



KALAMAZOO WATER RECLAMATION PLANT CELEBRATING 70 YEARS OF OPERATIONAL SUCCESS

CITY OF KALAMAZOO
PUBLIC SERVICES DEPARTMENT
HARRISON STREET FACILITY





“Water is the driver of nature”
Leonardo da Vinci

A little over a century ago, wastewater in Kalamazoo was sent directly to the Kalamazoo River or its tributaries. Such unsafe practices resulted in polluted rivers, destruction of plants and animals, and diseases such as Cholera, Typhoid, Dysentery, Polio and Hepatitis. In 1955, Kalamazoo built its first wastewater treatment plant. This plant processed 6 million gallons of wastewater per day using a simple process of solids removal through settling.

In the 1960s, Public concerns about environmental degradation resulted in increasingly stringent effluent requirements. During that time, citizens of Kalamazoo, Kalamazoo Township, and the industrial community began a partnership to improve sewage treatment capabilities for residents of Kalamazoo County. Advanced treatment facilities for removal of dissolved solids began operation in 1967. Improved facilities for processing biosolids—solids removed from the wastewater—became operational in June 1971.

With the passage of the Clean Water Act in 1972, Congress made a commitment to restore the nation’s water resources. Projections indicated that effluent requirements would become more restrictive and sanitary service needs of communities would increase. Again, the citizens of Kalamazoo, surrounding Cities, Townships and Villages, the newly formed Gull Lake Sewer and Water Authority, Kalamazoo County Board of Public Works, environmental and industrial communities, this time conducting pilot studies to determine the most cost-effective means of meeting current and future requirements. With federal assistance, the community embarked on a long series of construction projects to upgrade the Kalamazoo plant. This development was completed in 1987.

The City of Kalamazoo Water Reclamation Plant (KWRP) currently provides treatment services to more than 200,000 residents in 22 Kalamazoo area municipal jurisdictions.

The KWRP uses an innovative treatment system to treat a variety of pollutants in concentrations that most other plants cannot. The plant incorporates powdered active carbon (PAC) treatment into its secondary process. With a PAC process, the plant treats wastewater from a variety of industries without the need for intensive pretreatment.

