2019 WATER MANAGEMENT PLAN

Prepared by

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August 2019

Date of first Final – August 15, 2019
Date of Board of Directors Adoption – December 17, 2019

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Stockton East Water District

2019 WATER MANAGEMENT PLAN

Prepared in Accordance with

the Mid Pacific Region 2017 Standard Criteria

August 2019

FINAL

Prepared by

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PREFACE

This Water Management Plan (WMP or Plan) has been prepared by the Stockton East Water District (SEWD or District) in accordance with the Mid-Pacific Region 2017 Standard Criteria. In 2014, SEWD adopted a WMP to meet the requirements of the Mid-Pacific Region 2011 Standard Criteria. In 2015, SEWD also prepared an Agricultural Water Management Plan (AWMP) to meet the requirements of the Water Conservation Act of 2009, also known as Senate Bill x7-7 (SBx7-7), and Governor Brown's April 1, 2015 Executive Order B-29-15.

This Plan is an update of the 2014 WMP to meet the requirements of SEWD's contract with the U.S. Bureau of Reclamation (USBR, or Reclamation). This 2019 WMP meets the Mid-Pacific Region 2017 Standard Criteria and uses the 2015 AWMP as the primary source.

The resolution of adoption and a cross-reference table are provided on the following pages. The cross reference table identifies the location(s) in the WMP within which each of the applicable requirements of the Mid-Pacific Region 2017 Standard Criteria is addressed. This cross-reference table is intended to support efficient review of the WMP to verify compliance with the 2017 Standard Criteria.

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RESOLUTION
ADOPTION OF WATER MANAGEMENT PLAN

CROSS-REFERENCE TO REQUIREMENTS OF THE USBR MID-PACIFIC REGION 2017 STANDARD CRITERIA

Section	USBR Mid-Pacific Region 2017 Standard Criteria	Applicable WMP Section(s)
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	C. Topography and Soils	1.C.
	D. Climate	1.D.
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Section	USBR Mid-Pacific Region 2017 Standard Criteria	Applicable WMP Section(s)
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ACRONYMS AND ABBREVIATIONS

AB 3030	Assembly Bill 3030
ac-ft	acre-feet
ac-ft/yr	acre-feet per year
AWMP	Agricultural Water Management Plan
BMPs	Best management practices
Cal Water	California Water Service Company
CCTR	Central California Traction Railroad
CCWD	Calaveras County Water District
CDFW	California Department of Fish and Wildlife
CII	Commercial, Industrial, and Institutional
CIMIS	California Irrigation Management Information System
CPUC	California Public Utilities Commission
CSJWCD	Central San Joaquin Water Conservation District
CUWCC	California Urban Water Conservation Council
CVFPB	Central Valley Flood Protection Board
CVPIA	Central Valley Project Improvement Act
CV-SALTS	Central Valley Salinity Alternatives for Long-Term Sustainability
CWC	California Water Code
DBCP	dibromochloropropane
DJW	Dr. Joe Waidhofer
DWR	Department of Water Resources
EBMUD	East Bay Municipal Utility District
EDF	Environmental Defense Fund
ESU	evolutionarily significant unit
ET	evapotranspiration
ET_c	Crop Evapotranspiration
ET_o	Reference evapotranspiration
EDB	ethylene dibromide
EPA	U.S. Environmental Protection Agency
GMP	Groundwater Management Plan
GPM	gallons per minute
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
GWA	Groundwater Authority
HECWs	High-efficiency clothes washers
HPC	Heterotrophic Plate Count
ILRP	Irrigated Lands Regulatory Program
ITRC	Irrigation Training and Research Center
M&I	municipal and industrial
MCL	maximum contaminant level
MGD	million gallon per day
mg/L	milligrams per liter
msl	mean sea level
MOU	Memorandum of Understanding
MUSD	Manteca Unified School District
NMFS	National Marine Fisheries Service (also NOAA Fisheries)
NOAA	National Oceanic and Atmospheric Administration
NOAA-NCEI	National Oceanic and Atmospheric Administration's - National Centers for Environmental Information
OID	Oakdale Irrigation District
OWUS	Owner's Water Use Statement
RWCF	Regional Wastewater Control Facility
SAWS	Stockton Area Water Suppliers
SB 1938	Senate Bill 1938
SCADA	Supervisory Control and Data Acquisition
SEWD, or District	Stockton East Water District
SGMA	Sustainable Groundwater Management Act
SMCL	secondary maximum contaminant level
SSJID	South San Joaquin Irrigation District
TOC	Total Organic Carbon
USACE	U.S. Army Corps of Engineers
USBR, or Reclamation	United States Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service

WMP, or Plan	Water Management Plan
WSS	WaterSense Specification
WTP	water treatment plant
μg/L	micrograms per liter

EXECUTIVE SUMMARY

INTRODUCTION

This Water Management Plan (WMP, or Plan) has been prepared by the Stockton East Water District (SEWD, or District) to describe the District's agricultural and urban water management activities in accordance with the U.S. Bureau of Reclamation (USBR, or Reclamation) Mid-Pacific Region 2017 Standard Criteria. Preparation of the WMP includes a detailed evaluation of the District's water management operations as they relate to the implementation of all critical and other locally cost-effective best management practices (BMPs).

This Plan is an update of the SEWD 2010 WMP and SEWD 2015 AWMP focusing on the Mid-Pacific Region 2017 Standard Criteria. Plan elements developed to address DWR AWMP requirements were not required to be updated at this time. These elements are included in this WMP as Attachment Q and will be updated in 2020 when the next five-year update of the AWMP is due.

SEWD is dedicated to its mission to ensure proper management of its groundwater basin and provide supplemental surface water supplies. In 2017, SEWD became a Groundwater Sustainability Agency (GSA) under the Sustainable Groundwater Management Act (SGMA) and has joined with 15 other GSAs covering the Eastern San Joaquin Groundwater Basin to form an Eastern San Joaquin Groundwater Authority (GWA) to manage the basin sustainably.

Water for irrigation is foundational to supporting agriculture, which serves as the leading economic activity in San Joaquin County. In 2017, $2.5 billion in agricultural commodities were produced countywide[1]. SEWD also supplies wholesale treated drinking water to Stockton area customers that is retailed by the California Water Service Company (Cal Water), the City of Stockton, and San Joaquin County. Key strategies employed by SEWD to support overall water management objectives are the conjunctive management of surface and groundwater supplies and water conservation.

SEWD is an agricultural water supplier that is required to submit a WMP to Reclamation according to the Mid-Pacific Region Standard Criteria. Reclamation approved SEWD's most recent WMP in 2012. Recognizing the importance of water management planning, SEWD has made significant progress in water management in recent years and chose to develop and submit a 2015 AWMP according to the California Water Code (CWC) to comply with the requirement to submit an AWMP by December 31, 2015 (CWC §10820). This 2018 WMP was developed and adopted in compliance with the Mid-Pacific Region 2017 Standard Criteria and is submitted to comply with the requirement of Central Valley Project Improvement Act of 1992 and Section 210(b) of the Bureau of Reclamation Reform Act of 1982.

Development of the WMP represents a substantial effort by SEWD to evaluate its water management across both the agricultural and urban sectors. The WMP consists of an introduction to SEWD, its history, and previous water management activities; a detailed description of the District's physical setting, formation, organization, operations, and facilities; an inventory of water supplies and uses; and a review of SEWD's efforts to implement all critical and other locally cost-effective agricultural and urban BMPs.

[1] San Joaquin County 2017 Agricultural Report, San Joaquin County Office of the Agricultural Commissioner/Sealer.

IMPLEMENTATION OF BEST MANAGEMENT PRACTICES

The 2017 Standard Criteria lists 17 Agricultural BMPs and five Urban BMPs that are aimed at promoting efficient water management among Reclamation contractors. According to the 2017 Criteria, five Agricultural BMPs are considered critical and mandatory, while the remaining 12 BMPs are considered exemptible and are to be implemented if technically feasible and locally cost effective. Among the Urban BMPs, three are Foundational BMPs which are considered by Reclamation to be essential water conservation activities that should be conducted, as applicable, by any utility at any level of distribution as part of ongoing practices. The remaining two Urban BMPs are considered "Programmatic BMPs" that relate to direct efforts to manage residential, commercial, industrial, institutional, and landscape water use.

SEWD is implementing all of the agricultural contractor Critical BMPs and all of the urban contractor Foundational BMPs, as applicable. Of the twelve exemptible agricultural BMPs, SEWD is implementing all that are technically feasible at locally cost effective levels. Because SEWD serves as a wholesale supplier of treated drinking water, it does not deliver water directly to urban customers and therefore does not play a direct role in leading Programmatic BMP efforts. However, SEWD supports its urban contractors in their efforts and policies to achieve the Programmatic BMPs.

Table ES-1 provides a summary of these BMPs as well as the District's past and future implementation activities related to each.

Table ES-1. Summary of BMP Implementation Status.

Reclamation 2017 Criteria	BMP	Position	Implementation Activities
CRITICAL (MANDATORY) BMPs FOR AGRICULTURAL CONTRACTORS			
Critical BMP A.1	Water Measurement/Measure the volume of water delivered to customers with sufficient accuracy	Implementing	• SEWD field-metering staff read and record irrigation delivery meters on a monthly basis from mid-April through mid-October during the irrigation season. Additionally accurate records are kept regarding the calibration of each irrigation outlet. • Of 224 total connections, 218 connections are equipped with measurement devices (170 active, 48 inactive), six connections are unmeasured (inactive; will be equipped with measurement devices once active) • 202 connections measured with McCrometer propeller meters (or similar) • 16 connections measured with PG&E (electric) meters or hour meters, volume calculated (will upgrade to higher accuracy meters as the connections' plumbing permits)
Critical BMP A.2	Designate the Water Conservation Coordinator	Implementing	*Name:* Ed Morley *Title:* Water Quality Control Analyst *Address:* 6767 East Main Street, Stockton, CA 95215 *Telephone:* (209) 444-3127 *E-mail:* emorley@sewd.net
Critical BMP A.3	Provide or Support the Availability of Water Management Services to Water Users/Provide for the availability of water management services to water users	Implementing	• SEWD has provided on-farm irrigation evaluations free to its customers since 1999 ($2,500 per evaluation) • SEWD provides real-time weather data from the CIMIS network to its customers via a link on its website (https://sewd.net/california-irrigation-management-information-system-cimis/) • Irrigation Allowance Index (comparing the volume of water that should be applied (Irrigation Allowance) to the volume of water actually applied) and crop water requirements for growers in SEWD have been evaluated (ITRC, 2013) and are available to growers (more detail in Attachment S) • Water quality monitoring program for surface water at seven key points in the irrigation water conveyance system maintained since 1997 • Courtesy groundwater monitoring service (assesses for potential groundwater quality issues and monitors specific conductance) available to private well owners upon request • SEWD provides semi-annual newsletter and AG Water Report to interested growers (6,500 accounts) • SEWD hosts the City of Stockton "State of the City" agricultural education event (2,000 attendees) and numerous education events through Stockton Area Water Suppliers (SAWS)

Critical BMP A.4	Pricing Structure/Adopt a pricing structure based at least in part on quantity delivered	Implementing	• Surface water pricing structure is based on the quantity of water delivered
			  ○ Surface water rate: $23.00/ac-ft in 2018)
			• No water conservation pricing structure is used for municipal or agricultural groundwater because SEWD is not selling the water, but rather assessing for the use of a well
			  ○ Domestic well rate: $44.00/well in 2018
			  ○ Municipal groundwater rate: $325.92/ac-ft in 2018, based on 2.8 ac-ft/ac estimated consumptive use (assessment charge of $3.60/ac-ft, rate equalization charge of $322.32/ac-ft)
			  ○ Agricultural groundwater rate: $5.23/ac-ft in 2018, based on 2.8 ac-ft/ac estimated consumptive use

Critical BMP A.5	Evaluate and Improve Efficiencies of Contractor's Pumps/Evaluate and improve the efficiencies of the supplier's pumps	Implementing	• Two pumps used to transfer water from Mormon Slough to Potter Creek, used to supplement gravity flow pipeline since 2001 • Pumps last tested in 2019
EXEMPTIBLE (CONDITIONAL) BMPs FOR AGRICULTURAL CONTRACTORS			
BMP B.1	Facilitate Alternative Land Use	Not Applicable	Not Applicable—no land within SEWD that has high water table (<5 feet), poor drainage, groundwater Selenium concentration > 50 ppb, or poor productivity
BMP B.2	Facilitate Use of Available Recycled Water that Otherwise Would Not be Used Beneficially, Meets all Health and Safety Criteria, and Does not Cause Harm to Crops or Soils	Not Applicable	Not Applicable—No available sources of recycled water

Reclamation 2017 Criteria	BMP	Position	Implementation Activities
BMP B.3	Facilitate the Financing of Capital Improvements for On-Farm Irrigation Systems	Implementing	• SEWD offers a Surface Water Incentive Program that encourages irrigators to convert to surface water from groundwater through water pricing incentives. • Majority of irrigation systems are high-efficiency, obviating an urgent need for a dedicated program. • Under SGMA future on-farm water management in SEWD will be required to support sustainable operations of the Eastern San Joaquin Groundwater Basin.
BMP B.4	Implement an incentive pricing structure that promotes one or more of the following goals: (A) More efficient water use at farm level, (B) Conjunctive use of groundwater, (C) Appropriate increase of groundwater recharge, (D) Reduction in problem drainage, (E) Improved management of environmental resources, (F) Effective management of all water sources throughout the year by adjusting seasonal pricing structures based on current conditions.	Implementing	SEWD promotes conjunctive use of groundwater by charging a groundwater assessment fee in addition to the O&M costs incurred by groundwater users to pump and use groundwater. Proceeds from the groundwater charges subsidize District's surface water costs. As a result, using surface water is much less expensive than the cost to produce groundwater, thereby incentivizing the use of surface water.
BMP B.5	Canal Lining/Piping and Regulatory Reservoirs to Increase Distribution System Flexibility and Capacity, Decrease Maintenance, and Reduce Seepage	Implementing	Canal Lining/Piping: • SEWD actively monitors for leaks that can occur on the conveyance system along unlined canals, pipelines, and around concrete structures • 19 miles of pipeline have been constructed (Bellota Pipeline, Peters Pipeline) • Percolation from natural waterways and canals provides natural recharge to a critically overFinaled groundwater basin; no future lining planned as this would eliminate these benefits • 2010 Environmental Impact Report for the canal system found that lining the Upper Farmington Canal may affect terrestrial biological resources Reservoirs: • Ponds at Dr. Joe Waidhofer (DJW) Water Treatment Plant (WTP) act as buffers to regulate and settle out water during storm events (combined storage capacity of approximately 370 ac-ft) • New 73-acre storage and recharge basin north of the DJW WTP constructed in 2019 that would provide an additional 368 ac-ft of recharge
BMP B.6	Increase Flexibility in Water Ordering By, and Delivery to, Water Users (Within Operational Limits)	Implementing	• SEWD delivers irrigation water to customers through an arranged demand system using a 48-hour notice scheduling system • Planned upgrades of DJW WTP SCADA system to full-plant Ignition SCADA (next 3 years) • Planned SCADA upgrades of SEWD agricultural conveyance system (next 5 years)
BMP B.7	Construct and Operate Contractor Spill and Tailwater Recovery Systems	Not Locally Cost Effective	Not Locally Cost Effective— SEWD would need to build costly facilities to pump a small volume of water over 20 miles upstream (Attachment U)
BMP B.8	Plan to Measure Outflow	Implementing	• Planned upgrades of the DJW WTP SCADA system to full-plant Ignition SCADA (next 3 years) • Planned SCADA upgrades of the SEWD agricultural conveyance system, including four outflow locations (next 5 years) •
BMP B.9	Optimize Conjunctive Use	Implementing	• SEWD has secured and provides surface water from the New Melones and New Hogan Reservoirs in order to protect the District's groundwater • Groundwater recharge furnished largely by strategically regulated releases from New Hogan Reservoir down the Calaveras River into check dams along natural waterways (operated by SEWD) • Farmington Groundwater Recharge Program has resulted in approximately 3,700 ac-ft per year between 2013 and 2018. • Active and continued participation in local groundwater entities and initiatives, including SGMA.

Reclamation 2017 Criteria	BMP	Position	Implementation Activities
BMP B.10	Automate Distribution, and/or Drainage System Structures	Implementing	• Rubicon BladeMeter™ installed at PC-2 in April 2019, allowing automated delivery of precise quantities of water from the Bellota Pipeline into Potter Creek using only gravity pressure and solar energy. • Planned SCADA upgrades at DJW WTP with an Ignition SCADA system in the next 2-3 years will provide plant-wide monitoring and control • Planned SCADA upgrades of conveyance system will help to reduce outflows from the SEWD system (next 5 years)
BMP B.11	Facilitate or Promote Water User Pump Testing and Evaluation	Implementing	• SEWD has provided customer pump tests free to its customers since 1999 ($2,500 value) • Three pump tests at one farm in 2018, four pump tests across two farms in 2016, and 17 pump tests across six farms in 2015 • SEWD plans to advertise its pump testing program in its newsletter, on its website (https://sewd.net/), and on the Owner's Water Use Statement
BMP B.12	Mapping	Implementing	• SEWD conducts ongoing maintenance of system maps and continues to develop its GIS-based system.
FOUNDATIONAL BMPS FOR URBAN CONTRACTORS			
1.1.A	Conservation Coordinator	Implementing	*Name:* Kristin Coon *Title:* Water Conservation Coordinator *Address:* 501 Pine Valley Court, Valley Springs, CA 95252 *Telephone:* (209) 304-1734 *E-mail:* water7996@gmail.com
1.1.B	Water Waste Prevention	Implementing	As a wholesaler, SEWD does not distribute urban water directly to customers, but is actively supporting its urban contractors (City of Stockton, Cal Water, and San Joaquin County) in their water waste prevention policies and programs.
1.1.C.	Wholesale Agency Assistance Programs	Implementing	SEWD supplies wholesale treated drinking water via its urban contractors (City of Stockton, Cal Water, and San Joaquin County) and monitors operations practices in its service area.
1.2	Water Loss Control	Implementing	SEWD conducts monthly water audits for the DJW WTP, measuring the total monthly volume of all diversions to the WTP, the total monthly volume treated at the DJW WTP, and the total monthly volume delivered to each of its urban customers. Any discrepancies are immediately investigated, and repairs made as necessary.
1.3	Metering with Commodity Rates for All New Connections and Retrofit of Existing Connections	Implementing	SEWD meters the connections to its urban contractors: • Two pipelines (24-inch and 42-inch) deliver water to Cal Water for south City of Stockton (one meter) • One pipeline (48-inch) delivers water to north City of Stockton (one meter) • City of Stockton wheels water to San Joaquin County The accuracy of these meters is within six percent, and is verified and calibrated annually by an outside testing company.
1.4	Retail Conservation Pricing	Implementing	• SEWD bills urban contractors based on the volume of water produced (per the Second Amended Contract). • Attachment D.2 provides a copy of the 2018 and 2019 rate ordinances (Ordinance No. 44 and 45, respectively) • Each ordinance establishes a base cost (calculated by contract and water usage) and the municipal groundwater rate equalization set per contract between the District and the urban contractors
2.1	Public Information Programs	Implementing	SEWD participates in the SAWS, which jointly funds the Water Conservation Education Program in the Stockton urban area. The SAWS Water Education Program participates in and supplies hand-outs and outreach materials for numerous community gatherings and other special activities and events in Stockton, such as: • Rotary Read In (February 2018) • San Joaquin County Science Fair Judging (March 2018) • Stockton's Earth Day Festival (April 2018) • Water Treatment Plant Tours • Community Based Programs • DWR Water Education Committee

Reclamation 2017 Criteria	BMP	Position	Implementation Activities
2.2	School Education	Implementing	Through SAWS, SEWD also sponsors and participates in school education programs. The SAWS Water Education Program: • visited 66 Stockton area schools/event venues • presented or staffed a booth in 354 classrooms/events • reached 22,538 students and citizens Event highlights from the 2017-2018 school year include: • SAWS Water Education Program visited 66 Stockton area schools/event venues, presenting or staffing a booth in 354 classrooms/events for 22,538 students and citizens • San Joaquin County AgVentures (South County: November 2017, Stockton: January 2018, Lodi: February 2018) • Lincoln Unified School District “Window on Your Future” (February 2018) • Manteca Unified School District (MUSD) “Planet Party Day” (April 2018) • MUSD’s Farm Days (Spring 2018)
3	Residential	Not Applicable (Supporting Contractor Implementation)	SEWD does not deliver water directly to urban customers, but supports its urban contractors in their efforts.
4	Commercial, Industrial, and Institutional (CII)	Not Applicable (Supporting Contractor Implementation)	SEWD does not deliver water directly to urban customers, but supports its urban contractors in their efforts.
5	Landscape	Not Applicable (Supporting Contractor Implementation)	SEWD does not deliver water directly to urban customers, but supports its urban contractors in their efforts.

SECTION 1: DESCRIPTION OF THE DISTRICT

Section 1 of this WMP provides a description of Stockton East Water District (SEWD) in accordance with the Mid Pacific Region 2017 Standard Criteria. This description is divided into the following subsections:

- 1.A. History (background, water supplies, land use, irrigation methods)
- 1.B. Location and Facilities (inflow/outflow points; conveyance, distribution, and storage facilities)
- 1.C. Topography and Soils (topography impacts on water operations and management, soil map)
- 1.D. Climate (average precipitation, temperature, reference evapotranspiration)
- 1.E. Natural and Cultural Resources (natural, recreational, and cultural resources in service area)
- 1.F. Operating Rules and Regulations
- 1.G. Water Measurement, Pricing, and Billing
- 1.H. Water Shortage Allocation Policies
- 1.I. Evaluation of Policies of Regulatory Agencies Affecting the Contractor and Identification of Policies that Inhibit Good Water Management

Contact information for SEWD is provided in Table 1-1. Additional detail is provided in the subsections that follow.

Table 1-1. District Contact Information.

