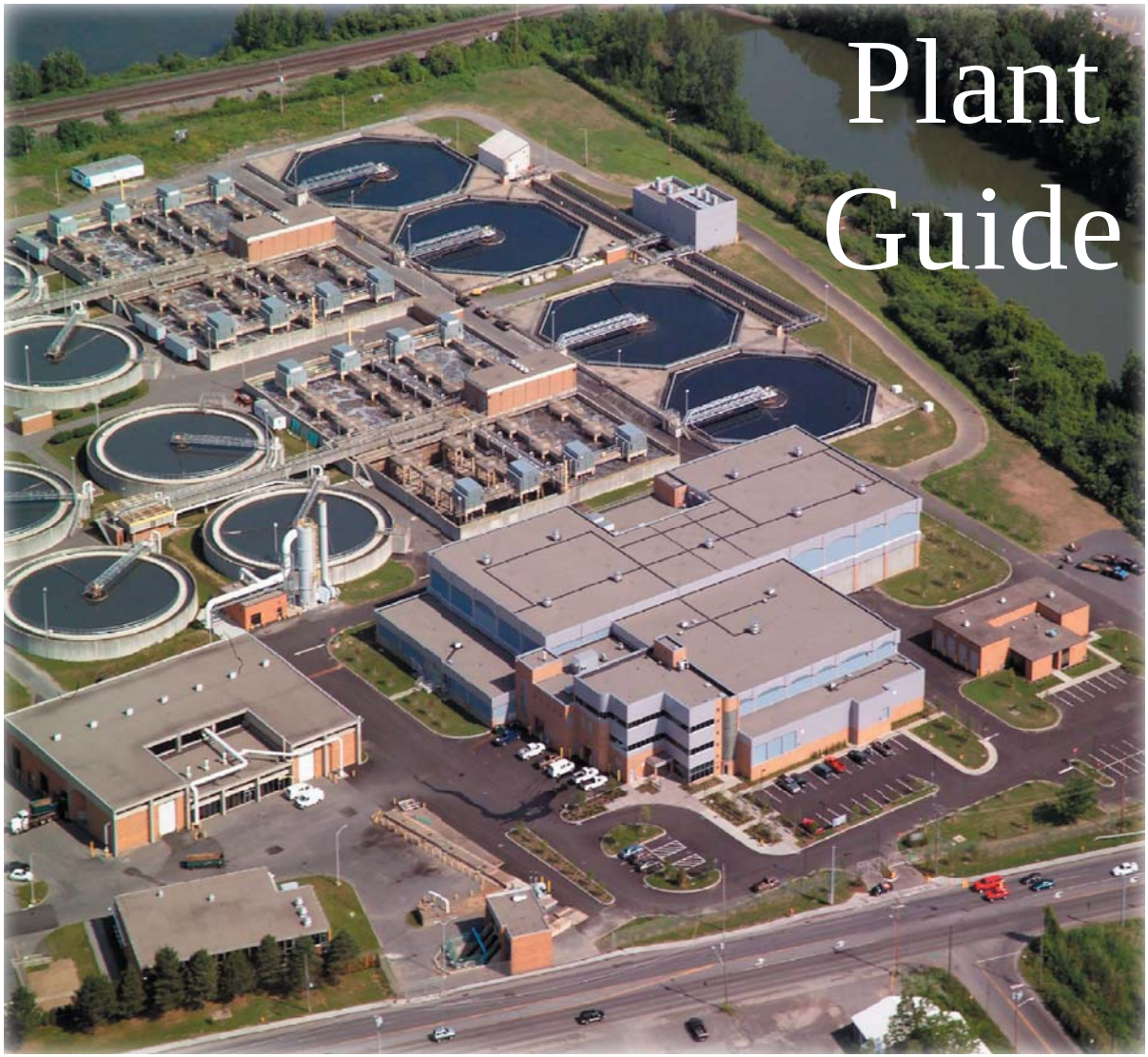
Onondaga County Department of
WATER ENVIRONMENT PROTECTION

