



Schematic Description

- source water is withdrawn from the Youghiogeny River, passing through 1 of 4 traveling screens and pumped to the treatment plant; if needed, powdered activated carbon can be added at the pump house
- at the plant, the water is treated with chlorine, caustic soda, polymer, and sodium permanganate
- just before the inline static mixer, a polyaluminum chloride coagulant is added
- the coagulated water then enters the flocculators where gentle mixing enhances floc formation
- the flocculated water then enters the sedimentation basins where solids are removed
- the settled water is distributed to the dual-media filters
- the filter effluents discharge directly into the clearwell where chlorine, caustic soda, poly-orthophosphate and anhydrous ammonia (seasonally) are added
- the finished water is pumped to the Gibson storage tanks and/or directly into the distribution system

Facility Information

Plant Production

- current average daily production: 26 MGD on 1/31 & 34 MGD on 2/1
- time of operation: 24 hours; plant staffed at all times
- permitted capacity: 40 MGD (27,778 gpm) in 24 hours based on a filtration rate of 4.0-gpm/ft² and 11 filters in operation; allocation permit authorizes a withdrawal of 40 MGD with stipulations
- pumps: raw-5 vertical turbine pumps; finished-5 vertical turbine pumps; backwash- 2 pumps

Chemical Treatment (see figure 1 for injection locations)

- coagulation: polyaluminum chloride (PAX-XL8)
- pH adjustment: pre and post with caustic soda (25%)
- disinfection: pre & post with chlorine gas & post anhydrous ammonia to form chloramines (seasonally)
- other: poly-orthophosphate (Shannon SLI 5250); sodium permanganate (turbidity >20 NTU); cationic polymer (AS 2221) (colder water temps) and; powdered activated carbon (approved but not used for over a decade)

Rapid Mix

- one inline static mixer

Flocculation

- 12 basins, each 25' x 25' x 21' (98,000 gal/basin) with a variable speed, horizontal shaft mixer
- design detention time: 42 minutes* (at 40 MGD & 12 basins in operation)
- actual detention time: 49 minutes* (at 34 MGD & 12 basins in operation)
- *no baffling factor assigned for calculation

Sedimentation

- 12 basins, each 125' x 25' x 32' (748,000 gal/basin); bi-level design - flocculated water enters the bottom section (16'), travels the length of the basin with upward flow to top section (16') and length way travel to an effluent manifold
- design detention time: 5.3 hours* (at 40 MGD & 12 basins in operation)
- actual detention time: 6.3 hours* (at 34 MGD & 12 basins in operation)
- surface overflow rate: 0.63 gpm/ft² (at 34 MGD & 12 basins in operation)
- chain-in-flight scrapers remove sludge (timer operated); basins drained and cleaned annually
- *no baffling factor assigned for calculation

Filtration

- 12 dual-media filters (25' x 25'); 24" anthracite over 6" sand over graduated gravel with a Leopold tile underdrain; media replaced in 2004 with additional sand added in 2009 (filters 1-6); in 2005 anthracite media replaced (filters 7-12); each filter is equipped with 4 surface sweeps
- filter inspections are conducted and includes performing maintenance on the surface sweeps, checking backwash bed expansion, monitoring for media loss and filter media excavation; last conducted 7/16
- design filtration rate: 4.0 gpm/ft²
- actual filtration rate: 3.4 gpm/ft² (at 34 MGD with 11 filters in operation & 1 filter in backwash)
- backwash criteria: effluent turbidity approaching 0.1 NTU; typical filter run times ~40-50 hours in the winter & ~70-80 hours in the summer; backwash manually initiated
- backwash sequence (automated): low rate-6 minutes at ~5,200 gpm; high rate-10 minutes at ~9,000 gpm; low rate-2 minutes at ~5,000 gpm; surface wash operates 2 minutes before & during low rate wash
- filter-to-waste: typically 5-10 minutes and filter effluent <0.10 NTU
- the backwash rates are adjusted seasonally based on water temperature
- when a filter is removed from service for backwash, plant flow remains constant which increases the flow through the remaining filters
- future renovations planned for the filters include underdrain replacement including a cap, addition of air scour, & replacement of the media

Storage

- clearwell: 1.2MG at 12' high level; 0.748 MG at 7.5' low level

Alarms & Emergency Power

- a SCADA system monitors much of the plant operations and includes alarms
- both the IFE and CFE turbidities alarms are set at 0.1 NTU
- chlorine residual at the entry point alarm is 1.0 mg/L minimum and 3.0 mg/L maximum
- no alarms shut down the plant; supervisor responsible for a shut down
- on-site generator capable of powering only the 110 circuits

On-Line Monitoring Instruments

- raw water: Hach monitoring panel includes Accu4 turbidity monitor, pH, temperature, conductivity, dissolved oxygen, & oil/grease monitor; data used for RAIN network
- static mixer effluent (coagulated water): Hach SCM AF7000 streaming current monitor
- combined sedimentation effluents (settled water): 2-Hach 1720E turbidimeters
- IFEs: Hach FilterTrac 660 turbidimeters
- clearwell effluent: Hach FilterTrac 660 turbidimeter; Hach CL17 chlorine analyzer; Hach temp/pH
- lab: Hach TU5200 turbidimeter
- IFE turbidimeter calibration (last 4): 12/22/16; 10/13/16; 8/10/16; 5/16/16

* Excerpted from Feb. 2017 DEP Filter Plant Performance Evaluation. Notes made at the time of the evaluation may no longer be in effect.