

Chapter 3 – Water Supply Sources

3.1 Introduction

This chapter describes the City's existing and planned sources of water supply. As noted in Chapter 1, the City currently receives 100 percent of its potable water supply from the Hetch Hetchy regional water system operated for the City and County of San Francisco by the San Francisco Public Utilities Commission (SFPUC). This water supply source is described in Section 3.2 of this chapter. Since the last UWMP update in June 2003, Redwood City has approved and begun construction of a recycled water project to help the City achieve its goal of reducing demand on the Hetch Hetchy system. The recycled water supply is described briefly in Section 3.3 of this chapter; a more detailed description of the recycled water project is provided in Chapter 7 of this UWMP. Also since June 2003, Redwood City has developed and begun the implementation of active water conservation measures, beyond those measures already in effect as of 2003. The City's water conservation program is described in Chapter 6 of this UWMP. Section 3.4 of this chapter describes other water supply sources and their potential for serving the water needs of Redwood City, and Section 3.5 describes the City's resource maximization/import minimization plan.

Table 3-1 identifies the existing and planned water supply sources discussed in this chapter, and the current and planned quantities available to Redwood City from the present (2005) to 2030 in five-year increments.

| Water Supply Sources | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 |
|---|---------------|---------------|---------------|---------------|---------------|---------------|
| SFPUC Potable Water Purchases ("Best Estimate") | 12,768 | 12,096 | 12,544 | 12,768 | 12,880 | 12,992 |
| Redwood City Recycled Water | 30 | 922 | 1,178 | 1,398 | 1,695 | 1,995 |
| Transfers/Exchanges in or out | 0 | 0 | 0 | 0 | 0 | 0 |
| Desalination | 0 | 0 | 0 | 0 | 0 | 0 |
| Redwood City Groundwater* | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 12,798 | 13,018 | 13,722 | 14,166 | 14,575 | 14,987 |

*Defined as municipal potable source only. Does not include existing or future private wells.

3.2 SFPUC Water

3.2.1 SFPUC Regional Water System

As noted above, Redwood City receives potable water from the City and County of San Francisco's regional system, operated by the SFPUC. This supply is predominantly from the Sierra Nevada, delivered through the Hetch Hetchy aqueducts, but also includes treated water produced by the SFPUC from its local watersheds and facilities in Alameda and San Mateo Counties. The amount of imported water available to the SFPUC's retail and wholesale customers is constrained by hydrology, physical facilities, and the institutional parameters that allocate the water supply of the Tuolumne River.

requires San Francisco to take steps to improve the Hetch Hetchy regional water system. The WSIP is expected to be completed in 2016.

A Program Environmental Impact Report (PEIR) is being prepared under the California Environmental Quality Act (CEQA) for the WSIP. A PEIR is a special kind of Environmental Impact Report that is prepared for an agency program or series of actions that can be characterized as one large project. PEIRs generally analyze broad environmental effects of a program with the acknowledgement that site-specific environmental review may be required at a later date.

Projects included in the WSIP will undergo individual project specific environmental review as required. Under CEQA, project-specific environmental review would result in preparation of a Categorical Exemption, Negative Declaration, or Environmental Impact Report. Each project will also be reviewed for compliance with the National Environmental Policy Act (NEPA) and local, state and federal permitting requirements as necessary.

3.2.3 Master Water Contract and Implications for Long Term Supply

The business relationship between San Francisco and its wholesale customers is largely defined by the *Settlement Agreement and Master Water Sales Contract* (Master Contract) executed in 1984. The Master Contract primarily addresses the rate-making methodology used by San Francisco in setting wholesale water rates for its wholesale customers in addition to addressing water supply and water shortages for the regional water system. The contract expires on June 30, 2009.

