GSA Board on GSP development and SGMA implementation. Advisory Committee members also report to, and seek input, from their larger constituency groups on key components and proposals related to GSP development. The Advisory Committee makes written recommendations to the GSA Board that reflect the outcome of Committee discussions. To ensure that all viewpoints are heard and considered by the Board, Advisory Committee reports to the GSA Board identify areas of agreement and disagreement among the Committee.

GSA Coordination

Implementation of SGMA in the Petaluma Valley Basin is closely coordinated with neighboring GSAs in Sonoma Valley and the Santa Rosa Plain, as well as local agencies with land use responsibilities including the City of Petaluma and the County of Sonoma. In addition to closely coordinating on managing and monitoring along shared basin boundaries, resources are leveraged and shared by the three existing GSAs in Sonoma County to maximize efficiencies, including shared templates and methodologies for certain GSP components, outreach resources, grant opportunities, and the development of data management system tools and technologies.

Contact information for the Petaluma Valley GSA is:

Petaluma Valley Groundwater Sustainability Agency
404 Aviation Boulevard, Santa Rosa California 95403
www.petalumavalleygroundwater.org (707) 524-8378

GSA Administrator: Ann DuBay, Community & Government Affairs Manager, Sonoma County Water Agency

GSA Plan Manager: Jay Jasperse, Chief Engineer and Director of Groundwater Management, Sonoma County Water Agency

2.0 Description of Plan Area (Reg. 354.8 b)

This section provides a description of the Plan Area, including the Basin'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 sub-heading indicate the applicable SGMA regulation.

2.1 General Setting and Jurisdictional Areas (Reg. 354.8 b)

The Plan Area for this GSP is the entire Petaluma Valley Basin, which lies within a northwest trending structural depression in the Coast Ranges immediately north of San Pablo Bay in the San Francisco Bay Hydrologic Region. It is generally bounded on the east by the Sonoma Mountains and on the west by low-lying hills. As shown on **Figure 2-1**, the approximately 46,000-acre Basin extends from San Pablo Bay northward to a series of low hills near the community of Penngrove and includes the City of Petaluma and communities of Penngrove and Lakeville. As shown in **Figure 2-2**, the principal stream draining the Basin is the Petaluma River, which is tidally influenced from near the center of the City of Petaluma downstream to its mouth at San Pablo Bay. The Basin is located within the Petaluma River watershed and is a subset of the larger watershed.

Neighboring groundwater basins and subbasins are also shown on **Figure 2-1** and include the medium/high(?) priority Sonoma Valley Subbasin (designated as basin 2-002.02 by DWR) to the east, the medium/high(?) priority Santa Rosa Plain Subbasin (designated as basin 1-55.01 by DWR) to the north, the very low/medium priority Wilson Grove Formation Highlands Basin (designated as basin 1-059 by DWR) to the northwest and the very low priority Novato Valley Basin (designated as basin 2-030 by DWR) to the southwest. The Santa Rosa Plain GSA and the Sonoma Valley GSA are the only neighboring GSAs and also formed in June 2017 to implement SGMA in those two neighboring subbasins. DWR's 2018 Draft Basin Prioritization proposes a change in priority from very low to medium for the neighboring Wilson Grove Formation Highlands Basin which would trigger SGMA compliance requirements in that basin.

Available technical information related to the hydrologic connection between the Petaluma Valley Basin and adjacent basins and 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).

While the Plan Area and jurisdiction of the Petaluma Valley GSA is limited to the Bulletin 118 Basin, technical studies (including monitoring data and groundwater flow modeling) indicate that contributing watershed areas outside of the Bulletin 118 Basin are hydrologically connected and represent important sources of inflow (both in the form of surface streamflows and subsurface inflows) to the Bulletin 118 Basin. 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 Basin and 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 Basin include the Petaluma Valley GSA, City of Petaluma, North Bay Water District, Sonoma RCD, Sonoma Water, and County of Sonoma. **Figure 2-3** shows the jurisdictional boundaries of these local agencies, mutual water companies and public water systems, state and federal lands, and protected lands within the Basin. State lands include the Petaluma Marsh Wildlife

Area within tidal marshlands in the southern portions of the Basin managed by the California Department of Fish and Wildlife and the Petaluma Adobe State Historic Park. Federal lands of the San Pablo Bay National Wildlife Refuge are also present within tidal marshlands in the southern portions of the Basin and are managed by the U.S. Fish and Wildlife Service. Other protected lands located within the Basin and contributing watershed areas (**Figure 2-3)** include city parks and fields, county regional parks and preserves, special district properties and preserves, and non-profit preserves.

