

## Why water isn't free

Published: May 3, 2011

Clean water fulfills an amazing number of needs. Water from the tap is frequently among the first things we use in the morning and the last thing at night. Throughout the day, clean water hydrates and nourishes our bodies. We use it to drink, cook, clean, flush toilets, launder, and water our lawns. In much larger quantities, it keeps businesses and society running smoothly and is available for fighting fires when needed.

Tap water is one of the better values in southeast Michigan. For the price paid in a typical water bill, the quality of water in terms of taste, pressure and availability can't be beat. The plentiful supply from our faucets is the result of a significant infrastructure investment made by the Detroit Water and Sewerage Department (DWSD) in the treatment and distribution system, and by local governments in their distribution systems. While the source water from the Detroit River is free, costs are incurred for chemicals, treatment, pumping, distribution system operation and maintenance, meter reading, billing and customer support services. Safe drinking water is delivered to our taps as a not-for-profit service that covers these water production expenses.

Our water infrastructure, its work force and the regulatory environment are rarely in the public eye, but a tremendous amount of work is going on to ensure water demands are met each day, particularly in summer months. This Operation Clean Water article details how DWSD and local communities work together to deliver water to our taps and enhance the quality of our lives.

### **From treatment plant to tap – delivering water is a complex process**

Five water treatment plants (WTPs) produce potable water for nearly 4 million people in 127 communities in the DWSD service area. On the highest demand day in the summer of 2010, these plants produced 928 million gallons of water that was delivered through a network of hundreds of miles of pressurized water main.

The journey our water takes from a buried intake in the river or lake through a treatment plant, and then safely through booster stations and transmission mains, to the water main that connects to a home's service lead is an underappreciated marvel. Our water infrastructure system has been continually refined for nearly 200 years to meet the escalating public health and commerce needs of our society. Today, this system pumps an average of 610 million gallons of drinking water each day delivering it to service area customers through 12,500 miles of transmission and distribution mains. A regional work force comprised of DWSD's and local communities' water departments operate, maintain and update this system to serve our needs and protect public health.

Four of Detroit's WTPs obtain water from the Detroit River and the fifth plant draws from Lake Huron. These are convenient water sources to all areas served and represent smart, shared use of local water resources.

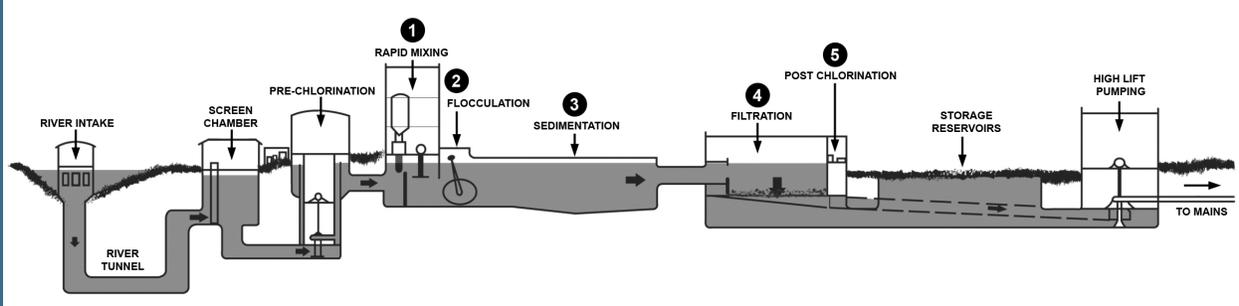


*Municipal drinking water is one of the most valuable and lowest cost utilities in your home.*



*Water is treated in one of five Detroit water treatment plants and then pumped to suburban communities who distribute it to their customers.*

## 5-Step Water Treatment Process



1. After river or lake water flows through screens to remove bulk material and fish, low lift pumping sends water to the first treatment step where rapid mixing is conducted by vertical turbine impellers, hydraulic turbulence or a pump mixing system.
2. Flocculation is a chemical process where smaller particles combine to form larger particles. Alum and other chemicals are added to form tiny sticky particles called “floc” that attract the dirt particles.
3. The dirt and floc become heavy enough to sink to the bottom of the tank during sedimentation.
4. The clear water moves on for filtration where it passes through filters to remove even smaller particles.
5. Chlorination or ozonation is used as a disinfectant to kill bacteria or microorganisms that remain before the water is sent to the storage reservoir and distribution system.

“It is logical to think Lake Huron has cleaner water to begin with since it is a larger body of water, but when you look at the data, Lake Huron source water is no easier to treat than the Detroit River,” states Cheryl Porter, DWSD Assistant Director of Water Supply Operations. “No matter the source water quality coming in, DWSD is designed to adjust treatment to meet all regulatory standards for the entire customer base – the finished water quality is the same from each plant.”

