DRAFT

Section 2: Description of Plan Area

Groundwater Sustainability Plan for
Sonoma Valley Groundwater Subbasin

Table of Contents

Appendices

Tables

Figures

2 DESCRIPTION OF THE PLAN AREA (23 CCR 354.8 B)

In accordance with 23 CCR Section 354.8 b, this section provides a description of the area of the GSP (Plan Area), including the Subbasin's general physical setting and jurisdictional areas, topography and surface water features, land use characteristics, water source types and uses, existing monitoring and management programs, applicable land use plans, and the well permitting process. The numbers in parenthesis in each subheading indicate the applicable SGMA regulation.

2.1 General Setting and Jurisdictional Areas (23 CCR 354.8 b)

The Plan Area for this GSP is the entire Subbasin, which lies within a northwest trending structural depression in the coast ranges immediately north of San Pablo Bay. The Subbasin is one of three coastal alluvial subbasins of the Napa-Sonoma Valley Groundwater Basin in the San Francisco Bay Hydrologic Region (DWR 2003). It is generally bounded on the west by the Sonoma Mountains and on the east by the Mayacamas Mountains. As shown on **Figure 2-1**, the approximately 44,000-acre Subbasin extends from San Pablo Bay northward to about 2 miles south of the town of Kenwood and incorporates the city of Sonoma and communities of El Verano, Agua Caliente, Fetters Hot Springs, Boyes Hot Springs, Glen Ellen, Schellville, Buena Vista, and Vineberg. As shown on **Figure 2-2**, the principal stream draining the Subbasin is Sonoma Creek, which is tidally influenced from approximately Schellville downstream to its mouth at San Pablo Bay. The Subbasin is a subset of the larger Sonoma Creek watershed.

Neighboring groundwater basins and subbasins include the Petaluma Valley Basin (designated as basin 2-001 by DWR), Kenwood Valley Basin (designated as basin 2-019 by DWR), and the Napa-Sonoma Lowlands Subbasin (designated as basin 2-002.03 by DWR) (**Figure 2-1**). The Petaluma Valley Basin is a medium-priority basin that lies to the west and abuts southwestern portions of the Subbasin. The Petaluma Valley GSA formed in June 2017 and is responsible for implementing SGMA in the Petaluma Valley Basin. The Kenwood Valley Basin is a very low-priority basin that lies to the north of the Subbasin. The Napa-Sonoma Lowlands is a very low-priority basin located in Napa County that occupies lowland areas northeast of San Pablo Bay and shares a boundary with the Subbasin in the Carneros area and within the low-lying tidal marshlands along the margin of San Pablo Bay. As very low-priority groundwater basins, the Kenwood Valley and Napa-Sonoma Lowlands are not required to form GSAs or develop GSPs; only high- and medium-priority basins are required to meet SGMA mandates.

Available technical information related to the hydrologic connection between the Subbasin and the adjacent basins/subbasins is included in **Section 3** (Basin Setting), and provisions for coordinating with applicable GSAs and other local agencies within neighboring basins are described in **Section 7** (Implementation Plan).

The Plan Area and jurisdiction of the Sonoma Valley GSA is the Sonoma Valley Groundwater Subbasin as defined by SGMA basin prioritization (DWR 2020) and DWR Bulletin 118 (DWR 2003). The Subbasin has been well-studied (See **Section 3**) with technical information that indicates that areas of the Sonoma Creek watershed outside of the Subbasin are hydrologically

connected and represent important sources of inflow (both in the form of surface streamflows and subsurface inflows). In recognition of the hydrologic connection with the contributing watershed areas, available data and information from these areas are also included in this GSP. Distinctions between metrics and features associated with the Bulletin 118 Subbasin and the contributing watershed areas are clearly indicated or displayed in relevant sections and figures.

Local agencies with water supply, water management, or land use responsibilities within the Subbasin include the Sonoma Valley GSA, City of Sonoma, Valley of the Moon Water District (VOMWD), North Bay Water District (NBWD), Sonoma Resource Conservation District (RCD), Sonoma Water, and Sonoma County. **Figure 2-3** shows the jurisdictional boundaries of these local agencies, state and federal lands, and protected lands within the Subbasin. State lands include the Sonoma Developmental Center and properties within tidal marshlands in the southern portions of the Subbasin managed by the California Department of Fish and Wildlife. Federal lands are also present within tidal marshlands in the southern portions of the Subbasin and are managed by the U.S. Fish and Wildlife Service. Other protected lands located within the Subbasin and contributing watershed areas shown on **Figure 2-3** include city parks and fields, county regional parks and preserves, special district properties and preserves, state parks and preserves, and non-profit preserves.

The California Legislature assigned primary responsibility for protecting and enhancing California's surface water and groundwater quality to the State Water Resources Control Board (SWRCB), and the nine regional water quality control boards (Regional Boards).The SWRCB provides state-level coordination for the water quality control program and regulatory monitoring by establishing statewide policies and plans for implementing state and federal laws and regulations. The Regional Boards adopt and implement water quality control plans (basin plans), recognizing the unique characteristics of each region's natural surface water and groundwater quality, actual and potential beneficial uses, and surface water and groundwater quality problems. Article 3 of Chapter 4 of the Porter-Cologne Act directs the Regional Boards to adopt, review, and revise basin plans, and provides specific guidance on factors that must be considered in the adoption of surface water and groundwater quality objectives and implementation measures.

The San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) implements water quality regulations in the watershed, including establishing Total Maximum Daily Loads for pathogens and sediment in Sonoma Creek, adopting General Waste Discharge Requirements (WDRs) for vineyard discharges, and for stormwater and wastewater discharges. The WDRs for vineyard discharges require the development of a farm plan that outlines best management practices (BMPs) implemented to reduce sediment and stormwater runoff and monitoring and reporting. The SFBRWQCB and the California Department of Toxic Substances Control (DTSC) are responsible for regulating the cleanup of contaminant sites and the migration of contaminated groundwater; the GSA has no authority to regulate groundwater contaminant site cleanups or the migration of plumes.

2.2 General Land Use Characteristics (23 CCR 354.8 b)

Maps of existing land uses for 1999, 2012, and 2013 are shown on **Figures 2-4a**, **b**, and **c**, respectively. Existing conditions correlate most closely with the DWR 2012 land use survey (**Figure 2-4b**), which indicates the land uses within the Subbasin, as shown in **Table 2-1.**

Table 2-1. Major Land Uses in Subbasin

Land Uses in Subbasin	Percent of Subbasin
Agriculture	44
Native Vegetation or Water	43
Urbanized Uses (residential, commercial, industrial)	13

The majority of the native vegetation is located in the lower portions of the Subbasin along the tidal marshlands and in the upper portions of the Subbasin near Glen Ellen. For several decades, the primary agricultural crop has been vineyards for wine production. Non-irrigated pastures, grains and hay, and dairies are also important land use categories, with a total area comparable to irrigated agriculture. The urbanized and residential areas in the Subbasin are primarily along the Highway 12 corridor and include the city of Sonoma, several unincorporated communities, and areas of rural and semi-rural residential development.

