Water Treatment

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The modern science of creating safe drinking water varies from one community to the next. But the fundamental concepts date back to ancient Rome.

Toledo actually benefits from geography more than most communities. Several hours pass from the time raw Lake Erie water is drawn into the city's intake crib and it reaches the Collins Park Water Treatment Plant. That's important, operators say, because it gives them time to pretreat the water before it arrives at the main facility for full treatment.

It's not all about how many chemicals are added along the way: Contact time also makes a difference.

Once that partially treated water arrives at the plant, a series of steps are taken over several more hours before the water is clean enough to come out of your faucet.

First, operators try to get the big stuff — the particles — out. That removes a lot of the algal toxins right off the bat, including microcystin.

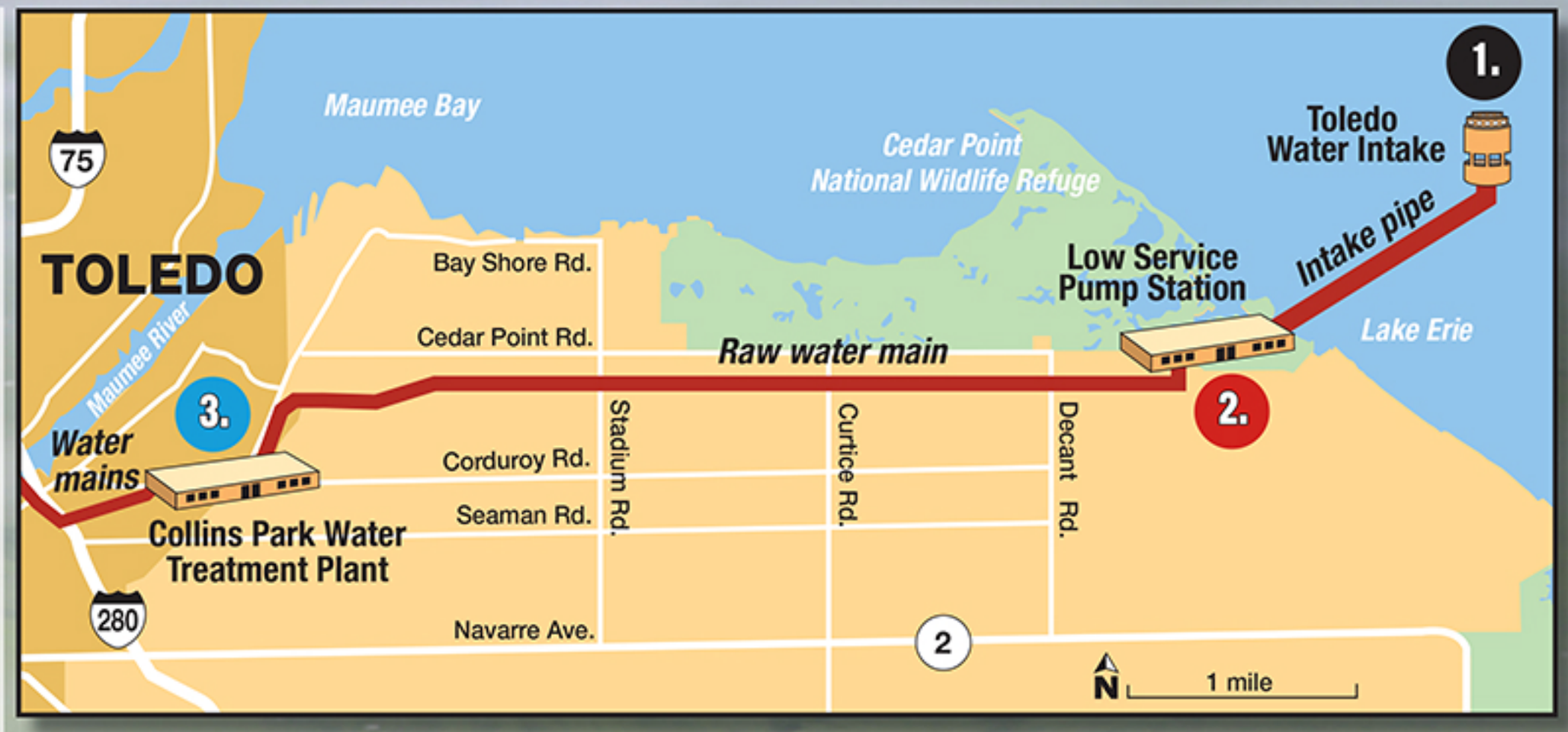
Chemicals such as alum help particles bind together and settle to the bottom. That clumping action is enhanced by paddles that gently stir slow-moving water like spoons mixing cake batter — not too fast and not too slow.

