

### III. Existing Wastewater Facilities

Prior to any process upgrade or expansion of any wastewater facility the processes and equipment within the current facility should be addressed and assessed to determine the overall magnitude and impact the proposed changes will have on the rest of the system.

Construction began on the Lynn Township Wastewater facility in 1979 and operation was fully commenced in 1980. The facility and several old pieces of equipment are still functioning well even though parts are hard to obtain. The plant's primary limitations at the moment are its hydraulic and organic capacity and outdated level of technology currently employed in the facility.

#### A. Lynn Township Wastewater System – Lehigh County

##### 1) Location, Size and Ownership

The Lynn Township Sewer Authority owns and operates a municipal wastewater collection system and treatment facility with a permitted flow of 80,000 gallons per day (gpd) and organic loading of 162 pounds per day of BOD<sub>5</sub>. The system includes a collection system with no force mains or pump stations and a cast-in-place concrete treatment plant. The facility is currently built on the floodplain of the Ontelaunee Creek, which it uses as its outfall stream. The outfall discharges into Ontelaunee Creek downstream of its confluence with School Creek. At this point it is classified as an exceptional value cold-water fishery. The current NPDES discharge limits for this facility are as follows (Permit No. Is PA0070254):

**Table III-1 Lynn Township  
Existing WWTP Effluent Limitations**

<b>Parameter of Interest</b>	<b>Average Monthly</b>	<b>Average Weekly</b>
C-BOD5 (5/1-10/30)*	15 mg/l	40 mg/l
C-BOD5 (11/1-4/30)*	25 mg/l	40 mg/l
Total Suspended Solids	30 mg/l	45 mg/l
Total Chlorine Residual	0.3 mg/l	-
Fecal Coliform (5/1-9/30)*	200/100 ml mpn	-
Fecal Coliform (10/1-4/30)*	2000/100 ml mpn	-
PH	-	6.0 - 9.0

#### **Effluent Limitations**

\*For C-BOD5: Summer limits apply May 1 through October 30, while winter limits are in place for the rest of the year. For Fecal Coliform: Summer limits apply May 1 through Sept 30. Winter limits are in place the rest of the year. Instantaneous Maximum: No more than 10% of the samples can exceed the max. in any given month.

A large portion of Lynn Township is considered to be rural, with a population of approximately 4,500 people. Its major population center is located in the Village of New Tripoli. The existing facilities currently service the Village of New Tripoli and the Northwestern High School and Middle School. The rest of the township, which is outside of the service area, is served by on-lot systems.

The current Wastewater Treatment Plant in Lynn Township was originally owned and financed by the Lynn Township Sewer Authority, but under a leaseback agreement the facility was operated and administered by the Lynn Township Board of Supervisors. The Board of Supervisors purchased the existing bonds and assumed ownership of the facility in June 1992. The Supervisors retained ownership until March 1995 when they again turned the sewer system and its operation back over to the Lynn Township Sewer Authority who has assumed the full financial obligations and operation since.

## 2) Narrative and Schematic Diagram

The Township's Wastewater Treatment Plant was constructed between 1979 and 1980 using common wall construction. Currently, the administration building houses the generator, the Chlorine contact tank and electrical room, the aeration blowers and the office/lab. This building space is sandwiched between the two aeration tanks and digesters. Common wall construction saved cost, but all rooms in the plant are very cramped.

The overall condition of the concrete constructing the Wastewater Treatment Plant and the concrete visible above the water lines appear to be in sound condition, such that it could continue to be used for the life of the proposed expansion.

*Head Works:* Within the head works, the influent flow metering channel, comminutor and wetwell all share a common structure. This structure is periodically flooded when high peak flows occur within the facility. The original v-notch weir was replaced last year with a rectangular weir because it was unable to measure flows greater than 200,000 gpd, which the facility receives during storm flows.

*Preliminary Treatment:* The first step in the preliminary treatment at this Wastewater Treatment Plant is a comminutor, which is currently set in the shallow rectangular head works. The comminutor is a conventional shredder that grinds large objectionable material, most of which is buoyant, into smaller objectionable material that floats on the surface of the downstream treatment tanks.

Flow from the influent pumps is piped into the facility's two aeration tanks. A simple tee splits the flow between the two tanks. The split is never even due to subtle differences in the hydraulics that depend on the flow rate, and this causes the two aeration tanks to operate differently because they do not receive the same feed.

*Secondary Treatment:* The original wastewater treatment plant was equipped with two parallel, conventional activated sludge-type aeration tanks that had small settling compartments at their effluent ends. These aeration tanks are each 34 feet long and 15 feet wide and able to hold a total volume of 10,800 ft<sup>3</sup>. These settling compartments had no method in place for mechanically removing the activated sludge contained within them. This created a problem when flows exceeded 60,000 gpd because the tanks were not large enough to hold that volume. To remediate this problem, the Sewage Authority built a 20-foot diameter circular clarifier that had mechanical sludge collection and surface skimming in 2001. The two remaining secondary clarifiers were converted into sludge holding tanks able to hold a combined volume of 24,000 gallons. The original holding tank continues to be used for its designed purpose, with a capacity to hold 10,700 gallons.