Land use mapping over the past several decades illustrates the more significant growth and land use changes in the Subbasin, which most notably includes increases in irrigated agriculture and residential and commercial land uses (**Table 2-2** and **Figures 2-4a**, **2-4b**, and **2-4c**). In the Subbasin, native vegetation, which had been declining as a percent of land use, increased from 38 percent in 1993 to 43 percent in 2012, mostly owing to the restoration of tidal marshlands of southern Sonoma Valley that has replaced non-irrigated agriculture.

Table 2-2. Land Use Changes in Subbasin

Land Use Type	Percent of Land Use Type					
	1974	1979	1986	1993	1999	2012
Non-irrigated agriculture	22	33.8	35.3	33.7	16.3	21.5
Irrigated agriculture	14.1	13.3	16.4	19.7	21.7	21.5
Native vegetation or water	54.2	44.9	39.2	37.5	49	42.6
Combined residential, commercial/ industrial, and unknown	9.7	8.0	9.1	9.1	13.0	13.3

2.3 Water Source Types and Water Use Sectors (23 CCR 354.8 b)

This GSP recognizes that the efficient use and conjunctive management of the various available water sources is integral to achieving sustainable groundwater management in the Subbasin. The Subbasin has four primary water source types: groundwater, imported surface water, local surface water, and recycled water. An overview of the spatial distribution of the reliance on the

four primary water source types by primary water use sectors in the Subbasin is shown on **Figure 2-5** and provided in the following paragraphs. Additional details on water uses associated with the Subbasin water budget are described in **Section 3** (Basin Setting) and additional information on the availability and feasibility for future uses is included in **Section 6** (Projects and Management Actions).

Early on, Sonoma Valley relied completely on abundant springs and surface water during its early settlement and growth period and the first and second incorporations of the City of Sonoma in 1850 and 1883, respectively. Census information for the City of Sonoma indicates relatively flat population growth from 1890 to 1940, and then growth of 1,000 to 2,000 per year until 2010 and has remained at around 11,000 into 2020. Local water supply accounts for approximately 3 percent of the water supply in the Subbasin in 2020.

Historically, Sonoma Valley relied completely on its local groundwater and surface water resources until March 1963 with the completion of the construction of the Sonoma Aqueduct and initiation of Russian River imported surface water deliveries. Deliveries to the Sonoma Valley have been between 5,000 to 6,000 acre-feet per year (AFY) over the past 25 years, accounting for approximately 35 percent of the overall water supply in 2020.

Growth in the wine industry and increasing vineyards in the Sonoma Valley accounts for most of the agricultural demand expansion, from about 10,000 acres of vineyards in 1960 to about 60,000 acres of vineyards in Sonoma Valley in 2020. Groundwater pumping was estimated through the groundwater model at about 4,000 AFY in 2020. Urban and private systems well groundwater demands did not begin to ramp up until later due in part to the Sonoma Aqueduct imported water supplements beginning in the 1960s, and urban and small system groundwater pumping increased from a few hundred AFY in the 1980s to about 1,800 AFY in 2020. Rural residential well pumping is estimated through the groundwater model, and was approximately 500 AFY in 1970, increasing to approximately 1,000 AFY in 2020. Today, groundwater accounts for approximately 52 percent of the overall Subbasin water supply.

Deliveries of recycled water in 1990 with about 700 AFY for the irrigation of vineyards has replaced groundwater pumping. Recycled water ramped up in the early 2000s to 800 AFY, hit a peak of 1,400 AFY in 2013, and has been about 1,100 AFY for the last few years, accounting for about 10 percent of the water supply in the Subbasin.

2.3.1 Groundwater

Nearly 60 percent of all Sonoma Valley water demands are estimated to be met by local groundwater (SVGMP 2014). **Figure 2-6** presents a map showing the approximate density of water wells within the Subbasin, based on available data from DWR. (Note to reviewers: This map will be updated and refined with local information from Sonoma County Permit and Resource Management Department [Permit Sonoma] and other well databases.) These groundwater resources are relied upon to varying degrees by rural and urban residents, vineyards and wineries, dairies, and other businesses, and also support streamflows and ecosystems present in Sonoma Valley. Groundwater represents the primary, or in some cases

only, source of supply for agriculture, rural residents, mutual water companies, irrigated park lands, golf courses, and other commercial businesses located outside of the city of Sonoma and VOMWD service areas. Local groundwater represents an important supplemental source of supply for both the City of Sonoma and VOMWD, which operate municipal wellfields within the basin and watershed.

2.3.2 Imported Surface Water

Imported surface water consists of Russian River surface water sourced from Sonoma Water's production facilities near Forestville that is delivered via aqueduct to the City of Sonoma and VOMWD within the Subbasin, as shown on **Figure 2-5**. Imported surface water represents the primary source of water for urban residents and businesses that are served by the City of Sonoma and VOMWD. These two providers collectively serve approximately 75 percent of the population in Sonoma Valley and delivered approximately 3,500 AFY of imported surface water in Water Year 2015, representing approximately one-quarter of the total water demands in the watershed (City of Sonoma 2016 and VOMWD 2016).

2.3.3 Local Surface Water

Local surface water from Sonoma Creek and its tributaries represents an important source of supply for some water users. Information on the approximate amounts of surface water is available through reported surface water diversions filed with the California SWRCB. These local surface water diversions are estimated to represent less than 10 percent of the total water demands in the watershed (SVGMP 2014) and are primarily relied upon for agricultural purposes and for supplying drinking water to the site of the former Sonoma Developmental Center.

2.3.4 Recycled Water

Recycled water is treated to tertiary standards at the Sonoma Valley Wastewater Treatment Plant (**Figure 2-5**) and is used for crop and landscape irrigation in lieu of using groundwater or imported water. Recycled water deliveries are estimated to represent less than 10 percent of the total water demands in the watershed (SVGMP 2014) and are primarily relied upon for agricultural purposes to irrigate vineyards, dairies, and pasturelands in southern Sonoma Valley in the areas shown on **Figure 2-5**. Some playing fields and parks within the city of Sonoma are irrigated with recycled water. A significant portion of the total recycled water available from the Sonoma Valley Wastewater Treatment Plant is currently being delivered for wetlands enhancement at the Napa-Sonoma Salt Marsh Restoration Project located outside of the Subbasin.

2.4 Existing Monitoring Programs and Networks (23 CCR 354.8 c, d, e)

As described in this section, existing monitoring programs and networks within the Subbasin have been developed and implemented by many agencies, organizations, and volunteers for a variety of purposes. Current monitoring efforts focus on tracking trends in groundwater levels, groundwater quality, climate, and surface water flows. An assessment of the existing monitoring networks and programs for their suitability to comply with DWR's GSP regulations,

including identification of data gaps, is described in **Section 5** of this GSP (Proposed Monitoring Plan).