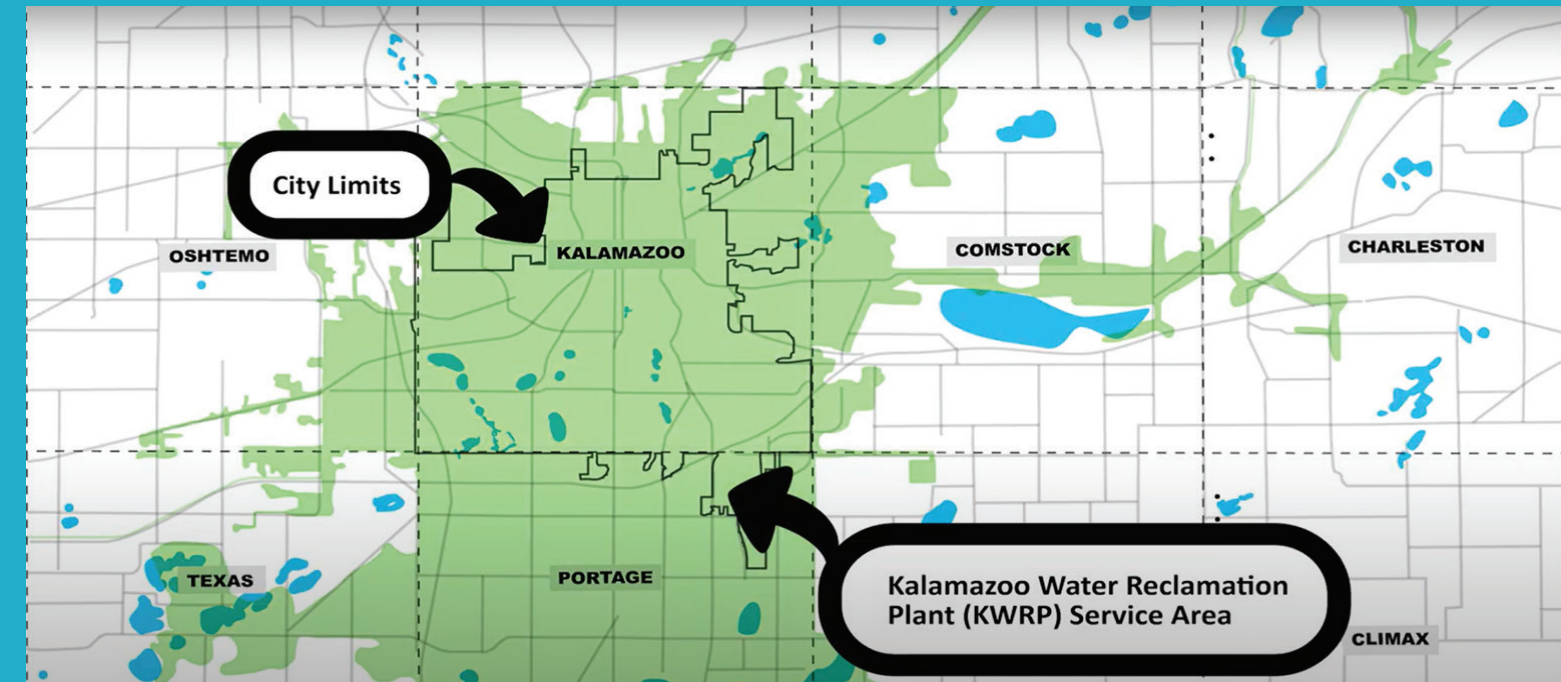
How many regional stakeholders collaborate with the Kalamazoo Water Reclamation Plant to ensure its success?

Twenty two governmental agencies regularly meet with the Kalamazoo Water Reclamation Plant to discuss the status of wastewater treatment in the region. We thank them for the key role they play in helping KWRP achieve its mission of outstanding wastewater treatment. These agencies include:

Charleston Township
Cooper Township
Kalamazoo Township
Oshtemo Township
Pavilion Township
Schoolcraft Township
Texas Township
City of Galesburg

City of Parchment
City of Augusta
Village of Vicksburg
Comstock Township
City of Kalamazoo
City of Portage
Village of Mattawan
South County

Gull Lake Sewer Authority:
Barry Township
Prairieville Township
Richland Township
Village of Richland
Ross Township



How does wastewater get to the plant?

Wastewater travels through a vast underground network known as the sanitary sewer collection system, which conveys flow from homes, businesses, and industries to the Kalamazoo Water Reclamation Plant (KWRP). The system consists of more than 900 miles of sewer main, with pipe diameters ranging from 4 inches to 78 inches, designed to accommodate varying flow volumes from neighborhoods to large industrial complexes.

Under normal conditions, flow moves by gravity, taking advantage of natural elevation changes. Where topography doesn’t allow gravity flow, the system relies on 66 lift stations strategically located throughout the service area. These stations temporarily pump wastewater to higher elevations, allowing it to resume gravity flow toward the treatment plant. This combination of gravity flow and mechanical assistance ensures efficient and reliable conveyance across Kalamazoo’s diverse landscape.

The Wastewater Collections Team plays a crucial role in maintaining the health and functionality of this infrastructure. On call 24/7, they respond to emergencies and conduct routine inspections, cleaning, and repairs to prevent blockages, pipe degradation, and sanitary sewer overflows (SSOs). Their work helps protect public health, preserve environmental water quality, and safeguard property from sewer-related damage.

By keeping the collection system operating smoothly, the team ensures that wastewater is safely and effectively transported for treatment—forming the first essential link in Kalamazoo’s water reclamation process.





