SLVWD Water Supply Master Plan

1 Introduction

This report provides a comprehensive description and assessment of the water supply of San Lorenzo Valley Water District (SLVWD or District), Santa Cruz County, California, prior to its 2008 annexation of the Felton system formerly operated by the California American Water Company (Cal-Am).

1.1 San Lorenzo Valley Water District

Established in 1941, SLVWD serves several communities within the 136 square-mile watershed of San Lorenzo River and its tributaries (Figure 1-1). The District's Northern Service Area includes the unincorporated communities of Boulder Creek, Brookdale, Ben Lomond, and portions of Felton. Its Southern Service Area encompasses portions of the City of Scotts Valley and adjacent unincorporated areas.

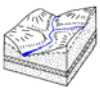
The District's legal boundaries encompass approximately 58 square miles. The District's "current serviceable area," defined as the area that is currently served–or has the potential to be served–by existing District infrastructure, encompasses approximately 22.2 square miles (14,220 acres) in the Northern Service Area and 0.8 square mile (513 ac) in the Southern Service Area and recently annexed Mañana Woods subdivision (Figure 1-2).[1]

San Lorenzo Valley extends 21 miles from the river's mouth at the ocean to its headwaters near Santa Cruz County's most northern boundary. The valley is framed by the crest of the Santa Cruz Mountains to the north and northeast (maximum elevation 3,200 feet above mean sea level [ft msl]) and the crest of Ben Lomond Mountain to the west (elevation 2,600 ft msl). The District's current serviceable area ranges in elevation from approximately 400 ft msl near Scotts Valley to 1,400 ft msl along the flanks of Ben Lomond Mountain.

As shown in Figure 1-2, other principal water purveyors adjacent to SLVWD include Scotts Valley Water District (SVWD), Lompico County Water District (LCWD), the former Cal-Am Felton service area (annexed by SLVWD in 2008), and the City of Santa Cruz Water Department (SCWD). Smaller water purveyors adjacent to SLVWD include Big Basin Water Company and Brackenbrae, Forest Springs, and Olympia mutual water companies. Area land uses include the residential and commercial areas served these water purveyors, state and regional parks, quarries, and timber resources (Figure 1-3).

SLVWD currently produces approximately 2.0 million gallons per day (mgd), on average, to meet the demand of nearly 6,000 service connections and a population of more than 20,000 (including the Mañana Woods Mutual Water Company annexed by SLVWD in March 2006). The District's currently active water sources consist of five stream diversions and seven groundwater wells. The Northern Service Area is supplied by both streams and wells, the conjunctive use of which has provided a reliable supply through past drought cycles. The Southern Service Area relies solely on groundwater, although an inter-tie to the Northern Service Area is planned. The District has an entitlement to a portion of the yield of Loch Lomond Reservoir operated by the City of Santa Cruz, but has not exercised this right since the 1970s.

[1] In this report, reference to SLVWD's Northern and Southern Service Areas is essentially synonymous with SLVWD's North and South Systems.



As shown in Figure 1-4, SLVWD's active water supply sources consist of direct diversions on Peavine, Silver, Foreman, Clear, and Sweetwater creeks; two wells at each of its Quail Hollow, Olympia, and Pasatiempo wellfields; and the Mañana Woods well. The diversion watersheds are situated along the steep northeast facing slopes of Ben Lomond Mountain. All of SLVWD's wells are associated with the Santa Margarita Sandstone aquifer. The Pasatiempo and Mañana Woods wells also draw from the underlying Lompico Sandstone aquifer (Figure 1-5).

SLVWD's ability to meet expected future water demand through future climatic cycles will depend on the optimal conjunctive use of its available supplies throughout its served area.

1.2 Water Supply Master Plan Objectives

This Water Supply Master Plan provides a comprehensive characterization and analysis of SLVWD's

- Sustainable water-supply sources as defined by climate, watershed hydrology, aquifer hydrogeology, water quality, and water rights.
- Existing and planned water collection, treatment, storage, and conveyance infrastructure.
- Expected water-supply yield given SLVWD's
  - Current and projected water demand
  - Past and potential conjunctive use of available sources.

