Salinas Valley Groundwater Basin
Forebay Aquifer Subbasin
Groundwater Sustainability Plan

Salinas Valley Basin
Groundwater Sustainability Agency

Photo courtesy of Steve McIntyre

Prepared by:

MONTGOMERY
& ASSOCIATES
Water Resource Consultants

Salinas Valley: Forebay Aquifer Subbasin Groundwater Sustainability Plan

VOLUME 1

Chapter 1. Introduction to the Forebay Aquifer Subbasin

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Prepared for:

Salinas Valley Basin Groundwater Sustainability Agency

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ACRONYMS AND ABBREVIATIONS

$/AF ....dollar per acre-foot
AF ....acre-foot or acre-feet
AF/yr. ....acre-feet per year
ASCMA ....Arroyo Seco Cone Management Area
ASGSA ....Arroyo Seco Groundwater Sustainability Agency
Basin ....Salinas Valley Groundwater Basin
Basin Plan ......Water Quality Control Plan for the Central Coast Basin
BLM...............U.S. Bureau of Land Management
BMPs.............Best Management Practices
CASGEM.......California Statewide Groundwater Elevation Monitoring
CCGC............Central Coast Groundwater Coalition
CCRWQCB....Central Coast Regional Water Quality Control Board
CEQA............California Environmental Quality Act
COC ....constituents of concern
CPE Actions...Communication and Engagement Actions
CSD................Community Services District
CCGC............Central Coast Groundwater Coalition
CCRWQCB....Central Coast Regional Water Quality Control Board
CEQA............California Environmental Quality Act
COC ....constituents of concern
CPE Actions...communication and public engagement actions
CSD................Castroville Community Services District
CSIP ....Castroville Seawater Intrusion Project
DACs.............Disadvantaged Communities
DDW ....Division of Drinking Water
DEM...............Digital Elevation Model
DMS ....Data Management System
D-TAC ....Drought Advisory Technical Committee
DTSC ....The California Department of Toxic Substances Control
DWR ....California Department of Water Resources
EIR ....Environmental Impact Report
EPA ....Environmental Protection Agency
ET...................evapotranspiration
eWRIMS ....Electronic Water Rights Information Management System
GAMA ....Groundwater Ambient Monitoring and Assessment Program
GDE ....groundwater-dependent ecosystem
GEMS ....Monterey County Groundwater Extraction Management System
GIS ....Geographic Information Systems
GMP...............Groundwater Management Plan

GSA................Groundwater Sustainability Agency/Agencies
GSP or Plan....Groundwater Sustainability Plan
HCM ....hydrogeologic conceptual model
HCP................Habitat Conservation Plan
ILRP...............Irrigated Lands Regulatory Program
InSAR ....Interferometric Synthetic Aperture Radar
IRWMP..........Integrated Regional Water Management Plan
ISW ....interconnected surface water
JPA.................Joint Powers Authority
MCLs ....Maximum Contaminant Levels
MCWRA.........Monterey County Water Resources Agency
NAVD88........North American Vertical Datum of 1988
NCCAG..........Natural Communities Commonly Associated with Groundwater
NEPA ....National Environmental Policy Act
NMFS.............National Marine Fisheries Service
O&M..............operations and maintenance fees
OWSCR ....Online System for Well Completion Reports Database
RCDMC ....Resource Conservation District of Monterey
RMS ....Representative Monitoring Sites
RWMG...........Greater Monterey County Regional Water Management Group
SAGBI............Soil Agricultural Groundwater Banking Index
SDACs ....Severely Disadvantaged Communities
SGMA............Sustainable Groundwater Management Act
SMC ....Sustainable Management Criteria
SMCLs...........Secondary Maximum Contaminant Levels
SMC TAC......Sustainable Management Criteria Technical Advisory Committee
SMP................Salinas River Stream Maintenance Program
SRDF..............Salinas River Diversion Facility
Subbasin.........Forebay Aquifer Subbasin
SVBGSA........Salinas Valley Basin Groundwater Sustainability Agency
SVIHM...........Salinas Valley Integrated Hydrologic Model
SVOM............Salinas Valley Operational Model
SWRCB..........State Water Resources Control Board
TAC................Technical Advisory Committee
TDS................total dissolved solids
URCs.............Underrepresented Communities
USACE ..........U.S. Army Corps of Engineers
USFWS ..........U.S. Fish and Wildlife Service
USGS .............U.S. Geological Survey
UWMP ....Urban Water Management Plan

1 INTRODUCTION TO THE FOREBAY AQUIFER SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

1.1 Introduction and Purpose

The 2014 Sustainable Groundwater Management Act (SGMA) requires groundwater basins or subbasins that are designated as medium or high priority to be managed sustainably. In general, satisfying the requirements of SGMA requires 4 activities:

1. Forming one or more Groundwater Sustainability Agency(s) (GSAs) in the basin
2. Developing a Groundwater Sustainability Plan (GSP, or Plan)
3. Implementing the GSP and managing to measurable, quantifiable objectives
4. Providing regular reports to the California Department of Water Resources (DWR)

DWR has designated the Salinas Valley – Forebay Aquifer Subbasin (Subbasin, or Forebay Subbasin) as a medium priority basin. The Forebay Subbasin is one of 9 subbasins in the Salinas Valley, and it is located near the middle of the Salinas Valley (Figure 1-1). This document satisfies the GSP requirement for the Forebay Subbasin and meets all of the regulatory standards.

Groundwater level has declined somewhat in recent decades, and many wells were impacted or rendered unusable during the 2012 to 2016 drought. The purpose of this GSP is to outline how the Salinas Valley Basin GSA (SVBGSA) and Arroyo Seco Groundwater Sustainability Agency (ASGSA) will address the declining groundwater conditions and achieve groundwater sustainability in the Subbasin. Sustainability is the absence of undesirable results for any of the 6 sustainability indicators applicable in the subbasin: chronic lowering of groundwater levels, groundwater storage reductions, seawater intrusion, groundwater quality degradations, land subsidence, and interconnected surface water (ISW) depletion. Sustainability must by achieved in 20 years and maintained for an additional 30 years.

This GSP first presents the stakeholders, plan area, geologic and hydrogeologic data, groundwater conditions, and water budget necessary to develop an informed and robust plan. This GSP is based on best available data and analyses. As additional data are collected and analyses are refined, the GSP will be modified to reflect changes in the local understanding.

Following the foundational hydrogeologic information, the GSP introduces the current agreed-to sustainbility goal for the Subbasin. It also locally defines significant and unreasonable conditions, which underpin the quantifiable minimum thresholds, measurable objectives, and interim milestones for each of the corresponding sustainability indicators. The final chapters detail projects and actions that should be implemented to achieve sustainability and provide an implementation plan for maintaining sustainability. The GSP is intended to include adaptive management that will refine the implementation and direction of this GSP over time.

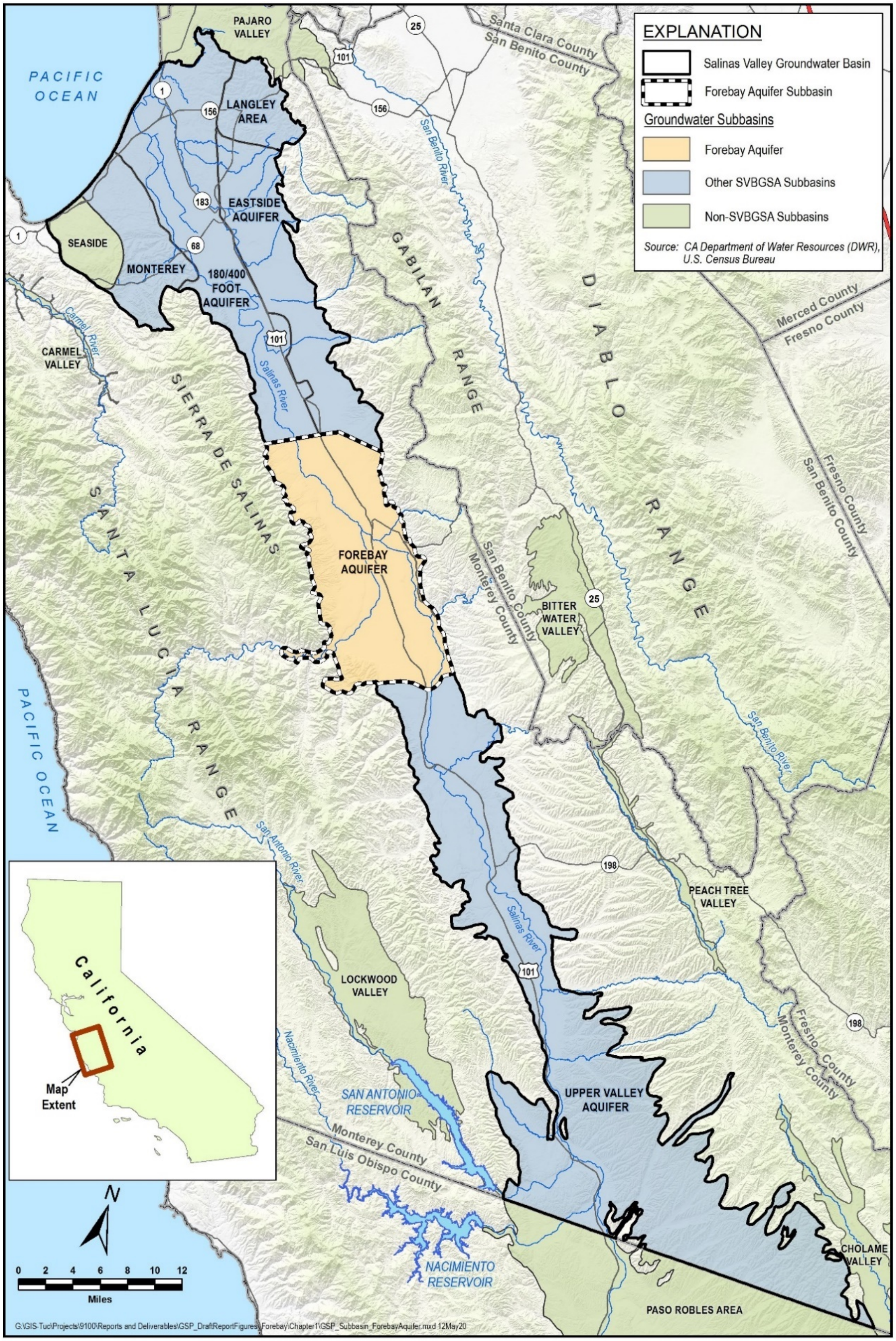

Figure 1-1. Forebay Aquifer Subbasin Location

1.2 Agency Information

The Forebay Subbasin falls partially within the jurisdiction of the SVBGSA and partially within the jurisdiction of the ASGSA. Figure 1-2 shows the current extent of the 2 GSAs' boundaries. In accordance with the Forebay Implementation Agreement (2021), approved by the ASGSA Board of Directors on April 7, 2021, and the SVBGSA Board of Directors on April 8, 2021, the ASGSA will manage the Arroyo Seco Cone Management Area (ASCMA), and the SVBGSA will manage the remaining area of the Subbasin.

1.2.1 Agency Names, Mailing Addresses, and Plan Manager

Pursuant to California Water Code § 10723.8, the name and contact information for each GSA representative that is a signatory to this GSP are provided:

Salinas Valley Basin Groundwater Sustainability Agency
Attn.: Donna Meyers, General Manager
1441 Schilling Place
Salinas, CA 93901
https://svbgsa.org

Arroyo Seco Groundwater Sustainability Agency
Attn.: Curtis Weeks
599 El Camino Real
Greenfield, CA 93927
http://ci.greenfield.ca.us/379/ASGSA

The Plan Manager and her contact information are:

Ms. Donna Meyers, General Manager
Salinas Valley Basin Groundwater Sustainability Agency
1441 Schilling Place
Salinas, CA 93901 | (831) 682-2592
meyersd@svbgsa.org

https://svbgsa.org

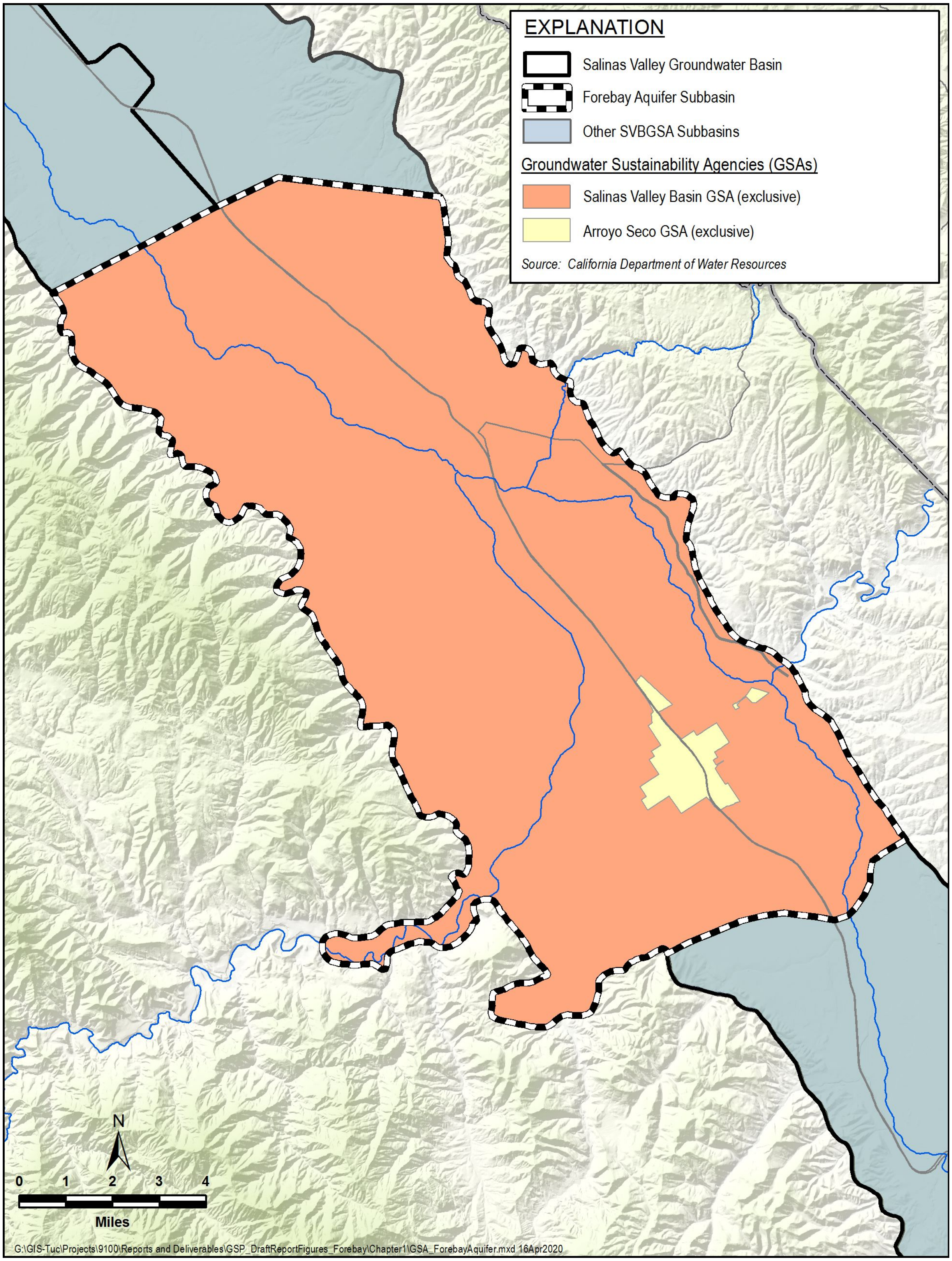

Figure 1-2. Map of Area Covered by the SVBGSA and ASGSA in the Forebay Aquifer Subbasin

1.2.2 SVBGSA Organization and Management Structure

Local GSA-eligible entities formed the SVBGSA in 2017. The SVBGSA represents agriculture, public utility, municipal, county, and environmental stakeholders, and is partially or entirely responsible for developing GSPs in 6 of the Salinas Valley Groundwater Subbasins.

The SVBGSA is a Joint Powers Authority (JPA), and its membership includes the County of Monterey, Monterey County Water Resources Agency (MCWRA), City of Salinas, City of Soledad, City of Gonzales, City of King (King City), the Castroville Community Services District (CSD), and Monterey One Water (formerly the Monterey Regional Water Pollution Control Agency). The SVBGSA is governed and administered by an 11-member Board of Directors (Board), representing public and private groundwater interests throughout the Valley. When a quorum is present, a majority vote is required to conduct business. Some business items require a super majority vote or a super majority plus vote. A super majority requires an affirmative vote by 8 of the 11 Board members. A super majority vote is required for:

- Approval of a GSP
- Amendment of budget and transfer of appropriations
- Withdrawal or termination of Agency members

A super majority plus requires an affirmative vote by 8 of the 11 Board members, including an affirmative vote by 3 of the 4 agricultural representatives. A super majority plus vote is required for:

- Decisions to impose fees not requiring a vote of the electorate or property owners
- Proposals to submit to the electorate or property owners (as required by law) decisions to impose fees or taxes
- Limitations on well extractions (pumping limits)

In addition to the Board of Directors, SVBGSA includes a Budget and Finance Committee consisting of 5 Directors, an Executive Committee consisting of 5 Directors, and an Advisory Committee consisting of Directors and non-directors. The Advisory Committee is designed to ensure participation by constituencies whose interests are not directly represented on the Board. The SVBGSA's activities are coordinated by a general manager. The SVBGSA established individual subbasin planning committees to advise the Board on each of the subbasins under its jurisdiction for which it is developing a 2022 GSP. This GSP has been guided and reviewed by the Forebay Subbasin Planning Committee, which consists of local representatives from the Subbasin. Once all GSPs are adopted, the subbasin planning committees will transition to implementation committees to advise on the implementation of the GSPs.

1.2.3 ASGSA Organization and Management Structure

The ASGSA was formed through agreement with the City of Greenfield and nearby lands, consisting of the Clark Colony Water Company and contiguous surrounding lands. The ASGSA is governed and administered by a 5-member Board of Directors, representing public and private groundwater interests throughout the Arroyo Seco area. The Board has the ultimate decision-making authority for ASGSA and arrives at decisions based on input from the General manager, Advisory Committee, public workshops, and attendees of the monthly Board meetings.

In addition to the Board of Directors, the ASGSA has an Advisory Committee consisting of Directors and non-Directors including Greenfield City residents and environmental interests. The Advisory Committee is designed to ensure participation by, and input to, the Board of Directors by constituencies whose interests are not directly represented on the Board. The ASGSA's activities are staffed by a General Manager, City of Greenfield staff, and contract services provided by Clark Colony Water Company and the City of Greenfield.

1.2.4 Authority of Agency

1.2.4.1 SVBGSA

The SVBGSA was formed in accordance with the requirements of California Water Code § 10723 *et seq*. This section lists its specific authorities for GSA formation and groundwater management.

SVBGSA is a JPA that was formed for the Salinas Valley Groundwater Basin in accordance with the requirements of California Government Code § 6500 *et seq*. The JPA agreement is included in Appendix 1A. In accordance with California Water Code § 10723 *et seq.*, the JPA signatories are all local agencies under California Water Code § 10721 with water or land use authority that are independently eligible to serve as GSAs:

- The County of Monterey has land use authority over the unincorporated areas of the County, including areas overlying the Forebay Subbasin.
- The MCWRA is a California Special Act District with broad water management authority in Monterey County.
- The City of Salinas is incorporated under the laws of the State of California. The City provides water supply and land use planning services to its residents.
- The City of Soledad is incorporated under the laws of the State of California. The City provides water supply and land use planning services to its residents.
- The City of Gonzales is incorporated under the laws of the State of California. The City provides water supply and land use planning services to its residents.

- King City is incorporated under the laws of the State of California. The City provides water supply and land use planning services to its residents.
- The Castroville CSD is a local public agency of the State of California, organized and operating under the Community Services District Law, Government Code § 6100 et seq. Castroville CSD provides water services to its residents.
- Monterey One Water is itself a joint powers authority whose members include many members of the SVBGSA.

Upon establishing itself as a GSA, the SVBGSA retains all the rights and authorities provided to GSAs under California Water Code § 10725 *et seq*. as well as the powers held in common by the members.

1.2.4.2 ASGSA

The ASGSA was formed in accordance with the requirements of California Water Code § 10723 *et seq*. The Notices of Intent to form a GSA were filed with the California Department of Water Resources on April 27, 2017 and modified on June 30, 2017. The Resolution whereby the City of Greenfield reinstates the ASGSA as a groundwater sustainability agency, adopted on February 12, 2019, is included in Appendix 1B.

1.2.4.3 Coordination Agreement

The SVBGSA and ASGSA completed a Forebay Subbasin Groundwater Sustainability Plan Implementation Agreement in April 2021. The agreement establishes the ASCMA. The agreement establishes the preparation of a single GSP for the Subbasin and that the ASGSA shall implement in the ASCMA and the SVBGSA shall implement in the balance of the Forebay Subbasin. The agreement establishes a Coordination Committee in order to provide a forum for the Parties to consult on the progress of implementing the Forebay GSP and maintaining sustainability in the Forebay and the ASCMA.

1.3 Overview of this GSP

The SVBGSA and ASGSA jointly developed this GSP for the entire Forebay Subbasin. This GSP is developed in concert with GSPs for 5 other Salinas Valley Groundwater Subbasins under SVBGSA jurisdiction: the 180/400-Foot Aquifer Subbasin, the Eastside Aquifer Subbasin, the Upper Valley Aquifer Subbasin, the Langley Area Subbasin, and the Monterey Subbasin. While this GSP is focused on the Forebay Subbasin, the GSP will be implemented in accordance with SVBGSA's role in maintaining and achieving sustainability for all subbasins within the Salinas Valley Groundwater Basin. The Forebay Subbasin is referred to as the Subbasin throughout this GSP, and the collection of Salinas Valley Groundwater Subbasins that fall partially or entirely under SVBGSA jurisdiction are collectively referred to as the Basin or the Valley.

The SVBGSA used a collaborative process to develop this GSP. Chapter 2 details the stakeholders who participated, and the process followed, to develop this GSP. Stakeholders worked together to gather existing information, define sustainable management criteria (SMC) for the Subbasin, and develop a list of management actions and projects.

This GSP describes the basin setting, presents the hydrogeologic conceptual model, and describes historical and current groundwater conditions. It further establishes estimates of the historical, current, and future water budgets based on the best available information. This GSP defines local SMC, details required monitoring networks, and outlines management actions and projects for maintaining sustainability in the Subbasin by 2042.

The SVBGSA developed this GSP as part of an adaptive management process. This GSP will be updated and adapted as new information and more refined models become available. This includes updating SMC and management actions and projects to reflect updates and future conditions. Adaptive management will be reflected in the required 5-year assessment to GSPs and annual reports.

2 COMMUNICATIONS AND PUBLIC ENGAGEMENT

2.1 Introduction

The SVBGSA was formed in 2017 to implement SGMA locally within the Salinas Valley Groundwater Basin. GSA formation and coordination took place from 2015 through 2017 and included completing a Salinas Valley Groundwater Stakeholder Issues Assessment which resulted in recommendations for a transparent, inclusive process for the local implementation of SGMA and the formation of the SVBGSA. Through the development and implementation of the GSPs SVBGSA is committed to following the requirements for stakeholder engagement as defined by SGMA:

- Consider the interests of all beneficial uses of water and users of groundwater (§ 10723.2)
- Encourage the active involvement of diverse social, cultural, and economic elements of the population within the groundwater basin (§ 10727.8)
- Establish and maintain a list of persons interested in receiving notices regarding plan preparation, meeting announcements and availability of draft plans, maps, and other relevant documents (§ 10723.4)
- Make available to the public and DWR a written statement describing the manner in which interested parties may participate in the development and implementation of the GSP (§ 10723.2)

2.2 Defining and Describing Stakeholders for Public Engagement

The SVBGSA stakeholders are highly diverse. Groundwater supports economic activities from small domestic scale to large industrial scale. Groundwater is an important supply for over 400,000 people living within the Salinas Valley Groundwater Basin. Beneficial users in the Basin are the key stakeholders targeted for robust public engagement for GSP development and implementation. Beneficial users in the Basin are listed below:

Agriculture. Includes row crops, field crops, vineyards, orchards, cannabis, and rangeland. The Salinas Valley agricultural region supports a $4.25 billion dollar production value and produces a large percentage of the nation's produce and healthy foods including 61% of the leaf lettuce, 57% of celery, 56% of head lettuce, 40% of broccoli, and 38% of spinach. Agriculture is the largest user of groundwater in the Basin accounting for approximately 250,000 irrigated acres and 94% of pumping in the Basin. In the Forebay Subbasin, Clark Colony Water Company provides irrigation water to approximately 2,000 irrigated acres.

Domestic Water Users. Includes urban water use assigned to non-agricultural water uses in the cities and census-designated places and rural residential wells used for drinking water. In the Forebay Subbasin the City of Greenfield is a domestic water provider. Urban water use includes small local water systems, small state water systems, and small and large public water systems.

Industrial Users. Includes industrial water users, such as quarries and oil production. There is little industrial use within the Basin.

Environmental Users. Environmental users include the habitats and associated species maintained by conditions related to surface water flows such as steelhead trout and groundwater dependent ecosystems including brackish and freshwater marsh and riparian habitats. Environmental users include native vegetation and managed wetlands.

Stakeholders associated with these beneficial users and uses include the following. These users are also represented on the SVBGSA Board and Advisory Committees as described in the next section.

- **Environmental organizations.** Environmental organizations that are stakeholders include Sustainable Monterey County, League of Women Voters of Monterey County, Landwatch Monterey County, Friends and Neighbors of Elkhorn Slough, California Native Plant Society Monterey Chapter, Trout Unlimited, Surfriders, the Nature Conservancy and the Carmel River Steelhead
- **Underrepresented communities (URCs) and Disadvantaged Communities (DACs).** URCs and DACs include the City of Greenfield, Castroville Community Services District, San Jerardo Cooperative, San Ardo Water District, San Vicente Mutual Water Company, Environmental Justice Coalition for Water
- **City and county government.** Cities of Gonzales, Soledad, Greenfield, King City, Marina, and Salinas, Monterey County, Monterey County Environmental Health Department
- **Land use nonprofits.** Sustainable Monterey County, League of Women Voters of Monterey County, Landwatch Monterey County, Friends and Neighbors of Elkhorn Slough
- **Residential well owners.** Represented by public members and members of mutual water companies and local small or state small water systems.
- **Water agencies.** MCWRA, Marina Coast Water District, ASGSA, Castroville Community Services District, Monterey One Water, Monterey Peninsula Water Management District
- **CPUC-regulated water companies.** Alco Water Corporation, California Water Service Company, California American Water.

2.3 SVBGSA Governance Structure

SVBGSA is governed by a local and diverse 11-member Board of Directors (Board) and relies on robust science and public involvement for decision making. The Board meets monthly and all meetings are open to the public. The Board is the final decision-making body for adoption of GSPs completed by the GSA.

The SVBGSA Advisory Committee advises the SVBGSA Board. The Advisory Committee is comprised of 25 members. The Advisory Committee strives to include a range of interests in groundwater in the Salinas Valley and outlined in SGMA. Advisory Committee members live in the Salinas Valley or represent organizations with a presence or agencies with jurisdiction in the Basin including:

- All groundwater users
- Municipal well operators, Public-Utilities Commission-Regulated water companies, and private and public water systems
- County and city governments
- Planning departments/land use
- Local landowners
- URCs
- Business and agriculture
- Rural residential well owners
- Environmental uses

The Advisory Committee, at this time, does not include representation from:

- Tribes
- Federal government

The Advisory Committee will review its charter following GSP completion for additional members if identified as necessary by the Board. The Advisory Committee provides input and recommendations to the Board and uses consensus to make recommendations to the Board. The Advisory Committee was established by Board action and operates according to a Committee Charter which serve as the bylaws of the Advisory Committee. The Advisory Committee reviews and provides recommendations to the Board on groundwater-related issues that may include:

- Development, adoption, or amendment of the GSP

- Sustainability goals
- Monitoring programs
- Annual work plans and reports
- Modeling scenarios
- Inter-basin coordination activities
- Management actions and projects to maintain sustainability
- Community outreach
- Local regulations to implement SGMA
- Fee proposals
- General advisory

Subbasin planning committees were established in May 2020 by the Board of Directors to inform and guide planning for the 5 GSPs due in January 2022. Membership is 7-12 people per subbasin planning committee and all meetings are subject to the Brown Act.

Together the Board, Advisory Committee, and subbasin planning committees are working to complete the 6 GSPs required within the SVBGSA jurisdiction. Subsequent to that SVBGSA, will complete a Salinas Valley Basin-wide Integrated Implementation Plan that is intended to be consistent with the GSPs of the subbasins within the Salinas Valley Groundwater Basin will detail project portfolios and groundwater sustainability programs to meet SGMA compliance for subbasins by 2040 and maintain sustainability through 2050. Once all the GSPs are filed, the subbasin planning committees will transition to implementation committees.

The following graphic captures the phases of GSA development and GSP planning and implementation intended by the SVBGSA through 2050.