ADMINISTRATION BUILDING CONTROL ROOM

The Kalamazoo Water Reclamation Plant utilizes Supervisory Control and Data Acquisition (SCADA) to create a centralized computer system that continuously monitors and displays operations—both within the facility and at remote wastewater lift stations. This sophisticated system gathers real-time data, enabling trained and state-licensed Treatment Operations Supervisors to make informed, immediate adjustments that optimize wastewater treatment based on evolving plant conditions and shifting wastewater characteristics.

Bridging the gap between technology and hands-on expertise, our Treatment Operations Supervisors serve as the vital link between ongoing facility operations. They carefully analyze system data, collaborate with field operation staff, and proactively address any performance fluctuations to operations maintain peak efficiency. Their role extends beyond monitoring—they coordinate responses, fine-tune processes, and uphold regulatory standards

to ensure high-quality treatment outcomes that protect environmental and public health. With 24/7, 365-day monitoring, our team is always on watch, ensuring reliable and effective treatment.

By integrating advanced technology with skilled oversight, our wastewater treatment operations remain proactive, adaptive, and sustainable—delivering clean water to the Kalamazoo River with precision and care.



RAW WASTEWATER PUMPING AND SCREENING

Before wastewater undergoes treatment, it must first pass through an essential screening process designed to remove large debris from the flow. Items such as sticks, plastics, rags, and other solid materials are extracted to prevent damage to pumps and sensitive equipment within the facility. Without this critical step, unwanted debris could clog pipes, impair mechanical systems, and disrupt treatment operations.

Once screened, the wastewater is directed to the primary treatment facilities through powerful pumps engineered to handle high volumes. These large-capacity pumps ensure consistent and controlled transfer, moving wastewater efficiently while maintaining proper hydraulic conditions.

To further optimize operations, computer-controlled automation—guided by personnel oversight—stabilizes the flow rate, ensuring

Our facility is designed with built-in pump redundancy, ensuring reliability and operational continuity. We can utilize different-sized pumps as needed, allowing us to effectively manage varying flow conditions and amply handle incoming wastewater volumes. This flexibility ensures smooth operations under various changing conditions, preventing bottlenecks and maintaining system efficiency.

PRIMARY TREATMENT FACILITIES

The municipal primary treatment facilities consist of three processes, grit removal, screening, and sedimentation. During the first process, grit is removed as the wastewater flows through the two grit tanks. The heavy grit particles settle to the bottom of the tank. Air, which is injected into the flow, creates a spiral motion and ensures that lighter organic solids are not removed with the grit.

The second step takes the flow through any of three fine screens to remove smaller floating solids. The fine screens remove anything larger than 3mm in size.

The third primary treatment is sedimentation. Wastewater flows to any of six sedimentation tanks. Here, under quiescent conditions, settleable solids are removed from the wastewater. The settled solids are moved to one end of the tank and pumped to the solids treatment facility.

Primary treatment also helps to remove fats oils and greases from the wastewater. As settleable solids sink to the bottom of the tanks, fats oils and grease float to the top. These are then skimmed from the surface of the wastewater and pumped to the solids treatment facility.



POWDERED ACTIVATED CARBON AND SECONDARY TREATMENT

The KWRP uses an innovative treatment system to treat a variety of pollutants in concentrations that most other plants cannot. The plant incorporates powdered active carbon (PAC) treatment prior to its secondary treatment process. With a PAC addition, the plant treats wastewater from a variety of industries without the need for extensive pretreatment.

PAC plays an important part, since it adsorbs impurities which may inhibit bacterial growth or are not easily “digested” by bacteria. On-site studies have shown that PAC addition also acts as a weighting agent to enhance settling characteristics and improves nitrification by providing surface area for the microorganisms.

The KWRP Industrial Pretreatment Program (IPP) works closely with significant industrial users to monitor and trend loadings and wastewater operations adjusts carbon dosing accordingly. Approximately 5,000 to 6,000 pounds of powdered activated carbon is added to the treatment system each day.

