Addendum 1

City of Canton, Ohio

Purchasing Department
218 Cleveland Ave. SW, 4th floor
Canton, Ohio 44702

Engineering Design Services – Canton Water Department Facilities – TAG 587A & TAG 587B

Item/Project

Water Department

Responsible Department

Thursday, April 30, 2020 at 4:00 PM local time

Qualifications Due On or Before

Qualifications Submitted By:

Company Name

Street Address

City **State** **Zip**

Contact Person **Phone No.** **Email Address**

1. Information concerning the existing conditions of the water plant and are provided for informational purposes.

End of Addendum

Section 3

Existing Conditions

BURGESS & NIPLE
Engineers ■ Architects ■ Planners

SECTION 3
EXISTING CONDITIONS

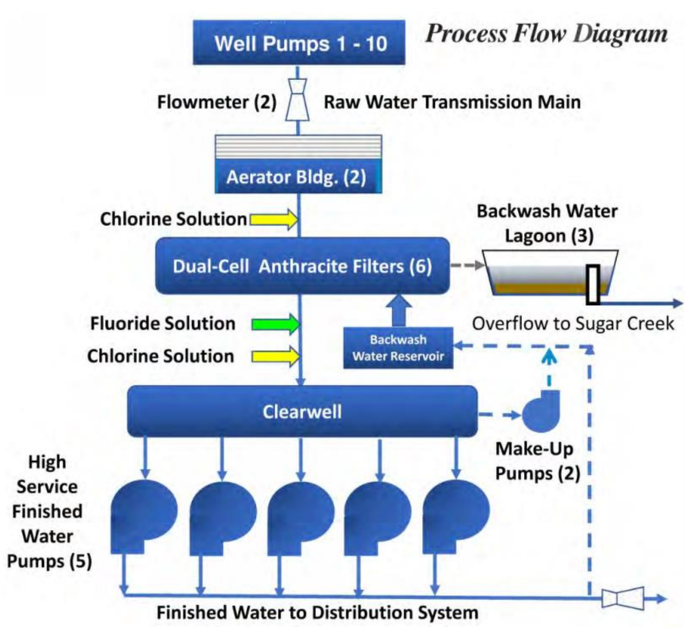
3.1 SUGAR CREEK WATER TREATMENT PLANT

The Sugar Creek Water Treatment Plant is located at 9520 Dolphin Street, State Route 212, Strasburg, Ohio in Tuscarawas County. The Sugar Creek Water Treatment Plant (WTP) was put into service in 1962. Contract 95-4 increased the plant design flow to 20.0 MGD with a hydraulic capability of 25 MGD. **Figure 3.1** depicts the current plant process flow diagram. The City owns 640 acres of land surrounding the Sugar Creek WTP. The wellfield draws its water supply from a large deep aquifer. The Sugar Creek WTP supplies a nearly one-half of the water supplied to City of Canton water customers.

The Sugar Creek WTP provides iron and manganese removal. Water from the wellfield is pumped to the top of stacked cascading aerator trays. A portion of the soluble iron is oxidized and iron precipitate settles in the detention basins below the aerator trays. Chlorine is applied to the process flow stream and iron and manganese precipitate is removed by gravity filters. Filtered water flows into a clearwell where fluoride and chlorine are applied. Five vertical turbine pumps transfer treated water to the Canton distribution system.

Prior to 2018, backwash water from filter backwashing operations was not treated, and the WTP discharged to an onsite wetland. Three backwash water holding lagoons were added in 2018, to receive, retain, and allow the solids in the backwash water to settle out in the lagoons. Settled effluent is treated to reduce residual chlorine in the discharge from the lagoon prior to being discharged to the receiving stream.

Figure 3.1 Sugar Creek WTP Process Flow Diagram



3.1.1 Wellfield

There are ten active deep wells arranged in a cross-shaped pattern with Wells #1 through #6 along the main wellfield road that runs through the wellfield. Wells #1 through #3 are located south of US 21 and connect to an 18" and 20" raw water main that runs along the service road adjacent to the wells. The main crosses under US 21, and continues northward to the WTP aerators. On the north side of US 21 the raw water main increases from 24" to 36" to serve Wells #4 through #6. Currently no isolation valves are provided on the original main to allow for cleaning or repairs.

In 1979, a second 36" raw water transmission main was constructed to parallel the existing 30" raw water transmission main that discharged to the original west aerator. Both mains are interconnected to that raw water transmission main and can be directed to either aerator at the plant. The new 36" main discharges into the new East Aerator. Both mains are equipped with motor-operated flow control valves and venturi meters to control flow based on the number of filters in service using the SCADA system.

Wells #7 through #10 are situated to either side of the transmission mains. Well # 7 is to the north of the wellfield gravel service road, Well # 8 and Well #9 are the south, and Well #10 is closest to the river. In 2019, Well #10 casing pipe was dropping due to consolidation of the gravel around the well screens. New X-shaped rails were fabricated and welded to the sides of the casing pipe and supported on new concrete pads set back 10' from the well to prevent further settling. Similar settlement has been noted on other wells and will be address in the recommendations for well improvements in Section 4.

A summary of the wells condition and capacity are provided in **Exhibit 3-1** for the ten well pumps. Well # 1 capacity has been reduced to a current output capacity of 1.2 MGD.

Wellfield Existing Design Data

Rated Capacity:	25 MGD (with largest out of service)
Number of Wells:	10
Well #1-4 and 6 Capacity:	American Marsh 14 LC (2- Stage) 2.50 MGD each
Well #5 Capacity:	American Marsh 12 WC (2-Stage)1.50 MGD each
Well #7 Capacity:	Hydroflow 14HH (2-Stage) 2.50 MGD each
Well #8-10 Capacity:	American Marsh 14 HC (2- Stage) 4.75 MGD each
Well #1 Pump Data:	1,750 gpm @ 163'TDH, 100 HP, 480V, 3 PH
Well #2 Pump Data:	1,750 gpm @ 171' TDH, 100 HP, 480V, 3 PH
Well #3 Pump Data:	1,750 gpm @ 171' TDH, 100 HP, 480V, 3 PH
Well #4 Pump Data:	1,750 gpm @ 151' TDH, 100 HP, 480V, 3 PH
Well #5 Pump Data:	1,050 gpm @ 120' TDH, 75 HP, 480V, 3 PH
Well #6 Pump Data:	1,050 gpm @ 110' TDH, 75 HP, 480V, 3 PH
Well #7 Pump Data:	1,750 gpm @ 160' TDH, 100 HP, 480V, 3 PH
Well #8 Pump Data:	3,325 gpm @ 160' TDH, 125 HP, 480V, 3 PH
Well #9 Pump Data:	3,325 gpm @ 160 'TDH, 125 HP, 480V, 3 PH
Well #10 Pump Data:	3,325 gpm @ 160' TDH, 125 HP, 480V, 3 PH

A typical arrangement for Wells #1 - #6 and Wells #7 to #10 are provided in **Exhibit 3-2 and 3-3**.

Existing Aquifer

Although the aquifer can reliably deliver the future water demand of the City, the ability to supply raw water is impacted by the condition of the well screens, including plugging of the interstices of the aquifer and well screens due to iron deposition. As part of this CIP, a hydraulic model was developed to confirm pumping rates for various combinations of pumps in service using either or both of the raw water mains pumping to either aerator.

Existing Raw Water Transmission Main

Cleaning and inspecting the existing 30” raw water transmission main is needed to restore its full capacity. The cleaning will remove scaling which is currently adding headloss.

Currently, there is no means of cleaning the first 1,900 lineal feet of the raw water transmission main without installing temporary piping or shutting down Pumps #1 to #6. Installing another parallel transmission main from Well #1 to Well #6 allows portions of the transmission main to be taken out of service for cleaning. A parallel transmission main prevents long shut downs, when the raw water transmission main was cleaned and inspected between the Northwest WTP and its wellfield it required taking the plant out of service. In order to restore the pipe capacity, sections of the pipe will need to be removed and cleanouts installed so that the pipe cleaning can be performed. Three cleanouts would be installed at Well #1, the mid-point, and before the crossroad isolation valve. If the second transmission main is not constructed, the water production will need to be curtailed. New gate valves should be added to provide shutoffs with cleanouts for future cleaning and inspection of the original and proposed parallel raw water transmission main.

Existing valves are provided at both ends of the two 1,500-foot long sections of 30” DIP and 36” PCCP mains extending from the crossroad to the plant. Cleaning would have to be sequenced, taking one transmission main out of service and removing sections of pipe or installing cleanout manways at each end and at the midpoint to facilitate cleaning and inspection.

Well Pumps

Ohio Drilling has worked with the City to maintain and repairs the well pumps. Pumps #1 to #6 were installed in 1961, Pump #7 was installed in 1977, and Pumps #8 to #10 were installed in 1980. Cleaning of each well has occurred on a 5-year cycle. Two pumps are scheduled each year. The motors and pumps are pulled and inspected, and repairs are made if needed. At 40-50 years old, the motors and pumps are approaching the end of their useful, and replacement in the next 10-15 years is likely. Pumps should be removed and reconditioned. Shafts the casing pipes should be shortened to lower the motor. The recommendations address features to incorporate into the design of a new well house that will minimize future settlement.

Screens

The condition of the well screens appears to be of greater concern with corrosion, iron buildup, and packing of sediment around screens. Ohio Drilling has been fairly successful with restoring screen capacities to match pump capacities, but the well screen conditions is being slowly compromised by heavy cleaning that can be destructive to the screens. Replacement is difficult and limited by the ability to install a replacement screen of suitable diameter inside the existing 26” diameter lower casing pipe. In addition, settlement has caused the casing pipe’s vertical alignment to be out-of-plumb, and further limits the size of screen that can be accommodated with the current pump impellers. At this time, the condition of well screens needs to be monitored.

Valve Vault

Well #1 through Well #6 have an 8’ x 12’ x 8’ high concrete valve vault houses the piping to the pump connection, meter, and the pump discharge valve. Currently, the well base plate is bolted to the casing flange that is at the top of the valve vault, elevating the pump motor approximately 7’ above grade. The ground surrounding the well head is sloped up to the pump, making servicing and pulling the pump and motor difficult due to the sloped grade. Research shows that the pumps are 7’ above the 100-year floodplain and can be lowered by 4’ while maintaining a 3-foot all equipment a minimum of 3-feet above flood level after improvements are complete.

Figure 3.2 Well #1 Valve Vault

The valve vault shown in **Figure 3.2** will be demolished, reducing the stresses in the piping due to settlement. A new valve house should be constructed to house meter, controls, and electrical equipment. The discharge will be directed to either the original transmission main or proposed transmission mains. A pre-fab insulated metal building will be installed to house the meter and controls. Connections to the existing transmission main will be connected to the original main using a tapping sleeve and valve. The operator can re-direct the flow to either transmission main.

Site Work

The steep grade around Pumps #1 to #6 make removing pumps using a crane difficult due to the steep slope of the grassy approach to access the existing pump and motor mounted on the concrete valve vault. Settlement has accelerated putting more stress on the piping. If the pumps are lowered, the grade can be leveled to create an area off the wellfield service road. A new gravel drive would provide a more suitable surface for service vehicles to pull up along the new well house. New drive aprons to pull off US 21 are needed, and new fence and gates installed to allow vehicles to pull up to the gate without pulling off the side of the road to open and close the existing cyclone fence gates.

The main wellfield gravel road has an 8” subbase with chip and seal topping. Any road crossings, soft spots in the roadway, and potholes should be repaired prior to a complete new top topping installed on the entire gravel road. All areas for the new transmission main, work at the wells, and installation of the electrical ductbank should be regraded and reseeded.

Electrical Power Feed

Overhead 4160-volt lines are strung between poles along the length of the wells. Transformers are mounted on overhead platforms as shown in **Figure 3.3** with feeds that drop down to the local power panel and control panel for the pumps. The overhead lines are high voltage, and not redundant. Any break along the path interrupts power to other transformers. A looped system similar to that installed at the Northeast WTP wellfield is recommended to replace the existing overhead lines. Two cables in buried duct bank should be provided so

Figure 3.3 Electrical Feed to Wells

if a feeder is cut accidently or power is lost during a storm a redundant power supply to each well pump. New transformers located indoors in the new well house to provide 480-volt power to the pump and controls is recommended.

Currently, flow control valves are used to match flow to the water demand. In the proposed recommendations, mag meters will be used to establish flow setpoint and used to control variable speed drives being proposed for Pumps #3, #6, and #9.

Instrumentation and Controls

Level controls were installed in 2007 and are in need of replacement. The existing propeller water meter becomes fouled with scale and iron buildup, and does not provide an accurate flow measurement. Each pump should be fitted with a pressure gage, air/vacuum relief valve, and 8" blow-off with 8" gate valve to aid in pump cleaning and testing. A new magnetic flow meter is recommended to replace the existing meter, and wired to the existing local SCADA panel. A new fiber optic cable should be installed to replace the radio telemetry system used at the plant to monitor the wells. CCTV monitors should be provided at Wells #1, #3, #6, and #10 to monitor unauthorized intrusions into the wellfield.

