protecting the environment

WASTEWATER TREATMENT // MISHAWAKA, INDIANA

protecting the environment

INSIDE

Beneath the ground, hundreds of miles of sewer lines converge at the Mishawaka Wastewater Treatment Plant, situated on a wooded plot of land next to the meandering St. Joseph River. Sanitation, including wastewater treatment and clean drinking water, has been cited by the British Medical Journal as the greatest medical advance for public health over the past 150 years.

We at the Mishawaka Wastewater Treatment Plant are proud to provide wastewater treatment to the citizens of Mishawaka. As the protector of the St. Joseph River, the treatment plant does not clean the river itself. Rather, we ensure its quality by preventing pollutants from entering this vital waterway.

Along with Wastewater Treatment, *Mishawaka Utilities* comprises two other divisions: Water (for drinking) and Electric. As with many communities, our drinking water comes from wells.

Come along as we help you understand how wastewater treatment contributes to a growing community and protects our water resources.

history of wastewater treatment

We can credit the 19th century French microbiologist and chemist Louis Pasteur for making clear the relationship between pollution and disease—and, subsequently, the need for treating a community's waste.

Raw sewage can be dangerous to public health because it contains harmful bacteria and parasites. If left untreated, wastewater can endanger animals, plant life and humans by spreading disease.

While the collection of stormwater and sewage can be traced to ancient times, the modern collection of wastewater dates only to the early 1800s. A century later, in the early 1900s, the process of actually treating wastewater began to be better understood and implemented.

Wastewater, or sewage, is anything that goes down the drain in your home (or business)—whether sink, garbage disposal, tub, shower or toilet. This wastewater flows through a series of underground pipes to the Mishawaka Wastewater Treatment plant. Interestingly, typical wastewater comprises only 0.1% pollution. The remaining 99.9% is just water.

Across the country, no two wastewater treatment plants are quite alike. Wastewater treatment in general, however, follows a basic process that includes screening, settling, and chemical and biological treatment. You'll find the specific process for our Mishawaka treatment plant detailed in this brochure.

In Mishawaka, the "activated sludge process" that is central to our operation was invented in 1914 by English chemists Arden and Lockett. Arden and Lockett's pioneering work is reflected in the cleanliness of the St. Joseph River, the beautiful ribbon of water that graces our City.

facts & figures

13 million gallons of average daily flow
42 million gallons of peak capacity during wet weather
20,987 households served by the Mishawaka Wastewater Treatment Plant
99.9% of the flow into the treatment plant is water; only 0.1% of the wastewater is pollution
half of the pollutants are dissolved and half are suspended

Annually: Over 4 billion gallons treated
Over 7 million pounds of pollutants removed
4,000 tons of biosolids are recycled by land application on local farm fields

mishawaka
wastewater treatment

For the half century prior to Mishawaka's first wastewater treatment facility, the St. Joseph River was little more than an open sewer. What the Native Americans had called "M'shehwahkeek" ("swift flowing river") was a neglected waterway. The balance of life in the river, from which Mishawaka took its name, was destroyed.

