a “Lamp Failure” alarm which automatically shut down the flow to the rest of the reactors, stopping all flow downstream of the UV plant. BMID crews manually opened the valves to allow flow to the distribution system. However, some of the water was “off-spec” during this event as UV disinfection was bypassed. Primary disinfection (chlorine gas) remained throughout the event;
5. A power loss at the primary chlorinator occurred on December 21. This resulted in unchlorinated water entering the transmission line. However, the unchlorinated water was held in reserve and was later chlorinated at reduced volumes at the UV treatment plant after the primary chlorinator resumed operations. No unchlorinated water entered the distribution system throughout the event as the water held in reserve was blended with fully chlorinated water and topped up with hypochlorite at the UV station;
6. Disinfection byproducts (THMs and HAAs) experienced a seasonal variation as the source water in Mission Creek changed throughout the year. The Water Treatment Plant was able to greatly reduce DBP precursors before chlorination, however the results were above recommended levels at certain times of the year (see table 4.1)

Table 4.1 – Disinfection By-Product Testing

Sample Date	THM			HAA		
	Belgo Rd	Pearson School	3976 Hwy 97	Kirschner Reservoir	Pearson School	
Q1		0.0746	0.0698	0.0722	0.2177	0.1693
Q2		0.0830	0.0743	0.0796	0.1046	0.0929
Q3		0.0508	0.0497	0.0543	0.0475	0.0388
Q4		0.1245	0.1270	0.1285	0.0892	0.0803
Running Average		0.0794	0.0759	0.0796	0.1171	0.0967

## 5.0 - Annual Consumption Data

**CONSUMPTION:** Total annual consumption was 11,113 ML which was slightly below the ten-year average of 12,034 ML. The average daily flow for 2020 was 30.36 ML/day. The maximum daily flow was on August 18, 2020 when 117.11 ML of water was consumed.

**WATERSHED:** Graystoke, Fishhawk and Loch Long Reservoirs are normally used to keep water quality as high as possible through the summer months. BMID did not utilize water from the high elevation storage reservoirs until August, similar to the 2019 release year. Belgo Reservoir is utilized in early summer when the Water Treatment Plant is running because of the high levels of colour found in the water source. Water from James Lake Reservoir is only used as an irrigation source for the Scotty Creek area of the distribution network in BMID's north-end.

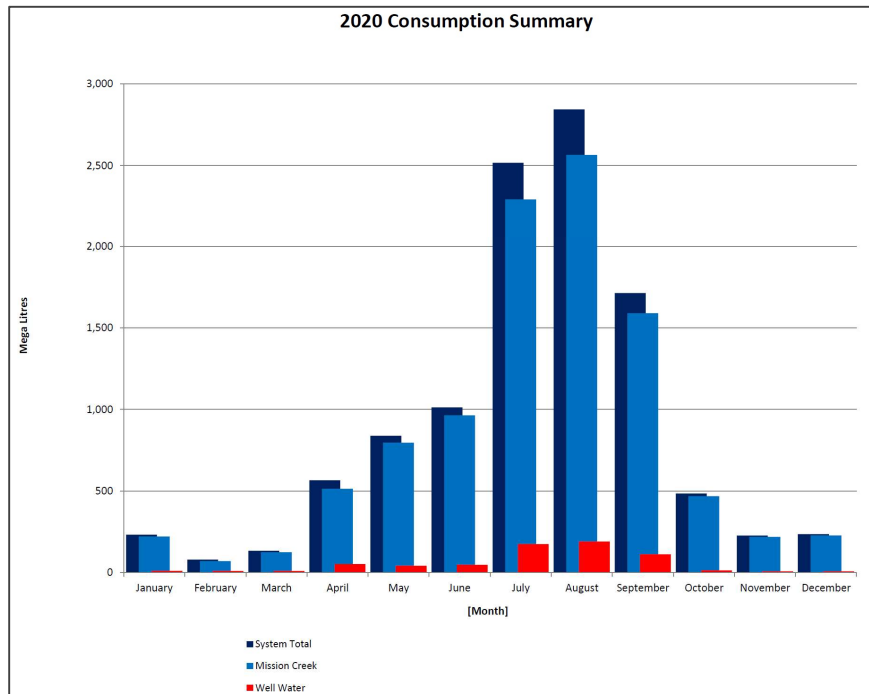
The reservoir levels at 2020 year-end are summarized below. At year end 46% of storage remained in place.

