# Woodburn POTW – Process Mechanical Assessment

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## Introduction

The following is a summary of the on-site process/mechanical assessment of the Woodburn Publicly Owned Treatment Works (POTW). The assessment was conducted on March 26, 2008. All major plant components were reviewed, along with five major collection system pump stations. We spoke with Curtis Stultz, Frank Sinclair, Jerry Tabler and Jeff Hansen This memorandum summarizes our observations.

This summary is organized by unit process and conveys a general description of how each system works. The major operational and/or performance issues identified as part of the performance assessment are described. Specific recommendations to be considered as part of Facility Plan alternative development are identified.

## Liquids Processes

### Headworks

The headworks includes two mechanically cleaned 7/16” John Munier continuously self-cleaned screens and two vortex-style grit removal systems. The headworks is not enclosed, and includes no provisions for odor control. A significant amount of grease is received at the facility. A hot water system is available to handle grease, but is not often utilized due to freezing concerns. Corrosion of metal components is a widespread issue. The covers installed over the channels (some type of PVC or plastic) also suffer from corrosion, with significant amounts of the material delaminating.

Provisions for a third screen (to be installed in an existing channel between the current screens) were included in the last design. However, this installation would significantly impede maintenance access to the existing screens (required from the side). The screens perform adequately, but support from John Munier is lacking. Staff does not experience problems with freezing of screen components; however, the spray system is not utilized for that reason. The screens discharge into a screenings conveyor. This system performs adequately, however staff must leave it running continuously during the winter to avoid freezing.

The vortex grit units function well. The facility was designed to accept a 3rd unit as part of the next phase of improvements. The grit pumps are in a generously-sized pit adjacent to the grit chambers. The pit is not covered, and is exposed to the elements. The lack of provisions for lifting equipment in or out of the pit is problematic. The sump pump for the area is installed in a deep pit and the ultrasonic level instrument installed to control the pump does not function properly (interference from the walls causes erroneous readings). As a result, plant staff controls the pump manually, introducing opportunities to flood the grit pump pit and pumps. The grit cyclone functions well, however, wash water is not utilized in the grit washer to avoid issues with freezing. Performance without the wash water appears to be adequate.

The grit and screenings are discharged to dumpsters located at grade. The arrangement and configuration for the dumpsters is not optimal. The trench drain running along the front of this area is of poor construction, and not rated for heavy traffic. It is in severe disrepair and represents a safety hazard.

A dumping location is provided for waste from portable toilets. This location does not include rag removal, rather manual rag removal is provided by the haulers. This waste is eventually routed to the headworks, but via a circuitous gravity route, before it is pumped by the in-plant pump station. The introduction of this waste into the plant drain system creates opportunities for back-venting into occupied spaces.

### Facility Plan Considerations

- Consider screen replacement with different screen type of greater hydraulic capacity, rather than installation of 3rd, similar screen. Ensure adequate access is provided for maintenance of the existing and/or proposed screen(s).
- Consider replacement of channel covers with more substantial materials to address errant odor emissions and prevent further corrosion.
- Define drivers (if any) for future odor control. Consider mechanisms to address this potential future need.
- Document system deficiencies such as trench drain, weather and freeze protection, instrumentation and equipment lifting provisions for further consideration during subsequent design activities.

## Wet Weather Clarification

The original secondary clarifiers were converted to wet weather primary clarifiers. Discharge from the wet weather clarifiers can then commingle with secondary effluent, resulting in a blended effluent. The NPDES permit does not specifically allow this practice; plant staff does not utilize these units to avoid this scenario, as flows have not warranted the need.

### Facility Plan Considerations

- Define potential options for usage of these units in a fashion consistent with operational philosophy and permit limitations, or demolish.

## Primary Clarification

The previous expansion modified the two original 55′ diam. primary clarifiers by raising the walls of the structures (by ~ 5′). New mechanisms with standard rake arms were provided. The new headworks included provisions for flow split to a third primary clarifier. The piping was installed from the splitter box out to the north of the northern primary clarifier. Under peak flow conditions, the weirs are submerged.

A portion of the primary clarifier influent piping (glass-lined ductile iron) was cut in the previous expansion, replaced with PVC and backfilled with concrete. Staff have a concern about potential failure in that location.

### Facility Plan Considerations

- Evaluate hydraulics and flow split associated with additional primary clarifier.
- Document system deficiencies such as PVC effluent piping and weir submergence during peak flows for further consideration during subsequent design activities.

## Aeration Basins

The aeration basins generally perform well from a process perspective. The aeration basins are 3.7 million gallons and were designed with a great amount of flexibility. Each basin includes four selector zones that can be operated as anoxic or aerobic zones. Primary effluent and RAS can be introduced into any of these four zones. These components allow for various process configurations to optimize treatment and manage flows. The NPDES permit around which the system was designed included strict summer ammonia discharge requirements. Plant staff has reliably operated the facility to achieve low ammonia concentrations. During summer conditions when the most stringent limit is in place (Ammonia <= 0.1 mg/l), plant effluent is discharged to the poplar plantation. New, more stringent discharge requirements may impact the capacity of the basins.

During the previous expansion, the aeration basins were deliberately oversized, though the rating was not increased. DEQ may only recognize the stated capacity associated with the existing basins. Return from the facultative sludge lagoons includes a high ammonia concentration (up to 300 mg/L). The facility was not designed to take this ammonia load – the intent was to land apply biosolids at a rate such that the lagoons did not overflow back to the facility. However, the dredge which was planned to be installed as part of the last expansion is just now being installed. It will be important to define the impact of that recycle stream on the secondary process, once operations are established with the new drege on-line.

Staff can waste from either the aeration basins (MLSS) or the secondary clarifiers (RAS), but typically waste from the aeration basins (MLSS).

A scum removal feature was included in the aeration basin effluent channels, but is not functional.

The aeration basins were designed to accommodate expansion to the north and plumbed to accommodate a fourth secondary clarifier.

System deficiencies include the instrumentation and control system associated with DO and blower control. Staff has also experienced significant problems with the ABS mixers and is in the process of replacing them with Flygt mixers as the units fail.

Electrical installation at the aeration basins is especially problematic. Conduit is located within the walkways, significantly impacting access for operations and maintenance activities.

### Facility Plan Considerations

- Define actual capacity of existing basins associated with new discharge requirements.
- Evaluate options for expanding the aerations basins to provide additional capacity.
- Consider alternative process configurations/operations for wet weather and dry weather. Consider opportunities to optimize secondary treatment to address water quality requirements and/or provide energy savings.
- Document system deficiencies such as electrical installation, scum removal and instrumentation and control issues for further consideration during subsequent design activities.

## Blower Building

A new blower building was constructed as part of the previous expansion. The system includes two 1,050 scfm blowers and two 2,100 scfm blowers. The blower building was designed to accommodate four 2,100 scfm blowers. A single monorail is provided, and is adequate for motor removal, but does not access the blowers themselves.

Plant staff have experienced significant problems with operation of the blowers installed as part of the Phase I expansion. The Hoffman blowers are single stage, centrifugal blowers, and the original control loop intended to match blower operation with DO demand was problematic. Until recently, plant staff often operated the basins at DO levels upwards of 6 or 7 as a result. Recent mechanical and control improvements have been implemented; however, various issues with individual components (DO probes, air flow meters, actuated valves) have prevented a complex fix to the control loop.