Conjunctive use is evaluated for a representative climatic period with and without (a) projected future demand, (b) a proposed inter-tie between SLVWD's Northern and Southern Service Areas, and (c) use of SLVWD's negotiated portion of Loch Lomond Reservoir's yield.

This plan is intended to provide the technical reference needed for subsequent District planning and environmental assessments and implementation of various District projects.

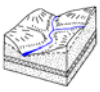
Subsequent to this Water Supply Master Plan, SLVWD is expected to conduct additional related analyses including the following:

- Financial aspects of its current and planned water supply.
- The effects of various environmental constraints on its estimated water-supply yield.
- Aspects of water-supply reliability apart from this report's evaluation of climate, hydrology, and hydrogeology.
- Appropriate measures for demand management and contingency plans for potential water shortages.
- The potential use of recycled water and other possible supplemental sources.

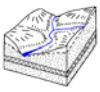
1.3 Previous Studies and Available Information

Previous work that addressed aspects of SLVWD's water supply includes the following:

- Initial assessments of potential well sites and groundwater yield in the Quail Hollow, Olympia, Pasatiempo, and Scotts Valley areas (e.g., California Department of Water Resources, 1951; Akers, 1969; Wire, 1975; 1977; Akers and Jackson, 1977; Geoconsultants, 1979, 1980; Muir, 1979, 1981; Ellis, 1987).
- Early evaluations of SLVWD's water-supply yield (Williams & Associates, 1976; Barrett & Associates, 1978).



- A comprehensive assessment of regional surface-water and groundwater resources by the North-Central Santa Cruz County Water Supply Master Plan Study (HEA, 1983, 1984; Luhdorff & Scalmanini Consulting Engineers, 1984).
- Assessment of existing wellfield conditions (Ellis, 1990, 1992, 1997; Johnson, 2000).
- Estimated monthly streamflow records for SLVWD diversion watersheds (Geomatrix, 1999).
- Comprehensive hydrogeologic interpretation (i.e., conceptual models) of Quail Hollow and Pasatiempo groundwater conditions (Johnson, 2001; 2002).
- Development of a numerical groundwater flow model (using MODFLOW) for the Quail Hollow area (Johnson, 2003).
- Evaluations of existing and potential conjunctive use of surface-water and groundwater resources, including artificial groundwater recharge with diverted streamflow (Ellis, 1981; Linsley, Kraeger Associates, 1983; Todd Engineers, 2000; Johnson, 2000, 2004, 2005; Ramlit Associates, 2001).
- Evaluation of potential and observed groundwater quality degradation in the vicinity of SLVWD wellfields (HEA, 1982; Johnson, 1988, 2001; CH2M HILL, 1994; Santa Cruz County Environmental Health Services, 1994, 1995).
- Characterization of water treatment capacities (Lyon WTP Operation Plan; Kennedy/Jenks Consultants, 2002).
- Evaluation of potential effects of groundwater pumping on streamflow (Johnson, 1989; Alley & Associates and others, 2004).
- Potential effect of quarrying on groundwater conditions (Gilchrist, 1989; Thomas Reid and Associates, 1997; SECOR, October 1997; CH2M HILL, 1999; Weber, Hayes & Associates, 2000, 2002; Bowman and Williams, 2003).
- Assessment of declining groundwater levels in the vicinity of SLVWD's Pasatiempo wellfield (Ellis, 1995).
- Watershed management plans and sanitary surveys encompassing SLVWD's diversions (CDM, 1996; Santa Cruz City Water Department (SCCWD), 2001; Santa Cruz County Environmental Health Services and Planning Department, 2001; SLVWD, 2007; Balance Hydrologics, 2007).
- Drinking Water Source Assessment and Protection (DWSAP) reports for SLVWD wells (Johnson, 2001, 2002) and diversions (Johnson, 2005), SVWD wells (Todd Engineers, 2001, 2003), and City of Santa Cruz diversions from Loch Lomond and the San Lorenzo River (Johnson, 2003).
- Studies and annual reports regarding Scotts Valley groundwater resources (Santa Cruz County Office of Watershed Management, 1978; Todd Engineers, 1984-2003; Watkins-Johnson Environmental, 1993; ETIC, 2005-07).
- Development and updates of a Scotts Valley area numerical groundwater flow model (using MODFLOW) (Watkins-Johnson Environmental, June 1992; Todd Consulting Engineers, 1997; ETEC, 2006).



