



Hendersonville WTF

Plant Spotlight: City of Hendersonville Water Treatment Facility

By Ricky Levi Water Treatment Facility Manager, Keith Kirchner, Chief Operator & ORC and John Rutledge, W.K. Hile Company, NC AWWA-WEA Plant Operations & Maintenance Committee

General

The Hendersonville Water Treatment Facility (WTF) is publicly owned by the City of Hendersonville and serves a population of approximately 70,000. It is located in Henderson County, inside the Town of Mills River, about 20 miles south of Asheville.

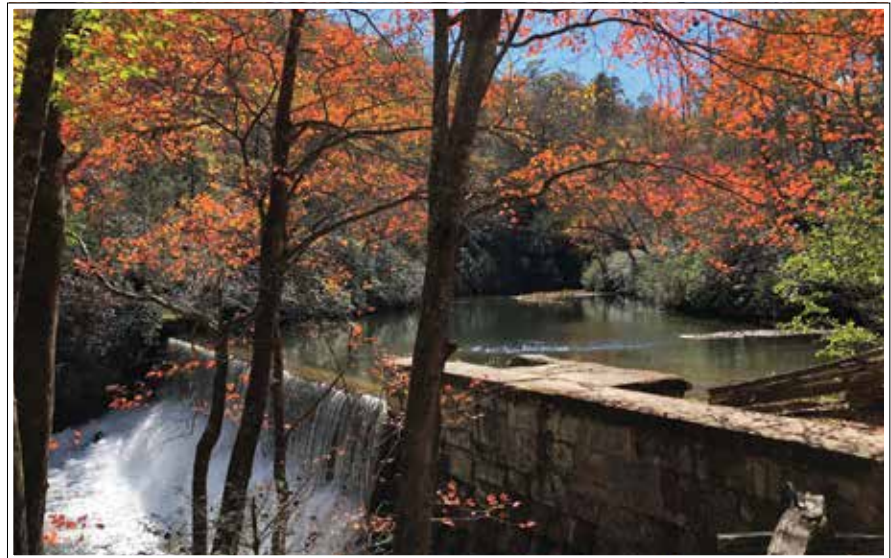
Hendersonville Water Sewer operates the WTF. The distribution system includes 653 miles of water line and 21 ground storage tanks with a total capacity 16 MG of storage. It also includes 32 hydro stations and a combination of 130 water and wastewater pump stations.

History

The plant was completed in 1965. At that time, it included two filters, two sedimentation basins and a production capacity of 3 mgd. In 1980, the WTF expansion included two additional filters and two sedimentation basins to increase the production capacity to 9 mgd. In 1990 the plant was expanded from 9 mgd to 12 mgd. This expansion included renovating the raw water river intake and providing variable frequency drives (VFD) on the raw water pumps.

A \$20 Million total plant renovation in 2010 included a new basin, additional office space, labs, HVAC system and new supervisory control and data acquisition (SCADA) system. In addition to this, the existing paddle wheel flocculators were replaced with vertical turbine flocculators along with other equipment upgrades and improvements.

In 2019, a renovation of the finished water pump station was completed. This included four new pumps (two 600 hp and two 450 hp). VFDs were also included in order to improve the pump efficiency and lower power costs. There are plans in the



North Fork Falls

near future to upgrade the plant to 15 mgd.

The current design flow is 12 mgd with an average daily flow of 7.5 mgd and a maximum daily flow of 8.5 mgd.

Process Flow Components

- Raw water reservoirs and pump intakes
- One rapid mix basin with chemical injection
- Five flocculation basins
- Five sedimentation basins
- Four dual cell multimedia filters
- One chlorine disinfection system
- One chlorine scrubber
- One centrifuge
- Two sludge thickening clarifiers
- One clearwell with a capacity of 2 mgd

The plant is a conventional surface water treatment facility and consists of an east side and a west side. The process has four main steps: coagulation, sedimentation, filtration and disinfection.

The first process, coagulation, is accomplished when positively charged chemicals are introduced to the raw water and mixed at the rapid flash mix basin. Since the raw water has a negative charge, this causes small particles to cling to each other to create larger, heavier particles.

In the second process, sedimentation, these heavier particles settle out in the sedimentation basins and are later disposed of through the wastewater treatment facility.

Third, the water then flows through multimedia gravity filters, which remove the remaining particles. Once the filters become dirty from particles, they are backwashed in order to remove the particles and any other debris that may have accumulated.

Finally, chlorine is added to disinfect the water to ensure it is safe to drink when it reaches the tap.