In terms of water supply, the Master Contract provides for a 184 million gallon per day (mgd, expressed on an annual average basis) "Supply Assurance" to the SFPUC's wholesale customers, subject to reduction in the event of drought, water shortage, earthquake, other acts of God, or rehabilitation and maintenance of the system. The Master Contract does not guarantee that San Francisco will meet peak daily or hourly customer demands when their annual usage exceeds the Supply Assurance. The SFPUC's wholesale customers have agreed to the allocation of 184 mgd Supply Assurance among themselves, with each entity's share of the Supply Assurance set forth on a schedule adopted in 1993. This Supply Assurance survives the termination of the Master Contract in 2009.

The SFPUC can meet the water demands of its retail and wholesale customers in wet and average years. The Master Contract allows the SFPUC to reduce water deliveries during droughts, emergencies, and for scheduled maintenance activities. The SFPUC and all wholesale customers adopted an *Interim Water Shortage Allocation Plan* (IWSAP) in 2000 to address the allocation of water between San Francisco and wholesale customers in aggregate and among individual wholesale customers during water shortages of up to 20 percent of average system-wide use. This Plan also expires in June 2009.

3.2.4 Redwood City Water Supply Contract

Redwood City, along with 29 other Bay Area water suppliers, signed the Settlement Agreement and Master Contract with San Francisco in 1984; the Master Contract is supplemented by an individual Water Supply Contract. Redwood City's contracted Supply Assurance is 12,243 acre-feet per year (af/yr). The City is currently consuming

approximately 1,100 af/yr over the contractual amount; the City is able to purchase this additional supply from the SFPUC as a result of other customers not using their full contractual supply.

Table 3-2 provides a summary of the City's potable water supply deficit over the past six years. The demands reflect annual variations due to weather, implementation of increasingly active water conservation measures, and commercial building occupancy. The deficit increase from 2002/2003 to 2003/2004 was due to a two-week period of extremely hot weather in early spring, which triggered irrigation demand almost a month earlier than normal. It is reasonable to assume that, in addition, irrigation schedules were not reduced once the hot weather passed. In 2004/2005, the spring and early summer were unusually cool and wet, delaying the need for irrigation. It is noteworthy that in the last two-year period, Redwood City's total demand on its Hetch Hetchy supply varied by 1,200 af/yr, driven primarily by weather and outdoor water use. The five-year average deficit prior to 2004/2005 was 942 af/yr, and the six-year average deficit, including 2004/2005, is 819 af/yr.

| Table 3-2 Redwood City Potable Water Deficit History (af/yr) | |
|--|---|
| Fiscal Year | Potable Water Supply Deficit (af/yr)^(a) |
| 1999/2000 | 1,028 |
| 2000/2001 | 950 |
| 2001/2002 | 794 |
| 2002/2003 | 524 |
| 2003/2004 | 1,410 |
| 2004/2005 | 207 |
| <small>(a) Deficit is based on the San Francisco Public Utilities Commission Supply Assurance of 12,243 af/yr from the Hetch Hetchy regional water system.</small> | |

3.2.5 Description of BAWSCA and Its Role

The Bay Area Water Supply and Conservation Agency (BAWSCA) was created in May 2003 (SB 1870) to represent the interests of 26 cities and water districts, and two private utilities, in Alameda, Santa Clara, and San Mateo counties that purchase water on a wholesale basis from the San Francisco regional water system. Redwood City is a member of BAWSCA. BAWSCA is the only entity having the authority to directly represent the needs of these wholesale customers that depend on the regional water system. BAWSCA provides the ability for customers of the regional system to work with San Francisco on an equal basis to ensure the water system gets fixed, and to collectively and efficiently meet local responsibilities. While BAWSCA does not provide any agency a direct voice in SFPUC's decisions, it enables Redwood City, with BAWSCA colleagues and staff, to address community and regional needs.

BAWSCA has the authority to coordinate water conservation, supply and recycling activities for its agencies; acquire water and make it available to other agencies on a wholesale basis; finance projects, including improvements to the regional water system;

and build facilities jointly with other local public agencies or on its own to carry out the agency's purposes.