2.4.1 Groundwater-Level Monitoring

Numerous organizations within the watershed collect groundwater-level measurements, including DWR, Sonoma Water, City of Sonoma, VOMWD, Permit Sonoma, local volunteers, and many operators of small mutual water systems. Groundwater levels are measured from a combination of private wells, dedicated monitoring wells, and inactive and active public water supply wells. The groundwater-level monitoring network expanded significantly under the voluntary Sonoma Valley Groundwater Management Plan (SVGMP) through public outreach and education to private well owners who volunteered to have their wells monitored. In addition, the SWRCB GeoTracker program provides groundwater-level monitoring data on soil and groundwater cleanup sites in the Subbasin.

Groundwater-level monitoring is generally conducted twice a year, in the spring and fall, at 158 groundwater-level monitoring program wells within the watershed, as shown on **Figure 2-7a**. A subset of the wells is monitored on a more frequent basis, including continuous monitoring using pressure transducers. The 158 wells in the existing monitoring program were subdivided according to their well-screen depth or total depth, where known, into the following categories:

- 200 feet deep or less (67 wells)
- 200 to 500 feet deep (47 wells)
- Greater than 500 feet deep (33 wells)
- Unknown well-screen and depth (11 wells)

DWR has measured groundwater levels in a network of wells within both the Subbasin and watershed for decades. Most of these wells were incorporated into DWR's monitoring network between the mid-1950s and 1981. Measurements are generally collected from these wells semiannually in the spring and fall, although a subset of wells are monitored on a monthly basis.

Since 2004, Permit Sonoma has administered a groundwater monitoring program, which requires the measurement and reporting of groundwater levels on a quarterly or monthly basis for all cannabis permits, and commercial/industrial projects requiring a use permit and that use over 0.5 AFY of water.

The DWR California Statewide Groundwater Elevation Monitoring (CASGEM) Program is a voluntary, collaborative state program established by Senate Bill 6 in 2009 to compile groundwater-level monitoring data statewide from local monitoring programs. Local agencies are required to submit groundwater-level monitoring data to be eligible for water grants and loans awarded by the state. A subset of the Subbasin groundwater-level monitoring data is reported to the CASGEM program.

2.4.2 Groundwater Quality Monitoring

Groundwater quality data has been collected through many different programs and initiatives, described in the following paragraphs. The synthesis and evaluation of results from these water quality monitoring programs are described in **Section 3** (Basin Setting).

2.4.2.1 Public Water Supply Well Monitoring

The SWRCB Division of Drinking Water (DDW) monitors public water system wells for CCR Title 22 (Social Security) requirements relative to levels of organic and inorganic compounds such as metals, microbial compounds, and radiological analytes. Data are available for active and inactive drinking water sources, for water systems that serve the public, and wells defined as serving 15 or more connections, or more than 25 people per day. In the watershed, DDW wells were monitored for Title 22 requirements, including pH, alkalinity, bicarbonate, calcium, magnesium, potassium, sulfate, barium, copper, iron, zinc, and nitrate.

2.4.2.2 Groundwater Ambient Monitoring and Assessment Program

In response to the Groundwater Quality Monitoring Act of 2001 (CWC Sections 10780 to 10782.3), the SWRCB established the Groundwater Ambient Monitoring and Assessment (GAMA) Program to monitor groundwater quality throughout the state of California. GAMA is intended to create a comprehensive groundwater monitoring program throughout California and increase public availability and access to groundwater quality and contamination information. GAMA receives data from a variety of monitoring entities including DWR, the U.S. Geological Survey (USGS), and the SWRCB. The GAMA data can be accessed at https://gamagroundwater.waterboards.ca.gov/gama/gamamap/public/Default.asp.

2.4.2.3 Water Data Library

DWR monitors groundwater quality data. Samples are collected from a variety of well types, including irrigation, stock, domestic, and some public supply wells. Wells are sampled infrequently; therefore, most wells have only a few data points and there are large temporal gaps between the results. Constituents most frequently monitored include dissolved chloride, sodium, calcium, boron, magnesium, and sulfate. Measurements taken include conductance, pH, total alkalinity, and hardness (more than 1,000 total samples per parameter). Additional dissolved nutrients, metals, and total dissolved solids (TDS) are also sampled but have fewer sample results available (one to 1,000 samples per parameter). DWR reports the results through the Water Data Library (WDL).

2.4.2.4 Sonoma Valley Salt and Nutrient Management Plan

In Sonoma Valley, 47 wells that are currently monitored by DWR, California Department of Public Health (CDPH), and SVGMP are included in the Salt and Nutrient Management Plan (SNMP) monitoring program. Wells are monitored and results are reported through the GeoTracker database system to the Regional Water Board every 3 years in an SNMP Groundwater Monitoring Report. Parameters monitored include electrical conductivity (EC), TDS, and nitrate.

2.4.2.5 U.S. Geological Survey Studies

Special studies conducted by the USGS within the Subbasin have included the collection and analysis of groundwater quality data. Water quality analyses have included major ions, trace elements, nutrients, and stable isotopes (oxygen-18 and deuterium), tritium, the radioactive isotope of carbon (carbon-14), and the stable isotope carbon-13. Data collected by the USGS through these studies are available on the National Water Information System (NWIS) database (https://waterdata.usgs.gov/nwis).

2.4.3 Climate Monitoring

Climate-related monitoring stations in the watershed provide part of the information necessary for forecasting weather conditions, flood preparedness, drought preparedness, water supply planning, and for determining the Subbasin water budget. Climate monitoring stations may include sensors to collect data on rainfall, air temperature, relative humidity, wind speed and direction, solar radiation, and soil temperature and moisture.

The primary weather station in the Subbasin that has been used to calculate mean annual rainfall is Climate Station Sonoma (National Climatic Data Center #8351, Sonoma), which also collects temperature data. Data are available from 1953 to the present at this station, which is located in the city of Sonoma.

The California Irrigation Monitoring Information System (CIMIS), operated by DWR, maintains a climate station in the Carneros area in Napa County. The Carneros station (CIMIS Station 109) is about 1,000 feet east of the Subbasin boundary and has been in operation since March 11, 1993. The station measures evapotranspiration (ET), precipitation, solar radiance, vapor pressure, temperature, relative humidity, dewpoint, windspeed and wind direction, and soil temperature.

Climate data (**Figure 2-7c**) are collected by other stakeholders in the watershed, including:

- Western Weather Group (http://www.westernwx.com/sonoma/)
- Community Collaborative Rain, Hail and Snow Network (https://www.cocorahs.org/ViewData/CountyDailyPrecipReports.aspx?state=CA&county=SN)
- Sonoma Water (One Rain, https://sonoma.onerain.com/home.php)

Local agencies are also working collaboratively with the National Oceanic and Atmospheric Administration (NOAA) and the USGS to develop better information on weather conditions, weather and river level forecasting, and climate change.