Once the big stuff's removed, the water is filtered, removing even finer particles.

Adjustments are made to the water chemistry along the way.

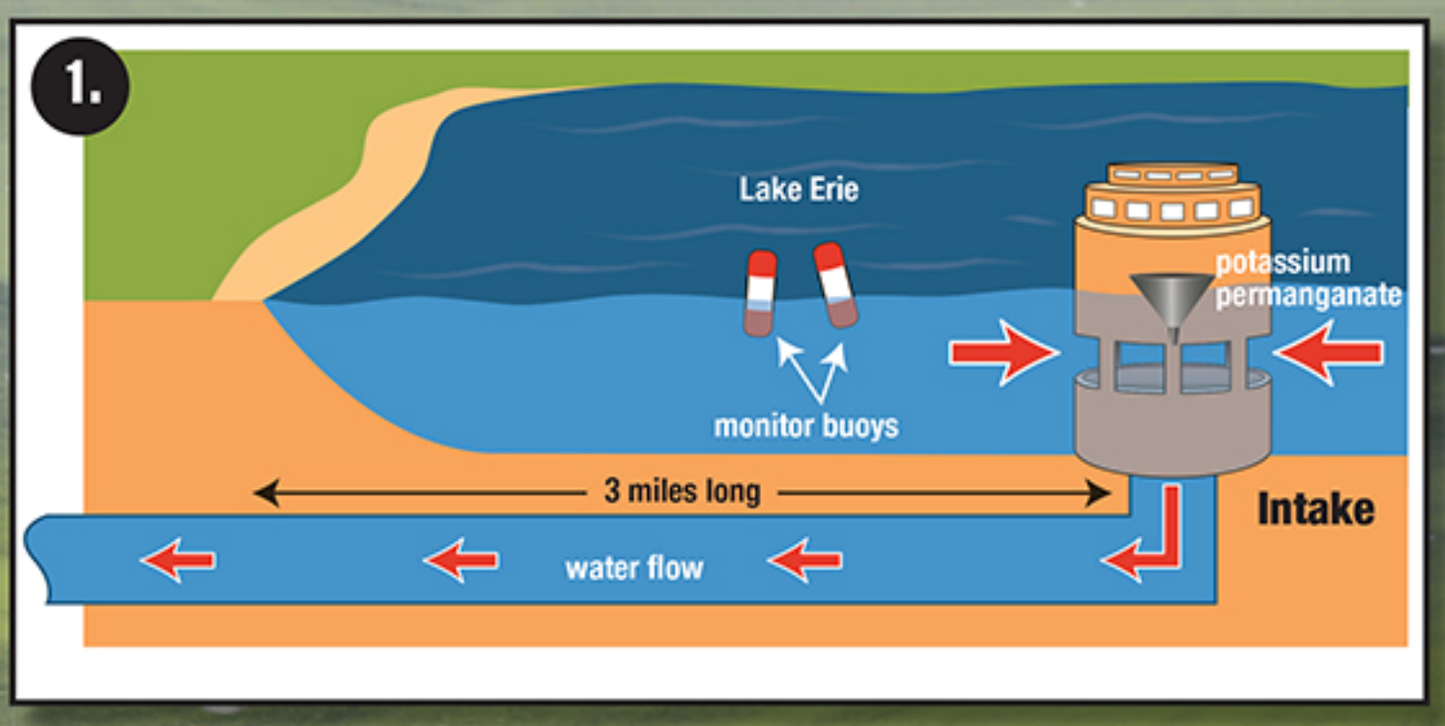
Toledo's current water-treatment operation at the Collins Park Water Treatment Plant is 74 years old. It was dedicated by President Franklin D. Roosevelt.