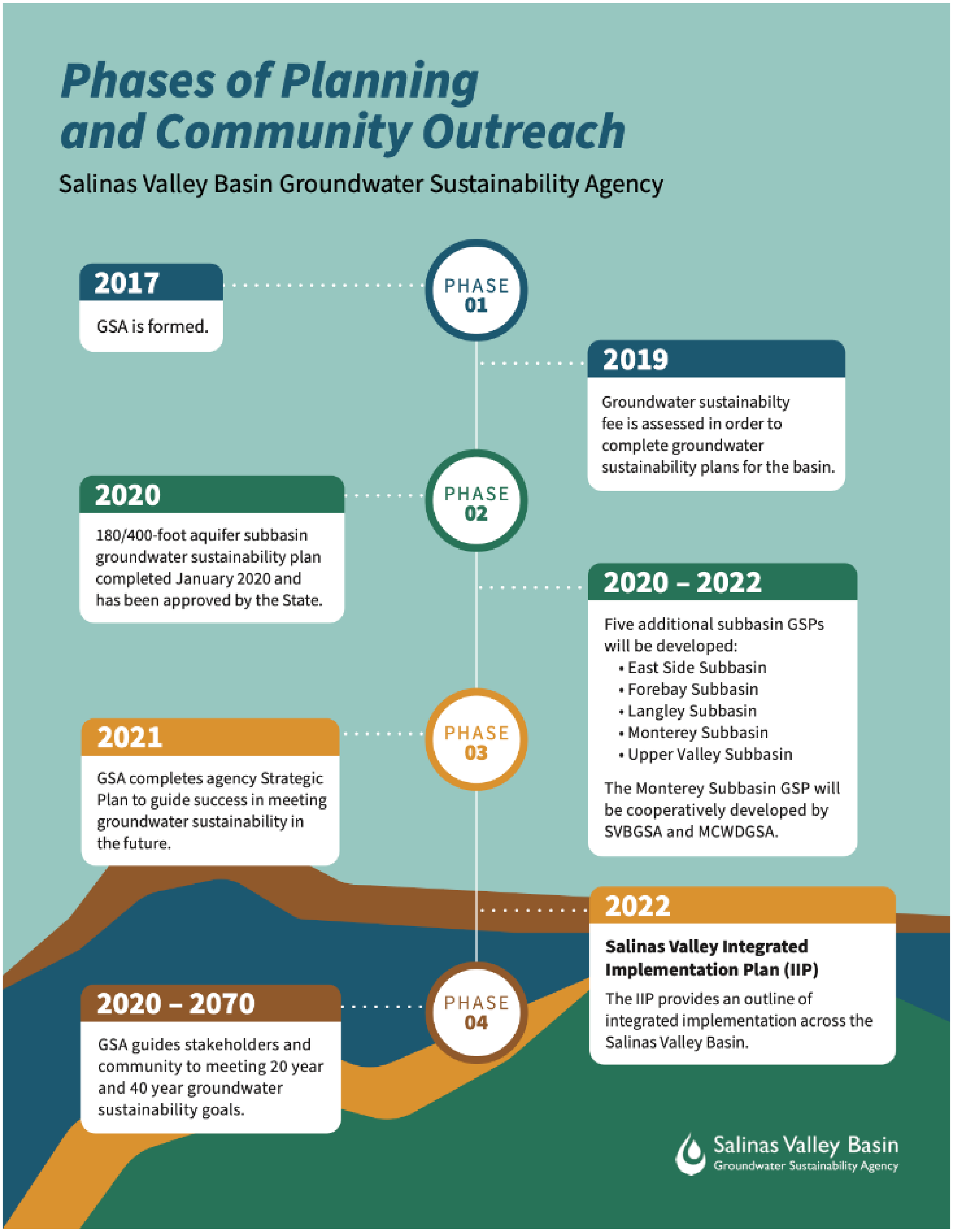

Figure 2-1. Phases of Planning and Community Outreach

2.4 Forebay Subbasin GSP Preparation

Given the importance of the Basin and the development of the Forebay GSP to the communities, residents, landowners, farmers, ranchers, businesses, and others, inclusive stakeholder input was a primary component of the Forebay GSP process. In order to encourage ongoing stakeholder engagement SVBGSA deployed the following strategies in the preparation of the Forebay Subbasin GSP:

- An inclusive outreach and education process conducted that best supports the success of a well- prepared GSP that meets SGMA requirements.
- Kept the public informed by distributing accurate, objective, and timely information.
- Invited input and feedback from the public at every step in the decision-making process.
- Established Subbasin Planning Committee for the Subbasin and completed a comprehensive planning process with this Committee including engagement on key items with the Board and Advisory Committee
- Publicly noticed drafts of the Forebay Subbasin GSP and allowed for required public comment periods as required by SGMA. Comments received and responses are included in Appendix 2A.

Additionally, a rigorous review process for each chapter in the Forebay GSP and for the final plan was completed. This process ensured that stakeholders had multiple opportunities to review and comment on the development of the chapters. A graphical presentation of the planning process is presented below.

Figure 2-2. GSP Development Process

2.5 Forebay Subbasin Planning Committee

Subbasin planning committees are comprised of local stakeholders and Board members and were appointed by the Board of Directors following a publicly-noticed application process by the GSA. Subbasin planning committees were convened in June and July 2020. Subbasin planning committees do the comprehensive work of plan development, review, and recommendations, with assistance provided by SVBGSA staff and technical consultants.

These committees represent constituencies that are considered important stakeholders to developing comprehensive subbasin plans for the Salinas Valley or are not represented on the Board. A list of the Forebay Subbasin Planning Committee is included in the Acknowledgements section of this GSP.

Subbasin planning committee meetings are subject to the Brown Act and noticed publicly on the SVBGSA website. Public comment is taken on all posted agenda items. Subbasin planning committees have been engaged in an iterative planning process that combines education of pertinent technical topics through presentations and data packets and receiving GSPs chapters for review and comment. A live GSP comment form is available on the SVBGSA website for ongoing comment submission on all GSP chapters. All GSP chapters were posted for public review and comment.

GSP chapters that have been taken to the Subbasin Planning Committee were also taken to the Advisory Committee for further review and comments. Community engagement and public transparency on SVBGSA decisions is paramount to building a sustainable and productive solution to groundwater sustainability in the Basin. At the conclusion of the planning process in August 2021 for the Forebay GSP the SVBGSA will have held more than 38 planning meetings and technical workshops on each aspect of the Forebay Subbasin GSP.

In addition to regularly scheduled committee meetings, a series of workshops were held for the Forebay Subbasin Planning Committee as detailed below. These workshops were informational for committee members, stakeholders, and the general public and cover pertinent topics to be included in the GSPs. Workshops were timed to specific chapter development for the GSP. Subject matter experts were brought in as necessary to provide the best available information to Subbasin Planning Committee members.

Table 2-1. Subject Matter Workshops Held During GSP Preparation

Topic	Date
Brown Act and Conflict of Interest	July 22, 2020
Sustainable Management Criteria	July 28, 2020
Water Law	August 10, 2020
Salinas Valley Watershed Overview	August 26, 2020

Topic	Date
Web Map Workshop	September 30, 2020
Town Hall – Domestic Wells & Drinking Water	October 28, 2020
Pumping Allocations	November 18, 2020
Funding Mechanisms	January 27, 2021
Water Budgets	February 24, 2021
Communications and Implementation	March 31, 2021
Technical Modeling Workshop – SVIHM & SVOM	June 30, 2021

2.6 Forebay Subbasin and Arroyo Seco Cone Management Area Coordination Committee

The Forebay Subbasin GSP includes the ASCMA to be managed by the ASGSA. Under an Implementation Agreement completed by the SVBGSA and ASGSA in April 2021, the 2 agencies have established a Coordination Committee which is subject to the Brown Act and will meet quarterly through the year. The Committee is comprised of 2 board members each from the SVBGSA and ASGSA. The Committee does not have decision making authority but will make recommendations to each respective GSA Board of Directors. The Coordination Committee provides a forum for the GSAs to discuss the implementation or elimination of management actions, projects, or funding mechanisms in each Agency's implementation area to ensure that those actions do not negatively impact or impede the goal of sustainability for the Forebay Subbasin as a whole or individually in the greater Forebay Subbasin or ASCMA.

2.7 Communication and Public Engagement Actions

SVBGSA is focused on communication and public engagement targeted at the public, including beneficial users, regarding the development of the SVBGSA's GSP for the Forebay Subbasin**.** Communication and public engagement actions (CPE Actions) that have taken place during GSP development will continue during implementation of all SVBGSA GSPs. Communication and public engagement actions provide the SVBGSA Board and staff a guide to ensure consistent messaging about SVBGSA requirements and other related information. CPE Actions provide ways that beneficial users and other stakeholders can provide timely and meaningful input into the GSA decision-making process. CPE Actions also ensure beneficial users and other stakeholders in the Basin are informed of milestones and offered opportunities to participate in GSP implementation and plan updates. Appendix 2B includes the SVBGSA's marketing and communications plan.

Notice and communication, as required by GSP Regulations § 354.10, was focused on providing the following activities during the development of the Forebay Subbasin GSP**:**

- Clear decision-making process on GSP approvals and outcomes

- Robust public engagement opportunities
- Encouragement of active involvement in GSP development
- Completion of the Forebay Subbasin Implementation Agreement and creation of the ASCMA in the Forebay Subbasin GSP

2.7.1 Goals for Communication and Public Engagement

Ultimately, the success of the Forebay Subbasin GSP will be determined by the collective action of every groundwater user. In order to meet ongoing water supply needs, both for drinking water and for economic livelihoods, the Subbasin must maintain sustainability into the future. This outreach strategy engages the public early and frequently, and keeps the internal information flow seamless among staff, consultants, committee members and the SVBGSA Board and ASGSA Board regarding the goals and objectives of the Forebay Subbasin GSP and associated monitoring and implementation activities.

Critical to the success of the Forebay GSP implementation will be public understanding of the management actions and projects planned for sustainability, as well as sustainability implementation actions and other groundwater management activities. These important actions are identified below (not in order of priority) and specifically described in Chapter 9 of the Forebay GSP.

Management Actions

- Forebay SMC TAC
- Conservation and Agricultural BMPs
- Improve Rural Residential Water Quality
- Watershed Protection Policy for Arroyo Seco River
- Fallowing, Fallow Bank, and Agricultural Land Retirement
- MCWRA Drought Reoperation
- Reservoir Reoperation

Projects

- Multi-benefit Stream Channel Improvements
- Managed Aquifer Recharge of Overland Flow

Implementation Actions

- Well Registration
- Groundwater Extraction Management System (GEMS) Expansion and Enhancement

- Dry Well Notification System
- Water Quality Coordination Group
- Land Use Jurisdiction Coordination Program

Additional important actions of GSP implementation will be the production of the required Annual Report by April 1 each year for the Forebay Subbasin. The Annual Report covers annual data collected each water year from October 1 through September 30. The Annual Report provides an annual benchmark for SVBGSA and ASGSA to provide to the public and stakeholders to assess progress towards sustainability. The Annual Report also includes assessment of the 5 sustainable management criteria for the Subbasin. The Annual Report provides an important opportunity to reengage the Forebay Subbasin Planning Committee in its review and to discuss sustainability status and goals.

CPE Actions provide outreach during the Subbasin planning efforts and assists SVBGSA and ASGSA in being receptive to stakeholder needs through communication tools. The CPE Actions also forecast how SVBGSA and ASGSA will communicate during GSP implementation.

The goals of the CPE Actions are:

1. To keep stakeholders informed through the distribution of accurate, objective, and timely information while adhering to SGMA requirements for engagement (noted above).
2. To articulate strategies and communications channels that will foster an open dialogue and increase stakeholder engagement during the planning process.
3. To invite input from the public at every step in the decision-making process and provide transparency in outcomes and recommendations.
4. To ensure that the Board, staff, consultants, and committee members have up-to-date information and understand their roles and responsibilities.
5. To engage the public on GSP Implementation progress especially for project and management actions and Annual Reports.

2.7.2 Communication and Outreach Objectives

The following are the communications and outreach objectives of the CPE Actions:

- Expand Audience Reach
  - Maintain a robust stakeholder list of interested individuals, groups and/or organizations.

- Secure a balanced level of participants who represent the interests of beneficial uses and users of groundwater.

- Increase Engagement
  - Keep interested stakeholders informed and aware of opportunities for involvement through email communications and/or their preferred method of communications.
  - Publish meeting agendas, minutes, and summaries on the SVBGSA website: www.svbgsa.org.
  - Inform and obtain comments from the general public through GSP online comment form and public meetings held on a monthly basis.
  - Facilitate productive dialogues among participants throughout the GSP planning process.
  - Seek the input of interest groups during the planning and implementation of the GSP and any future planning efforts.
- Increase GSP Awareness
  - Provide timely and accurate public reporting of planning milestones through the distribution of outreach materials and posting of materials on the SVBGSA website for the GSP.
  - Secure quality media coverage that is accurate, complete, and fair.
  - Utilize social media to engage with and educate the general public.
- Track Efforts
  - Maintain an active communications tracking tool to capture stakeholder engagement and public outreach activities and to demonstrate the reporting of GSP outreach activities.

2.7.3 Target Audiences and Stakeholders

SVBGSA stakeholders consist of other agencies and interested parties including all beneficial users of groundwater or representatives of someone who is. Under the requirements of SGMA, all beneficial uses and users of groundwater must be considered in the development of GSPs, and GSAs must encourage the active involvement of diverse social, cultural, and economic elements of the population.

There are a variety of audiences targeted within the Basin whose SGMA knowledge varies from high to little or none. Given this variance, SVBGSA efforts are broad and all-inclusive. Target audiences include:

- SVBGSA Board of Directors, Advisory Committee, and Subbasin Planning Committees

- ASGSA Board of Directors and Advisory Committee
- Forebay Subbasin and ASCMA Coordination Committee
- SVBGSA Groundwater Sustainability Fee Payers
- Partner agencies including ASGSA, Monterey County Environmental Health Department, County of Monterey, MCWRA, and the Greater Monterey County Integrated Regional Water Management Group (RWMG)
- Municipal and public water service providers
- Private and small water system providers
- Local municipalities and communities
- Elected officials within the Basin
- Beneficial uses and users of groundwater including, agriculture, domestic wells and small water systems, and environmental uses such as wetlands
- Diverse social, cultural, and economic segments of the population within the Basin including URCs
- The general public

Stakeholder involvement and public outreach is critical to the GSP development because it helps promote the plan based on input and broad support. The following activities summarize involvement opportunities and outreach methods to inform target audiences and stakeholders. It is important to note that levels of interest will evolve and shift according to the GSP's implementation opportunities and priorities.

2.7.4 Stakeholder Database

A stakeholder database of persons and organizations of interest will be created and maintained. The database will include stakeholders that represent the region's broad interests, perspectives, and geography. It will be developed by leveraging existing stakeholder lists and databases and by conducting research of potential stakeholders that may be interested in one or all of the following categories: municipal users and groundwater users including agricultural, urban, industrial, commercial, institutional, rural, environmental, URCs, state lands and agencies, and integrated water management.

2.7.5 Key Messages and Talking Points

SVBGSA developed key messages focused on getting to know your GSA, an overview of groundwater sustainability planning for our community, and how we intend to continue outreach through implementation. These messages were guided by the underlying statements:

- The GSP process, both planning and implementation, is transparent and direct about how the GSP will impact groundwater users.
- SVBGSA represents the groundwater interests of all beneficial uses/users of the basin equitably and transparently to ensure that the basin achieves and maintains sustainable groundwater conditions.
- SVBGSA is committed to working with stakeholders using an open and transparent communication and engagement process.
- As the overall GSP will be more comprehensive with an engaged group of stakeholders providing useful information, SVBGSA will create as many opportunities as possible to educate stakeholders and obtain their feedback on the GSP implementation and plan updates.

These messages are being used as the basis for specific talking points/Q&A to support effective engagement with audiences. The SVBGSA Key Messages are also used to support communication with audiences (Appendix 2C).

2.7.6 Engagement Strategies

SVBGSA utilizes a variety of tactics to achieve broad, enduring, and productive involvement with stakeholders during the development and implementation of the GSPs. Below are activities that SVBGSA uses to engage the public currently and anticipated activities for GSP implementation:

- Develop and maintain a list of interested parties
- Offer public informational sessions and subject-matter workshops and provide online access via Facebook Live or via Zoom
- Basin tours (currently on hold due to COVID restrictions)
- SVBGSA Web Map
- Annual Report presentations
- FAQS – Offer FAQs on several topics including SGMA, SVBGSA, ASCMA, GSP, projects, Monitoring Program, Annual Report, Programs and Groundwater Sustainability Fee
- Science of Groundwater – new examples (studies, etc.)
- Board, Advisory Committee, and other Committee Meetings
    - Regular public notices and updates; Brown Act compliance
    - Develop talking points for various topics and evolve as necessary

- Subbasin Implementation Committees
    - Each subbasin's planning committee for GSP development will transition to a subbasin implementation committee to be convened for GSP updates and annual report reviews.
- Integrated Implementation Committee
    - The Integrated Implementation Committee will be convened to discuss Basin-wide aspects to the 6 GSPs in the Basin including public outreach.
- Online communications
    - SVBGSA website: maintain with current information
    - SVBGSA Facebook page: maintain and grow social media presence
    - Direct email via Mailchimp newsletter
- Mailings to most-impacted water users and residents – topics to include: Annual Report dashboard, What does your GSA do with the Sustainability Fee?, newsletter that accompanies each tax bill.
- Media coverage. Appendix 2D includes SVBGSA's media policy.
    - Op-eds in the local newspapers
    - Press releases
    - Radio interviews
- Promote/Celebrate National Groundwater Week (held in December)
- Co-promotional opportunities and existing channels with agencies, committees, and organizations including email newsletters, social media, board meetings and mailings to customers.
- Talks and presentations to various stakeholder groups, associations, community organizations, and educational institutions.
- Educational materials

2.7.7 CPE Actions Timeline and Tactics

CPE Actions and GSP milestone requirements by phase include:

- Prior to initiating plan development: Share how interested parties may contact the GSA and participate in development and implementation of the plan submitted to DWR. (23 California Code of Regulations § 353.6)
- Prior to GSP development: Establish and maintain an interested persons list. (California

Water Code § 10723.4)

- Prior to and with GSP submission:
  - Record statements of issues and interests of beneficial users of basin groundwater including types of parties representing the interests and consultation process
  - Lists of public meetings
  - Inventory of comments and summary of responses
  - Communication section in GSP (23 California Code of Regulations § 354.10) that includes: agency decision-making process, identification of public engagement opportunities and response process, description of process for inclusion, and method for public information related to progress in implementing the plan (status, projects, actions)
- Supporting tactics to be used to communicate messages and supporting resources available through GSP development and GSP implementation:
  - SVBGSA website, updated regularly to reflect meetings and workshop offerings
  - Direct email via Mailchimp sent approximately monthly to announce board meetings, special workshop offerings and other opportunities for engagement
  - Outreach to local media to secure coverage of announcements and events, radio interviews, op-ed placement
  - Workshops, information sessions and other community meetings
  - Social media, specifically Facebook, updated regularly to share information and support other outreach efforts

2.7.8 CPE Actions – Annual Evaluation and Assessment

CPE Actions and GSP milestone requirements by phase include:

- What worked well?
- What didn't go as planned?
- Are stakeholders educated about the GSP development process and their own role?
- Is the timeline for implementation of the GSP clear?
- Has the GSA received positive press coverage?
- Do diverse stakeholders feel included?
- Has there been behavior changes related to the program goals? Or improved trust/relationships among participants?

- Community meeting recaps and next steps
- Lessons learned
- Budget analysis

2.8 Underrepresented Communities and Disadvantaged Communities Strategic Engagement and Communications

During development of the 2022 GSPs SVBGSA conducted the scoping of an engagement strategy for URCs and DACs that would provide both an assessment of how URCs and DACs may be engaged with the GSA and to develop GSA materials that are accessible and culturally responsive (visual and in Spanish). These materials will communicate impacts of groundwater management on local water conditions in order to engage URCs and DACs into GSA plan reviews and develop pathways for future involvement.

2.8.1 Underrepresented Communities and Disadvantaged Communities in the Salinas Valley

In this GSP, URCs and DACs are considered communities that currently have little or no representation in water management, or who historically have had disproportionately less representation in public policy decision making. URCs and DACs are inclusive of Severely Disadvantaged Communities (SDACs), Economically Distressed Areas (EDAs) and other communities that are traditionally underrepresented. The City of Greenfield is a DAC.

The basin wide SVBGSA program area also has well documented DAC designation including 7 Census Designated Places, 60 Block Groups and 20 Tracts. Additionally, work conducted by the Greater Monterey County Integrated Regional Water Management Program (IRWMP) identified 25 small DACs, SDACs, and suspected disadvantaged communities in unincorporated areas of the IRWMP region (RWMG, 2018). Figure 2-3 shows where DACs, SDACs, and EDAs are located within the Salinas Valley Groundwater Basin, and Appendix 2E further describes DACs.

SVBGSA seeks to engage more constructively with URCs and DACs moving forward in subbasin planning processes and ultimately GSP implementation. In August 2019, SVBGSA hired the Consensus Building Institute (CBI) to conduct an assessment with URC and DAC community leaders via formal interviews. The purpose of the assessment was to capture insights and recommendations to inform an engagement strategy for URCs and DACs. CBI conducted 14 interviews and summarized findings from the assessment to identify initial strategic steps for work with URCs and DACs for GSP planning and implementation. Based on this work, an initial set of short and middle term actions to complete from January 2021-August 2021 was identified and work has begun on these items during the GSP development period and will be operational for implementation in Fall 2021. The Board of Directors affirmed these short and middle term actions on February 11, 2021 and are intended for focus during implementation of the GSP. Middle and long-term actions with URCs were identified for 2022. The *Spectrum of Community to Ownership* will be utilized as a guide in further shaping SVBGSA work with URCs and DACs communities in the Basin in consultation with community leaders.

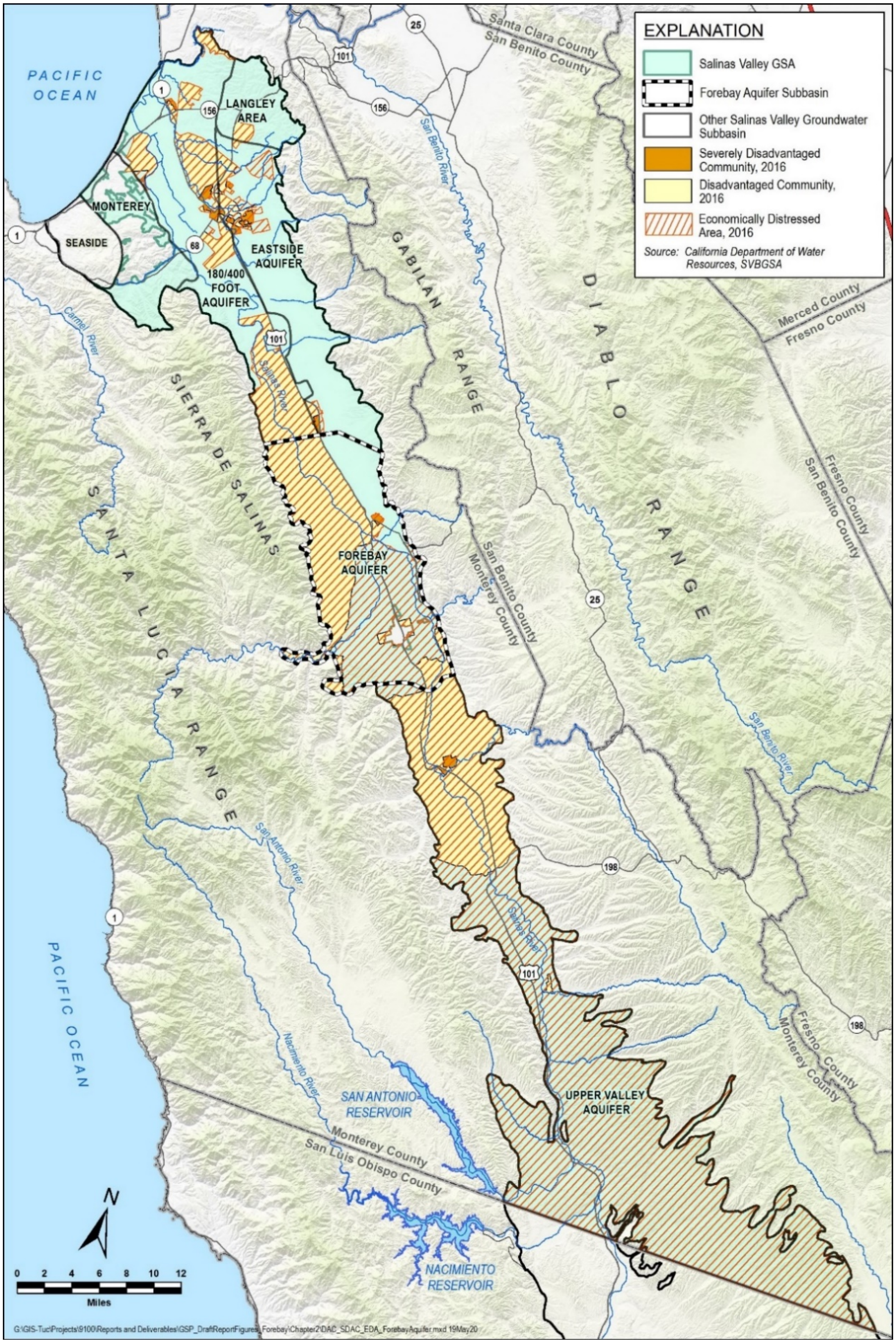

Figure 2-3. Disadvantaged Communities in the Salinas Valley Groundwater Basin

2.8.2 Additional activities scoped for engagement of Underrepresented Communities and Disadvantaged Communities

Additional activities scoped for engagement of URCs and DACs include:

- Conduct workshops with partners on importance of water and groundwater sustainability
- Identify URC and DAC concerns and needs for engagement
- Plan listening sessions around GSA milestones
- Coordinate with partner organizations to develop a "resource hub" where people can go for support
- Identify community allies in groundwater engagement work and bring down barriers for participation
- Consider particular URC and DAC impacts during routine GSA proceedings
- Convene a working group on domestic water, including URCs and DACs

3 DESCRIPTION OF PLAN AREA

This GSP covers the entire Forebay Subbasin, as shown on Figure 3-1. The Subbasin covers an area of approximately 94,000 acres, or 147 square miles (DWR, 2004a). It lies in the middle of Monterey County, and the middle of the Salinas Valley Groundwater Basin. The Forebay Subbasin is bounded by the Gabilan Range to the east, the 180/400-Foot Aquifer and Eastside Subbasins to the north, the Sierra de Salinas to the west, and the Upper Valley Subbasin to the south. Figure 3-3 shows the overlap between the Forebay Subbasin and MCWRA's Forebay Subarea.

The Salinas River runs through the Forebay Subbasin, entering from the Upper Valley Subbasin from the south and draining into the 180/400-Foot Aquifer Subbasin to the north. The main tributary to the Salinas River is the Arroyo Seco, which joins with it in the middle of the Subbasin. Historical flows in the Arroyo Seco formed a significant alluvial fan in the Subbasin, known as the Arroyo Seco Cone. The ASCMA within the Forebay Subbasin reflects the unique hydrogeologic, water quality, and water supply characteristics of the Arroyo Seco Cone region. The ASCMA is shown on Figure 3-1. The limits of the Arroyo Seco Cone may be modified when more data become available. The Forebay Subbasin contains the municipalities of Greenfield and Soledad. United States Highway 101 runs generally north-south along the Subbasin. Rivers and streams, urban areas, and major roads are shown on Figure 3-1.

This description of the plan area has been prepared in accordance with the GSP Regulations § 354.8. Information from existing water resource monitoring, management, and regulatory programs have been incorporated into this GSP through the development of the sustainability goal, SMC, and management actions and projects. This GSP has been developed to reflect the principles outlined in existing local plans, programs, and policies, and will build off them during GSP implementation.

3.1 Summary of Adjudicated and Jurisdictional Areas

3.1.1 Adjudicated Areas, Other GSAs, and Alternatives

The Forebay Subbasin is not adjudicated. The only adjudicated area in the Salinas Valley Groundwater Basin is the Seaside Subbasin (DWR subbasin number 3-004.08), which is not adjacent to the Forebay Subbasin.

No alternative plans have been submitted for any part of the Subbasin, or for any other Salinas Valley Groundwater Subbasin.