2.4.4 Surface Water Monitoring

Continuous streamflow data are collected by the USGS, Trout Unlimited, and Sonoma Water (**Figure 2-7b**). The USGS operates three streamflow gages in the watershed:

1. Kenwood (11458433 SONOMA CREEK A KENWOOD CA)
2. Agua Caliente (11458500 SONOMA C A AGUA CALIENTE CA)
3. Nathanson (11458600 NATHANSON C A SONOMA CA)

Synoptic streamflow measurements (seepage runs) were conducted on Sonoma Creek and its tributaries in 2003 and 2010 by the USGS. Sonoma Ecology Center has conducted seepage runs since 2014 and it is anticipated the organization will continue this work into the future. These seepage runs consist of a series of streamflow measurements made at multiple sites over a short time period (for example, single day to several days) along Sonoma Creek and its tributaries to quantify streamflow gains and losses for a specific time period. The seepage runs provide insights into stream reaches that rely on shallow groundwater to support streamflow and areas where surface water from streams provide a source of recharge to the groundwater system, as well as how these conditions can vary seasonally. Measurements have been collected at approximately 50 to 70 sites on a semiannual basis and at approximately 15 to 20 sites on a monthly to bimonthly basis (**Figure 2-7b**).

2.4.4.1 Land Surface Subsidence Monitoring

There are two primary systems for monitoring land surface subsidence in the Subbasin:

- To support the implementation of SGMA, subsidence is currently estimated every month by DWR using Interferometric Synthetic-Aperture Radar (InSAR) data. The InSAR data are spatially extensive (covering nearly the entire Subbasin) with data available monthly going back to 2015.

- Global positioning system (GPS) stations monitored by the University NAVSTAR Consortium's (UNAVCO's) Plate Boundary Observatory (PBO) program are an indicator for subsidence. There are currently no regularly scheduled theodolite (precision optical instruments used in land surveying) or total station surveys and no extensometers in the Sonoma Valley. The UNAVCO PBO consists of a network of about 1,100 continuous GPS and meteorology stations in the western United States used to monitor multiple pieces of information, including subsidence. There are two stations in the Subbasin and one in the upper watershed located: (1) near Highway 12 at Sonoma Creek, (2) on Rogers Creek near Temelec, and (3) on the ridgetop just south of Sugarloaf Ridge State Park. This is described in more detail in **Section 3**, Basin Setting.

2.5 Existing Management Programs and Studies (23 CCR 354.8 c, d, e)

There are many existing and previous water management programs, studies, and initiatives that cover the Sonoma Valley Subbasin that have been developed for a variety of purposes by multiple agencies and organizations. This section summarizes those deemed most relevant to groundwater management planning and indicates the type of information and details from these plans that is incorporated into subsequent sections of this GSP.

2.5.1 Sonoma Valley Groundwater Management Program

The current trend in declining groundwater levels was recognized in a 2006 USGS study (Farrar et al. 2006) conducted in cooperation with Sonoma Water. This study formed the basis of the 2007 Sonoma Valley GMP, developed for the Sonoma Creek watershed under the leadership of a basin advisory panel (BAP), comprised of a diverse group of local stakeholders. The GMP was prepared under the authority of the Groundwater Management Act, California Water Code Section 10750 et seq., originally enacted as Assembly Bill (AB) 3030 in 1992 to encourage voluntary, non-regulatory groundwater management at the local level.

The GMP aimed to locally and voluntarily manage, protect, and enhance groundwater resources for all beneficial uses in a sustainable, environmentally sound, economical, and equitable manner for generations to come. This plan identified a range of voluntary water management actions, including groundwater recharge, groundwater banking, increased water use efficiency, and greater use of recycled water to reduce demand for groundwater. Key information, tools, and outcomes from these previous groundwater management planning activities include:

- Technical information on the Subbasin hydrology, hydrogeologic framework, water chemistry and source, surface water and groundwater interaction monitoring, and records of groundwater levels, including historical trends and documentation of groundwater depletion in southern Sonoma Valley
- Significant expansion of monitoring activities
- Initiation of studies and pilot programs for groundwater banking and stormwater recharge
- Development of a MODFLOW groundwater-flow model of surface water and groundwater systems in the Basin and contributing watershed area
- Initial scoping of projects and actions needed to address ongoing groundwater depletion and sustain groundwater resources in Sonoma Valley
- Engagement of local stakeholders in local groundwater planning and management

Prior to being discontinued in 2017, the BAP and Technical Advisory Committee developed *Insights and Recommendations, Sonoma Valley Groundwater Conditions and Management* (GSA 2017) for the Sonoma Valley GSA to consider in developing this GSP.

2.5.2 Bay Area Integrated Regional Water Management Plan

In November 2002, California voters approved Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002. The Act encourages regional cooperation in water resources planning by providing grant funding for projects identified in a regional plan, referred to as an Integrated Regional Water Management Plan (IRWMP 2019). DWR designed the IRWMP planning process to be consistent with the California Water Plan, a

statewide water resources planning document that is updated periodically and intends that IRWMPs and future updates of the California Water Plan be integrated further in the future.

The Bay Area IRWMP defines the Bay Area region according to the SFBRWQCB's (Region 2) jurisdiction, which includes the Subbasin. This region includes all or major portions of the nine counties that surround the Bay. The Bay Area IRWMP is a living document and involves a diverse group of water supply, water quality, wastewater, stormwater, flood management, watershed and habitat agencies, local governments, environmental groups, business groups, and community-based organizations.

Stakeholders from the nine counties identified needs and challenges related to specific "Functional Areas," described water management strategies to address these needs, and developed a list of potential strategies and implementation projects that maximize benefits and enhance opportunities for regional cooperation within a given functional area. The four Functional Areas are:

- Water Supply and Water Quality
- Wastewater and Recycled Water
- Flood Protection and Stormwater Management
- Watershed Management-Habitat Protection and Restoration

More information on the Bay Area IRWMP is available at http://bayareairwmp.org.

2.5.3 Urban Water Management Planning

Urban Water Management Plans (UWMPs) are prepared every 5 years by California's urban water suppliers to support long-term resource planning and ensure adequate water supplies are available to meet existing and future water demands. Every urban water supplier that either provides more than 3,000 acre-feet of water annually or serves 3,000 or more customers is required to assess the reliability of its water sources over a 20-year planning horizon considering normal, dry, and multiple dry years. The plans are submitted to DWR, which then reviews the plans to make sure they have completed the requirements identified in the Urban Water Management Planning Act (Division 6 Part 2.6 of the Water Code Sections 10610–10656).