3.1.2 Aerators

Aerators Existing Design Data (East - 1995)

Number of Units:	3 (1- East Aerator and 2 – West Aerator)
Number of Modules :	18 (3 @ 6 each)
Levels of Treatment:	
Distribution Tray:	1
Corrugated Tray(s):	3
Size of Trays 8'-6"x 8'4":	70.8 SF each 3-tray module
Total Surface Area per Module:	212.5 SF
Total Surface Area*:	3825 SF (1275 SF East + 2550 SF West)
* Corrugated Trays Only	
Capacity Rate Criteria:	
Nominal:	4 gpm/SF
Peak:	5 gpm/SF
Design Flow:	
Nominal:	22.05 MGD (Total)
Peak:	27.55 MGD (Total)

Aerator Basins Existing Design Data (West-1960)

Number of Units:	3
Size:	18' x 54' x 15'-6" (max water level)
Volume:	112,000 gallons each
Volume Total:	336,000 gallons
Detention Time:	20 min.
Design Flow:	8.0 MGD each (24.2 MGD Total)

The Sugar Creek WTP has two Aerator Buildings as shown in **Figure 3.4.** The original 30" cast iron raw transmission main from the raw water well field discharges into the West (1960) Aerator Building shown in **Exhibit 3-4**, and a 36" prestressed concrete raw water line discharges into the smaller East (1995) Aerator Building shown in **Exhibit 3-5**. Water is discharged into a water trough located above the aerator trays that allow water to trickle trough openings in the trays, and absorb air to oxidize iron and manganese, while stripping dissolved carbon dioxide from the groundwater. The water flows down through the aerator trays and into to clearwell reaction tanks that provide retention time for the oxidation of iron and manganese to occur. Each tank is provided with a clearwell that provides 20 minutes retention time at the design flow. Chlorine is added to the water after aeration but prior to filtration.

Figure 3.4 Aerator Buildings

<u>Aerators</u>

Each aerator has a rate of flow control valve that regulates the flow into the aerators. The control valve on the west aerator does not close tight and is in need of replacement.

Both aerators were evaluated to determine their ability to handle the peak hourly pumped flows from the wells. The old trays shown in **Figure 3.5** were fabricated for the project and are constructed of aluminum. It was determined that the frame and trays are corroded and needed to be replaced. The holes in the original design restricted flow and caused the trays to back up and overflow. The holes in the trays need to be properly sized with the new unit. Several manufacturers offer stand-alone cascade aerator or packed towers, but not could be used to retrofit the existing units and were not considered.

The most troublesome problem with the aerator tray operation is the buildup of sediment in the trays. Several suggestions included the use of vibratory shaker mechanism to attached to trays to dislodge the scale. Currently, flow to the aerator is shut off, which has allowed the scale to dry, so it can be scraped off. Sediment that passes through the openings collects in the reaction basins and drains to backwash junction chamber so that it can be flushed to the lagoons, where it would settle out and be removed.

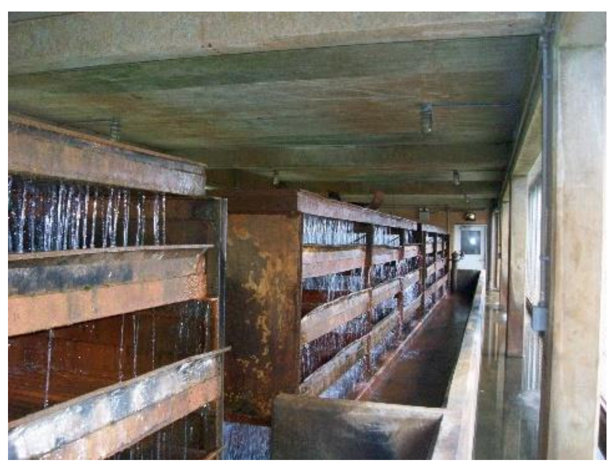


Figure 3.5 Aerator Trays

<u>Piping and Valves</u>

The valves and actuators in the pipe gallery were replaced in the 1995 renovation. The City has replaced several of the actuators since 1995 and several of the existing actuators continue to be a maintenance issue.

All existing valves should be replaced, including motor operators. New floor stands for manually operated valves should also be replaced. Some of the piping is steel and severely corroded and needs to be replaced with ductile iron pipe. Distributor piping above the aerators is steel and should be sandblasted and epoxy coated. Several sections of corroded piping should be removed and replaced.

Architectural

The precast concrete planks roof shown in **Figure 3.6** is in the original West Aerator Building is spalled from the moisture and outdoor freeze-thaw of the planks, and rebar is exposed. Various products used to patch the concrete were not suited for outdoor conditions and are expected to delaminate after several years of service. Existing concrete roof beams are in good condition, so it was determined that removal and replacement of the roof deck is the most cost-effective means to restore the structural integrity of the roof. A chemical additive should be specified for the concrete mix, and a spray on moisture sealant should be applied when construction is complete.

Figure 3.6 Aerator Roof

Moisture and water collection behind the masonry face brick is apparent below the waterline of the clearwells of the original west aerator, but not the newer east unit. Moisture appears to be due to condensation buildup in the air space. During construction, each aerator should be taken out of service to determine if any cracks in walls are allowing water to seep into the wall cavity. The entire brick facing of the concrete structure should be cleaned of moss and grime, and resealed. New weep holes need to be added around the base of all walls around the perimeter of the building. During design, the flashing for the roof, openings, and masonry-faced concrete wall of the storage should be evaluated to determine the best method to eliminate the problems and correct any defects.

During the 2007 improvements, the roof of the new aerator was not replaced. The replacement of roof planks and installation of new roof drains requires both aerator roofs to be replaced with a single-ply roofing system. There is currently no means of accessing the roof, so a new roof hatch and ladder should be installed to create a roof scuttle instead of relying on a crane or ladder to access and inspect the roof. All new handrail for the stairwell should be provided.

All existing doors and frames should be replaced with new aluminum doors and frames, including hardware and closures suitable for outdoor use. The existing block windows are leaking and should be removed and replaced with translucent Kalwall-type plastic insulated windows. New roof drains and piping should be installed on both aerators, and a new single ply membrane installed over a tapered insulation board to slope the roof to drains. New unit heater should be provided in the access room to the building. The existing fence that is used to prevent leaves and birds from entering the upper aerator should be replaced with new plastic-coated fence attached with stainless steel hardware.

3.1.3 Filters

Filters Existing Design Data

Filtration Capacity:	15.9 MGD @ 3.0 gpm/SF and all filters in service
	17.7 MGD @ 4.0 gpm/SF and one filter out of service
Number of Filters:	6 Dual-Cell (4 – 1960 and 2 – 1995)
Type:	Gravity Sand Filters, Mono-media anthracite with Leopold Style Underdrains
Total Filtration Area:	3,680 SF
Filter Dimensions:	15.33' x 20' x 30" Mono-media anthracite over 12" gravel underdrain
Effective Grain Size:	0.8 mm maximum
Capacity Rate Criteria:	
Nominal	4 gpm/SF
Peak	5 gpm/SF
Design Flow:	
Nominal @ 4 gpm/SF	17.7 MGD (1 unit out of service)
	21.2 MGD (All units in service)
Peak @ 5 gpm/SF	22.1 MGD (1 unit out of service)
Trough size	18" wide x 21" deep
Trough spacing	6'-8" c/c

All filters were rehabilitated during the 1995 plant improvements. Each filter is equipped with surface sweeps to break up surface deposition during backwash. Restoring the anthracite filters to provide the maximum allowable filtration rate allowed by OEPA for groundwater treatment is critical to sustaining the rated capacity of the plant.

The flow from the 3 aerator units is combined and enters the Filter Building influent channel that is provided with a sluice gate to isolate the filters. Piping headers distribute the flow to a flume where it enters each gullet wall of the filters. Water enters the gullet wall and fills the fiberglass troughs shown in **Figure 3.7** that are located at the quarter points of the filter cell. Water fills the trough and drops down onto the partially submerged filter media surface. When the water in the filter cell and launder equalize, the effluent valve opens and allows water to drain down through the media and gravel underdrains above each filter block. Water passes through the perforated filter block and collects in the filter flume, where is drain by gravity to the clearwell located immediately under each filter.

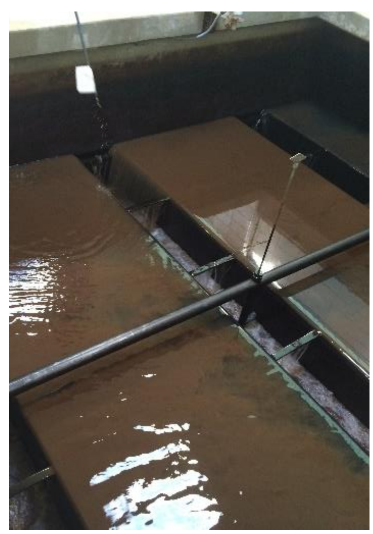


Figure 3.7 Anthracite Filters

The filter effluent valve remains partially open and modulates to open to maintain a constant water level across all filters. A differential pressure gauge monitors the headloss across the filter, and when it reaches a preset limit, the filter influent valve closes and the water level is allowed to drain down to the underside of the launder to allow the operator to initiate the filter backwash operation. A typical filter run time varies based on the number of filters in use, flow rate, and suspended solids loading. Filters are usually backwashed every 60 hours if the headloss does not call for an immediate backwash.

While observing the backwash operations when the new holding lagoons were being put into service, a concern was raised regarding the effectiveness of the existing backwash operations. After three successive days of backwashing the dual-cell filters, samples were collected on the fourth day. Influent waters were still very turbid with solids in spite of the intensive backwashing schedule. This indicated possible plugging of the filter underdrains with scale and deposits.

Media Replacement

Anthracite filter media is being lost over time and is periodically replaced. The current filter design allows 24” between the bottom of the trough and the filter media. Ten States Standards recommends allowing for a 50% bed expansion to prevent washout of filter media. A review of the current clearance is 21” or 40% bed expansion when using 30” of media as shown in **Exhibit 3-6**. The only way to increase the clearance is to either raise the trough to provide more clearance since the filter bottom is fixed by the depth of the filter box, or by reducing the media depth to less than 30” is not recommended.

Two options were considered. Option 1 would add a fourth row of troughs to each filter cell and removing the 3 existing troughs, cutting in new openings in the gullet walls for the new troughs, and purchasing additional shallower and slightly wider fiberglass troughs to gain the 3” of additional clearance. Since the filter currently produce a high quality of finished water, this was not deemed cost-effective. Option 2 included installation of new instrumentation to monitor and control filter bed expansion and turbidity and modulation of the backwash flowrate to optimize the backwash effectiveness. Ten States guidelines allow for reduction in backwash rate from 15 gpm to a low as 10 gpm and coupled with the proposed instrumentation and controls. The CIP is based on implanting this option. During design a pilot demonstration project would be conducted to confirm its effectiveness.

The recommendations include adding 36” isolation valves to the transfer pipes for improving access to the clearwell so that a portion can be taken out of service for cleaning. Although 60-hour run times between backwashes is achievable, the existing media needs to be removed to expose the filter block to clean and add new media.

Improvements to the backwash system, improved metering, and new valves and operators will improve control to minimize carryover of filter media. More frequent monitoring of filter bed depth and filter grain particle size distribution is recommended to replace media before fines are created through repetitive backwashing that leads to particle size reduction and medial loss. Instrumentation is available to monitor the filter bed expansion and a pilot test to determine its effectiveness in optimizing backwash rates versus expansion may help minimize the loss of filter media.

Fiberglass Troughs

The fiberglass troughs appear to be in good condition and only need to be pressure washed and the weir plates adjusted to be level across all the filters to improve flow distribution.

Surface Sweeps

Surface sweeps are provided with spray nozzles and are hung above the filter. The jet action of the nozzle forces the arms to rotate slowly and scour the surface layers of the filter media to break up packed solids on the surface of the media. It also introduces mixing action and agitation to clean and scrub filter particles. Each 15’3” by 20’ long filter is equipped with a sweep arm and rotating drive unit that allows clean backwash water to pass through the arms to the nozzles. The arms, rotating parts, and seals typically experience considerable wear from the filter turbulence. The surface sweeps, control valves and piping should be replaced.

Secondary Influent Header to Filters

There is only a single main header feeding the filters. A plant outage is required to perform any repair work on the main influent pipe that runs between the aerators and the filter pipe gallery. A tee is used to split the flow to the 4 original and 2 newer filters. A second 30" influent feed pipe would provide an end feed of the filters to isolate half of the filters for inspection or valve maintenance without a plant shutdown.

Cleaning and Drilling Filter Block

The existing filter media has never been removed to clean the Leopold-style clay block underdrains. Evenly space holes are provided on the underdrains to assure even flow distribution of the filtered water or backwash water across the entire surface area of each filter cell. To clean the filter blocks, the back row of filter blocks need to be removed. The solids built up in the 4 channels (2 top and 2 bottom) of block can be flushed into the drain trough using a pressure jet cleaning system. If possible, blocks that span ends of the effluent flume could also be removed to flush solids down the drain. These solids can be flushed into the backwash lagoon for collection and disposal.

Once the blocks are exposed, they should be inspected to see if there are any broken or damaged filter block. These need to be removed and a new unit grouted in place. Hand drills are used with properly sized drill bits that do not chip the block but can ream out the calcium hardness and iron scale around the openings in the block deposits. Special tools and wire brushes provide the final cleaning of the holes. After a filter cell is cleaned, the filter blocks are pressure cleaned. New block can be purchased with properly designed anchor rods to hold the blocks in place and set in and grouted in place per the manufacturer's recommendations. This procedure should be repeated for all 12 filter cells.