Metropolitan Syracuse Wastewater Treatment Plant

650 Hiawatha Blvd. West
Syracuse, New York 13204-1194

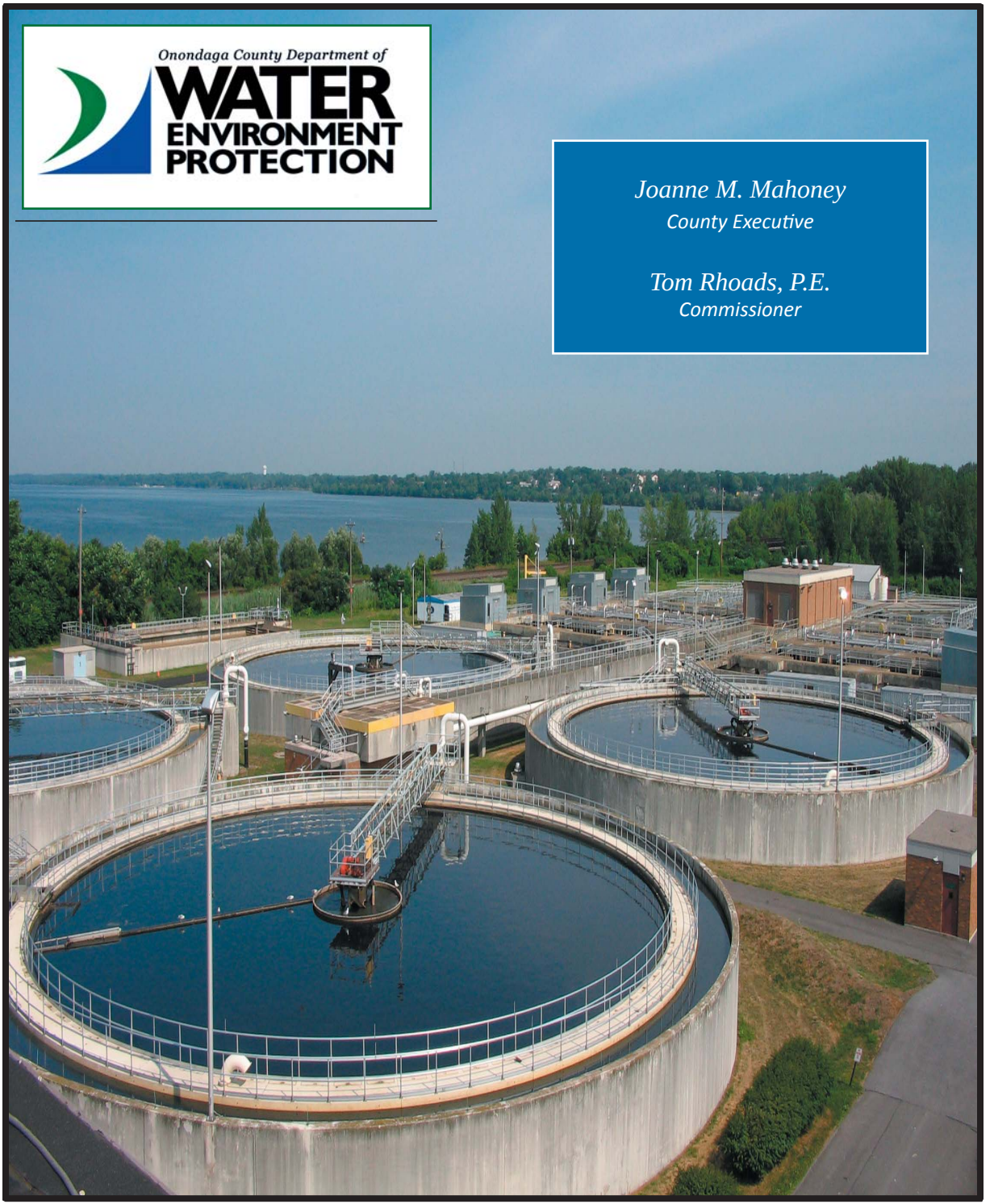


Plant Guide

Onondaga County Department of
WATER ENVIRONMENT PROTECTION

Joanne M. Mahoney
County Executive

Tom Rhoads, P.E.
Commissioner



The Metropolitan Syracuse Wastewater Treatment Plant

The Metropolitan Syracuse Wastewater Treatment Plant (Metro), WEP's largest plant, provides high quality treatment for 270,000 people and many industrial and commercial customers in the City of Syracuse and surrounding suburbs of Onondaga County. Metro is designed to treat an average of 84.2 million gallons per day (MGD). Full secondary and tertiary treatment can be provided for up to 126.3 MGD. Metro has a total hydraulic capacity of 240 MGD during wet-weather events.