Within the Subbasin, UWMPs are prepared by Sonoma Water as a wholesaler (Sonoma Water 2016), and the City of Sonoma (City of Sonoma 2016) and VOMWD (VOMWD 2016) as water retailers. Updated UWMPs were submitted to DWR in 2021. The UWMPs discuss and describe:

- Existing water supplies and infrastructure
- Projected water demands over the next 20 years, based on population growth projections, land use designations, and growth policies in city and county general plans
- Projected water supplies available over the next 20 years, the reliability of that supply, and general plans for water supply projects

- Current and planned water conservation activities, targets, and compliance
- A water shortage contingency analysis
- A comparison of water supply and water demand over the next 20 years under different hydrological assumptions (normal year, single dry year, 4 consecutive dry years)

Because local groundwater makes up a portion of the urban water supply within the Subbasin, the UWMPs also discuss and describe groundwater-production facilities, historical and projected groundwater use, and the conditions of the groundwater basin. Thus, UWMPs serve as a routine mechanism for local urban water providers to coordinate and plan for future urban groundwater use. The most recent projections for future urban groundwater use are incorporated in **Section 3** (Basin Setting). However, it is noted that UWMPs do not consider rural residential, agriculture, and small municipal/mutual water systems.

In addition to the UWMPs required by the state, local urban water providers perform other water supply planning activities related to groundwater, including development of water master plans, preparation of water supply assessments for larger proposed developments (more than 500 dwelling units or equivalent), updates of city and county general plans, and other activities. Information regarding some of these activities is summarized below:

- A Water Master Plan Update was developed by the City of Sonoma in 2018 (City of Sonoma 2018) and a Water Master Plan was developed by VOMWD in 2019 (VOMWD 2019).
- Sonoma Water developed the *2018 Water Supply Strategies Action Plan* (Sonoma Water 2018) in coordination with its water contractors (including the City of Sonoma and VOMWD) to increase water supply system reliability, resiliency, and efficiency in the face of limited resources, regulatory constraints, and climate change uncertainties. The *Water Supply Strategies Action Plan* was updated in 2018, and incorporates SGMA-related requirements and initiatives. The most recent version is available at http://www.scwa.ca.gov/water-supply-strategy/.
- Beginning with the passage of Senate Bill (SB) 610 in 2002, water supply assessments must be furnished to local governments for inclusion in any environmental documentation for certain projects that are subject to the CEQA. The water supply assessments are required to determine water supply sufficiency for a 20-year projection in addition to the demand of existing and other planned future uses.

2.5.4 Water Conservation Programs

Numerous regional and local water conservation programs are operational in the Plan Area, including the Sonoma-Marin Saving Water Partnership, the LandSmart program, and the Sustainable Winegrowing Program.

These programs are described in the following sections; however, it is anticipated that changes will likely occur as a result of sweeping legislation approved in 2018: AB 1668 (Friedman) and SB

606 (Hertzberg), which lay out a new long-term water conservation framework for California. The framework addresses both the urban and agricultural sectors, with goals to establish long-term improvements in water conservation and drought planning that recognize the need to adapt to climate change and the resulting longer and more intense droughts in California. The development of programs and initiatives is organized around four primary goals:

1. Use water more wisely
2. Eliminate water waste
3. Strengthen local drought resilience
4. Improve agricultural water use efficiency and drought planning

To fully plan, develop, and implement the new framework, DWR and the SWRCB are working together in collaboration with stakeholders to develop new standards for:

- Indoor residential water use
- Outdoor residential water use
- Commercial, industrial, and institutional (CII) water use for landscape irrigation with dedicated meters
- Water loss

Based on these standards, urban water suppliers will be required to stay within annual water budgets for their service areas. In addition, water suppliers will need to report the implementation of new performance measures for CII water use.

The legislation also made important changes to existing urban and agricultural water management planning, and enhanced drought preparedness and water shortage contingency planning for both urban water suppliers and small water systems and rural communities. Currently, state agencies are conducting needed studies and investigations, and developing standards and performance measures, web-based tools and calculators, data and data platforms, reports, and recommendations for the adoption of new regulations.

2.5.4.1 Sonoma-Marin Saving Water Partnership

The Sonoma-Marin Saving Water Partnership represents 10 water utilities in Sonoma and Marin Counties that are signatories to the California Urban Water Conservation Council and have joined to create a regional approach to water use efficiency. Within the Subbasin, these utilities include the City of Sonoma, VOMWD, and Sonoma Water. Each member utility has water conservation programs to assist its community with reducing water use. Water conservation and water use efficiency program elements specific to the Sonoma-Marin Saving Water Partnership include:

- Establishing a conservation coordinator, water waste prohibition, assistance, and water loss control programs (audits, leak detection, and repair)

- Urban water metering and conservation pricing (tiered structure)

- Developing and maintaining public information and school education programs on water and conservation
- Specific urban residential programs for indoor (high-efficiency toilets, fixtures, and washers) and outdoor landscaping assistance, surveys, and retrofits for increasing conservation
- Specific industrial and large landscape assistance, surveys, and retrofits for increasing conservation
- Rebate programs for high-efficiency appliances and fixtures
- Qualified water-efficient landscaper training that provides education on proper plant selection for local climates, irrigation system design and maintenance, and irrigation system programming and operation
- An online water-wise gardening website that offers a Mediterranean and native plant list, design and garden installation tips, and irrigation system design and maintenance information
- Green business program that provides businesses with water and energy conservation information and incentives to reduce waste and prevent pollution

More information is available at http://www.savingwaterpartnership.org/.

2.5.4.2 Local Landscape Ordinances

The county, City of Sonoma, and VOMWD have developed individual water-efficient landscape ordinances. The new water-efficient landscape ordinances require a landscape plan check for certain projects, as described in the ordinance. It includes requirements for landscape water budgets, landscape and irrigation design, and irrigation scheduling.

2.5.4.3 LandSmart

The Sonoma RCD, Napa RCD, and the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service developed the LandSmart program to help land managers identify and meet their natural resource management goals that support productive landscapes and thriving streams while meeting or exceeding environmental regulations. The program is applicable to a variety of agricultural lands. LandSmart Plans are developed by the agricultural producer, either independently, through workshops, or through one-on-one assistance from an RCD. Producers can also seek certification from the RCD's certification team once plans are complete. LandSmart Plan templates and guidance materials are designed to assess current practices and identify recommendations for other practices that would benefit natural resources such as water quantity and quality. Practices are prioritized and tracked over time. Information on LandSmart is available at www.LandSmart.org.