- Evaluations of groundwater contamination in the Scotts Valley area (Santa Cruz County Health Services Agency, 2002; Stollar & Associates, 1988; S.S. Papadopulos & Associates, 2004).
- Groundwater use by Mount Hermon Association (Geoconsultants, 1990; Weber, Hayes & Associates, 1997, 1999; Luhdorff and Scalmanini Consulting Engineers, 2000;
- City of Santa Cruz water plans (SCCWD, 2004, 2005; Gary Fiske & Associates, 2003;

Available data pertinent to this study include the following:

- SLVWD service connections and monthly water deliveries (1978-2006)
- SLVWD surface-water and groundwater monthly production (1976-77, 1984-20086)
- Mañana Woods Mutual Water Company monthly water production (1988-2002, partial record)
- SLVWD, NOAA, and various other rainfall records (1867-2008)
- US Geological Survey (USGS) streamflow gaging records for area streams (1936-2008)
- SLVWD, SVWD, and other groundwater-level records (1967-2008)
- SLVWD and various other water quality records (SLVWD 1984-2006)
- Santa Cruz County geographical information system (GIS) coverages.

Relatively continuous and complete SLVWD records are available beginning in 1984. Some water production and use data are available from the 1970s, and some groundwater-level data extends back to the 1960s.

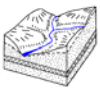
1.4 Approach and Report Organization

This water supply master plan inventories SLVWD's surface-water and groundwater supplies and its infrastructure for water collection, treatment, storage, and conveyance. The yield of the system is estimated as a function of expected water demand, a representative climatic cycle, and the conjunctive use of available water sources. This analysis draws on a study area consisting of the entire San Lorenzo Valley and its surrounding area.

Given the many constraints on water-resource development in San Lorenzo Valley and California in general (e.g., water-rights, potential environmental impacts, feasibility, cost), this Water Supply Master Plan does not attempt to quantify the maximum supply of water potentially available to SLVWD. Rather, it evaluates the feasibility of meeting SLVWD's current and projected future water needs through the conjunctive use of its available resources with existing and planned infrastructure.

Following this introduction:

- Section 2 evaluates historical SLVWD water demand and presents a projection of future demand.
- Section 3 evaluates the climatic record and defines a representative climatic period for evaluating alternative conjunctive use scenarios.
- Section 4 evaluates the watershed hydrology, infrastructure, and recorded and potential production of SLVWD's surface water resources.
- Section 5 evaluates the groundwater resources, infrastructure, and historical and potential yield associated with SLVWD's existing wellfields (including the Mañana Woods well).
- Section 6 evaluates SLVWD's entitlement to a portion of the yield of Loch Lomond reservoir, or a negotiated equivalent supply from the City of Santa Cruz Water Department.



- Section 7 evaluates SLVWD's potential system yield given existing and planned storage and distribution infrastructure and the conjunctive use of available sources.
- Section 8 presents conclusions and recommendations and Section 9 provides references for cited sources of information and prior work.

This report gives water-supply volumes in units of both gallons and acre-feet (e.g., million gallons per year [MG/yr], acre-feet per year [AF/yr]). The results are also provided in terms of both the calendar year (CY) and the water year (WY) (e.g., WY 2009 extends from October 1, 2008 to September 30, 2009). It is useful to consider the occurrence of annual streamflows using water years, whereas both groundwater production and water demand are better described using calendar years. Calendar years are used except where indicated otherwise.

Figure 1-6 shows the location of subarea maps used to describe SLVWD's stream diversions and wellfields in the remainder of this report.