Instrumentation and Controls

The operator selects which filters will be in service, and monitors the headloss, run time, and effluent flow passing through the dual-cell filters. In 2007, a new plant SCADA system was installed and new level transmitters, headloss pressure transmitters, and turbidity analyzers were installed and connected to new Filter Control Panels shown in **Figure 3.8** that were installed in the Filter Gallery. Existing valve operators, backwash pumps, venturi flow meters, and various other sensors were connected to the SCADA system to monitor and control system the filter operation.

Headloss is monitored and the effluent valve modulated to open as headloss in a filter increases due to solids being trapped in the filter media. A backwash can occur using a preset time interval between backwashes or headloss is monitored to notify the operator to initiate a backwash sequence.

Figure 3.8 Filter Consoles

3.1.4 Filter Backwash Operation

Backwash Water Reservoir

Number of tanks:	1
Capacity:	156,500 gallons (or 121,200 gallons Working Volume)
Dimensions:	45'x45'x10.33' (Normal Water Level is 8' SWD)

Backwash Water Reservoir Fill Pump

Number of Pumps:	2
Type:	Vertical Turbine
Capacity	1 – 350 GPM @ 50' TDH; 1 – 700 GPM @ 50' TDH

Filter Backwash

Wash water rate (Max High Rate):	4,500 gpm or 14.7 gpm/SF	
Length of cycle:	18 minutes (5 steps – w/surface wash starts)	
Sequence:	Surface Wash:	1 gpm/SF, Start Backwash and ramp up
	Slow Rinse:	2,500 gpm for 2 min., then ramp up
	Medium Rinse	3,500 gpm for 2 min., then ramp
	Fast Rinse	4,500 gpm for 3 min., then ramp down
	Slow Rinse:	2,500 gpm for 2 minutes, then ramp
	Surface Wash:	Stop
	Influent/Effluent:	Close drain valve, Open Influent
	Filter-to-Waste	2 minutes (No currently in use)
	Effluent Valve	Close F-T-W valve open effluent valve
Volume water required:	55,000 gallons (for ½ unit) including future F-T-W	

Backwash Holding Lagoons

Number of lagoons:	3
Type:	Concrete Lined Basins
Total Storage Capacity:	945,000 gallons
Working Volume:	315,000 gallons per lagoon
Side Water Depth	6' at inlet, 7' at outlet
Bottom Dimension:	21' wide x 132' long
Top Dimension:	42' wide x 180; long
Slope:	2:1 side slope and 4:1 end slopes
Minimum DO:	2 mg/l in lagoon effluent discharge
Effluent Pipe:	24" to 3 Backwash Holding Lagoons

Backwash Lagoons

The three lagoons were constructed in 2018 to intercept the backwash water and storm drainage served by the existing outfall that flowed into Sugar Creek. A flume carried the flow to the stream at the base of the hill into what appears to be a former stream channel of Sugar Creek. This channel functioned as a settling lagoon for the filter backwash solids, and was designated as a wetland by OEPA. The distance to Sugar Creek from the outfall is about 2,400 feet. The City has a National Pollutant Discharge Elimination System (NPDES) Permit No. 3IY00012*BD, issued by the Ohio EPA for this discharge, and required the City to treat the backwash water flow in accordance with the NPDES requirements. **Appendix A** includes Sugar Creek's discharge limits.

Figure 3.9 Backwash Lagoons Filters

Backwash Water Reservoir

During design, the 121,200-gallon backwash water reservoir should be pressure washed and inspected to determine if there are any hairline cracks that would allow surface waters to leak into the tank. Any cracks should be sealed, and the cover treated with a spray-on waterproofing sealant to minimize surface water contamination. The existing 20" gate valve and box on the effluent should be replaced. As previously described, the existing 750 gpm makeup reservoir fill pump, piping, and vales should be reconditioned and used to fill the backwash reservoir when the proposed 4,500 gpm backwash pump is out of service.

Backwash Water Reservoir Fill Pumps

The total backwash volume to clean 2 filter cells is 110,000 gallons when F-T-W is implemented. The backwash reservoir is completely drained after backwashing both cells of a single filter. The current 350 gpm and 700 gpm transfer pumps shown in **Figure 3.10** refill the reservoir in approximately 5.25 hours and 2.6 hours respectively. A new 4,500 gpm backwash pump that draws from the clearwell is needed to provide additional backwash capabilities and flexibility for when and how long each filter is backwashed. The existing backwash makeup water reservoir should be maintained as a backup to a new pump, and both transfer pumps should be refurbished.

Figure 3.10 Backwash Reservoir Fill Pumps

Valves and Backwash Piping

Several areas of the 24" steel backwash header is corroded and needs to be removed and replaced. All backwash piping should be insulated to minimize condensation in the pipe gallery. The existing Kathabar dehumidification system is costly to operate and does not dehumidify the pipe galleries using the amount of air being circulated. A new desiccant dryer system is proposed, and by installing foam pipe insulation to wrap all pipes in the filter gallery, the humidity will be reduced allowing for a more cost-effective dehumidification system to be provided.

All process valves in the filter gallery shown **Figure 3.11** and throughout the plant should be replaced. A sampling of the larger 24", 30", and 36" butterfly valves that were installed in the clearwells during the 1995 upgrade are not frequently used. These valves should be inspected during construction to see if they can be reused or if the seats are worn and need to be replaced. Motor operators and gear-operated manual valves should be replaced throughout the plant. Filter influent, effluent, drain, surface wash, and Filter-to-Waste valves that are critical to the backwashing and filter automation are frequently used and need replaced. In 2018, 6 influent valves and 12 washwater valves motor operators were replaced and should be reused with the new valves.

Figure 3.11 Filter Pipe Gallery

<u>Air and Water Backwash</u>
Currently, only finished water is used to backwash the filters. Alternate types of backwashing processes could be considered as a means of improving backwashing operations using a fixed or removable air-water backwash system like the ARIESTM system used at the Northeast WTP. During workshops the combination system was discussed, but it was determined that there was little difference between the backwashing efficiency at the Northeast WTP with the air-water backwash and the conventional water only backwash currently being used at Northwest and Sugar Creek WTPs.

<u>Filter-To-Waste Pump and Piping</u>
F-T-W drain lines are not used because they discharge to a funnel drain that is undersized and allows water to spray on the floor. A new closed header should be provided that connects each F-T-W valve to a new header that is equipped with a dedicated F-T-W Pump located in the pipe gallery where the backwash water drain line exists the building. The new F-T-W Pump will start when the "ripening" cycle is initiate and run for several minutes (adjustable) to flush the filter after backwash and before the filter is put back into service and filtered effluent flows back to the clearwell. New filter to waste piping will need to be installed in the lower level of the piping gallery. Each filter will be provided with a motor operated valve to be controlled by the SCADA backwash sequence program. A 4" mag meter should be installed on the discharge of the F-T-W pump discharge to meter the flow being pumped to the backwash drain that empties into the backwash lagoon.

<u>Instrumentation and Controls</u>
The existing backwash supply from the makeup reservoir enters the filter pipe gallery at the rear of the building. An existing flow tube venturi meter and modulating flow control valve were installed in 1995 and should be replaced with a new magnetic flow meter and modulating butterfly valve. This will become the standby backwash system if the proposed backwash pump is not operational. The level controls, headloss gauges, turbidity meters that were installed in 2007 upgrade should be

replaced and used as spare units. New mag meters should be installed to replace the flow tubes and venturi meters currently used to measure flows associated with the filter operation. All these should be replaced with new magnetic flow meters. A new 16” magnetic flow meter should be installed on the new main header of the backwash pump discharge for the new filter. The 20” flow tube meter used to meter flows from the Makeup Reservoir should be replaced with a new 16” magnetic flowmeter.

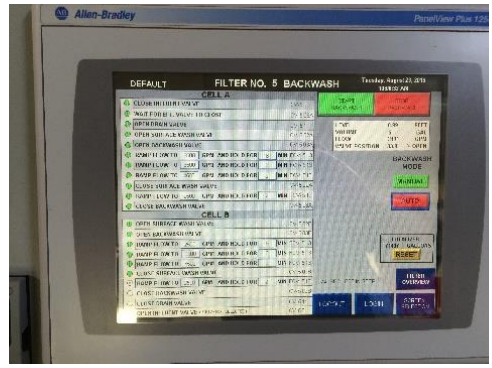


Figure 3.12 Backwash Controls

The backwash sequence shown in **Figure 3.12**, time intervals for steps, and rates should be reviewed and optimized once the filter blocks are cleaned, the new surface sweeps are installed, and the new backwash pump is installed and operational. Ten States Standards do allow for full depth anthracite filters to be operated at a reduced rate of 10 gpm/SF. This would result in reducing backwash water volumes being used and improve holding basin operation.

The SCADA system program and HMI displays should be modified to include the F-T-W process for ripening of filters after backwash, and should include the new backwash pumps, meters, and provisions to switch to the auxiliary Backwash Water Reservoir flow control valve, new mag meter, and level controls to fill the reservoir and control the transfer pump. The current filter piping allows use of Filter-to-Waste (F-T-W) techniques at the end of a filter backwash cycle but is not currently in operation. F-T-W is key to improving water quality of the filtered effluent, and the new backwash lagoons have been designed to handle the incremental flow. During design, the modifications to the piping and floor sump to re-activate the F-T-W practice should be implemented in the final design.

Backwash Holding Lagoons

With the backwater water holding lagoons improvement project, a new 24” sewer was installed to carry backwash waters down the hillside to a flow control chamber designed to split flows evenly between 3 new and 1 future lagoon. Overflow weirs in the effluent structure shown in **Figure 3.13** of each lagoon allow solids to be settled out in the front end of the lagoon while clear supernate slowly works its way toward the overflow structure. Two rows of orifices in each weir plate control the overflow rate, allowing the lagoon levels to rise approximately one foot during the backwashing operation of the two filter cells. The water level gradually drops as the head over the weir drops and minimizes high velocity currents that carry over the fragile pin-point floc without any chemical or polymer additions. Effluent is directed through a new outfall pipe to the original location. Sampling of the combined effluent of the threes lagoons is taken at the headwall. There are not baffles in the lagoons, and addition of a floating baffle wall with plastic sheeting is recommended to aid in preventing short-circuiting between the influent pipe and overflow structure.

Figure 3.13 Backwash Lagoon Overflow Control Structure

Chlorinated finished water is pumped by the transfer pump to the makeup water reservoir located on the hillside at the rear of the plant. Backwash water drains to the new backwash holding lagoons where the solids are settled out, but the effluent remains out of compliance due to high residual chlorine levels. Treatability studies were conducted to use Sodium Metabisulfite (MBS), and it was pilot tested by feeding MBS to the backwash drain line at the plant. High dosages of reducing agents in excess of the recommended amounts described in the literature were tested but could not reduce the residual chlorine levels to the required NPDES limit of 0.05 mg/l in the effluent discharged to the stream. After further sampling and testing, it was determined that by adding the reducing agent ahead of the settling basins, the reducing agent was reacting with the iron hydroxide solids in the backwash water. However, further testing showed that when the reducing agent was added to the settled effluent of the basins, the amount of reducing agent was near stochiometric amounts described in the literature. Filter Backwash De-chlorination at the Lagoons has been included in this CIP to construct a new chemical feed station at the last manhole where the effluent of the three lagoons are combined before flowing to the effluent outfall. The mixing in the effluent pipe provides enough mixing and retention time to reduce residual chlorine levels to meet permit requirements.

3.1.5 Clearwell

Clearwell Existing Design Data

<u>Clearwell</u>	<u>Length x Width x Depth @ Elev. 969.50</u>	
Clearwell 1A (Filters 1 and 3)	19’-8" x 79’-8" x 17’-6" (205,150 gallons)	516,650 gallons
Clearwell 1B (Under Pipe Gallery)	18’-4" x 81’-0" x 10’-7" (117,500 gallons)	
Clearwell 1C (Under Main Floor)	19’-2" x 48’-0" x 17’-6" (120,450 gallons)	
	23’-4"x 24’-1” x 17’-6" (73,550 gallons)	
Clearwell 2 (Filters 2 and 4)	19’-8" x 129’-0" x 17’-6" (332,150 gallons)	
Clearwell 3 (Filter 5 and 6)		
Clearwell 3A (Filter #5	19’-8" x 34’-8" x 17’-6" (89,300 gallons)	½ to Clearwell 1B
Clearwell 3B	17’-8" x 34’-8" x 10’-7" (48,500 gallons)	227,100 gallons
Clearwell 3A (Filter #6)	19’-8" x 34’-8" x 17’-6" (89,300 gallons)	½ to Clearwell 2
Clearwell Volume:	1,075,900 gallons	
<u>Chlorine Contact</u>		
Chlorination Chamber:	22’-0" x 22’-7" x 17’-6" (65,000 gallons)	
Pump Chamber 1:	25’-10" x 30’-10" x 22’-6" (134,000 gallons)	
Pump Chamber 2:	25’-10" x 26’-4" x 22’-6" (114,500 gallons)	
Chlorine Contact Volume:	313,500 gallons	
Volume (total):	1,389,400 gallons	
Detention Time		
Nominal @ 17.67 MGD:	113.3 min. @ Max WL in Clearwell El. 969.50	
Peak @22.1 MGD:	90.5 min.	

