Somersworth Water Treatment Facility

- Since 1895, the Somersworth Water Treatment Facility has provided its customers with safe, clean & affordable drinking water
- The sophistication and short hydraulic retention time of the new facility enables operators to observe each part of the process in action, affords greater flexibility in operation, and provides the capability to treat the water to a much finer degree
- In addition to over 12,000 residents, many commercial and industrial users depend on Somersworth water including Velcro USA, General Electric, and several medical centers
- We have been featured in numerous trade publications, engineering case studies, and our local newspapers

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History and Overview

The City of Somersworth Water Treatment Facility is a sophisticated NH Grade III surface water treatment plant nestled in a quiet woodland alongside the Salmon Falls River occupying 3 acres of a 26 acre recreational parcel.

Water is drawn from the Salmon Falls River which has for its headwaters Milton Three Ponds in Milton, NH, and Little River & Long Swamp in Maine. The river forms the border between New Hampshire and Maine.

The original building dates from 1895 and housed a pumping station for a slow sand filtration bed and chlorinator. Circa 1915 Somersworth became the first community to start using chlorine to disinfect the drinking water.

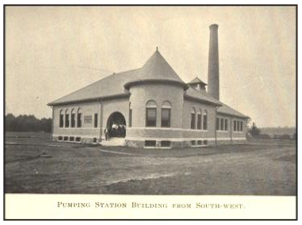
In 1970 a Trident conventional clarification and filtration system was installed. In 1990 an addition was built to house a Microfloc Upflow Clarification system with two multimedia filter beds.

As peak demand increased and exceeded our existing finished water pump capacity, a new high-lift pump station was built in 2001.

To address more stringent regulations and demand, pilot studies and planning for a new treatment process began in 2005. The upgraded facility was engineered by Wright-Pierce and built by Methuen Construction at a cost of $7 million. The historical characteristics were preserved throughout the project, and all modification were performed on a continually operating system.

Renovation was completed in May 2008. Installation of a Kruger Actiflo Ballasted Microsand Clarification System, and four US Filter/Siemens multimedia filter beds comprised the primary modifications. Additional construction included 3 new lagoons, a new clearwell/chlorine contact tank, pipework for a raw water equalization tank, and structural modifications.

The 1895 plant as seen today (above) and yesteryear (below)



Features

- Improved TOC Removal to meet LT2ESWTR
- Improved Disinfection Regimen to meet Stage 1&2 DBP (TTHM & HAA5)
- Improved Sludge Handling and Dewatering
- Meet Deactivation for Viruses, Giardia and Cryptosporidium
- Improved Customer Acceptance of Water Supply (decreased taste and odor)
- Increased Plant Capacity from 3 MGD -> 6 MGD
- Integrated cutting edge technology – in an 1895 environment
- Historic Preservation
- Enhanced Organic Removal
- Clarification & filtration upgraded
- Chemical feed system upgraded
- SCADA Integration
- Lagoons & Equalization Basin
- Chlorine Contact Tanks

View of the hydrocyclones from atop the Actiflo system (above) and the front of the system from the process floor (below)

"Process and control-wise, it's the most sophisticated in the area."

-Fosters Daily Democrat, May 10, 2008

Process

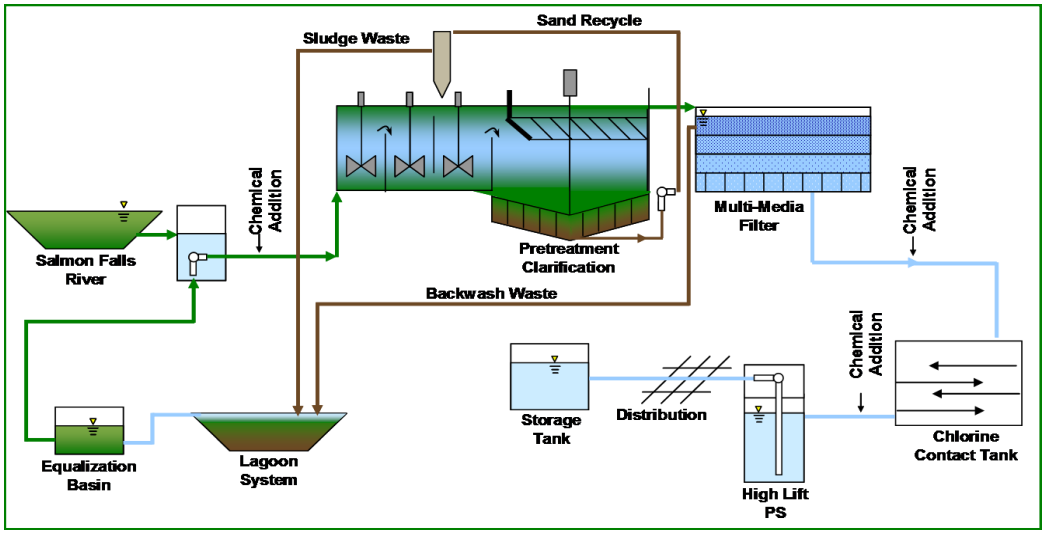
Raw river water is blended with lagoon effluent, filter waste, and pretreatment discharge in a 1.2 million gallon equalization basin. Potassium permanganate is applied for pre-oxidation of iron, manganese, and organic compounds.

The conditioned water is then processed by two parallel Kruger Actiflo clarification trains where soluble compounds are destabilized and colloids & solids are removed. Aluminum sulfate, sodium hydroxide, powdered activated carbon, anionic polyelectrolyte aid, and microsand clarify the water by coagulation, flocculation, and sedimentation to less than 1NTU and 3ptcu.