2.5.4.4 Sustainable Winegrowing Program

Members of the Wine Institute and the California Association of Winegrape Growers introduced the Sustainable Winegrowing Program in 2002 (California Sustainable Winegrowing Alliance et al. 2020) to promote environmental stewardship and social responsibility in the California wine industry. The workbook is a self-assessment tool for California's vintners and growers and provides practical information on how to conserve natural resources, protect the environment, and enhance relationships with employees, neighbors, and local communities. The workbook addresses criteria for measuring performance, including Vineyard Water Management and Winery Water Conservation and Quality. More information on sustainable winegrowing practices is available at http://www.sustainablewinegrowing.org/. Additionally, Sonoma County Winegrowers (https://sonomawinegrape.org/) have developed a Sustainability Certification Program for vineyards, which includes water conservation assessments.

2.5.5 Climate Change Studies and Planning

Projected changes in climate include increased variability in precipitation and rises in air temperature, resulting in a shorter wet season, longer dry season, more frequent droughts, and more extreme high flows. To face these potential changes in climate, local organizations are working with federal and state partners, including the USGS, DWR, NOAA, and the U.S. Army Corps of Engineers to advance the science in the region in an effort to plan for and adapt to predicted changes. Local agencies have also partnered to form the Sonoma County Regional Climate Protection Authority and developed a regional climate action plan, *Climate Action 2020 and Beyond* (Sonoma County Regional Climate Protection Authority 2016). Findings and results from these efforts are described in **Section 3** (Basin Setting) and incorporated into model projections in this GSP.

2.5.6 Groundwater Banking Feasibility Study

Due to uncertainties in the reliability of future regional water supplies (both surface water and groundwater), Sonoma Water, City of Sonoma, and other local partners, including the cities of Rohnert Park and Cotati, VOMWD, and the Town of Windsor, conducted a Groundwater Banking Feasibility Study for a regional groundwater banking program. The purpose of the study was to investigate the viability of enhancing the conjunctive management of surface water and groundwater resources (GEI Consultants, Inc. et al. 2013). The feasibility study is available at https://evogov.s3.amazonaws.com/185/media/182081.pdf.

Conceptually, the program would involve the diversion and transmission of surplus Russian River water produced at existing drinking water production facilities during wet weather conditions (that is, the winter and spring seasons) for storage in aquifers beneath the Santa Rosa Plain and/or Sonoma Valley—a concept referred to as Aquifer Storage and Recovery (ASR). The stored water would then be available for subsequent recovery and use during dry weather conditions (that is, the summer and fall seasons) or emergency situations. The Feasibility Study provided an evaluation of the regional needs and benefits, source water availability and quality, regional hydrogeologic conditions, and alternatives for groundwater banking.

Based on the findings from the study, pilot studies to further assess the technical feasibility of ASR as a method for groundwater banking were recommended and currently are being pursued in the City of Sonoma, where a pilot project was completed in fall 2018. The pilot project resulted in the empirical verification of specific hydrogeologic and water quality factors. The next steps are a technical and economic viability assessment of ASR technology in the region. If deemed feasible, the pilot project results could be used to complete environmental documentation and design for a full-scale or permanent ASR project in the region. Results from the pilot project also provided information on the technical feasibility for ASR in Sonoma Valley to other local agencies, including the VOMWD and the Sonoma Valley GSA.

2.5.7 Sonoma Valley Salt and Nutrient Management Plan

The SWRCB adopted a Recycled Water Policy in February 2009, subsequently updated in 2013 and 2018 (SWRCB 2018). The purpose of the Policy is to increase the use of recycled water in a manner that implements state and federal water quality laws. The Recycled Water Policy requires that SNMPs be completed to facilitate basin-wide management of salts and nutrients from all sources, to optimize recycled water use while protecting groundwater supply and beneficial uses, agricultural beneficial uses, and human health.

The Sonoma Valley County Sanitation District (SVCSD) prepared a SNMP for the Subbasin (SVCSD 2013), which was approved by the SFBRWQCB in 2015. Components of the SNMP included:

- Water recycling goals and objectives
- Salt and nutrient source identification
- Basin loading – assimilative capacity estimates
- Anti-degradation analysis
- Implementation measures
- Basin-wide water quality monitoring
- Consideration of emerging constituents of concern

The SNMP concluded that basin-wide levels of salts (specifically TDS levels) and nutrients (specifically nitrate values) generally are acceptable as established by the Water Quality Objectives in the SFBRWQCB Water Quality Control Plan (or Basin Plan) (SFBRWQCB 2010) and are projected to increase very slowly over time. The contribution of future projected recycled water levels within the Subbasin was estimated to be a minor component of projected increases. A groundwater quality monitoring program is included as part of SNMP implementation, and is a subset of the GSP monitoring program, required to be reported separately to the SFBRWQCB every 3 years.

2.5.8 Stormwater Management Planning

In 2012, Sonoma Water completed a scoping study in Sonoma Valley to identify opportunities to alleviate urban flooding, while possibly recharging groundwater aquifers or providing other benefits (Sonoma Water 2012). Information and results from this study and others in the region have informed the development of a Stormwater Resources Plan (SWRP). SWRPs are required

by SB 985 (Pavley 2014) in order to be eligible to seek funding from any future state bond measures for stormwater projects. A SWRP is a non-regulatory, watershed-based and stakeholder-driven plan that builds on local stormwater management objectives and identifies and prioritizes projects that capture, treat, or reuse stormwater and dry weather runoff. These projects must provide at least two benefits, which may include environmental enhancement, flood protection, groundwater recharge, water quality improvement, and/or recreational opportunities.

Sonoma Water, with support from a technical advisory committee, collaboratively developed with other local stakeholders the Southern Sonoma County Storm Water Resources Plan (Sonoma Water 2019) covering the Petaluma River and the Sonoma Creek watersheds (including the Subbasin). Through the planning process, more than 60 projects were identified and submitted by proponents for consideration and inclusion. The resulting plan provides a framework for submitting, quantifying, scoring, and ranking future projects in an objective and data-driven format.

2.6 General Plan and Related Land Use Planning

Existing city and county planning activities that are directly or indirectly linked with water supply and groundwater management include general plans, specific plans, and UWMPs, as described in the previous subsections. Under SGMA, cities and counties retain their land use authorities; however, in recognizing the linkages between land use and water management, SGMA does require increased coordination between land use planners and GSAs. Cities and counties must now refer proposed general plan changes to GSAs, and similarly GSPs must account for "the most recent planning assumptions stated in local general plans of jurisdictions overlying the basin" (CWC Section 10726.9). In addition, California State Government Code Title 7, Division 1, Article 6, Section 65350.5 stipulates that before general plans are adopted, they must review and consider GSPs.

The City of Sonoma and Sonoma County general plans and specific plans provide growth estimates based on the build out of land use designations that are used in the UWMPs and in this GSP to project future water demands. The growth estimates are also incorporated into the sustainable management criteria and metrics, including measurable objectives and interim milestones, the sustainability goal, proposed projects, and management actions. Projections of future groundwater availability and planned projects and actions needed for sustaining groundwater resources in the Subbasin will be shared with city and county planners for incorporation into their respective land use planning and decision making.

