Technical Memorandum No. 3

Subject:	Sonoma Valley Analysis
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Section 1 Introduction and Purpose

This Technical Memorandum is part of a feasibility study of satellite recycled water treatment prepared as part of a regional water recycling analysis for the North Bay Watershed Association. The general analysis techniques, developed in Technical Memorandum #1 "General Process and Distribution System Overview" (hereinafter referred to as the General Criteria) dated May 2004 will be applied to the Sonoma Valley County Sanitation District's (SVCSD's) service area. The general analysis techniques and analyses are used to identify a range of candidate satellite treatment plant sites and compare the feasibility of these satellite systems to a centralized recycling system.

The Sonoma Valley is located within the CalFed Solution Area. Projects within this Solution Area are expected to have priority for funding under Proposition 50.[1] This service area analysis is generally consistent with the State Water Resources Control Board Water Recycling Funding Guidelines.

Section 2 Study Area Characteristics

2.1 General Hydrologic Overview

The SVCSD service area generally includes southeast Sonoma County, east of the Sonoma Mountains and west of the Napa County line. The long narrow service area generally follows Sonoma Creek, a tributary to San Pablo Bay. The service area is located on an alluvial plain and groundwater resources are available. Groundwater resources are used by agricultural interests in the Sonoma Valley and provide a portion of the municipal supply.

The study area drains to San Pablo Bay via Sonoma Creek. The San Francisco Bay Regional Water Quality Control Board (Region 2) has listed Sonoma Creek as impaired for pathogens, nutrients and sediment.[2] San Pablo Bay is listed as impaired for multiple contaminants including pesticides, exotic species, dioxin and furan compounds, mercury, nickel, selenium and PCBs[3]. Improving water quality in the San Francisco Bay Delta System is the focus of the CalFed program and efforts by many local agencies and nonprofit groups.

2.2 Land Use & Population Trends

The Sonoma Valley is slow-growing as a result of both growth management policies and active land conservation efforts. The City of Sonoma has approved urban growth boundary and Sonoma County actively acquires development rights in rural portions of the County through its Open Space District.

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[1] Personal Communication, Diana Robles, Chief Office of Water Recycling, State Water Resources Control Board.
[2] http://www.swrcb.ca.gov/rwqcb2/tmdlmain.htm
[3] Phase 1 Executive Summary, North Bay Watershed Stewardship Plan. RMC, October 2003.

Valley of the Moon Water District (VOMWD) anticipates its service population will grow from 20,580 to 22,801 by the year 2020 (an increase of 0.5% per year).[4] The City of Sonoma anticipates its service population will grow from 9,282 to 13,482 by the year 2020 (an increase of approximately 2% per year).[5]

2.3 Water Supply

There are two retail water suppliers in the area of study; Valley of the Moon Water District and the City of Sonoma. Both retail water suppliers purchase wholesale water from the Sonoma County Water Agency (Agency). The retail water suppliers and the Agency have a contractual relationship defined in the "Eleventh Amended Agreement for Water Supply" dated 2001. This wholesale water is delivered through the Sonoma Aqueduct.

The Agency's primary water supply comes from underflow of the Russian River, which is in a separate watershed from the SVCSD Service Area. The Agency also has three groundwater wells in Santa Rosa. Russian River water supply is of high quality.

The Agency estimates its reliable groundwater supply at 3,025 acre-feet/year and its reliable Russian River water supply at 123,830 acre-feet/year in 2020.[6] Valley of the Moon Water District is contractually entitled to 3,200 acre-feet/year from the Agency's system. The City of Sonoma is contractually entitled to 3,000 acre-feet/year from the Agency's system.[7]

Table 1 Summary of Water Supply

Agency	Entitlement from SCWA
Valley of the Moon Water Agency	3,200 AF/Year
City of Sonoma	3,000 AF/Year

The Agency is developing the Water Supply, Transmission, and Reliability Project (Water Project) that is intended to provide a safe, economical, and reliable water supply to its retail water contractors to meet their current and defined future needs. The Water Project will include upgrades to the Agency's transmission system including a proposed parallel aqueduct to the Sonoma Valley.