District Name	Stockton East Water District
Contact Name	Cathy Lee
Title	Assistant General Manager
Telephone	(209) 948-0333
Email	sewd@sewd.net
Web Address	http://www.sewd.net/

1.A. HISTORY

1.A.1. District Overview

Date district formed: 1948
Original size (acres): 79,500
Date of first Reclamation contract: 1964
Current year (last complete calendar year): 2018

Introduction

SEWD is located in San Joaquin County and provides surface water for both agricultural and urban uses throughout the District and City of Stockton area (Figure 1-1). By providing surface water for agricultural irrigation, SEWD supports San Joaquin County's $2.5 billion agricultural industry[2], which is the area's leading economic activity. SEWD also supplies wholesale treated drinking water that is retailed to Stockton area customers by the California Water Service Company (Cal Water), the City of Stockton, and San Joaquin County.

[2] According to the San Joaquin County Office of the Agricultural Commissioner/Sealer, the gross value of all agricultural production in the County was $2,527,989,000 in 2017.

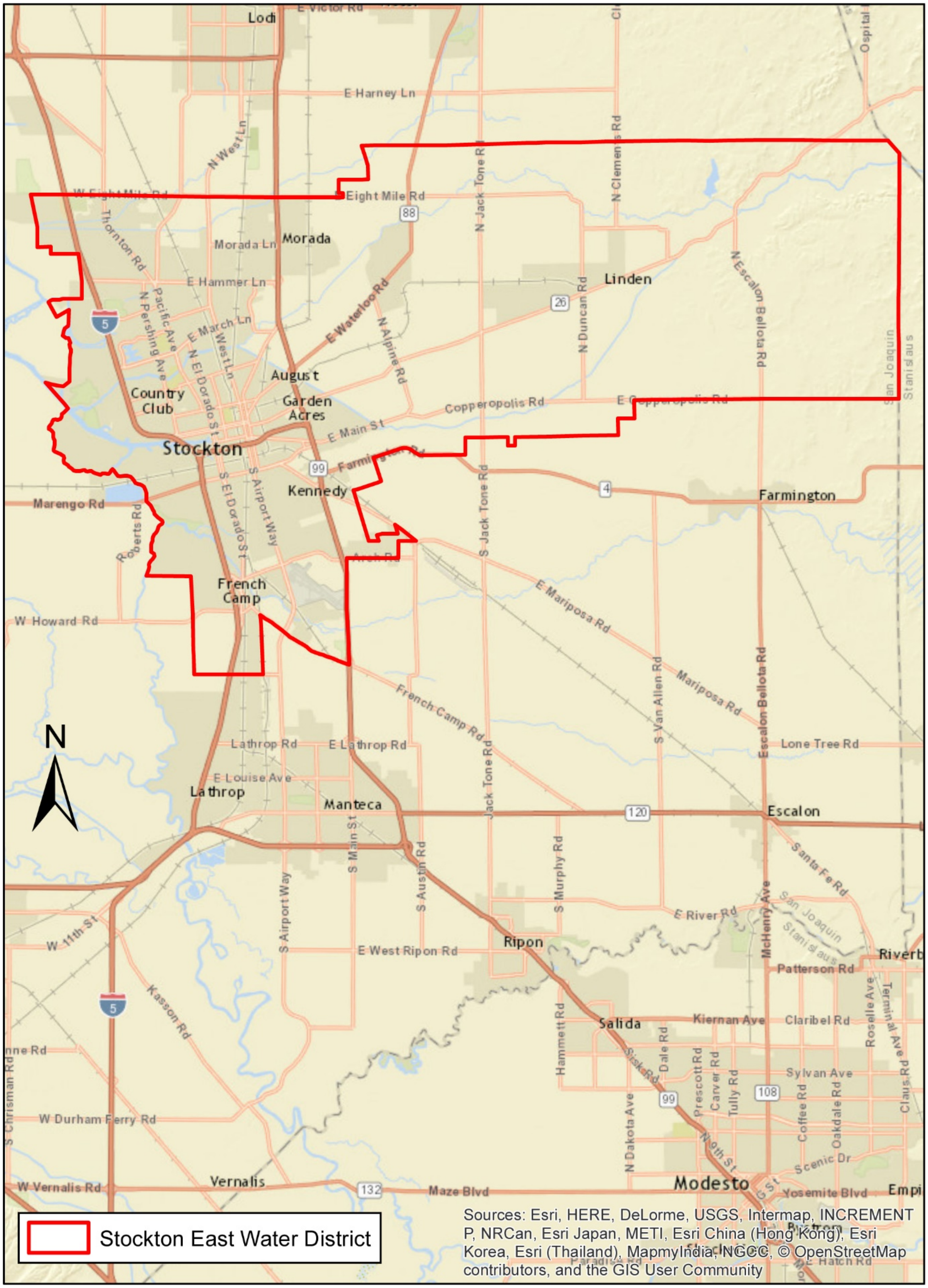


Figure 1-1. SEWD Service Area Boundaries.

SEWD owns and operates a drinking water treatment plant (WTP) in Stockton – the Dr. Joe Waidhofer (DJW) WTP – which has a primary intake from Goodwin Reservoir on the Stanislaus River, and a secondary diversion from the Calaveras River at Bellota. The water diversion at Goodwin Dam marks the beginning of the New Melones Conveyance System. Since 1978, the DJW WTP has produced over a million acre-feet (ac-ft) of water for urban use.

Formation of SEWD

SEWD was formed in 1948 under the 1931 Water Conservation Act of the State of California. SEWD was originally organized as the Stockton and East San Joaquin Water Conservation District, an independent political subdivision of the state government. As such, SEWD was deemed responsible for acquiring a supplemental surface water supply and developing water use practices that will promote conjunctive use and secure a balance between SEWD's surface and groundwater supplies.

Establishment of Water Supply and Financial Structure

From 1948 to 1963, SEWD focused its efforts on water resource planning by evaluating groundwater conditions within the District and determining supplemental water supply requirements. These intensive efforts on the part of SEWD and other local agencies resulted in the construction of New Hogan Dam on the Calaveras River in 1964. SEWD signed a contract for supplemental surface water with the United States Bureau of Reclamation (USBR, or Reclamation) in 1970 (see Attachment L). Also in 1970, SEWD and Calaveras County Water District (CCWD) signed a Memorandum of Understanding (MOU) which assigned SEWD 56.5 percent of the yield from New Hogan Reservoir (see Attachment L).

From its inception until 1962, SEWD's financial structure was dependent upon property taxes. In 1963, the Governor of California signed a bill establishing SEWD's right to levy groundwater use fees and surface water charges. SEWD used the additional revenue to contract for New Hogan Reservoir water. During this period, SEWD began registering wells within the district, while check dams were built on the Calaveras River, Mormon Slough, and Mosher Creek to control surface irrigation water and promote groundwater recharge. SEWD also became actively involved in the pursuit of projects to mitigate significant groundwater issues, which included declining aquifer levels, pumping depressions under urban Stockton, and the continuing threat of saline intrusion in wells near the Delta.

Boundary Expansion and Drinking Water Treatment Plant Construction

In 1971, SEWD boundaries were expanded from its original 79,500 acres to a total of approximately 114,000 acres, including the entire Stockton urban area. Plans were also initiated at that time for a 30 million gallon per day (MGD) drinking water treatment plant. In 1975, a district-wide election resulted in the approval of a $25 million bond to fund the new plant. The DJW WTP, located at 6767 East Main Street, was constructed in 1977 and began operation in 1978. In 1979, the Independent Benefit Commission concluded that the new drinking water treatment plant was a benefit to Stockton's planning areas.

In 2005, SEWD annexed an additional 27,000 acres into the district. Today, SEWD's area encompasses approximately 143,300 acres.

Pursuit of Supplemental Water Supplies

SEWD has actively sought supplemental surface water from the American River via the Folsom South Canal and from the New Melones Reservoir. Efforts to obtain the American River supply have been thwarted by the Environmental Defense Fund (EDF), litigation by the East Bay Municipal Utility District (EBMUD), and the Freeport Regional Diversion Project recently constructed by EBMUD and Sacramento County.

In 1983, SEWD and the Central San Joaquin Water Conservation District (CSJWCD) contracted with Reclamation for annual allocations of 75,000 and 80,000 ac-ft, respectively, from New Melones Reservoir (see Attachment M). Also in 1983, SEWD expanded its surface water irrigation capabilities by constructing the 12,000 gallons per minute (GPM) Potter Creek Pump Facility to facilitate diversions from New Melones Reservoir.

From time to time the District has purchased water from South San Joaquin Irrigation District (SSJID) and Oakdale Irrigation District (OID) to supplement the District's water supply as needed. The terms of the purchases including price and amount of water purchased are negotiated for the year of the purchase. No long-term agreement exists.

Plant Expansion and New Melones Conveyance Construction

In 1991, the DJW WTP was expanded to 40 MGD to accommodate increased demand from Stockton's urban areas. In anticipation of a new water supply from the New Melones Reservoir, construction of the New Melones Conveyance System was completed in 1994 to provide additional water to the DJW WTP. Currently, the New Melones Conveyance System consists, sequentially, of a diversion structure at Goodwin Dam, the Goodwin Tunnel, the Upper Farmington Canal, Shirley Creek, Hoods Creek, Rock Creek, the Lower Farmington Canal, and Peters Pipeline, which feeds into either the Bellota Pipeline or into the 6-mile Peters Pipeline extension constructed in 2003 (described below), which both supply the DJW WTP.

However, under the Central Valley Project Improvement Act (CVPIA), Reclamation did not supply water for the New Melones Reservoir project in 1993-1994. In 1995, SEWD began receiving New Melones Reservoir water, but the amount received was less than the contracted amount. Legal action in this matter is ongoing.

Under the current Reclamation operation of New Melones Dam, SEWD and CSJWCD are provided with a combined annual supply of up to 150,000 ac-ft of water from New Melones Reservoir. Water allocation amounts are based on the March-September water forecast and the February end of month storage in New Melones Reservoir each year.

Adoption of AB 3030 Groundwater Management Plan

In 1995, SEWD adopted a Groundwater Management Plan (GMP) in accordance with Assembly Bill 3030 (AB 3030). The goal of the SEWD AB 3030 GMP is to continue the District's efforts to protect existing water supplies, to relieve pressure on the local groundwater basin by seeking supplemental surface water supplies for conjunctive use, and to maintain pressure on Reclamation to meet the contracted delivery amounts for New Melones Reservoir water.

In 2005, SEWD replaced the 1995 plan by adopting the Eastern San Joaquin Groundwater Basin Groundwater Management Plan prepared by the Northeastern San Joaquin County Groundwater Banking Authority in compliance with AB 3030 and Senate Bill 1938 (SB 1938) and pursuant to California Water Code Section 10750 et seq. The comprehensive plan developed by those agencies that overlie the local groundwater basin serves to review, enhance, assess, and coordinate existing groundwater management policies and programs in Eastern San Joaquin County and develops new policies and programs to ensure the long-term sustainability of groundwater resources in Eastern San Joaquin County.

OID/SSJID Water Transfer Agreement

In 1997, SEWD entered into a water transfer agreement with OID and SSJID. This agreement transferred between 8,000 and 30,000 ac-ft per year (ac-ft/yr) to SEWD based on New Melones Reservoir storage and inflow as of April 1 of each year. The contract period for the transfer ended in 2009.

From time to time the District has purchased water from SSJID and OID to supplement the District's water supply as needed. The terms of the purchases including price and amount of water purchased are negotiated for the year of the purchase. No long-term agreement currently exists.

Peters Pipeline Extension Project

In 2003, SEWD applied for and received a Proposition 13 Groundwater Recharge Storage Construction Grant for an extension of Peters Pipeline. A 78-inch-diameter section of the Peters Pipeline portion of the New Melones Conveyance System extends 3 miles from the terminus of the Lower Farmington Canal to the existing 54-inch-diameter Bellota Pipeline that supplies the DJW WTP. Under this Groundwater Recharge Storage Project, SEWD built a 6-mile long, 60-inch diameter extension to the Peters Pipeline. This extension provides water for agricultural irrigation, groundwater recharge, and drinking water treatment. Construction on the Peters Pipeline Project was completed in 2006. The availability of both the Bellota Pipeline and the Peters Pipeline extension gives SEWD redundancy and flexibility in supplying water to the DJW WTP. This conjunctive use project enables the treatment of a greater percentage of available surface water and benefits the groundwater basin by banking water in- lieu of pumping.

Efficiency Enhancement Project

In 2005, SEWD implemented a $7.1 million Efficiency Enhancement Project, which improved the water treatment plant's chemical mixing and settling efficiency and provided delivery of 11 percent more drinking water to the Stockton urban area.

In 2006, SEWD implemented a $3.8 million upgrade and modernization of its water treatment plant high service pump station. This upgrade allowed SEWD to meet the various pumping requirements of its retail customers and increased the pump capacity from the Efficiency Enhancement Project. In 2006 SEWD upgraded the WTP to include a parallel 27.6 MGD processing system north of the existing pretreatment complex for a total treatment capacity of 65 MGD.

Sustainable Groundwater Management Efforts

SEWD is dedicated to its mission to ensure proper management of its groundwater basin and provide supplemental surface water supplies. In 2017, SEWD became a Groundwater Sustainability Agency (GSA) under the Sustainable Groundwater Management Act (SGMA) and has joined with the 15 other GSAs covering the Eastern San Joaquin Groundwater Basin to form an Eastern San Joaquin Groundwater Authority (GWA) to manage the basin sustainably. SEWD has and will continue to take an active role in local groundwater sustainability initiatives, including SGMA.

1.A.2. Current Size, Population, and Irrigated Acres

Table 1-2 summarizes the current gross area and irrigated area of SEWD and the population served by the District, as of 2018. The District irrigated area was determined from the 2018 Crop Report, and the population served by the District is based on the SEWD Urban Water Management Plan and information provided by the Urban Contractors.

Table 1-2. Current Size, Population, and Irrigated Area (2018).

Year	2018
Gross Area (acres)	143,300
Population Served[a]	358,000
Irrigated Area (acres)	59,712

[a] SEWD supplies treated drinking water from DJW WTP to wholesalers, but does not directly supply drinking water to urban connections.

1.A.3. Water Supplies Received in Current Year

Table 1-3 summarizes the water supplies received by SEWD in 2018 by water source type. Additional detail regarding each water source is provided below in Section 5.

Table 1-3. Water Supplies Received in Current Year (2018).

Water Source	Volume (ac-ft)
Federal urban water[a] (Tbl 5-1)	42,393
Federal agricultural water (Tbl 5-1)	74,587
State water (Tbl 5-1)	0
Other Wholesaler (define) (Tbl 5-1)	0
Local surface water (Tbl 5-1)	0
Upslope drain water (Tbl 5-1)	0
District groundwater (Tbl 5-2)	0
Banked water (Tbl 5-1)	0
Transferred water (Tbl 5-6)	0
Recycled water (Tbl 5-3)	0
Other (transfer) (Tbl 5-1)	0
Total	116,980

Source: SEWD spreadsheets: New Melones 2018 Water Use, May 2019; New Hogan Flows, Calendar Year 2018, May 2019.
[a] SEWD supplies wholesale treated drinking water that is retailed to Stockton area customers by Cal Water, the City of Stockton, and San Joaquin County. SEWD does not own or operate an urban distribution system. The urban water source is both the New Melones and New Hogan Reservoirs.

1.A.4. Annual Entitlement Under Each Right and/or Contract

Table 1-4 summarizes SEWD's annual surface water entitlement under its two contracts with Reclamation. SEWD receives water from both the New Hogan and New Melones Reservoirs for agricultural and urban (municipal and industrial, or M&I) use.

1.A.5. Anticipated Land Use Changes

There are no anticipated changes in District agricultural areas. SEWD boundaries increase as the City of Stockton's incorporated boundaries increase. Thus, as the urban area grows, SEWD boundaries expand. Agricultural acres are not expected to change significantly.

Table 1-4. Annual Entitlement Under Each Right and/or Contract.

Contract Type[a]	Entitlement, AF/yr	Source	Contract #	Availability
Reclamation Urban	56.5% of yield[b] Average Urban Supply (1979-2018): 18,000 ac-ft/yr	New Hogan	14-06-200-5057A	Mar-Apr
Reclamation Agriculture	56.5% of yield[b] Average Agricultural Supply (1979-2018): 25,000 ac-ft/yr	New Hogan	14-06-200-5057A	Mar-Apr
Reclamation Urban	75,000 ac-ft/yr total[c] Average Urban Supply (1995-2018): 15,000 ac-ft/yr	New Melones	4-07-20- WO329	Jan-Dec
Reclamation Agriculture	75,000 ac-ft/yr total[c] Average Agricultural Supply (1995-2018): 5,000 ac-ft/yr	New Melones	4-07-20- WO329	Jan-Dec

[a] Each contract provides water for both agricultural and M&I uses.
[b] The contract between SEWD and Reclamation entitles SEWD to take 56.5 percent of New Hogan Project water, which is used for both agricultural and urban use.
[c] Water allocation amount in a given year is based on the March-September water forecast and the February end of month storage in New Melones Reservoir. Water allocation is split between both agricultural and urban use.

1.A.6. Cropping Patterns

Table 1-5 summarizes the acreage of crops currently and historically grown in SEWD. Walnuts and cherries have remained the predominant crops grown in the District, collectively representing between 40 and 70 percent of the total agricultural acreage since 1995. As of 2018, much of the agricultural area not planted to walnuts or cherries is comprised of vineyards and other orchard crops.

Table 1-5. Agricultural Cropping Patterns.

Original Plan (1995)		Previous Plan (2010)		Current Plan (2018)[a]	
Crop Name	Acres	Crop Name	Acres	Crop Name	Acres
Walnuts	15,876	Walnuts	22,743	Walnuts	30,286
Cherries	6,711	Cherries	10,290	Cherries	11,417
Beans	5,782	Vineyard	4,264	Grapes/Vineyards	5,470
Tomatoes	3,759				
Other (<5% each)	22,821	Other (<5% each)	13,684	Other (<5% each)	12,538
Total	54,949	Total	50,981	Total	59,711

[a] Source: SEWD 2018 Crop Report, May 2019.

When formed in 1948, agriculture in SEWD was fully developed. District expansion in 1970 added the urban Stockton area and approximately 10,000 acres of fully developed agricultural lands to SEWD. District expansion in 2005 added 27,000 additional agricultural acres, most of which are range land. Cropping patterns are not expected to change significantly through 2030, although a small but insignificant reduction in irrigated agricultural acres is anticipated because of planned urban growth.

1.A.7. Major Irrigation Methods

Table 1-6 summarizes the major irrigation methods currently and historically used in the District. Information regarding irrigation methods are requested from and submitted by irrigators on the Owner's Water Use Statement (OWUS). The OWUS is completed by each grower and submitted to the District in

January of each calendar year as part of the District billing process. A sample OWUS is provided in Attachment N. This information was unavailable at the time of the original SEWD WMP in 1995. In recent years, irrigation has increasingly shifted toward higher-efficiency sprinkler and low volume systems typically used in irrigation of orchard and vineyard crops common throughout the district.

Table 1-6. Major Irrigation Methods, by Acreage.

Original Plan (1995)		Previous Plan (2010)		Current Plan (2017[a])	
Irrigation Method	**Acres**	**Irrigation Method**	**Acres**	**Irrigation Method**	**Acres**
Not available		Flood	4,021	Level Basin	105
		Furrow	3,785	Furrow	3,075
		Sprinkler[b]	31,350	Sprinkler[b]	38,548
		Drip	9,994	Low volume	15,253
		Micro-sprinklers	1,814	Multiple[c]	5,228
Other		Other	16	Other	635
Total		Total	50,981	Total	62,846

Source: SEWD Irrigation Reports.
[a] Irrigation methods are self-reported by irrigators as part of the SEWD billing process and are not compiled by the District until later in the following year. This information is unavailable for 2018 at the time of this WMP development (May 2019).
[b] Sprinkler irrigation systems (self-reported by growers) are generally high-efficiency systems similar to low volume systems in SEWD.
[c] Multiple irrigation methods self-reported by growers (e.g. furrow and sprinkler).

There is little historical information on irrigation practices within SEWD, although it is generally known that local irrigation practices have followed statewide trends that have evolved from flood to sprinklers, and more recently, to micro-sprinklers and drip. Nevertheless, all forms of irrigation continue to be practiced in SEWD.

1.B. LOCATION AND FACILITIES

Maps of SEWD facilities are provided in Attachment A of this WMP and show the District’s inflow locations, turnouts (internal delivery locations), outflow locations (spillage), conveyance system, storage facilities, and operational loss recovery system. These facilities are described below.

1.B.1 Incoming Flow Locations and Measurement Methods

SEWD receives surface water from both the Stanislaus and Calaveras Rivers. Table 1-7 summarizes the locations of district inflows and the measurement devices used at each site.

New Melones Dam is on the Stanislaus River and forms New Melones Reservoir, which is owned and operated by Reclamation. SEWD diverts the New Melones Reservoir water supply from the Stanislaus River below Tulloch Reservoir at the Goodwin Tunnel diversion structure.

Table 1-7. Incoming Flow Locations and Measurement Methods.

Incoming Flow Location Name	Physical Location	Type of Measure-ment Device	Accuracy
Goodwin Tunnel Diversion from New Melones Reservoir	Goodwin Reservoir on the Stanislaus River (New Melones supply)	ultra sonic (SONTEK-IQ)	+/- 6%[a]
Farmington Dam Diversion	Farmington Dam (New Melones supply)	ultra sonic (SONTEK-Argonaut)	+/- 6%[b]
New Hogan Reservoir	New Hogan Reservoir (New Hogan supply)	stilling well (water level) calculations	adjusted per stream flow measurements[c]
New Hogan Conveyance System	Bellota Intake (New Hogan supply)	ultra sonic (MACE)	+/- 6%
New Hogan Conveyance System	spillway at Mormon Slough (New Hogan supply)	ultra sonic (MACE)	+/- 6%
treatment plant inflow	Dr. Joe Waidhofer WTP (mixed supply)	venturi	+/- 6%[d]

[a] The Goodwin Reservoir measurement device is calibrated four times a year, and maintained monthly.
[b] The Farmington Dam Diversion measurement device was calibrated and maintained four times a year. This meter has not been in operation since 2016, though inflow can still be calculated from measured New Melones Reservoir releases reported by USACOE and metered deliveries to CSJWCD.
[c] Owned and maintained by USACOE.
[d] The Dr. Joe Waidhofer WTP measurement device is calibrated annually.