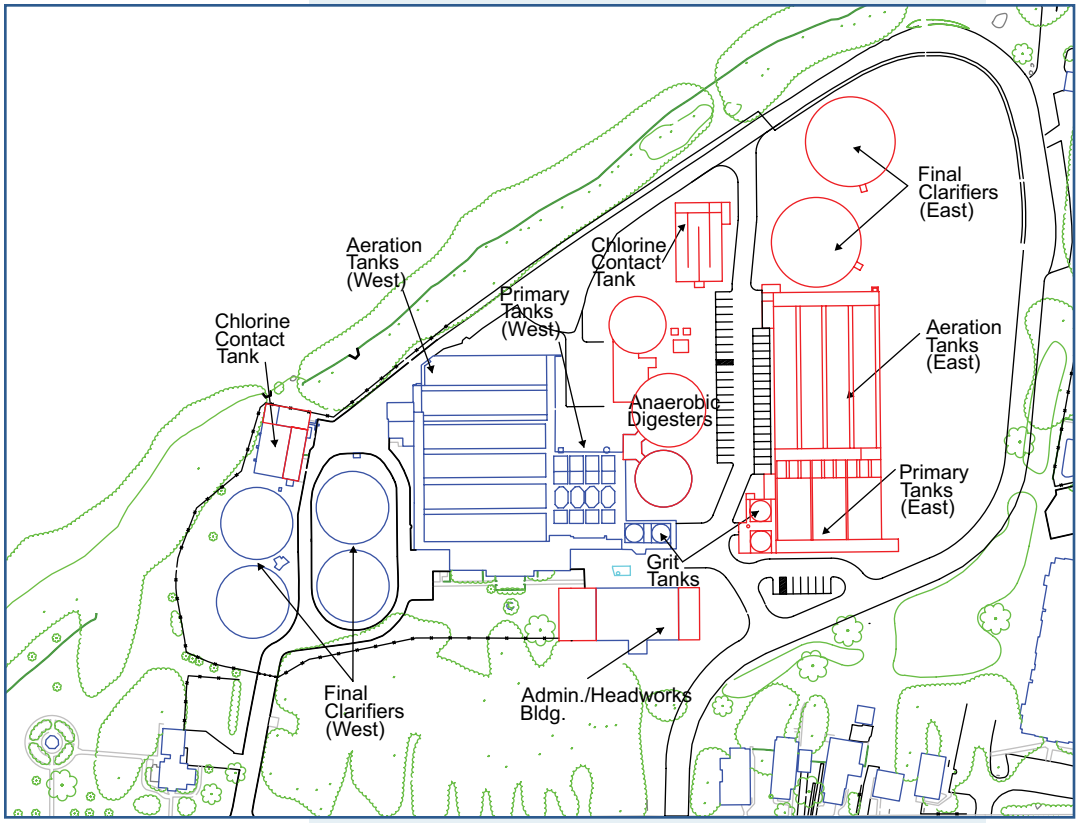
Mishawaka's first wastewater treatment plant began operation on April 15, 1952. With the new facility, we were able to intercept and purify the city's sewage and industrial waste before discharging it into the river.

Forty-one years later, in 1993, we completed a huge plant upgrade and expansion project. At a cost of $17 million, the project added 50% to the plant's capacity—a vital need for a community that had grown steadily over the years.

In 2008, a second major upgrade and expansion was completed at a cost of $42 million. This expansion assured capacity for continued community growth and significantly reduced combined sewer overflows during wet weather.

These investments in wastewater treatment have paid dividends over the past half century. Once a nearly dead stream, the St. Joseph River has again become a life-giving, scenic and recreational focal point for our community. Where Native Americans once took giant sturgeon, sport fishermen now reel in steelhead trout. Where birch bark canoes once navigated, powerboats now carry enthusiasts up and down the waterway.

But public health and recreation are not the only benefits. Our cleaner river has opened up a long neglected resource in Mishawaka—the beautiful riverfront. Over the coming years, we can eagerly anticipate new development opportunities along the St. Joseph, where explorers once camped and traded with local tribes.



EPA estimates

16,676 municipal WWTPs
1,066 > 5 MGD (million gallons per day)
544 of those > 5 MGD use anaerobic digestion
106 capture digester gas to use as renewable energy
Mishawaka has been doing this since 1952

the treatment process

Like many communities, Mishawaka's largest public works asset is wastewater treatment. The plant operates 24/7 every day of the year. Because the process must be continuous, we use a robust design with built-in redundancies. If one part of a process fails for any reason, a backup is available to keep us up and running—to protect the environment and to keep you and your family safe.

Our dedicated staff of 28 employees includes environmental scientists, biologists, chemists and highly skilled maintenance specialists and operators. Many of our staff voluntarily undergo the rigorous process to become certified in wastewater treatment by the State of Indiana. We employ a highly professional and motivated staff who are conscientious about their responsibility and role in protecting the environment.

on the horizon

In May 2008, Mishawaka completed a four-year expansion of the Wastewater Treatment plant. The $42 million project was prompted by both a growing population and a federal mandate to control combined sewer overflows, or CSOs. Through the expansion, we have increased our average capacity from 12 to 20 million gallons per day. At a peak, we can now handle in excess of 42 million gallons per day (up from 24 million).