As described in Chapter 1, responsibility for compliance with the Urban Water Management Planning Act lies with each agency that delivers water to its customers. Thus, Redwood City is responsible for preparing this 2005 UWMP. BAWSCA's role in the development of this UWMP is to work closely with Redwood City and the SFPUC to help maintain consistency between the multiple documents being developed by BAWSCA's member agencies, and to ensure overall consistency with the WSIP and the associated environmental documents.

3.2.6 Redwood City Potable Water Distribution System

Because treated water purchased from the SFPUC does not require further water treatment, water distribution is the City's main water resource function. This section describes the City's potable water distribution system, including descriptions of the City's leak detection, water quality monitoring, flushing and cross connection control, and Capital Improvement programs.

Water Distribution System

The City water system serves the City of Redwood City and portions outside the corporate limits, including Cañada College and the Emerald Lake Hills area. The City's service area covers approximately 14 square miles. Service is provided to areas between Highways 280 and 101, between Whipple Avenue and Marsh Road in the area east of Highway 101, and in Redwood Shores. The City's service area varies in elevation, from about mean sea level along Seaport Boulevard to over 800 feet in the Emerald Lake Hills area.

There are 13 metered connections to four SFPUC pipelines located in Redwood City. There are also 10 emergency interties with California Water Service Company, Belmont County Water District, and the City of Menlo Park. The potable water system has 265 miles of distribution mains, 12 storage reservoirs, 10 pump stations, 1,812 fire hydrants, and 26 pressure reducing valves ranging from two to six inches in diameter.

The distribution mains are fabricated mostly of ductile iron; approximately five percent of the mains are older, two-inch galvanized iron pipe, six-inch polyvinyl chloride (PVC) pipe, and some asbestos-cement pipe. Asbestos-cement pipe was installed over a period of several decades, from about 1960 to about 1988. Asbestos-cement pipe was typically installed in areas where the soil was determined to be too corrosive for the preferred material, cast iron pipe. The City has an ongoing water main replacement program in which undersized mains are replaced with C-900 PVC pipe.

The total capacity of the 12 storage facilities is 21.24 million gallons. The storage tanks and reservoirs are cleaned and inspected once every five years. Recoating, repairs, and structural work are performed as needed. All storage tanks have cathodic protection to prevent corrosion. The storage facilities are in excellent condition and are properly secured against unauthorized entry.

Ten pump stations are located throughout the system. Four of the pump stations have permanent standby generators; the City also has four portable generators for emergency use. Most pump stations are contained within structures. The City plans to eventually

build enclosures around the remaining pump stations to protect them from weathering and vandalism.

The City can meet maximum day water demands as long as the SFPUC pipelines are in service. In the event of a loss of the SFPUC supply, the City would be able to supply all but four of the 17 pressure zones in the system for an extended period. Those four pressure zones are not currently connected to other pressure zones and do not have storage facilities. In order to provide water to those four zones when the SFPUC supply is not available, the City has connected the four zones to storage tanks that normally supply the Main City pressure zone. The City connected Altamont, Fernside North, and Fernside South pressure zones to Carson Reservoir for emergency use only, and constructed a permanent connection from Cordilleras pressure zone to the Sequoia Tanks. In addition, the City may add storage facilities to serve remote services areas, such as Seaport and Friendly Acres areas, which are susceptible to low service pressures during prolonged interruptions.

Leak Detection

The City's unaccounted-for water rate is about four percent. This is considered an excellent rate by industry standards, and is significantly below the standard of 10 percent established by the U.S. Environmental Protection Agency (EPA) and also by the California Urban Water Conservation Council (CUWCC). The City monitors its unaccounted-for rate continually and repairs system leaks immediately when found. The City owns an electronic leak detector unit and City personnel have participated in leak detection trainings sponsored by the American Water Works Association (AWWA), and surveying at least 15 miles of main and service lines per year on an ongoing basis.