New Hogan Reservoir is the main water storage facility on the Calaveras River. The U.S. Army Corps of Engineers (USACE) operates the reservoir for multiple uses, including flood control, municipal and industrial water supply, agricultural irrigation, and recreation. SEWD coordinates daily water releases, other than for flood control, with the USACE manager.

There are 27 total removable check dams on the Calaveras River, Mormon Slough, Mosher Creek, Potter Creek, and Diverting Canal from which surface water irrigators pump water. These dams serve to pond water to allow irrigator's pumps to deliver surface water to fields. Irrigation also occurs from the Lower Farmington Canal (an unlined District canal) and Peters Pipeline (a distribution pipeline providing water to agriculture and the DJW WTP).

SEWD also diverts water at the Bellota Weir on the Calaveras River into a 13-mile pipeline to the 65 MGD DJW WTP. Four regulating reservoirs are located at the treatment plant with a combined capacity of approximately 120 ac-ft.

1.B.2. Current Year Agricultural Conveyance System

Table 1-8 summarizes the District's current agricultural water conveyance system, as of 2018. The entire system is approximately 100 miles long, and consists of natural waterways, flood control channels, pipelines, and unlined canals.

Table 1-8. Current Year Agricultural Conveyance System (2018).

Miles Unlined – Canal	Miles Lined – Canal	Miles Piped	Miles – Other[a]
17.5	0	19	64

[a] Other elements of the agricultural conveyance system include natural waterways and flood control channels.

1.B.3. Current Year Urban Distribution System

Although SEWD owns and operates the DJW WTP in Stockton, it does not distribute this water to urban customers directly. Thus, SEWD does not operate an urban distribution system at this time (Table 1-9). Instead, SEWD supplies wholesale treated drinking water to three urban contractors – Cal Water, the City of Stockton, and San Joaquin County – who then retail this water to Stockton area customers.

Table 1-9. Current Year Urban Distribution System (2018).

Miles AC Pipe	Miles Steel Pipe	Miles Cast Iron Pipe	Miles – Other
0	0	0	0

1.B.4. Storage Facilities (Tanks, Reservoirs, Regulating Reservoirs)

Table 1-10 summarizes the District's current water storage facilities, as of 2018.

Table 1-10. Storage Facilities (2018).

Name	Type	Capacity (ac-ft)	Distribution or Spill
New Hogan Reservoir[a]	reservoir	317,000	distribution
New Melones Reservoir[b]	reservoir	2,400,000	distribution
Dr. Joe Waidhofer WTP	ponds	738	distribution

[a] Reservoir operated by USACE, with SEWD serving as the water master.
[b] Reservoir owned and operated by Reclamation.

A portion of SEWD's water storage capacity is at New Hogan Reservoir along the Calaveras River, which receives its water supply primarily from rainfall runoff. This facility was completed in 1964 and has a total water conservation storage capacity of 317,000 ac-ft at maximum flood stage. The 10-year average storage in the reservoir at the beginning of April is 175,000 ac-ft based on available data between 1989 and 2018 (CDEC, 2019). USACE, DWR, and Reclamation jointly developed the operational plan for New Hogan Reservoir. USACE operates the reservoir for multiple uses, including flood control, municipal and industrial water supply, agricultural irrigation, and recreation. SEWD is the water master and coordinates with the USACE manager regarding daily dam releases to SEWD and CCWD for irrigation and municipal use during non-flood control periods. USACE ensures that the reservoir storage capacity is operated to provide flood control. New Hogan Reservoir is also used for recreation, offering camping, fishing, boating, etc. New Hogan Reservoir is located approximately 30 miles east of Stockton, south of State Highway 26 in Calaveras County.

Water is also stored at New Melones Reservoir, which has a capacity of 2.4 million ac-ft. The reservoir is formed by the New Melones Dam along the Stanislaus River and receives its water from rainfall and snowmelt runoff. The driving force to construct the 625-foot-tall rockfill dam was to provide water for irrigation. The reservoir, owned and operated by Reclamation, is multipurpose, providing flood control, drinking water supply, irrigation supply, hydroelectric power, and recreational activities, including camping, fishing, boating, etc. New Melones Reservoir is located approximately 40 miles east of Stockton, north of State Highway 120 in Stanislaus County.

Regulatory storage is available at the DJW WTP. The ponds at the DJW WTP were initially constructed to provide groundwater recharge, and also serve as a buffer to settle out stormwater. There are four ponds currently in service. These include a 19-acre storage and recharge deep pond, a 15-acre flat bottom recharge pond, and a 14-acre ridged recharge pond, which have a combined storage capacity of approximately 370 ac-ft. In 2017, designs were prepared for a new 73-acre storage and recharge basin north of the WTP that would provide an additional 368 ac-ft of storage volume. This fourth basin has been in operation since May 2019.

1.B.5. Description of the Agricultural Spill Recovery System

SEWD receives agricultural water from the New Hogan and New Melones Reservoirs on an as-needed basis, and delivers irrigation water to customers through an arranged demand system using a 48-hour notice scheduling system. Tail end loss is closely monitored. SEWD operates the agricultural conveyance system to minimize or prevent tail end loss. SEWD's water ordering system and arranged demand operations have prevented spillage from over-releases, as well as tailwater from over-irrigation.

In above average water years, the irrigation system is operated to ensure maximum recharge opportunities and to minimize end of year releases required to evacuate flood control storage space in New Hogan Reservoir. Wetter years, such as 2005 and 2006, result in higher system tail end loss.

SEWD has no formal agricultural spill recovery system, but the District previously sought and utilized grant funds to implement an early Supervisory Control and Data Acquisition (SCADA) system. Although SCADA is not a spill or tail water recovery system, it allows enhanced surface water management to minimize SEWD's limited system losses. In 2005, SEWD applied for and was awarded a Reclamation Challenge Grant in the amount of $150,255 over two years to implement this SCADA system. SEWD's contribution was $154,553. The equipment was installed in 2006 and was used to remotely monitor 12 sites in key locations within the water conveyance system (one flow monitoring site, 11 pool level monitoring sites), and to provide off-site water gate control at three locations. Recently, this system has gone offline.

SCADA and network upgrades are planned for the DJW WTP in the next 2-3 years, which will provide plant-wide monitoring and control. Additional upgrades will eventually be expanded out into the conveyance system over the next 5 years.

SEWD is improving its monitoring system to reduce spillage and increase efficiency on the Calaveras River, Mormon Slough, Mosher Creek, Potter Creek, and at the Diverting Canal. It is estimated these improvements will ultimately conserve up to 3,600 ac-ft/yr of water in an average or below average water year, which would then be available for agriculture, municipal and industrial (M&I), or recharge uses. This effort will enhance water supply reliability for SEWD and improve groundwater conditions in the Eastern San Joaquin County Groundwater Basin, which is designated by DWR as being in a state of critical overFinal (DWR, 2003) and is subject to saline intrusion.

At diversion turnout gates, Doppler radar type meters are used from the following manufacturers: MACE, SONTEK, and Gray Line. In addition to the Doppler style meters, the Bellota pipeline outflow at DJW WTP is metered with a Rosemount venturi style flowmeter. The District employs field-metering staff to keep accurate records of each irrigation outlet's calibration and to monitor the meters at the 54-inch Bellota Pipeline and at the DJW WTP on a daily basis.

The District recently installed a Rubicon BladeMeter™ at PC-2 along Potter Creek, which provides for automated delivery of precise quantities of water using only gravity pressure and solar energy. The BladeMeter™ is being piloted for other future sites. Construction was completed in April 2019, and flow data will be available in the next update to the WMP.

Additional tasks to be conducted include the retrofit of two existing flow monitoring stations used to transmit data to the SCADA system, and the automation of five water control gates at three locations to allow off-site control. Acquisition of this "real time" data and automation of the gates will enhance operation and management of SEWD's agricultural water delivery system.

1.B.6. Agricultural Delivery System Operation

The District's agricultural delivery system operation method is indicated in Table 1-11.

Table 1-11. Agricultural Delivery System Operation.

On-Demand	Scheduled	Rotation	Other (Arranged Demand)
			×

Agricultural water is delivered from New Hogan and New Melones Reservoirs on an as-needed basis. SEWD delivers irrigation water to customers through an arranged demand system using a 48-hour notice scheduling system. In 2014, SEWD changed its voluntary notification policy to be mandatory (see Rule 120 in Attachment B for more detail).

SEWD initially assesses the available water supply in New Hogan Reservoir by April of each year and, in dry years, determines whether voluntary or mandatory reductions in water use are required (see Section 1.F. for more detail). The District informs its customers of the available water supply and any need for reductions through its newsletter, as-well-as postcard reminders and the SEWD website.

SEWD requires that its customers contact the District by phone or through the District website (https://sewd.net/ag-water-order-form/) prior to diverting water so that SEWD can adjust releases at the dam. Customers are required to provide the following information 48 hours in advance: name of owner or operator, phone number of owner or operator, pump ID number (location of diversion), diversion rate, beginning diversion date/time, ending diversion date/time, and run time. The District may enforce penalties on customers who do not advise the District prior to their water use. SEWD's postcards remind customers of this penalty and advise customers of the official and actual lead times necessary for water orders and shut-off.

1.B.7. Restrictions on Water Source(s)

Restrictions on water sources historically available to SEWD are described in Table 1-12. Contractual restrictions on New Hogan supply stem from the MOU between SEWD and CCWD (see Attachment L). Under this MOU, SEWD is assigned 56.5 percent of the yield from New Hogan Reservoir, and any water not used by CCWD is available for SEWD use. New Melone supply follows CVP contractural restrictions and is determined according to water year allocation set by USBR (see Attachment M). Water allocation amounts are determined each year by the March-September water forecast and the February end of month storage in New Melones Reservoir. Thus, SEWD does not know how much water it will receive until February. This restriction poses challenges to annual water use planning and scheduling.

1.B.8. Proposed Changes or Additions to Facilities and Operations for the Next Five Years

To improve the flexibility of water deliveries to its urban contractors, SEWD plans to upgrade the DJW WTP SCADA system within the next three years. The planned upgrades will install a plant-wide SCADA system, allowing monitoring, data acquisition and archival, and control for the entire plant.

SCADA upgrades for the SEWD agricultural conveyance system are planned to follow the DJW WTP SCADA upgrades within the next five years. These upgrades will integrate with the WTP SCADA system, as applicable, benefitting flexibility in water ordering and delivery to both agricultural water users and the urban contractors. Additionally, SEWD plans to install Rubicon meters along the Lower Farmington Canal to provide more accurate measurements of flows in the New Melones Conveyance System.

In the next five years, SEWD also plans to survey connections currently equipped with PG&E meters or hour meters, assess these for viable repairs, and explore other types of measuring devices that can be installed to volumetrically quantify deliveries to the required six percent accuracy. The majority of active measured delivery points in SEWD are equipped with McCrometer propeller meters or similar propeller meters (93% of measured connections). However, some are still equipped with PG&E meters or hour meters and have plumbing configurations that do not provide room for propeller meters.

In addition to agricultural delivery meter upgrades, the Peters Pipeline project also has the ability to accommodate additional irrigation outlets that could be installed as desired in the coming years. Already, the project has included construction of 25-28 outlets for delivery of surface water to farmland adjacent to the pipeline, improving delivery flexibility to customers.

In an ongoing effort to improve fish passage through Mormon Slough and the Calaveras River, SEWD has participated with DWR for a fish passage study completed in 2007 and has worked with U.S. Fish and Wildlife Service and DWR to identify four crossings to achieve the most improvement of fish passages. The next projects scheduled under this efforts are the Central California Traction Railroad (CCTR) Crossing and the Hosie Crossing fish passage projects. DWR has completed the design of the CCTR Crossing fish passage project, and construction is tentatively scheduled for September 2019, pending issuance of permits from the Central Valley Flood Protection Board (CVFPB) and USACE. Following construction of the CCTR project, the next phase will be designing the Hosie Dam fish passage project upstream of the Diverting Canal.

In 2019, California Department of Fish and Wildlife (CDFW) awarded a grant to SEWD to begin design and environmental analysis for the Bellota Intake Fish Screen and Fish Passage Improvement Project. This project aims to protect, restore, and enhance anadromous fish habitat in California to aid the recovery of species . Among the top priorities in the California Water Action Plan is to provide fish passage and fish screening for intakes. The project includes removal of fish passage barriers, installation of fish screens, and construction of a fish bypass.

Table 1-12. Restrictions on Water Sources.

Source	Restriction	Cause of Restriction	Effect on Operations
New Hogan	Per MOU any water not used by CCWD is available for SEWD use. Typically, CCWD uses between 3,500 and 3,700 ac-ft per year.	Contractual	Provides additional water supply for SEWD.
New Melones	Reclamation water year is Jan. 1 – Dec. 31, Availablity is based on CVP allocations.	Contractual	Provides challenge to the annual water use plan.[a]
New Melones transfer water	Dependent on CVP allocations.	Contractual	Provides challenge to the annual water use plan.[a]

[a] The water years specified in the New Melones agreements, in particular, the transfer water agreement, make it difficult to schedule water use at the needed times.

1.C. TOPOGRAPHY AND SOILS

1.C.1. Topography of the District and its Impact on Water Operations and Management

SEWD is located on the floor of the San Joaquin Valley in San Joaquin County with the City of Stockton lying at its western end. The City of Stockton is located at the confluence of the San Joaquin and Calaveras Rivers on the eastern edge of the Sacramento-San Joaquin Delta. Westerly portions of the City of Stockton are slightly above sea level. SEWD extends 15 miles into the adjoining easterly foothills along the alignment of the Calaveras River.

The land slopes gently upward as it extends to the east, comprised of basin soils, recent alluvial fans, and flood plain soils to an elevation of approximately 100 feet at the edge of the foothills of the Sierra Nevada. The eastern boundaries of SEWD are bordered by the adjoining foothills, which rapidly narrow the width of the district to the extent of the irrigable land lying along the Calaveras River within the foothills. SEWD extends along the Calaveras River for approximately 8 to 9 additional miles to the County line, between Calaveras, Stanislaus, and San Joaquin Counties, rising in elevation to approximately 170 feet.

The primary topographic difference between the Calaveras River and Stanislaus River watersheds is their elevation, which impacts the timing of surface water availability. Most of the Stanislaus River watershed lies in the upper elevations of the Sierra Nevada (over 7,000 ft mean sea level (msl)), where there is abundant snow melt in the spring and summer months. In contrast, the headwater elevations in the Calaveras River watershed are about 5,000 ft msl, and precipitation throughout the watershed is most often in the form of rainfall during the winter and spring months. Thus, releases from New Hogan Reservoir along the Calaveras River are often required for flood control purposes prior to or early in the irrigation season, resulting in a loss of stored water that is not replenished by spring snowmelt. See Section 1.D. for additional discussion.

1.C.2. District Soil Association Map

The major soil texture classes within SEWD are summarized in Figure 1-2 and Table 1-13. Much of the western portion of the District is comprised of clay, clay loam, and other soil types. The eastern portion of the district is dominated by loam, sandy loam, and gravelly loam soils. See Attachment A for soil maps.

1.C.3. Agricultural Limitations Resulting from Soil Problems

SEWD does not have soil problems that affect water operations or management (Table 1-14).

1.D. CLIMATE

1.D.1. General Climate of the District Service Area

SEWD is located in the heart of the fertile Central Valley of California and has a semi-arid climate featuring hot, dry summers and mild winters. Table 1-15 provides a summary of average historical weather and climate data obtained from the California Irrigation Management Information System (CIMIS) and the National Oceanic and Atmospheric Administration's - National Centers for Environmental Information (NOAA-NCEI). Average monthly temperatures in SEWD range from 45.9 °F in January to 77.4 °F in July, with a mean annual temperature of 61.7 °F. The average annual precipitation is 13.7 inches, consisting entirely of rainfall. The average annual grass reference evapotranspiration (ET_o) is 52.4 inches.

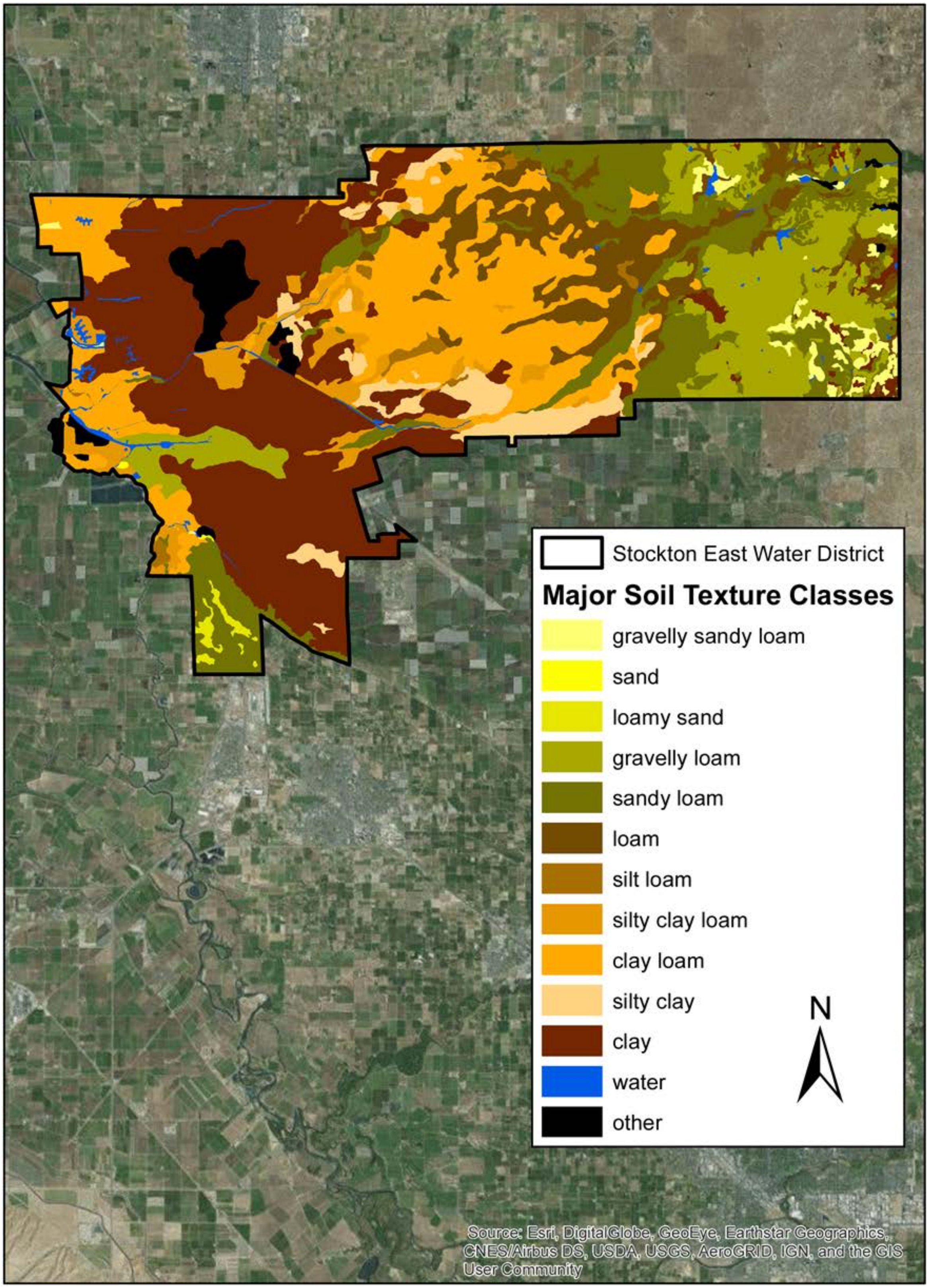


Figure 1-2. Major Soil Texture Classes Within the SEWD Service Area Boundaries.

Table 1-13. Major Soil Texture Classes in SEWD (Representing Areas Greater than 1,000 Acres).

Soil Texture	Map Unit Name	Area (acres)	Percent of Total Area (%)
Clay Loam	Archerdale clay loam, 0 to 2 percent slopes	12,439	9%
Loam	Cogna loam, 0 to 2 percent slopes	11,953	8%
Gravelly Loam	Redding gravelly loam, 0 to 8 percent slopes, dry, MLRA 17	8,079	6%
Clay Loam	Finrod clay loam, 0 to 2 percent slopes	6,459	5%
Silty Clay	Hollenbeck silty clay, 0 to 2 percent slopes	5,495	4%
Clay	Stockton clay, 0 to 2 percent slopes	4,388	3%
Sandy Loam	Pentz sandy loam, 15 to 50 percent slopes	3,443	2%
Fine Sandy Loam	Columbia fine sandy loam, drained, 0 to 2 percent slopes	3,164	2%
Gravelly Loam	Redding gravelly loam, 1 to 30 percent slopes, dry, MLRA 17	2,185	2%
Sandy Loam	San Joaquin sandy loam, 0 to 2 percent slopes	2,161	2%
Sandy Loam	San Joaquin sandy loam, 2 to 5 percent slopes	1,958	1%
Clay	Jacktone clay, 0 to 2 percent slopes	1,896	1%
Clay	Galt clay, 0 to 1 percent slopes, MLRA 17	1,887	1%
Silty Clay Loam	Vignolo silty clay loam, 0 to 2 percent slopes	1,830	1%
Other	Pentz-Redding complex, 2 to 15 percent slopes	1,736	1%
Clay Loam	Boggiano clay loam, 0 to 2 percent slopes	1,689	1%
Other	Keyes-Redding complex, 2 to 8 percent slopes	1,645	1%
Other	Keyes-Bellota complex, 2 to 15 percent slopes	1,616	1%
Other	Pentz-Bellota complex, 2 to 15 percent slopes	1,406	1%
Fine Sandy Loam	Cogna fine sandy loam, 0 to 2 percent slopes, overwashed	1,399	1%
Clay	Peters clay, 2 to 8 percent slopes	1,223	1%
Silty Clay Loam	Stockton silty clay loam, 0 to 2 percent slopes, overwashed	1,072	1%
Miscellaneous	Other	64,177	45%
Total	All	143,300	100%

Table 1-14. Agricultural Limitations Resulting from Soil Problems.

Soil Problem	Estimated Area (acres)	Effect on Water Operations and Management
Salinity	0	N/A
High-water table	0	N/A
High or low infiltration rates	0	N/A
Other (define)	0	N/A

Table 1-15. General Climate of the District Service Area.