**Table 5.1 – Watershed Reservoir Data**

<b>Reservoir</b>	<b>Capacity (ML)</b>	<b>Volume at Yr End (ML)</b>	<b>% Full</b>
Belgo Reservoir	6,785	2,316	34%
Graystoke Reservoir	5,103	2,072	41%
Fishhawk Reservoir	2,353	1,224	52%
Loch Long Reservoir	625	382	61%
James Lake Reservoir	1,774	1,589	90%
<b>TOTAL</b>	<b>16,640</b>	<b>7,583</b>	<b>46%</b>



**Graph 5.2 – Monthly Consumption**



**Table 5.3 – Monthly Consumption**

BLACK MOUNTAIN IRRIGATION DISTRICT									
MONTHLY CONSUMPTION TOTALS AND YEAR END SUMMARY									
Year	Mission Creek	Well #4	Well #5	Well #6	Scotty Creek	NE Production	Well Water	Surface Water	System Total
2020	Mega Litres	Mega Litres	Mega Litres	Mega Litres	Mega Litres	Mega Litres	Mega Litres	Mega Litres	Mega Litres
January	221.22	10.21	0.00	0.00	0.00	10.21	10.21	221.22	231.43
February	205.98	9.09	0.00	0.00	0.00	9.09	9.09	205.98	215.07
March	215.03	9.28	0.00	0.00	0.00	9.28	9.28	215.03	224.31
April	513.72	9.82	41.72	0.00	0.00	51.55	51.55	513.72	565.27
May	796.25	0.00	41.67	0.00	0.44	42.11	41.67	796.68	838.35
June	964.13	23.97	23.50	0.00	0.80	48.27	47.47	964.93	1,012.40
July	2,293.57	14.12	98.18	62.50	49.30	224.10	174.80	2,342.87	2,517.67
August	2,566.12	0.00	116.67	73.68	87.45	277.80	190.35	2,653.57	2,843.92
September	1,589.48	20.28	40.27	52.11	11.81	124.48	112.66	1,601.29	1,713.95
October	468.77	13.92	0.00	4.92	1.05	19.90	18.85	469.82	488.67
November	219.01	7.75	0.00	0.00	0.00	7.75	7.75	219.01	226.76
December	227.18	8.04	0.00	0.00	0.00	8.04	8.04	227.18	235.22
<b>Total</b>	<b>10,280.46</b>	<b>126.48</b>	<b>362.02</b>	<b>193.22</b>	<b>150.85</b>	<b>832.57</b>	<b>681.71</b>	<b>10431.32</b>	<b>11,113.03</b>
% of Total	92.51%	1.14%	3.26%	1.74%	1.36%	7.49%	6.13%	93.87%	100.00%

Note: between February 10 and March 16, BMID was supplied from Rutland Water Works.

## 6.0 – Completed and Ongoing Water Infrastructure Projects

- A sodium hypochlorite injection system was installed in both Towers Ranch Reservoir and Prospect Reservoir to aid in toping up the free available chlorine residual while the water is in storage.
- BMID staff continue the process of winterizing as many aspects of the Water Treatment Plant as possible to ensure that the facility can remain on stand-by throughout the winter.
- A pilot project to test the viability of a centrifuge at the WTP was completed, with results indicating that a centrifuge was not a practical option for dewatering the sludge produced at the WTP.
- Two new sludge drying ponds will be constructed at the WTP to store addition sludge produced at the WTP. Decanting and evaporation processes will be utilized to dewater the sludge.
- Due to a slope failure along BMID's primary transmission water main east of the existing tunnel, BMID is investigating the possibility of extending the existing rock tunnel to bypass the unstable slope, thereby eliminate the possibility of a slope failure cutting off BMID's Mission Creek water supply.
- BMID has completed the removal of the gas chlorination system at Scotty Creek intake. As a replacement, a new sodium hypochlorite injection system has been installed to provide disinfection.
- Well 5 was taken out of service in the fall of 2020 for routine inspection and maintenance of the motor, in addition to a like-for-like replacement of the pump bowl. The well be placed back in service, on standby, until flows increase in the summer of 2021.
- Phase one of a new transmission water main was installed upstream of the UV plant to increase available flow for a future transmission water main expansion downstream of the UV Plant. The downstream works (phase two) will provide for additional flow capacity to the north end of the distribution system. Phase two will be completed in early 2021.