2.2 General Land Use Characteristics (Reg. 354.8 b)

Land uses within the Basin are shown on **Figures 2-4, a, b, and c**. Existing conditions correlate most closely with the DWR 2012 land use survey (**Figure 2-4b**), which indicates the majority of the land in the Basin is native vegetation or water (57 percent). Agriculture represents approximately 23 percent of the land uses and residential, commercial and industrial land uses compose approximately 16 percent of the land uses (primarily within the City of Petaluma and community of Penngrove). The majority of the native vegetation is located in the lower portions of the Basin along the tidal marshlands and in the hills, northeast of the City of Petaluma. Throughout the last several decades, the primary irrigated agricultural crop has been vineyards for wine production. Pastures, grains and hay, and dairies, which are primarily not irrigated, are also important land use categories, with a total area exceeding that of irrigated agriculture. The urban and residential areas in the Basin include the City of Petaluma, unincorporated community of Penngrove, and areas of rural and semi-rural residential development.

Land use mapping over the past several decades provides a measure of growth and land use changes in the Basin, which includes increases in residential and commercial land uses and irrigated agriculture and a resulting decrease in native vegetation or water (**Table 2-1 and Figure 2-4a and b**). **Figure 2-4c** presents more detailed classification of vegetation types within the Basin and contributing watershed areas from the Sonoma County LiDAR and Vegetation Mapping Program.

2.3 Water Source Types and Water Use Sectors (Reg. 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 Basin. The Basin 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 Basin is shown on **Figure 2-5** and provided below. Additional details on water uses associated with the Basin 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 Actions).

Groundwater

Groundwater resources represent an important and often only source of water supply for many communities and water users in the Basin. **Figure 2-6** presents a map showing the approximate location and density of water wells within the Basin and contributing watershed areas, based on available data from DWR (note to reader: this map will be updated and refined with local information from 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 support streamflows and ecosystems present in the Basin. Groundwater represents the primary, or in some cases only available, source of supply for irrigated agriculture (where access to recycled water or surface water is not available), rural residents, and commercial and industrial users in unincorporated areas. Local groundwater represents an important supplemental source of supply for the City of Petaluma, which operates a municipal wellfield within the Basin and contributing watershed areas.

Imported Surface Water

Imported 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 Petaluma within the Basin, as shown on **Figure 2-5**. Imported water represents the primary source of water for urban residents and businesses that are served by the City of Petaluma.

Local Surface Water

Local surface water from the Petaluma River 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 State Water Resources Control Board.

Recycled Water

Recycled water is treated to tertiary standards at the City of Petaluma's Ellis Creek Water Recycling Facility and is used for crop and landscape irrigation in lieu of using groundwater or imported water. Recycled water is used for irrigation of agricultural fields, schools, parks, two golf courses and a vineyard.

2.4 Existing Monitoring Programs and Networks (Reg. 354.8 c, d, e)

Existing monitoring programs and networks within the Basin have been developed and implemented by many agencies, organizations and volunteers for a variety of purposes. This section provides a description of the existing monitoring programs and networks. 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 Program).

Groundwater Level Monitoring

Groundwater-level data in the PVW have been collected by the USGS since 1949 (Cardwell, 1958). Additional groundwater-level data in the watershed has been collected by the DWR since the 1950s. Historically, this has included approximately 24 wells and currently includes 13 wells which are privately owned wells monitored through voluntary agreements with DWR. Most of these wells were incorporated into DWR's monitoring network between the mid-1950's 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. The groundwater-level monitoring network has been supplemented through the California Statewide Groundwater Elevation Monitoring (CASGEM) program since approximately 2012, originally currently managed by the City of Petaluma, which includes an additional nine wells:

- Five are former public supply wells that are located within the City's boundaries. The remaining four wells in the monitoring network are privately owned.
- One private well is in the north part of the basin between Penngrove and Cotati.
- There are two private wells in east Petaluma, one just east of the City limits on Adobe Road, the other in the hills to the east of the wastewater treatment plant on Lakeville Highway.
- The fourth private well is southeast of Petaluma at the Sonoma Raceway near Highway 37.