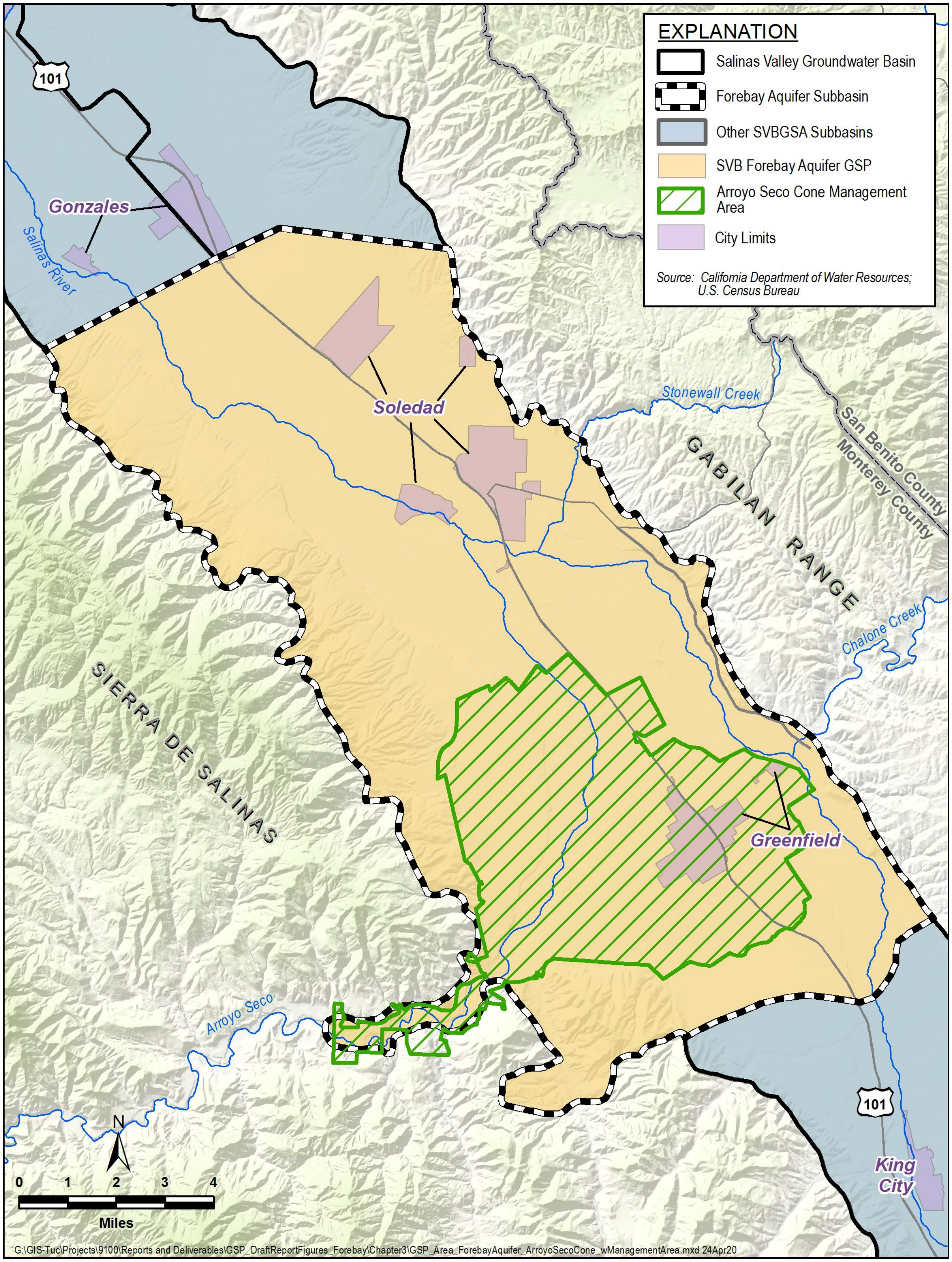

Figure 3-1. Forebay Aquifer Subbasin Area Covered by GSP

3.1.2 Jurisdictional Areas

3.1.2.1 Federal and State Jurisdictional Areas

Maps of federal and state jurisdictional areas are based on data from the U.S. Bureau of Land Management (BLM) National Surface Management Agency National Geospatial Data Asset (BLM, 2020). There are several areas in the Subbasin with federal or state jurisdiction over water management authority. BLM manages a 27.5-acre parcel in the Salinas River floodplain approximately 3.5 miles north of Greenfield. BLM additionally owns several parcels of land approximately 5.5 miles southwest of Soledad; a portion of these are within the Subbasin. The California Department of Corrections and Rehabilitation manages the Salinas Valley State Prison and the adjacent Correctional Training Facility; both located 5 miles north of Soledad. The Subbasin does not contain any tribal lands (RWMG, 2018).

3.1.2.2 County Jurisdiction

The County of Monterey has jurisdiction over the unincorporated area of the Subbasin. There are no County conservation areas or parks within the Subbasin (BLM, 2020).

MCWRA has broad water management authority in Monterey County, with its jurisdiction covering the entire Forebay Subbasin, as shown on Figure 3-2. MCWRA manages, protects, stores, and conserves water resources in Monterey County for beneficial and environmental use. Originally formed under a different name for flood control and management, it also has jurisdiction over water conservation, purveying water, and preventing extractions that are harmful to the groundwater basin. Key assessment zones for various projects and programs administered by MCWRA are shown in Figure 3-3. MCWRA is governed by a 9-member Board of Directors who are appointed by the 5-member MCWRA Board of Supervisors. The Board of Supervisors of the County is *ex officio* Board of Supervisors of MCWRA (Monterey County Water Resources Agency Act, Sec. 15).

3.1.2.3 City and Local Jurisdiction

The jurisdictional boundaries of cities and local jurisdictions shown on Figure 3-2 (U.S. Census Bureau, 2018). The cities of Soledad and Greenfield are located within the Subbasin and have water management authority.

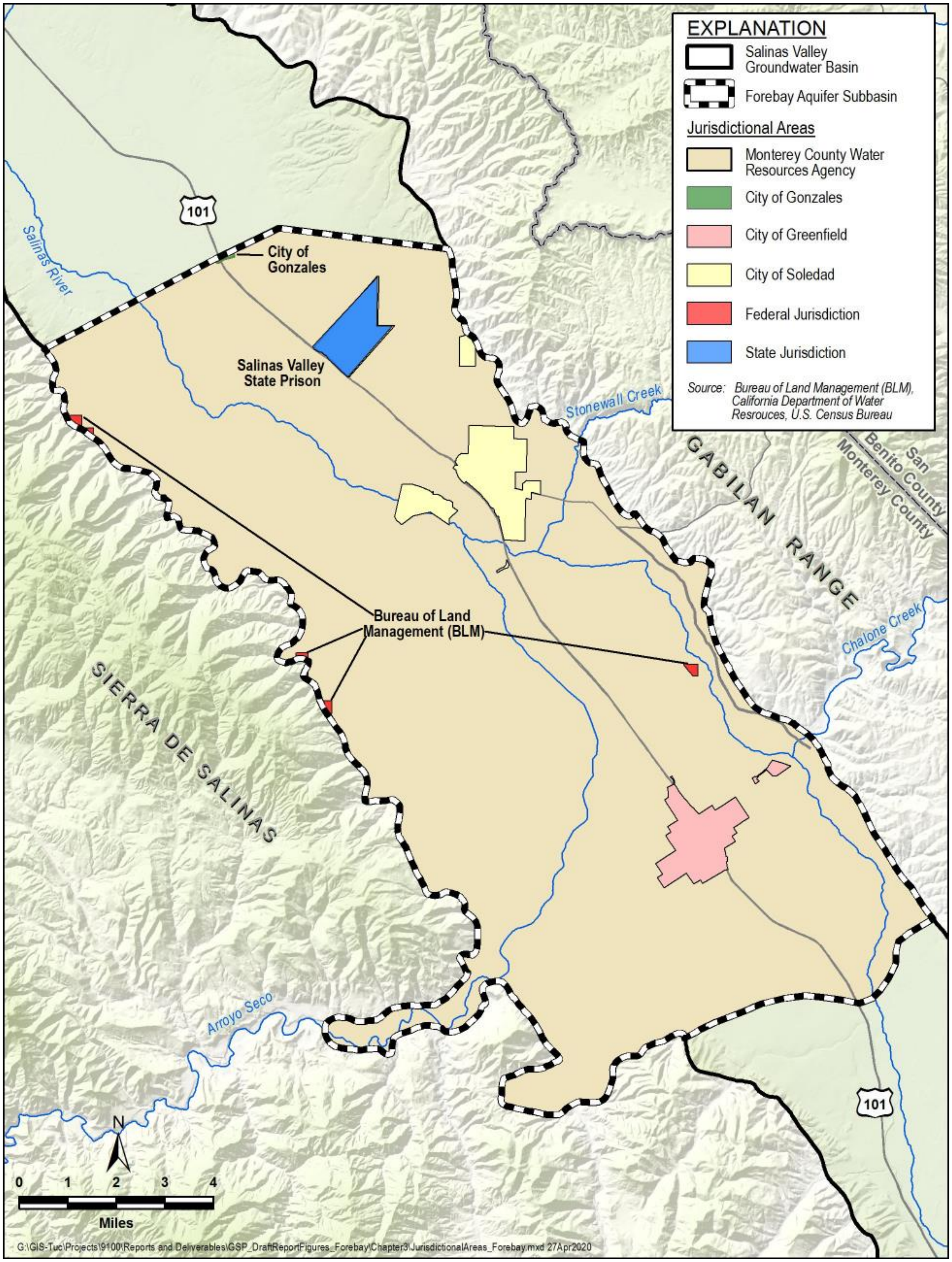

Figure 3-2. Federal, State, County, City, and Local Jurisdictional Areas

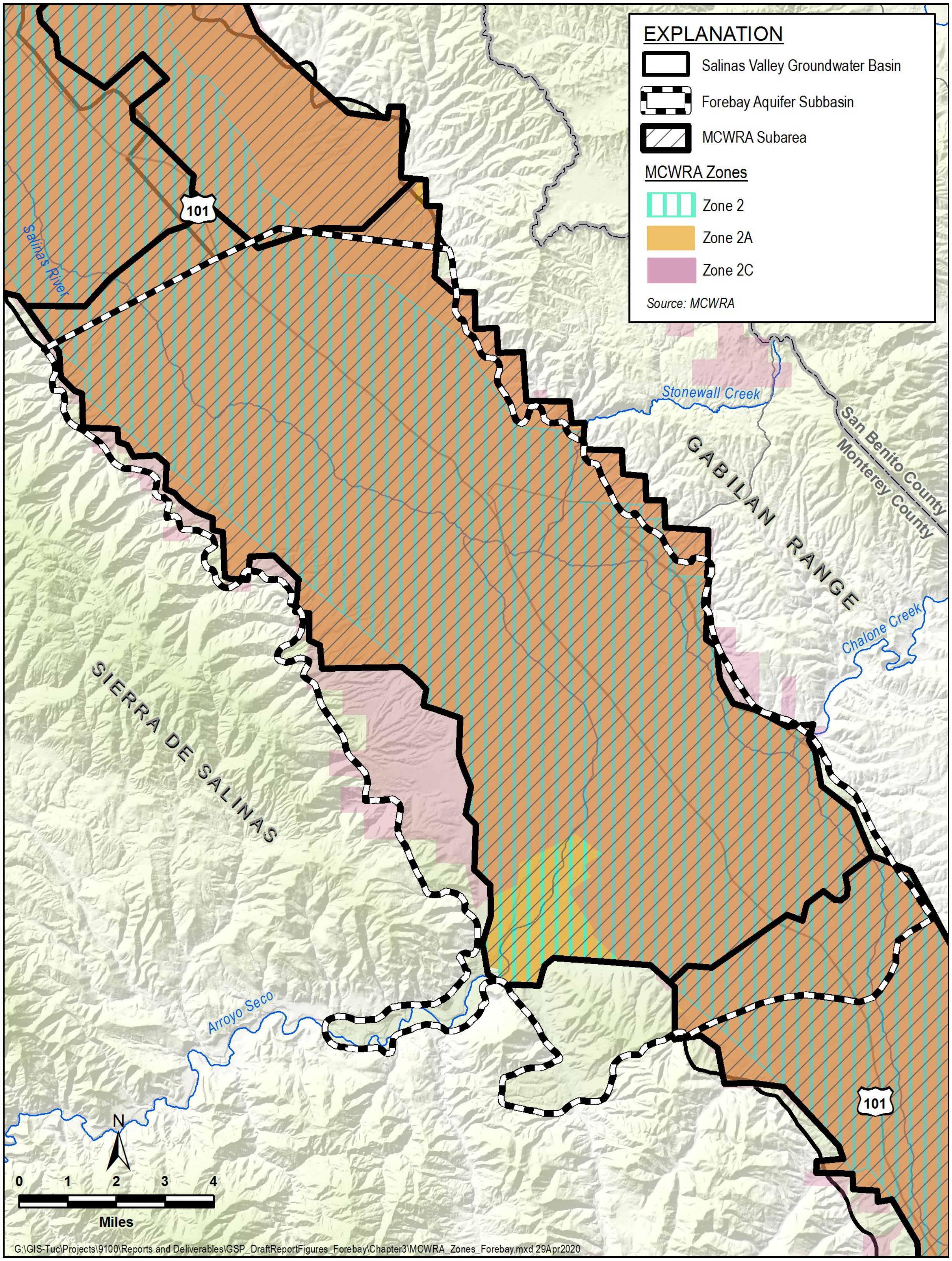

Figure 3-3. MCWRA Zones in the Forebay Aquifer Subbasin

3.2 Land Use

The Monterey County Assessor's office maintains a Geographic Information System (GIS) database of land use at the parcel level. Current (2019) land use categories in the Forebay Subbasin are shown on Figure 3-4 and summarized by major category in Table 3-1. The difference between the land use area in Table 3-1 and the total Subbasin area of 94,000 acres is the result of 1) some parcels having null land use values and 2) small gaps between parcels that are not counted.

Table 3-1. Land Use Summary

Category	Area in Subbasin (acres)
Agriculture (Row Crops)	72,728
Agriculture (Grazing)	13,106
Commercial	232
Industrial	615
Institutional	2,266
Miscellaneous	154
Multi-Family	275
Residential (Urban)	1,112
Rural	1,542
Not Classified	81
Total	92,111

Source: Monterey County Assessor's Office parcel data

The majority of land in the Subbasin is used for agriculture; the top 3 crops by value in Monterey County in 2017 were lettuce, strawberries, and broccoli (Monterey County Agriculture Commissioner, 2018). Grapes are also a major crop in Monterey County. Other crops included under irrigated agriculture are various row crops, field crops, alfalfa, pasture, orchards (fruits and nuts), and irrigated agricultural preserves.

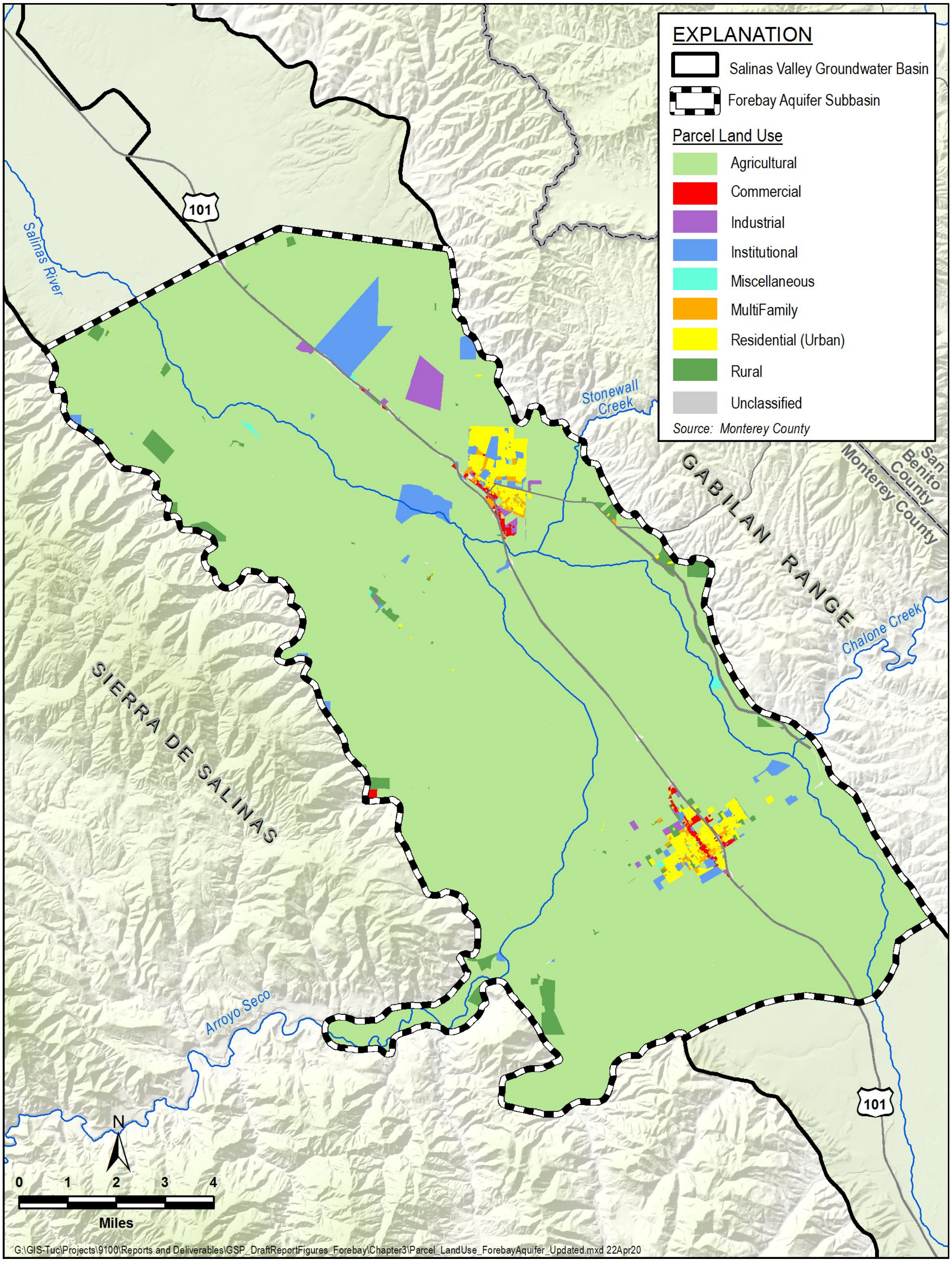

Figure 3-4. Existing Land Use

3.2.1 Water Source Types

No recycled water is used within the Subbasin. Surface water diversions within the Salinas River watershed are reported to the State Water Resources Control Board (SWRCB) under Electronic Water Rights Information Management System (eWRIMS). The locations of the reported surface water diversions are shown on Figure 3-5.

This figure does not show land that is dependent on the reported diversions, but rather infers areas through locations of diversion permits. Some reported surface water diversions are also reported to MCWRA as groundwater extractions. Based on an initial analysis comparing Water Year 2018 SWRCB diversion data and MCWRA pumping data, the estimated locations that reported both surface water diversions and groundwater pumping are identified with pink dots on Figure 3-5. Groundwater is the primary water source for all water use sectors in the Subbasin.

Communities that depend on groundwater are shown on Figure 3-6. The large public water systems shown on this figure are derived from data provided by Tracking California (Tracking California, 2020). Monterey County provided the boundaries for the small public water systems and the local small or state small water systems shown on Figure 3-6. More information on these water systems can be found on SVBGSA's Web Map, accessible at: https://portal.elmontgomery.com. Groundwater is also used for rural residential areas, small community systems, and small commercial operations such as wineries and schools. The complete list of water systems and their number of connections, if available, are listed in Appendix 3A.

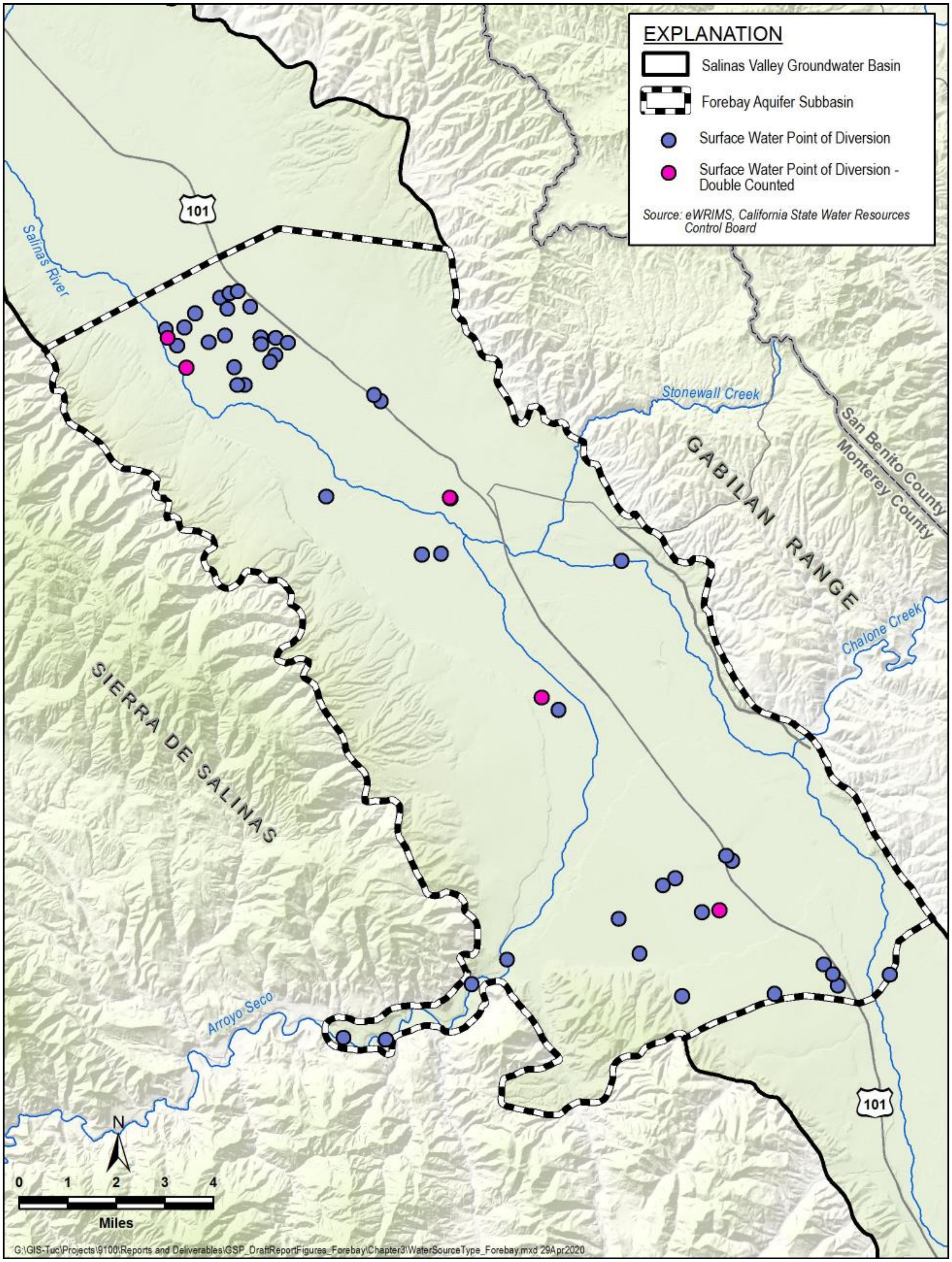

Figure 3-5. Salinas River Watershed Surface Water Points of Diversion in the Forebay Aquifer Subbasin

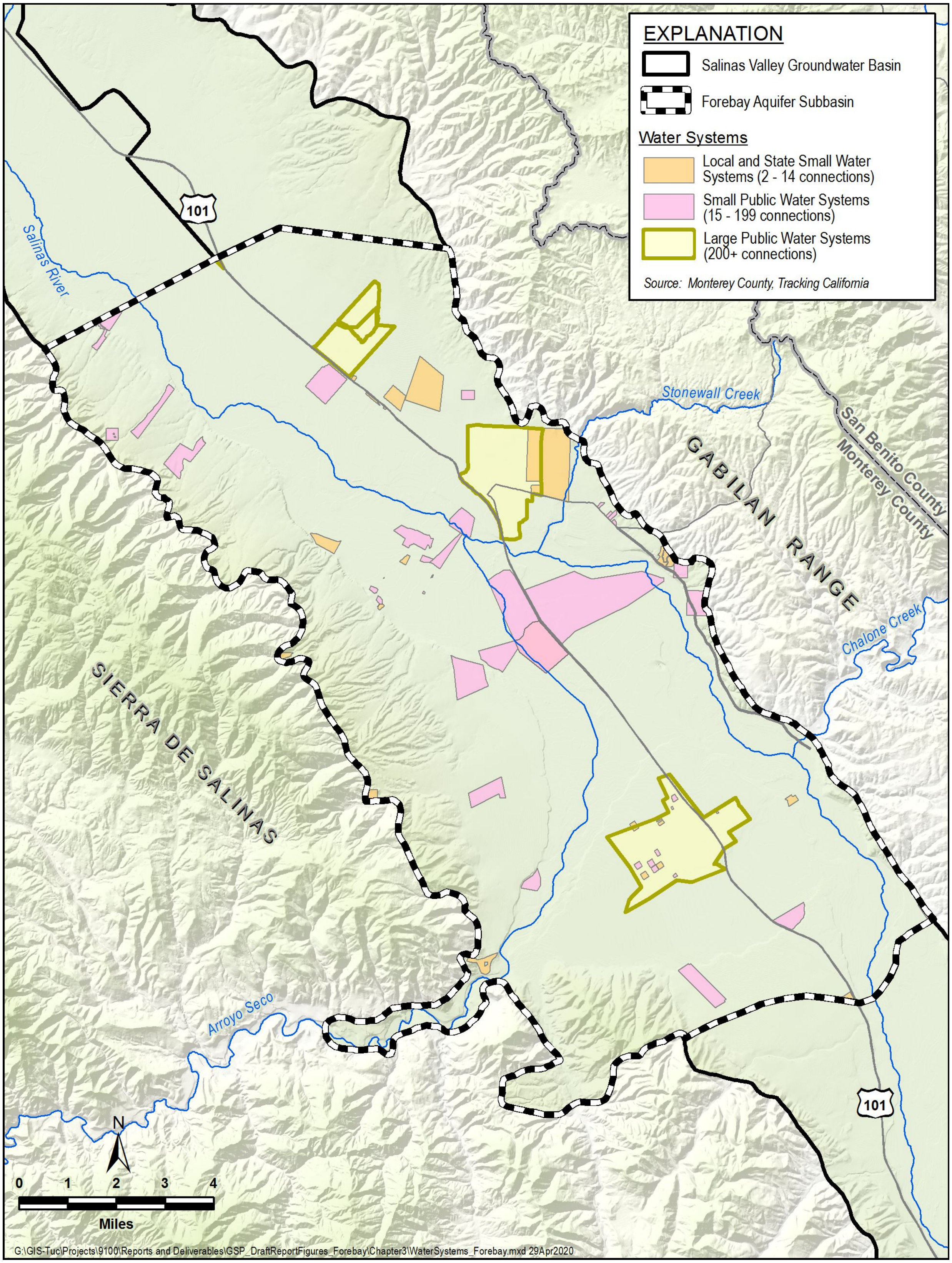

Figure 3-6. Communities Dependent on Groundwater

3.2.2 Water Use Sectors

Groundwater demands in the Subbasin are classified into the 6 water use sectors identified in the GSP Regulations. The water use sectors are shown on Figure 3-7. Groundwater demand categories include the following:

- **Urban**. Urban water use is assigned to non-agricultural water uses in the cities and census-designated places. Domestic use outside of census-designated places is not considered urban use.
- **Industrial**. There is limited industrial use in the Subbasin.
- **Agricultural**. This is the largest water use sector in the Subbasin, including grazing land.
- **Managed wetlands**. DWR land use records indicate that there are no managed wetlands in the Forebay Subbasin.
- **Managed recharge**. There is no managed recharge in the Subbasin.
- **Native vegetation**. Groundwater use by native vegetation is minimal. Although not a native species, water use by *Arundo donax* is estimated between 32,000 and 64,000 acre-feet per year (AF/yr.) in the entire Salinas Valley Groundwater Basin (Giessow, 2011); an unknown quantity occurs within the Forebay Subbasin.
- **Other**. This includes rural residential water use and any water use not captured in the other water use sector.

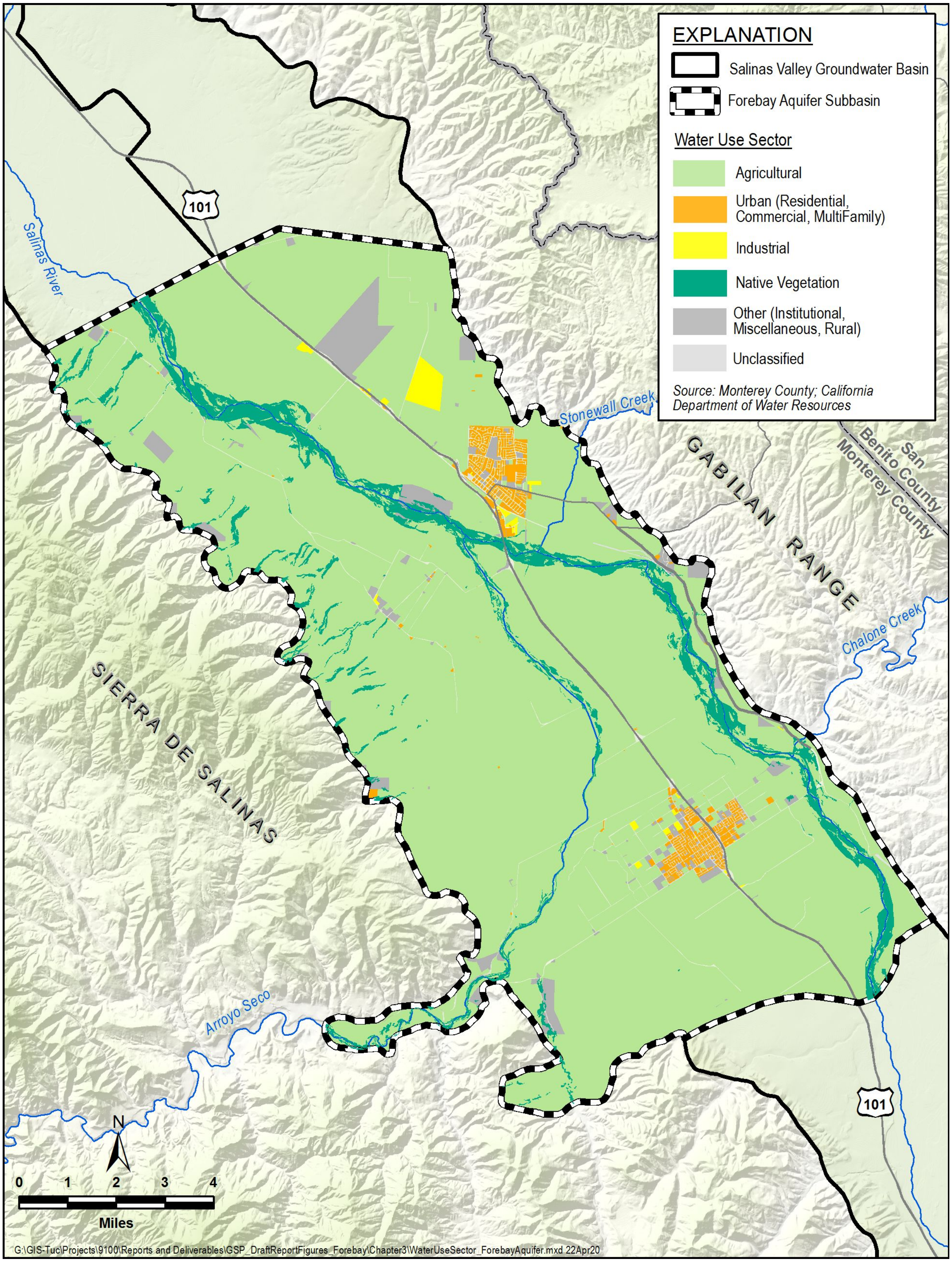

Figure 3-7. Map of Water Use Sectors

3.3 Existing Well Types, Numbers, and Density

Well density data were derived from DWR's Online System for Well Completion Report (OSWCR) Map Application (DWR, 2020a). Other data sources are available from MCWRA or other sources, and they may result in different well densities that are not reflected in DWR's OSWCR database. However, the DWR data were used for simplicity and consistency with other DWR data used in this GSP.