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg. Precip.[a] (in)	2.8	2.2	2.0	1.2	0.4	0.1	0.0	0.0	0.2	0.7	1.7	2.3	13.7
Avg. Temp.[a] (°F)	45.8	50.6	54.5	59.5	66.2	72.6	77.2	75.9	72.6	64.3	53.4	46.0	61.5
Max. Temp.[a] (°F)	54.2	60.9	66.3	73.1	81.2	88.8	94.3	92.7	88.4	78.6	64.7	54.4	74.8
Min. Temp.[a] (°F)	37.7	40.4	42.8	46.3	51.7	57.0	60.5	59.8	57.0	50.2	42.3	37.5	48.6
Avg. ETo[b] (in)	1.1	1.9	3.5	5.0	6.7	7.7	8.0	7.1	5.2	3.4	1.7	1.1	52.4

[a] Source: Stockton Metro Airport (WBAN:23237), NOAA-NCEI, period of record: 1948-2019.
[b] Source: Manteca (#70), CIMIS station, period of record: 1987-2019.

Weather station ID: Stockton Metro Airport (WBAN:23237) NOAA-NCEI
Data period: 1948-2018
Average wind velocity (ft/s): 7.9
Average annual frost-free days[3]: 359

Weather station ID: Manteca (#70), CIMIS Station
Data period: 1987-2018
Average wind velocity (ft/s): 6.7
Average annual frost-free days[3]: 357

1.D.2. Impact of Microclimates on Water Management within the Service Area

Given the topography and size of the irrigation service area, microclimates do not impact water management within the service area. However, as described below, the topography of the Calaveras River watershed significantly affects the water supply for the District.

The primary difference between the microclimates of the Calaveras River and Stanislaus River watersheds is their elevation. As described in Section 1.C, most of the Stanislaus River watershed lies in the upper elevations of the Sierra Nevada and receives abundant snowfall, whereas the lower elevations of the Calaveras River watershed rarely receive precipitation in the form of snow. Because of the lack of snow storage in the Calaveras River watershed, New Hogan Dam operations are more difficult because releases often need to be made for flood control purposes, which are not replenished by spring snowmelt. Water that would otherwise be stored is released downstream even in very dry water years.

The Stanislaus River flows are derived largely from snowmelt. Any decrease in snow storage resulting from climate change would thus have a significant impact on Stanislaus River flows and New Melones Dam storage. The Calaveras River flows are derived entirely from rainfall; therefore, the Calaveras River water supply would not be affected by a decrease in snow storage. Nevertheless, other climate changes (e.g., less rainfall) would affect both water supply sources.

[3]Frost-free days are defined as days with temperatures greater than 28 °F, based on "hard freeze" criteria (NWS, 2018).

1.E. NATURAL AND CULTURAL RESOURCES

1.E.1. Natural Resource Areas within the Service Area

Natural resource areas within the SEWD service area are summarized in Table 1-16. SEWD's past and present efforts to manage these resources are described below.

Table 1-16. Natural Resource Areas within the Service Area.

Name	Estimated Area (acres)	Description
Farmington Canal Wetland Mitigation Area	9.9	wetland habitat
Giant Garter Snake Mitigation Area	1.0	giant garter snake habitat
Calaveras River Habitat Conservation Plan	531	Calaveras River and Mormon Slough, Central Valley steelhead critical habitat

1.E.2. Description of District Management of these Resources in the Past or Present

The Farmington Canal Wetland and Giant Garter Snake Mitigation Areas were designed to offset the impacts of the New Melones Conveyance project to wetlands and the giant garter snake habitat. Both sites are outside of SEWD, but on district property. The sites were constructed at a 2:1 ratio of wetland habitat created to wetland impacted. The giant garter snake site uses one-third of an acre-foot of flood control water. The site drains into CSJWCD.

In March 1998, the National Marine Fisheries Service (NMFS) (also known as NOAA Fisheries) listed the Central Valley steelhead as a threatened species evolutionarily significant unit (ESU) under the Endangered Species Act. In March 2000, NOAA Fisheries designated the Calaveras River and Mormon Slough as critical habitat for the Central Valley steelhead ESU. Any actions that might harm the Central Valley steelhead or its habitat are restricted. Because this brought the entire management of the Calaveras River under review, SEWD immediately entered into a pre-informal consultation with federal and state regulators to begin discussing possible changes in the operation of New Hogan Dam and the Calaveras River water supply system.

To improve conditions for salmonids in the Calaveras River, SEWD is working with NOAA National Marine Fisheries Service (NMFS) through an Endangered Species Act Section 10 consultation. Conservation measures and an adaptive management plan are being developed as part of a Calaveras River Habitat Conservation Plan. The Calaveras River Habitat Conservation Plan will provide SEWD with legal permission to continue using the water resources of the Calaveras River for agricultural, municipal, and industrial purposes.

Since 2001, SEWD has voluntarily implemented several temporary fish passage improvements, including placing sandbags at road crossings to provide better depths and velocities for passage at these structures; installing a temporary Denil fish ladder at the Bellota Weir to allow fish access above the weir; installing a temporary barrier (i.e., net) at the head of the Old Calaveras River channel to prevent juveniles from entering and becoming stranded in the channel; and creating a sandbag wall on the Bellota Weir apron to direct flow into a lower fish ladder so that it would operate more effectively.

The District's Dam Removal Schedule is maintained on the SEWD website and provides information on the termination of irrigation season and when the winter weir and fish ladder is installed. A recent sample schedule is provided at: http://sewd.net/2016-preliminary-dam-removal-schedule/.

In an ongoing effort to improve fish passage through Mormon Slough and the Calaveras River, SEWD has participated with DWR for a fish passage study completed in 2007. As part of the study and in cooperation with U.S. Fish and Wildlife Service (USFWS) and DWR, SEWD identified four crossings to achieve the most improvement of fish passages. By 2013, fish passage improvements were completed at Budiselich Dam and Caprini Crossing.

The next projects are the Central California Traction Railroad (CCTR) Crossing (Figure 1-3) and the Hosie Crossing fish passage projects. In September 2015, USFWS provided a federal grant of $170,000 to SEWD to complete the design and implementation of fish passage improvements at CCTR Crossing and to begin coordinating efforts at Hosie Crossing. DWR completed the design of the CCTR Crossing fish passage project, and construction is tentatively scheduled for September 2019, pending issuance of permits from CVFPB and USACE. Additional CCTR Crossing project information is provided in Attachment O. Following construction of the CCTR project, the next phase will be designing the Hosie Dam fish passage project upstream of the Diverting Canal.

Figure 1-3. Central California Traction Railroad Crossing Fish Passage Project Site.

In 2019, CDFW awarded a grant to SEWD to begin design and environmental analysis for the Bellota Intake Fish Screen and Fish Passage Improvement Project. This project aims to protect, restore, and enhance anadromous fish habitat in California to aid the recovery of species. Among the top priorities in the California Water Action Plan is to provide fish passage and fish screening for intakes. The project includes removal of fish passage barriers, installation of fish screens, and construction of a fish bypass.

SEWD will continue to implement interim fish passage improvements until long-term fish passage and screening solutions are identified and put into operation. All of these studies have been, or are currently being, conducted to collect information that will aid in the design and management of the long-term conservation measures and adaptive management processes that will be incorporated into the Calaveras River Habitat Conservation Plan.

1.E.3. Recreational and/or Cultural Resources Areas within the Service Area

The City of Stockton features many neighborhood and community parks, the largest of which are described in Table 1-17. These parks offer an array of recreational facilities, sports complexes, and other amenities to serve the Stockton area community. The larger regional parks, such as Oak Grove and Micke Grove, are outside of the city limits as well as the SEWD boundaries.

Table 1-17. Recreational and/or Cultural Resource Areas within the Service Area.

Name	Estimated Area (acres)	Description
Parks in City of Stockton		
Oak Park	61	Located in central Stockton, this city park offers a large tennis complex, an ice arena, baseball and softball fields, pool, and senior citizen center.
Louis Park	60	Located on the San Joaquin River, this city park offers boat ramps and baseball and softball fields, as well as the Pixie Woods Amusement Park which features a carousel, train rides, and children's theater.
Buckley Cove Park	53	Located on the San Joaquin River, this city park offers a boat launch.
Other Community Parks	237	Other Community Parks in City of Stockton
Neighborhood Parks	215	Smaller neighborhood parks and greenspaces in City of Stockton (less than 15 acres each)
Specialty Parks	14	Other specialty parks (e.g. dog park, public school property)
Other Parks in SEWD		
Kennedy Memorial Park	18	Located just west of Highway 99 in southern Stockton, this county park features baseball fields, a basketball court and pool.
Giannone County Park	15	Located just west of Highway 99 in central Stockton, this county park features baseball and soccer fields, and a basketball court.

Source: City of Stockton, Envision Stockton 2040 General Plan, 2018.

The City of Stockton has designated two Historic Preservation Districts — the Magnolia Historic District and Doctor's Row District — and an area designated the "Old City," that is bounded by Harding Way, Wilson Way, Charter Way, and Pershing Avenue (City of Stockton, 2007). The City of Stockton has also designated four historical sites, 13 structures of merit, and 52 historic landmarks, of which two are identified as California Historic Landmarks and 17 are listed in the National Register of Historic Places (City of Stockton, 2018). In addition to resources identified by the City, the National Register and the California Register of Historic Landmarks also designate an additional four historical landmarks (City of Stockton, 2018). San Joaquin County has also designated a number of scenic roadways in the County, including portions of Interstate 5 in SEWD (San Joaquin County, 2016).

Most prehistoric settlement in San Joaquin County was focused along the San Joaquin, Cosumnes, and Mokelumne Rivers, and along the banks on high ground above marshy areas. Much of the historically significant resources are clustered around the City of Stockton downtown area. The evidence from previous survey work and site investigations in the area indicates that the prehistoric site types encompass the following:

- Surface scatters of lithic artifacts and debitage resulting from short-term occupation, and/or specialized economic activities, or long-term occupation.
- Bedrock milling stations, including mortar holes and metate slicks, in areas where suitable bedrock outcrops are present.
- Petroglyphs and/or pictographs.
- Isolated finds of cultural origin, such as lithic flakes and projectile points (City of Stockton, 2007).

1.F. OPERATING RULES AND REGULATIONS

1.F.1. Operating Rules and Regulations

The District Rules and Regulations are provided in Attachment B.

1.F.2. Water Allocation Policy (Agricultural Only)

SEWD's agricultural water allocation and delivery policies are provided in Attachment B (Rule 166, page 52) and are summarized below.

As water master of New Hogan Reservoir, SEWD assesses the water supply by April of each year. Riparian right users have first call on up to approximately 13,000 acre feet of water from New Hogan Reservoir pursuant to a settlement agreement. Through contract, the urban area is guaranteed 20,000 ac-ft of water if supplies are available (see Attachment L). Water is then allocated to all other surface water users.

As an initial assessment, if a water year is identified as a dry year based on CVP projections and DWR forecasts, SEWD asks its customers for voluntary reductions in use. If a second subsequent year is identified as a dry year, SEWD still requests voluntary reductions, but identifies these reductions as critical. A third subsequent dry year may result in continued voluntary reductions, or may require mandatory reductions SEWD makes this determination at the beginning of the water year. New Hogan Reservoir generally has sufficient water to withstand two to three dry years.

The District informs its customers of the available water supply, and any need for reductions, through its newsletter, as-well-as postcard reminders and the SEWD website. A final option is to allow diversions only by riparian users and the water treatment plant. In all water years, SEWD requires that its customers call the District in advance of diverting water so that SEWD can adjust releases at the dam.

Customers are required to provide the following information 48 hours in advance of the diversion: location of diversion, name of owner or operator, beginning diversion time, pumping rate, and ending diversion time. The District may enforce penalties on customers who do not advise the District prior to their water use. The postcard reminds customers of this penalty and official and actual lead times necessary for water orders and shut-off.

Under the current Reclamation operation of New Melones Dam, SEWD is also provided with up to 75,000 ac-ft of water from New Melones Reservoir. New Melones Dam releases are controlled by Reclamation CVP allocations. In any year that Reclamation determines there to be a shortage of available water, Reclamation has the right to reduce the quantity of water delivered to each contractor capable of receiving New Melones supply, as necessary, to meet the needs of all Basin contractors.

In total, approximately 152,000 ac-ft to 161,000 ac-ft from all sources is required to supply enough water to meet agricultural demand in SEWD for a full irrigation season, including both surface water and groundwater, based on 3 foot per acre irrigation practice for primary crops grown in the area within the district boundary.

1.F.3. Official and Actual Lead Times Necessary for Water Orders and Shut-Off

SEWD has a mandatory call-in program for water orders and requires at least 48 hours' notice. The District may enforce penalties on customers who do not advise the District prior to their water use, including issuing citations and fines. Customers are reminded of this penalty and advised of official and actual lead times necessary for water orders and shut off. See SEWD Rule 120 in Attachment B (page 22) for more detailed information.

1.F.4. Policies Regarding Return Flows (Surface and Subsurface Drainage from Farms) and Outflow

Soils within SEWD boundaries are permeable, so most irrigation tail water penetrates rapidly beyond the root zone of the crops and presents no problems during the irrigation season. Some drainage water collects in open farm ditches and flows to natural waterways where it is reused for irrigation. Present drainage practices present no problems to agriculture.

1.F.5. Policies on Water Transfers by the District and its Customers

Transfer water policy is in Section 6 of the District Act establishing SEWD. The policy specifies that SEWD can sell water outside the district as long as the SEWD water users' needs are met first and water is available. Further details are provided in Attachment P.

Customers are not allowed to transfer water to other users.

1.G. WATER MEASUREMENT, PRICING, AND BILLING

1.G.1. Agricultural Customers

a. Number of delivery points (turnouts and connections) 224 (170 active turnouts)
b. Number of delivery points serving more than one farm 0
c. Number of measured delivery points (meters and measurement devices) 218 (all active measured)
d. Percentage of delivered water that was measured at a delivery point 95 (estimate)
e. Total number of delivery points not billed by quantity 0
f. Delivery point measurement device table Table 1-18

Table 1-18 summarizes the agricultural delivery point measurement devices installed at active and inactive turnouts, as of 2018. In 2018, SEWD had a total of 224 agricultural delivery connections, of which 202 are measured with McCrometer propeller meters (or similar propeller meters).

The remaining measured connections are equipped with PG&E meters or hour meters, which use an equation to calculate volumes (see Attachment Q.4.). Many of these connections have been surveyed for retrofit with propeller meters. However, the plumbing configurations of these connections do not provide room for these measurement devices. In the next five years, these connections will be assessed for viable repairs and to explore other types of measuring devices to volumetrically quantify deliveries to the required accuracy.

Table 1-18. Agricultural Delivery Point Measurement Devices, Active and Inactive (2018).

Measurement Type	Number	Accuracy (+/- %)	Reading Frequency (Days)	Calibration Frequency (Months)	Maintenance Frequency (Months)
Orifices	0				
Propeller meter	202 (156 active)	+/- 6%[a]	30	As needed	As needed
Weirs	0				
Flumes	0				
Venturi	0				
Metered gates	0				
Acoustic doppler	0				
Other: Hour meters	16 (14 active)	+/- 25-30%[b]	30	As needed	As needed
Total	218 (170 active)				

[a] New meter technology ensures accuracy +/-6% with calibration as needed. See example of factory certification in Attachment C.
[b] The plumbing configurations of these connections do not provide room for propeller meters. In the next five years, these connections will be assessed for viable repairs and to explore other types of measuring devices to volumetrically quantify deliveries to the required accuracy.

Currently, the District charges a fixed non-metered rate of 2.8 ac-ft per acre for non-metered delivery locations. The fixed rate charges are based on the irrigated acreage that is self-reported by the customer on the Owner's Water Use Statement (OWUS). The OWUS is completed by each grower and submitted to the District in January of each calendar year. A sample OWUS is provided in Attachment N.

All connections without a measurement device are inactive as of 2019. Meters will be installed if these connections become active. See Section 3.A for additional information.

1.G.2. Urban Customers

a. Total number of connections 3
b. Total number of metered connections 3
c. Total number of connections not billed by quantity 0
d. Percentage of water that was measured at delivery point 100
e. Percentage of delivered water that was billed by quantity 100
f. Delivery point measurement device table Table 1-19

Table 1-19 summarizes the delivery point measurement devices installed at SEWD's urban connections. SEWD is under contract to supply wholesale treated surface water from DJW WTP to Cal Water, the City of Stockton, and San Joaquin County. Drinking water is retailed to Stockton area customers by these three urban contractors. SEWD does not own or operate an urban distribution system.

1.G.3. Agricultural and Urban Rates

a. Current year agricultural and/or urban water charges - including rate structures and billing frequency.

See Attachment D.2. for the 2018 and 2019 rate ordinances (Ordinance No. 44 and 45, respectively).

Table 1-19. Urban Delivery Point Measurement Devices (2018).

Meter Size and Type	Number	Accuracy (+/- percentage)	Reading Frequency (Days)	Calibration Frequency (Months)	Maintenance Frequency (Months)
5/8-3/4"					
1"					
1 ½"					
2"					
3"					
4"					
6"					
8"					
10"					
Compound					
Turbo					
Other[a]	3 (all active)	+/- 6%	annual	annual	annual
Total	3 (all active)				

[a] Two pipelines (24-inch and 42-inch) deliver water to south City of Stockton, as measured by one meter, and a third pipeline (48-inch) delivers water to north City of Stockton, as measured by a second meter. A 42-inch pipeline delivers water to Cal Water and is measured by a third meter. The City of Stockton wheels water to San Joaquin County.

b. Annual charges collected from urban and agricultural customers

Table 1-20 provides a summary of the annual charges collected from urban and agricultural customers in 2018, including both fixed and volumetric charges. SEWD does not sell agricultural and domestic groundwater to its customers, but instead issues assessment fees for the use of the wells as part of their mandate to protect the groundwater supply. The domestic groundwater assessment is based on domestic use units (wells). The agricultural groundwater assessment is $5.23 per ac-ft, assuming 2.8 ac-ft per acre of irrigated land. The assessment volume represents the average estimated consumptive use of irrigation water by groundwater-irrigated crops in the district. The assessment charges are based on the irrigated acreage that is self-reported by the customer on the Owner's Water Use Statement (OWUS). The OWUS is completed by each grower and submitted to the District in January of each calendar year. A sample OWUS is provided in Attachment N.

See Attachment D.1. for a 2018 sample District bill.

c. Description of the contractor’s record management system

The District employs field-metering staff to keep accurate records of each irrigation delivery meter’s calibration, and to monitor the meters at the 54-inch Bellota Pipeline and at the DJW WTP on a daily basis. Irrigation delivery meters are read on a monthly basis from mid-April through mid-October.

Table 1-20. Annual Charges Collected from Urban and Agricultural Customers (2018).

Charge Type	Customer Type	Water Type	Charge per Unit	Units Billed	Charges Collected
Fixed	Urban	Domestic groundwater	$44.00/domestic use unit	6,159	$270,996
	Agricultural	Surface water	$23.00/ac-ft	2,830[a]	$65,097
		Agricultural groundwater	$5.23/ac-ft[b,c]	137,417[a]	$718,689
Volumetric	Urban	Municipal groundwater	$325.92/ac-ft[d]	8,066	$2,628,740
	Agricultural	Metered surface water	$23.00/ac-ft	21,077[a]	$484,766
		Metered groundwater	$5.23/ac-ft[b,c]	5,867[a]	$30,687
		Surface Water, Out of District	$100/ac-ft	5,667[e]	$566,697

[a] Source: SEWD 2018 Crop Report, May 2019.

[b] SEWD does not sell agricultural groundwater to its customers; SEWD assesses the use of the wells, based on acreage, as part of their mandate to protect the groundwater supply.

[c] Groundwater assessments calculated based on 2.8 ac-ft/ac of irrigated land.

[d] Based on a water use rate of $3.60/ac-ft plus a rate equalization charge of $322.32/ac-ft.

[e] Source: 2018 Agricultural Surface Water Report.

SEWD's agricultural water use records contain information on the location, acres irrigated, gate numbers, meter numbers, water usage, crops irrigated, and miscellaneous information on growers' equipment and water history.

Information regarding crop types, irrigation methods, acres fallowed/not irrigated, acres irrigated with groundwater, acres irrigated with surface water, and a statement of non-agricultural irrigation water use are requested as part of the District billing process and submitted by each grower on the OWUS (see Attachment N). This information is submitted by the irrigator under penalty of perjury.

Agricultural water use and information regarding crop types, irrigation methods, acres fallowed/not irrigated, acres irrigated with groundwater, acres irrigated with surface water, and non-agricultural irrigation water uses are all accounted in the District's Annual Crop Report. These records are entered and managed in Microsoft® Excel. New Melones and New Hogan surface water supplies are accounted in the District's Annual Agricultural Surface Water Report (agricultural use) and in the metered inflows to the DJW WTP, including inflows to percolation ponds, and metered outflows to the urban contractors (urban use).

1.H. WATER SHORTAGE ALLOCATION POLICIES

1.H.1. Current Year Water Shortage Policies or Shortage Response Plan

SEWD's agricultural water allocation policies and water shortage plan are described in Section 1.F of this Water Management Plan. Additional detail is also provided in the District's Drought Management Plan (Attachment E.1). This plan documents SEWD's compliance with the requirements established by DWR and Governor Brown's April 1, 2015 Executive Order B-29-15.

In summary, SEWD serves as water master of New Hogan Reservoir and is responsible for assessing water supply and managing allocations. In all years, riparian right users have first access to a maximum of 13,000 acre feet of water from New Hogan Reservoir pursuant to a settlement agreement. Through contract, the urban area is guaranteed 20,000 ac-ft of water if supplies are available. Water is then allocated to all other surface water users.

New Hogan Reservoir generally has sufficient water to withstand two to three dry years. During an initial dry year following a period of wet years, SEWD asks its customers for voluntary reductions in use. If a second subsequent year is identified as a dry year, SEWD still requests voluntary reductions, but identifies these reductions as critical. A third subsequent dry year may result in continued voluntary reductions, or may require mandatory reductions SEWD makes this determination at the beginning of the water year.

The District's Urban Water Shortage Plan is provided in Attachment E.2.