Cooling within the Blower building as a whole is inadequate and conditions in the summer are poor. The cooling system within the Blower Building electrical room (heat pump style) works well and should be used as a model for other electrical rooms.

The blower building also houses a compressed air system comprised of two compressors, an air dryer and a receiver. This system provides plant air for pneumatic systems in the facility, but does not serve the admin building, digester facility or chem. storage building. Staff has addressed compressed air demand within these facilities in a temporary fashion. The exhaust of one compressor discharges directly onto the motor of the other, causing issues with overheating. The compressors are sized to be redundant; however, the exhaust/heating issues impact the true redundancy of this critical system.

### Facility Plan Considerations

- Define required blower capacity associated with aeration improvements. Identify impacts of future increased blower demand on system layout/configuration.
- Document system deficiencies such as instrumentation and control loop issues, building ventilation and compressed air system issues for further consideration during subsequent design activities.

## Secondary Clarification

Three new 75′ diameter secondary clarifiers were installed as part of the last expansion. They include inboard weirs and launders and hydraulic sludge removal (Tow-bro). Three submersible RAS pumps are located in a RAS pit adjacent to each clarifier. The SCADA system does not allow for independent operation of the pumps unless in local/hand mode. In general, the clarifiers and RAS pumping systems have performed well.

Secondary scum is collected at the clarifiers in addition to the scum removal system at the aeration basins. The scum collected at the clarifiers is too light to pump. Plant staff adds water to move the material.

The weirs are equipped with a brush cleaning system that is a maintenance issue.

Problems with the electrical installation also exist at the secondary clarifiers. The VFDs associated with the RAS pumps are installed outside under an overhang. The enclosures are not designed for exterior installation. Staff has retrofit the enclosures to provide additional protection. The flow meters on the RAS lines have experienced issues with leaking conduit due to the installation configuration. Sludge blanket detectors were installed and do not work.

Insufficient pressure exists in the 3-water system for wash-down purposes. Access to the basin isolation valves is below the access platform and is inadequate.

### Facility Plan Considerations

- Evaluate hydraulics and flow split associated with additional secondary clarifier.
- Document system deficiencies such as electrical installation and operational and maintenance issues for further consideration during subsequent design activities.

## Filtration

Two traveling bridge filters were installed as part of the last expansion. The filters are continuous backwash dual media filters, with 8″ of anthracite over 8″ of sand. The backwash system appears to be inadequately sized and staff frequently experience loss of the anthracite layer. Filtration system performance has been poor and unreliable.

### Facility Plan Considerations

- Define filtration system requirements for increased flow.
- Consider complete filtration system replacement with alternative filtration mechanisms.

## UV Disinfection/Effluent Flow monitoring

Two medium pressure Trojan UV systems were installed as part of the last expansion. The existing UV system is rated for 12 mgd, but two spare banks (eight lamps total) are available to accommodate expansion. All plant flow travels through the UV systems and is then discharged to either the discharge outfalls or to irrigation storage volume. The flow routed to the discharge outfalls is measured via a parshall flume.

The UV system is covered, but not enclosed. The cover provides minimal protection for staff working on the system in inclement weather. The UV ballast and electrical systems were enclosed in a building as a change order during construction. No provisions for building ventilation were provided; staff subsequently installed an air conditioning unit in the building performs adequately most of the time, however high heat is still an issue.

The flow signal that feeds into the UV system control system is from the parshall flume. This presents a problem when flow is being diverted for irrigation as the UV system output is based on the flow discharged from the facility, rather than the total flow through the UV system.

Plant staff has had significant issues with UV system programming and have modified it to increase lamp life. The UVT analyzer box is outdated and could be relocated inside the UV electrical building. The system programming also at times has completely shut down the system upon multiple lamp failure and a communications failure. This is a problem with system reliability of such a critical system.

Hydraulics in this area result in stagnant flow in the UV influent channel. Staff has added air for mixing. This air is provided by the temporary air system(s) fashioned by plant staff to serve this end of the facility, rather than a permanent system.

### Facility Plan Considerations

- Define UV system requirements for increased flow.
- Improve system operation to account for flow split between discharge and reuse
- Consider improvements to hydraulics and access and protection for operations and maintenance activities.
- Document system deficiencies such as instrumentation and control issues for further consideration during subsequent design activities.

## Effluent Discharge

Two discharge outfalls route flow from the plant to the Pudding River. The primary outfall is 24″ and the secondary outfall (original to the lagoon system) is 12″. Each outfall includes a single port diffuser. The primary outfall includes a reaeration structure that has not performed at the flow rates for which it was designed (14 mgd). The additional head loss imparted by the reaeration structure drives flow to the secondary outfall at lower flows than intended.

The previous design envisioned replacement of the 12″ secondary outfall with a new 24″ outfall. Regulatory drivers exist for additional consideration of outfall and diffuser configuration and location. These considerations and the impact of the recent Mixing Zone IMD (from Oregon DEQ) are discussed in the Regulatory TM.

### Facility Plan Considerations

- Define regulatory and hydraulic drivers for new outfall and diffuser
- Address hydraulic limitations of existing reaeration structure.

# Solids Processes

## Septage Receiving

Septage is received at the facility via a receiving unit and is then discharged to the sludge blend tank for introduction into the digesters. A fair volume of septage is received at the site. The original vault, receiving area and septage pump was original to the plant. An additional storage tank, along with new pumps and a Lakeside septage receiving unit was installed as part of the last expansion. The system works well, but is maintenance intensive.

### Facility Plan Considerations

- Define anticipated required capacity based on current and proposed operation.
- Document system deficiencies for further consideration during subsequent design activities.

## Primary Sludge Pumping

Primary sludge is typically thickened in the clarifiers to 3-4% solids. It is discharged to the Sludge Blend tank, where it is mixed with TWAS and septage.

The original primary sludge pumps (air diaphragm operated) and piping are located in what is now utilized as the DAFT building. This system was not modified as part of the last expansion and continues to be utilized. It appears that the building ventilation system was retrofit as part of the last expansion to provide 6 air changes/hour to be consistent with NFPA 820 code.

There is one dedicated pump per clarifier and one dedicated for primary scum. The pumps are intertied to provide redundancy. The pumps perform well. No provisions were made in the previous expansion to accommodate primary sludge pumping associated with a third primary clarifier. The pumps are located in a lower level of the DAF building; there are no provisions for lifting/pump removal.

### Facility Plan Considerations

- Confirm 6 air changes/hour are provided in DAF building.
- Consider options for inclusion of additional primary sludge pump in DAF building.
- Document system deficiencies such as equipment lifting provisions for further consideration during subsequent design activities.

## WAS Thickening

Two Dissolved Air Flotation Thickening (DAFT) units were installed as part of the last expansion. The DAF units accept WAS and secondary scum and perform well. Staff do not use polymer to enhance thickening. The two DAFT units operate in series and were not designed to run in parallel and as a result, are approaching their design flow capacity.

The mechanical pumping systems are housed in a building original to the POTW which also contain the primary sludge pumps. The systems are laid out well, but there is little access for maintenance, and no provisions for lifting. The floor drains in the facility are ill-placed and undersized for the current use with increased seal water flow.

The electrical room within the facility had corrosion issues with the water-cooled cooling system. Staff has replaced it with a heat pump style system which is working well.