2.4 Wastewater Disposal

Wastewater collection, treatment, reclamation and disposal are provided by the SVCSD. The Agency provides day to day operational and maintenance oversight for SVCSD. The SVCSD service area extends from the unincorporated communities of Glen Ellen in the north to Schellville in the south. The wastewater collection system consists of approximately 188 miles of pipeline and two lift stations that convey wastewater to SVCSD's secondary treatment plant (treatment facility) located in the southern portion of Sonoma Valley. As currently operated, effluent from the treatment facility is discharged to Schell Slough, from November through April, and is used for agricultural irrigation and wetlands enhancement during the remainder of the year. These discharges to waters of the United States are regulated under a National Pollutant Discharge Elimination System (NPDES) permit administered by the Region 2 RWQCB.

In 2002,[8] the SVCSD served approximately 16,452 equivalent single-family dwelling units with an average dry weather flow of approximately 2.5 million gallons per day (MGD). The permitted average

[4] Urban Water Management Plan 2000, Sonoma County Water Agency.
[5] Urban Water Management Plan 2000, Sonoma County Water Agency.
[6] Urban Water Management Plan 2000, Sonoma County Water Agency, Table 3-1.
[7] Urban Water Management Plan 2000, Sonoma County Water Agency, Tables 3-6 and 3-7.
[8] 2002 is the latest SVCSD service information available.

dry weather flow is 3.0 MGD. The treatment facility has the capacity to treat up to 16.0 MGD and discharge a peak wet weather flow of approximately 11.0 to 12.0 MGD depending on discharge conditions. Excess flow is stored in the influent equalization basins for deferred treatment.

Currently, the SVCSD has approximately 635 acre-feet of recycled water storage. This existing storage is located in the southeast area of Sonoma Valley and is comprised of four storage reservoirs: R1, R2, R3, and R4. R1 and R2 supply water to R3 and to a wetland restoration project (Management Units). R3 provides water to the reclamation users (vineyard, pasturelands, and dairies) and provides pressure for the reclamation system. R4 provides additional storage and water to Ringstrom Bay, to reclamation users (vineyards, pasturelands, dairies), and provides pressure in the reclamation system.

Construction to upgrade SVCSD treatment facility to tertiary treatment level is scheduled to begin in the summer of 2005. Construction is anticipated to be completed in the fall of 2006. Table 2 provides a summary of the Wastewater Treatment System.

Table 2 Summary of Wastewater Treatment System

Agency	Facilities Maintained	Permitted Average Dry Weather Flow	Recycling Capacity	Disposal Methods
Sonoma Valley County Sanitation District (SVCSD)	Collection system, Treatment, Storage & Recycling Facilities	3.0 MGD	2.5 MGD	Schell Slough Discharge, Agricultural Reclamation, Wetland Restoration

Section 3 Market Assessment Methodology

3.1 Regulatory Context

This market analysis assumes that the recycled water market in the Sonoma Valley will require Title 22 Disinfected Tertiary Recycled Water. Additional treatment to manage high salt content is not needed.

An urban water recycling operation would operate under permit from Region 2. Region 2 has implemented a General Water Recycling Permit; public agencies may apply for coverage under the General Permit by filing a Notice of Intent together with an Engineer's Report prepared in accordance with Title 22. The General Permit does not restrict the delivery of recycled water, applied at agronomic rates.

3.2 Water Demand and Costs

Water demand within the service area was quantified using historic use records, where available. For irrigation users that are not current water customers (vineyards and golf courses that use well water for irrigation) water use was estimated using the land use estimations outlined in the General Criteria as shown in Table 3. The acreages were estimated using parcel maps and spatial land use data from the Sonoma County GIS.

Table 3 Land Use Based Demand Factors

Land Use	Demand Rate (AF/acre/year)
Vineyards	0.5
Irrigated Agriculture	2.0
Irrigated Pasture	2.5
Golf Courses	3.5
Urban Irrigation	3.0
Commercial/Industrial Process	1.7
Toilet Flushing	1.5 gal/flush

3.3 Identifying Candidate Locations

The strategy for determining candidate locations for satellite treatment was to find a large anchor water user in the vicinity of a sewer main with enough flow to provide for the satellite plant. As previously stated, the anchor user must also be far enough away from the central wastewater treatment plant that it is more economically served by a satellite plant than the central plant. This distance was preliminarily set at 2.5 miles.

Applying this strategy to Sonoma Valley resulted in a focus on the Boyes Hot Springs area. The irrigation users in the area were discussed in two separate sets of analysis. The first analysis estimates the cost of supplying only the current VOMWD customers with recycled water. The second estimates the cost of supplying all of the major users in the area, including those that are currently using private wells.

