Glenbard Wastewater Authority WWTP

BACKGROUND

The Glenbard Wastewater Authority (GWA) provides wastewater treatment for the communities of Glen Ellyn, Lombard, and adjacent unincorporated areas. The GWA was created in 1977 and the regional wastewater treatment plant (WWTP) became operational in 1982.

A number of projects in the past 20 years have replaced or modified portions of the WWTP facilities. The WWTP is rated for an annual average flow of 16.02 million gallons per day (mgd) and a maximum daily flow of 47 mgd.

Treatment consists of deep mechanical fine screening, pumping, vortex grit removal, primary sedimentation, two-stage high purity oxygen activated sludge treatment (HPOAS), intermediate clarification, final clarification, sand filters, and ultraviolet disinfection. The treated effluent is discharged to the East Branch of the DuPage River. Primary and waste activated sludge (WAS) is cothickened in a gravity thickener and then pumped to the anaerobic digesters before dewatering and land application.

GWA owns and operates the North Regional Interceptor (NRI) and the South Regional Interceptor (SRI). These interceptors convey wastewater by gravity from the Villages of Glen Ellyn and Lombard to GWA's main treatment facility. GWA also owns and maintains five collection system pumping stations – the St. Charles Road, Hill Avenue, Sunny Side, Valley View, and SRI Pump Stations. In addition, GWA operates and maintains a Combined Sewage Treatment Facility (CSTF), located on Hill Avenue, just west of Interstate 355 that receives peak wet weather flows from a portion of the Village of Lombard. The primary treatment plant at the CSTF consists of screening, grit removal, primary clarification, and disinfection. The peak design flow to the primary treatment plant is 58 mgd. Flows in excess of 58 mgd are diverted to two excess flow lagoons via overflow structures at the north end of the lagoons with a total volume of approximately 8.5 million gallons. Excess wastewater stored in the lagoons is drained back to the intercepting sewers after storm events subside and conveyed to the main wastewater treatment facility for full treatment.

Strand Associates, Inc. completed several recent projects for GWA including a facilities plan in 2013. The comprehensive facilities plan evaluated the ability of GWA's collection system, WWTP, and CSTF to serve the GWA sewer service area for a period of 20 years. The facilities plan also discussed regulatory initiatives including new phosphorus limits, reviewed impacts of potential future limits on the GWA WWTP, and evaluated WWTP alternatives to meet future limits.

LIQUID TREATMENT

Bar Screening

The two original mechanical screens were replaced in 2006 with two, 30-foot-deep, 3/16-inch multi-rake style screens each rated for the maximum daily flow of 47 mgd. Because there are peak flow events, the multi-rake style screen was selected because of its ability to enter into a high water-level mode using the variable frequency drive (VFD) motor to accelerate the cleaning of the static bar rack.

Raw Sewage Handling

The treatment plant uses three large (350 hp) dry pit centrifugal pumps to begin moving the wastewater through the treatment processes via a force main to the grit removal system. These pumps were installed in 1977 and were rehabilitated in 2001. The pumps are operated with VFDs that allow the pumps to run at different speeds depending on the flow of wastewater entering the plant. Typically, the lowest flows occur in very early morning hours with peak flows observed in the afternoon or during a rain storm. The pumps are capable of pumping up to 47 mgd of wastewater through the treatment facility. A project currently in design will expand the existing wet well to add two smaller pre-rotation type influent pumps to operate more efficiently at dry weather flows and for improved wet well cleaning and install two new large pumps to replace the existing influent pumps.

Grit System

In 2004, two vortextype grit systems were cost-effectively retrofit into the existing aerated grit tanks, minimizing any excavation costs while reusing existing tankage. Two grit washing units were added as well. These improvements have increased grit removal efficiencies over the wide flow ranges experienced at the facility and produce a dewatered byproduct that is low in organic and fecal material to ease handling and disposal.

Primary Clarifiers

GWA has two 110-foot-diameter circular primary clarifiers. Primary sludge is directed to the gravity thickener to cothicken with WAS. The 2006 primary systems project replaced the primary sludge pumps and installed a primary scum concentrator.