DWR's OSWCR Map Application classifies wells as domestic, production, and public supply; production wells include wells that are designated as irrigation, municipal, public, or industrial, and only exclude those designated as domestic. Most of the wells in the Subbasin are desginated production wells. Fewer than 4% of wells in the Subbasin are classified as public supply wells, even though groundwater is the primary water source for urban and rural communities in the Subbasin. Domestic wells account for most of the remaining wells and have an average depth of approximately 281 feet. Some of the domestic wells identified by DWR may be classified as *de minimis* extractors, defined as pumping less than 2 AF/yr. for domestic purposes. Approximate well counts in the Subbasin are summarized in Table 3-2, with public supply wells subtracted from the production category to avoid double counting. DWR provides well counts by Public Land Survey System sections; well counts for sections that are only partially in the Subbasin use the proportion of the section in the subbasin to aportion the respective well count. These well counts may not be reflective of active wells in the Subbasin, as some wells may have been abandoned or are inactive. Figure 3-8, Figure 3-9, and Figure 3-10 show the density of domestic, production, and public supply wells, respectively, in the Subbasin, with the production wells being inclusive of the public supply wells.

Table 3-2. Well Count Summary

Category	Number of Wells
Domestic	145
Production	340
Public Supply	18
Total	**521**

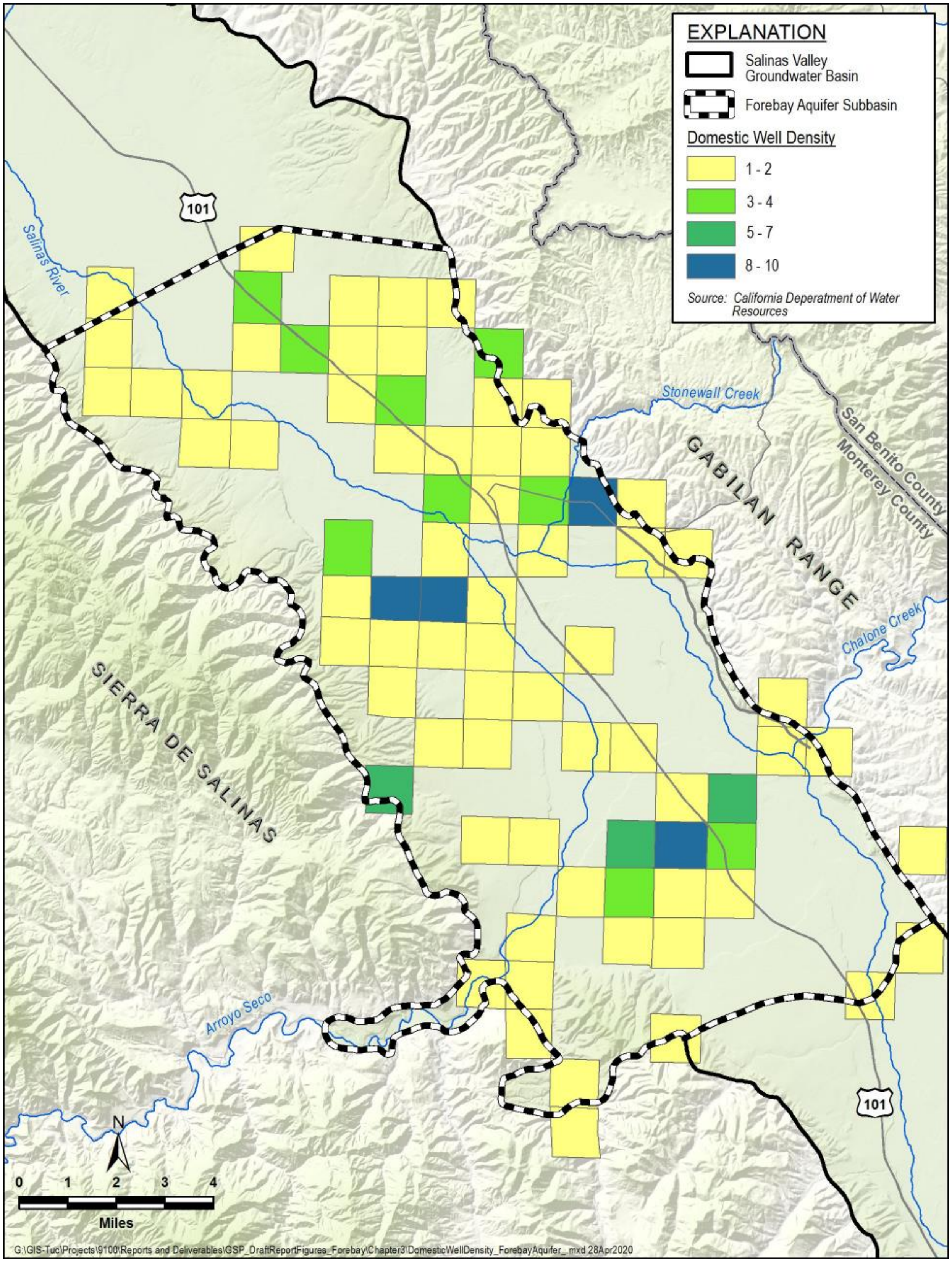

Figure 3-8. Density of Domestic Wells (Number of Wells per Square Mile)

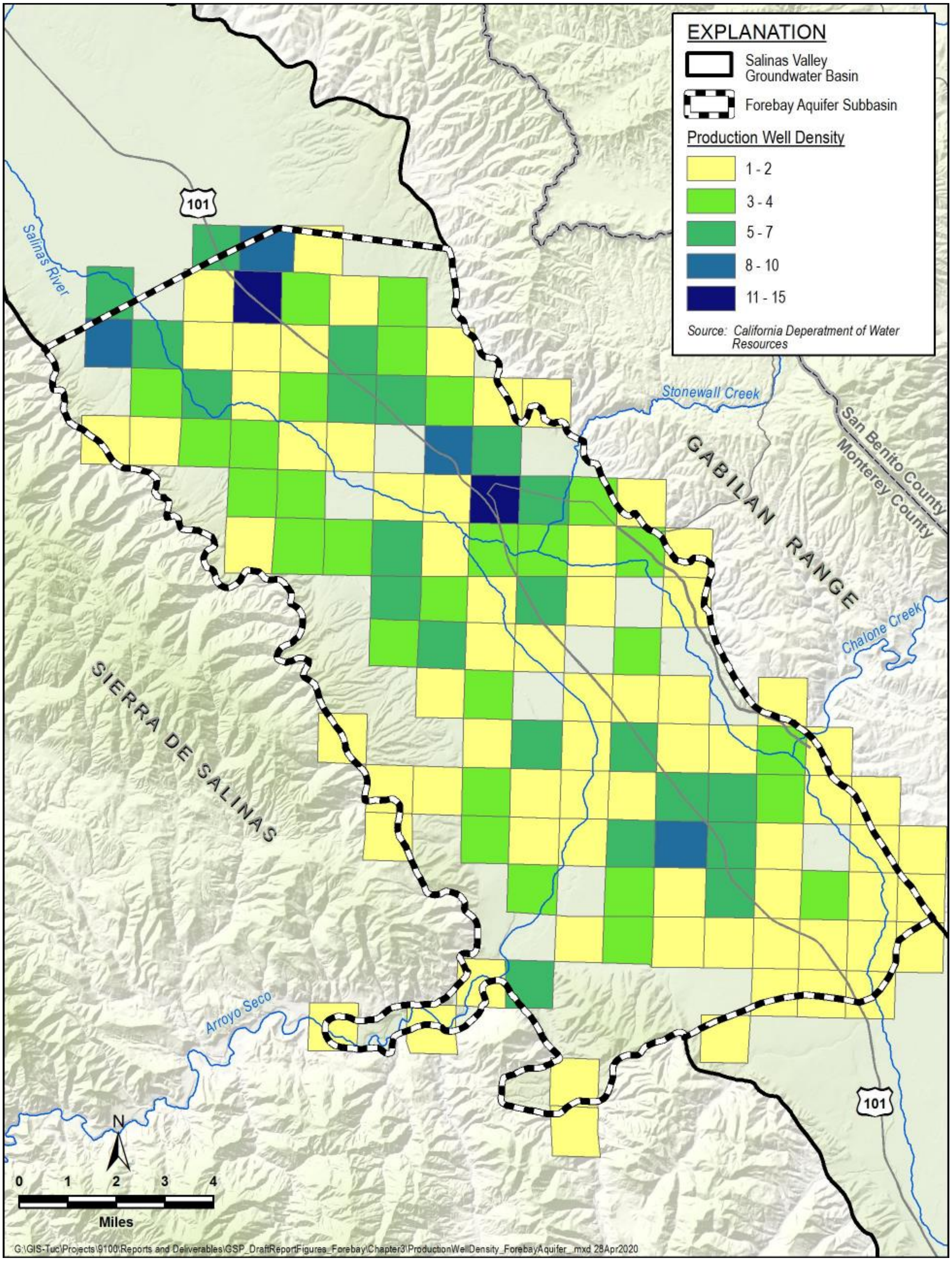

Figure 3-9. Density of Production Wells (Number of Wells per Square Mile)

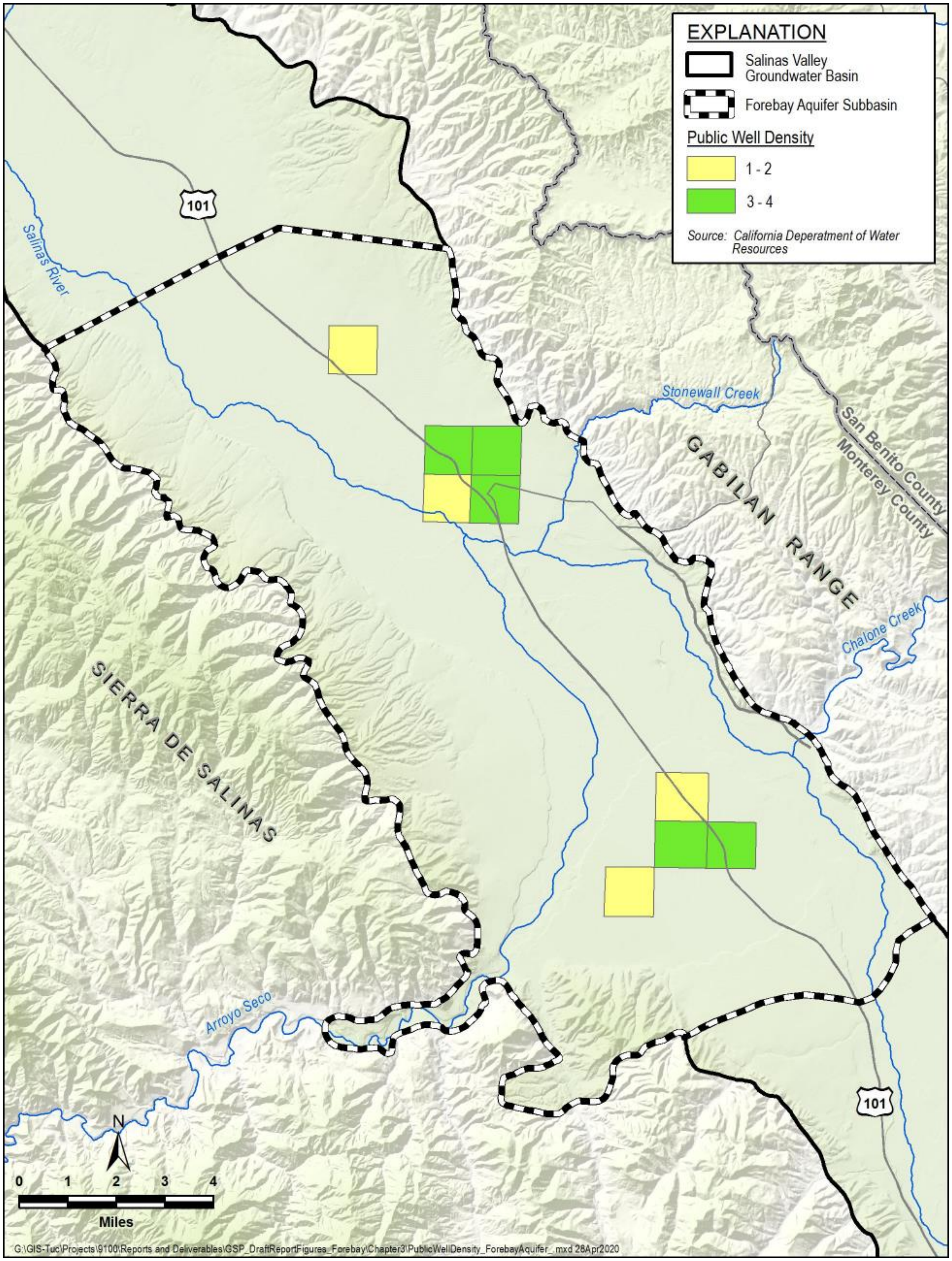

Figure 3-10. Density of Public Wells (Number of Wells per Square Mile)

3.4 Existing Monitoring Programs

3.4.1 Groundwater Elevation Monitoring

MCWRA operates existing groundwater elevation monitoring programs in the Salinas Valley Groundwater Basin, which are incorporated into the monitoring plan of this GSP as appropriate. MCWRA has annual fall, August, and monthly groundwater elevation monitoring programs, and is the responsible agency for the California Statewide Groundwater Elevation Monitoring (CASGEM) program in most areas of Monterey County. The existing groundwater elevation monitoring programs will be updated and improved to document the avoidance of undesirable results in the principal aquifer in the Subbasin.

MCWRA historically has monitored 11 wells within the Forebay Subbasin as part of the CASGEM network. Nine of the CASGEM monitoring wells are owned by MCWRA and the others are privately owned by owners who have volunteered the well for inclusion in the CASGEM program. MCWRA collects monthly groundwater elevation data from the CASGEM wells, except for a few that are monitored biannually, and reports the groundwater elevation data to DWR twice per year. The CASGEM wells have been migrated to the SGMA monitoring network and will be supplemented with 28 other wells that are already part of the MCWRA groundwater elevation monitoring networks. Groundwater elevation data from all wells in the monitoring network are publicly available. This network will be used for water elevation monitoring under this GSP, as described further in Chapter 7. It will be updated and improved as needed to monitor groundwater elevations for this Subbasin.

3.4.2 Groundwater Extraction Monitoring

MCWRA collects groundwater extraction information from all wells within Zones 2, 2A, and 2B that have discharge pipes of 3 inches or greater in diameter. These zones cover most of the Forebay Subbasin, including all of the valley floor and some of the foothills as shown on Figure 3-3. These data have been collected since 1993.

This network will be used for groundwater extraction monitoring under this GSP, as described in Chapter 7. SVBGSA will work with MCWRA to update and enhance the program to enable it to sufficiently monitor groundwater extractions for this Subbasin.

3.4.3 Groundwater Quality Monitoring

Groundwater quality is monitored under several different programs and by different agencies including the following:

- Municipal and community water purveyors must collect water quality samples on a routine basis for compliance monitoring and reporting to the SWRCB Division of

Drinking Water (DDW). These purveyors include municipal systems; community water systems; non-transient, non-community water systems; and non-community water systems that provide drinking water to at least 15 service connections or serve an average of at least 25 people for at least 60 days per year.

- Local small or state small water system wells are regulated by the Monterey County Department of Public Health. Local small water systems serve 2 to 4 service connections and state small water systems serve 5 to 14 connections.
- To fulfill the groundwater quality regulatory requirements of the Irrigated Lands Regulatory Program (ILRP), the Central Coast Regional Water Quality Control Board (CCRWQCB) requires monitoring of both on-farm domestic wells and agricultural wells for irrigation and livestock supply.
- In addition to the ILRP, the CCRWQCB conducts groundwater quality monitoring at multiple sites as part of investigation or compliance monitoring programs. These sites are discussed further in Chapter 5.

For this GSP, groundwater quality data will be downloaded and reviewed from SWRCB's DDW for municipal public water system supply wells and the ILRP irrigation supply wells and on-farm domestic wells monitored under the CCRWQCB's Agricultural Order, as described in Section 3.6.2.

3.4.4 Surface Water Monitoring

Three streamflow gauges operated by the U.S. Geological Survey (USGS) are within the Forebay Subbasin: Arroyo Seco near Soledad (USGS Site #11152000), Arroyo Seco below Reliz Creek near Soledad (USGS Site #11152050), and Salinas River near Soledad (USGS Site #11151700). The locations of these stream gauge surface-water monitoring facilities are shown on Figure 3-11.

On years when there are conservation releases from the Nacimiento and San Antonio Reservoirs, the MCWRA and USGS conduct the Salinas River Discharge Measurement Series (River Series) to monitor changes in streamflow along different river reaches. Reservoir releases are held constant for 5 days to ensure that the discharge measurements account for losses to the aquifer, stream vegetation, or evapotranspiration.

The SWRCB eWRIMS is used to collect surface water rights data in the Salinas River watershed for the points of diversion in the Subbasin that are shown on Figure 3-5. This includes monthly surface water diversions from the Salinas River and its tributaries, like the Arroyo Seco.

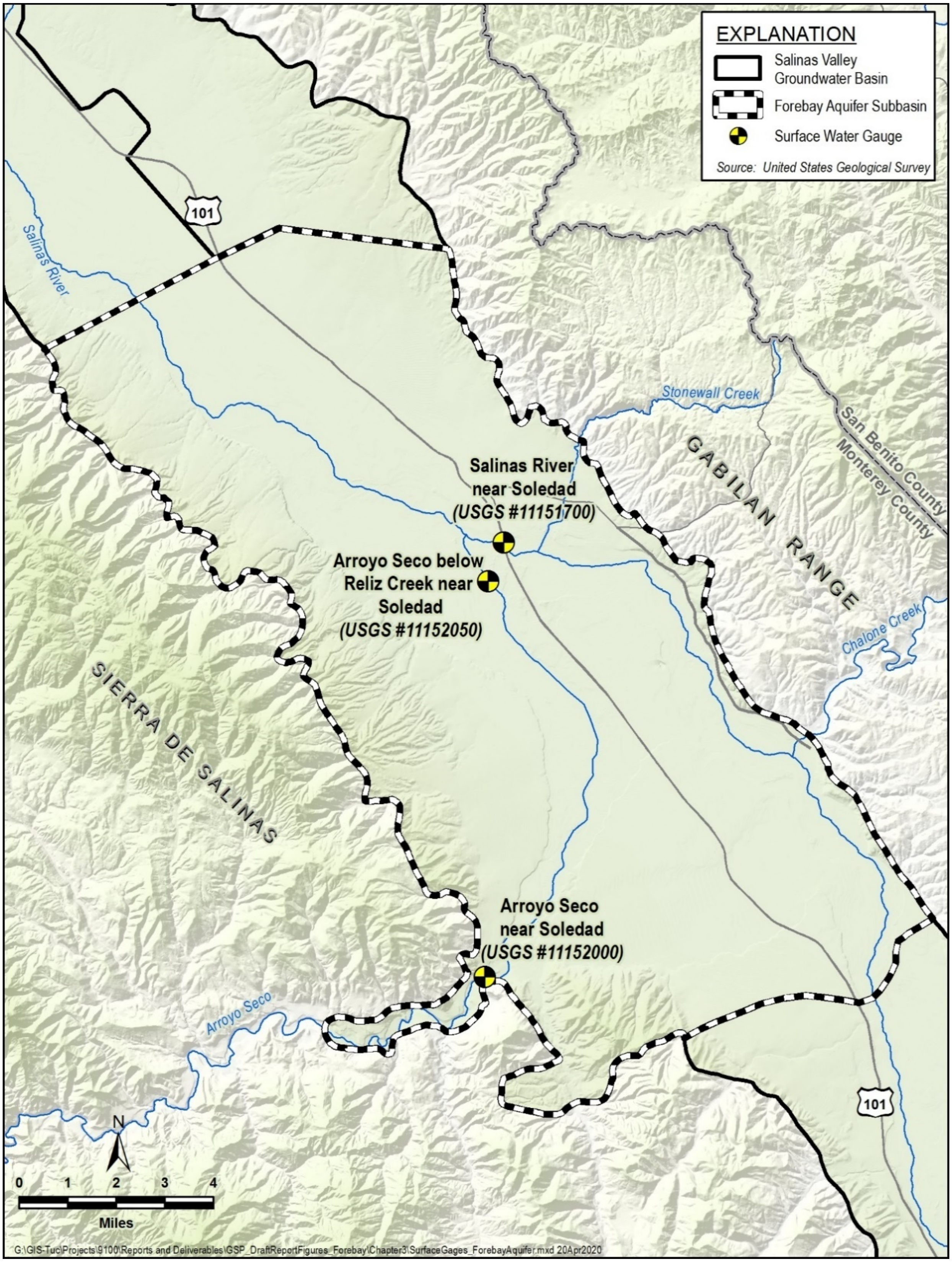

Figure 3-11. Surface Water Gauge Location

3.5 Existing Water Management Plans

3.5.1 Monterey County Groundwater Management Plan

MCWRA developed a Groundwater Management Plan (GMP) that is compliant with AB3030 and SB1938 legislation (MCWRA, 2006). This GMP exclusively covered the Salinas Valley Groundwater Basin in Monterey County. This GSP replaces the GMP.

The GMP identified 3 objectives for groundwater management:

Objective 1: Development of Integrated Water Supplies to Meet Existing and Projected Water Requirements

Objective 2: Determination of Sustainable Yield and Avoidance of Overdraft

Objective 3: Preservation of Groundwater Quality for Beneficial Use

To meet these 3 objectives, the GMP identified 14 elements that should be implemented by MCWRA:

Plan Element 1: Monitoring of Groundwater Elevations, Quality, Production, and Subsidence

Plan Element 2: Monitoring of Surface Water Storage, Flow, and Quality

Plan Element 3: Determination of Basin Yield and Avoidance of Overdraft

Plan Element 4: Development of Regular and Dry Year Water Supply

Plan Element 5: Continuation of Conjunctive Use Operations

Plan Element 6: Short-Term and Long-Term Water Quality Management

Plan Element 7: Continued Integration of Recycled Water

Plan Element 8: Identification and Mitigation of Groundwater Contamination

Plan Element 9: Identification and Management of Recharge Areas and Wellhead Protection Areas

Plan Element 10: Identification of Well Construction, Abandonment, and Destruction Policies

Plan Element 11: Continuation of Local, State, and Federal Agency Relationships

Plan Element 12: Continuation of Public Education and Water Conservation Programs

Plan Element 13: Groundwater Management Reports

Plan Element 14: Provisions to Update the Groundwater Management Plan

3.5.2 Integrated Regional Water Management Plan

The Integrated Regional Water Management (IRWM) Plan for the Greater Monterey County Region was developed by the Greater Monterey County Regional Water Management Group (RWMG), which consists of government agencies, nonprofit organizations, educational organizations, water service districts, private water companies, and organizations representing agricultural, environmental, and community interests.

The Forebay Subbasin falls within the IRWM Plan area. The IRWM Plan consists of a set of goals and objectives that were identified by the RWMG as being critical to address water resource issues within the planning area in the areas of:

- Water Supply
- Water Quality
- Flood Protection and Floodplain Management
- Environment
- Regional Communication and Cooperation
- Disadvantaged Communities
- Climate Change

The IRWM Plan includes more than 25 projects that could assist regional groundwater management (RWMG, 2018).

3.5.3 Urban Water Management Plans

Two Urban Water Management Plans (UWMPs) have been developed in the Subbasin for the Cities of Soledad and Greenfield.

3.5.3.1 City of Soledad Urban Water Management Plan

The City of Soledad UWMP was updated in 2011 (Harris & Associates, 2021). The UWMP describes the service area, reports historical and projected population, identifies historical and projected water demand by category (single-family, multi-family, commercial, industrial, institutional/government, and other), and describes the distribution system. Groundwater is the sole supply source for the City of Soledad, and the UWMP notes that several of its wells had to be replaced due to nitrate contamination. None of the City's wells are currently exceeding the nitrate Title 22 Maximum Contaminant Level (MCL). The City of Soledad UWMP indicates that it does not plan to develop alternative sources of water; rather it will focus on maintaining and expanding its existing infrastructure to meet demand. Desalination was not deemed a viable option due to the City's inland location. The City's wastewater treatment system was upgraded in 2010 and will be updagraded again within the next year, recycled wastewater can be used to offset non-potable demand.

Soledad is located near the confluence of the Salinas and Arroyo Seco rivers. Overdraft conditions have not been identified in this area by MCWRA, according to the UWMP. It is expected that groundwater will continue to be a reliable supply for the City of Soledad. The UWMP contains sections on water conservation, demand management, and water shortage and emergency supply contingencies. A drought risk assessment is also included in the UWMP to determine the impact of a 5-year drought on the City's water supply.

3.5.3.2 City of Greenfield Draft Urban Water Management Plan

The 2015 City of Greenfield UWMP was adopted in 2018 (City of Greenfield, 2018). The UWMP describes the service area, reports current and projected population, identifies current and projected water demand by category (single family, multi-family, commercial, industrial, landscape irrigation, and other), and describes the distribution system. Groundwater is the sole supply source for the City of Greenfield. The UWMP indicates that the City does not plan to develop alternative sources of water; rather it will focus on maintaining and expanding its existing infrastructure to meet demand. Desalination was not deemed a viable option due to the City's inland location.

Greenfield is in MCWRA's Forebay Subarea between the Salinas and Arroyo Seco rivers. The UWMP states that groundwater is not overdrafted in that area. It is expected that groundwater will continue to be a reliable supply for the City. The UWMP includes sections on water conservation, demand management, and emergency supply contingencies.

3.6 Existing Water Regulatory Programs

3.6.1 Groundwater Export Prohibition

The MCWRA Act, § 52.21 prohibits the export of groundwater for uses outside the Salinas Valley Groundwater Basin from any part of the Basin, from any part of the Basin including the Forebay Subbasin. In particular, the Act states:

> *For the purpose of preserving [the balance between extraction and recharge], no groundwater from that basin may be exported for any use outside the basin, except that use of water from the basin on any part of Fort Ord shall not be deemed such an export. If any export of water from the basin is attempted, the Agency may obtain from the superior court, and the court shall grant, injunctive relief prohibiting that exportation of groundwater.*

3.6.2 Agricultural Order

In 2021 the CCRWQCB issued Agricultural Order No. R3-2021-0040, the Proposed General Waste Discharge Requirements for Discharges from Irrigated Lands (CCRWQCB, 2021). The permit requires that growers implement practices to reduce nitrate leaching into groundwater and improve receiving water quality. Specific requirements for individual growers are structured into 3 phases based on the relative risk their operations pose to water quality. Each of the 3 phases encompass a different area of the Central Coast Basin. Monitoring results from this new Agricultural Order (Ag Order 4.0) will be incorporated into this GSP's groundwater quality network.

3.6.3 Water Quality Control Plan for the Central Coast Basins

The Water Quality Control Plan for the Central Coastal Basin (Basin Plan) was most recently updated in June 2019 (CCRWQCB, 2019). The objective of the Basin Plan is to outline how the quality of the surface water and groundwater in the Central Coast Region should be managed to provide the highest water quality reasonably possible. Water quality objectives for both groundwater and surface water are provided in the Basin Plan.

The Basin Plan lists beneficial users, describes the water quality that must be maintained to allow those uses, provides an implementation plan, details SWRCB and CCRWQCB plans and policies to protect water quality, and describes statewide and regional surveillance and monitoring programs. Present and potential future beneficial uses for water in the Basin are municipal supply; agricultural supply; groundwater recharge; recreation; sport fishing; warm freshwater habitat; wildlife habitat; rare, threatened or endangered species habitat; and spawning, reproduction, and/or early development of fish.

3.6.4 Title 22 Drinking Water Program

The SWRCB Division of Drinking Water (DDW) regulates public water systems in the State to ensure the delivery of safe drinking water to the public. A public water system is defined as a system for the provision of water for human consumption that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year. Private domestic wells, wells associated with drinking water systems with fewer than 15 residential service connections, industrial, and irrigation wells are not regulated by the DDW.

The DDW enforces the monitoring requirements established in Title 22 of the California Code of Regulations for public water system wells, and all the data collected must be reported to the DDW. Title 22 also designates the MCLs and Secondary Maximum Contaminant Levels (SMCLs) for various waterborne contaminants, including volatile organic compounds, nonvolatile synthetic organic compounds, inorganic chemicals, radionuclides, disinfection byproducts, general physical constituents, and other parameters.

3.7 County Public Policy of Safe and Clean Water

To recognize the Human Right to Water, in December 2018 the County of Monterey established a public policy that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes and that the human right to water extends to all residents of Monterey County, including disadvantaged individuals and groups and communities in rural and urban areas. The County intended for the policy to inform the County when implementing policies and regulations affecting water supply and usage and to help the County to focus on the issue of drinking water pollution in certain Monterey County domestic wells and water systems as well as potential future threats due to drought and a lack of available drinking water, while not impacting water rights or expanding or creating new County obligations.