Section 4 Alternatives Analyzed

4.1 No Project

Under the No Project Alternative, recycled water service is not expanded in the Sonoma Valley. Future water supply will be provided by expansion of the Sonoma Valley aqueduct system and from increased reliance on groundwater. The No Project Alternative also does not provide any wastewater disposal benefits. The SVCSD would continue to meet a portion of its disposal needs through discharge to Schell Slough, a tributary of San Pablo Bay resulting in up to 12 million gallons per day of discharge under wet weather conditions.

4.2 Assumptions for the Recycled Water Analysis

Some common assumptions are used in order to produce a uniform analysis throughout the Sonoma Valley study area. These assumptions relate to present and future water needs; quality, reliability and timing of water use; distance from the central wastewater treatment plant; availability of adequate sanitary sewer flow; and capital and operational costs.

4.2.1 Present and Future Water Needs

As noted above, the Sonoma Valley is slow-growing, with stable land uses. Each alternative developed is “anchored” on an existing urban irrigation use. Present and future water demands are estimated based on historic use pattern. When the analysis includes providing recycled water to an agricultural operation currently using ground water, the assumed water demand was determined based on the criteria in Table 3.

The proposed water recycling facilities are sized to provide for the demand of the average day of the peak month of water use. Figure 1 shows a typical distribution of the annual recycled water demand for Northern California irrigation uses. It has been assumed that the peak monthly demand is approximately 18% of the total annual water demand. To determine the size of the plant, the total annual demand is multiplied by 18% to determine the total demand during the peak month. It is then divided by 30, to determine the average daily demand during the peak month. The plant is sized to provide for this demand.

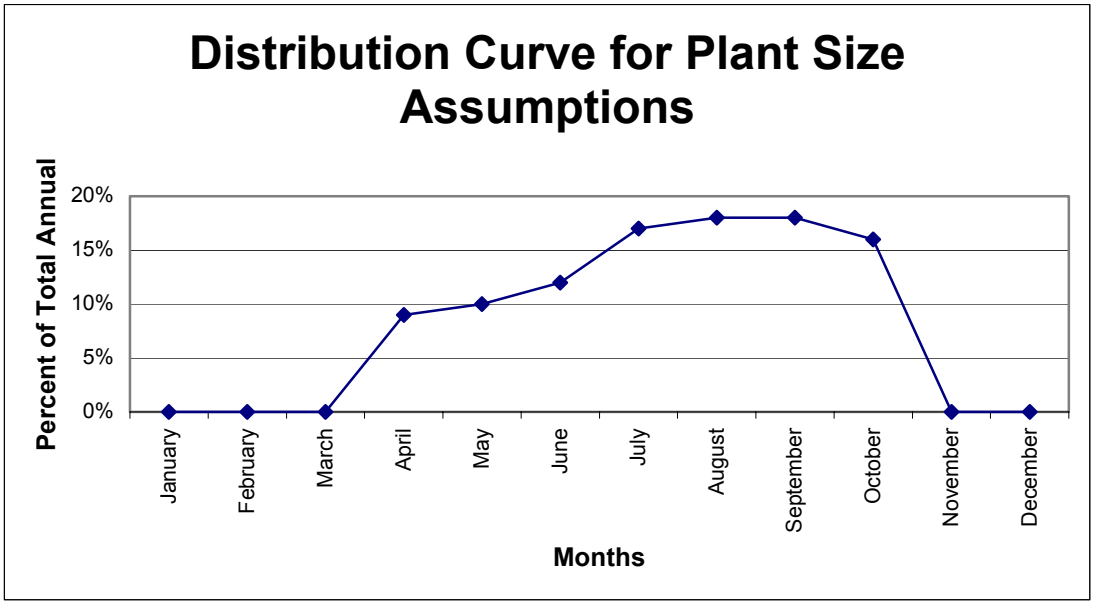

Figure 1 Distribution Curve for Plant Size Assumptions

4.2.2 Water Quality, Reliability and Delivery Timing

In accordance with the General Criteria, this analysis assumes that a potable water backup supply is available to provide adequate reliability to the user. In addition, and in accordance with the General Criteria, this study assumes that the satellite treatment plant includes a storage tank to manage potential discrepancies between wastewater flow and irrigation demand.

