

Case Study: The Marquette Area Wastewater Treatment Facility

In September 1977 Marquette County, the City of Marquette, Marquette Township, and Chocolay Township entered into an agreement to construct and operate a secondary wastewater treatment facility. Under the agreement the City of Marquette would own 79.8%, Marquette Township would own 5.5%, and Chocolay Township would own 14.7% and would also be required to pay the same share of principal and interest on the bonds issued by the county. Costs of operating, maintaining, and replacement funds would be divided respectively. The City of Marquette agreed to operate and maintain the facility for the local entities. The facility was constructed by the county and financed through a grant from the Environmental Protection Agency for 75% of the costs, a grant from the Department of Natural Resources for 5% of the costs, and \$2.5 million general obligation bonds.

In May of 1983 the agreement was replaced with a contract between the City of Marquette, Marquette Township, and Chocolay Township. In July of 1993 the agreement was modified to change the ownership amount for the local entities. The Township of Marquette paid to the City of Marquette and to Chocolay Township each the sum of \$53,743 representing an allocation of an additional 4.5% of the plant capacity. The new ownership percentages then became as they exist today with 77.55% for the City of Marquette, 12.45% for Chocolay Township, and 10% for Marquette Township.

Facility Description

The community's wastewater flows to the facility through a series of underground pipes, which we call the sewage collection system. Some of the waste flows completely by gravity, and some needs to be pumped from lower elevations by one or more of the nine lift stations located around the city. Operation and maintenance of these lift stations is the responsibility of the WWTP staff. Major lift stations are located at the corner of Baraga Ave. and Lakeshore Blvd., on Lakeshore Blvd. just south of Ridge St., on Lakeshore Blvd. at Hawley St., and on Pine St. across from the Lakeview Arena parking lot.



Grit Chamber

The first step in the treatment process is the **preliminary treatment** area, which contains a fine screen and Grit Removal System. As the wastewater flows through the step-screen inorganic and large solids are removed from the waste stream. These plastics and other inorganic materials are removed washed with high pressure spray as they work their way up the step-screen. The materials are compressed and bagged for disposal at the landfill.



Rotating contractors

Following the screen a grit chamber removes sand and other heavy inorganics. The sand, rocks, & other inorganic material that settles in the grit chamber is collected and bagged for disposal. Very little grit is collected in an average day. (less than 2 cubic feet)

The next step in the process is the Rotating Biological Contactors (RBCs). The surface of the RBCs is covered with a biological growth made up of algae, bacteria, protozoa, and other organisms that reduce the BOD and further remove suspended matter from the wastewater. The 23 RBCs have a total surface area of 2,700,000 square feet.

Following the preliminary treatment area, the wastewater flows into the primary settling tanks where approximately 50% of the organic material is settled. There are six primary tanks at the WWTP, each of which is 100' long, 16' Wide, and 10' deep. We generally use two or three of these tanks where the wastewater has a detention time of two to three hours. The solids that settle in the tanks are pumped to the "Digesters" for treatment. This treatment & what is done with the solids will be described later.

The wastewater then flows to the secondary clarifiers where final settling of solids occurs. Water chemistry dictates the Ferric Chloride be added in the preliminary treatment area, which allows for phosphorous removal throughout the system, additional phosphorous removal also takes place here. There are two secondary clarifiers each of which is 85' in diameter and 10' deep. Solids settled in this process are returned to the primary tanks where they are settled.



Secondary Clarifiers

The wastewater is then disinfected with sodium hypochlorite in the Chlorine Contact Chambers.

There are two chlorine contact tanks where the wastewater has an average contact time of 60 minutes. As the wastewater flows out of these tanks, sodium bisulfite is added to remove the residual chlorine to levels less than 0.036 ppm before the wastewater is discharged into the Carp River.



Sludge Digester

Solids removed in the primary settling tanks are pumped into one of the two "Primary Digesters" where the "sludge" is kept warm (95 to 100 degrees F.) and decomposed by the anaerobic bacterial population. Sludge from the primary settling tanks is pumped into the facility's sludge digesters. As the sludge decomposes and is changed by anaerobic microorganisms, methane gas is produced.

The gas produced is burned to heat the digesters and the facility itself. Excess gas produced is burned in the waste gas burner and can typically be seen only in the summer months. As the solids are digested they are then pumped to the digester for storage, additional settling & decanting, and gas holding. As this tank gets filled, we can also transfer "bio-solids" to a sludge storage tank. Each of the three digesters and the storage tank can hold approximately 400,000 gallons. The facility produces nearly 2,000,000 gallons of digested bio-solids annually containing over 550 dry tons of solids.



Waste Gas Burner

The Bio-solids from the digesters is land applied to the farm fields of some local landowners or applied on CCI property. Before the bio-solids can be applied numerous tests need to be conducted on both the soil and the bio-solids. The MDEQ and the EPA then approve the site and the application rates before application can begin.

Source: <http://www.mqtcty.org/>