### Facility Plan Considerations

- Define required DAFT thickening capacity associated with system improvements. Investigate capacity associated with parallel operation.
- Document system deficiencies such as equipment lifting provisions for further consideration during subsequent design activities.

## Sludge Blend Tank

The sludge blend tank mixes thickened primary sludge, TWAS and septage prior to introduction to the digesters. The tank was equipped with an ABS submersible mixer. Staff is in the process of replacing the mixer with a similar Flygt mixer.

The tank was originally uncoated, but was retrofit with a spray-applied liner that appears to be performing well.

A small carbon canister odor control system was originally installed. It is ineffective, and as a result, staff has not replaced the carbon, effectively abandoning the system.

### Facility Plan Considerations

- Consider odor control as part of an ultimate plant-wide system.

## Anaerobic Digestion

The plant includes two 50′ diameter digesters which both operate as active, primary digesters. The vessels are operated in parallel, and fed on a continuous basis from the sludge blend tank. The process is quite stable, and plant staff has not experienced foaming issues. The east digester has a fixed cover and the west digester has a floating cover. The floating cover is not sealed, and it is believed gas capture is not as complete as it could be as a result. Both covers were insulated with spray-applied foam that appears to be bubbling and delaminating. The digester building roof has poor drainage.

The tanks operate at a constant level in a ‘fill-and-spill’ mode. Digested sludge that leaves the tanks is routed to a standpipe that serves as a wetwell for the Facultative Sludge Lagoon feed pumps. Overflows from the standpipe are routed to the adjacent drying beds.

All mechanical components were replaced with the last expansion and the building was expanded. Each digester is served by one recirculation pump and heat exchanger (these are not intertied for redundancy). One tank drain pump is provided for both digesters. The suction for this pump is off the cone of the vessels. This pump can also transfer contents from one tank to the other. Two FSL feed pumps can draw from the standpipe (normal mode of operation) or from the digesters themselves.

Two boilers are provided to heat the digesters. One can run off either Digester Gas (DG) or Natural Gas (NG). The other is only plumbed up to operate on NG. The boilers do not provide building heat.

Two gas compressors (one dedicated per digester) feed the digester gas mixing systems. Staff believes that while the gas mixing system is complex, it performs well, although they've not taken a vessel offline since the last expansion. As a result the ability of the mixing system to suspend grit and move it through the system is not well understood. There is no redundancy in this system as the gas compressors are not interconnected. Drains for the compressors are routed outside the building to avoid a direct connection to the digester gas space. This drain system is undersized.

The new mechanical components (installed with the last expansion) perform well and are fairly well laid out. However, there is little provision for lifting of equipment or equipment removal. There is one hatch from below grade portion that is approximately 4' x 4'. It is difficult, if not impossible for staff to move equipment from its location to the hatch location. The tank drain pump is located in a sump, with no provisions for lifting.

The facility appears to take into consideration NFPA 820 code and has separated the gas handling equipment from the other system components. Portions of the boiler room and electrical room, as well as the below-grade pump area are common wall with the digester. Depending on interpretation, work in this area could trip a code requirement. It is prudent to keep this in mind and discuss with the code official early in the design process.

A temporary air system(s) fashioned by plant staff provides air for the facility, rather than a permanent system. This air supply feeds the pneumatically actuated valves on the boiler as well as the potable water and chem. storage building.

The sump in the original portion of the building discharges to the new sump. The pumps in the new sump do not appear to have adequate head to discharge into the pressurized drain system.

The electrical room in the digestion complex serves the digester building as well as the chem. storage building. The water-cooled cooling system in this room does not perform well and should be replaced with a heat pump style system.

### Facility Plan Considerations

- Define required digestion capacity associated with system improvements. Investigate total system capacity, including storage in FSLs.
- Assess mixing system performance when vessels are taken offline.

- Document system deficiencies such as equipment lifting provisions for further consideration during subsequent design activities.

## Facultative Sludge Lagoons

The FSLs and associated mechanical systems work well. Installation of the dredge to allow for solids removal is in progress. The following issues with the FSLs exist:

1. Return from the FSLs introduces a large ammonia load to the facility. Options for sidestream treatment may provide a benefit to the secondary process.
2. Struvite tends to form in the gravity return line (which discharges to the aeration basins).
3. The scum breaks do not perform well.

### Facility Plan Considerations

- Define required capacity and long term use of FSLs
- Investigate impact of ammonia return on secondary process. Assess proposed operation with new dredge and consider a sidestream treatment mechanism if warranted.
- Document system deficiencies such as struvite generation and scum break performance for further consideration during subsequent design activities.

# Ancillary and Support Systems

## Irrigation Storage and Supply/Plant 3-Water System

The original Chlorine Contact Basins were retrofit to function as irrigation storage as well as a wetwell for the irrigation pumps. The north basin is tied to the effluent hydraulic grade line (HGL). Small pumps transfer flow from the north basin to the south basin, where it is chlorinated. The south basin is tied to the smaller pond within the old storage lagoon to the east of the mechanical facility, providing ample volume for irrigation storage. While the basins were structurally retrofit to accommodate a differential level between the two basins, the foot valves in the basins leak from one basin to the other under such conditions (the basins sit on granular backfill). This creates a problem when trying to dewater a basin. Further, it can allow highly chlorinated irrigation water to seep into the south basin, which is tied directly to the effluent. The permit does not allow for a residual chlorine concentration; therefore this presents a potential problem with permit compliance. This effectively eliminates the ability to operate the basins with a differential level, restricting the level and associated volume in the basin. This results in constraints on the irrigation supply system, that contribute to pump and control issues.

The irrigation pumps and motors perform well, though staff has experienced control problems with the system. One pump is VFD driven and the other two are constant speed. The berms in the storage pond were never raised to allow for full depth of the south basin to be utilized. This exacerbates control issues with the irrigation pumps.

The irrigation pumps were originally utilized to supply the plant 3-water system. However, the system (strainers, piping and hydropneumatic tank) does not have adequate freeze protection. Further, feeding chlorinated water into the 3-water system resulted in a chlorine residual in the effluent – this is not allowed in the discharge permit. As a result, plant staff abandoned use of the irrigation pumps to supply the 3-water system and installed two constant speed pumps to perform that function. These pumps draw from the non-chlorinated portion of the converted CCB basin. Plant staff has not experienced regrowth issues within their distribution system. The pumps are undersized – both run to meet the demand – essentially providing no redundancy within the supply system. The hydropneumatic tank provides minimal storage.

The plant fire hydrants are tied to the problematic irrigation pumping system described above. When the irrigation pumping system is offline in the winter due to inadequate freeze protection, there is no immediate fire protection available at the facility.

The 3-water distribution system is especially problematic. It is not well laid out for distribution; there are few isolation valves within the system; it is undersized to provide adequate pressure at the north end of the facility. A high pressure booster pumping and limited distribution system was installed for washdown purposes, but has similar problems relating to small distribution lines and hydrants.

The 3-water system as a whole is unreliable. Seal water is provided via this system – when it goes down, valuable system components have a potential for failure. This recently occurred with one of the digester mixing gas compressors. As a result, the west digester is not currently being mixed.

### Facility Plan Considerations

- Define mechanism to address lack of fire suppression in the winter – this is a significant safety issue.
- Consider plant-wide non-potable water demand; identify impacts of increased demand on existing undersized system.
- Consider complete overhaul of 3-water system.
- Document system deficiencies such as system reliability, freeze protection and instrumentation and control issues for further consideration during subsequent design activities.