The GSA Board agreed to take over management of the CASGEM Program and has engaged Sonoma RCD to perform the monitoring and conduct outreach to expand the voluntary program.

Since 2004, Permit Sonoma has administered the Use Permit Groundwater Monitoring Program, which requires the measurement and reporting of groundwater-levels on a quarterly or monthly basis for commercial and industrial projects requiring a use permit and using over 0.5 acre-feet per year (afy) of water.

Groundwater Quality Monitoring

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

Public Water Supply Well Monitoring

The SWRCB's Division of Drinking Water (DDW) monitors public water system wells for California Code of Regulations Title 22 requirements relative to levels of organic and inorganic compounds such as metals, microbial compounds and radiological analytes. Data is 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 Basin, DDW wells were monitored for Title 22 requirements, including pH, alkalinity, bicarbonate, calcium, magnesium, potassium, sulfate, barium, copper, iron, zinc, and nitrate.

GeoTracker Groundwater Ambient Monitoring and Assessment Program

Established in 2000, the Groundwater Ambient Monitoring and Assessment (GAMA) Program monitors 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, USGS, and the State Water Resources Control Board (SWRCB).

Water Data Library (WDL)

DWR's monitors groundwater quality data and reports the results through the Water Data Library (WDL). Samples are collected from a variety of well types including irrigation, stock, domestic, and some public supply wells. Wells are not regularly sampled, and most wells have only a few sampling measurements and 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).

U.S. Geological Survey National Water Information System

The groundwater study conducted by the USGS within the Petaluma Valley Basin 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 studied is available on the National Water Information System (NWIS) database (https://waterdata.usgs.gov/nwis).

Climate Monitoring

Climate-related monitoring stations in the Basin and contributing watershed areas provide part of the information necessary for forecasting weather conditions, flood preparedness, drought preparedness, water supply planning, and for determining the Basin water budget. Climate monitoring stations may include sensors to collect data on rainfall, air temperature, relative humidity, wind speed and direction, solar radiation, soil temperature and moisture. Climate data is collected by many stakeholders in the Basin, as shown on **Figure 2-7b**.

The primary weather station in the Petaluma Valley Basin which has been used to calculate mean annual rainfall is the Western Regional Climate Center (WRCC) climate station in the city of Petaluma (046826). Data is available from 1913 to the present at this station

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.

Surface Water Monitoring

Existing continuous surface water monitoring locations in the Basin and contributing watershed areas are shown on **Figure 2-7b** and include one stream gauge operated by the USGS, eight gauges operated by Trout Unlimited, and one gauge operated by One Rain, on behalf of Sonoma Water. The active USGS streamflow gauge on the Petaluma River is located near the city of Petaluma, along the northern end of the tidally influenced reach of the river. Data collection at this streamflow gage began in February 1999 and is actively measured by the USGS (U.S. Geological Survey, 2016a). Additionally, the city of Petaluma manages five streamflow gauges on the Petaluma River and four gauges on tributaries of the Petaluma River in the Basin, as shown on **Figure 2-7b**.

Historically, the USGS also operated a streamflow gage on the Petaluma River located north of the city of Petaluma, along the non-tidally influenced reach of the river. Data collection at this streamflow gage began in October 1948 and ended in September 1963 (U.S. Geological Survey, 2016b).

Land Surface Subsidence Monitoring

In the Petaluma Valley, a global positioning system (GPS) stations monitored by the University NAVSTAR Consortium's (UNAVCO) Plate Boundary Observatory (PBO) program is available for use as an indicator for subsidence. There are currently no regularly scheduled theodolite or total station surveys and no extensometers in the Petaluma Valley.