Four multimedia anthracite/garnet/silica filter beds polish the water to typically 0.040NTU with a TOC removal exceeding 65%. Chemical optimization has extended filter runtimes to over 48 hours per backwash during peak flow and source quality extremes. Resultant TTHM & HAA5 concentrations are well below the MCL.

For final treatment we inject sodium hypochlorite for disinfection and caustic soda with blended phosphate for corrosion control and lead/copper sequestration.

After adequate contact time in two underground clear-wells, finished water is pumped into the city's distribution system and stored in a pair of one million gallon standpipes, ready to flow to every open tap and hydrant!



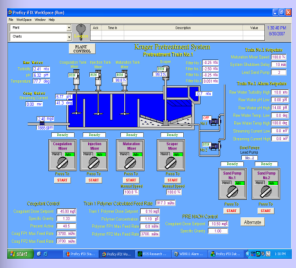
Operations & Maintenance

Three full-time treatment operators maintain and manage the continually running facility, including nights and weekends.

Our highly skilled staff perform all process and chemical adjustments; electromechanical facility work; motor and pump repair; plumbing; lab analysis and sampling; lagoon management; instrumentation maintenance, calibration and repair; and programming and technical maintenance on SCADA, logic controllers, and PC workstations.

The facility is controlled by a full-featured logic system called SCADA. Operator interface terminals and workstations provide a graphical and intuitive interface to core systems. All process adjustments and water quality parameters are performed and recorded in real time. Operators remotely access and monitor the facility and respond to any alarms or emergencies.

A staff of three water department distribution mechanics, DPW employees, and contractors assist with facility upkeep and field maintenance.



Screenshot of one panel of the plant control interface

Drinking Water Quality

Federal regulation of drinking water quality began in 1914, when the U.S. Public Health Service set standards for the bacteriological quality of drinking water.

The Safe Drinking Water Act (SDWA) became law in 1974, and was significantly revised in 1986 and 1996. The revisions reflected improvements in analytical methods to detect contaminants at lower levels and improvements in automated monitoring used to evaluate treatment plant performance. The revisions also started to address the need to balance immediate (acute) risks versus long-term (chronic) risks. The need to disinfect water to kill pathogens to protect against acute illnesses, versus the formation of disinfection by-products and their chronic health effects is an example of this risk balance.

Somersworth is continually refining and advancing water treatment techniques in response to new regulations and our duty to provide safe and clean water for our customers.

Our raw river quality fluctuates seasonally, with daily swings in turbidity and color from 1.5NTU to over 20NTU and 40ptcu to 400ptcu; TOC from 3-14mg/l; and pH from 5.5 to 6.5. This makes our source one of the most challenging to treat and why it was selected by PALL Corporation to test nanofiltration membranes.

Finished water production averages 2.5 million gallons per day with a 6MGD (9MGD max) capacity and typically enters the distribution system at less than 0.070NTU, 0ptcu, <2.7mg/l TOC, 7.3 pH, 1.10 mg/l free chlorine, and a hardness of 7-15 mg/l (very soft).

We monitor and test for the following parameters:

pH, conductivity, Color, Turbidity, Total Organic Carbon

Coliform, Cryptosporidium

DBPs (TTHM & HAA5)
Lead and Copper

Iron, Manganese, Nitrates

Birds-eye view of one of our four multimedia filters

The small footprint of the Kruger Actiflo system and Siemens multimedia filters can process in 20-60 minutes the equivalent water volume a traditional system ten times larger produces over four to six hours.

Equipment

Mechanical equipment includes two 200hp and two 100hp high lift finish pumps, two 35hp raw water pumps, six Philadelphia coagulation/flocculation/maturation mixers, four sand/slurry pumps, 10 VFDs, and four hydrocyclones for sludge shearing and sand reclamation.

Secondary systems include a polymer make-up and dosing unit, backup generator, fiber networked PLCs and full SCADA with multiple workstations.

Chemical feed systems include LMI positive displacement pumps, Masterflex peristaltic metering pumps and bulk tanks with transducers.

Instrumentation includes an online TOC analyzer, turbidimeters, pH and chlorine analyzers, and level transmitters.

Our laboratory is equipped with a bench-top turbidimeter, spectrophotometer, incubator, BOD/COD and TTHM reactors, and autoclave. An ample inventory of instruments and reagents enables us to analyze, jar test, and pilot new techniques in the pursuit of excellence in treatment.

Factoids

The Hamilton Street standpipe at the Noble Pines park is the oldest in New Hampshire.

Erected in 1895 with rivet construction, the free-standing tank reliably served as the only storage tank in Somersworth until Rocky Hill tank was built in the 1970s. At that time, Hamilton's top cover was finally installed.

The original distribution system was built and owned by Great Fall Manufacturing Company. Some pipe-work is over 100 years old and is made of unlined cast iron, asbestos-cement, ductile iron, or plastic.

The Water Department maintains a well-field which had once been the sole source of water for the City.

We are routinely engaged in research collaboration and pilot studies with other departments and agencies including the University of New Hampshire, the U.S. Military, PALL Corporation, and neighboring utilities.

Construction of the Hamilton Street standpipe

City of Somersworth

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Water...At your service.

The Somersworth Water Treatment Facility is a secure, sanitary, safe, and efficient workplace responsible for supplying potable water for consumption and fire protection.

Our pride is the production of safe and aesthetically pleasing drinking water in compliance with the Safe Drinking Water Act, US EPA regulations, and NH DES regulations.

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