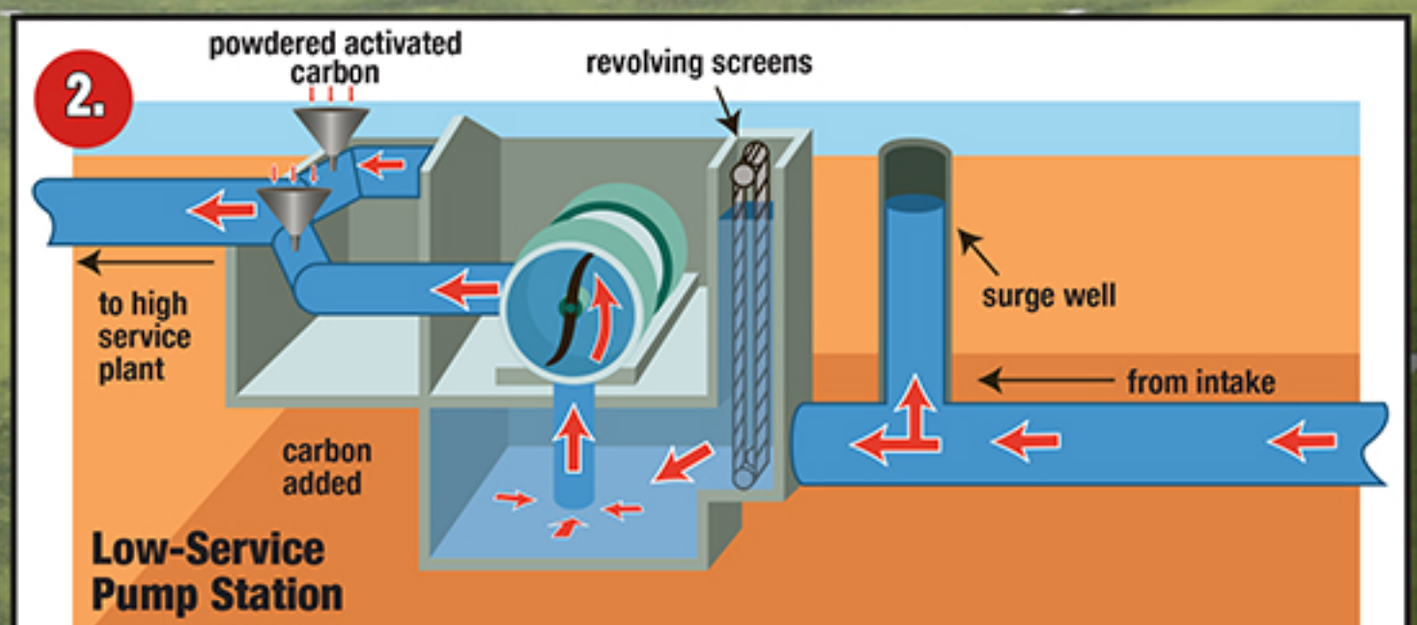
But, as Ed Moore, Toledo's public utilities director, told councilmen on Aug. 4, 2014 — the day last year's Toledo water crisis ended — it doesn't matter if it's a two-year-old plant or a 200-year-old plant. The source of the problem — the nutrients that grow algae in western Lake Erie — need to be reduced.



1. Water Intake

Raw Lake Erie water is drawn into the city of Toledo's water-intake crib three miles offshore, in Lake Erie's Maumee Bay. The water is drawn well below the surface, pretreated with potassium permanganate, and sent to the city's low-service pump station onshore. Buoys and sensors give operators more time to adjust treatment this year.





2. Low-Service Pump Station

The low-service pump station's main purpose is to move the raw lake water along to the Collins Park Water Treatment Plant for full treatment. While at the low-service pump station, powdered activated carbon is added into the water. It's important to note those two pretreatments — potassium permanganate and powdered activated carbon — make it much easier for the city to clean and disinfect the water when it reaches the Collins Park Water Treatment Plant because of the hours of contact time before it gets there.

3. Collins Park Water Treatment Plant

The Collins Park Water Treatment Plant in East Toledo is where most of the action occurs.

Alum is added to water when it first enters the plant to help particles bind together. That's called "flocculation."

Getting particles to bind together helps operators remove a lot of toxin from the water because it settles out.

Lime, soda ash, polyphosphate, chlorine dioxide, chlorine, carbon dioxide, and fluoride are added at various stages of the process, as is carbon. Each of them plays a role in softening, improving taste, removing odors, cleaning, and disinfecting the water.

Once particles are removed, the water is filtered before ending up in a 70-million-gallon underground reservoir, where it sits for several hours to give the chlorine more time to ensure the water is disinfected.

Massive pumps in another building, known as high-service pumps, are the plant's workhorses. They push the finished water out to the public water lines with incredible force. The water then passes through a network of pipes that lead to homes in the Greater Toledo area.

BLADE GRAPHIC

Chemicals at work

Here is a list of chemicals added to the city's water and the function they perform in water treatment.

Aluminum sulfate (alum): coagulation and algal toxin removal
Lime and soda: softening (removes hardness)
Polyphosphate: corrosion control
Potassium permanganate: zebra mussel control
Powdered activated carbon: taste and odor control and algal toxin removal
Chlorine: disinfection and algal toxin removal
Chlorine dioxide: disinfection
Fluoride: dental health
Carbon dioxide: helps stabilize water to prevent pipe damage