Clearwells

The original plant design incorporated 2 clearwell chambers with Clearwell 1 serving Filter 1 and 3, and Clearwell 2 serving Filters 2 and 4. Clearwell 1 extended under the pipe gallery creating 2 passes and includes a large area under the Main First Floor, before entering the Chlorine Contact Tank. Clearwell 2 is a single pass that received the flow from Filter 2 and 4, and then flows into the Chlorine Contact Tanks. Chlorine is added before flowing to the two High Service pump wells. In 1995, Filter 5 and 6 were constructed, and the clearwells for Filter 1 & 3 flows from Pass 1A through Pass 3A where it is combined with the flow from Filter 5 and then flows through pass 3B which is under the filter gallery extension. The flow then splits so one-half flows into Clearwell 1B, while the other half flow from Filter 3B enters into the third Pass 3C and combined with the flow from Filter 6, and then this combined flow is piped to Clearwell 2.

Four 36" transfer pipes are provided in a pipe gallery between the original and new clearwell addition. Filters 1, 3, and 5 can be isolated by closing a valve at the entrance to Pass 3B so that Filter 2, 4, and 6 can remain in service. A second gate is provided to isolate Clearwell 1B and Filters 2, 4 and 6. If the center Pass 1B needs to be isolated, Filters 2, 4, 5, and 6 can remain in service. To clean the Chlorine Contact Tank, the plant has to be shut down for a short period of time.

The total volume of Clearwell Pass 1A, 2, Pass 3A, and 1/2 of Pass 3B is 629,150 gallons, while the total volume of Pass 2, 3C, and ½ of Pass 3B is 445,650 gallons. With 5 filters in operation at 17.67 MGD, Clearwell 1 provides 53 minutes retention with Filters 1, 3, and 5 in service, while Clearwell 2 provides only 35 minutes.

Chlorine Contact Tanks

A 65,000-gallon Chlorine Contact Tank with chlorine solution diffusers mounted at each inlet is provided for disinfection. A total of 5.6 minutes of retention is provided at the 17.67 MGD ADF. When using the combined volume of the Chlorine Tanks and the two pump wells, the storage volume increases to 313,500 gallons which provides a total of 25.6 minutes contact time.

Construction of a second Chlorine Contact Tanks was discussed, but not deemed necessary if chlorine solution diffusers were added upstream of the chlorine contact tank in the clearwells to increase the contact time.

Four 24" butterfly valves with floor stands are provided at the inlet from the clearwells, and the outlets to the two pump wells. These are the original valves and should be replaced due to age.

Hydraulic Modelling

The clearwell receives filtered water from the 12 filter cells along the outer walls of the clearwells. Filter 2 is closest to the Chlorine Contact tanks and baffles in the clearwell would create a longer path and eliminate short-circuiting and dead zones in the corners of the various passes by increasing velocities and adding turbulence that minimizes dead zones. Experience indicates that short-circuiting and dead zones occur, and **Exhibit 3-7** portrays how the flow paths migrate through the clearwells to the Chlorine Contact Tank. Several options were discussed in the workshops, and it was determined that baffle walls should be installed. Baffle walls need be supported by columns, and fiberglass panels should be installed in the clearwells.

Cleaning and Inspection

The filter media breaks down due to repetitive backwashing, and fines can migrate through the filter media and collect in the clearwells. The loss of carbon from the filter has likely accumulated in the clearwells. Pressure cleaning and removal of sediment in the clearwells, chlorine contact tank, and pump wells is recommended. Once the clearwells are clean, the condition of the concrete walls, floors, and ceilings should be inspected by an engineer. If needed, patching to repair spalled concrete and epoxy grouting of cracks would be addressed during Construction with an allowance item.

Access Hatches and Vents

The four exterior access hatches should be replaced with new aluminum access hatches that meet OEPA watertight requirements. The clearwell access door in the lobby needs to be removed, and a new vapor tight access manhole lid installed. Concrete planters that are recessed in the floor of the lobby sit above the clearwell and should be eliminated. The two planters should be filled in with light-weight concrete, and a new concrete floor provided with a terrazzo finish to match the existing lobby floor.

Plant Potable Water Connection

A pressure reducing station is required to reduce the pressures in the high service finished water line from 125 psi to 80 psi house pressure to use for in-plant uses, including the surface washwater spray system for the 12 filter cells. A new reduced pressure backflow preventer is provided on the line that supplies finished water to the plant potable water system and to the plant potable water plumbing system.

3.1.6 High Service Pumping

High Service Pumping Existing Design Data

Number of Pumps:	5
Type:	Horizontal Vertical Turbine (Peerless)
Capacity Pump #1 and #5 (1960) Pump #3 (1970):	4,630 gpm (6.67 MGD) @ 320‘ TDH 450 HP, 1200 rpm, (6.67 MGD), 320’ TDH 24 MA Bowl, 4-stage, 16 x 16 x 30.5 FA Head Unit
Capacity Pump #2 (1960):	2,315 gpm (3.33MGD) @ 250’ TDH, 250 HP, 1200 rpm, 4,160-volt, Synchronous Motor 16HXB Bowl, 10-stage,1 2 x 12 x 30.5 FA Head
Capacity Pump #4 (1997):	4,630 gpm (6.67 MGD, 320’ TDH 500 HP, 1200 rpm, 4,160-volt, Induction Motor, 1997 24 MA Bowl, 4-stage, 16 x 16 x 30.5 FA Head Unit
Total Capacity:	16,205 MGD (23.35 MGD) with largest unit out of service
VFDs:	None

Finished Water Pumps

The plant has five 4,160-volt horizontal vertical turbine high service pumps as show in **Figure 3.14** that vary from 250 to 500 horsepower. Pumps 1, 2, and 5 are the original 1959 pumps. Pump 4 was installed as part of the 1995 renovation. Pump 1 was recently refurbished, and new bearings and seals were provided, the bowls were rotated, and new discharge head/motor stand was fabricated using Schedule 80 steel pipe. The motor was sent out to be cleaned, inspected, rewound, and refurbished with new bearings and thermocouples.

Figure 3.14 High Service Pumps

The High Service Pump Room houses the 5 High Service Pumps and the Backwash Reservoir Fill Pumps as shown in **Exhibit 3-8**.

Pump curves and service records for the Peerless High Service pumps were reviewed with two local Peerless pump service providers, North Shore Pumps and Ohio Drilling Company. All five High service Pumps are in good condition. Pump 1 has been recently rebuilt, and Pump #4 was installed in 1997 with a 4,160- volt induction rather than the synchronous motors used on the original pumps. We recommend that Pumps 2, 3, 4, and 5 be rebuilt in a manner similar to Pump 1, including removing the pumps one at time to inspect, clean, and rebuild in the shop. Pump 4 has an induction motor but needs the motor base and head replaced with a heavy duty Schedule 80 discharge elbow similar to the one installed on Pump 1.

The existing synchronous motors need to be cleaned, inspected, and rewound. In Workshop #3, costs were compared to refurbish the motors or replace them with new induction motors. If the existing motors could be reused, there is a potential saving of $100,000 per motor compared to replacing it. In addition, if the existing synchronous motors could be reused, the existing motor starters and 4,160-volt switchgear were found to be in good condition, then the motor controls could be cleaned, inspected, and reconditioned and the synchronous motors reused at a savings in excess of $400,000. It was decided to contact Eaton and have them inspect and test the switchgear and recommend whether it could remain in service. Eaton's service report is due by the end of March 2020. Therefore, it was decided that the CIP should proceed with assuming the motors could be reused, but new motor switchgear would be provided. If Eaton recommends that the 1995 switchgear is cost-effective to refurbish, the design would not replace motors or switchgear. Currently this CIP contains the cost to replace the switchgear, but this should be reevaluated during detailed design based on the findings included in Eaton's report.

Motors and Controls

The cost to replace the controls for the synchronous motors was compared to the cost to install new induction motors with soft starters. A total life cycle cost study compared the capital costs, installation, energy costs, and O&M costs. Since the large motors are already highly efficient there was little energy savings to be realized. Calculations demonstrated that there was no significant savings with induction versus synchronous motors and controls. Using VFDs on the large 450 HP and 500 HP motors was evaluated, but the cost of the 4,160-volt VFDs offset any energy savings over a 20 year period.

Low Service VFD for Pump #2

While evaluating the need for temporary outages that may be needed to construct improvement to the Surge Tanks, the need to have a smaller pump to maintain service to Beech City and other customers was needed. After discussing temporary pumping and other alternatives, it was determined to replace the 4,160-volt synchronous motor for Pump 2 with a 480-volt induction motor and provide a 480-volt VFD to have the capability to meet the water demands of local customers without temporary pumping. Although there is an added cost to purchase a new 250 HP induction motor, the costs are partially offset by the reduction in the costs of the 4,160 switchgear.

Piping and Valves

The cone check valves on the 5 High Service Pumps are obsolete, and replacement parts are no longer available. The existing butterfly valves also need to be replaced. A new motor operated butterfly valve and a slow-closing electric-check valve should be installed on each pump similar to the valves installed at the Northeast WTP. These valves provide surge detections and feature a slow close to minimize water hammer on power loss.

Instrumentation and Controls

New air-vacuum relief valves should be provided. Pressure transmitters, motor and bearing temperature sensors, and vibration switches should be installed on the refurbished pumps and/or motors to extend their useful life and be monitored by the SCADA system. Pressure switches, level transmitters, position switches, etc. that were installed in 2007 should be reused. Any additional monitoring of residual chlorine or water quality of the finished water required by OEPA should be incorporated in to the final design and monitored by the SCADA system. The SCADA system installed in 2007 is over 10 years old and should be updated with new server and network hardware, radios, PLC hardware and software, and the latest version of the HMI software.

General

A new overhead coiling door needs to be cut into the west wall of the High Service Pump Room as shown in **Figure 3.15** so that motors and pumps can be loaded on a truck and taken off-site for repairs. The spiral stairs to the second floor Control Room should be replaced with a wide staircase constructed over the top of the two small turbine pumps. The bridge crane, trolley, and hoist should be inspected for compliance and upgraded to meet the latest OSHA safety requirements. The existing backwash reservoir fill pump should be maintained as a backup to a new large backwash pump that will take finished water directly from the pump well and used to backwash the filters as described in Section 3.1.4.

Figure 3.15 High Service Pump Room

3.1.7 Chemical Feed Systems

Fluoride Chemical Feed System Existing Design Data

Storage Tanks:	2 @ 3,000 gallons each
Tank Material:	Fiberglass
Day Tank:	100 gallon
Transfer Pump:	None (Gravity Feed)
Metering Pumps:	2 Peristaltic
Weigh Scale:	Force Flow – 36 -DR10LP 1,000-pound capacity

Chlorination System Existing Design Data

Type:	Wallace & Tiernan V-2000 – 500 ppd Chlorine feed with: Rotameter sized for 500 ppd chlorine, automatic actuator, 1" Fixed throat Injector, 500 ppd vacuum regulator, 1-ton containers mounting kits with heater
Number:	2 - @ 2,000-pound per day

<u>Fluoride</u>

The Fluoride Room shown in **Figure 3.16** was constructed in 1997 to house two 2,000-gallon FRP storage tanks and the chemical feed equipment. The bulk fluoride feed system includes two 3,000-gallon dome-top fiberglass storage tanks, spill containment, 100 gallon covered day tank, transfer pumps, and chemical metering pumps. All tanks are vented to the exterior.

Due the corrosive nature of hydrofluoric acid, all equipment, conduit, and supports are severely corroded and needs to be replaced with proper materials to suit the corrosive environment. A plastic chemical-resistant transfer vertical wet pit pump is provided on the entry level to the building and used in case of a leak or spill during filling operations to pump out the below-grade containment sump. This pump should be removed and rebuilt with new bearings and seals.

In 2007, new concrete bases were constructed to elevate the tanks to flow by gravity to the day tank. New level controls were installed at that time; however, all process piping, heating and ventilation, plumbing lighting, and work equipment needs to be replaced. Currently, even the 316 stainless steel valves, switches, boxes, and motor disconnects are severely corroded and need to be replaced. The lighting and all electrical conduit and wiring are damaged and need to be replaced with gas tight plastic or CPVC lighting fixtures and conduit. The existing unit heater, safety shower, overhead safety shower water tempering tank, door, and hardware also need to be replaced due to the corrosive nature of the fluoride. Level transmitters dials and the glass entry window in the door are hazed by the corrosive fumes.