1.H.2. Current Year Policies that Address Wasteful Use of Water and Enforcement Methods

SEWD's Rule 120 establishes a mandatory 48-hour notification requirement for any person desiring to divert surface water provided by the district. The stated objective of this rule is to avoid waste of surface water. This rule establishes penalties for customers who do not properly request water or who do not inform the district of their cessation of use. The District may send a warning notification and/or a notification failure, impose fines, and lock-off water service, as determined by the Board of Directors in their sole discretion. A penalty of $100 is assessed for the first failure to notify; $200 for the second; and $500 for each subsequent failure (see Attachment B, page 22).

No procedures have been established for wasting water once the customer diverts the water, as customers pay for water received, and would not be expected to waste it.

1.I. EVALUATE POLICIES OF REGULATORY AGENCIES THAT AFFECT THE CONTRACTOR AND INHIBIT GOOD WATER MANAGEMENT

SEWD has two water contracts that have different contract water years. These differing water years have posed challenges to annual water use planning and scheduling. See Section 1.B.7 for additional detail. For ease of scheduling and providing the most economical water for its customers, SEWD continues to negotiate for a standard contract year.

The current Water Qualtiy Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary by the State Water Resrouces Control Board (dated December 12, 2018) and the resulting voluntary agreement process will have a significant impact on the operation of New Melones Reservoir, affecting water availability and reliability for SEWD. The potential reduction will force additional groundwater usage, which is contraray to the intent of SGMA. The phased approach could also potentially affect the Calaveras River flow, creating a larger impact on SEWD.

SECTION 2: INVENTORY OF WATER RESOURCES

2.A. SURFACE WATER SUPPLY

2.A.1. Surface Water Supplies Imported and Originating within the Service Area

The monthly surface water supplies available to SEWD are summarized in the Section 5 Water Inventory Tables (Table 5-1). In 2018, SEWD received both federal agricultural water and federal non-agricultural water from New Hogan and New Melones Reservoirs. No other surface water supplies were imported into the District.

2.A.2 Amount of Water Delivered to the District by each of the District Sources for the Last 10 Years

The annual surface water supplies available to the District between 2009 and 2018 are summarized in the Section 5 Water Inventory Tables (Table 5-10). Both the source and volume are provided for each delivery.

2.B. GROUNDWATER SUPPLY

2.B.1. Groundwater Extracted by the District and Delivered

Monthly groundwater volumes extracted and delivered by the District and private users are summarized in the Section 5 Water Inventory Tables (Table 5-2).

2.B.2. Groundwater Basin that Underlies the Service Area

SEWD is a conjunctive use District and overlies the Eastern San Joaquin Groundwater Basin[4] (Table 2-1). The Eastern San Joaquin basin encompasses 1,195 square miles (764,800 acres), generally bounded by Highway 99, Jack Tone Road, Mokelumne River and Temple Creek, and has an estimated sustainable yield of approximately 715,000 ac-ft/yr (Eastern San Joaquin Groundwater Authority, 2019).

Table 2-1. Groundwater Basin that Underlies the Service Area.

Name	Area (sq. mi.)	Usable Capacity (ac-ft)	Sustainable Yield (ac-ft/yr)
Eastern San Joaquin Groundwater Basin	1,195	See Attachment F	715,000

2.B.3. Map of District-Operated Wells and Managed Groundwater Recharge Areas

District Maps of Groundwater Facilities are included in Attachments A.1. and A.3.

The District currently has five wells located at the DJW WTP site that are used for emergency purposes only, such as during dry years when surface water supplies are reduced. All other wells in the district are privately owned. If groundwater is needed to supplement surface water, it is blended with surface water from the District for processing through the DJW WTP and is subsequently delivered to the City of Stockton, San Joaquin County, and Cal Water for urban distribution.

[4] Groundwater basin number 5-022.01, part of the San Joaquin Valley Groundwater Basin, as defined by DWR Bulletin 118 (DWR, 2003) and updated in 2016.

The primary effort for managed groundwater recharge in SEWD using dedicated groundwater recharge areas is from the Farmington Groundwater Recharge Program. This program is led by SEWD in partnership with the Sacramento division of the USACE. The goal of the program is to recharge an average of 35,000 acre-feet of water annually into the Eastern San Joaquin Basin, in part by directly recharging surface water to the groundwater aquifer. Available surplus water from SEWD's conveyance system is diverted into recharge cells at the project site, enabling recharge largely through field-flooding.

In 2003, SEWD completed the Pilot Phase of the Program, which consisted of 60 acres of recharge ponds and fields adjacent to the DJW WTP. Recharge rates at these ponds currently average over 0.5 feet per day, with an average annual recharge of approximately 3,700 ac-ft per year between 2013 and 2018. The Demonstration Phase, which began in 2003, aimed to obtain 25 to 30 parcels of land, totaling 1,200 acres, for directly recharging surface water to the groundwater aquifer. District construction of an additional 35 acres of recharge ponds at the DJW WTP is in the planning stages.

Additional information regarding the Farmington Groundwater Recharge Program is provided in Sections 2.B.4 and 2.B.5.

2.B.4. Description of Conjunctive Use of Surface and Groundwater

SEWD promotes conjunctive use of surface and groundwater through efforts to increase groundwater recharge and to encourage in-lieu recharge by providing surface water deliveries to irrigators as an alternative to private groundwater pumping. The overarching goals of the conjunctive use programs in SEWD include reversing groundwater overFinal and salinity intrusion, protecting water quality, meeting the challenges of climate change, and providing a sustainable water supply.

Across the Eastern San Joaquin Groundwater Basin, groundwater levels have decreased at the rate of 0.5 ft per year between 1996 and 2015 (Eastern San Joaquin Groundwater Authority, 2019). Since the early 1960s, hydrographs for wells underlying SEWD east of Stockton show a long-term average decline in groundwater of nearly 1.0 ft per year.

Recent analysis of historical groundwater conditions in the 2019 Eastern San Joaquin Final Groundwater Sustainability Plan (GSP) has estimated that the historical groundwater storage in the basin decreased by an average of 41,000 ac-ft per year between 1996 and 2015. The same plan estimates that approximately 78,000 ac-ft per year of increased groundwater recharge and/or reduction in groundwater extraction is required to achieve sustainability over the next 50 years.

Recent drought conditions reemphasize the importance of recharge from surface water supplies for the Eastern San Joaquin Groundwater Basin to be operated sustainability, as required by the enactment of the Sustainable Groundwater Management Act of 2014 (SGMA). In its efforts to achieve this basin-wide sustainability goal, SEWD is promoting conjunctive use of surface and groundwater through efforts to increase groundwater recharge and to encourage in-lieu recharge..

The Final Eastern San Joaquin Groundwater Basin GSP shows that seepage and deep percolation of SEWD's surface water supply serves as a significant source of recharge to the groundwater subbasin. Thus, management of surface water resources by SEWD and its irrigation customers is crucial for achieving the basin's sustainability goals. SEWD is and will continue to actively work with others within San Joaquin County to comply with SGMA. In addition to its own water management practices, SEWD will work with local interests to develop the tools needed to achieve long-term groundwater sustainability by identifying additional ways to maximize local water supplies, enhance conjunctive management practices, and recharge the groundwater system.

At present, groundwater recharge within SEWD is furnished largely by regulated releases from New Hogan Reservoir down the Calaveras River. These releases are regulated by SEWD to achieve the greatest beneficial use for the district. In the 1960s, check dams were built on the Calaveras River, Mormon Slough, and Mosher Creek to promote groundwater recharge from percolation. Measurements made by Murray, Burns & Kienlen (now MBK Engineers) for a water rights study of the Calaveras River system indicate that there is an average percolation of 6 cfs between New Hogan Dam and Jenny Lind, and more than 7 cfs between Jenny Lind and Bellota (Murray, Burns & Kienlen, 1969). Without the check dams in place, the percolation along Mormon Slough and the old Calaveras River below Bellota is 13 cfs each; with the check dams in place, the percolation rates increase to 19 cfs and 31 cfs, respectively.

Assuming that the check dams are in place and full for the maximum period permitted (213 days) and that sufficient water is flowing in the channels, the maximum annual percolation is 34,000 ac-ft, of which approximately 29,000 ac-ft percolates below Bellota. Water is not available for recharge during the maximum period during average years. Recharge for an average year is estimated at 26,000 ac-ft of which approximately 21,000 ac-ft percolates below Bellota.

SEWD also provides groundwater recharge through the Farmington Groundwater Recharge Program, which was initiated in 2003 following a series of studies that identified groundwater overFinal as a problem in Eastern San Joaquin County. The Farmington Dam and Reservoir Conjunctive Use Study, completed in 1998, evaluated potential structural and operational changes at Farmington Dam and found that long-term storage at Farmington Reservoir does not appear to be cost-effective. However, operations modifications to Farmington Dam and construction of groundwater recharge facilities appeared to be cost-effective. The Conjunctive Use Study recommended that the feasibility of groundwater recharge with integrated seasonal waterfowl habitat areas in eastern San Joaquin County be evaluated.

The 2001 Farmington Groundwater Recharge and Seasonal Habitat Study, prepared by SEWD in conjunction with the USACE and other local agencies, resulted from these concerns. This feasibility-level study was developed to determine the potential for development of integrated groundwater recharge and seasonal habitat improvements in Eastern San Joaquin County.

Conclusions of the study became the outline for the first phase of the subsequent Farmington Groundwater Recharge Program, launched in 2003, which plans for implementation of the flooded-field groundwater recharge technique on up to 1,200 acres for an average water recharge of approximately 35,000 ac-ft per year. The Pilot Phase of the program, completed in 2003, consists of 60 acres of recharge ponds and fields that have provided an average annual recharge of approximately 3,700 ac-ft per year between 2013 and 2018.

In addition to direct groundwater recharge, the estimated in-lieu recharge in SEWD is approximately 76,000 ac-ft per year, as of 2013 (DWR, 2013).

Analysis shows that seepage and deep percolation of much of SEWD’s surface water supply serves as a major source of recharge to the groundwater subbasin. Thus, management of surface water resources by SEWD and its irrigation customers is crucial for achieving the basin’s sustainability goals. SEWD is and will continue to actively work with others within San Joaquin County to comply with SGMA. In addition to its own water management practices, SEWD will work with local interests to develop the tools needed to achieve long-term groundwater sustainability by identifying additional ways to maximize local water supplies, enhance conjunctive management practices, and recharge the groundwater system

2.B.5. Groundwater Management Plan

The Eastern San Joaquin Final Groundwater Sustainability Plan is provided in Attachment F.

As a GSA in the Eastern San Joaquin Groundwater Basin, SEWD plans to implement two in-lieu recharge projects described in the Final GSP (Attachment F, Section 6). The first planned project is the Lake Grupe In-lieu Recharge project, in which a surface water diversion turn-out would be constructed on the Calaveras River upstream of Bellota and used to supply surface water to an estimated 2,500 acres of orchard crops currently using groundwater. The second planned project is the Surface Water Implementation Expansion project, in which SEWD would encourage landowners adjacent to surface water conveyance systems to utilize surface water as part of the SGMA implementation, effectively increasing surface water usage by about 18,000 to 20,000 ac-ft/year with in-lieu groundwater recharge benefits.

Additionally, SEWD has proposed one potential project, the Farmington Dam Repurpose project, that would increase the reservoir capacity from 52,000 ac-ft of flood control storage to 112,000 ac-ft of combined water supply and flood control storage. This additional supply could be stored and used even in drought conditions and could also be used to encourage surface water irrigation.

2.B.6. Groundwater Banking Plan

SEWD actively pursues any possible groundwater banking activities.

The Farmington Groundwater Recharge Program is one program led by SEWD in partnership with the Sacramento division of the USACE and aims to identify areas suitable for recharge and seasonal habitat development, evaluate recharge techniques, and conduct pilot recharge tests. SEWD and the USACE, in a cost-share agreement, created the program with the intent of replenishing the aquifer to help ensure future groundwater supply and protect against further saltwater intrusion in the Eastern San Joaquin County Basin.

In 2003, SEWD completed the Pilot Phase of the Farmington Groundwater Recharge Program, which consisted of 60 acres of recharge ponds and fields adjacent to the DJW WTP. This project was awarded the American Society of Civil Engineers Water/Environmental Project of the Year in 2003 and the San Joaquin Council of Government’s Regional Excellence award in 2004.

SEWD is continuing to identify and develop new recharge sites for this phased program. Available surplus water from SEWD’s conveyance system is diverted into recharge cells at the project site. Stored surface water would be pumped from the aquifer for agricultural, municipal, and industrial use. Recharge afforded by this program averaged approximately 3,700 ac-ft between 2013 and 2018.

See Attachment G for a program brochure and the most recent newsletter, which gives an overview of the program. Additional information is provided at: http://www.farmingtonprogram.org/.

2.C. OTHER WATER SUPPLIES

2.C.1. “Other” Water Used as Part of the Water Supply

Other water supplies used by SEWD are summarized in the Section 5 Water Inventory Tables (Table 5-1).

In the past, SEWD has obtained transfer water from OID and SSJID. In 2019, SEWD obtained a 1,000 ac-ft of water transfer from OID and SSJID. Future water transfers will be based on the water year and water availability.

2.D. SOURCE WATER QUALITY MONITORING PRACTICES

2.D.1. Potable Water Quality (Urban Only)

SEWD supplies wholesale treated drinking water from the DJW WTP to three urban contractors – Cal Water, the City of Stockton, and San Joaquin County – that retail this water to Stockton area customers. Water quality reports for the outflows from and inflows to the DJW WTP are provided in Attachments H.1. and H.2., respectively.

2.D.2. Agricultural Water Quality Concerns

Yes _______ No __X__

There are no current surface water quality problems that limit the use of surface water as an agricultural or potable water supply. However, in the past *Phytophthora* fungus has been identified in the Calaveras River water and is of concern to some irrigators. *Phytophthora* originates on land but is spread through water and can cause root rot, crown rot, and the decline and death of fruit and nut trees. Thus, there is concern among growers regarding the use of surface water for their crops and orchards. *Phytophthora* could be a limiting factor regarding the use of surface water for irrigation of affected permanent crops.

While groundwater quality in the Eastern San Joaquin Subbasin is generally sufficient to meet beneficial uses, a number of constituents of concern are either currently impacting groundwater use or have the potential to impact it in the future. These include salinity, nitrate, arsenic, and point-source contamination from generally anthropogenic sources (e.g. petroleum hydrocarbons, solvents, and emerging contaminants). In its role as a GSA in the Eastern San Joaquin Groundwater Basin, SEWD is helping to establish guidelines for efforts to preserve groundwater quality with other various stakeholders as part of the Eastern San Joaquin GSP development. See Attachment F for additional details.

Extensive groundwater pumping has caused declining aquifer water levels, which have contributed to movement of saline water eastward from under the Delta since the 1940s (DWR, 1967 and Eastern San Joaquin Groundwater Authority, 2019). Groundwater degradation has been particularly evident in the Stockton area, where groundwater chloride concentrations at some wells have exceeded 250 milligrams per liter (mg/L) – the EPA's (Environmental Protection Agency) secondary maximum contaminant level used to identify salinity concerns (Eastern San Joaquin Groundwater Authority, 2019). It is expected that additional surface water from New Melones Reservoir and other sources used in groundwater recharge efforts will stabilize the movement of the saline water.

Since the 1970s, elevated concentrations of arsenic have been observed in groundwater within the Stockton area, with several measurements exceeding the EPA's maximum contaminant level of 10 micrograms per liter (µg/L) (Eastern San Joaquin Groundwater Authority, 2019). Determining the source of arsenic in groundwater is a challenge as arsenic is both naturally occurring and used in human activities, such as agriculture. However, elevated arsenic concentrations have not been found to be related to groundwater management activities in the basin. SEWD will continue to monitor arsenic and other regulated and unregulated constituents of interest in its water supply.

Also since the 1970s, nitrate concentrations have increased in Stockton and surrounding agricultural areas, in some places exceeding 10 mg/L – the EPA's MCL for nitrate in drinking water sources. Two existing regulatory programs for monitoring and regulating nitrate in the Eastern San Joaquin Groundwater Basin include the Irrigated Lands Regulatory Program (ILRP) and Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS). The ILRP requires testing and potential mitigation for nitrate in domestic wells, while the 2017 Salt and Nitrate Management Plan developed by CV-SALTS identifies long-term nitrate management practices. As a GSA in this basin, SEWD supports these efforts.

2.D.3. Description of the Agricultural Water Quality Testing Program and the Role of Each Participant, Including the District, in the Program

SEWD began irrigation water quality monitoring for surface water at seven key points in the irrigation water conveyance system in 1997. On an annual basis SEWD samples eight offsite locations (Table 2-2) to test for typical water quality parameters important to agricultural irrigation, as described in Section 2.D.4. See Attachment H.2. for sample detailed reports for 2018. All results indicate a high-quality water supply that is suitable for irrigation of all crops grown in the District.

Table 2-2. Surface Water Quality Monitoring Program Sampling Locations.

Code	Monitoring Location
CR-1	New Hogan Reservoir
CR-5	Calaveras River at Bellota
MS-1	Beginning of Mosher Creek
MS-2	Mosher Creek after last irrigator
CR-6	Calaveras River after last irrigator
PC-1	Potter Creek after last irrigator
M-1	Mormon Slough after last irrigator
PP-1	Peters Pipe at Potter Creek siphon

The results are available on SEWD's web site (https://sewd.net/water-quality/) and upon request from the SEWD Water Quality Control Analyst:

Ed Morley
Water Quality Control Analyst
Post Office Box 5157
Stockton, CA 95205
209-948-0537
EMorley@sewd.net

2.D.4. Current Agricultural Water Quality Monitoring Programs by Source

The current agricultural and domestic water quality monitoring programs overseen by SEWD are summarized in Table 2-3.

SEWD's water quality lab staff monitor typical water quality parameters important to agricultural irrigation, including calcium, magnesium, potassium, sodium, carbonate, bicarbonate, sulfate, chloride, nitrate, boron, fluoride, pH, electrical conductivity, and turbidity. Sample test results during 2018 are summarized in Table 2-4.

SEWD staff also evaluate DJW WTP raw water influent for operational purposes, specifically monitoring cryptosporidium, total coliforms, Total Organic Carbon (TOC), Heterotrophic Plate Count (HPC).

Table 2-3. Current Agricultural Water Quality Monitoring Programs for Surface Water.

Analyses Performed	Frequency	Concentration Range	Average
Domestic Water Quality and Monitoring Regulations California Code Chapter 15, Title 22	As required by code	See Attachments H.1. and H.2.	See Attachments H.1. and H.2.
Agricultural Irrigation Suitability Test	Annual	See Attachment H.2., Table 2-5	See Attachment H.2.

Table 2-4. Sample Agricultural Water Quality Test Results for Parameters Monitored in SEWD Surface Water (2018).

Constituent	Units	Calaveras River at Bellota[a]	Stanislaus River, End of Pipeline[a]
Cations			
Calcium	mg/L	16	5
Magnesium	mg/L	6	2
Potassium	mg/L	2	1
Sodium	mg/L	5	2
Anions			
Carbonate	mg/L	<10	<10
Bicarbonate	mg/L	80	30
Sulfate	mg/L	10	1.6
Chloride	mg/L	4	<1
Nitrate	mg/L	<2	<2
Fluoride	mg/L	<0.1	<0.1
Other Constituents			
pH	std units	8.3	7.6
Electrical Conductivity	dS/m	0.2	0.1
Lab Turbidity	NTU	0.7	3.9

[a] FGL Environmental, Inorganic Chemicals Analysis, report dated July 20, 2018.

In general, groundwater quality within the Eastern San Joaquin Subbasin is suitable for municipal, industrial, and agricultural supplies. However, as discussed above, saline water has been moving eastward from the Delta as a result of declining water levels. Table 2-5 summarizes the District's groundwater quality monitoring programs.

SEWD provides a courtesy monitoring service for private well owners upon request. This service can include an assessment for potential groundwater quality issues and monitoring of groundwater specific conductance. Currently one well owner in French Camp requests the service due to the high salinity of groundwater in this area. Test results have ranged from 600 to 2,500 µmhos/cm (0.6-2.5 dS/m) with an average of 1,000 µmhos/cm (1 dS/m).

As required by code, SEWD also monitors water quality from District wells when used for M&I purposes. In an attempt to mitigate for reduced surface water supplies available for urban uses in 2015, the District pumped banked surface water from five wells located on District property at a total continuous pumping rate from 4,000 to 7,500 gpm. SEWD did not detect any contaminants in the pumped stored surface water.

Table 2-5. Current Water Quality Monitoring Programs for Groundwater.

Analyses Performed	Frequency	Concentration Range	Average
Specific Conductivity	As requested by well owner in the French Camp only. A high salinity area within SEWD.	600-2,500 µmhos/cm	1,000 µmhos/cm
Domestic Water Quality and Monitoring Regulations California Code Chapter 15, Title 22, District wells 74-01 & 74-02 (M&I use only)	As required by code	Included in DJW WTP outflow following mixing with surface water (Attachment H)	

2.E. WATER USES WITHIN THE DISTRICT

2.E.1. Agricultural

Agricultural water use to satisfy crop needs is summarized in the Section 5 Water Inventory Tables (Table 5-7).

2.E.2. Types of Irrigation Systems Used for Each Crop in Current Year

Table 2-6 summarizes the major irrigation methods currently used in the District for irrigating each crop. As described above, information regarding irrigation methods are requested from and submitted by irrigators in the OWUS as part of the District billing process.

Higher-efficiency sprinkler and low volume irrigation systems are most commonly used throughout the District, reflecting the rise in orchard and vineyard crops typically irrigated by these methods. Slight differences in irrigation system acreage and crop acreage may be due to double counting of areas where multiple systems are used, missing non-agricultural irrigated areas, and reporting of irrigation systems on land that has been idled or ripped and replanted, a process that may take several years.

2.E.3. Urban Use by Customer Type in Current Year

SEWD supplies wholesale treated drinking water from the DJW WTP to three urban contractors – the California Water Service Company (Cal Water), the City of Stockton, and San Joaquin County – that retail this water to Stockton area customers. Urban water use reported by each of these contractors is summarized in Tables 2-7 through 2-9.