## **7.0 - WTP OPERATIONS**

The Black Mountain Irrigation District's Class IV Water Treatment Plant (WTP) performed very well throughout the 2020 treatment season. Improved water quality was achieved in all water quality measurements, especially in the reduction of color, turbidity, total organic carbon levels, and disinfection by-products (Trihalomethanes and Haloacetic acids).

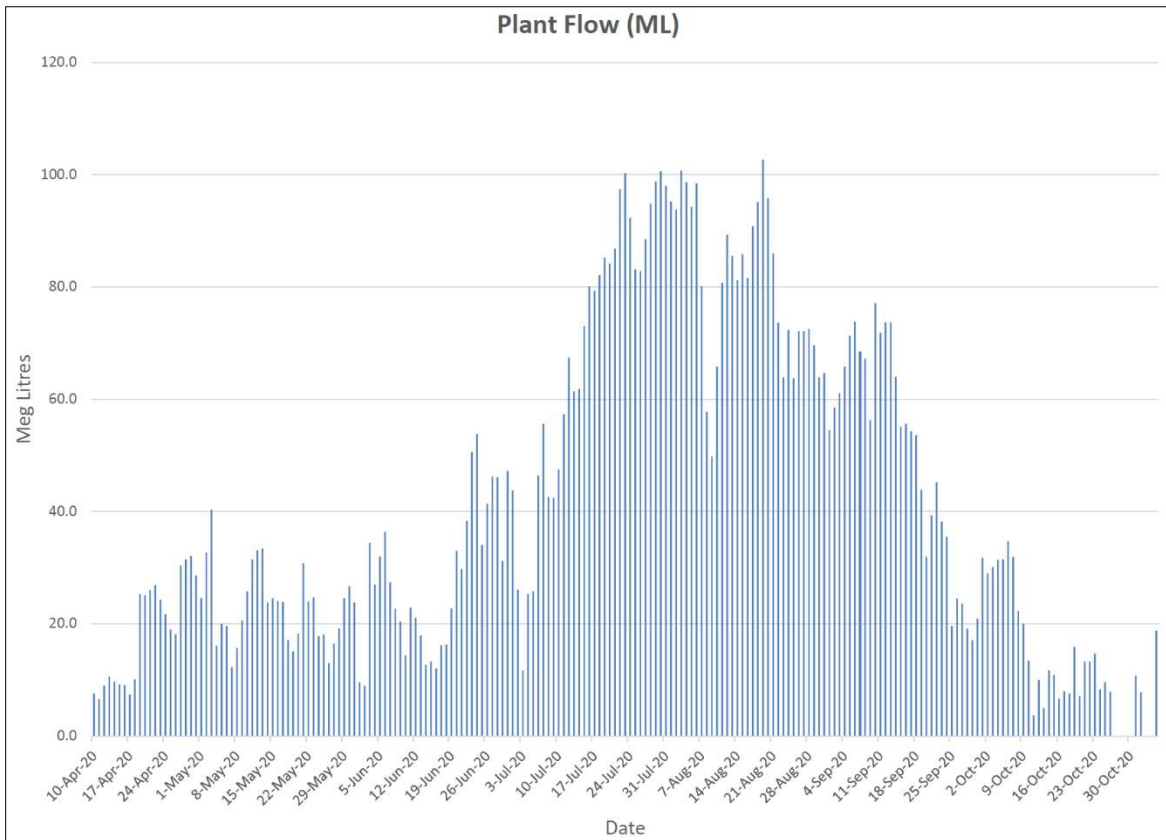
Beginning on February 10 and continuing to March 13, BMID utilized Rutland Water Works crossties as the primary supply source for domestic water in the distribution system while upgrades were taking place between the WTP and the UV disinfection facility. Moreover, Mission Creek experienced low turbidity and color levels in the early spring which allowed the WTP to remain in stand-by mode. As a result, the WTP was not utilized until April 10. The WTP remained in use until November 4 due to high turbidity and color in Mission Creek.