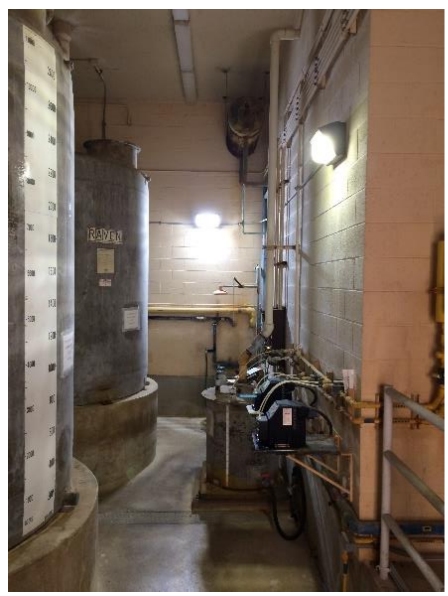


Figure 3.16 Fluoride Room

During Workshop #3, a plan was presented to construct a new wall at the main floor level of the room. Stairs lead down into the floor of the containment area to service the day tank and pumps. In the new plan, an operator room would be provided to house the electrical equipment, pumps, and motor controls. All conduit in the new building would be CPVC, and all boxes, switches, and lighting would be designed for a corrosive environment and gas-tight LED lighting. Any metal components should be 316 SS with epoxy coating, since this appears to be the most durable finish for metals. New chemical piping would be installed. A new door with epoxy coating would be provided, and all new hardware mounted in the operator room. New PVC exhaust fans would be provided on the roof. A rooftop makeup air unit would be provided to provide a constant air supply to the room to mitigate the buildup of corrosive fumes.

An instantaneous water heater should be provided in the Operator Room of the Fluoride Building and piped to a new CPVC safety shower, thereby eliminating the need for a tempering tank. All doors would be epoxy painted, and windows would be a plastic. The two existing pumps will remain in the fluoride side of the building, but new piping, ball valves, safety valves, and tubing will be provided. A non-metallic NEMA 7 disconnect switch will be provided at the pump and the motor controls and in the Operator Room. All level control indicators will be moved to the Operator Room. Any exposed hangers, support brackets and fasteners will be replaced with epoxy coated 316 SS parts.

Chlorine Feed System

The existing chlorination system consists of chlorine gas in 2,000-pound containers. The container is placed on a scale and an operator connects the container to a vacuum regulator that is connected directly to a 2,000-pound container. Chlorine gas flow from the container to the chlorinator is under vacuum. If vacuum is lost, the regulator valve closes preventing any flow of chlorine gas. If the chlorine gas line to the chlorinators was severed, the regulator valve would close, preventing container gas leakage.

Chlorination is key to disinfection of the filtered effluent. With the use of tray-type aerators, most iron and manganese are oxidized, but chlorine is needed for disinfection. The existing chlorine feed units should be replaced based on manufacturer's recommendation. This includes replacement of educators, controls, and gauges to re-build the chlorinators shown in **Figure 3.17** and distribution manifolds.

Figure 3.17 Chlorinators

Emergency Gas Scrubber System

The need to install an emergency chlorine gas scrubber or carbon absorption system at the Sugar Creek WTP was discussed. It was determined that a carbon absorption system was too costly and not necessary since the WTP is not in a residential area, and that a wet chlorine gas scrubber system would be considered during design after obtaining input from the local fire marshal.

General
In 2007 the weigh scale, leak detection alarms, and controls were integrated into the SCADA system, and are in good operating condition. Improvements to upgrade the chlorine solution feed system include insulation of water piping, upgrading heating and ventilation systems, installation of a new roof, and replacement of the garage door with an insulated overhead coiling door. In addition, the entry doors and hardware would be replaced in the Chlorinator Feed and Chlorine Cylinder Storage rooms. The masonry building as constructed in 1978, and all lighting, heating and ventilation should be replaced with LED lighting and a new HVAC system.

3.1.8 Site Work

B&N has evaluated the condition of the entrance sign structure, roadways, drainage, paving, and curbs in the plant and the wellfield.

Wellfield
The existing gravel roadway consists of 8’ of gravel with sealcoat topping. Although the roadway is located above the floodplain, the sandy soils in the area, and lack of roadside perforated drains results in potholes formation. With the recommendations discussed in the Section 3.1.1, it is recommended that the roadway be repaired to remove soft areas, repaired, regraded and resurfaced. Several areas will need the fencing repaired or replaced, and two new gates installed at US 21.

At Well #10, the bank of the river needs to be stabilized so that it does not erode any further toward the well casing. This may require a Corps of Engineers permit to make any improvement. Re-grading and seeding areas in the wellfield disturbed with the new construction will need to be addressed. Valve boxes are currently lost in the high grass and should be marked. Any excess excavation during construction can be stockpiled on the site of future Backwash Lagoon #4 and regraded and seeded.

Site Security
The addition of CCTV cameras to monitor the Main Gate, Wellfield, Front Parking, Rear Parking, and Aerators is recommended. Fiber optic cable can be installed with the new duct bank to provide fiber to install CCTV cameras at Wells 2, 6, 7. Conduit can be run to install roof-mounted cameras on the Main Building and two Aerator buildings.

Main Drive
The main drive is in fair condition due to poor drainage. The soft areas and potholes should be removed and filled. The top seal coat should be removed, and new asphalt pavement installed from Dolphin Street (SR 212) to the Main Gate. The stone entry should be repaired to its original design, and new aluminum letters and the City of Canton logo added. A solar light should be provided to make the entry noticeable since there is no street lighting, and it would require a 1,400 feet conduit run to bring power to the front entrance which is not cost-effective. An overhead LED streetlight should be installed with a solar sensor at the call box for night access. The existing automatic gate at the plant needs to be replaced. A new 24’ wide motorized cantilevered gate should be installed. Operation of the gate should be controlled by a keypad or card reader, with an inside control station in the SCADA control room on the second floor of the Main Building.

New Service Road around Filter Building

Chlorine and chemical deliveries need to perform difficult maneuvers with their truck to unload chlorine cylinder or unload hydrofluoric acid from tanker trucks. The area between the two aerators, garage, and chlorine building require special handling since the truck must back up to a building to unload.

The need to construct a new drive that connects to the main parking lot at the gate and swings out around the Filter Building was identified during the workshops. A 20-foot wide asphalt drive is proposed to allow trucks to drive through between the Fluoride/Chlorine Buildings and the Garage. Since there is a second-floor exit from the Filter Gallery, a curb or pipe guards are needed to protect where the stair exits at grade. Due to the steep grade along the hillside, a retaining wall may be needed to provide a swale to carry runoff away to the front of the building.

Parking Areas

The parking area in front of the building and along the south side and back of the building is cracked and needs to be repaired. It is recommended that the roadway be milled to remove several inches of the chip and seal topping so that a new asphalt leveling course can be added. Grading the new pavement to improve drainage along the back of the building is recommended. Any curbs in the circle at the front of the building or other curbing that is broken or missing should be added.

Underground Fuel Tank

A 2,500-gallon underground fuel tank for the emergency generator is located along the south side of the building. Fuel oil pipes and conduit pass under the road. The underground tank should be removed, UST closure provided, and the excavation backfilled. A new above ground tank with secondary containment should be provided at the same location, and new piping and power provided. Since the pavement will be removed when the new wellfield duct banks get installed, the roadway repairs and milling should occur after construction is complete. A new concrete drive apron is needed to connect the new overhead door on the south side of the High Service Pump Room.

Septic Tank and Sewer

The existing sanitary sewer that runs along the rear of the building and drains to the septic sewer should be replaced. Any storm downspouts should be removed. A new lab acid neutralization tank should be provided to pretreat the waste sent to the septic tank. A new buried oil-water separator tanks should be provided to handle floor drains in the Maintenance Garage prior to discharging to the septic tank. Two manholes should be provided at both ends of the proposed sanitary sewer so it can be accessed for cleaning.

3.1.9 Architectural / Structural

The interior and exterior condition of all buildings was assessed to develop a scope of recommendations for all the WTP facilities. Existing facilities were evaluated with respect to improvements needed to comply with state/local building and fire codes related to fire exits, stairwells, building occupancy, and use of spaces. Renovation of the existing facilities must address improvements to update buildings to meet Americans with Disabilities Act (ADA) requirements and comply with Occupational Safety and Health Administration/ Public Employee Risk Reduction Program (OSHA/PERRP).

Field inspections were conducted to assess the condition of the Main Building, Aerators, Chlorine, Fluoride and Garage. During workshops, the staff offered their input of what improvements were needed, and how the existing office and workspaces could be improved. B&N recommended improvements to common areas such as the men’s and women’s locker rooms, restrooms, lobby, second floor common areas, high service pump room, electrical room, workshop, and storage areas.

The original plant has not been updated since 1960 when it was constructed, and expanded in 1995 when the new East Aerator, Filter Building addition and Maintenance Garage where completed. The Chlorination Building was constructed in 1978. In 2006, the roofs of all building were replaced with single-ply membrane roof except for the Old West Aerator and Garage buildings.

Listed below is a description of deficiencies that should be repaired, renovated, or replaced for the various architectural, structural, mechanical, and electrical systems for each building. Building improvements needed are further broken down into specific areas (high service pump room, filter gallery, lobby, laboratory, SCADA control room, office, restrooms, halls, etc.).

Any improvements to the interior or exterior of the building had to consider maintaining the 1960’s architectural theme of the façade and lobby. All other areas of the building would be modernized to provide a safe and comfortable work environment, using proven technological solutions and the highest quality for building materials and equipment to provide a sustainable, low maintenance, and energy efficient solutions that are cost-effective and will extend the useful life of the existing facilities for decades.

Figure 3.18 is an aerial of the Sugar Creek Water Treatment Plant site. The buildings and facilities are numbered to correspond to the following areas.

1. Water Treatment Plant Main Building
2. Chlorination Building
3. Fluoride Building
4. Garage
5. East Aerator (1995)
6. West Aerator (1960)

Figure 3.18 Sugar Creek WTP Facilities

Water Treatment Plant Main Building

High Service Pump Room. The front of the building faces north elevation, and the north wall of the High Service Pump Room is comprised of existing glass block windows mounted between aluminum mullions which create the 80' side x 20' high glass block system that extends from 4 feet above ground to the top of the building as shown in **Figure 3.19.** Several options were considered, including replacing the glass blocks window wall, installing translucent insulated window panels (Kalwall or equal), or a storefront window system using thermopane windows and new aluminum frames. Glass block windows were not considered due to experience with cracking and leakage and they are not energy efficient. Translucent panels were not recommended because of experience with discoloration over time and they cost approximately the same as an aluminum storefront system. Use of a storefront system is economical and window mullions can be used that will maintain a fresh and modern appearance. Clear or tinted glass samples were provided, and a final selection will be made during design.

Figure 3.19 Front of WTP Main Building

Filter Building North and South Walls. Translucent panels are currently used for the windows in the filter room and stairwells. The twelve 16'-3" x 4'-0" translucent panels are subject to the high moisture conditions present in the filter rooms and the condensation on the inside of the windows. New translucent windows are proposed to replace the existing units located above each of the 12 filter cells. The white panels will match the original design and 1995 designs, and benefit from the use the latest materials technology in fabricating the panels. Their insulation value minimizes heat loss. A new ventilation system will be installed to reduce condensation in the Filter Rooms, thereby minimizing the buildup of chlorine fumes that attack the plastic sheets. The 6 windows on the south side on the rear of the building in the filter room will be match the 6 front windows.

Front Entrance. A stylized front canopy in front of the double doors offers weather protection at the lobby entrance. This architectural cast in place concrete element should be cleaned, and the roof and downspout will be replaced. A storefront window system covers the entire north wall of the lobby, allowing natural light to illuminate the historic mosaic tile wall covering the curved wall of the lobby. A new storefront window system should be designed to match the style of the existing window mullion pattern. Thermal windows can be clear or tinted to match the HS Pump Room windows described above. The wall between the two areas is covered with limestone veneer and should be cleaned and tuckpointed. A new elevator may be required and would be constructed on the front of the building adjacent to the lobby and covered with simulated limestone to match the existing veneer. The "Canton Water Works" letters should be removed, cleaned and polished or replaced.

Exterior Windows and Doors. The remainder of the windows and doors on the rear and sides of the main building are a single-pane steel window system. These windows should be replaced with new aluminum frames and thermopane windows. Vent-style windows will be provided where needed, otherwise windows will be fixed. New aluminum doors and hardware should be installed to replace existing single and double doors. Two existing garage doors in the Electrical Room should be replaced with energy-efficient insulated aluminum coiling doors with motor operators. All doors should be fitted with door switches for intrusion detection so the operator on duty can monitor building security from the Control Room using the SCADA system.

Masonry. The existing face brick should be pressure washed and inspected. Any cracks in joints should be chiseled out and repaired. All loose or soft areas in mortar joints should be chiseled out and tuckpointed with mortar to match the existing mortar. Weep holes should be cleaned of mortar and replaced in areas where water-stained joints indicate a plugged weep holes. Any flashing over doors or corroded lintel beams should be cleaned and recoated and new flashing installed before brickwork is replaced. Once the repairs are complete, the walls should be sealed with a waterproofing spray-on sealant.

Lobby

Entrance doors open directly into the first-floor lobby of the building as shown in **Figure 3.20**. Although the door is usually locked, an intruder could enter the main building unnoticed since the operator is located in the second-floor office or control room. Construction of an entrance lobby that is 12’ x 8’ x 9’ high should be constructed with a second set of double doors that open into the lobby. A CCTV camera in the lobby would allow the operator to monitor the entrance, and a door buzzer would allow the operator to control entry to the lobby.