Water Quality Monitoring

Monitoring the quality of the imported Hetch Hetchy supply is conducted by the SFPUC. The SFPUC treats the Hetch Hetchy supply by lime addition at Rock River for corrosion control and chlorination at Tesla Portal for disinfection, but does not filter the water prior to delivery. Water that is delivered to Bay Area reservoirs receives filtration and disinfection treatment at either the Sunol or the Harry Tracy filtration plants. Filtered water from these treatment plants may be commingled with unfiltered Hetch Hetchy water in Bay Area transmission pipelines.

The SFPUC and its wholesale customer agencies were granted filtration avoidance for the Hetch Hetchy supply under Federal and State regulations. Under revisions to the Surface Water Treatment Regulations (SWTR, Chapter 17, Title 22, California Code of Regulations), which became effective in July 1998, public water systems serving water from the Hetch Hetchy supply must demonstrate to the California Department of Health Services (DHS) that the supply meets the State criteria for filtration avoidance. Redwood City maintains its certification with DHS that the Hetch Hetchy water supply it distributes will be in compliance with the State criteria for filtration avoidance.

Monitoring of the water quality within the City distribution system is the responsibility of the City. The City's potable water quality consistently meets primary and secondary drinking water standards. Following is a brief description of components of the City's water quality monitoring program:

- ❑ **Bacteriological Quality.** The City has an approved bacteriological sample plan, dated August 2000, that makes use of a series of dedicated sampling stations located at key points within the distribution system. City personnel routinely collect 23 samples per week for bacteriological analysis. The 23 samples are selected from 28 sites designated for even numbered weeks and 28 sites designated for odd numbered weeks.
- ❑ **Disinfection Residual.** The City collects samples for free chlorine residual monitoring at the same time and same location as the bacteriological monitoring, as required by the State Surface Water Treatment Regulations.
- ❑ **General Physical Quality.** The City collects 24 samples per month for color, odor, turbidity, pH, and temperature measurements.
- ❑ **Trihalomethanes.** The City collects four samples from the distribution system per quarter for trihalomethane monitoring. Analysis of these samples is performed at the SFPUC certified laboratory in Millbrae.
- ❑ **Asbestos.** Due to the presence of asbestos-cement pipe in the distribution system, it is vulnerable to asbestos contamination from leaching. The City's testing cycle is once every nine years.
- ❑ **Lead and Copper.** Under the State Lead and Copper Regulations, Redwood City's water distribution system is classified as a large-size water system. This designation requires the City to perform corrosion control treatment steps. Since the City obtains all of its drinking water from the SFPUC and provides no further treatment, the City coordinates with the SFPUC's own corrosion control studies. The City has an approved sampling plan for lead, copper, and water quality parameter monitoring on file with the DHS dated November 3, 1998. The City is required to conduct two six-month rounds of lead and copper monitoring at consumer taps, two six-month rounds of water quality parameter monitoring at taps in the distribution system, and bi-weekly water quality parameter monitoring at points of entry to the distribution system. The SFPUC uses the data generated to determine optimal corrosion control treatment appropriate for the SFPUC transmission system.

Flushing and Cross Connections

The City has a proactive program to flush the distribution pipelines to remove deposits, encrustations, sediments, and other materials. This flushing prevents water quality problems related to taste, odor, and turbidity, among others. The City maintains a database recording the schedule and length of time for each flushing. City personnel use maps from the "block book" and valve cards to locate valves and perform proper valve exercising. During times of water shortage, the City may suspend flushing activities to conserve water resources.

The City also has a back-flow prevention program carried out by the San Mateo County Environmental Health Department, under contract with the County, which uses trained, certified staff to test all backflow prevention devices annually.