Metro

Wastewater Treated by Metro

Wastewater reaches Metro from a number of sources. The largest is the 90-inch in diameter Main Interceptor Sewer (MIS) that runs north-south through nearly the center of Syracuse.

The Harbor Brook Pump Station contributes up to 30 MGD to Metro. In addition, the Ley Creek, Westside, and Liverpool pump stations convey wastewater to Metro.

This influent enters a diversion structure that can channel wastewater to either of the two grit-removal facilities at Metro. An overflow structure prevents any flooding at the treatment plant in case of an emergency.

Preliminary Treatment

Grit Pumps

The first step in treating the wastewater at Metro is the removal of sizable objects. The wastewater flows through large steel bar racks spaced such that debris cannot fit through the spaces and is caught on the racks. This material is removed and then disposed of at a landfill.

The wastewater next enters the grit chambers. Sand, stones, and other small bits of solid waste are removed there.

Influent Pumping

Following grit removal, the flow enters a wet well for pumping to the remainder of the plant. Pumping wastewater to the next process allows the wastewater to flow by gravity through the various treatment processes. The low-lift pump station raises the incoming wastewater to such a level. The station has five centrifugal pumps rated for 600 horsepower. The pumps' speeds vary depending on the amount of wastewater entering the plant. Each pump has the capacity to handle 60 MGD—for a total of 240 MGD for the low lift pump station.

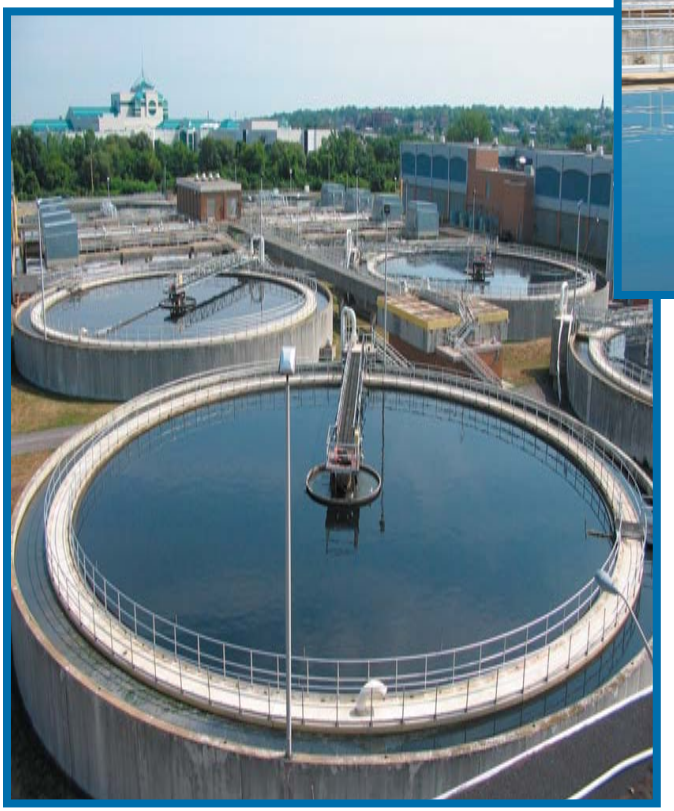
The wastewater is conveyed from the lift station to the primary clarifiers via a 90-inch diameter force main that is 820 feet long. At an average rate of 84 MGD, the flow is 2.2 ft/sec.

The wastewater is treated in three stages before it is disinfected and discharged to Onondaga Lake. The treatment stages are named *primary*, *secondary*, and *tertiary*.

Stage 1: Primary Treatment

In the first stage of the treatment process, flow from the low lift pumping station is conveyed to the primary treatment complex, where solid particles are removed by settling and oils and grease by skimming. The complex includes flow distribution structures and eight primary clarifiers. In the primary clarifiers, the solids are removed by slowing down the wastewater's velocity so that gravity separates the settleable solids. The settled solids are mechanically brought to the center of the tank and are then pumped to the thickeners. The processed wastewater leaves the primary clarifiers through 48 inch diameter lines and flows to the secondary treatment complex.