WASTEWATER TREATMENT
PATHWAY AT THE KALAMAZOO
WATER RECLAMATION PLANT

1. Water Purification Pathway

Wastewater entering the Kalamazoo Water Reclamation Plant (KWRP) comes primarily from two sources: residential and industrial. Residential wastewater includes everything from showers and dishwashers to toilets and drinking fountains. Industrial wastewater originates from processes such as cleaning, cooling, and manufacturing.

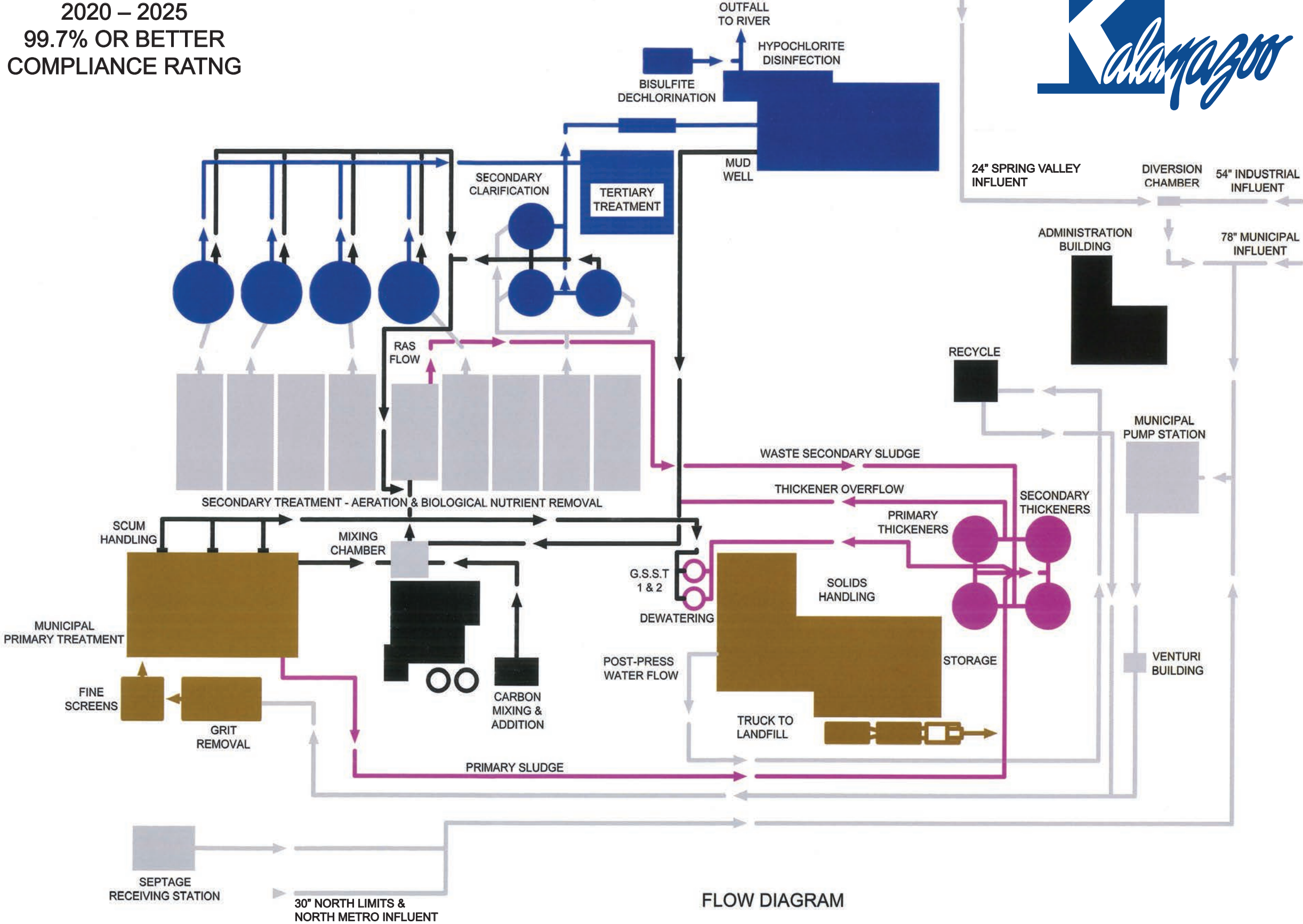
Upon arrival, all wastewater undergoes Primary Treatment, where screening and settling remove large and settleable solids. Next, Virgin Carbon is introduced at the mixing chamber to prepare the flow for Secondary Treatment, where biological processes break down organic material and activated carbon adsorbs contaminants. The mixture is then clarified a second time to remove the remaining solids.