## Chemical Storage

Hypochlorite storage is provided in a building original to the facility that originally served as a garage. Three hypo tanks providing a total of 2,300 gallons are housed in the northern half of the garage. The room was retrofit with a containment curb and fire suppression sprinklers (supplied by the potable water system in the neighboring room). The room appears to have no ventilation – staff keeps the garage door open in the summer. An emergency shower was also installed, but appears not to be tied into any control system to alert staff to its use. A drain immediately outside the entrance to the room is not tied into the plant drain system, but rather the stormwater system – if continued use of the facility is recommended, this should be remedied.

The chlorine demand associated with the reuse system is quite high – carrying residuals as high as 50 – 60 ppm to meet Total Coliform requirements. In the summer, when reuse demand is the highest, the tanks are filled weekly.

Several dosing pumps and distribution piping are provided to allow for chlorination of 4-5 various points in the process stream (RAS, Headworks, etc.). Plant staff has not experienced problems with filamentous growth that would drive the need for this system. As a result, they don't use it.

The room also houses a polyblend unit and polymer pumps. Polymer was intended to be utilized for the drying beds, but since those are not in service is this system is currently unused.

### Facility Plan Considerations

- Define safety and code issues associated with continued utilization of existing building for hypochlorite storage. Consider a new facility designed specifically for chemical storage.
- Consider options for polymer usage within the DAFT components.
- Consider future hypochlorite demand; identify impacts of increased demand on existing undersized system.

## Potable Water

Potable water is provided via a 2½" line from a well at the McLaren facility. The POTW is not currently charged for potable water usage. A storage tank and hydropneumatic tank are located in the southern half of a building original to the facility that originally served as a garage (the northern half is utilized for chem. storage). Local plant air is utilized to pressurize the tanks.

Water for potable uses (1-water) is fed to the administration building, maintenance building and a sink in the digester building. Water for non-potable uses (2-water) is boosted by two pumps located in the same space as the tanks. This water goes through a double backflow preventer and then feeds the plant. This also feeds the fire sprinklers in the adjacent chem. storage room.

Local plant air is utilized to pressurize the tanks.

### Facility Plan Considerations

- Consider future potable water demand and likely source for increased supply; identify impacts of increased demand on existing system and supply line.

## Main Electrical Feed and Backup Power

The plant has a single electrical feed from PGE with a backup generator. The main electrical feed equipment is housed in a building in the southeast corner of the facility. The plant has a 75 kVA transformer. The system works well. The plant has certified electricians on staff that can work on all system components in the facility.

The emergency generator is located in a building original to the facility. The generator is not sized for the full load. During an outage, plant staff can operate the headworks, primary clarification system, UV system and critical lighting and ventilation. Staff has some ability to selectively swap out loads during an outage.

Ventilation in the generator building is well thought out, though there are some control issues associated with the louver actuators. The diesel fill port is on the building exterior and is higher than the tank, creating the potential to overfill the tank and spill diesel fuel within the facility.

### Facility Plan Considerations

- Confirm PGE feed and plant electrical distribution system is adequate to handle projected electrical demand.
- The existing backup generator system performs well. Consider supplementing capacity with a separate system rather than retrofitting and/or revising the existing system.
- Document system deficiencies such as fueling and ventilation control issues for further consideration during subsequent design activities.

## Plant Access/Site

The width of the entrance, and curbs associated with the plant entrance do not accommodate chip trucks (for poplar harvest).

The roadway surface within the poplars are not designed to accommodate the heavy chip trucks that access the area during poplar harvest. This past year, the City spent a large sum of money on several occasions to supplement the roads with additional gravel to support the truck traffic.

### Facility Plan Considerations

- Document system deficiencies such as inadequate roadway configuration and durability for further consideration during subsequent design activities.

## Laboratory/Administration

The existing admin building was constructed with the last expansion. The building is very functional, with defined spaces for differing uses. The building includes no space to expand to accommodate additional staff.

The laboratory is quite large and very functional from a space and layout perspective. However, heating, ventilation and cooling of the space is especially problematic. The lab does process and compliance testing. A small, separate operator's lab is also included in the admin building.

### Facility Plan Considerations

- Identify staffing and space utilization impacts associated with proposed improvements.
- Document system deficiencies such and inadequate HVAC systems, for further consideration during subsequent design activities.

# Plant-wide issues

The following represent issues observed plant-wide, associated with equipment or material selection or installation practices from the previous expansion.

- Plant has standardized on Allen Bradley PLCs and utilizes Wonderware for SCADA. Plant staff utilize an outside firm (TSI) for SCADA programming and are happy with his work. Upgrades will need to consider the system as a whole.
- Both EIM and AUMA actuators have performed poorly. The AUMA actuators specified were low quality and discontinued shortly after purchase. Plant staff have had limited experience and success with Rotork.
- Heat tracing systems are not adequate (primarily an issue on sludge and water lines).
- Electrical installation was not well thought out or executed. The original electrical contractor filed for bankruptcy during the construction project and a second contractor was hired to complete the installation. Full time inspection was not provided during the project, and the electrical contractor had little oversight. Conduit significantly impacts access in many locations, reducing width of walkways and presenting trip hazards. Many connections were poorly oriented, allowing for water to enter conduit.
- Tile roofs on original buildings are deteriorating and are an ongoing maintenance issue.

# Major Pump Stations

## Mill Creek Pump Station

The Mill Creek Pump Station was originally constructed in 1979 and pumps all but a very small portion of Woodburn's flow to the plant. It's a caisson-style station, with an internal wall that separates the wet pit from the dry pit. The station was constructed with three shaft-driven pumps, which have been replaced over time with dry-pit immersible pumps (The last original pump is in the process of being replaced). A trailer-mounted engine-driven pump was installed in 2001 and provides additional back-up capacity for peak flows. Twice in the past six years, staff recalls that they have had to run all three internal pumps. The pumps are sized to handle peak flows, and typically cycle frequently during low flow periods. The discharge piping includes a actuated throttling valve that allows a portion of the flow to be pumped back into the wetwell so that the pump can operate on its curve. The wetwell is undersized, and the main trunk lines feeding the station typically serve as additional storage.

Dual force mains from the pump station to the plant (18″ and 24″) provide some measure of redundancy. The 24″ force main was installed in 2000.

Pump removal is problematic – there is a monorail directly above the pump hatches, but no clear mechanism to remove the pumps from the building. Level instrumentation in the wetwell works well. The plant has no odor control, but experiences few complaints. The lower level(s) of the station are accessed via a spiral staircase. The spiral staircase represents a major access concern – both for routine personnel access as well as for life-safety in the event of an injury or catastrophic failure.

Two influent sluice gates are located in the wetwell and are actuated annually to allow for wetwell cleaning. This is a labor intensive, messy job. Given the critical nature of the station, it must be performed in the middle of the night during low flows. The station receives a heavy grease load and tends to accumulate grease balls. Staff enters the wetwell and must construct long flexible tubing to allow for vactor truck clean-out. A fixed pipe would greatly facility this effort.

There is a significant pigging vault in the yard just north of the station. Both force mains were installed without an isolation valve just downstream of the pigging station.

An emergency generator is housed on the main floor of the station, along with the electrical equipment. The generator is only sized to run two pumps and is quite old. This may not meet DEQ reliability requirements for pump stations. The PLC is outdated.