Water is produced as needed, in response to demand. “The system is designed to treat and deliver water on a continuous basis,” adds Porter. “We typically keep about a 12- to 16-hour supply of treated water in the reservoir at each plant ready to supply potable water throughout the distribution system. If demand increases, our production increases. Our Systems Control Group is constantly monitoring use in the system and letting us know how demand is changing for each of the five plants.”

Water distribution systems operate under pressure to ensure that water is constantly available and that it flows, rather than drips, from our faucets. Pressure must be balanced within a system based on what the pipe material and looping configuration can handle. Generally, older pipes require lower pressure to avoid breaks. To effectively manage pressure, districts or zones are maintained within a distribution system. Detroit maintains three pressure zones within its system. Local communities, in turn, maintain their own pressure districts within their distribution systems.

Suburban community consumption, in terms of volume and pressure, is monitored using a web-based automated master meter in a meter facility, or underground structure connecting to the local distribution system, that delivers water with an established pressure range.

“The automated meter system is one of the best technological developments that DWSD has implemented in the distribution system,” states Tim Sikma, Water and Sewer Manager for the City of Novi. “With the click of a button, we can get information on all five of our meters to see which meters are drawing the most water and what the pressures are.”

“Novi maintains four different pressure zones using pressure reducing valves (PRVs) and booster stations to control over 300 miles of 8- to 36-inch water main,” adds Sikma. “The PRVs on the two north feeds are used in combination with the meter pits to balance flow and pressure within the City. If consumption increases faster in one of the meter pits, we can adjust one of our PRVs or turn on the booster pumps in the other area to balance the water supply coming into our system. We monitor the southern area of the City in much the same way to make sure pressures remain fairly stable.”

## Guided by many workers

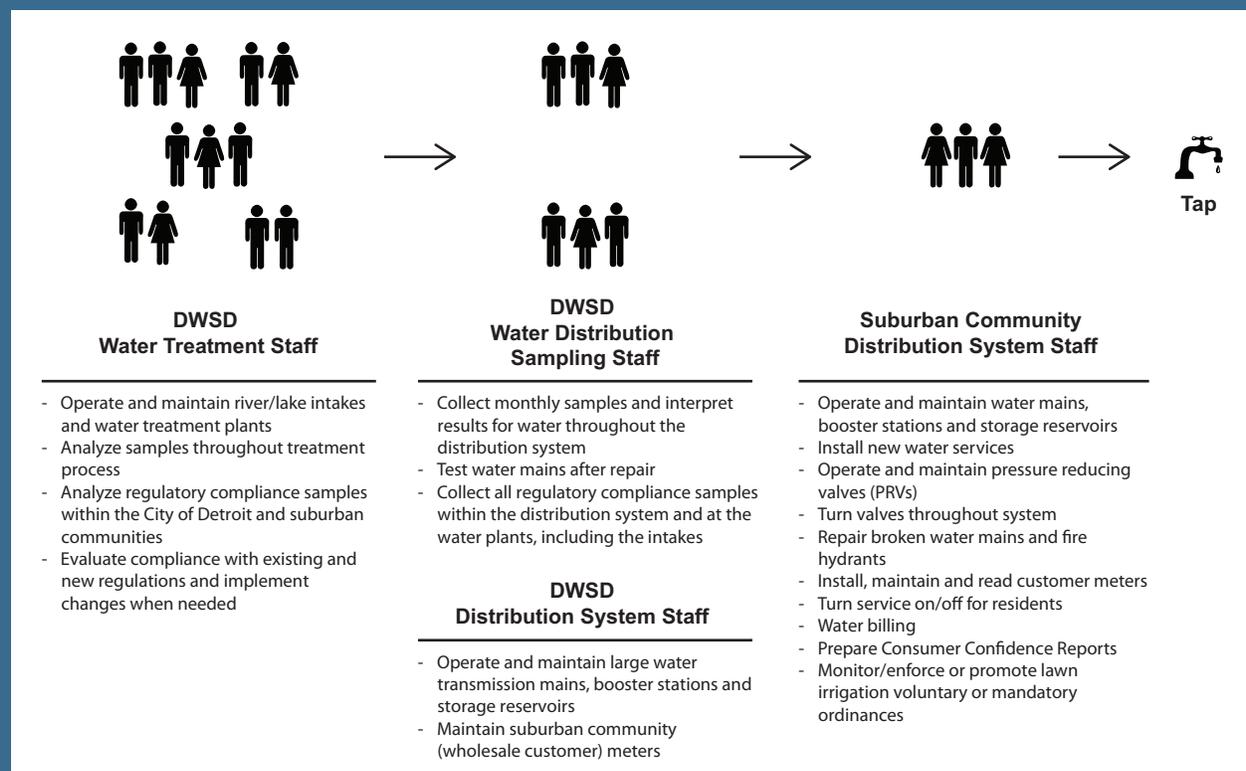
Water production by DWSD staff is a 24/7 operation 365 days a year. The 5 treatment plants, 20 booster pumping stations, 34 reservoirs and transmission mains are always in operation ready to meet demand. Three shifts of workers rotate through each plant every day to keep pace with demand. The water treatment process is turning to automation – the chemists and licensed operators work to monitor the quality of the treatment process and adjust it accordingly. A water distribution sampling team travels throughout the distribution system taking samples at customers’ taps and providing feedback to the WTPs if chlorine adjustments are needed. The Systems Control Group continuously monitors system performance and relays data to the water treatment plants to keep supply matching demand. The Maintenance and Repair and Meter Operations Groups provide additional maintenance support.