Capital Improvement Program

One of the City's guiding principles regarding water service is to repair/replace/upgrade the water distribution infrastructure on a 50-year cycle to ensure the system's long-term

integrity. The City Council appropriates \$2 million per year through its Capital Improvement Program to accomplish this objective, as illustrated in Table 3-3.

| Table 3-3 Capital Improvement Program System Replacement Cost Allocations | |
|--|---|
| System Component | Estimated Annual Cost Allocation |
| Distribution system replacement | \$1,755,000 |
| Water system facility replacement | \$75,000 |
| Water pumps and controls replacement | \$50,000 |
| Cathodic protection program | \$100,000 |
| GIS/CAD system development / maintenance | \$20,000 |
| TOTAL | \$2,000,000 |

3.3 Recycled Water

In August 2003, the Redwood City Council approved a broadly-defined and flexible recycled water project to help the City achieve its goal of reducing demand on the Hetch Hetchy system. Also in August 2003, the City Council created the Community Task Force on Recycled Water (Task Force or TF). The objective of the Task Force, in summary, was to identify ways to reduce drinking water demand by 2,000 af/yr in a financially feasible manner that would give the City alternatives to using recycled water at schools and playgrounds. The Task Force focused on solving the City's water supply and demand imbalance by the year 2010. The Task Force Report, issued in March 2004, recommended that the City implement a project called "Alternative TF" (TF=Task Force), which is comprised of several components and which is now being implemented by the City Council:

- ❑ A recycled water system that will provide treated and disinfected recycled water for landscape irrigation (to customers other than identified school yards, parks, and playgrounds) and other non-potable uses (industrial and indoor uses).
- ❑ Potable demand reduction by replacing natural grass playing fields with synthetic turf.
- ❑ Continuing to use existing groundwater by private, non-municipal pumpers for landscape irrigation.
- ❑ Additional water conservation measures, including:
 - Water efficient pre-rinse spray nozzles in dishwashing facilities
 - Evapotranspiration controllers for landscape irrigation systems
 - Hot water recirculation pumps on residential water systems

The Task Force Report also recommended that the City investigate or implement ten "Other Potential Measures" (OPMs) that may further reduce potable water demand. The OPMs were not included in Alternative TF because the potential potable demand reductions were difficult to quantify, additional research was required to determine their viability, and/or technology improvements were needed before the OPM can be implemented.

The Redwood City Recycled Water Project will be used to irrigate eligible landscapes (commercial, City-owned, Caltrans right-of-ways, and homeowner's associations) as well as for industrial applications and for indoor uses, e.g., toilet flushing in new commercial buildings. The Alternative TF system will deliver water to approximately 108 customers, for an estimated potable water demand reduction of 1,687 af/yr. Chapter 7 of this UWMP provides a detailed description of the Alternative TF recycled water system, which the City embarked on the design and construction of in July 2004; it also includes the recycled water information required to be included in UWMPs by Section 10633 of the State Water Code. Chapter 7 also provides background information on recycled water use in Redwood City, and on the City's contractual relationship with the South Bay Side System Authority, the supplier of recycled water to the City.

3.4 Other Water Supply Sources

3.4.1 Transfers/Exchanges

Securing water from willing sellers inside and outside of the Hetch Hetchy water system is theoretically possible. Within the SFPUC system, it is possible to transfer water entitlements and/or "banked" water among contracting agencies during drought periods when rationing is in effect. The Interim Water Shortage Allocation Plan adopted by SFPUC and its wholesale customers provides for voluntary transfers of water among wholesale customers during periods when mandatory rationing is in effect on the San Francisco regional water system. Some wholesale customers have the capacity to draw more heavily on local groundwater (or other surface water supplies, such as the State Water Project) during dry years and thus may be willing to agree to transfer some portion of their San Francisco entitlement to other customers willing to pay for this back up supply. This is a possible source of relief from rationing at levels more severe than those required in neighboring communities. Initial inquiries by Redwood City of other agencies have not produced any affirmative responses. It is not possible to rely on this potential source unless and until contracts are signed with one or more other wholesale customers.

Securing water from willing sellers outside the SFPUC service area is theoretically possible. State laws enacted in the 1980s allow for "wheeling" of water from willing sellers to willing buyers through transmission systems owned by third parties, such as the SFPUC's San Joaquin pipelines. This is a much more complex process and one that would require not only a contract with a water supplier (such as an irrigation agency), but also agreement with the SFPUC on the water quality, price, and operational terms.