The 2008 expansion gave us the dual benefit of allowing for future growth as well as significantly reducing our CSO volume. Mishawaka has been very proactive and our efforts have reduced annual CSO volume by 85% since 1990.

Currently, the city is close to reaching an agreement with the EPA on a plan to take care of our remaining CSOs. Mishawaka's long-term control plan will result in 100% capture of wet weather flows in years with average rainfall.

Although this plan is cost-effective, it will still be expensive, with an estimated price tag of $140 million. Because of this, the city is asking the EPA to allow us to complete the project over 20 years. The city is committed to minimizing the rate increases necessary to pay for the long-term control plan. However, we also do not have a choice. CSO control is a federal mandate; we don't have the option to ignore it; and it is the right thing to do.

The City of Mishawaka and the Wastewater Treatment facility will continue to work toward cost-effective solutions for a cleaner St. Joseph River and healthier neighborhoods in our community.

1) Influent Screening

The wastewater, or raw sewage, entering the treatment plant is called "influent." At the treatment facility, influent passes through a fine screen with ¼" openings. The screen prevents large debris and trash from damaging downstream process equipment. A second screen is used for backup and during high-flow conditions. The material that collects on these screens is hauled to a landfill for disposal.

2) Influent Wastewater Pumps

After screening, the influent flows into a structure called a wet well. This is the lowest point in the plant. The treatment plant is divided physically into separate flow trains called the East and West sides. Approximately two-thirds of the influent is pumped to our West side plant, while the other one-third is pumped to the East side plant.

3) Grit Removal

After influent pumping, four large circular tanks slow the velocity of the wastewater to approximately one foot per second. At this speed, heavy suspended grit, sand and other inorganic material settle to the bottom and are removed. The grit is then dewatered and sent to a landfill.

4) Primary Clarification

The wastewater then flows to five rectangular primary clarifier tanks, which further reduce the flow velocity to a fraction of a foot per second. Lighter organic suspended solids are given time to settle to the bottom of the tanks. These solids are pumped to the anaerobic digesters (step 8) for further treatment. An additional sixth clarifier can be brought online for high-flow during heavy rain.

5) Aeration Tanks

The wastewater now flows into four aeration tanks, where it is mixed with pregrown bacteria (called activated sludge). The activated sludge is aerated along with the effluent from the primary clarifiers. The bacteria feed on the dissolved organics in the wastewater and convert them to bacterial solids, which can be removed by settling in the next process. Nutrients such as ammonia and phosphorus are also removed in this process, because they can cause excessive algal growth and oxygen depletion if discharged to the river. Ammonia nitrogen is converted to nitrate by biological action. Phosphorus is removed both biologically and by chemical precipitation.

6) Final Clarification

The activated sludge leaving the aeration tanks enters the final clarifiers. Here, the bacterial solids in the water settle to the bottom, where they are pumped back into the aeration tanks for reuse in the activated sludge process. Since the bacteria are continually growing in number, some bacterial solids must be removed from the system each day. These excess bacterial solids are thickened to remove excess water and are then pumped to the anaerobic digesters (step 8).

7) Chlorination—Dechlorination

Prior to discharge to the river, the wastewater must be disinfected by chlorination, which kills harmful bacteria. Chemicals are then added to remove (dechlorinate) the remaining chlorine, which can damage aquatic life. The treated water, now called final effluent, is discharged into the river.

8) Anaerobic Digestion

The solids generated in primary (step 4) and excess bacterial solids generated in the aeration tanks are pumped to the anaerobic digesters, where they are stabilized and reduced in volume. In the digesters, anaerobic bacteria are used to convert the volatile solids into stable simple organic compounds. A byproduct of anaerobic digestion is methane gas, which is captured and burned in hot water boilers to supplement the plant's heating requirements—a truly "green" process.

9) Biosolids Dewatering and Disposal

The stable organic compounds from the anaerobic digesters are now called biosolids, which are as different from raw human waste as fireplace ashes are from firewood. Water from the biosolids is removed and the beneficial remaining organic matter is sent to farm lands to be used as a safe fertilizer—yet another green process.

process schematic