Water Recycling

"Dedicated to creative, responsive, quality solutions for those we serve."

Planning and Design of an Award-Winning Water Recycling Facility for the Napa Sanitation District

Carollo completed reuse planning and design of a $52 million water recycling facility for the Napa Sanitation District.

Carollo first began working for the Napa Sanitation District (NSD) in 1982 with a study of required wastewater treatment plant modifications and the viability of wastewater recycling. This study's major purpose was to evaluate alternative sites and outline facilities necessary to develop a recycled water program using wastewater effluent for agricultural irrigation. Following the study, Carollo designed water pumping and transmission facilities to deliver recycled water to ranches for pasture irrigation.

Carollo then completed a facility plan and designed a 10-mgd tertiary water recycling facility for NSD. Effluent from the new facility is discharged to the Napa River during the winter months and recycled for California Title 22 unrestricted irrigation uses during the summer months.

Phase 1 of the project, completed in 1996, includes tertiary filtration, sodium hypochlorite chlorination, and bisulfite dechlorination. Tertiary treatment for recycling includes three-stage flocculation; a 2,000-foot, 4-cell upflow continuous backwash filtration system; a two-hour chlorine contact basin; and a two-cell, 20-acre-foot recycled water storage reservoir. Recycled water is pumped using three high-pressure vertical turbine pumps that each pump up to 8 mgd at pressures exceeding 140 psi. Each pump is fitted with a high-efficiency 600-hp motor. The pump station includes a cost-effective "pump can" wet well design and a valving and flow metering structure which is used to divert and meter recycled water to the "north" and "south" distribution systems.

Energy management was a key concern in design. The system includes a 10,000-gallon hydropneumatic surge tank that is used to deliver flow demands less than 1 mgd. For flow demands greater than 1 mgd, the pumps are speed controlled through VFD drives. A control system sets the pump speed based upon the flow meter reading and a pressure set point algorithm.

The recycled water delivery system is designed to pump recycled water to pasture land, golf courses, airport runway boundaries, local parks, business parks, and vineyards. Upon full implementation, over 2 billion gallons of Title 22 unrestricted use recycled water will be recycled each year.

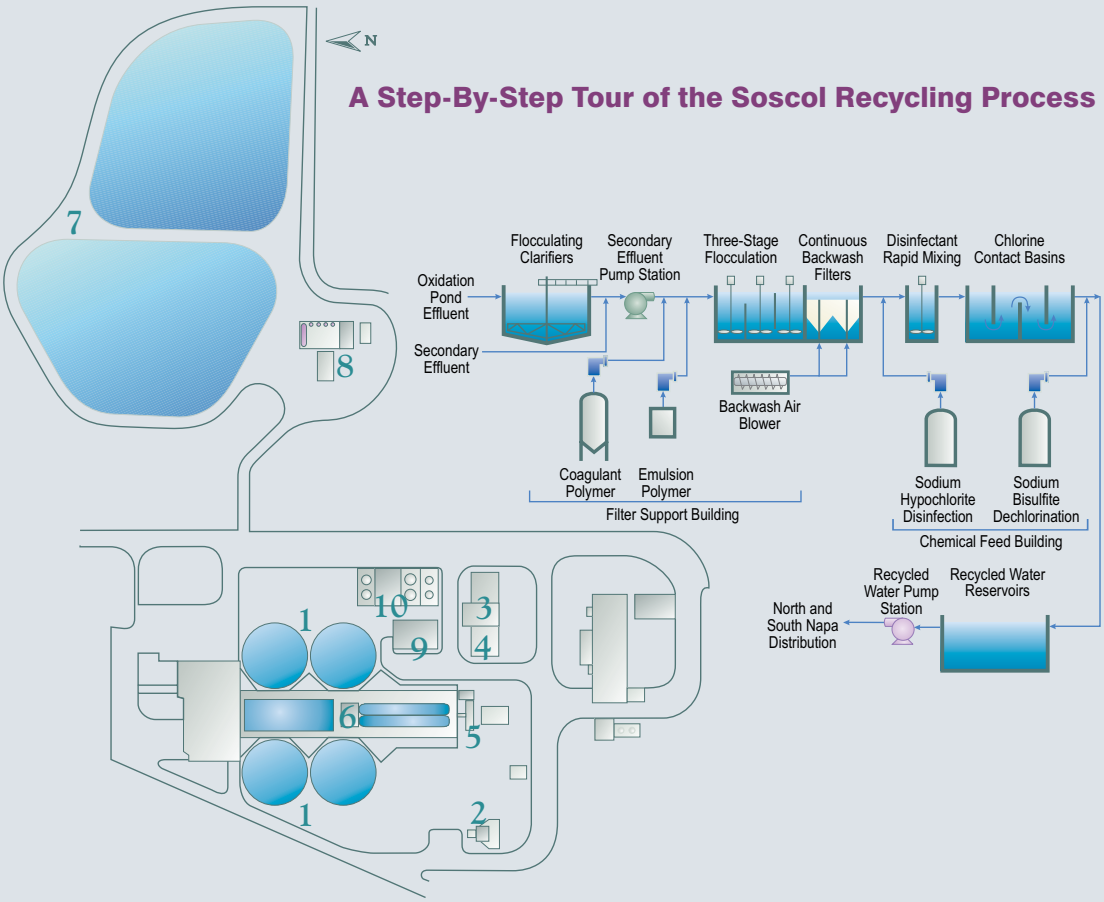
As part of this project, Carollo helped NSD to develop an effective way inform/educate plant workers and the public on the rules and regulations governing the production and use of recycled water. Carollo produced a recycled water educational video which addresses three different and important issues: basic worker training, recycled water marketing to potential customers, and public education.