3.8 Incorporating Existing Programs into the GSP and Limits on Operational Flexibility

Information from existing water resource monitoring, management, and regulatory programs have been incorporated into this GSP. They are taken into consideration during the preparation of the sustainability goal, when establishing sustainable management criteria, and when developing management actions and projects. This GSP has been developed to reflect the principles outlined in those existing local plans and builds off existing plans during GSP implementation. Some of the existing management plans and ordinances may limit operational flexibility. These potential limits to operational flexibility have already been incorporated into the management actions and projects included in this GSP. Examples of limits on operational flexibility include:

- The groundwater export prohibition included in the MCWRA Act prevents export of water out of the Salinas Valley Groundwater Basin. This prohibition is not expected to adversely affect SVBGSA’s ability to reach sustainability.
- The Basin Plan and the Title 22 Drinking Water Program restrict the quality of water that can be recharged into the Subbasin.
- The Habitat Conservation Plan (HCP) being developed by MCWRA on the Salinas River will limit operational flexibility for Nacimiento and San Antonio reservoir releases for groundwater recharge in the Basin.

The other monitoring, management, and regulatory programs do not limit the operational flexibility in this Subbasin.

3.9 Conjunctive Use Programs

There are currently no conjunctive use programs in the Forebay Subbasin.

3.10 Land Use Plans

3.10.1 Land Use Plans in the Subbasin

Land use is an important factor in water management. Monterey County and the cities of Greenfield and Soledad have land use authority over portions of the Forebay Subbasin. Each of these entities has developed a general plan that guides land use in the Subbasin. General descriptions of these land use plans and how implementation may affect groundwater management in the Forebay Subbasin are included in Appendix 3B.

3.10.2 Land Use Plans Outside of Basin

Monterey County's General Plan is applicable throughout the unincorporated area of the County, including the adjoining 180/400-Foot Aquifer Subbasin and the Upper Valley Subbasin. The Cities of Salinas and Marina have general plans with land use elements in the neighboring 180/400-Foot Aquifer Subbasin and King City in the Upper Valley Subbasin. Because they are members of the SVBGSA or the SVBGSA has a cooperation agreement with their water district, management actions taken by the SVBGSA will be in alignment with the concerns and plans of the County and those cities. Therefore, it is unlikely that these land use plans will affect the ability of the SVBGSA to achieve sustainable groundwater management.

3.10.3 Well Permitting

The Public Service element of the Monterey County General Plan addresses permitting of individual wells in rural or suburban areas. Table 3-3 summarizes the Monterey County General Plan's water supply guidelines for the creation of new residential or commercial lots (Monterey County, 2010, Table PS-1).

Table 3-4 depicts the decision matrix from the Monterey County General Plan for permitting new residential or commercial wells for existing lots (Monterey County, 2010, Table PS-2).

On August 29, 2018, the State Third Appellate District Court of Appeal published an opinion in *Environmental Law Foundation v. State Water Resources Control Board* (No. C083239), a case that has the potential to impact future permitting of wells near navigable surface waters to which they may be hydrologically connected. The Court of Appeal found that while groundwater itself is not protected by the public trust doctrine, the doctrine does protect navigable waters from harm caused by extraction of groundwater if it adversely affects public trust uses. Further, it found that Siskiyou County, as a subdivision of the State, shares responsibility for administering the public trust. Similarly, Monterey County is responsible for well permitting. Therefore, it has a responsibility to consider the potential impacts of groundwater withdrawals on public trust resources when permitting wells near areas where groundwater may be interconnected with navigable surface waters.

Moreover, California Supreme Court's decision in *Protecting Our Water and Environmental Resources v. County of Stanislaus* (2020) held that Stanislaus County could not categorically classify its issuance of groundwater well construction permits as ministerial decisions exempt from environmental review under the California Environmental Quality Act ("CEQA"). Chapter 15.08 of the Monterey County Code sets forth the application and decision-making process for the County in considering applications for well construction permits. The Chapter sets forth certain technical requirements that appear to be purely ministerial in their application; however, the Chapter also gives the Health Officer discretion to impose unspecified conditions on a permit, grant variances, and deny an application if in his/her judgment it would defeat the purposes of the Chapter. The Monterey County Code has not yet been amended, so permits are currently issued according to Chapter 15.08 and the 2010 General Plan, as applicable. The Monterey County Health Department, Environmental Health Bureau issues well permits and receives input from the County of Monterey Housing and Community Development to determine what, if any, level of CEQA review is necessary.

Table 3-3. Monterey County Water Supply Guidelines for the Creation of New Residential or Commercial Lots

Major Land Groups	Water Well Guidelines
Public Lands	Individual Wells Permitted in Areas with Proven Long-Term Water Supply
Agriculture Lands	Individual Wells Permitted in Areas with Proven Long-Term Water Supply
Rural Lands	Individual Wells Permitted in Areas with Proven Long-Term Water Supply
Rural Centers	Public System; Individual Wells Allowed in limited situations
Community Areas	Public System

Table 3-4. Monterey County Well Permitting Guidelines for Existing Residential and Commercial Lots

Characteristics of Property	Water Connection Existing or Available from the Water System	Not Within a Water System or a Water Connection Unavailable
Greater than or equal to 2.5 acres connected to a Public Sewage System or an on-site wastewater treatment system	Process Water Well Permit	Process Water Well Permit
Less than 2.5 acres and connected to a Public Sewage System	Process Water Well Permit	Process Water Well Permit
Less than 2.5 acres and connected to an on-site wastewater treatment system	Do not Process Water Well Permit	Process Water Well Permit

3.10.4 Effects of Land Use Plan Implementation on Water Demand

The GSA does not have authority over land use planning. However, the GSA will coordinate with the County on general plans and land use planning/zoning as needed when implementing the GSP.

A lawsuit filed against the County of Monterey's 2010 General Plan led to a settlement agreement that could affect water supplies. The settlement agreement requires the County of Monterey to develop a study of the Salinas Valley Groundwater Basin within Zone 2C which largely overlaps the Basin and includes, among other items:

- An assessment of whether the total water demand for all uses designated in the General Plan for the year 2030 is likely to be reached or exceeded
- An evaluation and conclusions regarding future expected trends in groundwater elevations
- An evaluation and conclusions regarding expected future trends in seawater intrusion

Should the study conclude the following, the study shall make recommendations on how to address these conditions:

- Total water demand for all uses is likely to be exceeded by 2030, or
- Groundwater elevations are likely to decline by 2030, or
- The seawater intrusion boundary is likely to advance inland by 2030.

The outcomes from this study may affect the GSP implementation. However, the GSP will consider multiple approaches to keep extraction within the sustainable yield through the measures laid out in Chapter 9. The study and GSP implementation are 2 parallel efforts, and the results of the County's study will be reviewed when finalized and considered during GSP implementation. SGMA may preempt implementation of the County's study if it were to conflict with the purposes of SGMA and the efforts of the SVBGSA to attain sustainability in the Basin.

Monterey County has chosen to retain the USGS to develop the Salinas Valley Integrated Hydrologic Model (SVIHM), which will be used during implementation of this GSP. The USGS is currently planning to publicly release it in 2022.

3.10.5 Effects of GSP Implementation on Water Supply Assumptions

Implementation of this GSP is not anticipated to affect water supply assumptions of relevant land use plans over the planning and implementation horizon. This GSP includes sufficient management actions and projects to keep extraction within the sustainable yield, should they need to be implemented. Changes in the cost of groundwater may affect whether surface water or groundwater is used. Land use changes may occur as a result of these activities and based on financial decisions by individual growers. However, GSP implementation has no direct impact on land use management.

4 HYDROGEOLOGIC CONCEPTUAL MODEL

The hydrogeologic conceptual model (HCM) characterizes the geologic and hydrologic framework of the Subbasin in accordance with the GSP Regulation § 354.14. It is based on best available data, technical studies, and qualified maps that characterize the physical components and surface water/groundwater interaction in the Subbasin. This HCM provides comprehensive written descriptions and illustrated representations of subsurface conditions. The chapter describes the Subbasin characteristics and processes that govern the flow of water across the Subbasin boundaries, and outlines the general groundwater setting that may be encountered in the subsurface environment. Current and historical groundwater conditions are discussed in greater detail in the subsequent chapter. This current HCM in this GSP will be part of an iterative process where current conditions and data gaps are described, investigated, and then updated accordingly.

4.1 Subbasin Setting and Topography

The Forebay Subbasin is in the central portion of the Salinas Valley Groundwater Basin, an approximately 90-mile-long alluvial basin underlying the elongated, intermountain valley of the Salinas River. The Subbasin is oriented southeast to northwest, with several streams that drain the mountains on the western and eastern sides of the valley. The largest of these streams is the Arroyo Seco. These streams flow to the Salinas River which then drains towards the northwest into the Pacific Ocean at Monterey Bay (Figure 4-1).

The colored bands on Figure 4-1 show the topography of the Subbasin, derived from the USGS Digital Elevation Model (DEM). The Subbasin slopes at an average grade of approximately 10 feet/mile to the northwest along the river. The ASCMA, on the southwestern boundary of the Subbasin, slopes at an average grade of approximately 40 feet/mile to the northeast toward the Salinas River. Land surface elevations in the Subbasin range from approximately 1,800 feet along the Sierra de Salinas alluvial fans to less than 200 feet at the boundary with the 180/400-foot Aquifer Subbasin.

Although the ASCMA encompasses distinct hydrogeological characteristics compared to the rest of the Subbasin, this Chapter will generally discuss the hydrogeologic conditions of the Subbasin as a whole. Where the Arroyo Seco Cone hasunique characteristics, they are noted and detailed.

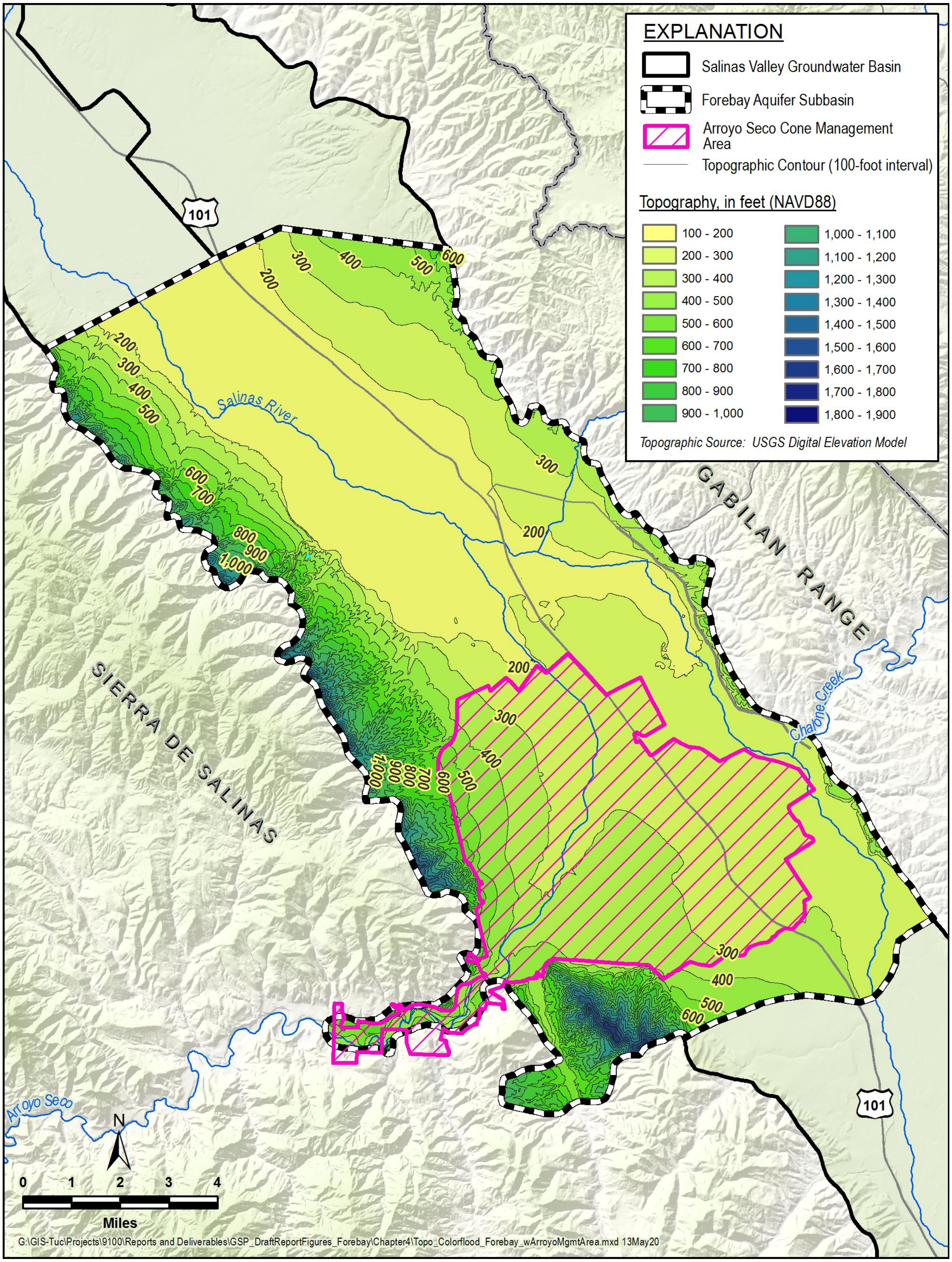

Figure 4-1. Forebay Aquifer Subbasin Topography

4.2 Subbasin Geology

The Subbasin geology describes the physical framework in which groundwater occurs and moves. The geology of the Subbasin controls the locations and depths of aquifers and aquitards, as well as the Subbasin boundaries. The geologic descriptions provided here are derived from previously published scientific reports, and from investigations conducted by the USGS, State of California, and academic institutions.

The Subbasin was formed through periods of structural deformation and periods of marine and terrestrial sedimentation in a tectonically active area on the eastern edge of the Pacific Plate. Figure 4-2 presents a geologic map of the Subbasin and vicinity. This geologic map was adopted from the 2001 Digital Geologic Map of Monterey County as well as the California Geologic Survey's 2010 statewide geologic map (Rosenberg, 2001; Jennings, *et al.*, 2010). The locations of cross sections used to define principal aquifers in Section 4.4 are also shown on Figure 4-2. The legend on Figure 4-2 presents the age sequence of the geologic materials from the youngest unconsolidated Quaternary sediments to the oldest pre-Cambrian basement rock.

The geology of the Forebay Subbasin is characterized by 2 intersecting geologic facies: the fluvial and marine dominated deposits of the main Salinas Valley; and the Arroyo Seco alluvial fan originating in the Sierra de Salinas on the west side of the Subbasin. In general, the alluvial sediments encountered in the Arroyo Seco Cone are more coarse-grained than those found in the main valley's fluvial and marine deposits. Because of these differences, and the Arroyo Seco Cone's separate source of recharge the, 2006 Groundwater Management Plan identified the Arroyo Seco Cone as a separate subarea (MCWRA, 2006). Both the main Valley deposits and the Arroyo Seco Cone deposits are in contact with the basement rocks that form both the Sierra de Salinas and the Gabilan Range, which mark the western and eastern boundaries of the Subbasin, respectively.

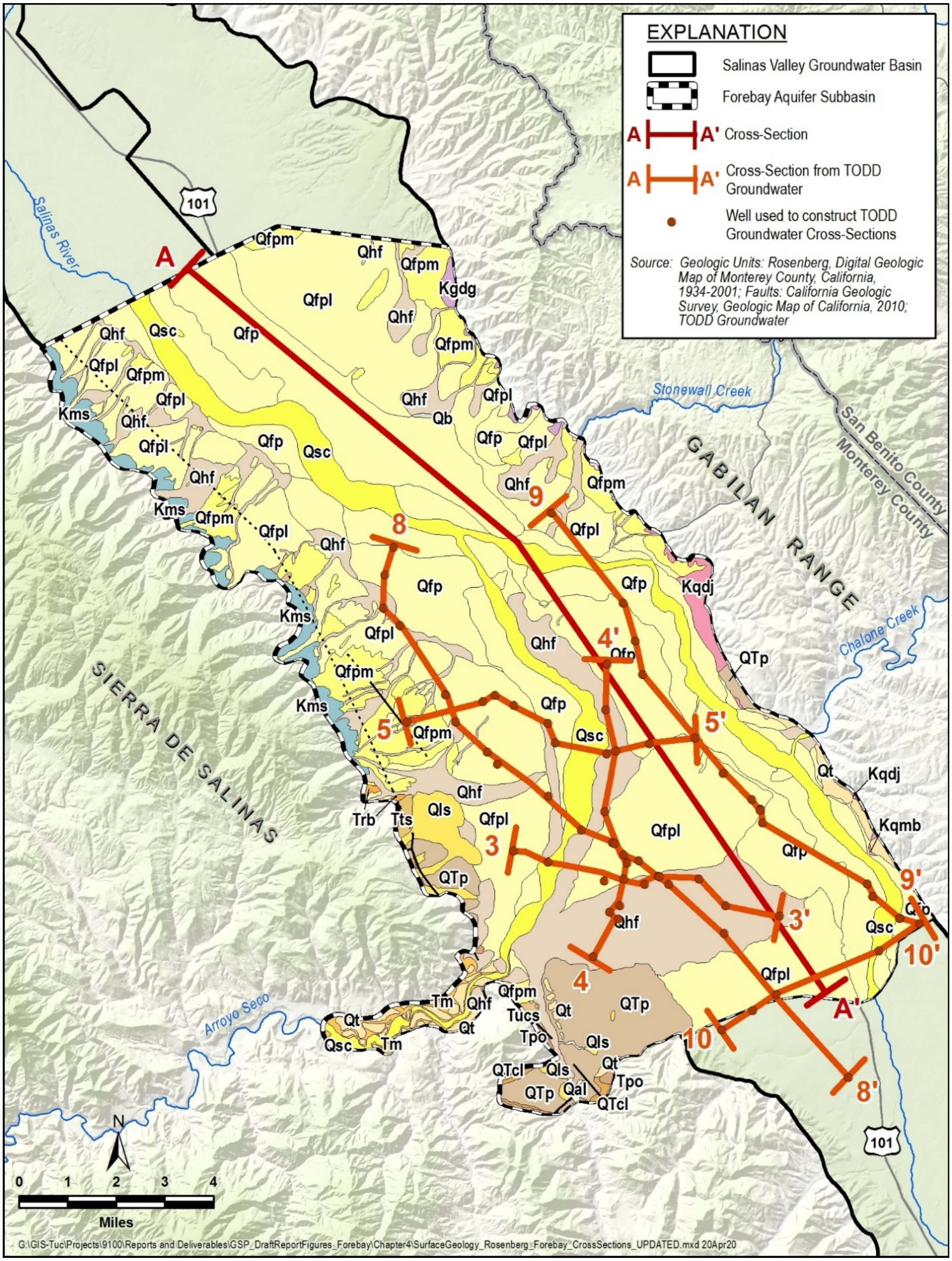

Figure 4-2. Subbasin Geology
(from Rosenberg, 2001; Jennings, *et al*., 2010; and TODD Groundwater, personal communication, 2020)

FIGURE 4-2. EXPLANATION

QUATERNARY

Qal	Alluvial deposits, undifferentiated
Qb	Basin deposits
Qd	Dune deposits
Qfp	Flood-plain deposits, undifferentiated?
Qfpl	Alluvial fans, late Pleistocene
Qfpm	Alluvial fans, middle Pleistocene
Qhf	Alluvial fan deposits, Holocene
Qls	Landslide deposits
Qsc	Stream channel deposits
Qt	Fluvial terrace deposits, undifferentiated

QUATERNARY-TERTIARY

QTcl	Paso Robles Formation
QTp	Paso Robles Formation, undifferentiated

TERTIARY

Tm	Monterey Formation, siliceous
Tmc	Monterey Formation, clay shale
Tml	Monterey Formation, semi-siliceous
Tpo	Pancho Rico Formation, mudstone
Trb	Red beds
Tts	Marine sandstone
Tucs	Unnamed clastic sedimentary unit

CRETACEOUS

Kgdg	Granodiorite of Gloria Road
Kms	Schist of Sierra de Salinas
Kqdg	Gneissic quartz diorite of Stonewall Canyon
Kqdj	Quartz diorite-granodiorite of Johnson Canyon
Kqmb	Quartz monzonite of Bickmore Canyon

GEOLOGIC FEATURES

———	fault, certain
·········	fault, concealed

4.2.1 Geologic Formations

Major geologic units present in the Forebay Subbasin are described below, starting at the surface and moving through the geologic layers from youngest to oldest. Geologic descriptions are derived from the USGS's 2001 Monterey County Geologic Map as well as the California Geologic Survey's 2010 statewide geologic map (Jennings, *et al.*, 2010). The corresponding designation on Figure 4-2 is provided in parentheses.

Quaternary Deposits

- *Flood Plains and Stream Channel Deposits (*Qfp and Qsc*)* – These deposits consist of unconsolidated, relatively fine grained, mixed deposits of sand and silt. There are thin, discontinuous layers of clay present. The gravel content is variable and is locally abundant within channel and lower point bar deposits. The thicknesses of the youngest deposits are generally less than 20 ft. These deposits are typically incised within older flood-plain deposits proximal to the stream channel.
- *Alluvial Fans (*includes Qfpl, Qfpm, Qhf*)* – Alluvial fans are sediments deposited in a distributary manner at the base of mountain fronts where streams emerge (Kennedy/Jenks, 2004). They consist of weakly to moderately consolidated, moderately to poorly sorted sand, silt, and gravel deposits. Gravel content increases toward the head of the alluvial fans, particularly the Arroyo Seco Cone which is the most prominent alluvial fan in this subbasin. Finer sediments such as clay and silt increase towards the furthest extents of the Cone, interfingering with the silts and clays often found in flood-plain and stream-channel deposits.
- *Landslides and Terraces (*Qls and Qt*)* – These features occur as debris flows and slope washouts along the boundaries with the Sierra de Salinas. Terraces occur as erosional remnants of former stream channels of the Arroyo Seco. These terrace deposits consist of weakly consolidated to semi-consolidated, moderately to poorly sorted, fine- to coarse-grained silty sand with gravels and cobbles. Their thickness is highly variable.

These quaternary deposits are sometimes grouped together in other reports as Alluvium or Valley Fill Deposits. The thickness of the alluvium in the Forebay Subbasin is greatest near the mouth of Arroyo Seco, where depth to the bottom of the basin is approximately 6,000 feet (Taylor, *et al.*, 2017).

Quaternary-Tertiary Deposits

- *Paso Robles Formation* (QTcl and QTp) – This Pliocene to lower Pleistocene (1.6 million to 5 million years ago) unit is composed of lenticular beds of sand, gravel, silt, and clay from terrestrial deposition (Thorup, 1976, Durbin *et. al.*, 1978). The depositional environment is largely fluvial but also includes alluvial fan, lake, and floodplain deposition (Durbin, 1974; Harding ESE, 2001; Thorup, 1976; Greene, 1970). The alternating beds of fine and coarse materials typically have bed thicknesses of 20 to 60 feet (Durbin *et. al.*, 1978). The Paso Robles Formation is exposed on the southernmost portion of the subbasin where Reliz Creek meets the Arroyo Seco Cone.

Tertiary Deposits

- *Pancho Rico Formation* (TPo) – This Pliocene (1.6 million to 5 million years ago) unit consists of sandy marine strata and interbedded finer grained rocks (Durham and Addicott, 1965). This unit conformably underlies the Paso Robles formation and conformably overlies the Monterey Shale, or non-comformably overlies the basement rocks northeast of King City (Durham and Addicott, 1965). This unit crops out near the Arroyo Seco tributary, along Reliz Canyon, and ranges from approximately 20 feet to more than 1,000 feet in thickness (Durham and Addicott, 1965).
- *Monterey Formation* (Tm, Tmc, Tml) – These Miocene (5 million to 24 million years ago) units consists of shale and mudstone, with lower deposits being slightly more sandy deposited in a shallow marine environment (Harding ESE, 2001; Greene, 1977). This units typically underlies the Salinas Valley Groundwater Basin.

Cretaceous Rocks

The Gabilan Range, which borders the Subbasin to the northeast, is composed of Mesozoic intrusive rocks and is important as a geologic boundary in the Subbasin and greater Salinas Valley Groundwater Basin. The Sierra de Salinas, which borders the Subbasin to the southwest, is composed of metamorphic and sedimentary rocks and is important as a geologic boundary in the Subbasin and greater Salinas Valley Groundwater Basin as well.

4.2.2 Structural Restrictions to Flow

There are no known structural features, such as geologic folds or faults that restrict groundwater flow inside the Forebay Subbasin. However, lack of stratigraphic continuity associated with contrasting geologic depositional environments may restrict groundwater flow in some areas. The transition from the Arroyo Seco alluvial fan facies to the layered fluvial deposits may be observed as a slight depositional change and may restrict or redirect groundwater flow between the subareas. The Reliz fault is mapped on the west side of the Forebay Subbasin, with normal movement on the Salinas Valley side (Taylor, *et al.*, 2017). There is no evidence this fault restricts groundwater flow.

4.2.3 Soils

The soils of the Subbasin are derived from the underlying geologic formations and influenced by the historical and current patterns of climate and hydrology. Soil types can influence groundwater recharge and the placement of recharge projects. Productive agriculture in the Subbasin is supported by deep, dark, fertile soils. The arable soils of the Subbasin historically are classified into 4 groups (Carpenter and Cosby, 1925): residual soils, old valley-filling soils, young valley-filling soils, and recent-alluvial soils.

More recent surveys classify the soils into categories based on detailed soil taxonomy (U.S. Department of Agriculture, 2018). Figure 4-3 is a composite soil map of soils in the Subbasin from the USDA Natural Resources Conservation Service (NRCS) and the Gridded Soil Survey Geographic (gSSURGO) Database that is produced by the National Cooperative Soil Survey (NCSS).

The Subbasin is dominated by 4 soil orders: mollisols, entisols, alfisols, and vertisols. Minor soils include histosols and inceptisols. The 4 major soil orders are described below.

- **Mollisols** are the most widespread soil order in the Forebay Subbasin. Mollisols are characterized by a dark surface horizon, indicative of high organic content. The organic content often originates from roots of surficial grasses or similar vegetation. They are highly fertile and often alkaline rich (calcium and magnesium). Mollisols can have any moisture regime, but typically have enough available moisture to support perennial grasses.
- **Entisols** are the predominant soil order along the river corridor. Entisols are mineral soils without distinct soil horizons because they have not been in place long enough for distinct horizons to develop. These soils are often found in areas of recent deposition such as active flood plains, river basins, and areas prone to landslides. Nearly all the soils along active river and stream corridors are entisols.
- **Alfisols** are present along portions of the Subbasin. Alfisols are known to have natural fertility both from the tapering of clay in the subsurface horizons and from leaf litter when under forested conditions. This order of soils is commonly associated with high base minerals such as calcium, magnesium, sodium, and potassium.
- **Vertisols** are present over some areas on the Subbasin lowlands in the northern portion of the Subbasin. Vertisols are predominantly clayey soils with high shrink-swell potential. Vertisols are present in climates that have distinct wet and dry seasons. During the dry season, these soils commonly have deep, wide cracks. During the wet season, these soils trend to have water pooling on the surface due to the high clay content.

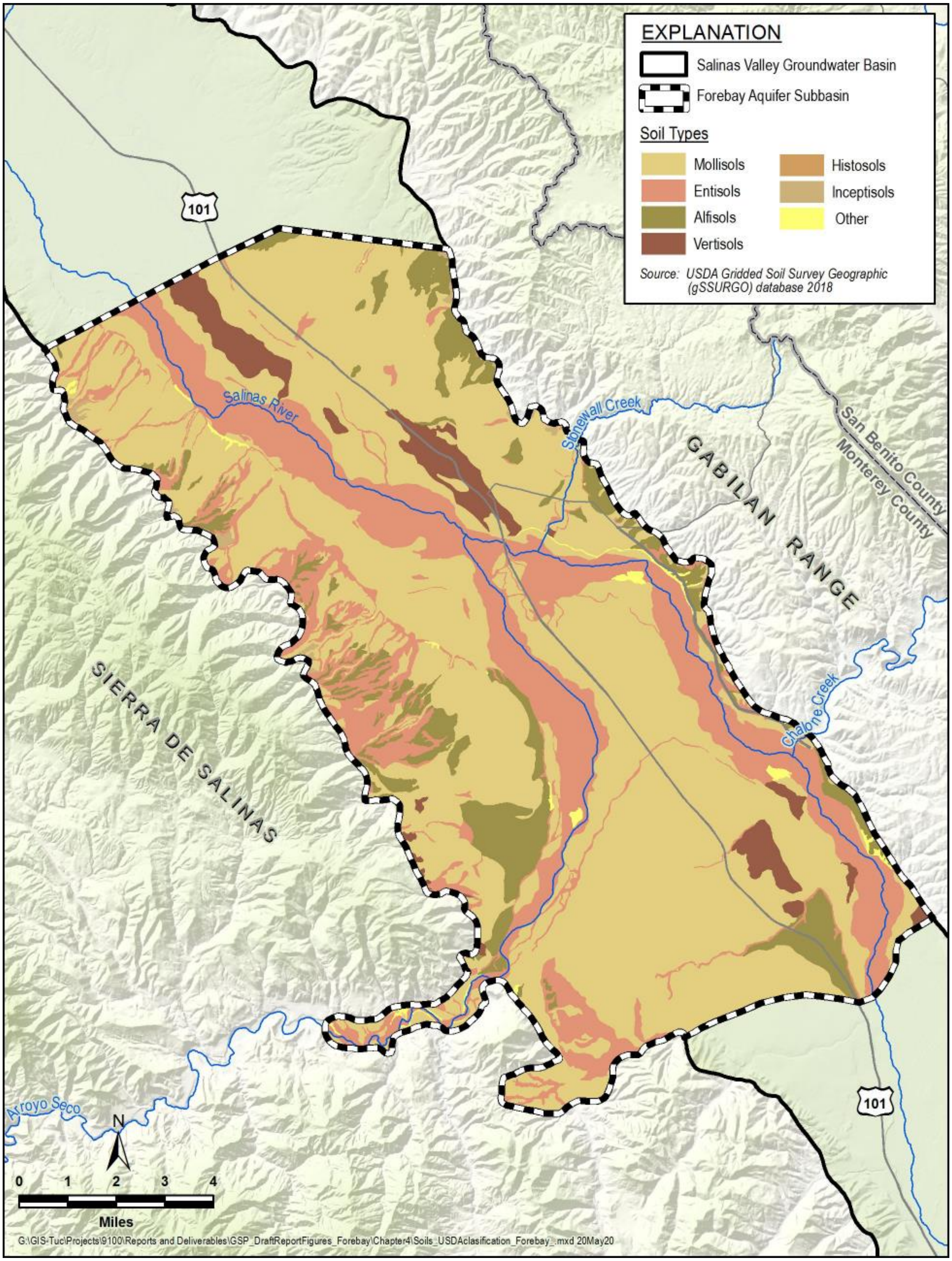

Figure 4-3. Composite Soils Map

4.3 Subbasin Extent

The Subbasin extents describe both the lateral and vertical extents of the Subbasin. The Subbasin extents are defined by the DWR and are documented in Bulletin 118, (DWR, 2003; DWR, 2016a). Figure 3-1 illustrates the extent of the Subbasin.