There is limited room to build additional capacity on the site. It is located immediately west of Front Street and the railroad. The City recently purchased property on the east side of Front Street and the railroad and installed a bore under both to allow for future expansion if required.

There is a permitted emergency overflow at the Mill Creek station. The mechanism for monitoring flow is problematic and unreliable.

### Facility Plan Considerations

- Define projected flows; identify impacts of increased flow on station capacity and force mains
- Define mechanisms to efficiently pump the full range of flows.
- Define improvements that address meeting required system reliability.
- As the pump station is evaluated for expansion and redundancy, evaluate dual wetwells and pumping systems that would allow for system shutdown and maintenance during seasonal low flow periods.
- Address deficiencies related to monitoring of permitted emergency overflows.
- Document system deficiencies such as equipment lifting and removal, maintenance access and instrumentation and control issues for further consideration during subsequent design activities.

## Rainier Pump Station

The station was originally designed as an air lift pump station and retrofit with submersible pumps. The floor of the wetwell was not designed as such. Discharge valves are located in an adjacent valve vault; there is no above grade structure.

The station simply lifts flow and discharges into a gravity line that feeds Mill Creek Pump Station. This gravity line is undersized and the area annually experiences backups. This gravity line is interconnected with the pump suction to allow for some relief when the downstream line is overloaded. In this instance, flow recirculates through the pump station, and flow is effectively stored in the upstream gravity piping until capacity frees up in the downstream line.

The pump station is located in a residential area within street right-of-way adjacent to a golf course. It includes no odor control, and receives some complaints.

The station has no hookup for a portable generator. When power fails, the upstream line fills up until it gets high enough to overflow through the bypass line.

### Facility Plan Considerations

- Define projected flows; identify impacts of increased flow on station capacity once downstream restriction is remedied.
- Document system deficiencies such as provisions for backup power and odor control for further consideration during subsequent design activities.

## Stevens Pump Station

This station is located west of I-5 and is one of the City's more dependable stations. The station was originally designed as a submersible station and the pumps were upgraded in 1993. The pump discharge valves are located inside the wetwell.

The station force main is approximately 500′ and discharges into a gravity line that feeds the I-5 Pump Station.

The pump station is located in a residential area off the street right-of-way on the edge of the Senecal Creek corridor. It includes no odor control, and receives no complaints. The station is enclosed with chain link fence with privacy slats. The access to the station is via a fairly lengthy gravel roadway which is sometimes problematic in wet weather.

The station has no hookup for a portable generator. If power fails, the system would overflow at an upstream manhole.

### Facility Plan Considerations

- Define projected flows; identify impacts of increased flow on station capacity.
- Document system deficiencies such as provisions for backup power and access for operations and maintenance activities for further consideration during subsequent design activities.

## I-5 (Wal-Mart) Pump Station

This station is located just east of I-5 south of Wal-Mart and is the second largest station after Mill Creek. It is submersible station with only one above grade structure – an air injection system building. It includes a below grade electrical vault, and pigging vault.

The station is enclosed with temporary construction fencing that was never replaced. Staff has not experienced problems with vandals, but the site is not secure. Vaults are locked with padlocks. The station includes no odor control, and receives no complaints – but there are no nearby receivers to complain. Site improvements including fencing and paving are warranted.

The sump pump in the electrical vault discharges into the wetwell. If the wetwell level is too high, the sump pumps cannot overcome the static head and the electrical vault floods.

The station includes an emergency bypass, but the associated isolation valves are frozen, so it effectively doesn't work. The pigging vault is not utilized by staff.

The station receives a heavy grease load and tends to accumulate grease balls. The station requires cleaning every six months. Staff enters the wetwell and must construct long flexible tubing to allow for vactor truck clean-out. A fixed pipe would greatly facility this effort.

### Facility Plan Considerations

- Define projected flows; identify impacts of increased flow on station capacity.
- Document system deficiencies such as site security and access and provisions for more efficient maintenance for further consideration during subsequent design activities.

## Santiam Pump Station

This station was originally constructed in 1968 as a temporary construction pump station and was never decommissioned. It was originally a large manhole and was retrofit with two small submersible pumps. The discharge piping and valves are in the wetwell, directly above the pumps. Pump removal requires complete demolition of the discharge piping and valves.

The station is located in a residential neighborhood between the sidewalk and the street. The electrical panel is located across the street and is a constant maintenance issue.

The plant could be eliminated if an easement can be purchased to allow for gravity flow from the subbasin to the I-5 pump station.

### Facility Plan Considerations

- Identify system options for elimination of station.

# Woodburn WWTP and Mill Creek PS Site Visit

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PROJECT NUMBER: 367677.FP.03

The following is a summary of the on-site visual structural assessment of the Woodburn Wastewater Treatment Plant (WWTP) and Mill Creek PS. The assessment was conducted on March 26, 2008. During the time of the walk through, the existing water holding basins were in operation. Because the basins were in operation, the interior inspection was limited to the upper portions of the tanks above the water line. Additionally, many of the tanks are fully or partially buried. Again, only the exposed exterior portions of the tanks were inspected at the time of the walk through.

In general, the hydraulic tanks and building structures are in good condition. Many of the older tanks do have minor cracks and some signs of efflorescence (a white powdery substance leaching out of the crack) and some minor rust staining. Any more significant cracking is noted in the write-up for each tank. Additionally, no active leakage was noted in the exposed portions of the hydraulic tanks.

In general, the *Oregon Structural Specialty Code* allows alteration and repair of buildings without an upgrade to the current Code, provided that the work proposed does not increase the lateral load by more than 5 percent, nor reduce the lateral resistance of the building by more than 5 percent. Replacing a tile roof with fiberglass composition shingles, for example, would be allowed without triggering an upgrade, since the alteration would *reduce* the roof weight rather than increasing it. There may be other non-structural restrictions (e.g., access and egress, energy conservation, etc.) on alterations which are outside the scope of this memo.

Following the Northridge earthquake, it became apparent that even though buildings might survive an event with minimal structural damage, the building might be a total economic loss due to non-structural damage. Typical examples are overturned tall shelves, bookcases, or electrical equipment; suspended ceilings and light fixtures not adequately braced; and broken piping and conduits due to excessive deformation. For this reason, and because these items are more readily observed on a cursory walk-through than are such things as masonry reinforcing, this memo will document bracing or lack of it for non-structural items.

## Headworks

One safety concern is the handrail system on the stair. The current handrail system has the posts directly embedded into the top of the concrete stair treads. There are many locations where cracking of the concrete has occurred at the embedded post connection and has caused spalling around the handrail post. As a general recommendation, the handrail and embedded post should be removed. The embed location should be filled back with a non-shrink repair mortar to avoid water collection and frost damage. A top mounted galvanized steel or aluminum handrail system is recommended as a replacement for the current system. The grated cover is mostly in good condition; however, towards the northwest corner, there are sections of fiberglass sheet bonded to the top of fiberglass grating that have become delaminated and are warped upward, and could be a tripping hazard. It is recommended that the warped section of grating be replaced.