The UNAVCO PBO network consists of a network of about 1,100 continuous GPS and meteorology stations in the western U.S. used to monitor multiple pieces of information, including subsidence. There is one station in the Basin located near the Petaluma Municipal Airport (Station P198).

2.5 Existing Management Programs and Studies (Reg. 354.8 c, d, e)

There are many existing and previous water management programs, studies and initiatives that cover the Petaluma Valley Basin 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.

USGS Petaluma Valley Groundwater Study

A study conducted by the USGS and funded by the City of Petaluma, Sonoma Water and the USGS will underpin much of the development of the Basin setting of the GSP. The objective of the study is to develop an updated assessment of the hydrogeology, geochemistry, and geology of the Petaluma Valley, including development of a geographical information system database, collection, and interpretation of water quality data and streamflow measurements, estimates of groundwater recharge and annual groundwater pumping, and development of a computer model to simulate groundwater flow. The study will culminate in a report in 2019 consisting of the following major sections:

- hydrogeologic characterization
- data collection and interpretation (primarily water quality)
- numerical groundwater flow model.

The study utilizes information from previous studies and will integrates them with a digital geologic map, borehole, and geophysical data to create a three-dimensional geologic framework model of the Basin and surrounding Petaluma Valley watershed that defines the subsurface stratigraphic and structural architecture for the study area. The integrated numerical groundwater flow model simulates groundwater flow, surface-water flow, and landscape processes in the basin for 56 years of historical hydrology from 1959 to 2015. The model incorporates the updated hydrogeologic model to represent the multi-layered aquifer system and was calibrated using groundwater level from groundwater monitoring wells and measured streamflow data from streamflow gauges.

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). DWR designed the IRWM planning process to be consistent with the California Water Plan, a statewide water resources planning document that is updated periodically and intends that IRWM Plans 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 San Francisco Bay Regional Water Quality Control Board's (Region 2) jurisdiction, which includes the Petaluma Valley Basin. This region includes all or major portions of the nine counties which 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 developed four Functional Areas in order to identify specific needs and challenges related to each specific Functional area, describe water management strategies to address these needs, and develop 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

For more information on the Bay Area IRMWP visit http://bayareairwmp.org.

Urban Water Management Planning

Urban Water Management Plans (UWMPs) are prepared every five 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 over 3,000 acre-feet of water annually or serves more than 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 submitted plans to make sure they have completed the requirements identified in the Urban Water Management Planning (UWMP) Act (Division 6 Part 2.6 of the Water Code §10610 - 10656).

Within the Basin, UWMPs are prepared by Sonoma Water (as a wholesaler) and the City of Petaluma (as a water retailer). The two UWMPs were last completed in 2015 and will be updated in 2020. The Plans discuss and describe:

- Existing water supplies and infrastructure;
- Projected water demands over the next 25 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 25 years, the reliability of that supply, and general plans for water supply projects;
- Current and planned water conservation activities;
- A water shortage contingency analysis; and
- A comparison of water supply and water demand over the next 25 years under different hydrological assumptions (normal year, single dry year, four consecutive dry years).

As local groundwater makes up a portion of the urban water supply within the Basin, 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 into 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 Groundwater Feasibility Study was been developed by the City of Petaluma to evaluate groundwater supplies as part of the City of Petaluma's General Plan update.
- Sonoma Water has developed a Water Supply Strategies Action Plan in coordination with its water contractors 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 is currently being updated and will incorporate SGMA-related requirements and initiatives. The most recent version is available at http://www.scwa.ca.gov/water-supply-strategy/.
- Beginning with passage of 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 California Environmental Quality Act (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.

Water Conservation Programs

Numerous regional and local water conservation programs are operational in the Plan Area. 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 (CUWCC) and have joined to create a regional approach to water use efficiency. Within the Basin, these utilities include the City of Petaluma and Sonoma Water. Each of these member utilities have water conservation programs to assist their communities reduce 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.
- Online water wise gardening website which 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/.