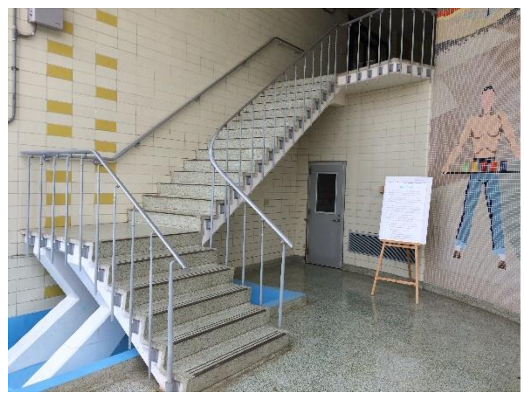


Figure 3.20 1st Floor Lobby

The ceramic tile mosaic mural should be cleaned, and a small repair made. Two planters in the lobby are situated in the floor with the finished water clearwell directly below. The planters should be filled with light-weight concrete and topped with a terrazzo floor to match the existing floor. An access floor door behind the stairway should be removed, and a watertight manhole casting and lid installed and the terrazzo floor repaired. Handrail on the stairway to the second floor should be replaced with new OSHA complainant architectural railing that matches the existing railing. The ceiling tile should be removed and replaced. A new wall should be constructed at the top landing of the stairway to the second floor. Two fire-rated doors, frames, and panic hardware are required by code to create a 1-hour fire separation between the lobby, the lower and upper floors. A new rooftop HVAC unit and exhaust ductwork should be provided to ventilate the area. New architectural lighting to highlight the mosaic features and motion detectors to activate lighting when the space is occupied will improve the lobby. The outside canopy should be fitted with new LED lighting. Emergency and exit signs should be provided.

New Elevator

Current Ohio Building Code requires the installation of a passenger elevator to accommodate ADA requirements for personnel working on the second floor. Since samples from nearby communities are dropped off at the lab for analysis, the terrazzo stairs present a slipping hazard to visitors carrying samples up to the second floor. In addition, an elevator would allow operators to use the elevator and eliminate the slipping accidents related to carrying samples up to the second floor laboratory. A new elevator shaft should be constructed off the side of the lobby, and passengers would be discharged into a new hallway constructed along the curved wall behind the mosaic.

Openings would be cut into the wall to install the elevator, and a fire door provided at the common area on the second floor between the offices and filter gallery. The exterior of the elevator shaft should match the limestone façade of the building. An elevator room above the elevator should be provided with access off the roof of the existing building. Ventilation, power and lighting would be provided to operate the proposed elevator. During design, the need for the elevator will be further investigated, and consideration given to request a variance from the State of Ohio Building Commission to waive the requirement for the elevator.

Filter Rooms and Filter Gallery

Windows and doors. The filters are isolated from the main Filter Gallery as shown in **Figure 3.21**. There is not spalling of paint on the ceilings, but the translucent windows are discolored and new energy efficient translucent windows and frames should be provided to replace all existing units. Since the original building was constructed in 1950 and the addition in 1995, the caulk and sealants used for the windows and doors should be tested to determine if they contain asbestos materials. If asbestos is detected, the materials will need to be properly removed and disposed of offsite in an approved landfill. The existing aluminum windows that enclose the filters are in good condition and should be cleaned and re-used. The doors to access the filters and the double doors at the two ends of the gallery should be replaced with new doors, frames, and hardware. A plan of the Filter Building is provided in **Exhibit 3-9.**

Figure 3.21 2nd Floor Filter Gallery

Floors. The terrazzo floors are in good condition and should be cleaned and polished.

Walls. The glazed tile block is in good condition. The mortar should be cleaned and the walls washed.

Skylights. Roof curbs for the skylights are supported by the steel beams that support the roof slabs. The moist air and chlorine in the air have corroded the steel. Since the exposed steel frame that surrounds each opening is part of the framing of the opening, the steel should be sand-blasted and coated with an epoxy paint. New skylights that have an inner and outer plastic shell should be installed. These skylights meet the requirements for energy and safety codes to prevent breaking if someone on the roof accidently falls onto the skylight. All new flashing should be provided around the perimeter of the roof curbs. Roof hatches should be replaced with new aluminum units with stainless steel fasteners and new flashing.

Perimeter wall heaters. Radiant fin-tube wall-mounted heaters are provided along base of the outer walls under the window. These heaters circulate hot water supply for heating and return back to the boiler. Chemical treatment of the boiler feed presents a potential source of contamination if a tube would leak and drain into a filter. A rooftop heating and ventilation system is being proposed that will eliminate the boiler and radiant fin-tube heating.

Roof. The original roof for the entire building was replaced with a single -ply membrane in 2006, and no further work is required Any new roof curbs for HVAC equipment and ductwork penetrations will be properly flashed and sealed.

Second Floor Office Areas

The second floor of the main building has a central area that is 2,750 SF that is split between a common area, office, SCADA control room, lab, men's and women's restrooms, men's locker room, and janitor's closet as shown in **Exhibit 3-10**. The existing painted steel partition walls used to separate the areas need to be replaced. The existing ceiling should be removed to install new HVAC ductwork and lighting. A new suspended ceiling with HVAC, diffusers, lighting, and plumbing should be installed. Existing floors should be cleaned and repaired to match the existing terrazzo finish. Ceramic tile in first and second floor lobby should be cleaned. New LED lighting, security lighting, and exit signs should be provided. A list of the proposed new areas is provided, including the allotted area and a brief description of the specific requirements is summarized as follows:

- Lobby/Conference area (575 SF): Walls, doors to Filter Gallery, windows, new HVAC, lighting, and projection system.
- SCADA Control Room (280 SF): Convert closet into IT closet, counter, SCADA hardware, Wall-mounted display screens, computer desks and chairs, new partition wall, and 4 doors.
- Elevator Hallway (75 SF): Walls and one-hour fire-rated door.
- Operator Office (210 SF): Walls, windows, 2 doors, furniture, counter, and cabinets.
- Kitchenette (170 SF): Kitchenette, refrigerator, sink, microwave, table, and chairs.
- Men/Women Restroom (70 SF): Walls, door, toilet, sink, and close off existing door to locker room.
- Men's Locker/Shower Room (160/160 SF): 16 lockers, benches, shower, sink, 2 windows, and 3 doors.
- Women's Locker/Shower Room (60/120 SF): 3 lockers, benches, shower, sink, and 3 doors.
- Laboratory / Lab Office (125/140 SF): (**Figure 3.22**) Door, new counter, base cabinets, lower wall cabinets, furniture, lab instruments, and supplies.
- Janitor's Closet (50 SF): New mop sink and door.
- Rear Stairwell (140 SF): Replace handrailing.

Figure 3.22 2nd Floor Laboratory

Chlorination Building

The Chlorination Building was constructed in 1978. The masonry should be cleaned and tuckpointed prior to applying a sealant. The existing door panels and hardware can be reused, but new door hardware should be provided. The two existing garage doors in the Electrical Room should be replaced with energy-efficient insulated aluminum coiling doors with motor operators. The roof was replaced in 2006 and should be repaired where any new HVAC equipment and fans are installed. The three windows should be replaced with thermopane windows with alumimum frames to match the Main Building. The interior walls are glazed tile and only need to be cleaned, but the ceiling should be repainted. New insulation should be provided for any waterlines and overhead storm sewer piping inside the buildings.

Fluoride Building

The Fluoride Building was constructed in 1995. The masonry should be cleaned and tuckpointed prior to applying a sealant. The existing door frame, door, and door hardware have been corroded by the fluoride fumes and should be replaced. New 8" CMU walls should be constructed to create a new Operator Room for housing electrical equipment and instruments in a well-ventilated space. The doors should be FRP and coated with an epoxy paint to reduce corrosion. The roof was replaced in 2006 and should be repaired where any new HVAC equipment and fans are installed. The CMU walls and the ceiling should be repainted. All electrical and mechanical ventilation systems should be replaced. All ductwork and conduit should be CPVC.

Maintenance Garage

The two-bay Maintenance Garage shown in **Figure 3.23** is 38'-8" wide x 32'-8" deep, and was constructed in 1995 and provides space for vehicle storage, lawn mower tractor, and work benches. The gasoline storage tank was relocated to a concrete pad located at the rear of the garage. The structure is brick/block construction to match the existing plant. Mechanical HVAC work and plumbing work is proposed for the maintenance garage.

Figure 3.23 Maintenance Building (East Aerator in Background)

Generator Building

Under Contract 95-4, the existing garage at the south end of the building was converted to an electrical equipment room to house the switch gear, transfer switch, motor starters, transformer and other miscellaneous electrical equipment. The generator building is located at the south end of the main building. All masonry should be cleaned and tuck-pointed and sealed when the main plant work is done. The existing fire door between the generator room and the electrical room is fire rated for 2 hours and can be reused. Interior walls are glazed tile and only need to be cleaned, but the ceiling should be painted. New LED lighting should be used to upgrade the existing lighting. The existing 1,250 KW generator is in good condition and will be re-used, however, the intake louver in the exterior wall should be replaced with a new aluminum unit.

High Service Pump Room

The interior walls of the High Service Pump Room are glazed tile and only need to be cleaned. The ceiling should be painted. The glass block windows on the north wall should be replaced with a new aluminum storefront window system. The doors, frame, and hardware should be replaced. An abandoned foundation for the old generator at the west end of the building should be cut down and a new floor installed with clay brick tile squares to match the existing floor. A new door is needed in the west wall to allow the motors and pumps to be loaded onto a truck. A 12' wide by 14' high opening should be cut into the existing wall and a new overhead coiling door should be installed. A new

Figure 3.24 HS Pump Room Stairs to 2nd Floor Control Room

rooftop HVAC unit should be provided on the roof, and new ductwork run to provide air to each pump motor.

The exhaust fans installed in 2006 can be re-used. A new overhead door with fire-link should be provided between the Pump Room and the Electrical Room to replace the existing 3-panel folding door. Fire code requires a 2-hour fire rating for the doorway between the two rooms, and the fire-link allows the overhead door to remain open and only close when a fire is detected. A new stairway should be constructed to replace the existing spiral stairs shown in **Figure 3.24** to provide a safe stairway from the pump room first floor up to the SCADA Control Room on the second floor. Interior walls are glazed tile and only need to be cleaned, but the ceiling should be painted. The windows on the second floor Control Room and Laboratory should be replaced with new thermopane windows with aluminum frames. The addition of sound-deadening panels should be evaluated during design for the Pump Room and Generator Building.

3.1.10 HVAC and Plumbing

After the proposed building improvements are finalized, the HVAC system should be evaluated to determine the requirements for providing adequate heating, cooling, and ventilation of the spaces and equipment. Energy conservation will be a special concern that will need to be addressed.

There were a number of HVAC improvements implemented as part of the 1995 renovation of the Sugar Creek WTP. The following several items that should to be addressed:

- The main HVAC units for the office areas are 25 years old and should be replaced with new units that service the first and second floor areas of the plant.
- The boiler should be removed, and electric heat should be used in the plant.
- Foam insulation should be installed on all process water pipes in the pipe gallery and wrapped with PVC covering to minimize condensation in the pipe gallery.
- An electric-heated desiccant dehumidification system should be provided to replace the Kathabar system shown in **Figure 3.25**. Electric heat should be used to regenerate the desiccant that absorbs water from the air circulated through the pipe gallery. By insulating water lines in the pipe gallery and other areas of the plant, the dehumidifier loads will be reduced, making a desiccant dryer more affordable to operate.

Figure 3.25 Mechanical Room with Kathabar Dehumidifier

- The existing unit heater is deteriorating due to the corrosive nature of the fluoride gas. The unit heaters and ventilators in the Fluoride Building are corroded and should be replaced with a new rooftop make-up air unit. New CPVC ductwork and exhaust fans should be provided to minimize fumes in the building.
- The Heating and Ventilation system for the Chlorine Building should be replaced. Further research is needed to clarify whether OEPA will require a fume scrubber for controlling chlorine gas release in case of an emergency chlorine gas leak.

- The rooftop heating and ventilation system should be replaced with a new HVAC unit that provides adequate supply air for cooling the large 450 HP and 500 HP high service pumps. In 2006, the exhaust fans were replaced and may be able to be reused. The new system should be re-evaluated to account for the new roof and windows that will reduce external heating and cooling loads. The new backwash pump and motor will require additional ventilation since it is outside of the high service pump room.
- A separate HVAC system with variable air volume (VAV) controls should be provided for the main filter gallery on the second floor.
- A new second floor HVAC rooftop unit should be provided with VAV controls to heat and cool the new SCADA control room, office, lab, kitchenette, first/second floor lobbies, restrooms, locker rooms, vestibule, and stairwells.
- If a new elevator is installed, the second floor HVAC system must be designed to provide the proper amount of cooling and ventilation per code.
- The old battery room, mechanical equipment room with dehumidifier, and hallways should be heated and ventilated.
- Ventilation of the filter rooms is needed to remove chlorine fumes, control humidity, and control the temperature in the filter area. New exhaust fans should be provided with outside air louvers that allow outside air to be used to minimize the buildup of fumes inside the glass-enclosed rooms. These areas are naturally cooled by the low water temperatures that cool the space. Heating units should maintain a 50 degree temperature that can be adjusted.
- The Filter Gallery is occupied during a filter backwash. A new HVAC rooftop will be provided to air condition this space in the summer and provide heat in the winter.
- The dehumidifier should circulate air through the pipe gallery and first floor area behind the first floor lobby. A small percentage of fresh air should be introduced to maintain a fresh air supply. The desiccant dryer should be in the mechanical room on the first floor.
- The Maintenance Garage should be equipped with a new rooftop unit that will recirculate the air in the space, and new exhaust fans should provide additional summer ventilation when equipment is being serviced and the garage doors are open.
- The old chemical feed room has no heaters or ventilation but should be provided with a new HVAC system with VAV controls to maintain the space as an instrument repair shop and machine shop with storage.
- A new HVAC system should be installed with VAV controls to handle heat generated by the switchgear and power distribution equipment located in the Electrical Room. The HVAC system should include recirculation and vents to maintain a temperature that is suitable for the operation of the new power distribution, MCCs, VFDs, control panels, power distribution and light panels.
- The hot water supply and return lines for the fin-tube baseboard heaters are a possible source of contamination if the chemically treated water leaks into the filter. These should be removed and the new indirect rooftop units will supply heat to the space.