In addition to coordinating on activities within the Subbasin, coordination and information sharing between the GSA and land use planning agencies will be needed for the contributing watershed areas located outside of the GSA's jurisdiction. These areas primarily fall within the purview of the Sonoma County General Plan.

Future land use planning and associated growth projections are incorporated into the analysis of the future water budget, over the planning and implementation horizon (**Section 3**, Basin Setting).

2.6.1 General Plans

Counties and cities are required to develop and adopt comprehensive general plans to guide future local physical development, as required by California State Government Code Title 7, Division 1, Article 5, Section 65300 et seq. Each general plan must contain a statement of policies, including maps or diagrams and text, setting forth objectives, principles, and standards, and designating land use densities and intensities. City general plans are focused on providing guidance on growth and development in the urban setting, while county general plans focus on the unincorporated areas of the county. Developing and updating general plans involves significant community involvement through workshops, hearings, and public review of draft plans and policies. The Subbasin includes areas covered by Sonoma County's General Plan and the City of Sonoma's General Plan (the northern portions of the city of Sonoma are outside the Subbasin).

While there are seven mandatory elements of a general plan, the conservation element is typically where water resources are addressed, although water-related topics may also be addressed in other elements. In particular, the conservation element of a general plan must account for "rivers, creeks, streams, flood corridors, riparian habitats, and land that may accommodate floodwater for purposes of groundwater recharge and stormwater management" (California State Government Code Section 65302[d][3]). The housing elements are updated on an 8-year cycle to correspond with state regional housing needs allocations (California State Government Code Section 65584 [b]).

Specific plans are also used within the Subbasin to focus on planning defined areas within a jurisdiction.

2.6.1.1 *Sonoma County General Plan 2020*

The *Sonoma County General Plan 2020* (Sonoma County 2008) contains the seven mandatory elements of a general plan plus four optional elements: agricultural resources, air transportation, water resources, and public facilities and services. The water resources element was developed and included in the *Sonoma County General Plan 2020* in recognition of the importance of water resources within unincorporated areas of the county. The main purpose of the water resources element is to ensure that Sonoma County's water resources are sustained and protected. To achieve this main purpose, the water resources element states that water-resource management should consider the amount of water that can be used without exceeding the replenishment rates over time or causing long-term declines or degradation in available surface water or groundwater resources.

The water resources element includes goals, objectives, and policies for water quality and groundwater; public water systems; conservation and reuse; importing and exporting; and watershed management. These goals, objectives, and policies include supporting local

groundwater studies and management programs, and encouraging activities that protect natural groundwater-recharge areas. The water resources element of the *Sonoma County General Plan 2020* can be reviewed at https://sonomacounty.ca.gov/PRMD/Long-Range-Plans/General-Plan/Water-Resources/.

Other water-related topics incorporated in the *Sonoma County General Plan 2020* include water availability as a factor in land use map densities, which is addressed in the land use element. Land use designations based on the *Sonoma County General Plan 2020* are shown on **Figure 2-8**. The open space and resource conservation element addresses riparian corridors, wetlands, wildlife protection, tree protection, fishery resources and other biotic resources, water-oriented recreation, soil erosion, forestry, and mineral resources. The public facilities and services element addresses connections to public water systems. The public safety element addresses flood hazards, fire suppression, and hazardous materials.

It is anticipated that the next Sonoma County General Plan update will begin in 2022 and conclude in 2028.

2.6.1.2 City of Sonoma General Plan

City general plans guide growth and development in the urban community, and typically involve an urban-growth boundary. The UWMPs and general plans are clearly linked: UWMPs calculate future water demand based on growth and development projected in the associated general plan.

The *City of Sonoma 2020 General Plan* (City of Sonoma 2006) contains community development, environmental resources, local economy, circulation, public safety, noise, and housing elements. Each element contains goals, policies, and implementation measures that set a course for future land use in the city. Goals summarize how development and future growth should be directed to achieve the general plan vision by identifying physical, economic, and/or social ends that the community wishes to achieve.

The community development element defines the planned growth within the city, which is controlled by the City's Growth Management Ordinance. The Growth Management Ordinance limits residential construction in the city to an average of 65 units per year based, in part, on water-supply availability. A policy related to groundwater to "protect Sonoma Valley watershed resources, including surface and groundwater supplies and quality" is included within the Environmental Resources element.

2.6.1.3 Specific Plans

Specific plans are tools for implementing general plans and guiding the development of a defined geographic area within the county. A specific plan establishes a link between implementing policies of the general plan and the individual development proposals for the specified area. Any new developments or subdivisions within the defined area must be consistent with the general plan and specific plan.

The Sonoma County *Springs Specific Plan* is currently being developed by Permit Sonoma and, if adopted, will be the primary planning document and reference guide for future development in the Springs area of the Subbasin, which covers approximately 178 acres within portions of the unincorporated communities of Agua Caliente, Fetters Hot Springs, and Boyes Hot Springs (**Figure 2-1**). Growth and land use criteria from the Springs Specific Plan will be incorporated into the GSP once the specific plan is adopted.

Similarly, Permit Sonoma is developing a Specific Plan for the former Sonoma Developmental Center (SDC) in unincorporated Glen Ellen and is expected to be completed in 2022. The SDC Specific Plan will address redevelopment of the approximately 200-acre campus, which is currently owned by the State of California. A mix of housing and commercial uses are expected to be planned for the site.

2.6.1.4 Sonoma County Local Agency Formation Commission

The Sonoma County Local Agency Formation Commission (LAFCO) is a state-created regulatory agency that approves or disapproves proposals to expand municipal water and wastewater services outside of existing service areas. Through this power, the LAFCO is an important player in proposals to offset groundwater use with urban water for both new and existing development in the county.

LAFCO has responsibility in four areas affecting local government in Sonoma County:

1. To review and approve or disapprove proposals for changes in the boundaries and organization of the 9 cities and 54 special districts within Sonoma County, including the incorporation of new cities, formation of new special districts and mergers, and consolidations or dissolutions of existing cities and special districts

2. To conduct studies, including municipal service reviews, of existing local government services with the goal of improving the efficiency of services

3. To establish spheres of influence, which are plans for the probable physical boundaries of each local agency, for cities and special districts within the County, and to review and update those spheres of influence every 5 years

4. To assist the public and other government agencies concerning changes in local government boundaries and organization

2.7 Well and Project Permitting Policies and Procedures

Permit Sonoma is the local agency responsible for administering permits for wells countywide and within both unincorporated and incorporated areas of the Subbasin. Permit Sonoma is also responsible for permitting certain development projects; for example, wineries, subdivisions, and cannabis production, in unincorporated areas.