Primary Clarifiers



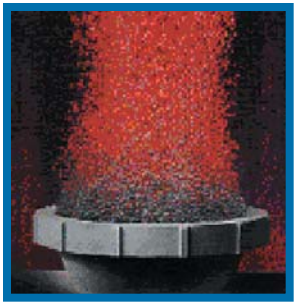
Primary Clarifier Tanks

Treatment starts in the 8 primary clarifiers. They are 135 ft. in diameter, have a 10-ft. side wall depth, and can hold 1.07 million gallons.

Bypass Flows

After primary treatment, any flow greater than 63 MGD/side (126 MGD total) is sent to the by-pass chlorine contact tanks for disinfection using sodium hypochlorite and decholorination using sodium bisulfite. This facility consists of two rectangular tanks (31 ft. by 100 ft. by 20 ft. deep). If flow is 126 MGD, the contact time is 13 minutes.

Stage 2: Secondary Treatment



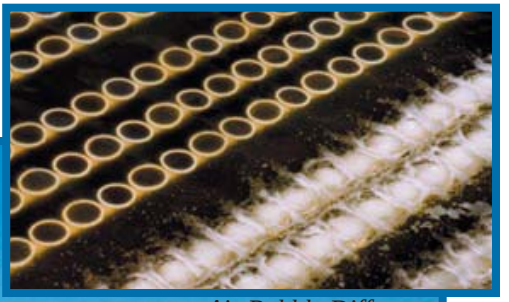
Diffuser

The next stage of wastewater treatment, the decomposition of remaining organics by bacterial action, is achieved in the secondary complex. The complex includes aeration tanks and the secondary clarifiers.

Aeration tanks mix the water and provide sufficient contact time for the bacteria to decompose the organic material and allow it to coalesce for later removal from the water. Metro has eight aeration tanks, 100 ft. by 130 ft. by 14.2 ft. deep. Each holds 1.4 million gallons.

After aeration, the wastewater passes to the secondary clarifiers. Secondary clarifiers hold the water to permit the solids to settle. In this process, the biosolids are moved to the center of the tank where a portion is returned to the aeration tanks and the excess is pumped to the thickeners. Each of the four secondary clarifiers are 170 ft. square by 11 ft. deep. They each hold 1.83 million gallons.

Treatment is not yet finished, however.



Air Bubble Diffusers

Aeration Area

Stage 3: Advanced Treatment—State of the Art

In January 2004, Onondaga County WEP put into service a new pump station that will pump secondary-treated wastewater to the advanced treatment process. The station has four vertical turbine variable speed pumps rated for 500 horsepower. Known as the SEPS (Secondary Effluent Pump Station), it pumps a peak flow of 126 MGD to a new state-of-the-art treatment process for year-round removal of ammonia.

