



Black Mountain Irrigation District Water Treatment Plant

SUPPLY WATER

The Black Mountain Irrigation District water treatment plant receives its water from Mission Creek. The watershed, which feeds Mission Creek, consists of 5 lakes of which Belgo Lake and Greystoke Lake are the largest supplier. Water quality in Mission Creek is normally within the Guidelines for Canadian Drinking Water Quality (GCDWQ) throughout the year except during spring run-off where rainfall and snowmelt can change water quality drastically.



Black Mountain Irrigation District had encountered water quality problems in the past in Mission Creek, especially in 1997 when heavy rains and mudslides upstream of the intake produced poor water quality conditions. Black Mountain Irrigation District took a proactive role in determining the most feasible plan to treat each year's spring run-off and maintain drinking water standards within the Guidelines for Canadian Drink Water Quality (GCDWQ). A water treatment facility was designed and built to provide the necessary means of treating Mission Creek water.

WATER TREATMENT PROCESS:

OPERATION

The Black Mountain Irrigation District operates a Class IV water treatment plant and water distribution system. They both require use of a SCADA system although manual control of the plant and system is possible in the case of an emergency. The plant has produced some very good results since its construction. These include; reduction in total organic carbon (TOC) by 50% (TOC can produce trihalomethanes when combined with chlorine), reduction in turbidity in the water distribution system of less than 1 NTU even though turbidity in Mission Creek can exceed 150 NTU, and reduction of colour as well. Black Mountain Irrigation District continues to provide quality drinking water to their customers.

1. INTAKE

Water is first coarsely screened at Mission Creek to protect the intake valves from objects such as logs, branches or large rocks and to prevent these objects from entering the process. Water enters the treatment process through a dual piping system consisting of two 900 mm diameter pipes and slide gates.



Mission Creek Intake

2. GRIT POND

Water enters the grit pond and flows slowly through it allowing heavier particles such as sand and silt to settle out. Once the water reaches the end of the grit pond, process water for the plant is screened through 1.5 mm fish screens and excess water is bypassed and discharged through a fish channel that allows fish and floating debris to flow back into Mission Creek.



Fish Screens

3. RAPID MIX

Process water is metered by 2 magnetic flow meters. From this point, it enters the one of 2 rapid mixer tanks where coagulant (Isopac) is added along with a cationic polymer. Water and coagulants are then rapid mixed for upwards of 1 minute.



Pre-sedimentation Grit Pond

4. FLOCCULATORS

Flocculation begins at the first of 3 flocculation tanks with anionic polymer addition taking place in the second flocculation tank. By the time the process water reaches the third flocculation tank, floc forms and is clearly visible.



Flocculators

5. SEDIMENTATION CLARIFIERS

The water then enters one of 2 clarifiers for sedimentation. Water flows through the clarifiers through a HDPE baffle curtain. The curtain creates a “plug” flow through the clarifier and allows clear water to flow through it and the sludge to settle out. Once the sludge settles out of the water, the sludge is collected and pumped to a sludge holding pond where it is further processed. The clear water from the top of the clarifier is diverted to the first of 2 balancing reservoirs.



Clarifier

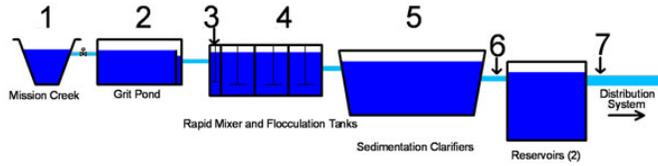
6. pH ADJUSTMENT

Prior to the treated water entering the first of 2 reservoirs, pH adjustment must occur for corrosion control. Caustic soda is added to the clarified water to provide water with a minimum alkalinity of at least 15 mg/L and a pH of 7.5.

7. DISINFECTION

Once the water has moved through Steven’s and Hadden Reservoir and given further time to settle out particulate matter, chlorine disinfection occurs. A fine screening process occurs at this point to screen out any material that may have entered either reservoir and from here the water enters the distribution system.

Treatment Plant Schematic:



PLANT PARAMETERS:

Design capacity	105 ML/day	1200 LPS
Average Flow 2002	2002 54 ML/day	625 LPS
Peak Flow 2002	115 ML/day	1350 LPS

PROCESS:

Grit Pond	
Volume:	3600 m3
Retention Time:	0.83 hours
Dimensions (m):	90 x 20 x 2

Rapid Mixer 2 (1 per train)	
Volume	31 m3
Retention Time	1 minute

Flocculator Tanks 6 (3 per train)	
Volume per tank	250 m3
Retention time	10 minutes
Dimensions (m)	7 x 7 x 6

Clarifiers 2 (1 per train)	
Volume of clarifier:	10692 m3
Retention time	7 hours at peak flow
Dimensions (m)	100 x 35 x 6

Reservoirs 2	
Volume of reservoirs	190000 m3

Distribution System	
Pressure Reducing Stations	13
Additional Supply	Scotty Creek Intake
Additional Supply from Wells	3
Booster Stations	3

WATER QUALITY PARAMETERS:

Mission Creek (April to July Annually)

	Low	High	Average
Turbidity (NTU)	0.9	270	18
Colour (TCU)	23	68	44
pH	6.7	7.7	7.3
Alkalinity (mg/L)	10	31	20
Particle Counts (#>2μ /ml)	2100	35000	9000

Treated Water

	Low	High	Average
Coagulant Dose (mg/L)	21	44	30
Caustic Dose (mg/L)	3	7	4
Turbidity (NTU)	0.5	1.7	1
Colour (TCU)	5	11	5
pH	7.1	8.1	7.6
Alkalinity (mg/L)	13	25	18
Particle Counts (#>2μ /ml)	250	1100	600

Thanks to Brian Thorburn