2.7.1 Well Permitting

Permit Sonoma is the Sonoma County agency responsible for administering permits for water supply and monitoring wells within the Subbasin, including within the jurisdiction of cities. Sonoma County Department of Health Services administers permits for environmental drilling and wells, generally associated with contaminated sites. The purpose of the County's well-construction policies is to provide for the location, construction, repair, reconstruction, and destruction of wells and to address the abandonment of all wells to protect the groundwater resources of the County, because contamination may cause serious public health, safety, or economic problems.

The Sonoma County Well Ordinance contains regulations and requirements for constructing wells to prevent groundwater contamination from the surface, and between multiple water bearing zones (Chapter 25B of Sonoma County, California – Municipal Code). The well-construction standard does not regulate flow volumes or rates, nor does it evaluate water availability or local hydrogeology.

2.7.2 Project Permitting

Permit Sonoma reviews all development proposals within unincorporated areas that will rely on wells for their water supplies, including wineries, subdivisions, and cannabis permits. Permits for agricultural development projects are processed through the Sonoma County Agricultural Commissioner. Permit Sonoma uses a four-tier groundwater classification system map, based on geologic information and water yields, to designate general areas of groundwater availability (**Figure 2-9**), for reviewing certain development and building permit applications. Class 1 areas are Major Groundwater Basins, Class 2 areas are Major Natural Recharge Areas, Class 3 areas are Marginal Groundwater Availability Areas, and Class 4 areas are Areas with Low or Highly Variable Water Yield.

The Class 1 and Class 2 groundwater availability areas generally correlate, but do not completely correspond, with DWR's Bulletin 118 basin boundaries. Discretionary applications in Class 3 and 4 areas and in SGMA medium- and high-priority basins, including the Sonoma Valley Subbasin, are required to include hydrogeologic reports to establish that groundwater quality and quantity are adequate and will not be adversely impacted by the cumulative developments and uses allowed in the area.

Since 2004, Permit Sonoma has required groundwater-level measurement and volume reporting from water wells on a quarterly or monthly basis as standard conditions of approval for cannabis permits and commercial/industrial projects requiring a use permit and using more than 0.5 AFY of water. Projects in southern Sonoma Valley are also generally required to perform and report water quality monitoring due to concerns with elevated salinity in that area. For projects where significant impacts are identified, Permit Sonoma may require a demonstration of zero or de minimis net water use through onsite water conservation, rainwater or surface water storage, groundwater recharge, and/or offsite mitigation.

References

California Department of Water Resources (DWR). 2003. California's Groundwater. DWR Bulletin 118 Update 2003.

California Department of Water Resources (DWR). 2020. Sustainable Groundwater Management Act 2019 Basin Prioritization, Process and Results. May.

California Sustainable Winegrowing Alliance, Wine Institute, and California Association of Winegrape Growers. 2020. *California Code of Sustainable Winegrowing Workbook, 4th Edition.* December. https://www.sustainablewinegrowing.org/swpworkbook.php

City of Sonoma. 2006. *City of Sonoma 2020 General Plan*. Prepared by the City of Sonoma, Crawford Multari & Clark Associates, Strategic Economics, Crane Transportation Group, Illingworth & Rodkin. Adopted October.

City of Sonoma. 2016. *City of Sonoma Urban Water Management Plan Final.* Prepared by Maddus Water Management Inc.

City of Sonoma. 2018. *City of Sonoma Final Water Master Plan Update.* Prepared by GHD. February.

Farrar, C.D., L.F. Metzger, T. Nishikawa, K.M. Kozcot, and E.G. Reichard. 2006. Geohydrologic characterization, water-chemistry, and ground-water flow simulation model of the Sonoma Valley area, Sonoma County, California. U.S. Geological Survey Scientific Report 2006-5092. September.

GEI Consultants, Inc., Pueblo Water Resources, and Parker Groundwater. 2013. Santa Rosa Plain/Sonoma Valley Groundwater Banking Program Feasibility Study. Prepared for Sonoma County Water Agency. June. https://evogov.s3.amazonaws.com/185/media/182081.pdf.

San Francisco Regional Water Quality Control Board (SFRWQCB). 2010. S*an Francisco Bay Region (Region 2) Water Quality Control Plan (Basin Plan)*, incorporating all amendments approved by the Office of Administrative Law as of May 4, 2017.

San Francisco Bay Area Integrated Regional Water Management Planning Group (IRWMP). 2019. *San Francisco Bay Area Integrated Regional Water Management Plan.* September 16.

Sonoma County. 2008. *Sonoma County General Plan.* Adopted by Resolution No. 08-0808 of the Sonoma County Board of Supervisors, September 23, 2008. Amended by Resolution No. 16-0283 on August 2, 2016.

Sonoma County Regional Climate Protection Authority. 2016. *Climate Action 2020 and Beyond - Sonoma County Regional Climate Action Plan.* July. https://rcpa.ca.gov/wp-content/uploads/2016/07/CA2020_Plan_7-7-16_web.pdf.

Sonoma Valley Groundwater Management Program (SVGMP). 2014. Five-Year Review and Update Final Report. March.

Sonoma Valley Groundwater Sustainability Agency (GSA). 2017. Insights and Recommendations, Sonoma Valley Groundwater Conditions and Management. https://sonomavalleygroundwater.org/wp-content/uploads/Basin-Insights-and-Recommendations.pdf.

Sonoma Water. 2012. Sonoma Valley Stormwater Management and Groundwater Recharge Scoping Study, Screening Evaluation and Prioritization Memorandum. Prepared by ESA PWA, Daniel B. Stephens & Associates, Parker Groundwater. April 30.

Sonoma Water. 2016. *2015 Urban Water Management Plan.* Prepared for Sonoma County Water Agency. Prepared by Brown and Caldwell. June.

Sonoma Water. 2018. *2018 Water Supply Strategies Action Plan.* https://www.sonomawater.org/media/PDF/Water%20Resources/Water%20Supply/Water%20Supply%20Strategies/WSSAP%202018%20FINAL%20v2.pdf.

Sonoma Water. 2019. *Southern Sonoma County Storm Water Resources Plan.* May. https://www.sonomawater.org/media/PDF/Water%20Resources/Stormwater/Stormwater%20Resource%20Plan/Southern_Sonoma%20County_SWRP_Final%20Update_2019-05.pdf.

State Water Resources Control Board (SWRCB). 2018. Water Quality Control Policy For Recycled Water. Adopted December 11, 2018. Effective April 8, 2019.

Sonoma Valley County Sanitation District (SVCSD). 2013. *Sonoma Valley Salt and Nutrient Management Plan.* Prepared by RMC Water and Environment, Todd Engineers, and Plan Tierra, Inc. September.

Valley of the Moon Water District (VOMWD). 2016. *2015 Urban Water Management Plan for the Valley of the Moon Water District.* Prepared by Erler & Kalinowski, Inc. June.

Valley of the Moon Water District (VOMWD). 2019. *Water Master Plan.* Prepared by Erler & Kalinowski, Inc. April.

Figures