In the Tertiary Treatment stage, water passes through fine mesh disc filter units to further polish the effluent. It is then chlorinated to eliminate harmful bacteria and dechlorinated to prevent ecological harm when the treated water is discharged into the Kalamazoo River.

2. Biosolids Treatment Pathway

Solids separated during Primary and Secondary Treatment are combined and gravity thickened before being transferred to the Solids Handling Facility (SHF). At the SHF, solids are dewatered using centrifuges, significantly reducing volume and moisture content. The resulting dewatered biosolids are then transported for landfilling, completing the solids management cycle.

2020 – 2025
99.7% OR BETTER
COMPLIANCE RATNG



AERATION TANKS

After the addition of Powdered Activated Carbon (PAC), the primary treatment effluent flows into the secondary treatment stage. This critical process is designed to remove dissolved and finely divided impurities, further refining the wastewater for discharge. Often referred to as “biological treatment,” this phase relies on various microorganisms to break down organic matter and pollutants, ensuring effective purification.

The Kalamazoo Water Reclamation Plant (KWRP) utilizes a sophisticated aeration system, consisting of nine aeration tanks, each holding approximately 2 million gallons of wastewater. Within these tanks, around 500,000 pounds of biomass actively work to process and purify the water.

Wastewater spends about 8 hours in these tanks, undergoing biological treatment to ensure thorough purification before advancing to the next stage.

To enhance treatment efficiency, these tanks are divided into three distinct zones, each facilitating a specialized biological process:

- Anaerobic Zone: No oxygen is introduced in this initial phase, creating conditions for bacteria to begin breaking down organic matter.
- Anoxic Zone: While no free oxygen is present, oxidized compounds like nitrite and nitrate exist. Specialized bacteria utilize these compounds in a process called denitrification, converting them into harmless nitrogen gas.
- Aerobic Zone: Hundreds of fine bubble diffusers provide dissolved oxygen to support biological activity, further breaking down organic material.



TERTIARY TREATMENT

Tertiary treatment consists of ten-disc filters which serves as a polishing step to remove small suspended solids particles, microplastics, and fugitive carbon remaining from secondary treatment. The tertiary disc filters remove solid particles as the wastewater passes through the 10-micron mesh filter panels. The solid particles that become trapped on the filter surface are removed by backwashing.

The filtered water is then chemically disinfected to destroy disease causing organisms. Following disinfection, the flow is dechlorinated prior to discharge to the Kalamazoo River.



FINAL CLARIFICATION TANKS

After passing through the aeration tanks, the treated wastewater enters clarifiers, where bacteria and biomass settle out. The separated biomass is returned to the aeration tanks, while a small portion is pumped to the solids treatment facility to maintain microorganism populations. The clarified water advances to the tertiary treatment stage for final refinement before discharge.