Plant Operations Center

Ammonia Removal

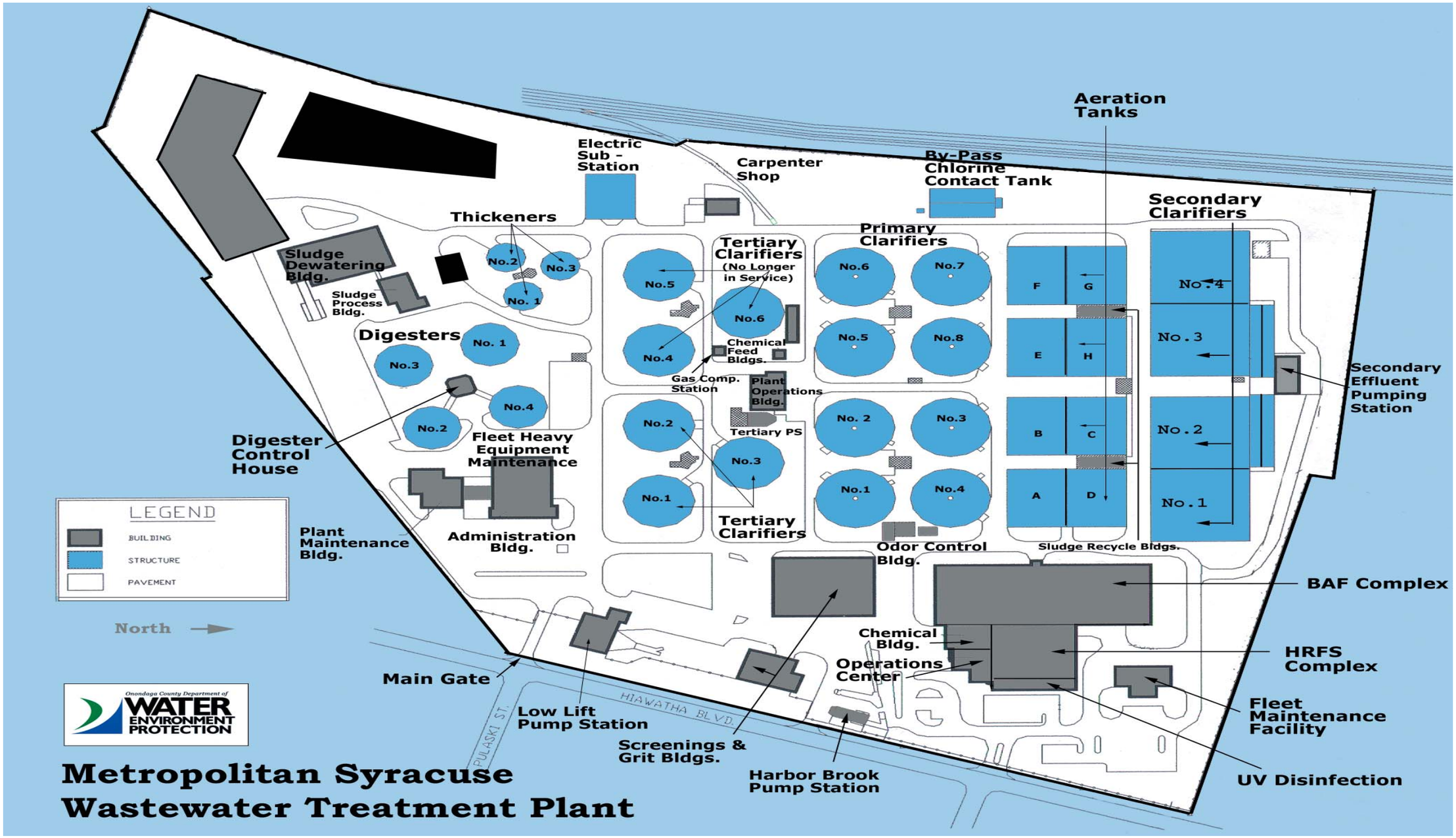
Ammonia in high concentrations can be lethal to juvenile fish and other aquatic animals. After startup in January 2004 of the biological aerated filter system (BAF), the concentration of ammonia discharged from Metro is now being reduced significantly.

Ammonia is removed from the wastewater using a process developed by *I. Krüger, Inc.* that uses a biological aerated filter (BAF) called Biostyr®.

At Metro, the BAF process consists of eight centrifugal blowers and eighteen individual cells, each with a capacity of about 273,000 gal. The cells are filled with billions of polystyrene beads that are 0.14 inch in diameter. These beads provide a huge surface area on which nitrifying bacteria is grown, and these bacteria convert ammonia to nitrate and nitrite. The BAF process lowers ammonia below 1 mg/L.

BAF Complex Gallery

BAF Blowers


Aeration Tanks
Electric Sub - Station
Carpenter Shop
By-Pass Chlorine Contact Tank
Secondary Clarifiers
Thickeners
Primary Clarifiers
Tertiary Clarifiers (No Longer in Service)
Sludge Dewatering Bldg.
Sludge Process Bldg.
Digesters
Chemical Feed Bldgs.
Gas Comp. Station
Plant Operations Bldg.
Tertiary PS
Secondary Effluent Pumping Station
Digester Control House
Fleet Heavy Equipment Maintenance
Tertiary Clarifiers
Plant Maintenance Bldg.
Administration Bldg.
Odor Control Bldg.
Sludge Recycle Bldgs.
BAF Complex
LEGEND
BUILDING
STRUCTURE
PAVEMENT
North
Chemical Bldg.
HRFS Complex
Operations Center
Main Gate
Low Lift Pump Station
HIAWATHA BLVD.
PULASKI ST.
Fleet Maintenance Facility
Screenings & Grit Bldgs.
Harbor Brook Pump Station
UV Disinfection
Onondaga County Department of WATER ENVIRONMENT PROTECTION
Metropolitan Syracuse Wastewater Treatment Plant

Phosphorous Removal

Phosphorus is a nutrient that aids algae growth. In limited quantities, algae is beneficial, but in high concentrations it can cause many problems. An over-abundance of algae is unsightly, leads to odors, and, most importantly, when it dies it sinks to the bottom of the lake and decomposes using precious dissolved oxygen in the process. The oxygen is critical to fish and other aquatic life. Thus, more phosphorus leads to more algae—which leads to less oxygen.