4.3.1 Lateral Subbasin Boundaries

The Forebay Subbasin is laterally bounded by a combination of Subbasin boundaries and physical boundaries of the Salinas Valley Groundwater Basin, all shown on Figure 1-1.

4.3.1.1 Boundaries with Adjacent Subbasins

The Forebay Subbasin is bounded by the following subbasins:

- **The Upper Valley Subbasin**. The sediments that confine the 400-Foot Aquifer in the 180/400-Foot Aquifer Subbasin extend intermittently into the Forebay Subbasin, and the southeastern extent of these sediments is the boundary with the adjacent Upper Valley Subbasin (DWR, 2004b). At this boundary there is also a constriction of the Valley floor caused by encroachment from the west by the Arroyo Seco Cone and Monroe Creek (DWR, 2004b). Additionally, this boundary marks the shallowing of the base of the groundwater basin. There are no reported hydraulic barriers separating these subbasins.
- **The 180/400-Foot and Eastside Subbasins**. The northwestern boundary with the adjacent 180/400-Foot and Eastside Subbasins generally coincides with the southeastern limit of confining conditions in the 180/400-Foot Aquifer Subbasin, which is extrapolated to the Gabilan Range to define the boundary with the Eastside Subbasin (DWR, 2004c). Many of the sediments which define the aquifer of the 180/400-Foot Aquifer Subbasin are generally found in the Forebay Subbasin, but the Salinas Valley Aquitard is not found in the Subbasin. There is no reported hydraulic barrier between the Forebay and the 180/400-Foot Aquifer Subbasins; however, the sediments are more stratified in the 180/400-Foot Aquifer Subbasin than in the Forebay Subbasin.

4.3.1.2 Physical Basin Boundaries

The Forebay Subbasin is bounded by the following physical features:

- **The Gabilan Range.** The eastern boundary of the Subbasin is the contact between the unconsolidated alluvial fan deposits and the Gabilan Range, which is comprised mostly of granitic rocks. Groundwater flow across this boundary has not been studied extensively, and many reports indicate there is groundwater recharge for this Subbasin through the stream channels originating in the Gabilan Range. There are no published mapped faults or significant fracture sets that could contribute to mountain block recharge for the Subbasin.

- **The Sierra de Salinas.** The western boundary of the Forebay Subbasin is the contact with the metamorphic and sedimentary rocks of the Sierra de Salinas. Groundwater flow across this boundary has not been studied extensively. There are no published mapped faults or significant fracture sets that could contribute to mountain block recharge for the Subbasin.

4.3.2 Vertical Subbasin Boundaries

The base, or bottom, of the Subbasin does not contain a sharp interface between permeable sediments and lower-permeability basement rock across the entire Subbasin. While a sharp interface between alluvium and the underlying granitic rocks exists near the Gabilan Range and Sierra de Salinas, the usable portion of the Subbasin does not always include the full thickness of sedimentary sequences. Previous investigations have estimated that the entire sedimentary sequence in the Salinas Valley Groundwater Basin might range between 10,000 and 15,000 feet thick (Brown and Caldwell, 2015). However, the productive freshwater principal aquifer in this Subbasin are at shallower depths.

With increasing depth, 3 factors limit the viability of the sediments as a productive, principal aquifers:

1. Increased consolidation and cementation of the sediments decrease well yields.
2. Deeper strata contain poor-quality brackish water unsuitable for most uses.
3. Discontinuous alluvial fan deposits interfingered with clay lenses impede vertical and horizontal groundwater flow.

Because these factors gradually change with depth, there is not a sharp, well-defined bottom of aquifers throughout the Salinas Valley Groundwater Basin. This GSP adopts the bottom of the aquifer that was defined by the USGS (Durbin, *et al.*, 1978) and extrapolates that surface to the Subbasin's boundary. Figure 4-4 shows a map of elevation contours of the bottom of the Subbasin. Figure 4-5 shows a contour map of depth to bottom of the Subbasin prepared using the extrapolated bottom elevation and ground surface elevation.

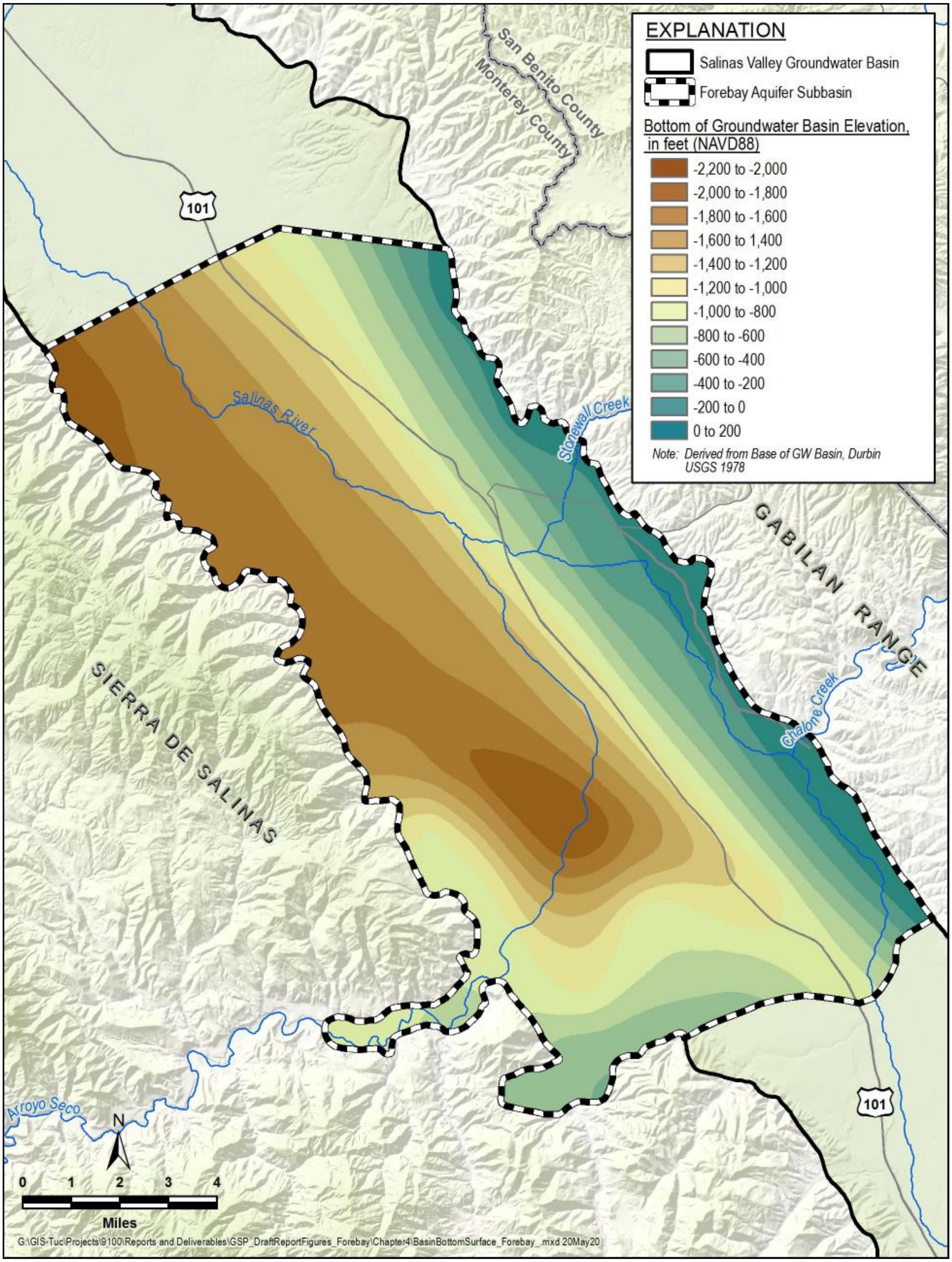

Figure 4-4. Elevation of the Bottom of the Forebay Aquifer Subbasin

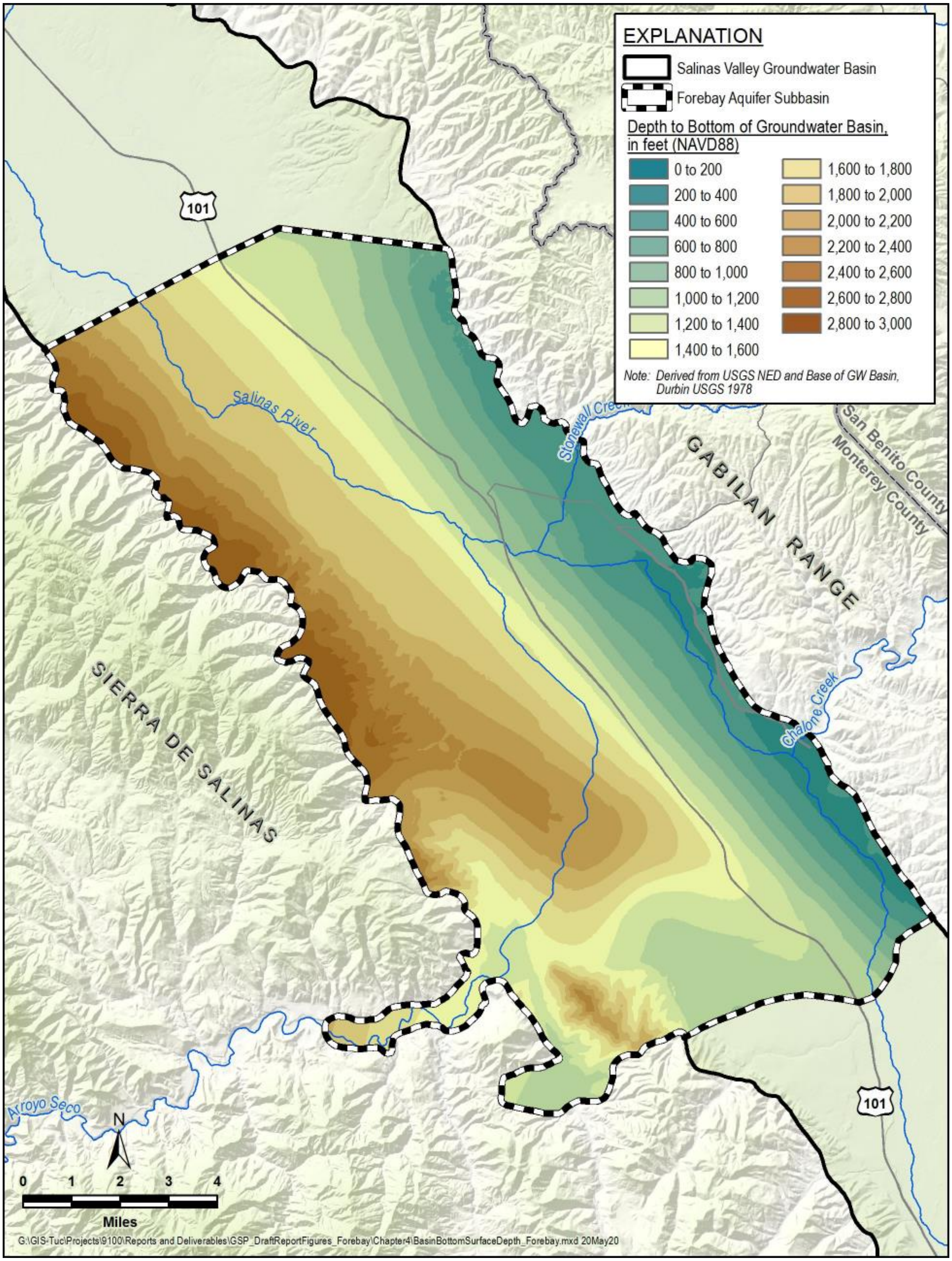

Figure 4-5. Depth to Bottom of the Forebay Aquifer Subbasin

4.4 Subbasin Hydrogeology

The Subbasin hydrogeology details the principal aquifers and aquitards that occur in the Subbasin, inventories known aquifer properties, and identifies naturally occurring groundwater inputs and outputs, which will be incorporated into the groundwater budgets described in Chapter 6. This section also includes cross sections that give graphical representations of what is described in the following subsections.

4.4.1 Principal Aquifers and Aquitards

The Forebay Subbasin has 1 principal aquifer, the Basin Fill Aquifer, which varies spatially with source material for the matrix. The most recent detailed hydrostratigraphic analysis of the Forebay Subbasin was published in 2015 (Brown and Caldwell, 2015). Three other reports offer detailed geologic analysis of the Arroyo Seco Cone, which has unique geologic and hydrogeologic characteristics:

1. *Quaternary Geologic Map of the North-Central Part of the Salinas River Valley and Arroyo Seco, Monterey County, California*, developed by Emily M. Taylor and Donald S. Sweetkind for the USGS illustrates the strath, or abandoned stream deposits, terraces of the Arroyo Seco stream, and their relative ages (Taylor and Sweetkind, 2014).
2. *Hydrogeologic Investigation, Arroyo Seco Cone* explored the feasibility of enhancing water storage in the Arroyo Seco Cone with a water spreading facility. This report explored the hydrogeology of the Arroyo Seco Cone and calculated aquifer properties (Staal, Gardner, and Dunne Inc., 1994).
3. *Selected Geological Cross Sections in the Salinas Valley Using GEOBASE*, developed detailed cross sections from driller's reports throughout the Salinas Valley, with 3 cross sections traversing the Arroyo Seco (Hall, 1992).

The principal aquifer of the Forebay Subbasin has minor lithological differences based on slightly varying depositional environments and ages. Additionally, the sediments in the principal aquifer is similar, if not the same as, the sediments in the principal aquifers of the neighboring 180/400-Foot Aquifer Subbasin. However, the near-surface confining unit, the Salinas Valley Aquitard, does not extend into the Forebay Subbasin (DWR, 2004a).

4.4.1.1 Basin Fill Aquifer

The Basin Fill Aquifer is the principal aquifer, and comprises sandy water-bearing layers that roughly correlate to, and are hydraulically connected to, the 180-Foot, the 400-Foot, and the Deep Aquifers as defined in the neighboring 180/400-Foot Aquifer Subbasin (Kennedy/Jenks, 2004). These sediments are deposited in thin beds, are laterally discontinuous, and may be locally perched due to the interbedded stratigraphy of the Arroyo Seco Cone and smaller alluvial fans where they occur in the Subbasin. These sediments include intermittent clay layers which may act as locally confining units. These sediments also increase in confinement with depth throughout the Subbasin.

The Basin Fill Aquifer includes the sediments that have built the Arroyo Seco Cone over time. The Arroyo Seco Cone covers approximately 22,000 acres on the west side of the Subbasin, near Greenfield (MCWRA, 2006). The interpreted extent of the Arroyo Seco Cone suggests that the Arroyo Seco Cone sediments are connected to sediments that cross almost the entire width of the Salinas Valley in the Forebay Subbasin. The primary water-bearing sediments of the Arroyo Seco Cone consists of coarse alluvial fill with a significant presence of boulders and coarse gravels to depths of 500 to 700 feet. This alluvial fill is relatively uniform and highly permeable with layers of coarse sand and reddish yellow clay (MCWRA, 2006). These sediments are primarily derived from native rock in the Santa Lucia Range, transported by the Arroyo Seco and deposited in the Salinas Valley.

The Basin Fill Aquifer is currently understood to be a single hydrogeologic unit that increases in thickness from approximately 200 feet near the eastern edge of the valley to greater than 2,000 feet along the western edge from Greenfield northward (Figure 4-5). The deepest sediments of the Basin Fill Aquifer in the Forebay Subbasin are the same as, and potentially hydraulically connected to, the sediments that comprise the Deep Aquifers in the 180/400-Foot Aquifer Subbasin. These Deep Aquifers sediments may be up to 900 feet thick and have alternating sandy-gravel layers and clay layers, which do not differentiate into distinct aquifer and aquitard units (DWR, 2003). Some previous investigators have hypothesized that the Deep Aquifers present within the 180/400-Foot Aquifer Subbasin extend into the Forebay Subbasin (Greene, 1970; Hanson et al, 2002; Brown and Caldwell, 2015; DWR, 2004a)however, not all available studies have reached the same conclusion (Staal, Gardner, & Dunne Inc., 1994). This deeper portion of the Basin Fill Aquifer has not been investigated or developed in a substantial way, and may not exist beneath the entirety of the Forebay Subbasin. This is a data gap that will be filled within the first two years of implementation. Subsequently, this GSP does not make a conclusion from these previous investigations and the Deep Aquifers are not currently defined as a delineated, separate principal aquifer for this Subbasin.

Understanding the complete depth and extent of the Basin Fill Aquifer, as well as the presence of the sediments which comprise the deeper sediments, is a data gap that will be addressed during implementation. Some of these data gaps potentially may be addressed by a Deep Aquifers Study led by SVBGSA. The results of both implementation as this potential study will refine this HCM further.

4.4.1.2 Cross Sections

Four cross sections showing the general nature of the Forebay Aquifers are shown on Figure 4-6 through Figure 4-7. The locations of these cross sections are shown on Figure 4-2.

Cross section A-A’ was developed and published in the *State of the Basin* report, and is part of a cross section that extends down the entire Salinas Valley (Brown and Caldwell, 2015). On this cross section, finer sediments are grouped with hatch lines; coarser sediments have no hatching. Individual aquifers are not explicitly identified on this cross section. This cross section is based on geologic logs provided in DWR Water Well Drillers Reports. In some cases, the logs may be old, the depth resolution poor, or the lithologic distinction suspect, and therefore the lithology shown on the well logs should not be viewed as precise. The generalized relationships of finer or coarser sediments between boreholes shown on the cross sections should be interpreted with caution.

Cross sections 3-3’ through 10-10’ were developed by TODD Groundwater for the ASGSA, and are included here as part of the technical coordination between the SVBGSA and ASGSA. These cross-sections show generalized groupings of deposited sediments based on textural qualities such as sand, gravel, clay, and a mix of these 3 textures. The textures shown are do not signify exclusive deposits of these sediments, rather an abundance of said texture encountered during dirlling.

Cross section 5-5’ begins in an alluvial fan close to the Arroyo Seco Cone, and traverses eastward across the Arroyo Seco Cone. This section shows thick deposits of gravels, along with a few distinct and thick clayey layers. The gravels occur primarily from ground surface to a depth os 400 feet below sufrcae, with another layer occuring below a large clay deposit of clayey materials.

Cross section 3-3’ begins in, and traverses, the Arroyo Seco Cone from the northwest to the southeast. The section shows an abundance of gravely materials in the northwest, to an abundance of clayey materials in the southeast. The gravelly materials coincide with the Arroyo Seco River and Reliz Creek, whereas the clayey materials coincide with the further extents of the Arroyo Seco Cone. There is a mix of sand, gravel, and clay between these 2 dominant sediment deposits shown in light green.

Cross section 4-4’ begins in the upper reaches of the Arroyo Seco Cone and traverses north. This section shows an abundance of gravels interspersed with mixed sediments. Gravels occur in the majority of this section, and the section generally follows the topography of the Arroyo Seco Cone down towards the Salinas River.

Cross section 8-8’ begins outside the end of the Arroyo Seco Cone and traverses southeast through the Arroyo Seco Cone until it ends outside both the Cone and the Subbasin. This section shows an abundance of sandy gravelly material in the northwest, and an abundance of clayey materials in the southeast. The primary break in these sediment groupings occurs around where the Arroyo Seco River is. There are interspersed lenses of clayey and gravely material in the northwest sandy region, and there are interspersed lenses of sandy and gravelly material in the southeast clayey region. The Salinas River is noted at each end of this cross section.

Cross section 9-9’ begins outside the end of the Arroyo Seco Cone and traverses southeast close to the Salinas River. This section is characterized by sandy and gravelly materials closer to land surface, and clayey materials at depth. There is a small portion of this section which shows decomposed granite below the surface where the section gets close to the Gabilan Range.

Cross section 10-10’ generally occurs along the boundary between the Forebay and the Upper Valley Subbasins. This section shows the sandy and clayey layers of alluvial material deposited towards the Salinas River, and the proximity to the Gabilan Range as evidenced by the presence of decomposed granite.

The cross sections show the depositional environments that drive certain groupings of sediments. There is an abundance of coarser material higher up section in the Arroyo Seco Cone, and an abundance of finer material proximal to the Salinas River. These cross sections also show generally interbedded lenses of sediments deposited in competing alluvial, fluvial, and marine environemnts with respect to climatic influences. The facies changes are difficult to discern since many of the materials are similary in texture, and the deposits are reflective of environments in flux. The lack of extensive and traceable aquifers or aquitards have resulted in assigning all the alluvial material in the Forebay Subbasin to a single aquifer.

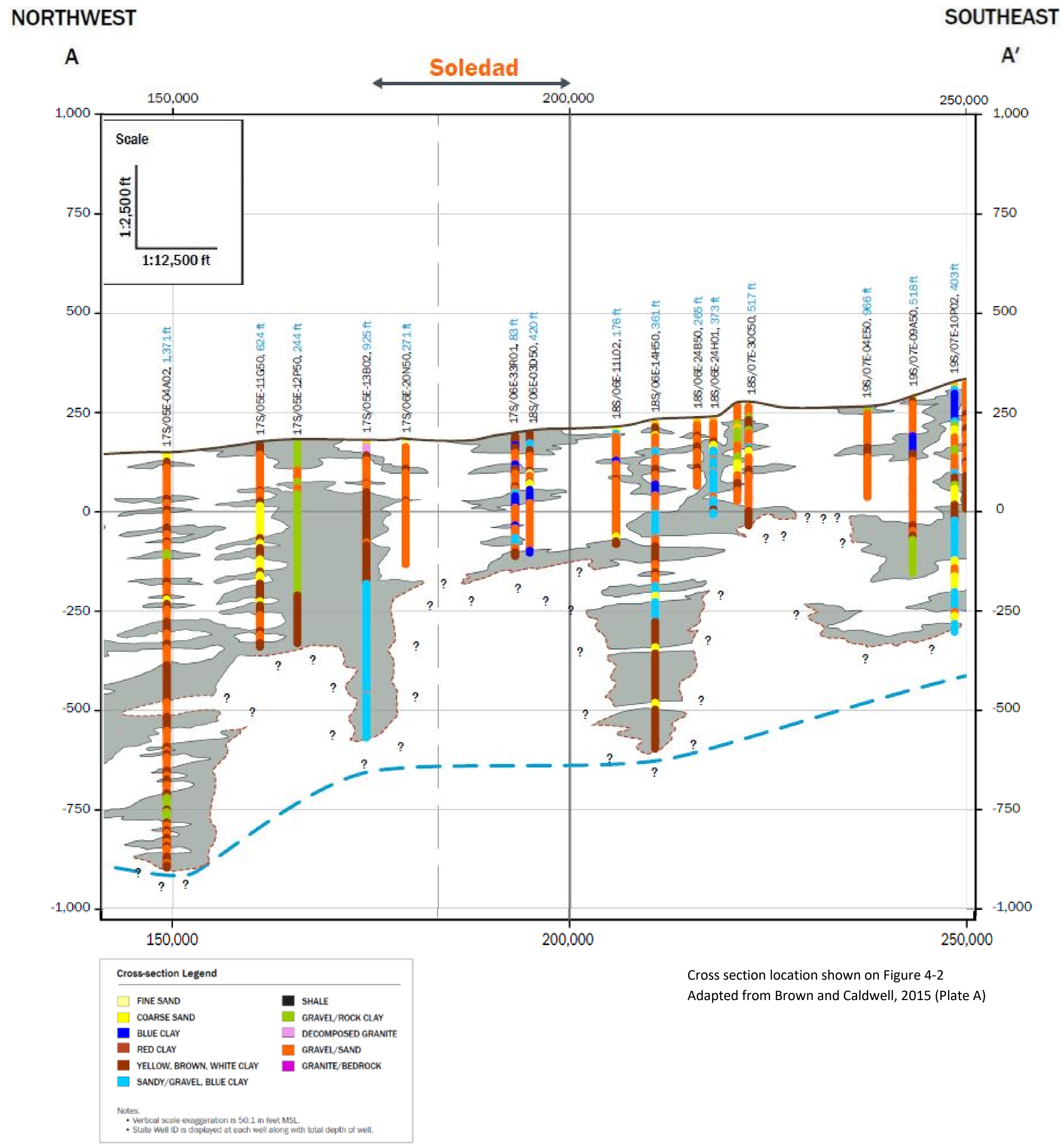

Figure 4-6. Cross Section A-A'
(modified from Brown and Caldwell, 2015)

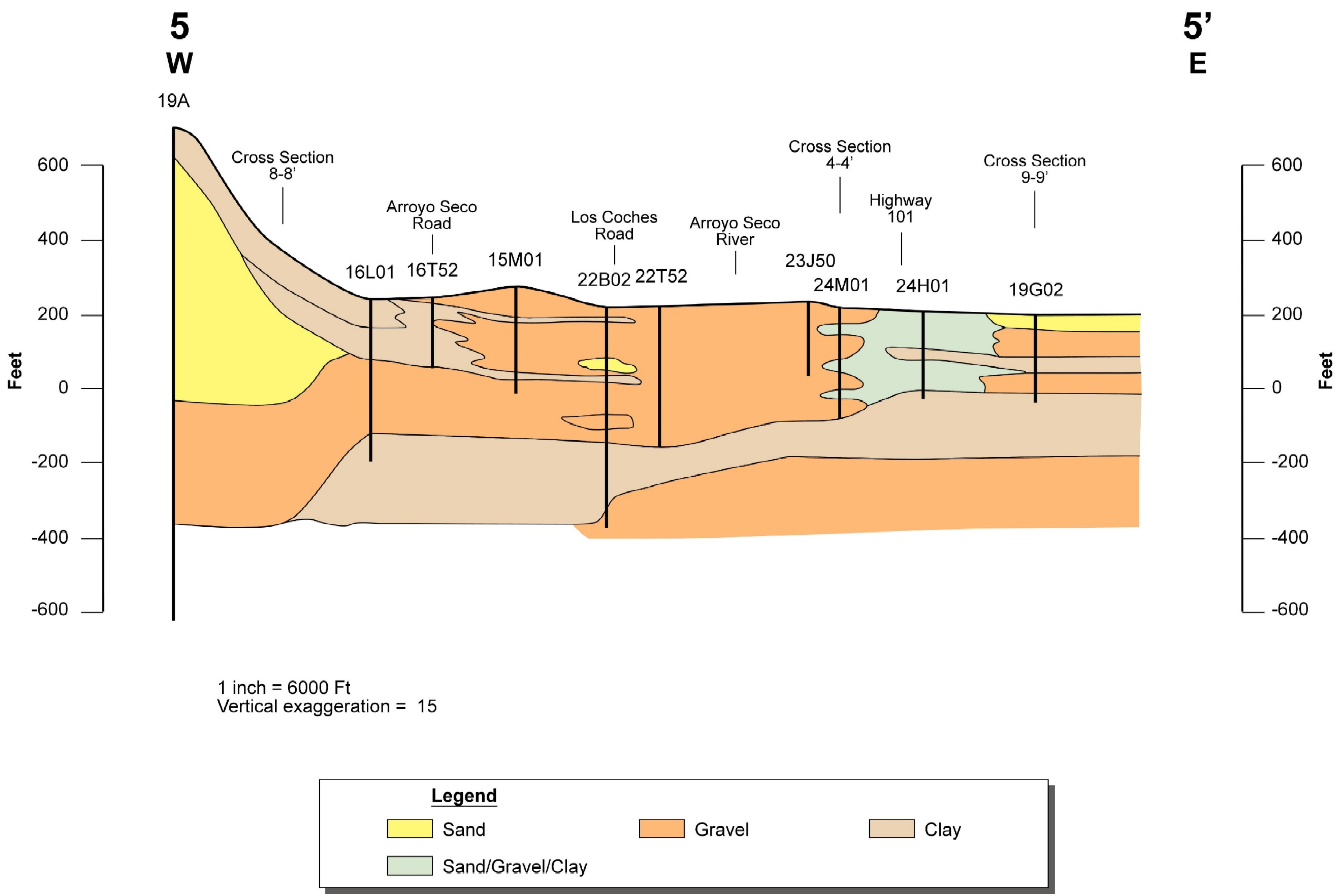

Figure 4-7. Cross Section 5-5'

