

Providing Environmental Support to San Francisco's Water and Power System

Built in the 1920s and 1930s, the city of San Francisco's water system, from its mountain source to its extensive delivery and distribution system, is an engineering marvel, as most of the original system still provides water to millions of customers. Although this composite water system has functioned well under the stress of growth and the 1989 Loma Prieta earthquake, the city continues to evaluate the system's long-term reliability. CDM is helping the city to maintain the reliability and quality of its drinking water by providing a wide-range of engineering and environmental services, to monitor, evaluate, and protect San Francisco's water supply.

Unique Water Source, Complex Water System

San Francisco receives 80 percent of its water from a watershed in the heart of Yosemite National Park, high in the Sierra Nevada mountains; water of such pristine quality that it meets state and federal drinking water standards without filtration. Water from Hetch Hetchy Reservoir is gravity-fed for 150 miles through a series of horseshoe shaped tunnels and large-diameter pipelines all the way to downtown San Francisco. Every day, 2.5 million San Francisco customers rely on the San Francisco Public Utilities Commission (PUC) to deliver up to 300 million gallons per day (mgd) of clean drinking water. As the water makes its way to the Bay Area, it also passes through hydro-electric powerhouses that generate valuable power used to run San Francisco's international airport and electrical transit system, including the world-renowned cable cars.

Water Quality and Treatment

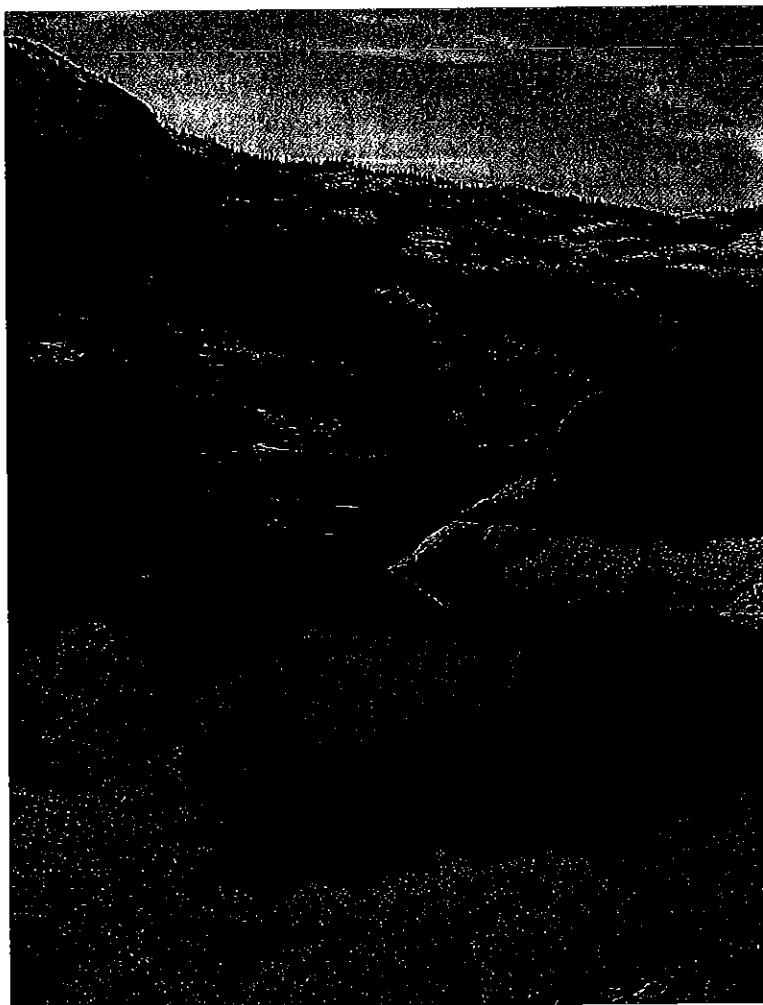
The U.S. Environmental Protection Agency's new surface water treatment and disinfection byproduct rules have placed greater emphasis on the quality of drinking water from unfiltered surface water sources, prompting the PUC to evaluate methods to maintain water quality through modified disinfection and watershed practices. The PUC has teamed with CDM to evaluate options. "Important to the PUC is identifying treatment strategies that are innovative, yet practical, to protect the current water sources and comply with stringent regulations," says Steve Price, CDM's project engineer for the Hetch Hetchy water treatment project. CDM is leading the team that is performing conceptual engineering for system-wide conversion to

chloramination and potential future use of ozonation for Hetch Hetchy water. The treatment alternatives, supported by system-wide hydraulic and operational analyses for the raw water system, take into account transmission, pumping, storage, and treatment facilities.

Twenty percent of the PUC's water originates from local reservoirs in the greater San Francisco Bay Area. This water is filtered in two PUC water treatment plants—Harry Tracy and Sunol Valley. "Integrating treated local source water from both the Sunol and the Harry Tracy plants into the Hetch Hetchy supply during periods of fluctuating water quality has always been one of the PUC's greatest challenges," explains Paul Mazza of the PUC's water supply and treatment division.