Once water crosses a meter pit and flows into a local community’s distribution system, it is entrusted to a new set of hands. For example, in Canton Township, a community with more than 90,000 residents, a staff of 12 that includes 7 licensed distribution system operators manages the delivery of water to businesses and residents.

“We have 427 miles of water main with 5 meter pits, 4,000 valves and 6,000 fire hydrants,” explains Tim Faas, Director of Municipal Services for Canton Township. “Our system includes primarily ductile iron water main that is less than 50 years old so it is in very good condition. Our water loss, or the amount of unaccounted water (water not billed to our customers), is less than 2% a year which is considered best in class. However, routine operations and maintenance keeps us busy. We exercise, or turn, all of the valves in our system on a 5-year rotating basis to increase our confidence that they will turn in an emergency situation. Fire hydrants also need to be flushed to ensure they operate correctly, have adequate flow and pressure, and are ready for winter use.”

Meter reading, billing and customer service for Canton’s 24,000 water accounts has been streamlined with technology. Faas continues, “An operator can drive through the township and download hundreds of meter readings via a radio-controlled device in the vehicle in only minutes. The 10-year-long, planned investment to install the radio-read meters dramatically reduces the effort to collect quarterly residential billing readings, but we still incur the costs to mail the bills out and process payments. We would like to expand our electronic payment options some day.”

## Workers Delivering and Safeguarding our Water



### **How community demand impacts production – from tap to plant**

Consumers create demand every time they turn on their faucets or sprinkler systems. The level of service provided to residents and businesses in the Detroit service area is dictated by the users' needs. DWSD produces the volume of water that communities request. Suburban communities deliver the volume of water that their customers use and manage their local system needs to optimize operations.

"Water consumption is impacted by the weather," explains Tim Sikma of Novi. "If we have ten days of heat and no rain, consumption really goes up. Once it rains, consumption immediately drops."

Before DWSD implemented new contracts with suburban communities for water service in 2008, communities projected their water usage each year based on the previous year's usage and any projected changes. Under the new 30-year contracts, annual water volumes and peak usage values are negotiated at set intervals. Peak usage values include the maximum amount of water that will be used on the entire system's busiest day and the maximum amount in the busiest hour between 5:00 AM and 11:00 PM on that same day. Committing to peak usage values for 2-, 3- and 5-year periods streamlines the administrative process for communities and DWSD alike.

By identifying the maximum day and peak hour demand, customers help DWSD determine how much water their plants will need to produce on the busiest day of the year and to set their operations and capital improvements budgets around that capacity. DWSD, in turn, commits to deliver these flow rates at a specific pressure range. The volumes, peak flow rates and pressure ranges are then used as the maximum conditions that DWSD must be prepared to deliver during the year.

"From a master planning and service standpoint, the new contracts are much better for suburban communities," exalts Faas. "Performance standards are detailed in the contract, customers establish their own demands at a pressure range committed to by DWSD, and conflict resolution is handled through an established process. The Technical Advisory Committee that includes 5 suburban community representatives and a DWSD representative provides the opportunity for suburban involvement in many areas."

In summer months, the demand for electricity intensifies as air conditioners work harder. Water use also increases in the summer and pumping water through the distribution system requires electricity. Thus, as electrical rates climb during peak power usage so does the cost to transport the water. Similar to DTE Energy's rate plan that gives customers a lower rate during off-peak hours, DWSD's wholesale rate formula allows customers to balance summer water consumption by increasing use during off-peak hours which reduces their peak hour consumption on the highest demand day. Suburban communities can reduce demand by moving automated water usage applications to the off-peak hours. The net effect is to balance the demands on the system and reduce pumping required during peak hours of electrical consumption.