New Finished Water Pumps



Chemical Feed Pumps

Water Sources

The raw water supply is provided from three different sources, two of which are located in the Pisgah National Forest and one is located on the Mills River. The two intakes found in Pisgah National Forest are located on the North Fork of the Mills River and Bradley Creek and are both gravity fed. They provide approximately 4.5 mgd to the WTF under normal operating conditions. The balance of the raw water is pumped from an intake located on the main stem of the Mills River. The City is currently developing a fourth source of raw water on the French Broad River approximately 2 miles from the treatment plant.

Sedimentation and Filter Operation

The WTF consists of two separate sides: an east side and a west side. Each side includes a quantity of two sedimentation basins and two dual-cell filters, each rated at 6 mgd. The sedimentation basins are manually cleaned twice per year to remove the accumulated solids from the basins. An air scour backwash is initiated at the end of each filter cycle.

The pipe and filter gallery instrumentation includes filter effluent turbidimeters, chlorine residual analyzers, filter effluent flow meters, and control valves. From the SCADA System, a backwash can be initiated. In addition to this, a manual backwash can be initiated from the filter consoles.

Chemical Feed and Disinfection System

Coagulation is achieved through the addition of polyaluminum chloride (PAC) at the flash mixing basin. Immediately downstream of the flash mix basin, a Chemtrac streaming current analyzer is used to monitor changes in water quality in real time. These changes may be due to increases in turbidity, solids, or organics. When these changes occur, the operators can use this data from the streaming current analyzer to make chemical dosage adjustments in order to optimize chemical use and cost.

Sodium bicarbonate is fed for alkalinity and fluoride is added for dental health. Corrosion protection (orthophosphate blend) is added for lead and copper protection.

Chlorine gas is injected into the filtered water for disinfection and then sent to the clearwell for additional contact time, which produces the required 2.0 ppm residual. The high service pumps then pump the water from the clearwell to the distribution system according to demand. Through proper monitoring, tank turnover, distribution system maintenance and flushing program, the staff are able to maintain proper chlorine residual without additional chlorination within the system. A chlorine scrubber is on standby in the event of a chlorine leak.

Solids Treatment

The solids treatment process consists of the following:

- Two clarifiers for thickening alum sludge
- Centrifuge and polymer feed system to dewater the solids
- Landfill disposal used for alum sludge

SCADA System and Controls

The WTF is fully automated and utilizes a SCADA system to monitor the plant, water storage tanks, pump stations and distribution system. The SCADA system consists of Rockwell “Factory Talk” human machine interface (HMI) software and a communication network that incorporates Allen-Bradley programmable logic controllers (PLCs). The remote sites are monitored and controlled via radio.



Filter Pipe Gallery



Chlorine Scrubber



Filter Consoles

Plant Staff and Certifications

The WTF currently employs a total of 12 plant personnel. This includes nine Operations and Maintenance staff, one laboratory staff and two administrative staff. The staff operates the plant 24/7 with three shifts. Each shift consists of three operators.

Certifications include:

- Surface water treatment
- Physical chemical waste water
- Back flow
- Distribution
- Collections
- Biological waste water
- Lab

Awards

Plant awards include:

- Area Wide Optimization Program (AWOP)
- Water Taste Test

Future Plant Improvement Projects

Some of the planning for the near future includes:

- Plant capacity upgrade to 15 mgd. This will include the addition of another filter.
- Additional raw water intake at the French Broad River.

Plant Challenges

The plant pumps water directly off of the river, so it can experience a wide variation of turbidity, especially during rainstorms. The plant deals with this through well-trained operators, quality chemicals and multiple sources that can be used to blend or turn on and off. Additional back up includes instrumentation, chemical feed systems, and other backup procedures in case of system failures that could cause the operators problems.

Unique Operations

The WTF operates 24/7 and is the call center for after hours and weekends for the entire water and wastewater system. This includes dispatch as well as customer service. In addition to this, the operators monitor approximately 130 water and wastewater sites using the SCADA system.

The raw water is taken directly off of the river as well as having multiple sources. The staff also maintains 15 miles of raw water transmission lines and impoundment/dam areas. In addition to this they maintain two 5-million-gallon finished water storage tanks and its facility.

For additional information, please contact:

Ricky Levi – Water Treatment Facility Manager
 4139 Haywood Rd., Mills River, NC 28759
 Phone: (828) 891-7779
 E-mail: rlevi@hvlnc.gov



Staff, 1st Shift, August 2019



Staff, 2nd Shift, August 2019



Staff, 3rd Shift, August 2019