Highlights

- 10-mgd water recycling facility.
- California Title 22 unrestricted reuse.
- Cost-efficient distribution pumping.
- 20-acre-foot recycled water storage reservoir.
- Winner of the Water Reuse Association's 2000 Project of the Year Award.

Carollo's design of water recycling facilities for the Napa Sanitation District features cost-efficient distribution pumping and a 20-acre-foot recycled water reservoir.

A Step-By-Step Tour of the Soscol Recycling Process



1. **Flocculating Clarifiers**. Up to 150 parts per million of total suspended solids enter the recycling process. Algae removal begins in the flocculating clarifiers.
2. **Secondary Effluent Pump Station**. Clarified oxidation pond effluent and secondary effluent flows to the secondary effluent pump station where it is lifted to the flocculation basins. Three 100-hp pumps, each capable of moving 10 mgd, are used.
3. **Flocculation Basins**. Prior to filtration, more polymers are added and the water is gently stirred in three consecutive flocculation basins. This conditions the remaining solids so they can then be readily removed through filtration.
4. **Continuous Backwash Filters**. In the filters, water passes through two meters (about six feet) of sand, removing the remaining algae solids. To keep the filters clean, air is used to continuously lift, agitate and wash the sand.
5. **Disinfectant Rapid Mixing**. Sodium hypochlorite disinfectant is added to the filtered water to destroy harmful bacteria. This liquid chemical is a stronger version of common laundry bleach.
6. **Chlorine Contact Basins**. The chlorinated water is allowed to sit for two hours in chlorine contact basins to ensure maximum bacteria reduction.
7. **Recycled Water Storage Reservoirs**. High-quality recycled water is stored in two 3.3 million-gallon reservoirs for a short time prior to distribution and reuse.
8. **Recycled Water Pump Station**. The recycled water pump station delivers the water to customers throughout the southern Napa Valley. The pump station uses three 600-hp pumps to distribute the water at pressures of up to 150 psi. A control sets the pump speed so that the pressure does not exceed that required to deliver the water at any given time. This energy management system results in thousands of dollars of power cost savings each month.
9. **Filter Support Building**. Air blowers used for cleaning the filters, and polymer pumping systems which aid in clarification and filtration, are contained in the filter support building.
10. **Chemical Feed Building**. Disinfection and dechlorination chemicals and pumping systems are located in the chemical feed building. For safety, chemical storage tanks and pumps are isolated by spill containment basins.