Two-Stage HPOAS

The existing two-stage HPOAS system has been in operation since the early 1980s. The two-stage HPOAS includes firststage high purity oxygen (HPO) carbonaceous aeration basins (Carbo), intermediate clarification, carbonaceous return activated sludge (CRAS) pumping station and the intermediate pumping station

HPO basin deck

which is utilized to pump intermediate clarifier effluent into the second stage. The second stage of the two-stage process includes nitrogenous aeration tanks (Nitro), the intermediate pumping station which is also utilized to handle nitrogenous return activated sludge (NRAS) and final clarification. Historically, the WWTP has operated in a two-stage mode with all flows less than 16.02 mgd conveyed to the Carbo stage and remaining flows in excess of 16.02 mgd conveyed to the Nitro stage. The two Carbo stage aeration basins with a total volume of about 600,000 gallons provide biochemical oxygen demand (BOD) removal and flow to two 85-foot-diameter intermediate circular clarifiers. Settled sludge from the intermediate clarifiers is returned to the head of the Carbo aeration trains. At the intermediate pump station, the intermediate clarifier effluent and Nitro return activated sludge (NRAS) are blended and then three seven-foot-diameter screw pumps lift the wastewater to the head of the eight Nitro aeration trains. The eight Nitro aeration trains have a total volume of approximately 2,500,000 gallons to provide nitrification. Following the Nitro trains are four 135-foot-diameter final clarifiers. Oxygen is provided by a cryogenic oxygen plant that produces pure oxygen by separating it from other gases present in air. The HPOAS includes a 32-ton/day cryogenic oxygen generation system, a single 700hp compressor, and ten aeration trains with four stages in each train. Each stage has a mixer with surface and subsurface mixing blades that are utilized to transfer 96 percent pure oxygen to the microbes for respiration. The aeration deck has a total of 40 mixers equating to 600hp.

The 2013 facilities plan evaluated several activated sludge alternatives including maintaining the existing two-stage HPOAS and the alternative of converting to single-stage air activated sludge. The HPOAS was recommended to be maintained because of the higher oxygen transfer rates of HPOAS providing a smaller footprint, site constraints, and significantly lower capital costs compared to converting to conventional air activated sludge.

Tertiary Filters and Ultraviolet Light Disinfection

The wastewater currently flows through ten sand filters to remove any remaining solids that pass through the final clarifiers. A project is under design to replace the ten sand filters with six disc filter units to be retrofitted into the existing sand filter cells. The disc filters are recommended because of reduced space requirements, reduction and ease of maintenance, and improved performance. In addition, the disc filter units will significantly reduce backwash recycle flows compared to the current sand filter backwash return of more than 10 mgd to the head of the plant during increased hydraulic flow conditions.

The final stage of treatment uses ultraviolet light to disinfect the wastewater before it is discharged into the East Branch of the DuPage River.

BIOSOLIDS TREATMENT

Biosolids management at the WWTP includes gravity thickening, anaerobic digestion, and belt filter press (BFP) dewatering.

Sludge Thickener

Primary sludge and WAS generated from the Carbo and Nitro stages is piped to the gravity thickener to co-thicken. The GWA staff installed a solids density meter to improve the quality of the thickened sludge that is being pumped to the digesters. The intent is to pump 3.5 percent solids consistently to the digesters to reduce the heating demand resulting from excessive amounts of water being pumped to the digesters. Under current conditions 3.5 percent is the highest percent solids content GWA can pump because of constraints on the suction side of the progressive cavity pumps.

Anaerobic Digesters

Primary sludge and WAS stabilization are provided by anaerobic digestion with two primary digesters (80-foot-diameter and 60-foot-diameter) and one secondary digester (60-foot-diameter). All the digesters have floating covers, but only the secondary digester was designed for gas storage. The methane gas is captured and used as fuel for the two combination heat exchanger-boiler units to heat the digesters. Any excess methane gas is sent to a waste gas flare. GWA is in the process of a design-build cogeneration project that will include biogas conditioning equipment and generators for electrical generation and heat recovery. The heat recovery will be used for process and building heating.