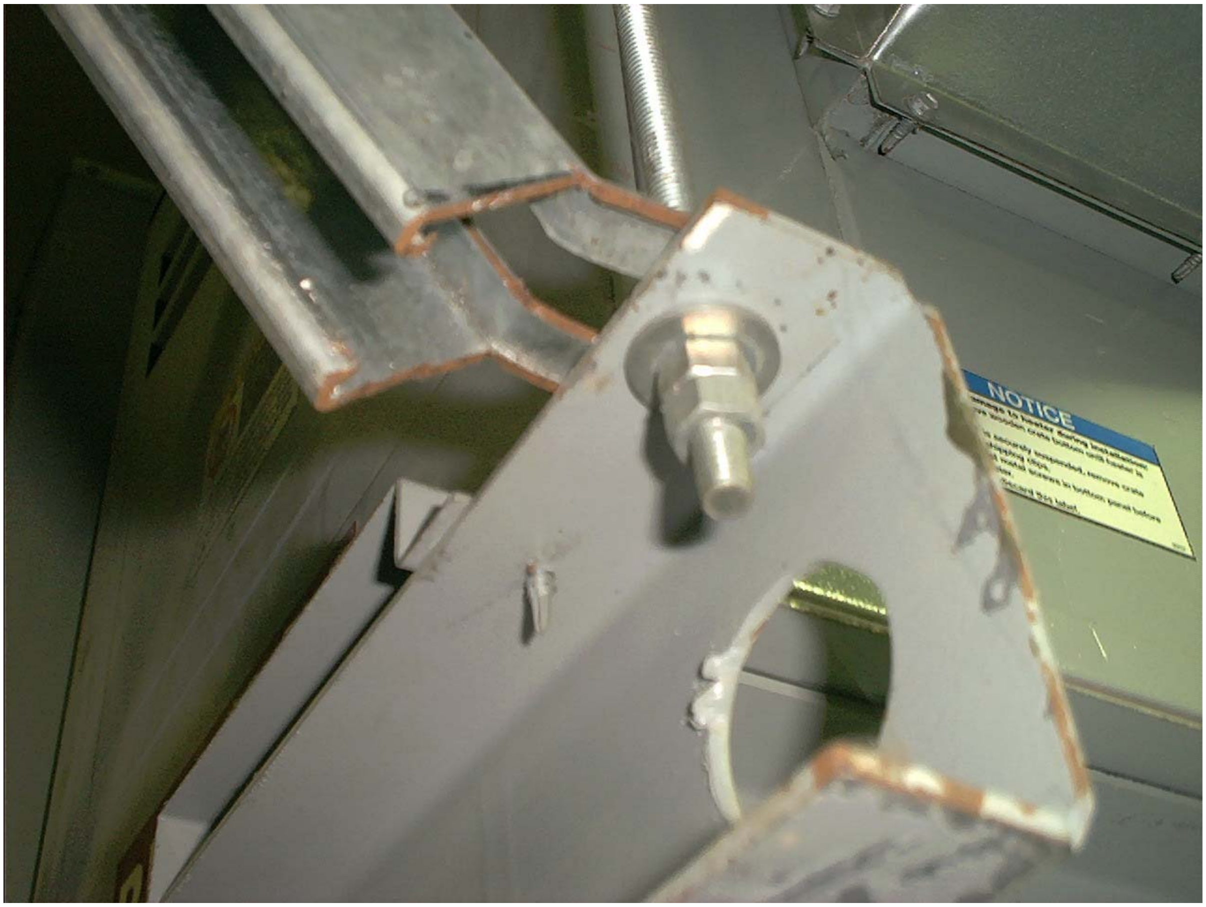
## Filter Channels

These are long, rectangular reinforced concrete channels constructed as part of the 2001 expansion. The most serious structural deficiency observed was a series of vertical cracks, most of which coincide with the location of anchor bolts for the rails attached to the tops of the longitudinal walls. There were also some locations where the concrete has spalled at these anchor bolts.

## DAFT and Building

This facility was remodeled in 2001. The building is a one-story masonry building with CMU walls and brick veneer, a gypboard ceiling, and composition shingle roof. Due to the gypboard ceiling, no details of the roof framing could be observed. The drawings for the remodeling appear to indicate that the roof framing is wood trusses. Piping and conduits in the main room appear to be well braced, except that as shown in one photo, the bracing was connected through a longitudinally slotted hole rather than through the hinged connection piece normally used. It appears that only the friction created by tension in the bolt is available to resist lateral load. No bracing of tall electrical equipment in the separate room was observed.

Site Visit 3 26 08 011.jpg




## Secondary Clarifiers

These are circular reinforced concrete tanks constructed as part of the 2001 expansion. They appear to be in good structural condition.

## UV Disinfection

Rectangular concrete channels, constructed in 2001, appear to be in good condition. There is an unguarded opening at a slide gate which is 16" wide with the gate closed, a violation of OSHA requirements. UV equipment is covered by a low-rise rigid frame pre-engineered steel building, with the ends and roof X-braced by cables – typical of this type of manufacturer. Column bases do not have complete grout pads, may be resting on some type of rubber or fabric bearing pad. The adjacent electrical building is constructed of split-face CMU and appears to be in good condition. Most equipment inside it is anchored to the walls.

## No. 3 Water Pump Station

A 20″ pipe is supported on concrete saddles and strapped down. Irrigation pump pads show some loss of grout at corners, although base plates still have full bearing. These should be drypacked with nonshrink grout when the weather permits.

## Main Switchgear Building

The framing of the building is covered inside and out by sheet metal panels, thus the framing system could not be observed. Only light sheet metal gauge clips were observed anchoring tall electrical equipment to the walls. Conduits were braced to the walls. Outside, as was typical throughout the plant, there was no indication of any anchorage of transformers to their foundation slabs. Most are of about a 1:1 height to width ratio, although there is an unused HV switch cabinet with greater than a 2:1 ratio at this location.

## Blower Building

The Blower Building was constructed in 2001 under the 1997 Uniform Building Code. It is 36′-4″ by 79′-4″ by 19′-4″ to the higher joist bearing elevation, with a smaller electrical room inside. The construction is CMU walls with brick veneer and corrugated steel roof decking on open-web steel joists. Unfortunately, there is not enough reinforcing in the CMU to qualify as fully reinforced masonry. A 1000 kg rated monorail is supported from the roof joists. In the electrical room, there is no indication that the MCC cabinets are anchored to the walls, and there is a free-standing switchgear cabinet which shows no visible anchorage to the floor. In the blower room, the inlet manifold is braced in both horizontal locations; the discharge manifold is braced transversely and anchored longitudinally by the end wall; and the large HVAC duct is braced transversely. All transverse bracing is connected to the bottom chords of the roof joists.

## Chemical Storage (former Garage)

This building was originally constructed in 1979, and remodeled at least once since then. It has two-wythe brick walls to approximately 7′ above the floor, then a cripple wall of wood framing with interior gypboard above. The roof consists of tile on plywood sheathing on wood roof trusses supported on glulam beams and columns. The beams parallel to the east and west walls are connected to the columns with four bolts and an assumed knife plate let into the beam. The beams parallel to the end walls are connected to the other beams with sheet metal saddle hangers. The lateral force resistance must rely upon transfer of force from the columns into the brick walls.

One long side is taken up entirely with the original overhead garage doors. The northern half of the building is currently used to store polymer and three large tanks of sodium hypochlorite. The tanks have a height to diameter ratio approaching 2:1 and show no sign of being anchored. The south half of the building is currently used for two large saddle-mounted water storage tanks. A gas-fired water heater is strapped to the south wall. A ceiling-hung gas-fired unit heater is well braced in the eats-west direction, but the only restraint in the north-south direction which was observed is the gas piping itself.