Microsand Recirculation Area

As with ammonia, the concentration of phosphorus in Metro's discharge has been declining over the past several years because of Onondaga County's operating changes and pretreatment efforts. With the addition of the Advanced Ammonia and Phosphorus Removal Project, water quality has been even better. Phosphorous is removed from the wastewater using a process developed by *I. Krüger, Inc.* that uses high rate flocculated settling (HRFS) called Actiflo®.

Effluent from the BAF flows by gravity to the HRFS units. In the first tank, coagulants are injected into the effluent. The coagulant adheres to phosphorous molecules causing them to form larger flocs or clumps of particles. The effluent then flows through a second tank where micro-sand is added. In the third tank the floc is gently mixed to further increase the floc size. A concentrated sludge is formed in the fourth tank by the micro-sand adhering to and weighing-down the floc, where it is siphoned off. The sand is separated from the phosphorus-rich sludge and recycled; and the phosphorus sludge is pumped to the solids handling facilities at the Plant. HRFS technology allows the County to meet the current phosphorus limit of 0.10 mg/l (measured as a 12-month rolling average) and the aggregate Waste Load Allocation (WLA) of 27,212 lbs/yr (measured as a 12-month rolling sum)

HRFS Microsand Pump Gallery

Disinfection of the Discharge Water

Following the HRFS process, the treated water passes through an ultraviolet light disinfection system, which alter pathogens using high energy lights submerged in the effluent before discharge to the lake. UV light provides a chemical-free way to disinfect wastewater by destroying the genetic material in bacteria, viruses, and other micro-organisms so that they no longer can reproduce.

Installation of UV Disinfection Lights

The UV system consists of 308 high-intensity germicidal lamps that are submerged in an open channel. As the wastewater flows past the lamps, the micro-organisms are exposed to a lethal dose of UV energy. The intensity of the UV lamps can be varied to deliver between 840 and 2400 watts.

Trojan UV 4000 Disinfection Unit

UV Effluent

Metro serves as the central biosolids processing facility for four (4) other plants. The solids removed in the various wastewater treatment processes will be conveyed to the biosolids treatment and disposal facilities. Biosolids handling facilities include three tank thickeners, three (3) primary digesters, one (1) gas holder/secondary digester, three (3) gravity belt thickeners, three (3) centrifuges, and two (2) blend tanks.

Biosolids Thickening

The biosolids and associated liquid—products separated through primary, secondary, and tertiary treatment—are thickened to reduce the liquid content. The settled solids are moved to the center of the tank and pumped to the digesters. The supernatant is recycled back to the Low Lift Pump Station Wetwell for treatment.

The three thickening tanks are 65 ft. in diameter and 12 ft. deep. Each holds 298,000 gallons.

Biosolids Digestion & Dewatering

The thickened biosolids are kept heated above 95°F and mixed to reduce the volume and to reduce pathogens in the solids. A byproduct of this process is methane gas, which is stored in the Gas Holder/ Secondary Digester and used to fuel the boilers that heat the digesters and the buildings at Metro.

Digesters

The plant has three primary digesters that are 100 ft in diameter with walls 27.5 ft. high. They each hold 1.8 million gallons. The secondary digester is 100 ft in diameter with walls 24.5 ft. high. This digester holds 1.6 million gallons.

The digested biosolids are treated with a polymer to promote further separation of solids and the water. The biosolids are then centrifuged to produce a cake which is about 30-33% solids, and currently transported to a sanitary landfill.

Instrumentation & Control

The Metro Board is located in the Plant Operations Center (POC) and is the Operations and Communication Center for the Metro Plant and all facilities in the southern half of Onondaga County. In addition to the telephone and 2-way radio, the Board is the home for Data Acquisition and the Control Computer, which monitors and controls most of the equipment in the Plant. The Computer generates alarms for certain conditions and allows the Operators to cover more of the plant quickly and with fewer people. The Computer also monitors the status of 69 Pump Stations and 3 other Treatment Plants and generates alarms so that the Operators can call out the appropriate dutyman. The Metro Operators also utilize a personal computer to maintain the Process Control Database and all operating data from 1990 to present. The computer system makes Process Control adjustment calculations and produces monthly monitoring reports. The Metro Board is staffed 24-hours a day from a crew of over twenty (20) operators, the majority of which are New York state licensed at 3A or above.