4.2.3 Distance from the Central Treatment Plant

The General Criteria suggested that users located outside a 4-mile distance from the central treatment plant might be cost-effectively served by a satellite water recycling facility. This analysis acknowledges that pipeline can rarely be placed on a radial alignment and uses a 2.5 mile radius to approximate a 4 mile distance along an alignment. This initial assumption has helped to focus the study on a reasonable range of customers to review.

4.2.4 Sanitary Sewer Flow

SVCSD has an active program that uses flow meters to record volume of flow in its collection system. This flow monitoring data has been used as the basis for determining wastewater flow in the sewersheds tributary to proposed satellite facilities.

4.2.5 Capital and Operational Costs

The General Criteria in Technical Memorandum #1 include cost curves for both satellite treatment facilities and central plant upgrades. These curves were used to develop the cost analysis for each alternative evaluated. The cost per acre foot calculation includes capital cost annualized over 30 years

at an interest rate of 6% plus the annual O&M cost divided by the annual yield of the plant in acre feet. For more information on cost development, see Technical Memorandum #1.

4.3 Boyes Hot Springs Area – Current Water Customers Only

4.3.1 Summary Market Analysis

The Boyes Hot Springs Area is located just north of the City of Sonoma and approximately 7 miles north of the SVCSD treatment facilities. The water customers in the area purchase water from VOMWD. There are 6 large irrigation users that are current VOMWD customers in the Boyes Hot Springs Area. Their total estimated use is 75.39 acre-feet per year. Figure 2 illustrates the location of the irrigation users. Table 4 provides a listing of the users and their annual demand.

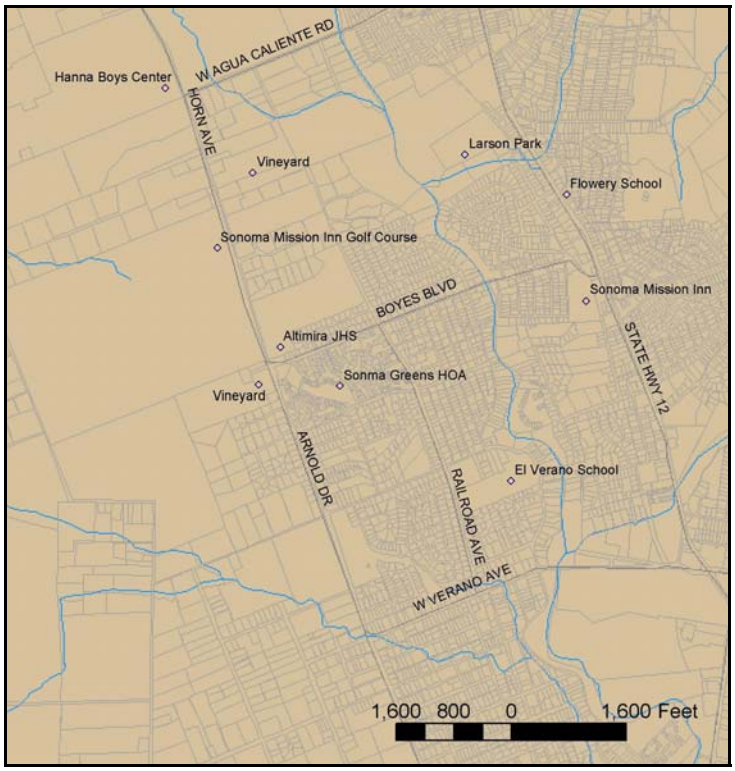

Figure 2 Location of Water Users

Table 4 Large VOMWD Customers in the Boyes Hot Springs Area

User Site(s)	Entitlement (AF/yr)
Larson Park	6.73
Sonoma Greens HOA	17.26
Flowery School	0.36
Altimira JHS	11.09
Hanna Boys Center	31.34
Sonoma Mission Inn	8.61
Total	**75.39**

4.3.2 Sizing of Treatment Facilities

Based on the sizing criteria discussed in section 4.2.1, this satellite service area demand can be met by a recycling facility with a capacity of 150,000 gallons per day.

4.3.3 Location of Treatment Facilities

The Boyes Hot Springs service area is located just west of Sonoma Creek. SVCSD's major trunk sewer is located just east of Sonoma Creek. According to modeled flow data provided by SCWA, the daily dry weather flow in the sewer is approximately 1.13 mgd where it crosses through Maxwell Park. Therefore, the trunk sewer has more than adequate flow to support the recycled water demand in the area. Wastewater is proposed to be diverted just south of Vailetti Drive.