The operator reported that the gravity flow piping in the plant, downstream of the aeration tanks was only 6 inches, which is inadequate to the point that the clarifier is flooded out during peak flows and mixed liquor recycles through the scum trough back to the influent pump station. The gravity mains throughout the expanded plant will need to cover the current volumes and account for the anticipated future volumes.

*Disinfection:* Currently, disinfection in this plant is through the process of chlorination. The chlorine contact tank is located inside of the building. This is a health hazard for operators. Additionally, this poses a problem because a majority of the facilities electrical switchgear is located in the same room as the chlorine contact tank and chlorine is notorious for damage to metal.

*Sludge Treatment:* Approximately half of the sludge is applied to the 4 on-site reed-type sludge drying beds, while the other half is hauled to another facility. In 2005, 98,300 gallons of aerobically digested sludge was applied to the reed drying beds, 107,100 gallons of liquid sludge was hauled to the Lehigh County Pretreatment Plant and 116,000 gallons of liquid sludge was hauled to the Pottstown Wastewater Treatment Facility for additional treatment and disposal. In 1998 new reeds were replanted by Sigmatron Biological Systems to replace the existing reeds. These reeds were cleaned in 2003.

*Sludge:* The sludge holding tank and aeration zones are aerated by positive displacement blowers piped to coarse bubble air diffusers.

*Operations Buildings:* The administration building is sandwiched between the two existing aeration tanks. The existing building contains the aeration blowers, the Chlorine room, office, a small laboratory and the restroom.

The outfall runs approximately forty-five (45) feet to the discharge in Ontelaunee Creek.

### 3) Detailed Review of Treatment Processes and Description of Problems

The Municipal Wasteload Management Chapter 94 Annual Report for the Lynn Township Sewer Authority for the calendar year 2005 is included in this Act 537 Plan as an Appendix. It addresses the general condition of the treatment facility, its problems, and recommended actions to eliminate deficiencies. Chief among those actions is developing this Act 537 Plan and implementing its recommendations. Major concerns are:

- The facility is currently experiencing a hydraulic overload
- The plant experienced organic overloading
- It is hydraulically overloaded regularly during major storm events
  - a. *Structural Adequacy:* The concrete facilities are currently over 25 years old and appear to be structurally sound based on a visual inspection. Therefore, the existing tanks can be converted for use in whatever upgrade process is chosen. The effective reuse of the concrete tanks is an important goal of this study, but it is secondary to selecting a treatment process configuration that is optimal for Lynn Township.
  - b. *Preliminary Treatment:* The existing comminutor does not effectively remove objectionable material from the wastewater, and so it does not provide effective treatment. Plant staff has to regularly remove these particles from the pumps and other locations where they often become lodged.

- c. *Flow Distribution:* The tee that splits the influent flow to the two aeration tanks does not provide a uniform flow split. An even distribution of wastewater, both in terms of flow and organic loading, to multiple treatment tanks is extremely important for operating all tanks in an identical mode. If the difference between tanks is only 3%, within a month the more heavily loaded tank will receive twice the loading. This forces the operator to operate each tank differently from the other, greatly complicating his or her efforts.
- d. *Secondary Treatment:*
- 1) *Aeration Basins:* The aeration basins are adequately sized for an extended aeration process, with the permitted flows. However, these basins are inadequate when the facility receives high peak flows. The current capacity of these two aeration basins combined is 80,700 gallons or 10,800ft<sup>3</sup> and have a hydraulic detention time of 24 hours at their permitted flow of 80,000 gpd. There are currently 3 blowers, each with 10 horsepower. Coarse bubble diffusers provide aeration.  
  