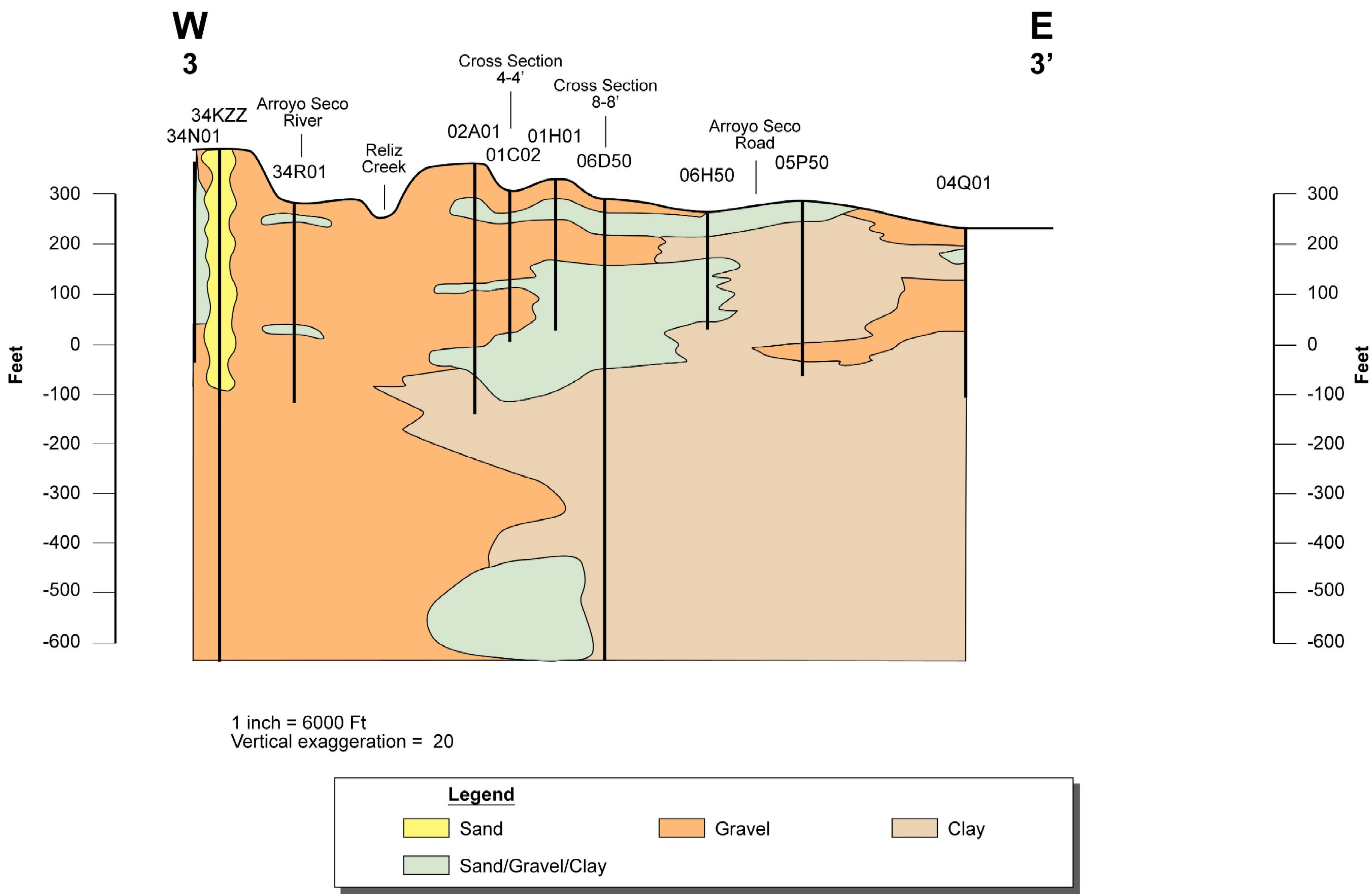

Figure 4-8. Cross Section 3-3'

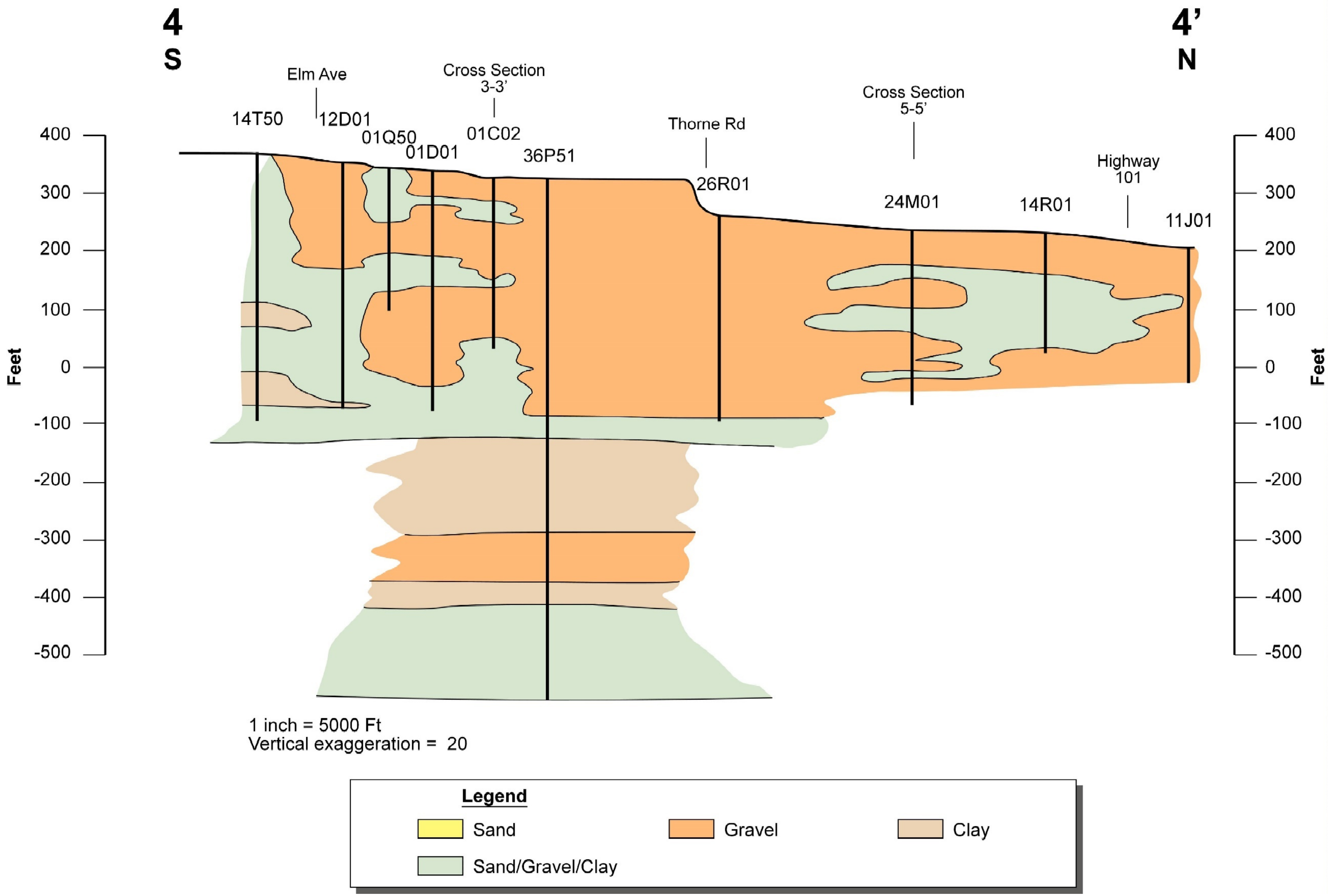

Figure 4-9. Cross Section 4-4'

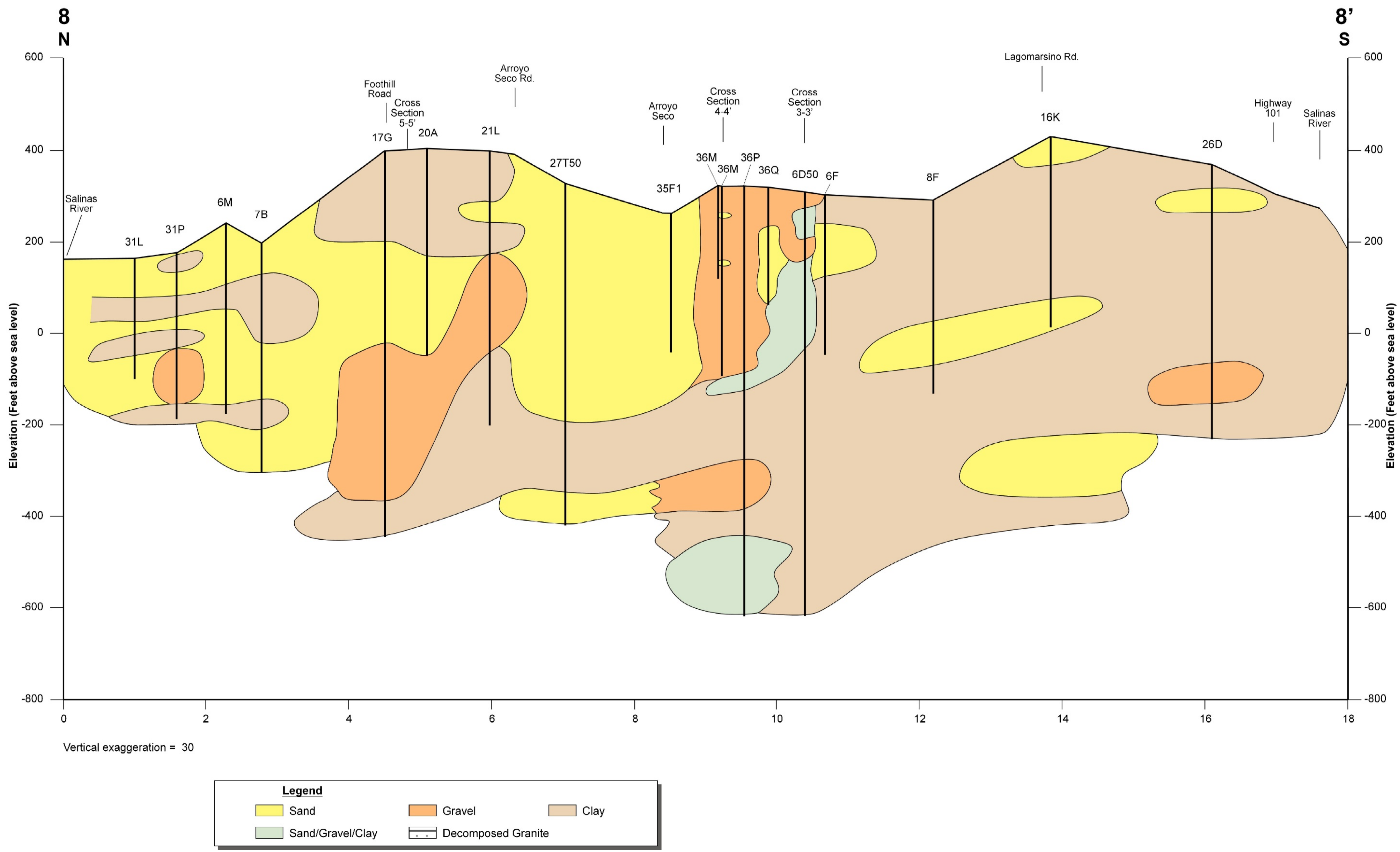

Figure 4-10. Cross Section 8-8'

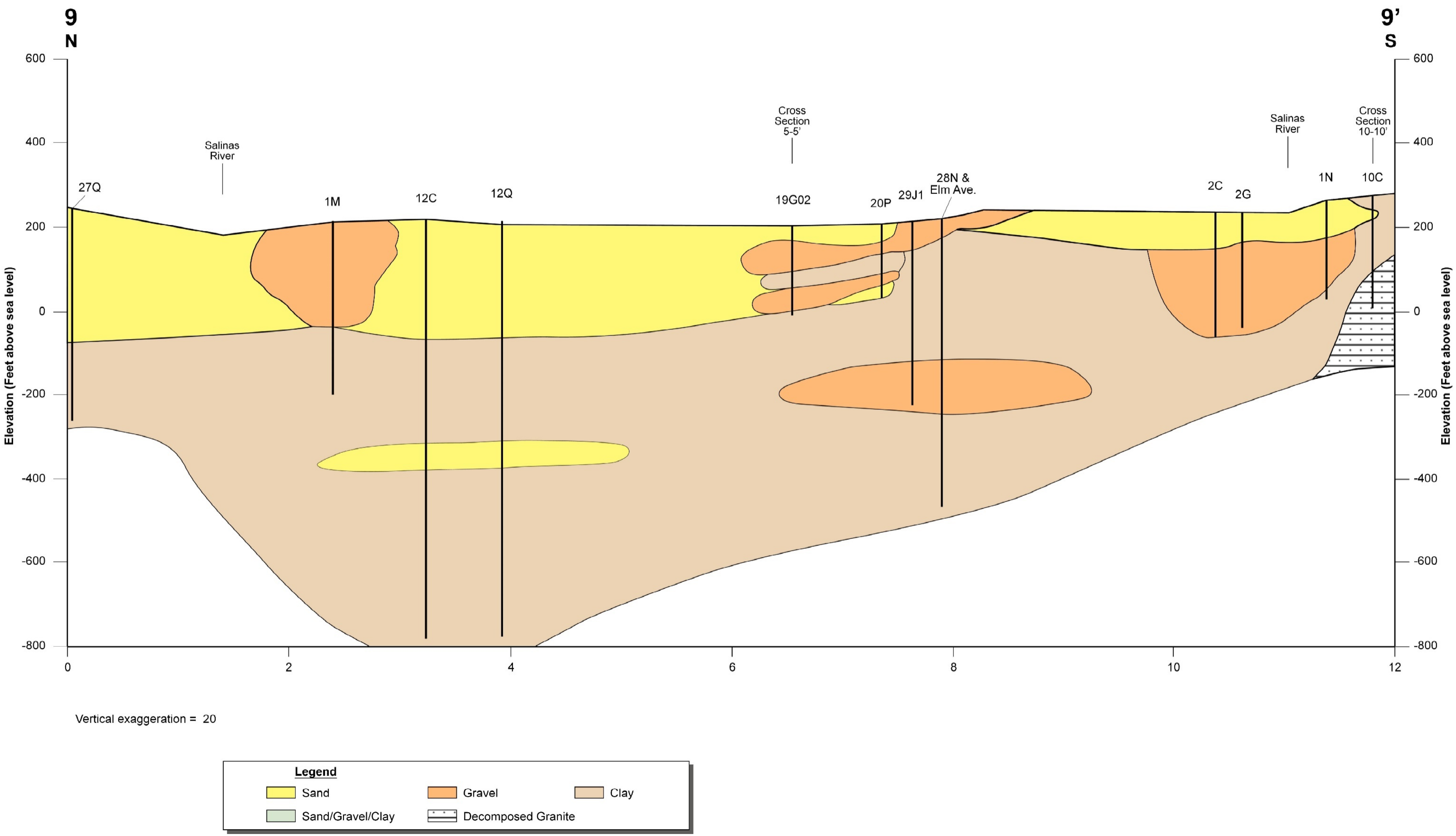

Figure 4-11. Cross Section 9-9'

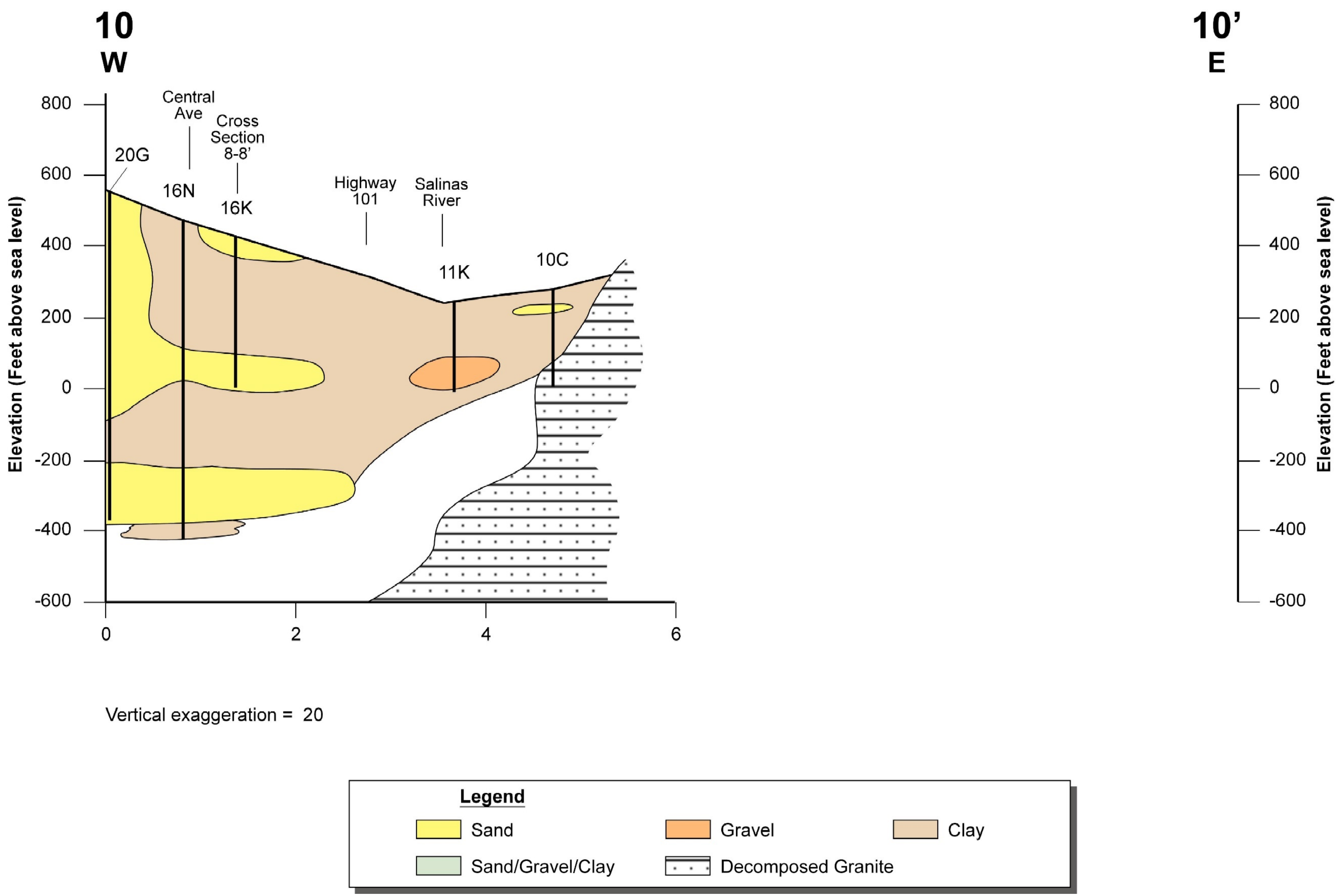

Figure 4-12. Cross Section 10-10'

4.4.2 Aquifer Properties

Aquifer properties define how groundwater is stored and how groundwater moves in the subsurface. This information is needed to understand current groundwater conditions, to predict future groundwater conditions, and to assess strategies for maintaining sustainability.

The values and distribution of aquifer properties in the Forebay Subbasin have not been well characterized and documented. The relatively sparse amount of measured aquifer properties throughout the Subbasin, particularly the differences between the Arroyo Seco Cone and the rest of the Subbasin, is considered a data gap that will be addressed during implementation of the GSP.

Aquifer properties have been estimated during calibration of regional numerical groundwater flow models for the Salinas Valley Groundwater Basin. Aquifer property calibration has been completed for numerous published modeling studies including studies by Durbin (1974); Yates (1988); WRIME (2003); and the Salinas Valley Integrated Hydrologic Model (SVIHM) that is used to develop this GSP.

There are 2 general types of aquifer properties relevant to groundwater management:

- **Aquifer storage properties**: these properties control the relationship between the volume of groundwater stored in the aquifer and the water elevation measured in the aquifer.
- **Groundwater transmission properties**: these properties control the relationship between hydraulic gradients and the rate of groundwater flow.

4.4.2.1 Aquifer Storage Properties

The aquifer properties that characterize the relation between groundwater elevation and amount of water stored in an aquifer are specific yield for unconfined aquifers and specific storage for confined aquifers. Storativity, or storage coefficient, is equal to specific storage multiplied by the aquifer saturated thickness for confined aquifers. Both specific yield and specific storage are measured in units of cubic feet of water per cubic feet of aquifer material. These ratios are often expressed as a percentage.

- **Specific yield**, or drainable porosity, is the amount of water that drains from pores when an unconfined aquifer is dewatered. Often, specific yield values range from 8% to 20%. Estimated specific yield values complied by DWR for the adjacent 180/400-Foot Aquifer Subbasin range from 6% to 16% (DWR, 2004b). There are no estimated specific yield values published for the Forebay Aquifer. The Arroyo Seco Cone has an estimated specific yield, of 17% (Staal, Gardner, & Dunne, 1994).
- **Specific storage** values are in units of 1/L and often on the order of $5x10^{-4}$ to $1x10^{-5}$ for alluvial deposits. There are no estimated specific storage values published for the Forebay Aquifer as this aquifer is generally unconfined.

Detailed aquifer property values specific to the Subbasin were not available at the time of this GSP development. This is a data gap that will be filled during implementation.

4.4.2.2 Groundwater Transmission Properties

Hydraulic conductivity measures the ability of an aquifer to transmit water. Hydraulic conductivity is expressed in units of length per unit time, such as feet per day. Materials with higher hydraulic conductivities, such as sands and gravels, transmit groundwater more readily than units with lower hydraulic conductivities, such as clay. Transmissivity is equal to the hydraulic conductivity multiplied by the aquifer saturated thickness. Few estimates of either hydraulic conductivity or transmissivity exist for the Subbasin.

Transmissivities were estimated for the Arroyo Seco Cone in the Hydrogeologic Investigation, Arroyo Seco Cone by Staal, Gardner, and Dunne Inc. (1994). Transmissivities ranged from 76,000 gallons per day per foot (gpd/ft) to 572,300 gpd/ft. These are relatively high transmissivities, suggesting wells in the Arroyo Seco Cone will produce substantial amounts of water with limited drawdown. However, these estimates are based on application of an equation with estimated data, and not rigorous field tests and data.

Specific capacity of a well is sometimes used as a surrogate for estimating aquifer transmissivity. The specific capacity of a well is the ratio between the well pumping rate in gallons per minute (gpm), and the drawdown in the well during pumping measured in feet. Specific capacity is moderately well correlated, and approximately proportional to, aquifer transmissivity.

Although no published specific capacity data are available for the Subbasin, Durbin, *et al*. (1978) reported relatively high specific capacities of between 30 and 70 gpm/ft. for sediments in the adjoining 180/400-Foot Aquifer Subbasin. Because of the sediment continuity between subbasins, these estimated values are likely similar to values expected in the Forebay Subbasin.

4.4.3 Primary Aquifer Uses

The primary uses of groundwater from this single aquifer include domestic, irrigation, and municipal water supply uses (DWR, 2004a).

4.4.4 Natural Recharge Areas

Natural recharge areas allow rainfall, local runoff, and streamflow to replenish aquifers by percolating through the subsurface. Identifying areas of potentially significant natural recharge can inform water budgets and help planners promote good groundwater management by incorporating recharge areas into land use plans. This section only identifies areas of natural recharge; quantitative information about all natural and anthropogenic recharge is provided in Chapter 6. There is no known anthropogenic recharge in this Subbasin.

Natural groundwater recharge occurs through the following processes:

- Recharge of surface water from the streams originating in the Gabilan Range and the Sierra de Salinas
- Recharge of surface water from the Salinas River and Arroyo Seco River
- Deep percolation of infiltrating precipitation
- Subsurface inflow from the adjacent Subbasins

Recharge of surface water and deep percolation of precipitation are both surficial sources of natural groundwater recharge. An area's capacity for surficial groundwater recharge is dependent on a combination of factors, including steepness of grade, soil surface conditions such as paving or compaction, and ability of soil to transmit water past the root zone. To assist agricultural communities in California assess groundwater recharge potential, a consortium of researchers at University of California, Davis developed a Soil Agricultural Groundwater Banking Index (SAGBI) and generated maps of recharge potential in agricultural areas of California (O'Geen, *et al.*, 2015). Figure 4-13 presents the SAGBI index map for the Forebay Subbasin. This map ranks soil suitability for groundwater recharge based on 5 major factors including: deep percolation, root zone residence time, topography, chemical limitations, and soil surface condition. Areas with excellent recharge properties are shown in green. Areas with poor recharge properties are shown in red. Not all land is classified, but this map provides helpful guidance on where natural recharge likely occurs.

Areas with the highest potential for recharge are along the Salinas River, tributary streams, and much of the Arroyo Seco Cone. Most soils in the Subbasin are classified as moderately good to good for recharge potential. Although Figure 4-13 shows some areas of good recharge potential, the relationship between surficial soils and subsurface units must be clearly understood when siting potential artificial recharge facilities. An earlier report detailed an investigation into potential recharge sites in the Arroyo Seco Cone and described the disconnect between conducive soils found at the surface and nonconductive soils below which could impede deep percolation (Staal, Gardner, and Dunne Inc., 1994). This disconnect results not only from the interbedded sediment structure of alluvial fans, but also how fines are deposited further from the head of fans and the interfingered nature of the alluvial and fluvial deposits. This demonstrates the limited utility of recharge potential maps that are solely based on surficial soil properties. This map should not be used exclusively to identify recharge areas that will directly benefit the aquifer in the Forebay Subbasin. Rather, it should be used in conjunction with additional research and investigation tools.

Subsurface recharge is estimated to be 31,000 AF (DWR, 2004a). This includes groundwater inflow to the MCWRA Arroyo Seco subarea (Brown and Caldwell, 2015). The magnitude of tributary recharge solely along Arroyo Seco, but not limited to the Subbasin, is estimated to be between 40,000 and 60,000 AF/yr. (MCWRA, 2006).

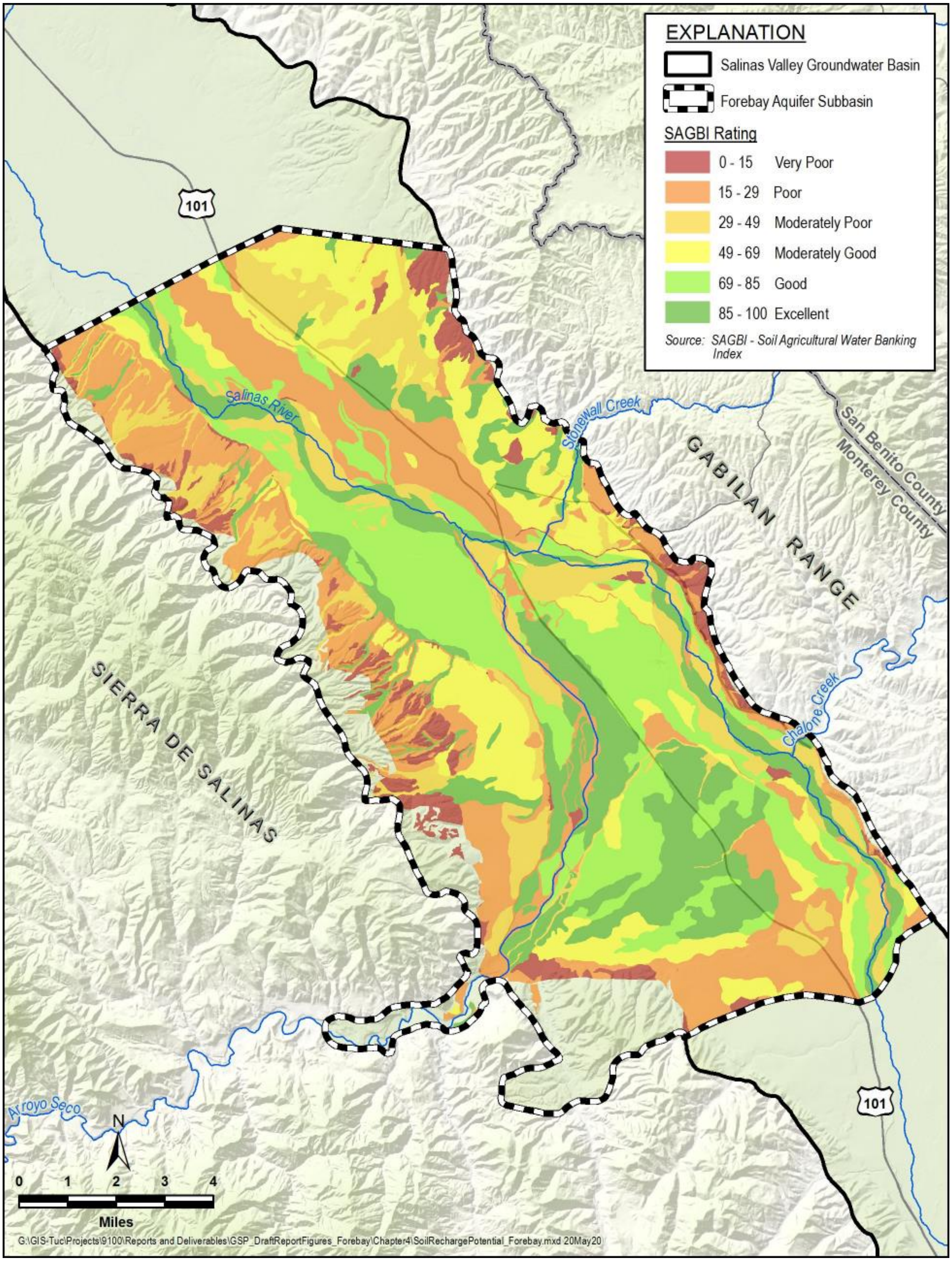

Figure 4-13. SAGBI Soils Map for the Forebay Aquifer Subbasin

4.4.5 Natural Discharge Areas

Natural discharge areas are areas where groundwater naturally leaves aquifers through flow to adjoining basins or percolation to the ground surface. Identifying areas of potentially significant natural discharge can inform water budgets and help locate important environmental uses of groundwater. Quantitative information about all natural and anthropogenic discharge is provided in Chapter 6.