The State Legislature adopted the "Water Conservation in Landscaping Act of 2006" (AB 1881) requiring the Department of Water Resources to update the State Model Water Efficient Landscape Ordinance. All local land use agencies were required to adopt the model ordinance, or develop an ordinance that is at least as effective by January 1, 2010. The county and cities 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.

The Sonoma RCD, Napa RCD, and the USDA Natural Resources Conservation Service developed the LandSmart program to promote productive lands and thriving streams through planning and on-the-ground implementation on beneficial management practices. 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. 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.

Members of Wine Institute and the California Association of Winegrape Growers introduced the Code of Sustainable Winegrowing Practices Self-Assessment Workbook in 2002 to promote environmental stewardship and social responsibility in the California wine industry. The workbook addresses a number of 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, the Sonoma County Winegrowers have developed a Sustainability Certification Program for vineyards, which includes water conservation assessments.

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 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 our 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. Findings and results from these efforts are described in Section 3 (Basin Setting) and incorporated into future model projections in this GSP.

Groundwater Banking Feasibility Study

Due to uncertainties in the reliability of regional future water supplies (both surface water and groundwater), the Water Agency, City of Sonoma, and other local partners, including the cities of Rohnert Park and Cotati, Valley of the Moon Water District, and the Town of Windsor (study participants) have conducted a feasibility study for a regional groundwater banking program (Groundwater Banking Feasibility Study) to investigate the viability of enhancing the conjunctive management of surface water and groundwater resources (GEI, 2013). The feasibility study report is available at:
http://www.scwa.ca.gov/files/docs/water-resources/groundwater//banking/SRP-SVGroundwaterBankingFeasibilityFINAL130625REDUCED_ADA.pdf
Conceptually, the groundwater banking program would involve the diversion and transmission of surplus Russian River water produced at existing drinking water production facilities during wet weather conditions (i.e., the winter and spring seasons) for storage in groundwater basins. The stored water would then be available for subsequent recovery and use during dry weather conditions (i.e., the summer and fall seasons) or emergency situations. The Groundwater Banking Feasibility Study provided an evaluation of the regional needs and benefits, source water availability and quality, regional hydrogeologic conditions, and alternatives for groundwater banking. While groundwater resources in Petaluma Valley were not evaluated as part of the feasibility study, regional information from the feasibility study is applicable to potential groundwater banking alternatives in Petaluma Valley.

Based on the findings from the study, pilot studies to further assess the technical feasibility of Aquifer Storage and Recovery (ASR) as a method for groundwater banking were recommended and currently are being pursued in Sonoma Valley, where a pilot project was completed in Fall of 2018 in the City of Sonoma. The overall objective of the pilot project is to verify and empirically determine specific hydrogeologic and water-quality factors. If the project is successful, 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.

Stormwater Management Planning

In three of its flood zones, Sonoma Water conducted scoping studies to identify opportunities to alleviate flooding, while possibly recharging groundwater aquifers or providing other benefits. The "Stormwater Management-Groundwater Recharge" studies assessed the feasibility of projects in Laguna-Mark West watershed, the Sonoma Valley watershed and the Upper Petaluma River watershed. Information and results from these studies have informed the development of a Storm Water Resources Plan (SWRP). SWRPs are required by Senate Bill 985 (Pavley, 2014) in order to be eligible to seek funding from any future state bond measures for storm water projects. A SWRP is a non-regulatory, watershed-based and stakeholder-driven plan that builds on local storm water management objectives and identifies and prioritizes projects that capture, treat or reuse storm water 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 the Southern Sonoma County Storm Water Resources Plan covering the Petaluma River and the Sonoma Creek watersheds (including the Basin). Through the planning process, over 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.

Water Quality Regulatory Programs

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 Water Boards; or RWQCB).

The State Water Board provides state-level coordination for the water quality control program by establishing statewide policies and plans for implementing state and federal laws and regulations. The regional water 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 regional water boards to adopt, review, and revise basin plans, and provides specific guidance on factors which must be considered in adoption of surface water and groundwater quality objectives and implementation measures. The San Francisco Bay Regional Water Quality Control Board (SFRWQCB) implements water quality regulations in the Basin and contributing watershed areas, including establishing Total Maximum Daily Loads for bacteria and sediment in the Petaluma River.