As described previously in this chapter, BAWSCA has statutory authority to assist the 29 wholesale customers of the San Francisco Hetch Hetchy regional water system to plan for and acquire supplemental water supplies. Transfer opportunities may become easier to initiate under the auspices of this agency.

3.4.2 Groundwater

The feasibility of developing groundwater supply to supplement the City's Hetch Hetchy water supply was evaluated in a technical report prepared for the City by Todd Engineers in March 2003. Historically, groundwater has not been a source of supply for the City because of water quality, reliability, and long-term production capacity concerns. Local groundwater does exist, however, and is currently used by a limited number of

private well owners for domestic and irrigation uses. Sequoia High School in Redwood City currently irrigates some of its landscape with groundwater. This site was originally identified as a potential customer of recycled water for landscape irrigation; however, the Alternative TF included a recommendation to maintain existing potable water demand reduction by continuing to use groundwater. This recommendation is currently being implemented, and the school will continue to irrigate partially with groundwater, provided the well continues to produce sufficient quantity and quality of water. The total potable water savings by irrigating with groundwater at the school is estimated to be 27 af/yr. Within the next year, the City will initiate further discussions with school district operations staff to ensure the site is maximizing the use of groundwater for landscape irrigation, and to evaluate the entire irrigation system for efficiency and optimization of water use in accordance with the City's water conservation program.

With regard to future development of groundwater supplies, the technical report concluded that the aquifers under the Redwood City area are considered marginal as sources of municipal supplies, but may be adequate to provide small amounts of supplemental water. Use of groundwater in the area is minimal, so there is little competition for the resource. Existing data indicate that the expected yield from a properly sited and designed production well in the area would likely be less than 500 gallons per minute (gpm), and probably would be on the order of 200 gpm. The estimated annual recharge to groundwater in the Redwood City area is between 1,700 and 2,800 af/yr. With a network of properly sited and designed wells, the City might feasibly recover between 500 and 1,000 af/yr of supplemental water. Groundwater quality is acceptable for potable and/or irrigation uses; however, to address aesthetic concerns, groundwater treatment and blending would be required for potable use. The existence of contaminated sites and the costs of such a system would need to be evaluated and considered in the well siting process.

3.4.3 Desalination

In addition to studying the feasibility of developing groundwater supply, the City also explored the feasibility of desalination of seawater as an option for additional water supply in 2003. The feasibility study concluded that due to high capital and operational costs, siting constraints, and environmental requirements, desalination is not an option for immediate resolution of the Redwood City potable water deficit or near-term supply needs.

The SFPUC, Santa Clara Valley Water District (SCVWD), East Bay Municipal Utilities District (EBMUD), and Contra Costa Water District (CCWD) are jointly exploring developing the feasibility of regional desalination facilities that could directly or indirectly benefit the 5.4 million San Francisco Bay Area residents and businesses served by these participating agencies. The Bay Area Regional Desalination Project (RDP) may consist of one or two desalination facilities, with an ultimate total capacity of up to 80 million gallons per day (SCVWD, 2005). The RDP would provide a new potable water source. However, siting a regional desalination plant presents many regulatory and technical challenges. While the agencies have made significant progress over the past two years and continue to advance the planning for a RDP, consideration of desalination as a local supply option for Redwood City is not possible for near-term supply needs.

3.5 Resource Maximization/Import Minimization Plan

Section 10620(f) of the State Water Code requires the UWMP to discuss how water management tools and options are used to maximize resources and minimize an agency's need to import water. In order to maximize resources and minimize the need to be 100 percent reliant on SFPUC water (a majority – though not all – of which is imported), Redwood City has initiated both a local recycled water project (described in detail in Chapter 7) and more active water conservation measures (described in Chapter 6). Each of these efforts is reflected in the policies and programs contained in this 2005 UWMP update. There are no other water supply projects on the horizon for Redwood City beyond those described in this UWMP.