The following plumbing items are recommended due to the improvements discussed for the second floor of the Main Building. The proposed plumbing renovations will strive to provide restroom facilities and locker rooms that comply with ADA and local building codes.

- Construction of a new women's locker room, including adding a new shower, and sink are needed to address the needs of the female staff working at the plant.
- A new Women's Restroom should be provided for visitors and staff. An interconnecting door allows the restroom to be connected to the new locker room.

- A new Uni-Sex Restroom should be constructed in the main hall that can be shared by visitors. It should include a toilet, urinal, and sink.
- The men's locker room should include a toilet, shower, and sink.
- The Janitors Closet off the main hall should have a new floor sink.
- A drinking fountain should be provided in the hall leading to the rear stairs.
- A new kitchenette with a sink unit that includes a filtered water faucet, hot and cold water, and a hand sprayer.
- In the Maintenance Garage, an oil-water separator should be installed to treat floor drains that currently discharge directly to the septic tank system.
- In the lab, a new corner cabinet should be installed to house the deionized water system. A new cup sink and drain should be provided. A new limestone acid neutralization system should be provided on the first floor to neutralize lab waste before flowing to the septic tank system.

3.1.11 Electrical

Electrical Service Existing Design Data

Service Provider:	Ohio Edison (OE)
Current Service:	23 kV, 3-phase primary with City-owned substation and pad-mounted transformers stepping voltage down to 480Y/277V, three-phase secondary service
Actual Peak Demand:	1,000 amps at 3 phase, 480V (12 months peak demand data received from OE)
Backup Power:	1,250 KW Diesel Generator

The Sugar Creek WTP motor control centers and pump starters were replaced in the 1995 renovation. A new generator was installed to run the plant with standby power.

<u>Main Electrical Service to the Plant</u>

The steel termination tower was replaced with wooden poles to intercept the incoming overhead power service. The overhead circuits and conductors were transferred to wooden poles to accommodate service to the well fields. The electrical service connection and breakers on the main feed to the plant require replacement.

<u>Standby Generator</u>

The Generator Building is located adjacent to the electrical equipment room in a masonry building that was constructed to house a 1,250 KW diesel generator and day tank. The generator is in good working order and sized to handle the loads of the four largest pumps running at 20 MGD. The existing generator is in good condition and is maintained by Caterpillar service representatives. No new work is anticipated. During design, the ventilation system louvers and actuators will be inspected to determine if any repairs or service is needed.

<u>Fuel Oil Tank</u>

A 2,000 gallon double walled fiberglass storage tank is buried on the west side of the generator room. An interstitial leak detection and monitoring system and overfill protection and alarm are provided. The goal is to have the tank replaced with an above ground unit as a precaution against contamination of the aquifer with diesel fuel if the tank were to rupture. Removal and replacement with an aboveground tank with double containment tank in a concrete encasement was chosen as the best solution to provide a safe fuel storage system.

Main 5 KV Switchgear

Under Contract 95-4, the switch gear shown in **Figure 3.26** was replaced with a 5 KV automatic transfer switch and vacuum type circuit breaker. The load center was replaced with a dry type unit substation including a 750 KVA transformer, main switch and two fused distribution panels. The MCC in the mechanical room was replaced. The 4,160-volt gear appears to be in good condition and requires an Eaton-Cutler Hammer field service technician to clean and test the equipment to determine if it can be refurbished or if it should be replaced. The CIP carries the cost of the replacement of the gear with switchgear, automatic transfer switch, breakers and feeds to the well field and high service pumps and MCCs, but the scope will be confirmed during the design phase.

Figure 3.26 Main Switchgear

Wellfield Electrical

Power to the well field is provided via an overhead 4,160-volt power pole line from the treatment plant into the wellfield pump #1 - #10. Each well has a 480-volt transformer mounted on a platform and a power pole. Many of the power poles and transformer platforms are deteriorating and need replaced. The overhead service lines are subject to breaking during storms and should be replaced with new cable in a buried duct bank so that the overhead service can be eliminated.

The recommended new 4,160-volt power distribution system will provide redundant feeds to all the well pumps so there not a single point of failure for pump operation. This will allow any well to be taken out of service, while the other nine wells still have power. The emergency generator will also be available to power the load of both the well pumps and high service pumps. A step-down transformer should be provided at each of the ten wells. Three of the pumps should be equipped with variable frequency drives to allow flow modulation to improve plant performance and conserve power by optimizing pump operation to meet demand without the use of energy-dissipating flow control valves.

Motor control centers, VFDs, and the SCADA panels should be housed in the new Well Building that will house the meters and pump controls. The existing radio communications between the wells and the plant should be replaced with a new fiber optic cable to provide more reliable communications with all ten wells. Levels, flows, pressure and motor status and alarms should be displayed on a local OIT panel in the Well Building and at the plant SCADA system.

High Service Pump Motors and 4,160-volt Motor Starters

The major source of power usage in the plant is the high service pumps that vary from 250 HP to 500 HP. Pumps 1, 2, 3 and 5 have the original 4,160-volt synchronous motors, and Pump 4 has a 4,160-volt induction motor. Pumps 3, 4, and 5 should be refurbished, and soft starters should be installed on Pumps 1, 3, 4 and 5. Pump 2 should be equipped with a new 480 volt induction motor with a VFD.

Lighting

Throughout the plant, garages, aerators, and site the lighting is outdated and should be updated with the latest LED technology to reduce O&M costs.

Security

CCTV security remains a key consideration for plant operation and sustainability. It is recommended to install CCTV cameras in the well field, access roads, main gate, building entrance, control room, filters, and pipe gallery. All CCTV would be integrated with the City's existing CCTV system.

3.1.12 SCADA / Instrumentation

The first Supervisory Control and Data Acquisition System (SCADA) system within the plant was installed in the 1995 renovation. In 2006, the SCADA system was replaced with a new PLC-based control system capable of providing data acquisition, monitoring, control, data reporting and management functions. Between 2006 and 2016, a distribution system wide SCADA system was installed to monitor and control all three water plants operated by the City of Canton and their respective wellfields, reservoirs, elevated tanks, and points in the distribution system.

Figure 3.27 SCADA Control Room

In 2006, all electrical and instrumentation needed at the Sugar Creek Plant to provide monitoring and control for the following was included: well field levels and well pumps; high service pumps, effluent flow, effluent chlorine residual, in-plant water pressure, clearwell level and plant discharge pressure; filter influent levels, valve positions, flow, loss of head, washwater reservoir level and pump controls. In 2018, the motor operators for the six 24" influent valves and twelve 10-inch butterfly control valves were replaced and added to the SCADA system.

The current SCADA system that was installed in 2008 is approaching the time when the servers and software should be upgraded to the latest standards. Old equipment could be used as shelf spares or additional workstations for the NE and NW WTPs. New actuators, equipment, instruments, and controls should be integrated into the SCADA system. During design, final costs for replacements of the Allen-Bradley PLC hardware with the latest Rockwell CompactLogix hardware and Factory-Talk software will be obtained. Computer servers, network devices, and communication systems should all be upgraded. Radio communications equipment should be upgraded with the latest high-speed radios to communicate with remote tanks and reservoirs. The final scope of work for hardware, software, programming, configuration, commissioning and testing will be negotiated with the City's preferred provider for systems integration services to establish the scope of work and budgets for the proposed improvements. The cost proposal from the system integrator will be included in the final bid documents for use by Contractors to prepare their bids. This method assures the City can maintain consistency with the SCADA standards that have been adopted for the City of Canton's SCADA system.

3.2 42” WATER TRANSMISSION MAIN

Two transmission mains leave the Sugar Creek WTP and run parallel to each other approximately 11 miles north. At that point, the flow is split and a single 42” finished water transmission main heads north to connect to the City’s water distribution system. The High Service Pumps supply over 50% of the water to the City and fill the two 6.4 MG Cromer Reservoirs and the two 5 MG ground level concrete reservoir tanks at 53rd Street. The Sugar Creek WTP sits at Elevation 970 and the highpoints in the finished water transmission main approach Elevation 1150. The water surface in Cromer is approximately at Elevation 1235.

3.2.1 42” Water Transmission Main

Treated water from the Sugar Creek WTP is pumped to the Canton distribution system through a 42” concrete transmission main approximately 15 miles long. The design capacity of this pipe is approximately 20 MGD. During the early 1970s problems with the original pipe had been experienced at the Tuscarawas River crossing. During the late 1970s a parallel 42” main was installed from the Sugar Creek WTP to 11 miles north. The parallel main reduced friction head loss such that, when placed in service with the existing 42” line, overall transmission capacity increased from 20 MGD to approximately 25 MGD.

Installation of a parallel 42” main along the balance of the transmission main would increase capacity from approximately 25 MGD to 38 MGD. The length of piping required to complete the parallel 42” main is approximately an additional 45,500’. Due to the cost of the extension of a second parallel transmission main, this project was not considered in this CIP.

3.2.2 Plant Finished Water Metering Chamber

Plant Finished Water Metering Chamber	
Dimensions - Meter Vault:	13’-4” L x 6’-6” x 9’-0” D
Dimensions - Valve Vault:	11’-0” L x 7’-6” x 9’-0” D
Meter Size and Type:	30” Venturi Meter
Isolation Valve:	24” Ball Valve

A meter vault and valve vault containing a 30’” diameter venturi meter and 24” shutoff valve is provided in the lawn area in the front of the Main Plant Building. The vaults are in good condition, but a new meter and valve are recommended. In 2006, an insertion probe was installed to provide a secondary flow reading of the total flow of finished water being pumped because the accuracy of the venturi meter was questionable. At that time, a new differential pressure transmitter was installed. The venturi meter should be removed, and the piping modified to install a new 24” magnetic flow meter. The 24” ball valve that is installed downstream of the venturi meter to prevent backflow from the 42” PCCP finished water transmission main so that the meter can be serviced should be replaced with a new 24” butterfly valve. A new aluminum double-leaf access hatch should be installed to replace the original hatch. A small submersible sump pump should be installed in the pit to minimize submergence of the new magnetic flow meter, and new alarms should be provided to warn of highwater levels.

3.2.3 Surge Tanks

Surge Tanks

South Tank Location:	Station 220+00
Type:	Steel above ground water storage tank
Dimensions:	16’-0” diameter x 31’-6” High Side Wall
Volume, Full:	47,350 gallon
Valve Vault:	2 - 30” Swing-type Check valves
	2 - 30” Butterfly valves
Vault Size:	11’L x 13’W x 7’ H w/ 5’ x 5’ x 15’-6” H Access Chamber
North Tank Location:	Station 327+00
Type:	Steel above ground water storage tank
Dimensions:	16’-0” diameter x 31’-6” High Side Wall
Volume, Full:	47,350 gallon
Valve Vault:	2 - 30” Swing-type Check valves
	2 - 30” Butterfly valves
Vault	11’L x 13’W x 7’ H w/ 5’ x 5’ x 15’-6” H Access Chamber

Air blow-off valves on the transmission mains are located at high points and they were inspected in 2006. Several 42” butterfly valves are located along the length of the mains to isolate portions for repairs in case of pipe breaks. Two 16’ diameter by 31’-6” high steel surge tanks are provided at the highpoints of the single 42” transmission main. Water is stored in the surge tanks and they operate automatically to allow the stored water to be drawn into the transmission main during an emergency power outage to avoid water column separation that might otherwise occur when power is lost and pumping ceases. When pumping ceases, a water hammer pressure wave travels back and forth in the line. Peak pressures can exceed 350 psi, so surge relief valves, air/vacuum relief valves, and air blow-off assemblies are provided at the plant and along the length of the transmission main to minimize the high pressure created by the water hammer.

Two 30-inch lines from each surge tank are connected to the 42” raw water transmission main at high points in the line. A concrete valve vault shown in **Figure 3.28** houses two 30” butterfly used to isolate the tank for inspection. Between the valve and the tank is a 30” diameter swing check valve that is normally closed, but it opens when the line pressure drops in the 42” transmission main. When flow stops, the water at the high point can flow in either direction causing column separation to occur. The vacuum created allows the check valves to open automatically and water from the surge tank to be introduced to the main. When the surge passes and normal conditions are restored, a 4-inch altitude valve is provided that allows the tank to be refilled to a predetermined level so that water is available in the Surge Tank for the next incident.