The anaerobic digester and biosolids handling improvements project completed in 2010 included substantial modifications to the existing solids handling building and anaerobic digester complex. The design project included the addition of one new 80-foot-diameter primary anaerobic digester tank and floating cover; addition of a new digester building; renovation of the existing digester facility pump room; completion of the combination boiler/heat exchanger system and piping; replacement of the existing 60-foot-diameter primary digester floating cover; addition of pumped mixing systems and structural tank modifications to the existing 60-foot-diameter digester tanks; sludge dewatering building renovation, including completion of the gravity belt thickener (GBT) system and installation of new polymer feed system; modifications to the existing BFPs; completion of plant non-potable water pumps and distribution system associated with the GBT and BFPs; and miscellaneous controls and supervisory control and data acquisition (SCADA) modifications.

Biosolids Dewatering and Storage

The biosolids are dewatered using two 2.2-meter BFPs. Dewatered cake is stored onsite on sludge storage pads until weather and crop conditions allow for Class B agricultural land application.

CWA schematic


Clarifier

The 2013 facilities plan evaluated several activated sludge alternatives including maintaining the existing two-stage HPOAS and the alternative of converting to single-stage air activated sludge.

WATERSHED WORKGROUP

The GWA is a member of the DuPage River Salt Creek Workgroup (DRSCW). The 2004 total maximum daily load (TMDLs) for the East Branch of the DuPage River resulted in the formation of the watershed-based group DRSCW that is working toward dissolved oxygen (DO), total dissolved solids (TDS)/chloride, and other water quality improvements in the Salt Creek and East and West Branch DuPage River watersheds. The Illinois Environmental Protection Agency (IEPA) has agreed to postpone more stringent BOD and ammonia limits at WWTPs as long as the group continues to make good progress toward water quality goals. Recently, the IEPA has also agreed to delay new phosphorus limits for members of the DRSCW that participate in the special assessments. The 2008 feasibility study by DRSCW recommended the removal of the Churchill Woods Dam, located upstream of GWA WWTP, and this project was completed in 2011.

GWA PERSONNEL

The GWA is staffed with seventeen full-time employees between the hours of 6:00 a.m. and 5:00 p.m. Monday through Friday. GWA also employs five part-time operators to cover weekends and holidays. Below is a list of the GWA employees.

- Erik Lanphier, Executive Director
- Gayle Lendabarker, Administrative Assistant
- Laurie Frieders, Environmental Resources Coordinator
- Dave Goodalis, Senior Operator
- Dave Peters, Lab Technician
- Chris Dillmann, Class I Operator
- Jason Neighbors, Class I Operator

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- Joe Kovac, Class IV Operator
- Andy Pakosta, Class IV Operator
- Raymond Booth, Part Time Laborer
- Rick Freeman, Senior Electronics Technician-Electrician
- Phil Dziewior, Instrumentation Technician
- Joe Solita, Electrician
- Jay Dahlberg, Senior Maintenance Mechanic
- John Braga, Maintenance Mechanic I
- Henry Altott, Maintenance Mechanic II
- Austin Cecelia, Maintenance Mechanic II

PERFORMANCE

The GWA has received the following awards:

- 2010–George W. Burke Safety Award
- 2011–NACWA Gold Peak Performance Award
- 2012–NACWA Gold Peak Performance Award
- 2013–Conservation Foundation Clean Water Award
- 2013–NACWA Silver Peak Performance Award
- 2014–NACWA Gold Peak Performance Award
- 2015–Illinois Section CSWEA Treatment Facility Operations Award

The GWA is proud to say it has been excursion-free for 908 days as of the end of July 2015. The longest excursion-free operating period for the GWA stands at 1,058 days, during the period of September 8, 2007, to April 10, 2010.

The GWA would also like the readers to recognize that the current days without any lost worktime injuries are at 831 days as of the end of July 2015. The longest consecutive period of days without a lost worktime injury currently stands at 1,680 days, during the period of March 5, 2002, to October 10, 2006. CS

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