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 and specific plans, in addition to the UWMPs described above. 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. At a minimum, cities and counties must now refer proposed general plan changes to GSAs, and similarly GSPs must take into account "the most recent planning assumptions stated in local general plans of jurisdictions overlying the basin" (CWC §10726.9).

The City of Petaluma and Sonoma County general plans and specific plans provide growth estimates based on build out of land use designations that are used in the UWMPs and in this GSP to project future water demands, and are 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 Basin 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 Basin, 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 County General Plan.

General Plans

Counties and cities are required to develop and adopt comprehensive general plans to guide future local physical development, as required in 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, standards and plan proposals. City general plans are focused on providing guidance on growth and development in the urban setting, while the county general plan focuses 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 seven mandatory elements of a general plan are Land Use, Circulation, Housing, Conservation, Open Space, Noise and Safety, although the degree of specificity and level of detail varies dependent upon local circumstances and programmatic needs.
The Conservation element of a general plan is typically where water resources are addressed, although other water related topics may also be addressed in other elements.

Land use elements must reflect the content of the other general plan elements and must account for "rivers, creeks, streams, flood corridors, riparian habitats, and land that may accommodate floodwater for purposes of groundwater recharge and stormwater management…" as identified in the conservation element (Gov. Code § 65302(d)(3)). The housing elements must be updated on a five-year cycle to correspond with state regional housing needs allocations (Gov. Code § 65584 (b)).

The Petaluma Valley Basin includes areas covered by the County of Sonoma's general plan and the City of Petaluma's general plan within the City's jurisdictional areas (the southwestern portions of the City of Petaluma are outside the Basin).

Sonoma County General Plan 2020

The Sonoma County General Plan 2020 contains Land Use, Circulation, Housing, Conservation, Open Space, Noise, and Safety elements in addition to the following 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 quality 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, groundwater, public water systems, conservation & reuse, importing & exporting, and watershed management. These goals, objectives and policies include supporting local groundwater studies and management programs, encouraging activities that protect natural groundwater recharge areas. The Water Resources Element for the Sonoma County General Plan 2020 can be reviewed at http://www.sonoma-county.org/prmd/gp2020/wre.pdf.

The Water Resources Element goals related to groundwater include:

- Protect, restore, and enhance the quality of surface and groundwater resources to meet the needs of all reasonable beneficial uses.
- Manage groundwater as a valuable and limited shared resource.
- Assure that new proposals for surface and groundwater imports and exports are consistent with Sonoma County's ability to sustain an adequate supply of high-quality water for all its water uses and dependent natural resources.
- Improve understanding, valuation and sound management of the water resources in Sonoma County's diverse watersheds.

Other water related topics incorporated in the Sonoma County General Plan 2020 include water

availability as a factor in Land Use Map densities that is addressed in the Land Use Element. Land use designations based on the County's 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. The process for updating the Sonoma County General Plan 2020 is planned to begin in 2019.

City of Petaluma 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 General Plan.

The City of Petaluma's 2025 General Plan (2008) addresses the following key elements: Land Use/Growth Management, Community Design, Historic Preservation, Natural Environment, Mobility, Recreation/Music/Parks/Arts, Community Facilities/Services/Education, Water Resources Economic Health and Sustainability. Each element in the general plan 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 City of Petaluma's 2025 General Plan Water Resources Element includes water conservation BMPs and goals and policies for water supply and demand, wastewater, recycled water, groundwater supply, water conservation, surface water management and water quality. The Water Resources Element includes the following policies:

- 8-P-19 Ensure adequate water supply during emergency situations by developing potential groundwater resources and aquifer storage capacity, combined with management of surface water, to meet overall emergency water supply objectives. The City's groundwater resources shall be preserved to meet emergency needs and to offset peak demands.

- 8-P-20 Manage groundwater as a valuable and limited shared resource by protecting potential groundwater recharge areas and stream sides from urban encroachment within the Petaluma watershed.

- 8-P-21 Protect groundwater quality from surface contamination by requiring 100-foot sanitary seals on all new municipal water supply wells.