2.E.4. Urban Wastewater Collection/Treatment Systems Serving the Service Area

Urban wastewater in the SEWD Service Area is collected and treated by the Stockton Regional Wastewater Control Facility (RWCF). The RWCF is a 55 MGD tertiary wastewater treatment facility owned and operated by the City of Stockton that collects and treats an average of 33 MGD of municipal wastewater generated within the City's wastewater service area (City of Stockton, 2016). In 2015, the RWCF produced over 23,000 ac-ft of treated wastewater. Historically, treated wastewater was released into the San Joaquin River, through which it entered the Sacramento/San Joaquin River Delta. Since 2017, City of Stockton has reused all treated wastewater, leaving no excess treated wastewater available for nearby agricultural use.

Table 2-6. Types of Irrigation Systems Used for Each Crop (2017[a]).

Crop name	Total Area (acres)	Level Basin (acres)	Furrow (acres)	Sprinkler[b] (acres)	Low Volume (acres)	Multiple methods[c] (acres)	Other (acres)
Alfalfa	409	0	313	71	24	0	0
Almonds	676	0	0	343	333	0	0
Apples	1,605	0	0	924	188	360	133
Apricots	27	0	0	27	0	0	0
Asparagus	20	0	8	0	0	12	0
Basil	5	0	0	0	3	0	2
Beans	753	0	198	128	0	381	46
Berries	25	0	0	21	5	0	0
Blueberry	26	0	0	26	0	0	0
Cabbage	26	0	0	26	0	0	0
Carrots	114	0	31	83	0	0	0
Cherries	15,522	20	458	11,637	1,341	1,988	79
Chestnut	35	0	0	35	0	0	0
Corn	1,385	3	282	14	971	115	0
Cucumbers	8	0	0	8	0	0	0
Eggplant	30	0	0	0	30	0	0
Grapes	1,664	0	0	320	1,344	0	0
Melons	231	0	0	0	90	141	0
Nectarine	6	0	0	6	0	0	0
Nursery	594	0	0	127	467	0	0
Oats	15	0	0	15	0	0	0
Olives	342	0	0	2	341	0	0
Onions	81	0	4	78	0	0	0
Orchard	2,796	0	33	2,207	227	329	0
Other[d]	560	0	58	430	63	0	8
Pasture	2,629	54	787	893	53	675	167
Peaches	783	0	76	394	90	223	0
Pears	104	0	0	104	0	0	0
Pecans	45	0	0	43	2	0	0
Peppers	54	0	7	38	9	0	0
Persimmon	19	0	0	19	0	0	0
Pistacchio	19	0	0	19	0	0	0
Plums	4	0	0	4	0	0	0
Pomegranate	82	0	0	0	8	74	0
Pumpkins	465	0	10	0	353	75	28
Squash	87	0	41	0	0	46	0
Tomatoes	1,042	0	289	40	449	239	25
Vegetables	261	3	41	214	0	0	3
Vineyard	4,481	0	0	37	4,028	356	60
Walnuts	25,722	26	344	20,216	4,836	215	85
Wheat	95	0	95	0	0	0	0
Total	62,846	105	3,075	38,548	15,253	5,228	635

Source: SEWD Irrigation Reports.

[a] Irrigation methods are self-reported by irrigators as part of the SEWD billing process and are not compiled by the District until later in the following year. This information is unavailable for 2018 at the time of this WMP development (May 2019).

[b] Sprinkler irrigation systems (self-reported by growers) are generally high-effiencicy systems similar to low volume systems in SEWD.

[c] Multiple irrigation methods self-reported by growers (e.g. furrow and sprinkler).

[d] Includes miscellaneous field and row crops, mixed crops, grass, landscape, and unspecified other irrigated fields.

Table 2-7. Urban Use by Customer Type, City of Stockton (2018).

Customer Type	Number of Connections	Volume (ac-ft)
Single-family	42,260	15,600
Multi-family	3,720	2,200
Commercial	2,570	2,800
Industrial	30	700
Institutional	180	3,700
Landscape irrigation	870	3,100
Wholesale	N/A	1,500
Recycled	0	0
Other (const/hydrants/fireflow)	N/A	100
Unaccounted for	N/A	2,100
Total	49,610	31,800

Source: City of Stockton 2015 Urban Water Management Plan, 2016.

Table 2-8. Urban Use by Customer Type, California Water Service Company (2018).

Customer Type	Number of Connections	Volume (ac-ft)
Single-family	38,200	13,200
Multi-family	400	1,800
Commercial	4,030	5,600
Industrial	90	2,500
Institutional	340	2,200
Landscape irrigation	30	100
Wholesale	N/A	0
Recycled	0	0
Other	N/A	100
Unaccounted for	N/A	1,600
Total	43,080	27,100

Source: California Water Service Company 2015 Urban Water Management Plan, 2016.

Table 2-9. Urban Use by Customer Type, San Joaquin County (2018).

Customer Type	Number of Connections	Volume (ac-ft)
Single-family	0	0
Multi-family	0	0
Commercial	20	100
Industrial	0	0
Institutional	10	100
Landscape irrigation	10	100
Wholesale	0	0
Recycled	0	0
Other (assessed)	1,760	1,400
Unaccounted for		0
Total	1,780	1,500

Source: Estimated based on projected deliveries to San Joaquin County in Stockton East Water District 2015 Urban Water Management Plan (2016) and historical San Joaquin County Utilities Operations Department of Public Works records (2010).
Note: Until water use is at or above 2,000 ac-ft annually, San Joaquin County is not subject to the Urban Water Management Planning process.

Table 2-10. Urban Wastewater Collection/Treatment Systems Serving the Service Area.

Treatment Plant	Treatment Level (1, 2, 3)	Volume[a] (ac-ft)	Disposal Location / Uses
Stockton Regional Wastewater Control Facility	3	23,349	San Joaquin River
Total		23,349	
Total Discharged to Ocean and/or Saline Sink		-	

[a] 2015 volume, from the City of Stockton 2015 Urban Water Management Plan, 2016.

2.E.5. Groundwater Recharge/Management in Current Year

Groundwater recharge in SEWD is provided by the Farmington Groundwater Recharge program and by seepage from natural rivers, creeks, and canals within the District boundaries. The total recharge volume in 2018 is summarized in Table 2-11 for each source.

2.E.6. Transfers and Exchanges into the Service Area in Current Year

SEWD purchases water from OID and SSJID through water transfer agreements. In 2019, SEWD purchased 1,000 ac-ft from OID and SSJID. Currently, SEWD does not participate in water transfers or exchanges into or out of the District (Tables 2-12 and 2-13). In addition, transfers are not allowed between agricultural water users.

2.E.7. Wheeling or Other Transactions In and Out of the District Boundaries in Current Year

SEWD wheels water to CSJWCD through the Upper and Lower Farmington sections of the New Melones Conveyance System. The total recorded deliveries in 2018 are summarized in Table 2-14.

Table 2-11. Groundwater Recharge (2018).

Recharge Area	Method of Recharge	Volume (ac-ft)	Method of Retrieval
60 ac	Farmington Groundwater Recharge Program ponds	3,703	Groundwater pumping
849 ac	Seepage during agricultural and M&I deliveries (natural rivers, creeks, and canals)	51,980[a]	Groundwater pumping
700 ac	Seepage during natural flows and flood flows (natural rivers and creeks)	36,717[b]	Groundwater pumping
Total		92,400	

Sources: SEWD New Hogan and New Melones supply and recharge records, May 2019; Eastern San Joaquin Final Groundwater Sustainability Plan, July 2019.

[a] From Table 5-5. Combined seepage from Mormon Slough, Potter Creek, and Mosher Creek during agricultural deliveries, and Calaveras River and the New Melones Conveyance System during agricultural and M&I deliveries.

[b] Total estimated seepage along natural creeks and rivers in SEWD when agricultural and M&I deliveries are not occurring.

Table 2-12. Transfers and Exchanges Into the Service Area (2018).

From Whom	To Whom	Volume (ac-ft)	Use
N/A	N/A	0	N/A

Table 2-13. Transfers and Exchanges Out of the Service Area (2018).

From Whom	To Whom	Volume (ac-ft)	Use
SEWD	N/A	0	N/A

Table 2-14. Wheeling or Other Transactions In and Out of the District Boundaries (2018).

From Whom	To Whom	Volume (ac-ft)	Use
SEWD	CSJWCD	5,667	agricultural

2.E.8. Other Uses of Water in Current Year

SEWD does not collect information on other water uses in the District, except for irrigation and municipal usage (Table 2-15).

Table 2-15. Other Uses of Water (2018).

Other Uses	Volume (ac-ft)
N/A	0

2.F. OUTFLOW FROM THE DISTRICT

The locations of surface and subsurface outflow points, outflow measurement points, and outflow water-quality testing locations are identified in Attachment A.1. These locations and outflows are also described below.

2.F.1. Surface and Subsurface Drain/Outflow in Current Year

SEWD primarily uses natural waterways to convey surface water to growers. Surface outflows from the District occur along natural waterways at three locations on the district boundary: Mormon Slough at Main Street, the Calaveras River at McAllen Road, and Mosher Creek at Hildreth Lane (Table 2-16). Outflows along these waterways provide required instream flows. The total outflows are estimated based on measured releases from New Hogan Reservoir and New Melones Reservoir, measured surface water inflows to SEWD for irrigation, measured deliveries to growers, and measured surface water inflows to the DJW WTP. Total outflows from the District are estimated, based on a water balance of the distribution system, to be approximately 3,000 ac-ft per year, on average; however, the outflow volume and acreage that drains through each particular discharge location is unknown. SCADA is not used to measure outflows along natural waterways. Outflow from these points flow to the Calaveras River and subsequently flow to the Delta (Table 2-17). Additional outflows occur from the Lower Farmington Canal at Rock Creek. All excess releases from New Melones Reservoir flow down Rock Creek into CSJWCD.

Table 2-16. Surface and Subsurface Drainage/Outflow (2018).

Outflow Point	Location Description	Volume (ac-ft)	Type of Measurement	Accuracy (%)	Percent of Total Outflow	Area Drained (ac)
Main Street	along Mormon Slough	-[a]	Calculated based on measured inflows and deliveries	-[a]	90%[b]	-[a]
McAllen Road	along Calaveras River	-[a]	Calculated based on measured inflows and deliveries	-[a]		-[a]
Hildreth Lane	along Mosher Creek	-[a]	Calculated based on measured inflows and deliveries	-[a]		-[a]
Rock Creek	along Lower Farmington Canal	-[a]	Calculated based on measured inflows and deliveries	-[a]		-[a]

[a] The total outflow volume and acres drained per outflow location is not known. There are no accurate measurements available at this time.
[b] The three sites together measured an estimated 90% of the total outflow from the District.

Table 2-17. Drainage/Outflow Locations (2018).

Outflow Point	Where the Outflow Goes (Drain, River or Other Location)	Type Reuse
Main Street	Calaveras River	Unknown (Outside of District)
McAllen Road	Calaveras River	Unknown (Outside of District)
Hildreth Lane	Calaveras River	Unknown (Outside of District)
Rock Creek	CSJWCD	Unknown (Outside of District)

2.F.2. Description of the Outflow Water Quality Testing Program

At this time, SEWD does not participate in an outflow water quality testing program.

2.F.3. Outflow Quality Testing Program

SEWD does not have a water quality testing program for surface or subsurface outflows from the District (Table 2-18 and 2-19).

Table 2-18. Outflow (Surface Drainage and Spillage) Quality Testing Program.

Analyses Performed	Frequency	Concentration Range	Average	Reuse Limitation
N/A				

Table 2-19. Outflow (Subsurface Drainage) Quality Testing Program.

Analyses Performed	Frequency	Concentration Range	Average	Reuse Limitation
N/A				

2.F.4. District Involvement in Central Valley Regional Water Quality Control Board Programs or Requirements

SEWD is not currently involved in any remediation or monitoring programs in conjunction with the Central Valley Regional Water Quality Control Board.

2.G. WATER ACCOUNTING (INVENTORY)

The agricultural and urban water supplies available to and delivered by SEWD are summarized in the Section 5 Water Inventory tables. These tables include detailed monthly and annual accounting of the following District inflows and outflows:

1. Water Supplies

    a. Surface water supplies, imported and originating within the service area, by month (Table 5-1)
    b. Surface water supplies, imported and originating within the service area, each of the last 10 years (Table 5-10)
    c. Groundwater extracted by the district, by month (Table 5-2)
    d. Estimated annual groundwater extracted by private pumping, by month (Table 5-2)
    e. Recycled urban wastewater, by month (Table 5-3)
    f. Effective precipitation, by crop (Table 5-7)
    g. Other supplies, by month (Table 5-1)

2. Water Used

    a. Agricultural conveyance losses, including evaporation, seepage, and operational spillage from canal systems (Table 5-5)
    b. Urban distribution system losses, including leaks, breaks, and flushing/fire losses (Table 5-6)
    c. Consumptive use of applied water, by crop (Table 5-7)
    d. Water use for leaching and cultural practices (e.g., frost protection, soil reclamation, etc.), by crop (Table 5-7)
    e. Consumptive use by riparian vegetation or environmental use (Table 5-8)
    f. Groundwater recharge (Table 5-8)
    g. Water transfers out of district (Table 5-8)
    h. Drainwater outflow from the District (Table 5-8)
    i. Estimated deep percolation within the service area (Table 5-8)
    j. Change in groundwater storage (Table 5-9)
    k. Outflow to a perched water table or saline sink (Table 5-9)

SECTION 3: BEST MANAGEMENT PRACTICES (BMPS) FOR AGRICULTURAL CONTRACTORS

3.A. CRITICAL AGRICULTURAL BMPS

The 2017 Standard Criteria describe five critical BMPs that are required for all federal water suppliers:

1. Measure the volume of water delivered to customers with sufficient accuracy for aggregate reporting.
2. Designate a water conservation coordinator.
3. Provide or support the availability of water management services to water users.
4. Adopt a pricing structure based at least in part on the quantity delivered.
5. Evaluate and improve efficiencies of contractor's pumps/evaluate and improve the efficiencies of the supplier's pumps.

SEWD is implementing all federal, critical BMPs. Each one is discussed in greater detail in the following sections.

3.A.1. Measure the Volume of Water Delivered by the District to each Turnout with Devices Operated and Maintained to a Reasonable Degree of Accuracy

STATUS: IMPLEMENTING

g. Number of delivery points (turnouts and connections) 224 (170 active turnouts)
h. Number of delivery points serving more than one farm 0
i. Number of measured delivery points (meters and measurement devices) 218 (all active measured)
j. Percentage of delivered water that was measured at a delivery point 95 (estimate)
k. Total number of delivery points not billed by quantity 0
l. Delivery point measurement device table Table 3-1

Table 3-1 summarizes the agricultural delivery point measurement devices installed at active and inactive turnouts, as of 2018. In 2018, SEWD had a total of 224 agricultural delivery connections, of which 202 are measured with McCrometer propeller meters (or similar propeller meters). The remaining measured connections are equipped with PG&E (electric) meters or hour meters, which use an equation to calculate volumes (see Attachment Q.4.). Many of these connections have been surveyed for retrofit with propeller meters; however, their plumbing configurations do not provide room for such measurement devices. The District also began to use magnetic meters in 2018 and will continue to explore other types of measuring devices to volumetrically quantify deliveries to the required accuracy.

All connections without a measurement device are inactive as of 2019. If these connections become active, the connections will be assessed for viable repairs and to explore other types of measuring devices that could volumetrically quantify deliveries. In the interim, SEWD could make comparisons with the groundwater metering usage for customers who are non-metered and help address self-reporting discrepancies regarding the irrigated acreage.

Irrigation delivery meters are read on a monthly basis from the start of irrigation season in April through the end of the season in October/November. Among other information, SEWD's records track the water usage and acres irrigated at each delivery point. The District employs field-metering staff to keep accurate records regarding the calibration of each irrigation outlet. Additionally, SEWD is looking into developing an ongoing program that would calibrate each meter every 5-years so that the District is in compliance with California SB-88 and "Emergency Regulation for Measuring and Reporting The Diversion of Water."

Table 3-1. Agricultural Delivery Point Measurement Devices, Active and Inactive (2018).

Measurement Type	Number	Accuracy[a] (+/-%)	Reading Frequency (Days)	Calibration Frequency (Months)	Maintenance Frequency (Months)
Orifices	0				
Propeller meters	202 (156 active)	+/- 6%	30	As needed	As needed
Weirs	0				
Flumes	0				
Venturi	0				
Metered gates	0				
Acoustic doppler	0				
Other: Hour meters[b]	16 (14 active)	+/- 25-30% [b]	30	As needed	As needed
Total	218 (170 active)				

[a] New meter technology ensures accuracy +/-6% without the need for field calibration. See example of factory certification in Attachment C.
[b] The plumbing configurations of these connections do not provide room for propeller meters. In the next five years, these connections will be assessed for viable repairs and to explore other types of measuring devices to volumetrically quantify deliveries to the required accuracy

3.A.2. Designate a Water Conservation Coordinator to Develop and Implement the Plan and Develop Progress Reports

STATUS: IMPLEMENTING

The Agricultural Water Conservation Coordinator responsible for five-year plan preparation, implementation, and annual updates is the SEWD Water Quality Control Analyst.

Name: Ed Morley
Title: Water Quality Control Analyst
Address: 6767 East Main Street, Stockton, CA 95215
Telephone: (209) 444-3127
E-mail: emorley@sewd.net

In 2004, the District created a position for a full time Water Conservation Coordinator with the responsibility to develop and implement a comprehensive public outreach and water conservation education program. The District designated Kristin Coon of Kristin Coon Consulting as the District's urban water conservation coordinator to manage conservation and outreach activities and coordinate with the retailers to implement water conservation efforts. The job description and minimum qualifications of this position are provided in Attachment R. SEWD will maintain an appropriate and responsible staff person in the position of water conservation coordinator.

Name: Kristin Coon
Title: Water Conservation Coordinator
Address: 6767 East Main Street, Stockton, CA 95207

Telephone: (209) 304-1734
E-mail: kcoon@sewd.net

3.A.3. Provide or Support the Availability of Water Management Services to Water Users

SEWD collaborates with other local agencies to provide technical assistance to growers with the goal of increasing on-farm water use efficiency throughout the Stockton area. Information on these programs is provided below and in Attachment I, Notices of District Education Programs and Services Available to Customers. Specific implementation efforts are described for each BMP below.

3.A.3.a. Provide On-farm Evaluations and Water Delivery Information

STATUS: IMPLEMENTING
Using grant funding from Reclamation, SEWD has provided on-farm irrigation evaluations free to its customers since 1999. The evaluations have been promoted through SEWD's semi-annual newsletter, District field personnel, and at District Advisory Committee meetings, which are attended by stakeholders representing the urban and agricultural areas of SEWD. The on-farm evaluation program is voluntary but is encouraged and supported by SEWD.

The program includes both agricultural pump testing and irrigation evaluations. In recent years, between one and six farms have been surveyed per year (Table 3-2). The total number of pumps tested each year has ranged from 17 in 2015 to three in 2018. SEWD will continue to offer these services free to its customers. In the future, SEWD plans to advertise its on-farm irrigation and pump testing program in its newsletter, on its website (https://sewd.net/), and on the Owner's Water Use Statement.

The actual cost of an irrigation evaluation is approximately $2,500. Offering this evaluation free to customers represents a discount of greater than 25 percent off the fair market price of the evaluation, thereby complying with Reclamation's example of an adequate program per the 2017 Standard Criteria.

Table 3-2. Number of On-Farm Evaluations.

Survey	Number of Farms	Irrigated Area (acres)
Total in District[a]	224	59,711
Number Surveyed (2015)	6	500
Number Surveyed (2016)	2	30
Number Surveyed (2018)	1	70
Number Projected (2019)	2[b]	15-70[b]
Number Projected (2020)	3[b]	15-70[b]

[a] Based on number of active and inactive farm gates.
[b] Based on the number of farms requesting evaluations in 2018 and the typical farm size and increased promotion in the newsletter, on the website and with the OWUS.

In its efforts to provide timely field and crop-specific water delivery information to customers, SEWD collects meter readings on a monthly basis. As described previously, field-level crop information is self-reported by customers as part of the District billing process. With this information, SEWD prepares an Annual Crop Report that summarizes water use per crop, water use per method of irrigation, and estimated total water use and metered use. This report is posted and available to SEWD customers at the SEWD office.

3.A.3.b. Provide Real-time and Normal Irrigation Scheduling and Crop Evapotranspiration Information

STATUS: IMPLEMENTING

SEWD has provided its customers with ET information available from the California Irrigation Management Information System (CIMIS). CIMIS is a program of the DWR Office of Water Use Efficiency and was developed in 1982 by DWR and the University of California, Davis, to assist irrigators in managing their water resources efficiently.

SEWD provided daily and seven-day-average evapotranspiration (ET) information from the Lodi West Station 166 and Manteca Station 70 through its CIMIS Hotline (209-942-4647) beginning in January 1998. Between 1998 and 2004 there were no inquiries; therefore, the hotline was discontinued.

Subsequently, SEWD provided its customers with ET information through a link to the CIMIS web site on the District website home page. Signage at the District office and SEWD's spring and fall newsletters, which are delivered to all of SEWD's customers, have also been used to direct customers to the CIMIS website. However, CIMIS has historically provided reference evapotranspiration (ET_o) rather than crop-specific ET information. Although growers can calculate ET for their crop based on information available on the CIMIS website (i.e. adjusting CIMIS ET_o by crop coefficients for particular crop types and ages), crop-specific ET information was not readily available on the CIMIS website.

Consequently, the Irrigation Training and Research Center (ITRC) at California Polytechnic State University, San Luis Obispo, working under a technical services agreement with the U.S. Bureau of Reclamation Mid-Pacific Region, undertook a review of the procedure and materials used to create estimates for Irrigation Allowance Index evaluations and Crop Water Requirements for the growers in SEWD (ITRC, 2013). The Irrigation Allowance Index compares two values: the volume of water that should be applied to a certain crop (termed Irrigation Allowance; based on crop evapotranspiration, effective precipitation, and estimated distribution system uniformity), and the volume of water that is actually applied. These values can be used to create a real-time irrigation scheduling tool for the growers as well as a simple evaluation of total water use at the end of the irrigation season. A list of crops and Crop Evapotranspiration (ET_c) values was compiled specifically for SEWD to provide growers with a resource for irrigation management. A complete explanation of the methodology, as well as the irrigation allowance values and the Irrigation Allowance Index developed for SEWD growers, is provided in Attachment S.