Turbidity spikes during freshet in Mission Creek were common, as experienced in the past. However, the 2020 season did not encounter the same significant flooding and high turbidity events that occurred in Mission Creek during the 2017 and 2018 seasons. However, turbidity spikes were more severe than during the 2019 treatment season. The Water Treatment Plant was able to maintain turbidity levels below 1.0 NTU (Nephelometric Turbidity Units) at the point of disinfection for the entire time in which the WTP was in operation.

## 7.1 - PLANT FLOW

For the Mission Creek source, peak daily consumption of 102.6 ML (27,104,053 US Gallons) was reached on August 19, 2020. The peak instantaneous demand was recorded at 1,273 L/s. For the 2020 season, 8,541 ML of water was treated compared to an average of 9,252 ML over the past five years. In 2020, the Water Treatment Plant was open for 202 days, down from the 261 days during the 2019 season. The Water Treatment Plant was started on April 10, 2020 and ended on November 4, 2020 when the raw water quality had improved enough to no longer require chemical treatment.

**Graph 7.2 – WTP Plant Flow**



Daily plant flow ML for 2020 combined total for both trains

### 7.3 – TURBIDITY RESULTS

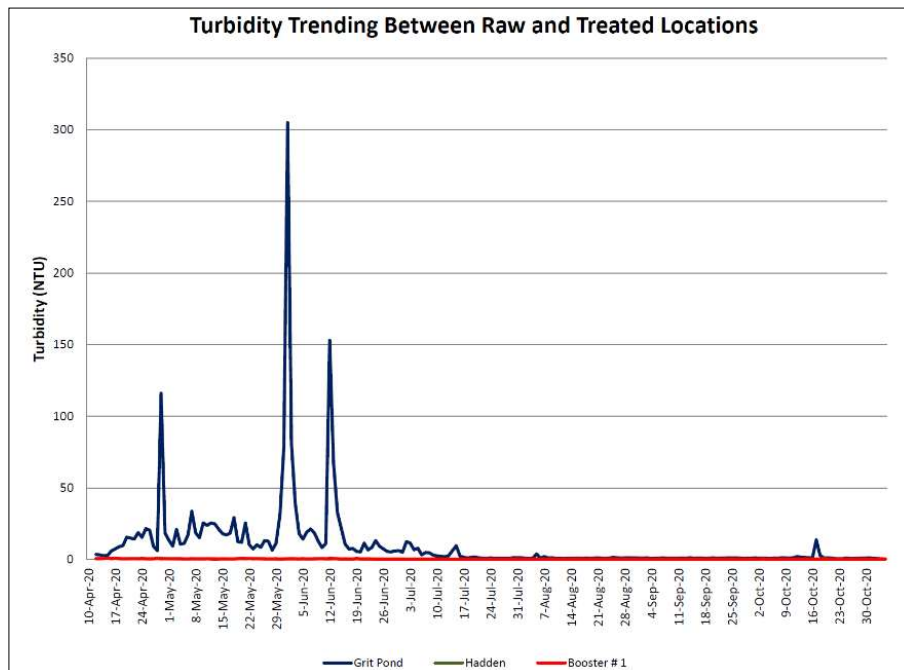
As set by the Canadian Drinking Water Guidelines, Black Mountain’s system turbidity is to be less than 1.0 NTU at its first customer (Booster 1). Throughout the treatment season, the Water Treatment Plant was able to maintain acceptable turbidity below this guideline. Turbidity at the first customer peaked at 0.90 NTU on May 20, 2020. During spring freshet, raw water turbidity at the Grit Pond peaked at 305 NTU on June 1, 2020.

In addition, the recorded highest turbidity at the Distribution Intake, Hadden Pond, was 0.97 NTU on April 14, 2020, with the data obtained through a single point grab sample. It should be noted that this spike in turbidity coincides with a mixing of treated and untreated water during the initial start up of the WTP for the year.

Average turbidity levels over the treatment period at locations in the water supply system are as follows:

Location	Lab (NTU)	On-line (NTU)
Raw Grit Pond	10.2	-
Stevens Intake	0.37	-
Stevens Outlet	0.35	-
Hadden Outlet	0.36	-
Screen Works	0.36	0.38
Booster Stn No. 1	0.38	0.33

**Graph 7.3 – WTP Turbidity Results**



Daily turbidity (NTU) results between raw water (Grit Pond) and treated water (Steven’s Intake and Booster 1)