Specific Area Plans

Specific area plans are planning documents that guide the development of a geographic area within the county. Any new developments or subdivisions within the defined area must be consistent with the general plan and specific plan. The Central Petaluma Specific Plan provides specific land use and development regulations for nearly 400 acres within the city, adjacent to downtown. The Penngrove Area Plan (updated in 2008) provides land use and development regulations for the community of Penngrove. The Petaluma Dairy Belt Area Plan (updated in 2008) is primarily located outside and to the west of the Basin. The West Petaluma Area Plan (updated in 2008) straddles the Basin and covers approximately 11,000 acres west of the City of Petaluma.

2.7 Well and Project Permitting Policies and Procedures

Sonoma County Permit and Resource Management Department (Permit Sonoma) is the local agency responsible for administering permits for wells within both unincorporated and incorporated areas of the Basin. Permit Sonoma is also responsible for permitting certain development projects in unincorporated areas.

Well Permitting

Water wells are permitted through a ministerial process following the Sonoma County Well Ordinance, most recently updated by Permit Sonoma in 2015, that contains regulations and requirements for constructing wells to prevent groundwater contamination from the surface, and between multiple water bearing zones in (Ordinance 25B). The ordinance includes standards for well construction, abandonment, destruction, setbacks, prohibitions, and water treatment for contaminated wells. It also addresses permit requirements, inspections, reporting, enforcement provisions, and alternate construction methods. The well construction standard does not regulate flow volumes or rates, nor does it evaluate water availability or local hydrogeology.

Additionally, the County commissioned a pilot study of three areas it determined to have relatively scarce groundwater in other areas of the County. The study examined climate, land use and the depths of wells drilled over time (Kleinfelder, 2003). Based on this pilot study, Permit Sonoma established countywide permit requirements and guidelines for performing pump tests on new water-wells in water scarce areas. The study also recommended further studies of these water scarce areas.

Sonoma County municipal code water well requirements are available on the web at: https://library.municode.com/ca/sonoma_county/codes/code_of_ordinances?nodeId=CH25BWAWECOST and the Groundwater Availability Map is located at: http://www.sonoma-county.org/prmd/gisdata/pdfs/grndwater_avail_b_size.pdf

Project Permitting

Permit Sonoma reviews all development proposals within unincorporated areas that will rely on wells for water supply, including wineries, subdivision 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 basin, including the Petaluma Valley Basin, 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. In addition, discretionary applications in Class 4 areas are required to complete an aquifer pumping test to establish the availability of an adequate water supply. The aim is to avoid causing or exacerbating an overdraft condition in a groundwater basin or Basin.

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 commercial and industrial projects requiring a use permit and using more than 0.5 afy of water. Projects in southern Petaluma 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 demonstration of zero or de minimis net water use through onsite water conservation, rainwater or surface water storage, groundwater recharge, and/or offsite mitigation.

2.8 Additional GSP Elements (Reg. 354.8 (g))

The GSP Regulations require that the Plan Area section include a description of any of the additional GSP elements from Water Code 1027.4 that the GSA determines to be appropriate. *It is anticipated that many, if not all the below elements will be addressed in subsequent sections of the GSP. Once those sections are complete, this section will be updated to indicate where the specific descriptions are located.* The additional GSP elements listed in Water Code 1027.4 are:

(a) Control of saline water intrusion.
(b) Wellhead protection areas and recharge areas.
(c) Migration of contaminated groundwater.

(d) A well abandonment and well destruction program.
(e) Replenishment of groundwater extractions.
(f) Activities implementing, opportunities for, and removing impediments to, conjunctive use or underground storage.
(g) Well construction policies.
(h) Measures addressing groundwater contamination cleanup, groundwater recharge, in-lieu use, diversions to storage, conservation, water recycling, conveyance, and extraction projects.
(i) Efficient water management practices, as defined in Section 10902, for the delivery of water and water conservation methods to improve the efficiency of water use.
(j) Efforts to develop relationships with state and federal regulatory agencies.
(k) Processes to review land use plans and efforts to coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity.
(l) Impacts on groundwater dependent ecosystems.