3.A.3.c. Provide Surface, Ground, and Drainage Water Quantity and Quality Data to Water Users

STATUS: IMPLEMENTING

SEWD began a water quality monitoring program for surface water at seven key points in the irrigation water conveyance system in 1997. As described in Section 2.D.4, District staff monitor typical water quality parameters important to agricultural irrigation and evaluate DJW WTP raw water influent for operational purposes. The results are displayed on SEWD's web site and Water Conservation Information table at the SEWD office. As required by code, SEWD also monitors water quality from District wells when used for M&I purposes. Sample results of urban and agricultural water quality tests from 2018 are presented in Attachments H.1. and H.2.

SEWD's agricultural groundwater quality monitoring programs are also described in Section 2.D.4. SEWD provides a courtesy monitoring service for private well owners upon request, which can include an assessment for potential groundwater quality issues and monitoring of groundwater specific conductance. The results are provided to the private well owners.

3.A.3.d. Provide Agricultural Water Management Educational Programs and Materials for Farmers, Staff, and the Public

STATUS: IMPLEMENTING

Agricultural water management educational materials and programs available to growers, staff, and the public are summarized in Table 3-3. The primary educational material provided by SEWD is the AG Water Report, which is co-funded by the SEWD Advisory Committee. This report is distributed with the SEWD newsletter and has a circulation of 6,500 accounts that includes growers, District staff, and other interested parties (Figure 3-1). A sample newsletter and AG Water Report is provided in Attachment I.

One major agricultural educational event hosted by SEWD is the State of the City event, which is co-funded by the City of Stockton, California Water Service Company, and San Joaquin County. The target yearly attendance of this event is 2,000 attendees.

In addition to this event, SEWD, as a member of the Stockton Area Water Suppliers (SAWS), sponsors and hosts numerous public outreach and school education programs. These are discussed in further detail in Section 4.A.2.

In its role as a Groundwater Sustainability Agency (GSA) in the Eastern San Joaquin Groundwater Basin, SEWD also conducts outreach to growers regarding the Sustainable Groundwater Management Act (SGMA) and development of the basin's Groundwater Sustainability Plan (GSP).

Table 3-3. Agricultural Water Management Educational Programs and Materials Available to Farmers, Staff, and the Public.

Program	Co-Funders	Yearly Targets
AG Water Report	SEWD Advisory Committee	6,500 accounts
Chamber of Commerce State of the City	City of Stockton, Cal Water, San Joaquin County	2,000 attendees
SAWS programs	City of Stockton, Cal Water, San Joaquin County	See Section 4.A.2 for targets and details.

3.A.3.e. Other
STATUS: IMPLEMENTING

SEWD plans to continue incorporating agricultural BMPs into its daily operations and support ongoing efforts to provide water management services to growers.

3.A.4. Pricing Structure based on Quantity Delivered
STATUS: IMPLEMENTING

SEWD's adopted rates for agricultural and urban water are described in Section 1.G.3.

SEWD's surface water pricing structure is based on the quantity of water delivered. In 2018, customers in the District were charged at a rate of $23.00/ac-ft. Approximately ninety percent of the volume delivered is based on measurements recorded by water meters (described in Section 1.G.1.). In the remaining cases where installation of a water meter would require capital improvements to the private owner's water pumping system, water quantity is determined using pump tests and hour meters.

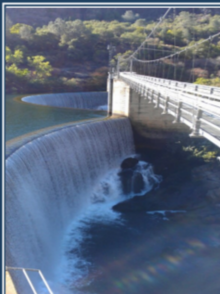
Domestic groundwater users were charged a flat rate of $44.00 for each private domestic well in 2018.

STOCKTON EAST WATER DISTRICT

Newsletter & AG Water Report

2019 Spring ♦ Summer

2019 WATER SUPPLY OUTLOOK



Goodwin Dam

New Hogan Reservoir is currently at 191,343 acre-feet of water as of mid-February 2019. The U.S. Army Corps of Engineers will have to release a lot of water for flood purposes but we expect to be able to provide a normal irrigation season regardless.

New Melones Reservoir is currently at 1,944,826 acre-feet of water as of mid-February 2019. This figure is nearly identical to this time last year. However, this year there is also a good snowpack in the mountains above the reservoir. We expect that we will have a normal irrigation season in 2019.

Sustainable Groundwater Management Act (SGMA)

As you may recall, the District is part of an organization called the Eastern San Joaquin Groundwater Authority. This group includes all GSA participants within the Eastern San Joaquin groundwater basin and our collective mission is to write the Groundwater Sustainability Plan (GSP) as required by the Act. The GSP is the key to the success of groundwater management in that it will determine how the groundwater basin will be managed and report our success to the Department of Water Resources. This plan will estimate how much water is pumped from the basin and will also estimate how much water enters the basin to recharge it each year. Our task will be to find a way to balance those two numbers and prove to DWR that our basin is sustainable. Simply put, the GSP will determine **how your groundwater will be managed and what projects the District will have to pay for to ensure its sustainability in the future.**

The Eastern San Joaquin Groundwater Basin Authority meets each month on the second Wednesday and the meeting is held at the Robert J. Cabral Agricultural Center at 9:00 a.m. I encourage you to attend some of these meetings and be aware of what is happening to your groundwater!

Unimpaired Flow Criteria

On January 11, 2019 the District's general counsel, Herum Crabtree Suntag, filed suit in San Joaquin County Superior Court against the State Water Resources Control Board (Board) challenging amendments to the Sacramento San Joaquin River Bay-Delta Plan adopted by the Board in December.

The changes would divert 40 percent of the Stanislaus River runoff from farming and industrial uses, and instead use it to increase fish flows. This action constrains New Melones Reservoir operations and takes water from farmers and cities. The District holds a contractual right to receive 80,000 acre feet of water from the New Melones Project, that has been consistently providing surface water to San Joaquin County. According to the District's attorney, Jeanne Zolezzi, the District's water contract is "threatened by this unprecedented and unsupported water grab." This water is currently used for farming and industrial users. The District delivers irrigation water to approximately 70,000 acres of agricultural land. The District will continue the effort of opposition and provide updates as the lawsuit progresses.

2019 Tentative Dam Installation

The 2019 Irrigation Season will begin tentatively on Wednesday, May 1, 2019.

APRIL 15th — Bellota 2-foot weir & fish ladder removed and the Bellota Dam installed

APRIL 16th — Bellota Dam installed

APRIL 17th through 22nd — Dam installation on Mormon Slough and Potter Creek

APRIL 23rd through 26th — Dam installation on Old Calaveras River & Mosher Slough

APRIL 30th — Dam installation and system filling complete

The District will communicate any changes or updates by mail; water supply staff & the District's website: www.sewd.net.

Remember to look out for signage in the field! Be sure to check before you begin your agricultural operations!

BOARD OF DIRECTORS

The Regular Meeting of the Board of Directors is held every Tuesday at Noon located at 6767 East Main Street Stockton, 95215

DIVISION 1	Richard Atkins
DIVISION 2	Andrew Watkins, *Vice President*
DIVISION 3	Alvin Cortopassi
DIVISION 4	Melvin Panizza, *President*
DIVISION 5	Paul Sanguinetti
DIVISION 6	Loralee McGaughey
DIVISION 7	Thomas McGurk

Figure 3-1. SEWD Newsletter and AG Water Report, Spring/Summer 2019, Page 1.

There is no water conservation pricing structure for municipal or agricultural groundwater because SEWD is not selling the water, but rather assessing for the use of a well. Municipal groundwater users are assessed on the quantity of water used at a rate of $3.60/ac-ft, with a rate equalization charge of $322.32/ac-ft resulting in a total charge of $325.92/ac-ft (in 2018). Agricultural groundwater users are assessed on the quantity of water used at a rate of $5.23/ac-ft.

3.A.5. Evaluate and Improve Efficiencies of District Pumps

STATUS: IMPLEMENTING

SEWD owns two pumps which can pump water from Mormon Slough into Potter Creek. In 2001, modifications were made to SEWD's Bellota Pipeline which allowed for gravity flow from the SEWD pipeline to Potter Creek. The cost savings realized from this project are comparable to the 2001 expenses, approximately $30,000. However, this practice can only be used when there is an adequate water supply from both the New Melones and New Hogan water contracts. The pipeline is dedicated to M&I use only when SEWD is relying 100 percent on the New Hogan water supply. Since these pipeline modifications, SEWD's two pumps have been used a few days per year in most years to provide sufficient volume to meet downstream needs when gravity flow is not available or insufficient through Bellota Pipeline. SEWD maintains these pumps regularly and last evaluated their efficiencies in 2019 (Table 3-4). The results of these pump tests are provided in Attachment T. SEWD plans to continue testing these pumps on a regular basis in the next several years.

Table 3-4. SEWD Agricultural Pump Efficiency Evaluations.

Pump Location	Total in District	Number Surveyed, Last Year (2017)	Number Surveyed, Current Year (2018)	Number Next Year (2019)
Wells	N/A	-	-	-
Lift Pumps	2	0	0	2

3.B. EXEMPTIBLE BMPS FOR AGRICULTURAL CONTRACTORS

3.B.1. Facilitate Alternative Land Use

STATUS: NOT APPLICABLE

The SEWD service area does not include agricultural lands with poor drainage characteristics (Table 3-5). Thus, no programs have been required or developed to encourage alternative land uses.

Table 3-5. Facilitate Alternative Land Uses for Agricultural Lands with Poor Drainage Characteristics.

Drainage Characteristic	Area (acre)	Potential Alternative Uses
High water table (<5 feet)	0	N/A
Poor drainage	0	N/A
Groundwater selenium concentration > 50 ppb	0	N/A
Poor productivity	0[a]	N/A

[a] SEWD is not aware of significant acreage within the district that is subject to poor productivity.

3.B.2. Facilitate Use of Available Recycled Urban Wastewater

STATUS: NOT APPLICABLE

Since 2017, City of Stockton has reused all treated wastewater, leaving no excess treated wastewater available for nearby agricultural use. SEWD supports the City of Stockton's recycling efforts.

SEWD's agricultural area is primarily upstream of urban recycled wastewater previously available from City of Stockton. Considerable pumping would have been required to provide this recycled water to SEWD customers. Until recently the City did provide some water to a farmer located near the wastewater treatment plant. However, this practice changed when the City of Stockton began to use its treated wastewater (Table 3-6).

Table 3-6. Facilitate Use of Available Recycled Urban Wastewater.

Sources of Recycled Urban Wastewater	Volume Available (ac-ft/yr)	Volume Currently Used in District (ac-ft/yr)
City of Stockton	0	0

3.B.3. Facilitate the Financing of Capital Improvements for On-Farm Irrigation Systems

STATUS: IMPLEMENTING

SEWD offers a Surface Water Incentive Program that encourages irrigators to convert from groundwater to surface water by offering surface water to irrigators at lower cost while they are paying the capital costs for facility improvements (Table 3-7). Under this program, the owner of the pumping facility is charged the groundwater assessment rate for water until the capital costs of the facility have been amortized or for up to seven (7) years, whichever occurs first. Prior to 2014, this program was advertised in SEWD's newsletter and on its web page. Between 2012 and 2014, an additional 20 farm gates were added to the SEWD surface water distribution system. SEWD will continue to advertise this program to customers in its newsletter and on its web page.

The majority of irrigation systems used within the District are already high-efficiency systems, particularly for orchard crops and vineyards, obviating an urgent need for a dedicated program to finance capital improvements of on-farm irrigation systems. SEWD currently does not have a program to finance capital improvements for on-farm irrigation system improvements. Under SGMA, future on-farm water management practices will be reviewed to support sustainable operations of the Eastern San Joaquin Groundwater Basin.

Table 3-7. Facilitate the Financing of Capital Improvements for On-Farm Irrigation Systems.

Programs	Description
Surface Water Incentive Program	Program encourages system conversion from groundwater to surface water through water pricing incentives. Under this program, participating owners of pumping facilities are offered surface water at the reduced groundwater assessment rate ($5.23/ac-ft for groundwater versus $23.00/ac-ft for surface water in 2018) until the capital costs of the facility have been amortized

3.B.4. Incentive Pricing

STATUS: IMPLEMENTING

SEWD is implementing this BMP by promoting conjunctive use of groundwater by charging a low groundwater assessment fee that, combined with the O&M costs incurred by groundwater users, incentivizes the use of surface water. The District uses this assessment fee to promote the use of available surface water supplies (goals B and C). By maintaining low water rates for surface water relative to groundwater pumping, SEWD is promoting conservation of precious groundwater resources and sustainability of the subbasin through in lieu and direct recharge. As a result, the District's surface water rate is much less expensive than the cost to produce groundwater, thereby incentivizing the use of surface water.

SEWD's enabling legislation limits its ability to offer further pricing incentives for water (see Attachment P).

3.B.5. Improve District Ditches, Canals, and Reservoirs

STATUS: IMPLEMENTING

3.B.5.a. Line or Pipe Ditches and Canals

SEWD primarily distributes surface water through 64 miles of unlined natural channels on the Calaveras River, Mormon Slough, Mosher Creek, and Potter Creek. Seepage from these natural waterways and canals provides natural recharge to the groundwater basin.

SEWD also has two main canal systems, Upper Farmington Canal and Lower Farmington Canal, which are part of the New Melones Conveyance System that brings water from New Melones Reservoir to SEWD (described in Section 1.A.1.). Both canals are unlined. Part of this seepage is reclaimed through groundwater pumping as a component of SEWD's conjunctive use plan.

Seepage was also addressed in a 2010 Environmental Impact Report for the canal system, which found that lining the Upper Farmington Canal may affect terrestrial biological resources developed as a result of ongoing existing seepage. Furthermore, SEWD and CSJWCD both use the Upper Farmington Canal and are both situated over the Eastern San Joaquin Groundwater Basin, which is considered to be critically overFinaled (DWR, 2003). Seepage thus also benefits subbasin recharge.

SEWD has already taken action to construct 19 miles of pipeline across its service area. As of 2018, the District's conveyance system includes the Bellota Pipeline and Peters Pipeline, which distribute water for agriculture and/or provide water to the DJW WTP. Most recently, SEWD built a 6-mile long, 60-inch diameter extension to the Peters Pipeline (Table 3-8). The pipeline was completed in 2006 and provides water for agriculture, recharge, and the DJW WTP.

SEWD actively monitors for leaks that can occur on the conveyance system along unlined canals, pipelines, and around concrete structures (Table 3-8). The system efficiency is improved by the District's routine canal inspection and maintenance program that serves to locate and repair both potential and current leaks. Once an area of canal is surveyed, a punch list of repair items is compiled and used to correct deterioration and other issues. Due to the destructive nature of rodents, a rodent abatement program is also a component of the District's inspection and maintenance program. This approach allows for proactive repairs, effectively thwarting leaks before they occur.

3.B.5.b. Construct/Line Regulatory Reservoirs

The recharge ponds surrounding the DJW WTP have a combined storage capacity of approximately 370 ac-ft and act as buffers to regulate water supplies for the DJW WTP (Table 3-9). The ponds also percolate water, recharging the aquifer at the treatment plant. Reservoir maintenance and groundwater monitoring are ongoing.

In 2017, designs were prepared for a new 73-acre storage and recharge basin north of the DJW WTP that would provide an additional 368 ac-ft of capacity. This basin has been in operation since May 2019.

Table 3-8. Line or Pipe Ditches and Canals.

Canal/Lateral (Reach)	Type of Assessment or Improvement	Length (miles)	Estimated Seepage	Accomplished/ Planned Date
Peters Pipeline	60-inch diameter pipeline extension for agricultural, urban, and recharge water	6	0	2006
All unlined canals and pipelines	Canal and pipeline inspection and maintenance program	36.5	N/A	Ongoing

Table 3-9. Construct/Line Regulatory Reservoirs.

Reservoir Name	Location	Estimated Volume Savings[a] (ac-ft/yr)	Improved Operational Flexibility
Recharge ponds (19-acre, 15-acre, 14-acre)	Dr. Joe Waidhofer WTP	0	allows for a constant inflow to the DJW WTP by regulating changes in flow into the recharge ponds
Recharge basin (73-acre)	Dr. Joe Waidhofer WTP	0	allows for a constant inflow to the DJW WTP by regulating changes in flow into the recharge ponds

[a] Recharge ponds and recharge basin at DJW WTP provide a combined storage volume of 754 ac-ft that is used for recharge and regulating inflows to the DJW WTP. Their location does not provide for reduction of spillage or losses from the SEWD system.

3.B.6. Increase Flexibility in Water Ordering by, and Delivery to, Water Users

STATUS: IMPLEMENTING

SEWD delivers irrigation water to customers through an arranged demand system using a 48-hour notice scheduling system. Details regarding this system are provided in Section 1.B.6 and Rule 120 in Attachment B.

This advance notice helps SEWD manage its irrigation supplies more efficiently, while the arranged demand operation provides flexibility in water ordering and delivery to water users. Together, SEWD's water ordering system and arranged demand operations have prevented spillage from over-releases, as well as tailwater from over-irrigation.

To improve the flexibility of water deliveries to its urban contractors, SEWD plans to upgrade the DJW WTP SCADA system within the next three years. Currently, the DJW WTP SCADA system is used for monitoring, but not for data acquisition or control. The planned upgrades will install a plant-wide SCADA system, allowing monitoring, data acquisition, and control for the entire plant The SEWD SCADA Master Plan was prepared to inform and guide this process. However, the plan is confidential as it includes IT components and network infrastructure information.

SCADA upgrades for the SEWD agricultural conveyance system are planned to follow the DJW WTP SCADA upgrades within the next five years. These upgrades will integrate with the WTP SCADA system, as applicable, benefitting flexibility in water ordering and delivery to both agricultural water users and the urban contractors.

3.B.7. Construct and Operate District Spill and Tailwater Recovery Systems

STATUS: NOT LOCALLY COST EFFECTIVE

Based on a cost-benefit analysis prepared by SEWD and provided in Attachment U, spill and tailwater systems are not locally cost effective. SEWD would need to build costly facilities to pump a small volume of water over 20 miles upstream.

In its efforts to limit spillage, SEWD receives agricultural water from the New Hogan and New Melones Reservoirs on an as-needed basis. Crops in SEWD are also predominantly irrigated with higher efficiency sprinkler, drip, and other low volume systems that have low runoff potential. As the Water Master of the New Hogan Reservoir releases in non-flood season periods, SEWD operates the agricultural conveyance system to minimize or prevent tail end losses, with the exception of years when SEWD needs to pass excess USACOE releases through the water supply system. Currently, excess water released into Potter Creek is naturally recovered through spillage into Mormon Slough. Other excess water flows downstream along the natural waterways used in the SEWD conveyance system and is put to beneficial use either by other growers or by flowing into the San Joaquin River (Table 3-10).

Table 3-10. Construct and Operate District Spill and Tailwater Recovery Systems.

Conveyance System Lateral[a]	Annual Spill (ac-ft/yr)	Quantity Recovered and Reused (ac-ft/yr)
Natural waterways[a]	3,000[b]	N/A

[a] Outflows from the SEWD conveyance system occur along natural waterways (Calaveras River, Mormon Slough, Mosher Creek). SEWD does not use separate distribution and drainage systems.
[b] Estimated average annual outflow volume available for pump back (Attachment U, Table 3).

3.B.8. Plan to Measure Outflow

STATUS: IMPLEMENTING

Outflows from SEWD occur along natural waterways used in the SEWD conveyance system.

As described in Section 2.F.1, surface outflow from the SEWD conveyance system occurs along natural waterways at three locations within the District: Main Street along Mormon Slough, McAllen Road along the Calaveras River, and Hildreth Lane along Mosher Creek. Outflows from SEWD along these waterways provide for required instream flows. It is estimated that 90 percent of the total outflows are estimated based on measured releases from New Hogan Reservoir, measured surface water inflows to the SEWD service area for irrigation, and measured deliveries to growers. Releases from New Hogan Reservoir provide for irrigation and flood control, and are controlled by SEWD and USACE, respectively. Outflows for in-stream flow requirements are estimated to be approximately 3,000 ac-ft per year, on average; however, the outflow volume and acreage that drains through each particular discharge location is unknown. Releases from New Melones Reservoir provide water for irrigation and supply the DJW WTP. For both purposes, water is released based on demand and measured at each connection. There are typically no "outflows" of New Melones supply because all releases are delivered to customers or the WTP. If and when there is an outflow, it is considered an operational "error." Operational "error" does not occur often. Excess releases from New

Melones Reservoir flow through Lower Farmington Canal and out along Rock Creek into CSJWCD. These flows are deliveries, rather than outflows.

As part of its planned SCADA system upgrades, SEWD has tentatively budgeted $57,000 per each of the four locations above for SCADA upgrades in 2021. SEWD plans to continue efforts to improve measurement of water leaving the District (Table 3-11).

a. Total # of outflow (surface) locations/points: 4
b. Total # of outflow (subsurface) locations/points: 0
c. Total # of measured outflow points: 4 (planned for 2021)
d. Percentage of total outflow (volume) measured during report year: 90*

* Percent of total outflow is estimated. There are no accurate measurements at individual outflow locations at this time.

Table 3-11. Plan to Measure Outflow.

Location and Priority	Estimated Cost ($)				
	2018	2019	2020	2021	2022
First priority: Mormon Slough at Main Street	$0	$0	$0	$57,000	$25,000[a]
Second priority: Calaveras River at McAllen Road	$0	$0	$0	$57,000	-
Third priority: Mosher Creek at Hildreth Lane	$0	$0	$0	$57,000	-
Fourth priority: Potter Creek at Mormon Slough[b]	$0	$0	$0	$57,000	-

[a] Recurring budget for SCADA system maintenance; does not apply to a singular site.
[b] Spillage from Potter Creek to Mormon Slough is not a direct outflow from the SEWD boundaries.

3.B.9. Optimize Conjunctive Use of Surface and Groundwater

STATUS: IMPLEMENTING

SEWD's goal is to optimize conjunctive management of surface and groundwater. SEWD has secured and provides surface water from the New Melones and New Hogan Reservoirs in order to protect the District's groundwater. To promote conjunctive use, SEWD has made efforts to increase groundwater recharge and to encourage in-lieu recharge by providing surface water deliveries to irrigators as an alternative to private groundwater pumping.

At present, groundwater recharge within SEWD is furnished largely by regulated releases from New Hogan Reservoir down the Calaveras River. SEWD releases these flows and uses check dams on the the Calaveras River, Mormon Slough, and Mosher Creek to achieve the greatest beneficial use and groundwater recharge for the district. Additional information on these efforts is provided in Section 2.B.4.

