



The City of Petaluma's Ellis Creek Water Recycling Facility, operated and maintained by the City's Department of Water Resources and Conservation, provides 24/7 wastewater service to Petaluma's residents and businesses. Highly treated wastewater is achieved through a unique combination of conventional wastewater treatment processes and natural wetland treatment processes. Recycled water produced by the facility is used for irrigation of golf courses, a vineyard and agriculture.

**1. COLLECTION SYSTEM**

Wastewater from homes, businesses and industrial facilities is conveyed to the Ellis Creek Water Recycling Facility through a network of 200 miles of underground pipeline. Most of the pipes slope downward to allow the wastewater to flow by gravity. For areas where gravity cannot be relied on, the wastewater is pumped by nine pump stations located strategically throughout the system. The system of sewers must be continually cleaned, maintained, repaired and occasionally replaced in order to transport the 2 billion gallons of wastewater that flows to the facility each year.

**2. PRETREATMENT**

After entering the plant, wastewater passes through bar screens where large objects such as rags, sticks, and bottles are removed. Screenings are disposed of in a landfill. The wastewater then continues on to the grit chamber where grit (sand, gravel, coffee grounds, eggshells and hard-shelled seeds) is removed. The grit is washed and dewatered prior to disposal in a landfill. Removal of screenings and grit helps protect mechanical equipment and pumps from abnormal wear and damage, and prevents pipes from getting clogged. After grit removal, the wastewater flows through a Parshall flume where the flow volume is measured and recorded.

**3. BIOLOGICAL TREATMENT - OXIDATION DITCHES**

Next, the wastewater flows via gravity to two large, oval-shaped oxidation ditches, each with a capacity of 3 million gallons and a side water depth of 14-feet. Each basin has 10 disc aerators that circulate the wastewater and add oxygen. In the ditches, millions of beneficial microscopic organisms, commonly called "bugs" by plant operators, break down and feed off dissolved organic wastes and material in the wastewater. As the "bugs" consume the organic material, they grow and reproduce. This process takes about 17 hours.

**4. SECONDARY CLARIFIERS**

Gravity conveys the wastewater to the secondary clarifiers, which include two, round concrete basins with a water depth of 14-feet and are 125-feet in diameter. Rotating blades skim material that floats (scum) from the water surface, and scrape material that settles from the bottom of the tank. To maintain an adequate population of "bugs" in the oxidation ditches, a portion of the settled solids are returned to the oxidation ditches, and the remainder is sent to the solids handling system for processing. Liquid wastewater is sent to either the oxidation ponds or the tertiary filters.

**5. OXIDATION PONDS**

A portion of the wastewater from the secondary clarifiers flows via gravity to the oxidation ponds. The oxidation ponds comprise an aerated lagoon and eight oxidation ponds. Algae growth in the ponds aids in the further degradation of organic matter and nutrients, and the removal of metals. The oxidation ponds also provide storage for the recycled water system. They also support a wide range of wildlife including Canada geese, swans, and pelicans.

**6. TREATMENT WETLANDS**

The treatment wetlands include 30-acres of densely vegetated wetlands. These wetlands remove algae from the wastewater by shading the wastewater from the sun and preventing photosynthesis from occurring.

**7. DISINFECTION**

Sodium hypochlorite is used to disinfect the treated wastewater that is then pumped to the polishing wetlands, discharged to the Petaluma River or recycled for agricultural irrigation.

**8. POLISHING TREATMENT WETLANDS**

The polishing treatment wetlands cover 30-acres and include four wetland treatment cells that comprise densely vegetated wetlands and open water bodies. The polishing wetlands provide additional nutrient and metals removal. The highly treated wastewater is discharged to the Petaluma River, recycled for agricultural irrigation, or sent to advanced treatment.

**9. ADVANCED TREATMENT**

A portion of the secondary flow from the secondary clarifiers is diverted to the advanced treatment plant where highly treated recycled water is produced through tertiary filtration and ultraviolet disinfection.

**10. TERTIARY RECYCLED WATER STORAGE AND URBAN REUSE**

Advance treated recycled water is used at the facility for fire suppression, plant water and flushing toilets in the operations building, and recycled for irrigation of golf courses and a vineyard. To save potable water, the recycled water will soon be used for irrigation of City parks, athletic fields and schoolyards. A 1.8 million gallon capacity reservoir supports this system.

**11. AGRICULTURAL RECYCLED WATER**

The City is prohibited by regulations from discharging treated wastewater into the Petaluma River from May through October. Instead, the City provides secondary recycled water for irrigation of 700 acres of agricultural land.

**12. PETALUMA RIVER**

From November through April, treated wastewater is released into the Petaluma River through an 24-inch outfall. Prior to discharge into the river, extensive laboratory testing and monitoring ensures that restrictive water quality standards are met and the treated wastewater is safe for the marine environment.

**13. SOLIDS HANDLING**

Solids collected from the secondary clarifiers are sent to a sludge thickener to remove water. The thickened sludge next enters an acid digester and then a methane digester which are large heated mechanical "stomachs" in which anaerobic micro-organisms break down the sludge solids into stable compounds. Digested sludge, also known as biosolids, still contains a significant amount of water. A 30-foot long screw press squeezes excess moisture from the biosolids, which reduces their volume. The water is returned to the oxidation ditches for treatment. The dewatered biosolids are trucked to a landfill for use as daily cover.