To assist the city with this task, CDM performed a comprehensive study that investigated a variety of drinking water quality and regulatory compliance issues. CDM evaluated performance-limiting factors in the treatment

San Francisco's pristine water supply originates in Yosemite's Tuolumne Meadows at an elevation of 8,000 feet.



processes; documented the causes of pH drift through the PUC transmission system, which can affect corrosion; studied the effects of chloramination and ozonation on bacteriological regrowth; and evaluated techniques for controlling disinfection byproduct formation in the distribution system.

In addition, CDM designed, procured, configured, installed, and commissioned new supervisory control and data acquisition (SCADA) systems at the Harry Tracy and Sunol Valley water treatment plants. The systems were installed to bolster system operator confidence and to provide for remote monitoring and control of plant operations. The new systems included programmable logic controllers, computer workstations, computer networking, system application programming of the new control computers, and integration into the city-wide SCADA system for remote monitoring purposes. The new fail-safe systems maintain full control and functionality upon failure of any single control component or even the entire communications network.

Citizen Concern

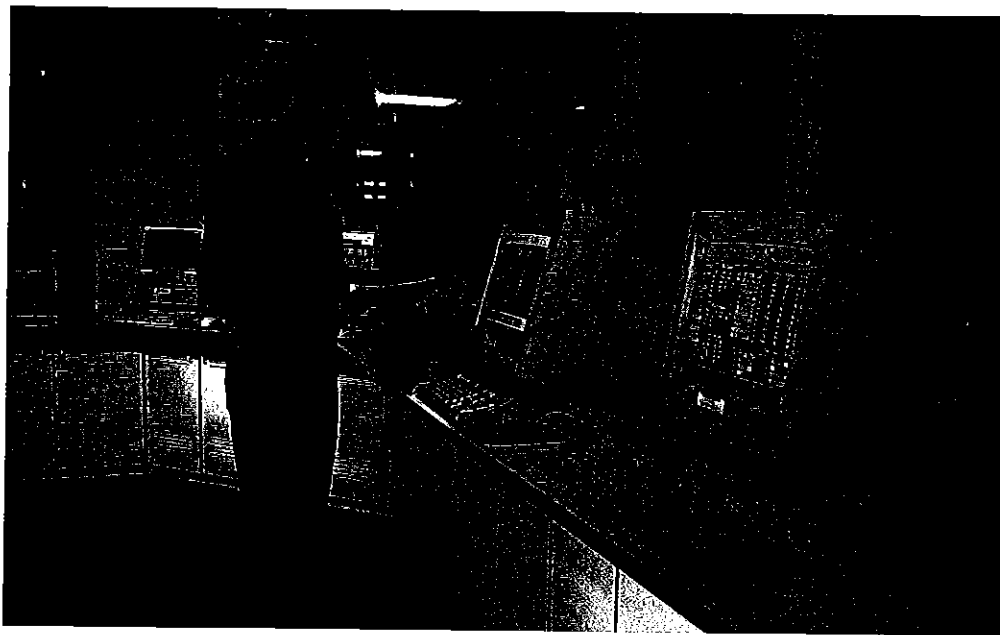
"Customers are more concerned about the quality of their drinking water these days," says Andrew DeGraca, manager of the PUC's Water Quality Bureau. "To communicate and keep the public informed about their water quality, the bureau has worked with CDM to prepare public notification guidelines." Key issues addressed by CDM include the identification of events that might require notification, where to set action levels for certain parameters, and how to word notification language.

Environmental Support for Power Generation

Generating in excess of 400 megawatts per hour, Hetch Hetchy Water and Power's (HHW&P) hydroelectric powerhouses are an important asset to the city. "Balancing water quality objectives with electric power generation is the goal of Hetch Hetchy Water and Power," says Matt Gass, HHW&P engineering manager.

CDM has assisted HHW&P's engineering staff with assessment and design of sanitary and industrial wastewater discharges from powerhouses to keep facilities in compliance with state and local discharge regulations, and to promote higher water quality. The current wastewater treatment systems were evaluated through site investigations, testing and monitoring, and review of historic information.

CDM developed engineering designs to treat and discharge powerhouse industrial wastewater to the Tuolumne River, meeting drinking standards, and is developing stormwater pollution prevention plans and spill prevention and countermeasure control plans for HHW&P facilities.



Harry Brown, plant operator at the Harry Tracey water treatment plant, oversees the plant's new SCADA system that is integrated into the city-wide SCADA system for remote monitoring.

"These plans will give the highest level of security to store hazardous materials at Hetch Hetchy's powerhouses to protect the Tuolumne River and the city's water supply," states Terry Rice, environmental coordinator with HHW&P.

Into the Next Century

San Francisco's water and power system will grow more valuable in the coming years as customers, industry, and regulations demand increasingly higher quality water. Source water protection is key in protecting this valuable city resource. Paul Meyerhofer, CDM senior vice president, notes that maintaining water quality requires not only an understanding of regulatory compliance, but also a detailed knowledge of the entire system. "The PUC's water system is highly complex, with many issues influencing water quality," he says. "Our experience with practically every element of the city's system helps us understand how to best respond to the water quality needs of San Francisco to protect this valuable resource into the next century." ~

—Daryl Shepard