4.3.4 Comparative Cost Analysis

This alternative compares: (1) the cost of building a 150,000 gpd satellite facility south of Vailetti Drive and east of Sonoma Creek to (2) the cost of a 150,000 gpd upgrade to the SVCSD facilities. The evaluation includes the cost of a creek crossing (assumed to be constructed with trenchless methods) in the satellite analysis because the main trunk sewer and the irrigation users are located on opposite sides of Sonoma Creek. Table 5 presents these costs estimates. The cost estimates are based on the cost estimating techniques outlined in Technical Memorandum No. 1 of this study.

The satellite facility is more cost effective than central treatment and distribution.

Table 5 Comparative Cost Analysis for Boyes Hot Springs Current Water Customers

Alternative	Capital Cost	Annual O&M	Total $/AF
150,000 gpd Satellite Facility	$5,490,000	$53,000	$5,881
150,000 gpd Upgrade to SVCSD	$5,950,000	$93,000	$6,891

4.4 Boyes Hot Springs Area – Current Customers and Private Well Users

4.4.1 Summary Market Analysis

This alternative expands the Boyes Hot Springs recycled water market to include The Sonoma Mission Inn Golf Course and two vineyards that utilize groundwater for irrigation purposes. Recycled water demand increases to approximately 380 acre-feet annually. These users are located in the same

vicinity as the water users described above and are also illustrated on Figure 2. Table 6 provides a listing of the expanded user group and their demands.

Table 6 Large Water Users in the Boyes Hot Springs Area

User Sites	Entitlement (AF/yr)
Larson Park	6.73
Sonoma Greens HOA	17.26
Flowery School	0.36
Altimira JHS	11.09
Hanna Boys Center	31.34
Sonoma Mission Inn	8.61
Sonoma Mission Inn Golf Course	266.00
Vineyard	20.00
Vineyard	6.40
Total	**367.79**

4.4.2 Sizing of Treatment Facilities

The satellite service area demand can be met by a recycling facility with a capacity of 720,000 gallons per day.

4.4.3 Location of Treatment Facilities

Wastewater is proposed to be diverted south of Vailetti Drive, just as described for the analysis of current water customers.

4.4.4 Comparative Cost Analysis

This alternative compares: (1) the cost of building a 720,000 gpd satellite facility south of Vailetti Drive and east of Sonoma Creek to (2) the cost of a 720,000 gpd upgrade to the SVCSD facilities. The evaluation includes the cost of a creek crossing (assumed to be constructed with trenchless methods) in the satellite analysis because the main trunk sewer and the irrigation users are located on opposite sides of Sonoma Creek. Table 7 presents these costs estimates. In this case, the central plant expansion is slightly more cost effective. The overall cost of delivered water is approximately one-half of the cost projected for the current water customers alternative described above. This is a result of economies of scale associated with the larger recycled water market.

Table 7 Comparative Cost Analysis for Boyes Hot Springs Users

Alternative	Capital Cost	Annual O&M	Total $/AF
720,000 gpd Satellite Facility	$11,020,000	$171,000	$2,609
720,000 gpd Upgrade to SVCSD	$8,610,000	$212,000	$2,249

Section 5 Conclusions & Recommendations

The SVCSD Service area has relatively limited opportunities for urban water recycling. Large irrigation users that utilize the water system to meet their needs are concentrated in the Boyes Hot Springs Area.

The recycled water market expands when groundwater users are included in the analysis. The combination of current water customers and groundwater users in the Boyes Hot Springs area results in a relatively cost-effective water recycling project that appears to be best served by expansion of the SVCSD's central facilities. Because the local water purveyors are considering expanded use of groundwater resources to meet their future needs, a recycled water program that allows offset groundwater to be dedicated to meeting overall basin demands is attractive from water resources management perspective.

The overall cost of recycled water facilities is high. SVCSD does receive some benefits because beneficial reuse reduces the overall hydraulic and pollutant loading associated with its surface water discharge. In addition, outside grant funding can reduce the cost of delivering recycled water.

CEQA documentation and ongoing funding coordination are critical to implementation. The current Water Recycling Grant program administered by the State Water Resources Control Board (SWRCB) requires environmental documentation as a condition of eligibility for the currently available construction funding. As Proposition 50 is implemented, both the SWRCB and the Department of Water Resources will be in a position to make grant funding for available water recycling projects. Preliminary information indicates that projects will be received most favorably if they are located within the CalFed solution area and if they are included with some form of an integrated regional water management plan.