Metro Board

Operations Lab

The Operations Lab is located in the Plant Operations Building. The lab analyzes plant samples for process control. A total of 7,900 samples per year are analyzed in the lab. New York State certified testing of samples is also performed for regulatory reporting at the Department's Environmental Laboratory located at the Henry Clay Boulevard Facility in Liverpool, NY.

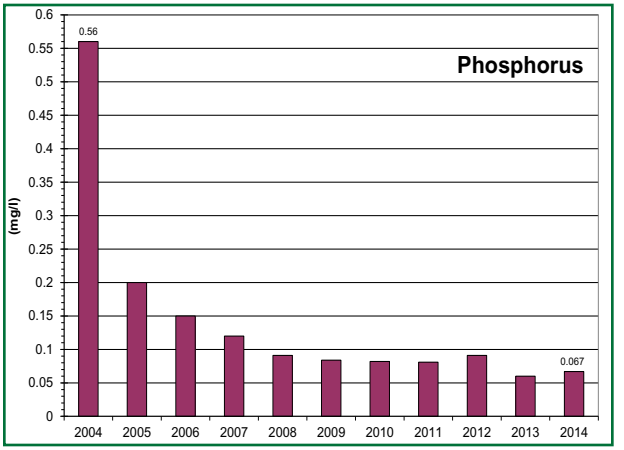
Operations Lab

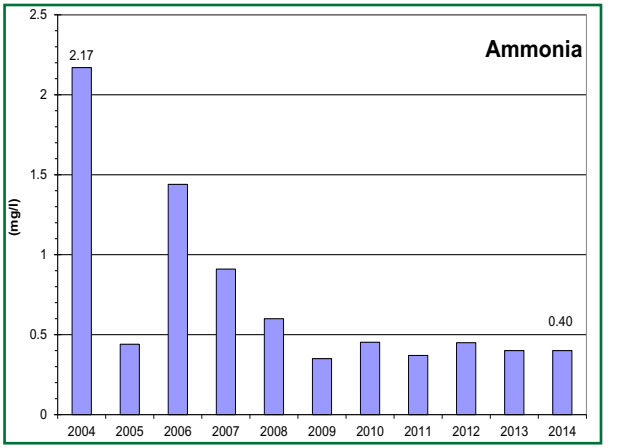
Electrical Facilities

Electrical power for the plant is supplied by two separate 34.5 kV feeders from the Niagara Mohawk Power Corporation. The plant's main substation distributes the electrical service to various units' substations within the plant. The distribution system is set up to provide for maximum reliability and minimal loss of plant operation should an electrical malfunction occur.

Signs of Progress

Improvements to Onondaga County's Metropolitan Sewage Treatment Plant have dramatically reduced the amount of phosphorous and ammonia the plant discharges into Onondaga Lake. Here are the current Phosphorus and Ammonia average discharges from the treatment plant's main outfall (001) over the past eleven (11) years.





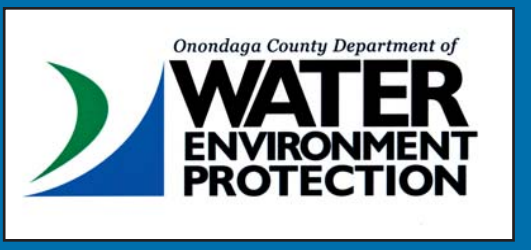
Metro SPDES Permit Limits (Outfall 001)

The most recent SPDES Discharge Permit is located under the Metropolitan Syracuse (Metro) permits and Reports section of the following Onondaga County Department of Water Environment Protection (OCDWEP) website address:

http://www.ongov.net/wep/we1901.html

Onondaga Lake Improvements

Onondaga Lake has seen remarkable improvements in water quality. For detailed information regarding the progress and improvement to water quality and the fish community, please visit http://www.ongov.net/wep/we15.html



650 Hiawatha Boulevard West
Syracuse, New York 13204

Phone: (315) 435-2260
Fax: (315) 435-5023

On the Internet:
http://www.ongov.net/wep

July 2015