SOLIDS HANDLING FACILITY

The Solids Handling Facility (SHF) at the Kalamazoo Water Reclamation Plant utilizes three high-speed centrifuges to dewater comingled primary and secondary solids. These centrifuges operate by rapidly spinning the solids slurry, using centrifugal force to separate water from the organic and inorganic materials. Prior to entering the centrifuges, a polymer solution is introduced to condition the sludge—improving flocculation and enhancing overall dewatering efficiency.

Once processed, the dewatered sludge—referred to as “cake”—is discharged into a cake pump system that transfers the material to one of three dedicated storage bunkers. These bunkers hold dewatered solids until they are ready for disposal. A front-end loader is used to load the material into trucks for hauling to a landfill.

The dewatering process significantly reduces the volume and weight of solids, lowering transportation costs and improving handling efficiency.



ENVIRONMENTAL SERVICES DEPARTMENT



INDUSTRIAL PRETREATMENT PROGRAM (IPP)

The KWRP receives a substantial portion of its wastewater from industrial contributors—including manufacturers of pharmaceuticals, organic chemicals, spices, and food additives, as well as groundwater remediation projects. The Industrial Pretreatment Program (IPP) plays a pivotal role in protecting the Kalamazoo Water Reclamation Plant (KWRP) from industrial pollutants that could interfere with treatment operations or pass through the plant untreated. By leveraging the Sewer Use Ordinance and issuing individual industrial permits, the IPP ensures that potentially harmful discharges are controlled at their source before entering the sewer system. This proactive, front-line strategy supports both regulatory compliance and system integrity.

The IPP team is responsible for more than just permit issuance. They conduct annual inspections of industrial facilities to verify ongoing compliance and operational transparency. In addition, they lead Maximum Allowable Headworks Loading (MAHL) and Maximum Allowable Industrial Loading (MAIL) studies—critical planning tools that guide the plant’s capacity management and pollutant load allocation. Enforcement is a key component of the program, with staff ensuring that industrial dischargers adhere to permit requirements and taking necessary corrective actions when violations occur.

By maintaining rigorous oversight and supporting the plant’s advanced treatment capabilities, the IPP helps safeguard public and environmental health, while strengthening the community’s ability to attract and retain high-value industries. Their work is essential to the long-term resilience of the KWRP and the region’s economic and ecological future.

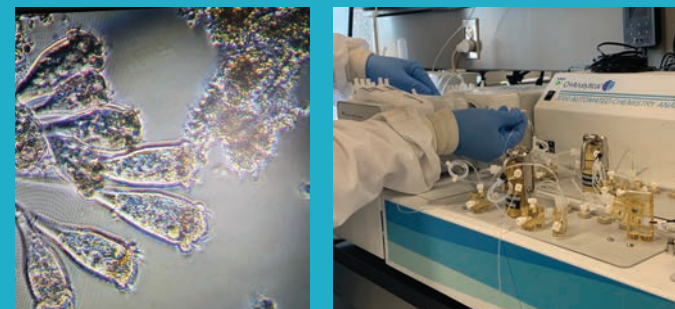


LABORATORY FACILITIES

The Environmental Services Laboratory is integral to the Kalamazoo Water Reclamation Plant’s environmental compliance and process monitoring efforts. Central to the laboratory’s mission is the accurate characterization of wastewater influent, effluent, and intermediate streams—an essential function for maintaining compliance with the Michigan Department of Environment, Great Lakes, and Energy (EGLE) requirements and the National Pollutant Discharge Elimination System (NPDES) permit.

The facility is equipped to perform a broad spectrum of water and wastewater analyses, guided by precise protocols and a robust quality assurance framework. Staffed by certified professionals in both drinking water and wastewater sampling and analysis, the Environmental Services Laboratory ensures all sampling and testing meets state and standard methods.

All analytical results are managed through an organized, traceable data system that supports reliable reporting to EGLE and internal operational decision-making. Operating with a strong culture of accountability and precision, the Environmental Services Laboratory upholds the plant’s commitment to public health protection, regulatory excellence, and environmental stewardship.





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