The maximum permitted organic capacity of 162 lbs./d corresponds to a BOD<sub>5</sub> concentration of only 242.8 mg/l.
  - 2) *Secondary Clarification:* The existing clarifier was built in 2001 to increase the capacity at the facility. This clarifier has a 20-foot diameter with a surface area of 314 square feet. At the permitted flow of 80,000 gallons, the surface over flow rate would be 255 gallons per day per square foot and the hydraulic detention time would be 6.3 hours. However, at the peak flow of 600,000 that was recorded, the surface over flow rate would be 1910 gallons per day per foot and the hydraulic detention time would be 50 minutes. The greatest concern is that there is only 1 clarifier. If it were to fail before the upgraded facility is complete, clarification capacity would be a problem at all flows until the clarifier was repaired.
  - 3) *Return Sludge:* There are two dry pit return sludge pumps. These are each rated at 2 horsepower.
- e. *Disinfection:* The chlorine contact tank's dimensions, as measured on the initial construction plans are as follows: length 7 feet, width 15 feet, depth 5 feet. The volume, based on these dimensions, is 3,900 gallons, and the contact time would be 71 minutes at a flow of 80,000 gallons per day, and 9.5 minutes at the peak recorded flow of 600,000 gpd.
- f. *Sludge handling:* The specifications from Suburbia Systems identified the volume of the sludge holding tank as 14,500 gallons. The average sludge flow was estimated to be 1,800 gpd, based on the average organic loading of 124 lbs./d (2006 DMR's), a sludge yield of 0.6, and a waste sludge solids concentration of 2.0% at average flows of 80,000 gpd. At that sludge flow the average hydraulic detention time would be 8 days. At a sludge flow corresponding to the peak recorded daily flow of 600,000 gpd, the sludge flow rate would be 6,775 gpd with a detention time of only 2.1 days. DEP's guidelines require a minimum solids retention time of 15 days of contact time, and so this tank is far too small to qualify as an aerobic digester.

The sludge does not meet 40 CFR regulations, which require it to meet specific pathogen reduction criteria. These can be met by several means, but the most commonly used for plants this size are aerobic digestion or lime stabilization. If aerobic digestion achieves a 40% reduction in volatile solids content, the sludge is considered stabilized. The plant is unable to do this because its sludge holding tank is too small, and it does not have sufficient solids detention time.

*Digester blowers:* Three 10-horsepower blowers supply air to the holding tank and the airlift pumps.

*Reed Beds:* The plant uses four (4) reed beds, with a total length of 100 feet and a width of 25 feet. During the winter months, waste activated sludge is sometimes hauled to the Lehigh County Pre-wastewater Treatment Plant for additional wastewater treatment and disposal.

- g. *Auxiliary systems:* The main office and laboratory are located together in the same room within the main treatment building.

#### 4) Capacity, Upgrading and/or Expansion

The plant is operating at or above its rated capacity, which is not acceptable due to a need to allow for future development, growth, and replacement of failing on-lot disposal systems. The treatment process is able to achieve the existing NPDES permit limits but it is operating right at the margin of failure in terms of peak hydraulic and organic loadings. The treatment plant needs renovations both to expand capacity for future growth in its service area and to continue to provide modernization and reliable treatment at the facility.

A policy adopted by the Authority in 1998 and supported by the PaDEP for the allocation of reserve capacity for new connections to the system does not allow more than 20 allocations per year for the next three years or until additional wastewater capacity is generated. Coinciding with this policy is a requirement that no more than 5 connections per year can come from any one development. In any given calendar year, connections can be reserved until they are used, by paying the tap-in fee, but the connection must be used during the calendar year in which the tap-in fee was paid or it is forfeit.

#### 5) OLDS Operation and Maintenance Requirements (ARRO 537)

Within the Township's sewer system, there are serious Infiltration and Inflow problems that need to be addressed more stringently. As problems have been found, they have been solved within the Authority's budget and limited manpower. In some circumstances, the I & I problems are a result of misinformed homeowners who have and will continue to have control over the operation and maintenance of their OLDS system. Information is provided to homeowners pertaining to proper maintenance of their OLDS system, but this information is not followed by every home owner.

### **B. On-Lot Wastewater Disposal System (ARRO 537)**

#### 1. Types of Systems in use:

The Lynn Township Wastewater Treatment Plant serves only a small portion of Lynn Township as a whole. The majority of the wastewater that this plant receives originates in the small town of New Tripoli with a smaller percentage coming from the areas immediately surrounding New Tripoli, which is the extent of the sewer service area. The rest of the Township not connected to the public sewer system is served by OLDS systems.

2. Sanitary and Water Supply Surveys:

According to the records kept by the Sewage Enforcement Officer for Lynn Township, there are no documented public health pollution or operational problems with OLDS systems including violations of local ordinances, the Sewage Facilities Act, or the Clean Stream Act. A township-wide well survey was not conducted in Lynn Township because the residents did not report any contamination issues. Ten random water samples were collected in the Township. The test results of these samples were negative for all contaminants measured. These results can be found in Exhibit 3 of the Act 537 Sewage Facilities Plan Update dated October 2005.

**C. Wastewater Sludge and Septage Generation, Transport, and Disposal (ARRO 537)**

The Lynn Township Wastewater Treatment Plant hauled 60,000 gallons of Liquid sludge to the Lehigh County Pre-Wastewater Treatment Plant in 2002. All excess waste activated sludge is aerobically digested and applied to the reed drying beds. During 2002, 28,310 gallons of aerobically digested sludge was applied to the reed beds.