## Digesters and Control Building

Two circular reinforced concrete anaerobic digesters, one with a fixed roof and one with a floating roof, and the control building between were constructed as part of the original plant in 1979. The control building has been remodeled and expanded at least once since. It is constructed of reinforced concrete with beam and slab system for the basement and ground floor. Above grade walls are CMU with brick veneer. Several openings have been cut for access, and existing openings filled in. In particular, a partition wall above the ground floor located under a roof beam was completely removed, and a large opening was made in the north exterior wall, in order to install a second boiler. Piping in the basement appears to be well braced. In the electrical room, the MCC’s are braced to the walls, but the light fixtures do not appear to be braced.

## Blend Tank

This circular reinforced concrete tank was constructed in 2001. A horizontal crack was observed extending over most of the circumference at approximately 5-1/2 to 6 feet above ground. The record drawings indicate that this is near the top of a large fillet inside the tank, thus the crack may be caused by an abrupt change in cross section. No leakage was observed from the crack.

## Emergency Generator Building (former Chlorine Storage)

This was probably constructed as part of the original plant in 1979. It is a one-story building with CMU walls and brick veneer, gypboard ceiling, and tile roof. Due to the gypboard ceiling, no details of the roof framing could be observed. There is a double door in the south wall, large louvers in the other two transverse walls, and louvers in the south end of both side walls, reducing the length of shear wall available. The muffler of the engine-generator is well braced to the side walls.

## Administration Building

The Administration Building was constructed as part of the original plant in 1979, and has been expanded since. It is a one-story building at grade, with CMU walls and brick veneer. There are extensive strips of window at the top of the masonry and below the roof level, suggesting the presence of a different lateral force resisting system, but due to finish material inside, none could be observed.

## Mill Creek Pump Station

This is a one-story masonry building with a hip roof covered with tiles, constructed in 1975 according to the city staff. The walls are CMU with a brick veneer. There is a 3 ton monorail suspended from the roof structure. Due to the gypboard ceiling, no details of the roof framing could be observed. The muffler of the engine-generator is well braced to the walls. There is a unit heater which is attached directly to the ceiling by a substantial mounting. There was no bracing of the MCC panels or large HVAC ductwork which could be observed. Opposite sides of the building have large louver openings, as well as a double door on one side, reducing the length of shear wall available.

## I-5 Pump Station (along the east frontage road of I-5, south of Wal-Mart)

This consists of a circular wet well with two submersible pumps, and rectangular dry vaults for electrical equipment, pig launching, and check valves. There is a piece of wall-mounted electrical equipment which is well attached to the wall of the dry vault. There was no bracing of the floor-mounted cabinets observed.

### Rainier Pump Station (opposite 1878 Rainier Road) (circa 1966)

### Stevens Pump Station (near the intersection of Stevens and Willow, west of I-5)

### Santiam Pump Station (near 2105 Columbia) (circa 1964?)

These are circular concrete wet pits below grade, each with two submersible pumps, and above-grade electrical and control equipment at the first two sites. No structural deficiencies were observed.

| Process Location | Brief Description | Hazard | Ventilation | Extent of Classified Area | NEC Classification | Special Requirements | Observations | Suggested Corrections | Condition | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Code Compliance | Cost Impact | Electrical (5 - Good, 1 - Poor) | Cost Impact |
| Mill Creek Pump Station | Below grade pumping station with generator and main site distribution on the upper level | Combined Sewer: Possible ignition of flammable gases and floating flammable liquids. | No ventilation or ventilated at less than 12 air changes per hour | Entire room or space | Class I Division 1, Group D | NA | Most of the electrical equipment installation and wiring outside the Influent Pump Station Building at the wet well does not meet the NEC. | The existing conduit & fittings fall into Class I Division I zone. Replace conduits/fittings with RGS conduits and locate the seal fittings out in unclassified area. | NO | Moderate | 1 | Low |
| | | | | | | | The standby diesel generator is rated for 570/713 KVA, the engine is capable of driving the generator of the original rated capacity, however the generator has been modified and is now rated for a maximum of 400 AMPS only. | Since the generator is old consideration should be for replacement of the diesel generator set. | YES | High | 5 | High |
| Rainier Pump Station | Below grade pumping station with generator and main site distribution on the upper level | Residential Sewer: Buildup of vapors from flammable or combustible liquids | No ventilation or ventilated at less than 12 air changes per hour | Entire room or space | Class I Division 2, Group D | NA | The Control Panel is located outside the Class I Division 2 area, however the conduit seals are broken/damaged. | Examine the conduit fittings that are not sealed properly and reseal those that are found deficient. | NO | Low | 4 | Low |
| Stevens Pump Station | Below grade pumping station with generator and main site distribution on the upper level | Residential Sewer: Buildup of vapors from flammable or combustible liquids | No ventilation or ventilated at less than 12 air changes per hour | Entire room or space | Class I Division 2, Group D | NA | The Control Panel and the conduit stubbing out of the well are located in Class 1 Division II area. | Relocate Control Panel and conduits stubbing out of the well to minimum three feet from the edge of the sewer well access hatch/vent. | NO | Moderate | 3 | Moderate |
| I-5 Pump Station | Below grade pumping station with generator and main site distribution on the upper level | Combined Sewer: Possible ignition of flammable gases and floating flammable liquids. | No ventilation or ventilated at less than 12 air changes per hour | Unclassified | Weatherproof installation | NA | MCC is located below grade. | None | YES | - | 5 | NA |
| | Below grade pumping station with generator and main site distribution on the upper level | Combined Sewer: Possible ignition of flammable gases and floating flammable liquids. | No ventilation or ventilated at less than 12 air changes per hour | Entire space or room | Class I Division 1 | NA | The limit switches and conduit fittings are not classified for the area. | Verify that all devices, conduit and conduit fittings in the Wet well are in conformance of the hazardous classification. Replace existing conduit and fittings with PVC coated Rigid Steel Galvanized conduit & fittings. Verify that all conduit and fittings outside the well area are minimum three (3) feet from the access hatch and are provided with classified fittings 18" above the top surface of the wet well. | NO | Low | 3 | Low |
| Santiam Pump Station | Below grade pumping station with generator and main site distribution on the upper level | Buildup of vapors from flammable or combustible liquids | No ventilation or ventilated at less than 12 air changes per hour | Entire room or space | Class I Division 2, Group D | NA | Most of the electrical equipment installation and wiring in the Influent Pump Station area is not rated for a classified environment. | Verify that all devices, conduit and conduit fittings in the wet well are in conformance of the hazardous classification. Replace existing conduit and fittings with PVC coated Rigid Steel Galvanized conduit & fittings. | NO | Moderate | 3 | Moderate |
| Headworks | Open channel structure. | Possible ignition of flammable gases and floating flammable liquids | Not enclosed, outdoors | Within a 10 foot envelope around equipment and open channel | Class I Division 2, Group D | N/A | Some Conduits and conductors installed for a typical outdoor installation but not rated for the hazardous environment of the headworks facility. | Replace conduits with RGS conduits and sealing fittings | NO | Moderate | 3 | Moderate |
| | | | | | | | The terminals and the starters/equipment in the Motor Control Center is deteriorating due to corrosion. Most of the corrosion is reported on the unfinished surfaces within MCC. Thru the wall A/C unit was reported to fail every other year and is replaced frequently on account of corrosion. | Further study is required to determine the cause of corrosion. Evaluation for the MCC hazardous classification is required. MCC will have to be replaced; depending on the outcome of the study, the MCC may have to be classified and rated for corrosive environment. All conduit entries must verified and sealed properly. Alternatively the MCC should be relocated out of this environment. | Additional study is required. | Moderate to High | 3 | High |
| | | | | | | | Some enclosures on equipment and control panels, located in the hazardous envelope are not rated for the classified environment. | Replace enclosures with rated enclosures or move them out of the hazardous environment. | NO | Moderate | 3 | Moderate |