Figure 3.28 Surge Tank Valve Vault

Water levels in the tank are monitored by the SCADA system, but there are no position switches to detect if a check valve opens nor a pressure transmitter in the valve vault. The check valves appear to leak, and the butterfly valves and operators are 50 years old and should be replaced. A new aluminum double-leaf access hatch should be installed to replace the original hatch. A small submersible sump pump should be installed in the valve vault to minimize submergence of the new magnetic flow meter, and alarms provided to warn of high-water levels.

The surge tanks have not been inspected or upgraded since they have been installed. The tanks should be inspected, and the insides sandblasted and painted. New combination air intake/exhaust vents with OEPA compliant insect screens should installed to replace the existing vents. Screens on the overflow and splash blocks and improvements in site drainage should be provided if needed. A new hydraulic water modelling study should be conducted to confirm settings for all controls needed to operate the high service pumps, air/vacuum reliefs, air blow-off valves, and surge tank water levels to mitigate potential damage due to water hammer and surge conditions.

3.3 Cromer Reservoir

3.3.1 Reservoir

Existing Design Data

Number of tanks:	2 tanks operated in series
Dimensions:	285-'8" x 357'-4" x 21'-9" D
	Columns on 18'-0" center-to-center.
	Side bays slope 4:1 from 10'-9" to 21'-9"
Volume:	2 @ 7.2 MG at Water Depth of 21'-9" (Maximum Volume)
	2@ 6.4 MG at Water Depth of 19'-9" (Operating Volume)
Construction:	Reinforced Concrete
Year Installed:	1935
Condition:	Cracks and spalled concrete on the interior ceiling and columns. Inspection of floor slab and walls is required.
Inlet/ Outlet Pipe:	2 – 36" diameter
Interconnecting gates:	2 – 36" x 36" Sluice Gates (Inoperable)
Overflow:	2 - 20" drains and an Overflow weir at 19'-9"
Discharge:	Nearby stream

The Cromer Reservoir is a critical asset and the largest reservoir in the City. It holds nearly a 1-day supply of water and allows the Sugar Creek High Service Pumps to operate on a fill and drawdown cycle so that pumping can be schedules for off-peak electrical demand periods that result in significant savings to the Department related to operating cost and customer user charges.

The existing Cromer Reservoir shown in **Exhibit 3-11** is approaching 85 years of continual service and is in need of major repairs to the roof. The original roofs and bottom slabs are only 7.5" thick and heavily reinforced. The tanks are partially buried, the earth is mounded on the sides to provide 18" of earth cover over the top of the tanks. Diver inspections found signs of spalled concrete, cracks in the ceiling, and leakage through cracks in the side walls and the roof. Currently, there is not a means of segregating one of the two tanks to take a tank out of service to conduct detailed investigations of the roof and bottom slabs. The two 36" cast iron sluice gates do no operate and need to be replaced. Upgrades to refurbish the building structure are needed to replace the roof, hoist, grating, windows and door, heating and ventilation, and electrical systems.

On March 12, 2019, OEPA issued the City a Notice of Violation for the leaking roof, spalled concrete on the tank interior, roof vents, sediment buildup in the tank, and flashing for the roof vents at Cromer Reservoir. A response with a tentative timeline was submitted on April 5, 2019 by the City. This CIP includes the steps to be taken to correct the violations in a timely manner, and a plan to renovate the reservoir to meet the latest OEPA standards. A copy is included in the **Appendix**.

Repairs to the roof require removal of the 18" earth cover, however, the material will have to be hauled to the front of the property or offsite since the steep side slopes provide little room to store excess excavation. The original design of the top and bottom slabs will not support heavy equipment. Cranes will be limited to working from the four sides of the reservoir, and an extended boom will be needed to reach the midpoints of the tanks.

Several Options were considered to repair and/or replace the roof, including:

- Option 1 includes complete removal of the existing roof, and construction of a new roof.
- Option 2 includes removal of a total of 304 column capitals and top slab, and constructing new beams to support a precast concrete roof planks covered by an insulated single-ply membrane roof.
- Option 3 includes the work to be performed in steps to determine if the damaged concrete and exposed rebar could be patched and repaired, and then a new insulated roof installed after the repairs are made.
- Option 4 was considered as a worst-case scenario, and includes demolishing the existing reservoirs one at time, and installing 2 new 5 MG prestressed concrete covered reservoir tanks on the site.

It was decided to pursue a multi-phase approach to assess the condition of the reservoirs before making a substantial investment in upgrading the tank. In addition to the reservoirs, the valve vault building and the existing 36" butterfly and swing check valves needed to be upgraded. If new reservoirs are selected to be constructed, then a new valve vault and building would also be needed. Complicating the matter, the Cromer Reservoir cannot be completely taken offline, so a plan had to be developed that would allow for inspection, repairing the gates to isolate the 2 basins, inspection, analysis, design, and then construction of the recommended improvements.

3.3.2 Phased Approach for Roof Repairs

A 3-phase approach to assessing the condition of the reservoir was recommended.

In Phase 1, the earth cover should be removed, and the sluice gates replaced so each of the two tanks could be taken out of service. Ground penetrating radar can be used to complete a detailed survey of the structural condition of the roof. When complete, the roof should be pressure washed and a spray-on waterproofing membrane installed to temporarily stop surface waters from leading into the reservoirs. Phase I will address all items mentioned in the OEPA Notice of Violation.

In Phase 2, detailed plans and specifications should be prepared to award a contract to clean the sediment and debris from the tanks. One of the two reservoir basins should be taken of out of service at a time to conduct a detailed investigation of the interior tank walls, ceiling, and concrete floor using ground penetrating radar can be completed to assess the condition of the tanks. Finally, a detailed report and cost estimates would be provided summarizing the finding, conclusions, and recommendations on how to proceed with repairs versus replacement.

In Phase 3, the construction of the recommended plan of improvements for repairs of the existing or demolition and construction of two new reservoirs would be completed. Upgrades to the Valve Vault are required, but they will also have to depend on whether the reservoir can be renovated, or a new vault must be constructed to serve the two new reservoirs.

Once the two basins are repaired, two new 36” influent lines should be installed so each reservoir can be operated independently. The existing 36” piping effluent pipes from the two reservoirs should be modified to provide a dedicated withdrawal line to each reservoir. With the new piping arrangement, the reservoirs can be operated in series or parallel. To minimize short-circuiting present with the current piping arrangement, a new influent and effluent header manifold should be installed in each reservoir to promote mixing and plug flow across the entire width of the tank.

3.3.3 Valve Vault

Existing Design Data

Building Dimensions:	28’-0” L x 16’-10” W x 15’-0” H
Valve Vault Dimensions:	14’ L x 19’ W x 13’ D
Influent/Effluent Pipes:	2 - 36” Diameter Cast Iron Pipes
Valve Vault Valves:	2 - 36” Swing-type Check valves
	2 - 36” Butterfly Valves w/ Motor Operators
Age:	1935/ Refurbished 1980

The existing valve vault houses 2 – 36” butterfly and check valves that handle the influent and effluent to and from each reservoir. The two reservoirs currently operate in series. One 36” supply line feeds the south tank, and water passes through the 2 - 36” x36” sluice gates to the second reservoir. When the tank is full, water from the reservoir is drawn down and flows back into the distribution system through the effluent check valve and butterfly valves. In 1986 the valves were replaced but their mechanical operation is questionable and should be replaced.

The existing masonry brick building needs a new roof. Grating over the valve pit should be replaced. The hoist and monorail beam also need to be replaced. The double doors to access the building should be replaced. The masonry should be cleaned and tuckpointed to repair cracks and repair mortar joints. New unit heaters should be installed, and new LED lighting and controls provided. Piping modifications will be required to accommodate the longer laying length of the new swing check valves and butterfly valves. Work will need to be staged to replace one butterfly and check valve at a time by propping open the check valve and manually operating the valve to fill or draw down the reservoir served by that valve arrangement.

3.4 NORTHEAST WTP (LIMITED EVALUATION)

3.4.1 Filter Room

The Filter Room at the Northeast WTP was re-coated in the last upgrade in 2014. Visual inspection shows no significant paint peeling on the ceiling of the filter room. As a precaution, samples of the paint and underlying coatings should be performed to determine if lead paint was used, and the condition monitored if peeling is noted so precautions and/or remediation can be taken in the future. No project was included in this CIP.

3.4.2 Raw Water Influent Flow Control Valve and Magnetic Flow Meter

Although the 30" magnetic flow meter and 36" motor-operated flow control valve were replaced in 2014, but it is difficult to maintain the desired flow rate with the existing flow control valve. The valves are continuously being throttled to less than 90% closed to maintain the set point flow to the filters. This causes excessive wear on the valve and operator. The valves should be inspected to determine their condition and whether any damage to the body or seats is evident, or a new valve should be installed.

The 30" magnetic flow meter electronics appear to be damaged based on the readings. A factory service technician should inspect the mag meter installation to determine if the mag meter can be repaired on site or will require factory service. If work must be done at the factory, a temporary meter and spool piece will be required while the meter is being serviced. No project was included in this CIP to replace the magnetic flowmeter, and flow control valves.

In 2015, the City installed a VFD to modulate the outflow from Well #17 to reduce the throttling of the 36" flow control valve. During the workshops, it was discussed to install a second VFD for a different Well that would provide both redundancy and reduce the percentage restriction needed to maintain flows.

During the design phase, these items should be re-evaluated after the field investigations are complete and the scope of work defined for potentially a separate project.

3.5 NORTHWEST WTP (LIMITED EVALUATION)

3.5.1 Filter Room

The paint on the ceilings over the four filters was repainted in 2012 but has been peeling. Initial investigations showed that the recent topcoat was lifting the underlying paint due to shrinkage cracking in the new surface coat. Samples were collected and found to contain lead. Due to the potential that paint which flaked off the ceiling would fall into the filters, B&N worked with the City to evaluate alternatives to cover, scrape and recoat, or completely removed the old and new coating. Similar peeling was occurring in the High Service Pumping Room and Filter Pipe Gallery. Additional samples of the areas confirmed the paint contained lead and should be removed.

Quotations were obtained from two certified contractors experienced in lead paint removal using different methods to remove the paint using dry methods for blasting with different types of grit to remove the paint down to the original concrete surface. Due to costs, only the Filter Room was completed at a cost of approximately $80,000 for the platform and the lead paint removal. To protect the filters from contamination, a wooden work platform was constructed and covered to prevent dust and water from entering the filters. In addition, a liner was added in the filter box under the platform to protect the sand filter surface and troughs. A sprayed on penetrant sealer was applied to protect the exposed concrete from moisture and chlorine fumes. When the remediation work was complete, the platform was removed, and the filter was thoroughly backwashed before being put back in service. The paint removal for the High Service Pump Room shown in **Figure 3.29** and Filter Gallery will postponed since they do not pose any immediate threat to water quality, but the flaking paint will be removed as funds are available.

3.5.2 High Service Pump Room and Filter Gallery

<u>High Service Pump Room</u>

The ceiling, walls, and portions of the floor were sampled and found to contain lead in the underlying paint. Scaling along the stairway presents a health hazard and should be covered to protect against traffic brushing up against the loose paint. To remove the peeling paint, tarping of each pump, equipment, and electrical controls will be required to prevent dust from infiltrating motors and controls. It may be necessary to take the plant off-line to expedite the removal process. This scope of work is not included in this CIP budget since it will be addresses with the annual budgeting process. No platforms are needed, but the work is complicated by the amount of conduit and piping on the walls that cannot be removed and will have to be protected. An estimate of approximately $50,000 should be allotted for the remediation work.

Figure 3.29 Northwest WTP High Service Pump Room

<u>Filter Pipe Gallery</u>

The wall along the filters is peeling in a similar manner and all the paint on this wall should be removed since it contains lead. The west wall of the gallery and the ceiling have several localized areas where the paint has peeled. The west wall is exposed to moisture from the backfill, leading to softening the concrete mortar wash that was applied to the interior surface before being painted. Only spot repairs are needed in these areas. Peeling paint should be removed, and a penetrant sealer applied and recoated. This would be an ideal area to test different types of coating to see if it is possible to recoat the exposed concrete in the future without experiencing peeling. Monies should be allocated to remediate this area in the near future but were not included in this CIP.

3.5.3 Miscellaneous

<u>Raw Water Influent Flow Control Valve and Magnetic Flow Meter</u>

Although the 24" magnetic flowmeter and the 30" motor-operated flow control valve were replaced in 2012, they have been problematic and need to be replaced. During the design phase, these items should be re-evaluated, and the scope of work defined for potentially a separate project.

Electrical Power Distribution Equipment

The power distribution equipment at the Northwest WTP was not upgraded in 2012 when the plant was modernized. These controls are over 50 years old and should be replaced. Inspection and testing of the gear should be performed to minimize the risk of failures that would affect the ability of the high service pumping operations. No estimates for replacement were included in this CIP.

Fluoride Tank Vent

The two fluoride tanks are not vented to the outside of the room, allowing corrosive fumes to attack piping and the electrical system. The exhaust vents at the top of both tanks should be rerouted to exhaust through the roof. The City may elect to perform this work in conjunction with the design of the Fluoride Room improvements for the Sugar Creek WTP. No estimates for this work were included in this CIP.