Natural groundwater discharge areas within the Subbasin include wetlands and other surface water bodies that receive groundwater discharge and evapotranspiration (ET) by vegetation types commonly associated with the sub-surface presence of groundwater. There are no springs and seeps in the Subbasin as identified in the National Hydrology Dataset (NHD). Natural groundwater discharge to streams – primarily, the Salinas River and its tributaries – has not been mapped to date.

4.4.5.1 Potential Interconnected Surface Water

Figure 4-14 shows locations of interconnected surface water, in the Forebay Subbasin evaluated on a monthly basis over the entire SVIHM model period from 1967 to 2017. This analysis also excludes the period from June to September for the Salinas River assuming that the majority of flow in the river during these months is from conservation releases from the reservoirs. The blue cells indicate areas where surface water is connected to groundwater for more than 50% of the number of months in the model period and are designated as areas of interconnected surface water. The clear cells represent areas that have interconnection less than 50% of the model period and require further evaluation to determine whether the sustainable management criteria, discussed in Chapter 8, apply. The gray cells show locations of canals, drains, or connectors and were excluded from the analysis. These ISW locations are based on simulated results from the preliminary SVIHM, which is calibrated to measured groundwater levels and streamflows. Although seepage along the ISW reaches is based on assumed channel and aquifer parameters as model inputs, the preliminary SVIHM is the best available tool to estimate ISW locations. The model construction and uncertainty are described in Chapter 6 of this GSP. This map does not show the extent of interconnection which is estimated in Chapter 5. Interconnection between surface water and groundwater can vary both in time and space. A seasonal analysis is included in Appendix 4A. Figure 4-14 is based on provisional version of the SVIHM[1] and is subject to change.

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[1] These data (model and/or model results) are preliminary or provisional and are subject to revision. This model and model results are being provided to meet the need for timely best science. The model has not received final approval by the U.S. Geological Survey (USGS). No warranty, expressed or implied, is made by the USGS or the U.S. Government as to the functionality of the model and related material nor shall the fact of release constitute any such warranty. The model is provided on the condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from the authorized or unauthorized use of the model.

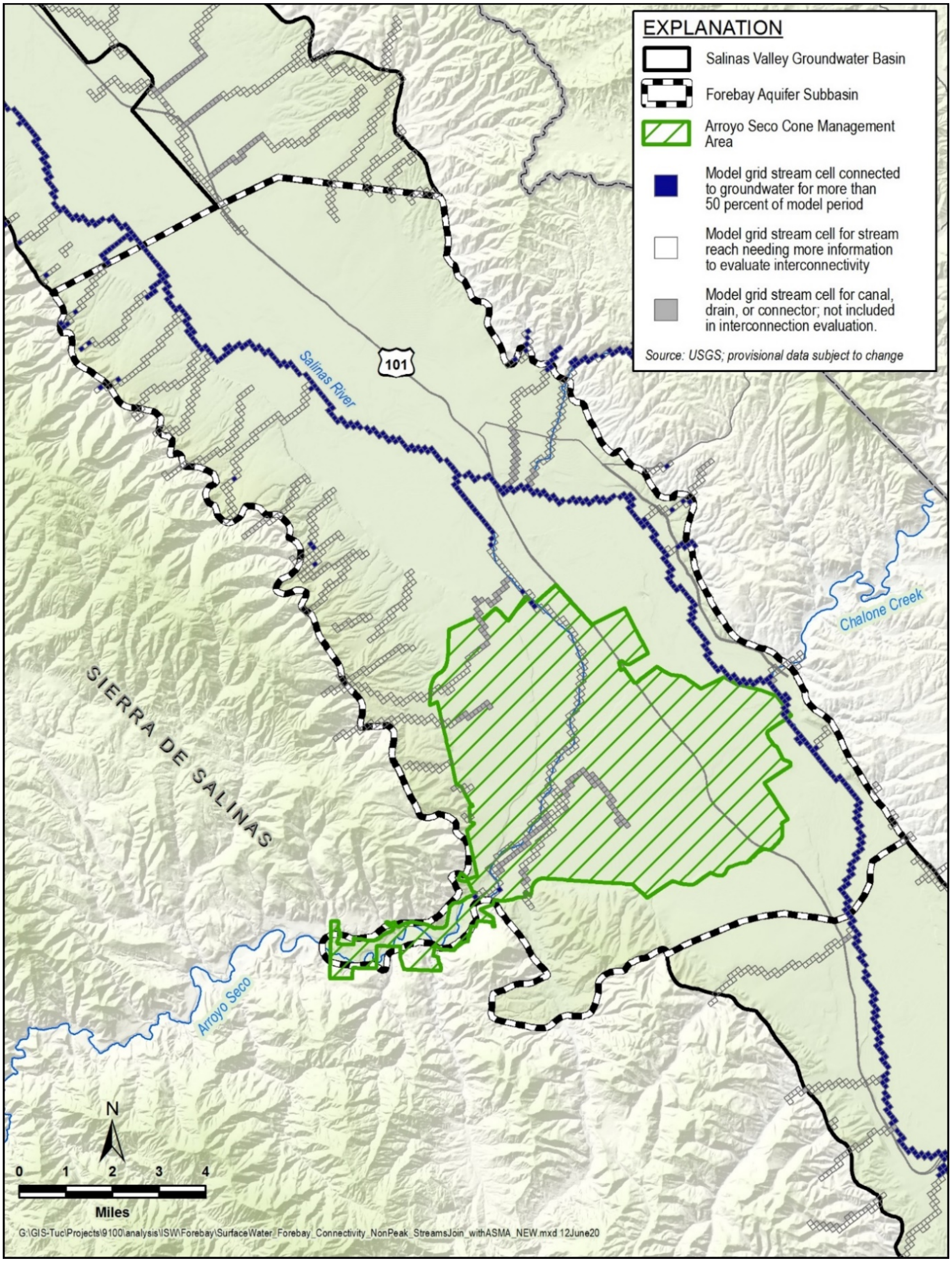


Figure 4-14. Locations of Interconnected Surface Water

4.4.5.2 Groundwater Dependent Ecosystems

Groundwater dependent ecosystems (GDEs) refer to ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. Two main types of ecosystems are commonly associated with groundwater: wetlands associated with the surface expression of groundwater and vegetation that typically draws water from a shallow water table (phreatophytes).

GDEs may provide critical habitat for threatened or endangered species. Areas designated as critical habitat for threatened or endangered species contain the physical or biological features that are essential to the conservation of these species, and may need special management or protection (USFWS, 2017). A list of threatened and endangered species that might rely on groundwater dependent ecosystems (GDEs) in the Subbasin was compiled using information from the U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW), and The Nature Conservancy (TNC). Several steps were taken to determine which threatened and endangered species were likely found in the Subbasin and of those, which were likely to rely on GDE habitat. A list of threatened and endangered species for Monterey County was downloaded from the USFWS website and cross-referenced to species identified in the CDFW California Natural Diversity Database. The threatened and endangered species for Monterey County was further cross-referenced with the TNC Critical Species LookBook to identify which species are likely to depend on groundwater, as indicated in Table 4-1.

Ten threatened and endangered species, including the Southern California Steelhead and the California Red-legged Frog, were identified as likely to rely directly on groundwater in Monterey County, several of which may be found in the Subbasin. Ten species were identified as likely to rely indirectly on groundwater, and the remaining species are unknown with respect to whether they directly rely on GDEs or groundwater. All species listed have the potential for groundwater dependence. There are 8 species that appear in both the federal and state list for threatened or endangered species.

Table 4-1. Federal and State Listed Threatened and Endangered Species, and Respective Groundwater Dependence for Monterey County

Groundwater Dependence	Common Name	Federal Status	State Status
Direct	California black rail	-	Threatened
	California red-legged frog	Threatened	-
	California Ridgway's rail	Endangered	Endangered
	longfin smelt	-	Threatened
	Santa Cruz long-toed salamander	Endangered	Endangered
	steelhead - central California coast DPS	Threatened	-
	steelhead - south-central California coast DPS	Threatened	-
	Tidewater Goby	Endangered	-
	tricolored blackbird	-	Threatened
Direct and Indirect	arroyo toad	Endangered	-
Indirect	bald eagle	-	Endangered
	bank swallow	-	Threatened
	Belding's savannah sparrow	-	Endangered
	California condor	Endangered	Endangered
	California least tern	Endangered	Endangered
	least Bell's vireo	Endangered	Endangered
	southwestern willow flycatcher	Endangered	Endangered
	Swainson's hawk	-	Threatened
	willow flycatcher	-	Endangered
Unknown	Bay checkerspot butterfly	Threatened	-
	California tiger salamander	Threatened	Threatened
	foothill yellow-legged frog	-	Endangered
	San Joaquin kit fox	Endangered	Threatened
	short-tailed albatross	Endangered	-
	Smith's blue butterfly	Endangered	-
	vernal pool fairy shrimp	Threatened	-

The areas in the Forebay Subbasin where GDEs may be found are mainly along the Salinas River where shallow alluvium is present, and in canyons and washes. The shallow alluvium along the Salinas River may be saturated, but more investigation is needed to determine whether a continuous saturated zone connects to the principal aquifer. This area will require more analysis into the near surface stratigraphy to determine the connection of the principal aquifer to surface water.

Figure 4-15 shows the distribution of potential GDEs within the Subbasin based on the Natural Communities Commonly Associated with Groundwater (NCCAG) Dataset (DWR, 2020b). The

NCCAG dataset maps vegetation, wetlands, springs, and seeps in California that are commonly associated with groundwater. These include: 1) wetland features commonly associated with the surface expression of groundwater under natural, unmodified conditions; and 2) phreatophytes. This map does not account for the depth to groundwater or level of interconnection between surface water and groundwater. Actual rooting depth data are limited and will depend on the plant species and site-specific conditions, and availability to other water sources.

The NCCAG dataset and the additional shallow groundwater analysis are not a determination of GDEs by DWR or SVBGSA, but rather represent the best available data to provide a starting point for this GSP, as well as to direct monitoring, fill data gaps, guide implementation, and support other field activities initiated or partnered by the SVBGSA. Field data are needed to ascertain the degree to which identified ecosystems are groundwater dependent, rather than sustained by soil moisture.

Additional resources that contributed to an initial mapping of GDE locations are the CDFW Vegetation Classification and Mapping program (VegCAMP), the USFWS National Wetlands Inventory, and the USFWS online mapping tool for listed species critical habitat, as described in the methodology for the NCCAG development which is publicly accessible on the NC dataset website: https://gis.water.ca.gov/app/NCDatasetViewer/.

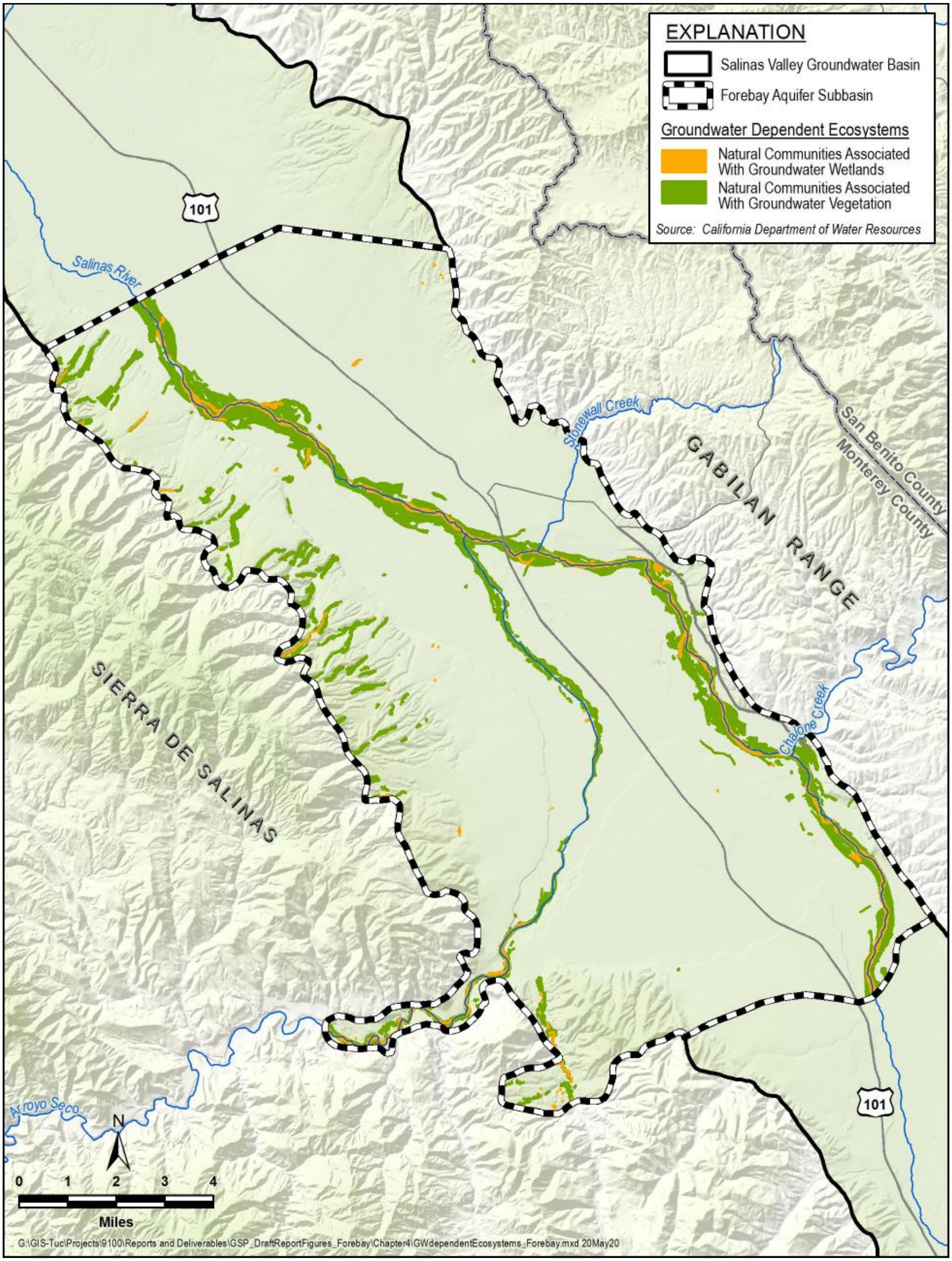


Figure 4-15. Potential Groundwater Dependent Ecosystems using NCCAG dataset

4.5 Surface Water Bodies

The primary surface water body in the Subbasin is the Salinas River. This river runs through the entire length of the Subbasin and is fed by local tributaries (Figure 4-16). The largest and most important tributary is the Arroyo Seco (Figure 4-16). The Arroyo Seco is a tributary with a 275 square-mile drainage area that has no dams and is characterized by both very high flood flows and extended dry periods.

Two reservoirs constructed to control flooding and to increase recharge from Salinas River are located outside of the Subbasin, but are important controls on the rate and timing of Salinas River flows in the Subbasin:

- Nacimiento Reservoir, in San Luis Obispo County, was constructed in 1957 and has a storage capacity of 377,900 acre-feet (MCWRA, 2015).
- San Antonio Reservoir, in Monterey County, was constructed in 1967 and has a storage capacity of 335,000 acre-feet (MCWRA, 2015).

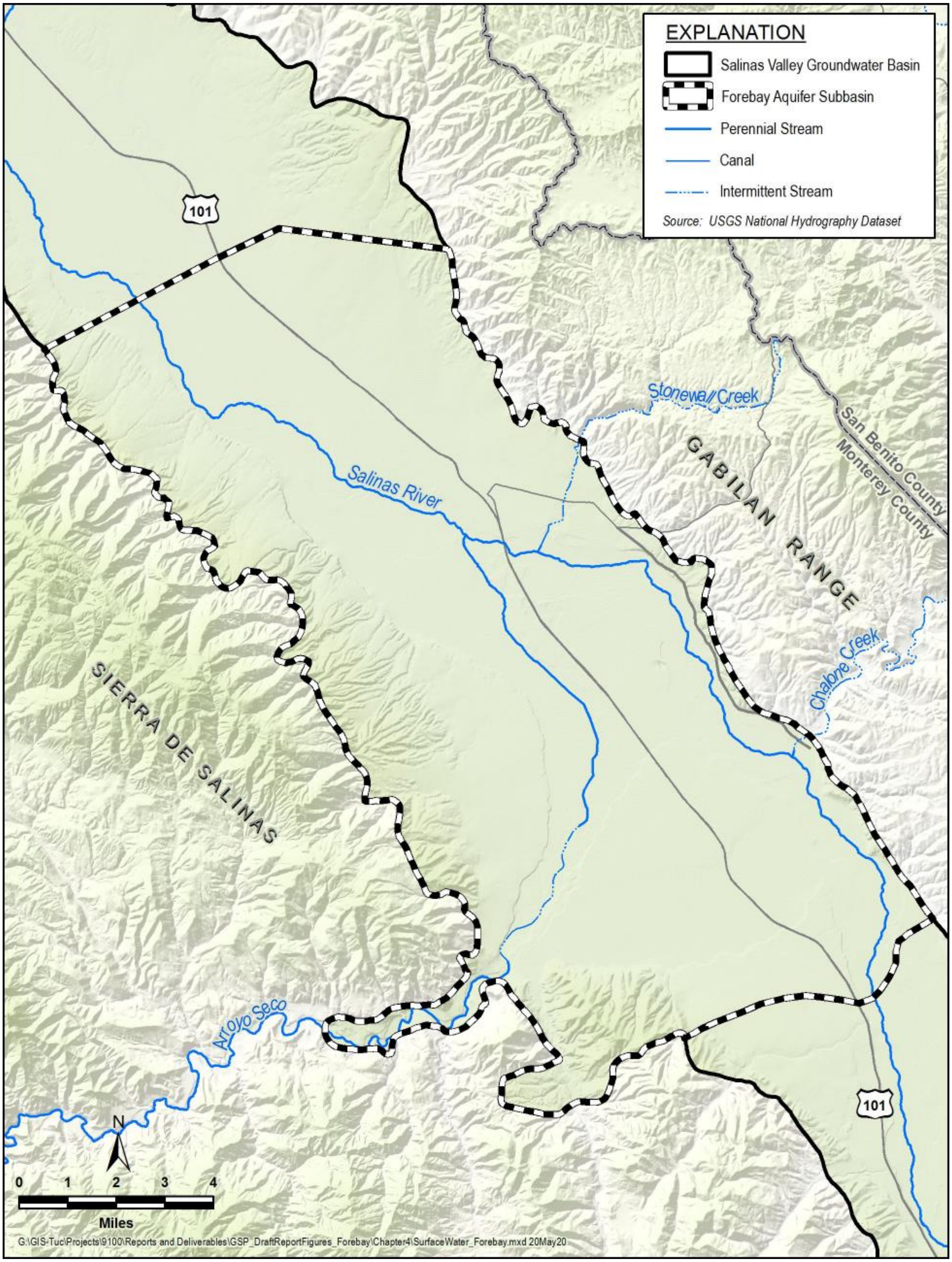


Figure 4-16. Surface Water Bodies in the Forebay Subbasin

4.5.1 Watersheds

Figure 4-16 shows several watersheds that contribute small tributary streams to the Salinas River in the Forebay Subbasin. From the boundary with the Upper Valley Subbasin to the Eastside and 180/400-Foot Aquifer Subbasin, the HUC12 watersheds within the Forebay Subbasin are as follows:

- Agua Grande Canyon-Salinas River
- Reliz Creek
- Vaqueros Creek
- Sweetwater Creek-Arroyo Seco
- Lower Chalone Creek
- Shirttail Gulch-Salinas River
- Stonewall Creek
- Paraiso Springs-Arroyo Seco
- Lasher Canyon-Salinas River
- McCoy Creek-Salinas River
- Limekiln Creek-Salinas River
- Johnson Creek

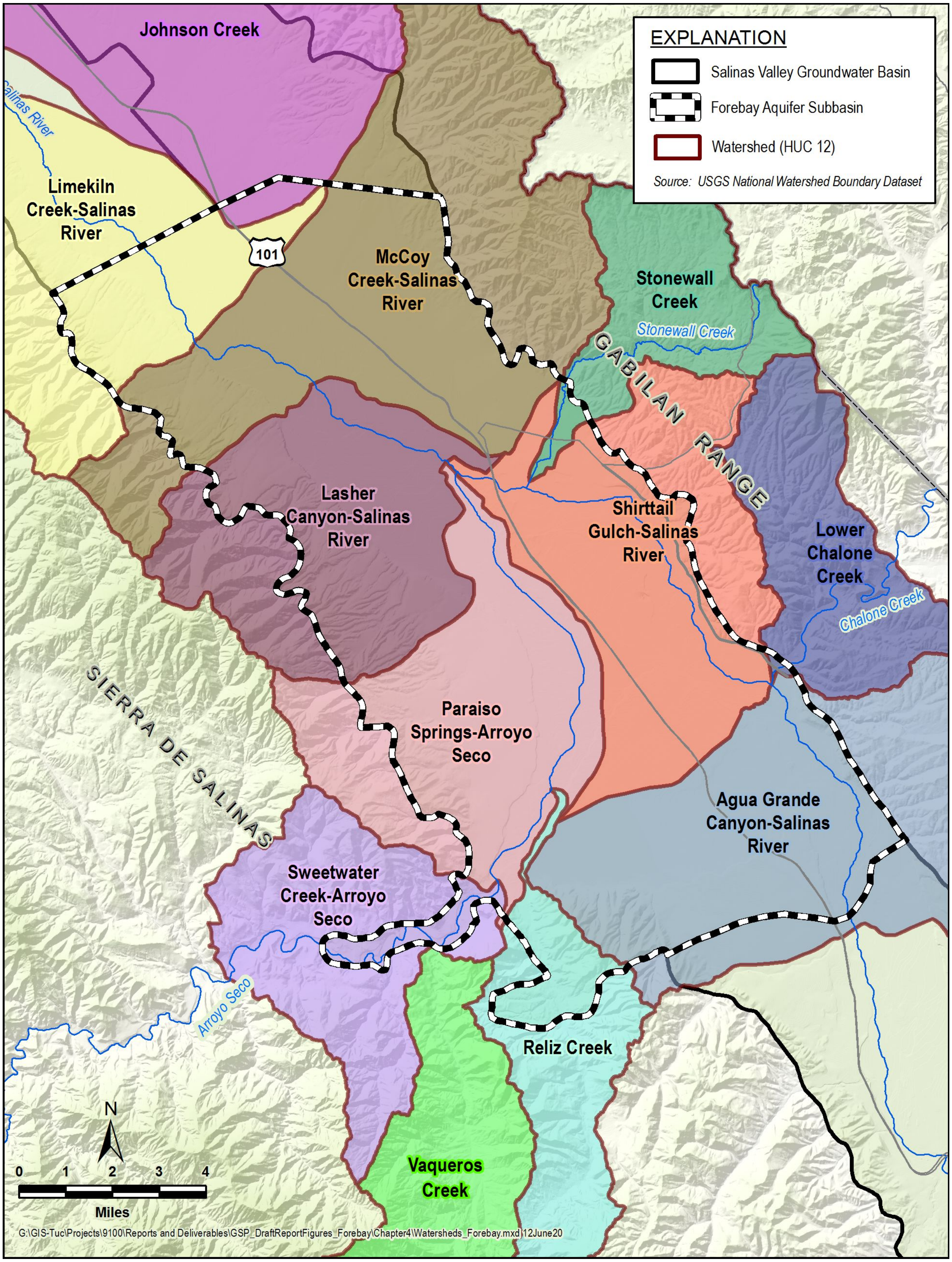


Figure 4-17. HUC12 Watersheds within the Forebay Aquifer Subbasin

4.5.2 Imported Water Supplies

There is no water imported into the Forebay Subbasin.

4.6 Water Quality

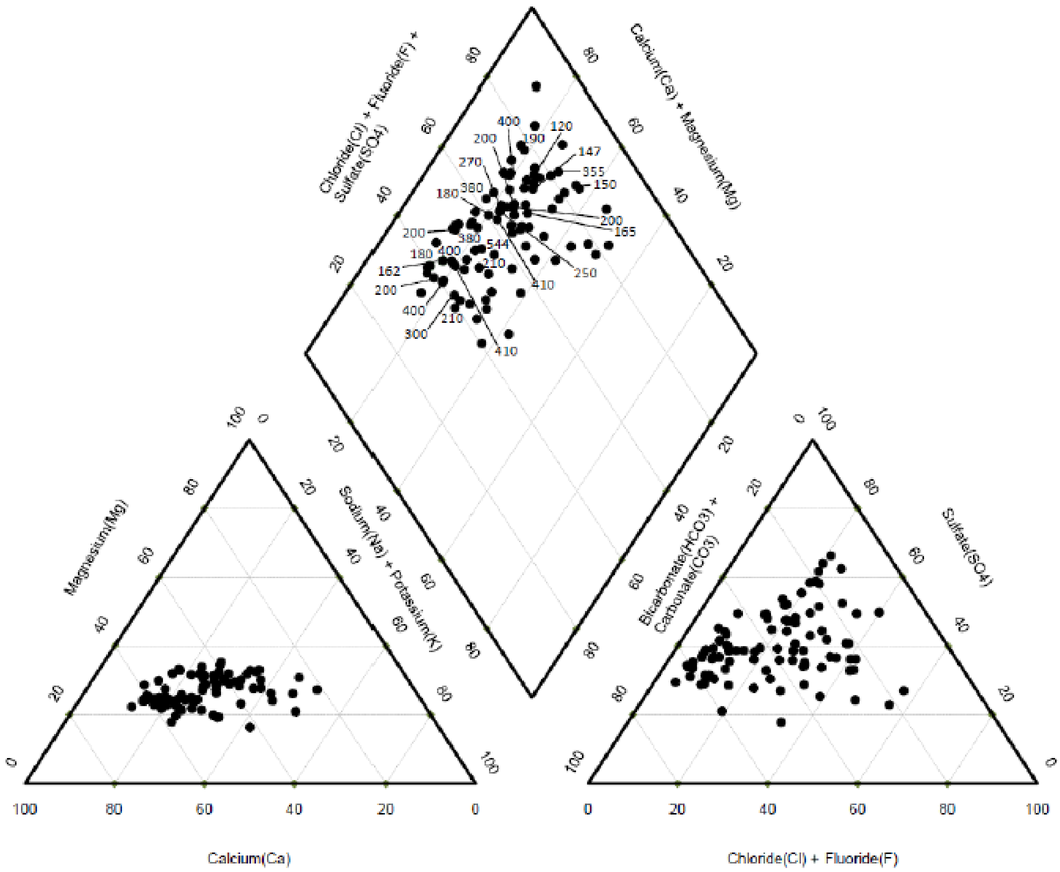
Natural groundwater quality can determine how much treatment may be needed prior to being used for municipal uses, or how the water may impact crop production. This chapter presents a general discussion of the natural groundwater quality in the Subbasin, focusing on general minerals, and is based on data from previous reports. Discussion of the distribution and concentrations of specific constituents of concern (COC) is presented in Chapter 5.

4.6.1 General Mineral Chemistry

The major ion chemistry of the Salinas Valley Groundwater Basin groundwater is summarized on the Distribution of Groundwater Nitrate Concentrations, Salinas Valley, California report, prepared for the Central Coast Groundwater Coalition (CCGC) (HydroFocus, 2014). This report was a response to the CCRWQCB requirement for monitoring elevated nitrate concentrations near drinking water supply wells. The report included the results of extensive groundwater quality sampling and thus provided a good characterization of the Subbasin's general mineral water quality.

General water chemistry provides a baseline of understanding of the water by showing major ions that are dissolved in the groundwater. The major ions that are dissolved can inform users if the water is more alkaline or more acidic. In many areas with more alkaline water, which has more dissolved cations such as calcium, magnesium, and sodium, users report their water as being 'hard.'

Figure 4-18 presents a Piper diagram from the CCGC report that plots major ion data from within and near the Subbasin. The diagram provides a means of representing the proportions of major anions and cations in water samples. The lower left triangle of the piper diagram plots the relative abundance of cations in groundwater samples. The lower right triangle of the piper diagram plots the relative abundance of anions in groundwater samples. The diamond in the middle of the diagram combines the cation and anion abundances in a single plot. Groundwater samples with similar general mineral chemistries will group together on these diagrams. The data plotted on Figure 4-18 show that most groundwater samples are of a similar type and plot in a single cluster. The samples are generally of a magnesium bicarbonate type, which is a more alkaline type of water. However, there are outlier samples that are higher in sodium and potassium than the other samples and are most noticeable in the dots that plot in the middle and right portions of the cation triangle. Piper diagrams do not provide spatial information about groundwater samples, and therefore it is difficult to illustrate the source of the sodium and/or potassium in the outlier samples.



Note: Well depths indicated when available.

Figure 17. Piper Plot of Forebay Subbasin Wells Sampled by the CCGC

Figure 4-18. Piper Diagram of Forebay Aquifer Subbasin Representing Major Anions and Cations in Water Samples (from CCGC, 2015)

4.6.2 Seawater intrusion

There is no recorded seawater intrusion in this Subbasin. The Forebay Subbasin is more than 30 miles from the coastline and is not affected by seawater intrusion. Furthermore, the groundwater elevations in the Forebay Subbasin remain above sea level, maintaining a groundwater gradient towards the coast.

4.7 Data Gaps and Uncertainty of the HCM

Data gaps of the Forebay Subbasin HCM include:

- Very few available measurements of aquifer properties such as hydraulic conductivity and specific yield in the Subbasin, particularly to highlight the differences between the Arroyo Seco Cone and the rest of the Forebay Subbasin.
- The hydrostratigraphy, vertical and horizontal extents, connectivity, and potential recharge areas of the sediments which comprise the Deep Aquifers are poorly known.
- Areas of Salinas River recharge and discharge have not been mapped.

These data gaps have led to some minor uncertainties in how the principal aquifer functions, and the SVBGSA will minimize these uncertainties by filling data gaps. As described in Chapter 7, the GSP will include ongoing data collection and monitoring that will allow continued refinement and quantification of the groundwater system. Chapter 10 includes activities to address the identified data gaps and improve the HCM.

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