| Process Location | Brief Description | Hazard | Ventilation | Extent of Classified Area | NEC Classification | Special Requirements | Observations | Suggested Corrections | Condition | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Code Compliance | Cost Impact | Electrical (5 - Good, 1 - Poor) | Cost Impact |
| Primary Clarifier #1 | Open clarifier with single pole mounted light near clarifier center. | Possible ignition of flammable gases and floating flammable liquids | Not enclosed, outdoors | Interior of the tank from the minimum operating water surface to the top of the tank wall; envelope 18 inches above the top of the tank and extending beyond the exterior wall; envelope 18 inches above grade extending 10 feet horizontally from the exterior tank walls. | Class I Division 2 Group D | N/A | Conduits installed under bridge and at clarifier platform not rated for hazardous or highly corrosive environments | Install sealing fittings for the hazardous environment and install PVC coated conduits and fittings for the corrosive environment. | NO | Low | 3 | Moderate |
| | | | | | | | Motor for clarifier drive is located within the hazardous environment and does not appear to be rated for it | Replace motor with one rated for the environment. | NO | Moderate | 3 | Moderate |
| Primary Clarifier #2 | Open clarifier with single pole mounted light near clarifier center. | Possible ignition of flammable gases and floating flammable liquids | Not enclosed, outdoors | Interior of the tank from the minimum operating water surface to the top of the tank wall; envelope 18 inches above the top of the tank and extending beyond the exterior wall; envelope 18 inches above grade extending 10 feet horizontally from the exterior tank walls. | Class I Division 2 Group D | N/A | Conduits installed under bridge and at clarifier platform not rated for hazardous or highly corrosive environments | Install sealing fittings for the hazardous environment and install PVC coated conduits and fittings for the corrosive environment. | NO | Low | 3 | Moderate |
| Aeration Basins #1 and 2 | Open Structure | None since preceded by Primary Clarifiers | Open, not enclosed | NA | NA | Corrosion resistant construction | Some of the conduit fittings show signs of corrosion. | Since the aeration basins have an extremely corrosive environment it may be necessary to replace these conduits fittings if the corrosion gets much worse. Cleaning of conduit fittings and using cold galvanizing spray may help reduce corrosion. | YES | Low | 4 | Minimal |
| Secondary Clarifiers #1 and #2 | Open clarifier with single pole mounted light near clarifier center. | None since preceded by Primary Clarifiers | Open, not enclosed | NA | NA | Corrosion resistant construction | Conduits and equipment are showing some signs of corrosion but nothing too significant. | Observe, clean and repaint/repair as required to control corrosion | YES | Low | 4 | Minimal |
| Blower Bldg | Building housing the blowers for the aeration basins. Also contains the pumps for the Primary Sludge system | Buildup of methane gas or flammable vapors associated with the primary sludge pumps | Ventilated at less than 6 air changes per hour | NA | NA | | - | - | YES | - | 4 | - |
| Secondary Clarifier #3 | Open clarifiers | NA | NA | NA | NA | None | Electrical equipment appeared to be in good shape, no corrosion, no apparent code issues. | - | YES | - | 5 | Minimal |
| Chemical Building | Above grade storage and dosing of chlorine | Highly corrosive environment | Natural for storage area | Entire building | Damp, corrosive | NA | Odor and corrosion is observed in part of the building. Some conduit support on the unit strut shows sign of corrosion. Other than that electrical installation meets the environmental requirement. | Replace existing fittings with stainless steel fittings. | YES | - | 4 | Minimal |
| UV | Above Grade Structure. | Unclassified | Unclassified | Unclassified | Unclassified | NA | The existing conduit and wiring were reported to be installed in the manner to hinder easy access from area to the other. The fittings were reported to be lea leaking allowing water to flow in the electrical junction boxes. | Re-install conduits to provide easy access. replace existing fittings with new ones and where permissible the conduits entry to be from the bottom of the box. | YES | - | 3 | Minimal |
| | | | | | | | Loose wiring at the slide gate. | Provide Junction box and terminate wiring in the Junction box. | NO | Minimal | 3 | Minimal |

| Process Location | Brief Description | Hazard | Ventilation | Extent of Classified Area | NEC Classification | Special Requirements | Observations | Suggested Corrections | Condition | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Code Compliance | Cost Impact | Electrical (5 - Good, 1 - Poor) | Cost Impact |
| UV Electrical Room | Above Grade Structure. | Unclassified | Required | Unclassified | Unclassified | NA | The existing electrical is totally enclosed causing the heat to accumulate and overheat the room. | Provide exhaust fan along with ventilation louvers to allow air circulation. | YES | - | 4 | Minimal |
| Digester Building | Fixed and floating lid digester tanks | Leakage and ignition of sludge gas. | Continuously ventilated at six air changes per hour or in accordance with Chapter 9. | Physically separated from gas-handling equipment | Unclassified | NA | Electrical equipment was in good shape with no observed issues or code deficiencies. | - | YES | Minimal | | |
| Digesters | Processing and handling of sludge gas | Leaking and ignition of sludge gas | No ventilation or ventilated at less than 12 air changes per hour | Entire bldg | Class I Division 1 | Combustible gas detector | Electrical equipment was in good shape with no observed issues or code deficiencies. | Ventilation may be considered to reduce gas accumulation. | YES | Minimal | | |
| Irrigation System | Comprising of number of pumps. | NA | NA | NA | NA | NA | One of the 10 HP pump operating on the AFD is reported to be running hot and getting damaged frequently. All measures for AFD had been taken by the plant maintenance but the problem still exist. The motor is rated for inverter duty and has been replaced number of time previously. | Further study is required to look into this issue. The issue could be with the pump & motor compatibility. Also need to verify if the motor is running above the minimum allowable speed. | YES | - | 1 | - |
| Admin Bldg | Administrative & Laboratory Facility | NA | NA | NA | NA | NA | Electrical equipment was in good shape with no observed issues or code deficiencies. | - | YES | - | 5 | - |
| Generator Building | The 480V standby power from the generator is stepped up to 12.47 KV and is connected to 12,47 KV system bus. | Unclassified | NA | NA | NA | NA | Generator appeared to be in good shape. Motorized air intake louvers were reported non-operational. | Evaluate plant generator requirements and add another generator if appropriate. The operation of motorized louvers need to be fixed ASAP. The operation of motorized dampers is vital to the operation of generator The restricted air flow can cause generator heating and possible damage. | YES | - | 1 | Minimal |
| Electrical System | Utility Power is distributed at site at 12.47 KV by number of distribution transformers located at various places on the site. | NA | NA | NA | NA | NA | The maximum demand of 801 KVA on the Electrical system occurred in May 2006. | The Electrical system has sufficient capacity and extra load can be added if required. | YES | - | 5 | Minimal |