When DWSD initiated the new contracts, the City of Troy saw the opportunity to take advantage of the savings potential and approved an ordinance that restricted the run time of underground sprinkler systems from 11:00 PM to 5:00 AM. The lower peak demand hour volume in their contract resulted in a 10% decrease in rates over the first two years of their contract or about \$500,000 annually.

"With implementation of the ordinance, we saw our peak hour of consumption move from the morning to around 3:00 or 4:00 AM," stated Rick Shepler, Troy's Superintendent of Water and Sewer. "At the same time, we saw overall sales drop with the declining economy so we adjusted the peak demand calculations in our contract again in 2010. While this further reduction of peak demand hour did not equate to another drop in our rate, it helped soften the increase and balances demand within the overall system."

Shepler continues, "Our consumption in February 2011, was the lowest month we have seen since the 1980's. Businesses and citizens are using less water. We used to buy 10 million gallons a day. Now we are buying 6 to 7 million gallons a day."

Declining or stagnating population and increased conservation are two trends that will continue to impact how we use our infrastructure. According to Chuck Hersey, Planning and Policy Leader at Southeast Michigan Council of Governments, "Reduced consumption is largely here to stay. Economic recovery in the region will take time and it may not significantly impact the level of reduced consumption that has occurred over the last five to seven years. Water, sewer, electricity and natural gas are experiencing declining usage to a level where the fixed cost of the system will have a greater impact on the individual user."

Our utilities and transportation system revenues are based on consumption. When consumption goes down, the fixed costs of operating a system are spread over a smaller base of users increasing the level of cost sharing. For some communities, this situation is compounded by a ripple effect into other public services resulting from additional loss of revenues from their declining property tax base.

**An industry marked with rising expectations and aging infrastructure**

Regulation and technology constantly impact water production and delivery. New federal and state regulations are routinely implemented requiring detailed testing to assess the performance of the treatment process and implementation of updates if new standards are not being met. Because our area has an abundant source of clean water and the treatment process is meticulously managed, the Detroit WTPs did not have to implement changes to meet the Long Term Surface Water Treatment Rule.

Public health data can also initiate changes in the treatment process. The Centers for Disease Control and Prevention recently recommended reducing the amount of fluoride added to water to promote dental health since we are getting fluoride from other sources now.

Aging infrastructure needs to be upgraded as it nears the end of its useful life and current technologies incorporated into the treatment process. With the exception of Water Works Park II, DWSD’s WTPs can benefit from newer technology. Distribution mains and pump stations also need rehabilitation in older communities.

“Our water resources are connected. We all drink from the same valuable resource – it is just accessed in different ways” according to Tony Drautz, Administrator of Environmental Health for the Oakland County Health Department. “Infrastructure is a component of our ability to access and safeguard water resources – we need to protect and invest in our water supply and sewage collection systems. Continued investment in rehabilitation and maintenance for our water systems keeps our drinking water safe.”

**The value of clean water**

A reliable, safe drinking water supply brings tremendous value to a community. While it is hard to see in these economic times, water supply does positively impact our property values like sewer service, roads and schools. Water is a shared resource that must be used wisely and protected for future generations.

Our views about the value and price of water can be conflicting. Bottles of water are purchased at costs ranging from \$1.16 to \$8.00 per gallon while the water from our tap runs around \$0.03 per gallon. Because water is a public service, it is openly discussed unlike the rate increase notice that is quietly slipped into our cable bill. Next time you get your water bill, compare it to all the other expenditures that keep your household running. Your water bill is likely to be the lowest expense in the pile.

**Monthly Utility Expenses for Three Households in Detroit Metropolitan Area**

Utility	2-person household	3-person household	4-person household
Phone	30%	27%	28%
Cable/Internet	24%	27%	20%
Electric	10%	15%	22%
Gas	18%	19%	16%
Water/Sewer	15%	9%	12%
Trash	3%	2%	2%
<b>Total expense</b>	<b>\$504.21</b>	<b>\$606.38</b>	<b>\$618.03</b>

*Like other utilities, water charges vary based on use and local service providers. Because water is frequently billed on a quarterly basis to reduce administrative costs of meter reading and postage, the costs can seem higher than they really are compared to other utilities. This is particularly true when the third quarter bill arrives with outdoor summer water usage. Drinking water typically costs about half as much as sewer service because wastewater requires a higher level of treatment.*

Operation Clean Water features articles on how DWSD and its suburban wholesale customers manage our water and sewer infrastructure to protect public health and the environment. It was created by the DWSD Wholesale Customer Outreach Public Education Work Group that includes individuals from wholesale customers (Macomb, Oakland and Wayne Counties), DWSD, MDEQ and SEMCOG and consultants, and is published on the DWSD Customer Outreach Portal at [www.dwsdoutreach.org](http://www.dwsdoutreach.org).