SEWD is in the process of looking for and developing more recharge sites through the Farmington Groundwater Recharge Program. The Farmington Groundwater Recharge Program identifies areas suitable for recharge and seasonal habitat development, evaluates recharge techniques, and conducts pilot recharge tests. Through this phased program, available surplus water from SEWD's conveyance system is diverted into recharge cells at the project site. Stored surface water would be pumped from the aquifer for agricultural, municipal, and industrial use. Recharge averaged approximately 3,700 ac-ft between 2013 and 2018. See Section 2.B.6 for more information.

3.B.10. Automate Distribution and/or Drainage System Structures

STATUS: IMPLEMENTING

This BMP is being implemented through the District's SCADA system and recent automation of PC-2 along Potter Creek.

Previously, grant funds were utilized to implement an early District SCADA system to enhance surface water management and allow conveyance system automation. In 2005, SEWD applied for and was awarded a Reclamation Challenge Grant in the amount of $150,255 over two years to implement this SCADA system (Table 3-10). SEWD's contribution was $154,553. The equipment was installed in 2006, but has since gone offline.

SEWD plans to upgrade its conveyance system in the next five year with an Ignition SCADA system that will allow monitoring of system outflows and potential automation of upstream structures, particularly those serving the DJW WTP (described in Section 3.B.6. above). In the next 2-3 years, planned Ignition SCADA upgrades at the DJW WTP will allow plant-wide monitoring, data acquisition, and control.

SEWD recently installed a Rubicon BladeMeter™ at PC-2 along Potter Creek, which provides for automated delivery of precise quantities of water using only gravity pressure and solar energy (Figure 3-2). The BladeMeter™ is being piloted for other future sites. Construction was completed in April 2019, and flow data will be available in the next update to the WMP.

Additional tasks to be conducted include the retrofit of two existing flow monitoring stations used to transmit data to the SCADA system, and the automation of five water control gates at three locations to allow off-site control. Acquisition of this "real time" data and automation of the gates will enhance operation and management of SEWD's agricultural water delivery system.

3.B.11. Facilitate or Promote Water Customer Pump Testing and Evaluation

STATUS: IMPLEMENTING

SEWD promotes its own pump testing program for its customers. SEWD has received Reclamation grant funding and offered free pump tests and irrigation evaluations to its customers, as described in Section 3.A.3. The pump tests are promoted in SEWD's twice annual newsletter, at Stockton East Advisory Committee meetings, and through SEWD field personnel in their communication with customers. SEWD completed three pump tests at one farm in 2018, four pump tests across two farms in 2016, and 17 pump tests across six farms in 2015.

SEWD will continue to offer these services free to its customers. In the future, SEWD plans to advertise its on-farm irrigation and pump testing program in its newsletter, on its website (https://sewd.net/), and on the Owner's Water Use Statement.

Figure 3-2. Rubicon BladeMeter™ Installed at PC-2.

3.B.12. Mapping

STATUS: IMPLEMENTING

SEWD is implementing the mapping BMP through the maintenance of system maps and ongoing maintenance of its GIS-based system. The District will budget, as necessary, sufficient funds between 2018 and 2022 to facilitate the mapping maintenance BMP efforts (Table 3-12).

Table 3-12. Mapping.

GIS maps	Estimated Cost ($)				
	2018	2019	2020	2021	2022
Layer 1 – Distribution system	$0[a]	$0[a]	$0[a]	$0[a]	$0[a]
Layer 2 – Drainage system	$0[a]	$0[a]	$0[a]	$0[a]	$0[a]
Layer 3 – Groundwater information	$0[a]	$0[a]	$0[a]	$0[a]	$0[a]
Layer 4 – Soils map	$0[a]	$0[a]	$0[a]	$0[a]	$0[a]
Layer 5 – Natural & cultural resources	$0[a]	$0[a]	$0[a]	$0[a]	$0[a]
Layer 6 – Problem areas	$0[a]	$0[a]	$0[a]	$0[a]	$0[a]

[a] SEWD will budget, as necessary, sufficient funds between 2018 and 2022 to facilitate mapping maintenance BMP efforts.

3.C. PROVIDE A 5-YEAR BUDGET FOR IMPLEMENTING BMPS

SEWD has developed projected five-year budgets for continuing and engaging in new planned BMP implementation activities. Tables 3-13 through 3-17 summarize the total planned spending for all BMP implementation activities beyond normal planned maintenance expenditures over the next five years (2018 through 2022).

Table 3-13. Amount Actually Spent for Implementing BMPs in Current Year (2018).

BMP	#	BMP Name	Budgeted Expenditure (not including staff time)	Staff Hours
A	1	Measurement	$6,400	11
	2	Conservation staff	$3,100	40
	3a	On-farm evaluations/water delivery info	$5,200	2
	3b	Irrigation Scheduling	$100	1
	3c	Water quality	$1,000	8
	3d	Agricultural Education Program	$600	25
	4	Quantity pricing	$0	0
	5	Contractor's pumps	$0	0
B	1	Alternative land use	$0	0
	2	Urban recycled water use	$0	0
	3	Financing of on-farm improvements	$900	8
	4	Incentive pricing	$0	0
	5	Line or pipe canals/install reservoirs	$113,800	700
	6	Increase delivery flexibility	$0	40
	7	District spill/tailwater recovery systems	$0	0
	8	Measure outflow	$0	0
	9	Optimize conjunctive use	$1,200	24
	10	Automate canal structures	$0	0
	11	Customer pump testing	$7,800	8
	12	Mapping	$0	0
		Total	$140,100	867

Table 3-14. Projected Budget Summary for Implementing BMPs in Second Year (2019).

BMP	#	BMP Name	Budgeted Expenditure (not including staff time)	Staff Hours
A	1	Measurement	$200,000	100
	2	Conservation staff	$3,200	40
	3a	On-farm evaluations/water delivery info	$5,300	2
	3b	Irrigation Scheduling	$100	1
	3c	Water quality	$1,000	8
	3d	Agricultural Education Program	$600	25
	4	Quantity pricing	$0	0
	5	Contractor's pumps	$0	0
B	1	Alternative land use	$0	0
	2	Urban recycled water use	$0	0
	3	Financing of on-farm improvements	$30,000	8
	4	Incentive pricing	$0	0
	5	Line or pipe canals/install reservoirs	$116,500	700
	6	Increase delivery flexibility	$0	40
	7	District spill/tailwater recovery systems	$0	0
	8	Measure outflow	$0	0
	9	Optimize conjunctive use	$1,300	24
	10	Automate canal structures	$365,000	300
	11	Customer pump testing	$7,900	8
	12	Mapping	$0	0
		Total	$730,900	1,256

Table 3-15. Projected Budget Summary for Implementing BMPs in Third Year (2020).

BMP	#	BMP Name	Budgeted Expenditure (not including staff time)	Staff Hours
A	1	Measurement	$190,000	100
	2	Conservation staff	$3,200	40
	3a	On-farm evaluations/water delivery info	$5,400	2
	3b	Irrigation Scheduling	$100	1
	3c	Water quality	$1,000	8
	3d	Agricultural Education Program	$600	25
	4	Quantity pricing	$0	0
	5	Contractor's pumps	$0	0
B	1	Alternative land use	$0	0
	2	Urban recycled water use	$0	0
	3	Financing of on-farm improvements	$900	8
	4	Incentive pricing	$0	0
	5	Line or pipe canals/install reservoirs	$0	0
	6	Increase delivery flexibility	$0	40
	7	District spill/tailwater recovery systems	$0	0
	8	Measure outflow	$6,500	0
	9	Optimize conjunctive use	$1,300	24
	10	Automate canal structures	$197,800	390
	11	Customer pump testing	$8,100	8
	12	Mapping	$0	0
		Total	$414,900	646

Table 3-16. Projected Budget Summary for Implementing BMPs in Fourth Year (2021).

BMP	#	BMP Name	Budgeted Expenditure (not including staff time)	Staff Hours
A	1	Measurement	$190,000	100
	2	Conservation staff	$3,300	40
	3a	On-farm evaluations/water delivery info	$5,500	2
	3b	Irrigation Scheduling	$100	1
	3c	Water quality	$1,000	8
	3d	Agricultural Education Program	$700	25
	4	Quantity pricing	$0	0
	5	Contractor's pumps	$0	0
B	1	Alternative land use	$0	0
	2	Urban recycled water use	$0	0
	3	Financing of on-farm improvements	$900	8
	4	Incentive pricing	$0	0
	5	Line or pipe canals/install reservoirs	$0	0
	6	Increase delivery flexibility	$0	40
	7	District spill/tailwater recovery systems	$0	0
	8	Measure outflow	$228,000	270
	9	Optimize conjunctive use	$1,300	24
	10	Automate canal structures	$813,500	900
	11	Customer pump testing	$8,300	8
	12	Mapping	$0	0
		Total	$1,252,600	1,426

Table 3-17. Projected Budget Summary for Implementing BMPs in Fifth Year (2022).

BMP	#	BMP Name	Budgeted Expenditure (not including staff time)	Staff Hours
A	1	Measurement	$190,000	100
	2	Conservation staff	$3,400	40
	3a	On-farm evaluations/water delivery info	$5,600	2
	3b	Irrigation Scheduling	$100	1
	3c	Water quality	$1,100	8
	3d	Agricultural Education Program	$700	25
	4	Quantity pricing	$0	0
	5	Contractor's pumps	$0	0
B	1	Alternative land use	$0	0
	2	Urban recycled water use	$0	0
	3	Financing of on-farm improvements	$1,000	8
	4	Incentive pricing	$0	0
	5	Line or pipe canals/install reservoirs	$0	0
	6	Increase delivery flexibility	$0	40
	7	District spill/tailwater recovery systems	$0	0
	8	Measure outflow	$6,700	0
	9	Optimize conjunctive use	$1,300	24
	10	Automate canal structures	$0	0
	11	Customer pump testing	$8,400	8
	12	Mapping	$0	0
		Total	$218,300	256

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SECTION 4: BEST MANAGEMENT PRACTICES FOR URBAN CONTRACTORS

SEWD is under contract to supply wholesale treated surface water from DJW WTP to Cal Water, the City of Stockton, and San Joaquin County. Drinking water is retailed to Stockton area customers by these three urban contractors. SEWD does not own or operate an urban distribution system.

SEWD implements programs to accomplish all urban BMPs applicable to its role as a wholesale supplier of treated surface water. These applicable BMPs and all remaining non-applicable BMPs are described below. A list of the previously exempted urban BMPs verified by Reclamation is provided is Attachment V. These exempted BMPs align with the urban BMPs listed as non-applicable in the sections below.

4.A. URBAN BMPS

As an urban water wholesaler, SEWD engages in activities to accomplish the Foundational BMPs, which are considered by Reclamation to be essential water conservation activities that should be conducted, as applicable, by any utility at any level of distribution as part of ongoing practices. SEWD does not supply water directly to urban customers, but SEWD supports the urban contractors in their efforts to achieve the remaining Programmatic BMPs related to residential, commercial, industrial, institutional, and landscape water use.

Foundational BMPs

4.A.1. Operations Programs

SEWD collaborates with its urban contractors to maintain utility operations programs that support water conservation, water waste prevention, and water loss control through operational effort and practices.

SEWD, the City of Stockton, Cal Water, and San Joaquin County are all members of the Stockton Area Water Suppliers (SAWS). This group meets on a regular basis to discuss water related matters, including water supply, use, conservation and the development of water shortage contingency planning. The District supports all of the urban contractors in their conservation plans.

The specific BMP activities implemented by SEWD and SAWS are described below.

4.A.1.1. Operations Practices

4.A.1.1.a. Conservation Coordinator

STATUS: IMPLEMENTING

In 2004, SEWD created a position for a full time Water Conservation Coordinator with the responsibility to develop and implement a comprehensive public outreach and water conservation education program. The District has designated Kristin Coon of Kristin Coon Consulting as the District's water conservation coordinator to manage conservation and outreach activities, prepare five-year Reclamation WMPs, and implement the Plans. Kristin Coon is a contractor employed jointly by SEWD and the three urban contractors. Each urban contractor has its own Water Conservation Coordinator in addition to Kristin Coon. The job description and minimum qualifications of this position are provided in Attachment R. SEWD will maintain an appropriate and responsible staff person in the position of water conservation coordinator.

Name: Kristin Coon
Title: Water Conservation Coordinator
Address: 6767 East Main Street, Stockton, CA 95207
Telephone: (209) 304-1734
E-mail: kcoon@sewd.net

4.A.1.1.b. Water Waste Prevention

STATUS: IMPLEMENTING

SEWD does not distribute urban water directly to customers and has therefore not established its own procedures for preventing water waste after water has been delivered to the urban contractors. As a member of SAWS, SEWD supports all of its urban contractors in implementing water waste prevention practices and policies.

City of Stockton and Cal Water both participate in the California Urban Water Conservation Council (CUWCC) and implement Urban Water Management Plans. Sections of these plans are provided in Attachment W.

The City of Stockton's municipal code Chapter 13.28 outlines the City's water conservation policies and restrictions on wasteful uses of water. A description is provided in Section 8.1 of its 2015 Urban Water Management Plan. The City also provides its residents with a website (www.stocktongov.com/savewater) containing water conservation tips and a phone number (1-866-STOKWTR) they can call to report water wasters as well as request information.

Cal Water's water waste prevention ordinances are summarized in its 2015 Urban Water Management Plan Section 9.2.1. In 2015, Cal Water filed Schedule 14.1 with the California Public Utilities Commission (CPUC) that instated measures to prohibit water waste with regard to commercial water use, landscape irrigation, decorative water features, and other water uses. Cal Water customers are also subject to restrictions regulated by ordinances of applicable local governments. Under its Water Shortage Contingency Plan, Cal Water also reduces water waste by deploying and increasing water waste patrols under conditions of increasing water shortage.

4.A.1.1.c. Wholesale Agency Assistance Programs

STATUS: IMPLEMENTING

SEWD supplies wholesale treated drinking water that is retailed to Stockton area customers by the City of Stockton, Cal Water, and San Joaquin County. The District's participation in SAWS and its implementation and support of public information programs and outreach efforts described in Section 4.A.2 helps its urban contractors achieve their SBX7-7 water use reduction targets. The District will continue to participate in SAWS and outreach efforts to support the urban contractors in meeting their established targets.

4.A.1.2. Water Loss Control

STATUS: IMPLEMENTING

SEWD conducts monthly water audits for the DJW WTP. As part of these audits, SEWD measures the total monthly volume of all diversions to the WTP, the total monthly volume treated at the DJW WTP, and the total monthly volume delivered to each of its urban customers. Any discrepancies are immediately investigated, and repairs made as necessary. The locations and measurement devices used to monitor these diversions and deliveries are summarized in Sections 1.B.1 and 1.G.2, respectively. District staff spend about 120 hours annually creating monthly reports that include water loss assessment. No direct funding is required.

4.A.1.3. Metering with Commodity Rates for All New Connections and Retrofit of Existing Connections

STATUS: IMPLEMENTING

SEWD meters the connections to its urban contractors, as described in Section 1.G.2. Deliveries are recorded by three meters. Two pipelines (24-inch and 42-inch) deliver water to south City of Stockton, as measured by one meter, and a third pipeline (48-inch) delivers water to north City of Stockton, as measured by a second meter. A 42-inch pipeline delivers water to Cal Water and is measured by a third meter. The City of Stockton wheels water to San Joaquin County. The accuracy of these meters is within six percent, and is verified and calibrated annually by an outside testing company (Table 1-19).

4.A.1.4. Retail Conservation Pricing

STATUS: IMPLEMENTING

The District bills the urban contractors per the Second Amended Contract based on the volume of water produced. Attachment D.2 provides a copy of the 2018 and 2019 rate ordinances (Ordinance No. 44 and 45, respectively). Each year's ordinance establishes a base cost (calculated by contract and water usage) and the municipal groundwater rate equalization set per contract between the District, Cal Water, City of Stockton, and San Joaquin County. The 2018 Water Fee Schedule was adopted April 2, 2018 and came into effect on May 3, 2018. The 2019 Water Fee Schedule was adopted April 9, 2019 and came into effect on May 9, 2019.

4.A.2. Education Programs

SEWD, City of Stockton, Cal Water, and San Joaquin County are all members of SAWS. This group meets on a regular basis to discuss water related matters and to plan or support joint education programs. SEWD administers and funds public outreach and education programs for SAWS with an annual budget of over $200,000. These public information and school education programs are described below. The 2017-2018 SAWS Water Education Program Annual Report is provided in Attachment X.

4.A.2.1. Public Information Programs

STATUS: IMPLEMENTING

SEWD participates in the SAWS, which jointly funds the Water Conservation Education Program in the Stockton urban area. The SAWS Water Education Program participates in and supplies hand-outs and outreach materials for numerous community gatherings and other special activities and events in Stockton.

Specific programs in which SAWS Water Education Program staff participated in 2017 and 2018 include:

- **Rotary Read In (February 2018):** The Coordinator participates annually in the Stockton Rotary Read-In event.
- **San Joaquin County Science Fair Judging (March 2018):** The Coordinator participates annually in exhibit judging at this county-wide event.
- **Stockton's Earth Day Festival (April 2018):** SAWS was a principle sponsor of this popular annual festival at Victory Park in Stockton. The SAWS Water Education Program hosted a booth offering free SAWS tote bags, water conservation materials, pencils and branded rain gauges. (Figure 4-1)
- **Water Treatment Plant Tours:** The SAWS Water Education Program and SEWD staff host tours of the Dr. Joe Waidhofer Drinking Water Treatment Plant for Grade 5 and above.

- **San Joaquin County AgVenture Events:** The Coordinator participates annually in the San Joaquin County AgVenture event.
- **Community Based Programs:** SAWS visited and/or supplied water conservation materials for various community programs in Stockton.
- **DWR Water Education Committee:** The Coordinator attended two meetings of the DWR Water Education Committee in 2018, joining water educators from all over California to share resources and ideas for water conservation education and outreach.

Other school education programs and highlights from 2017 and 2018 are described below. SAWS plans to continue sponsoring and participating in these events in the coming years.

Figure 4-1. The SAWS Booth at the Stockton Earth Day Festival (April 2018).

4.A.2.2. School Education Programs

<u>STATUS</u>: IMPLEMENTING

The SAWS, a partnership between SEWD, Cal Water, the City of Stockton, and San Joaquin County, are dedicated to providing quality water education programs for our youth. To this end, the SAWS partners offer stimulating, age appropriate water education presentations for public and private school classrooms within the Stockton Metropolitan Area. Special event presentations are also available. The SAWS water education programs align with the California Content Standards and are designed to coordinate with teachers' lesson plans.

Through these programs, the SAWS partners are seeking to reach out to our youth to promote an understanding of the scientific and social principles related to water resource conservation. It is SEWD's goal that this outreach effort will build a progressive knowledge base within the community that will

promote sound water resource decisions in the future. SAWS plans to continue sponsoring and participating in these outreach efforts in the coming years.
Highlights from the 2017-2018 school year are provided below:

- The SAWS Water Education Program visited 66 Stockton area schools/event venues, presenting or staffing a booth in 354 classrooms/events for 22,538 students and citizens.
- On behalf of SAWS, Kristin Coon Consulting contracted with Zun Zun, an environmental education assembly program, to perform nine "Water Beat" assemblies in five Stockton area schools, reaching 2,725 students.
- The SAWS Water Education Program participated in a variety of local, youth-oriented special events and promotional programs, including:
  - San Joaquin County AgVenture Events (Three venues: South County, Stockton & Lodi)
  - Manteca Unified School District's "Planet Party Day"
  - Manteca Unified School District's Farm Days
  - Stockton's Earth Day Festival at Victory Park (SAWS was a principal sponsor)
- Special presentations and/or materials were provided for a variety of organizations and groups, including:
  - Lincoln High School's "Window on Your Future" career path development event
  - Stockton First Five Parent Club
  - Stockton's Black Family Day
  - Stockton Rotary Read-In
  - San Joaquin UC Master Gardeners Event
  - Bear Creek Community Church Summer Day Camp: Water Conservation Workshop and H2Olympics
- In 2018, the coordinator joined water educators from all over the state of California at DWR's fall Water Education Committee Meeting, hosted by MWD and Las Virgenes Water District in Calabasas, California. In the spring, the coordinator attended the Water Education Committee Meeting in Santa Cruz, hosted by Soquel Creek Water District and Watsonville Public Works.

Specific programs in which SAWS Water Education Program staff participated include:

- **San Joaquin County AgVentures (South County: November 2017, Stockton: January 2018, Lodi: February 2018):** The SAWS Water Education Program staffed a booth featuring a hands-on activity and prize wheel at each of the three AgVenture events in the 2017/2018 school year. SAWS continues to participate in these events in the 2018/2019 school year. Our participation in AgVenture allows us to promote SAWS sponsored in-class, after school and assembly programs while sharing our message of water awareness and conservation with thousands of third grade students and their teachers. Each AgVenture event hosts between 2,500 and 4,000 San Joaquin County third graders. SAWS/SEWD supports this event with a $1,000 annual donation.
- **Lincoln Unified School District "Window on Your Future" (February 2018):** The Coordinator participated in mock job interviews designed to prepare Lincoln High School students for entry into the job market. This event presents an opportunity for staff to share career path outreach with potential job seekers. The Coordinator reached approximately 30 Lincoln High School juniors and seniors at this event.
- **Manteca Unified School District (MUSD) "Planet Party Day" (April 2018):** The SAWS Water Education Program hosts an activity booth annually for this event focusing on science and math.
- **MUSD's Farm Days (Spring 2018):** SAWS sponsored H2Olympics booths at the MUSD Farm Day events.

Programmatic BMPs

As a wholesale supplier of treated drinking water, SEWD does not deliver water directly to urban customers and therefore does not play a direct role in managing residential, commercial, industrial, institutional, and landscape water use. However, SEWD continues to support the urban contractors in their efforts and policies to achieve the Programmatic BMPs.

4.A.3 Residential

SEWD supports the urban contractors in their efforts and policies to achieve the Residential BMPs described below.

4.A.3.1. Residential Assistance Program

STATUS: NOT APPLICABLE (SUPPORTING CONTRACTOR IMPLEMENTATION)
SEWD supports the urban contractors in their efforts and policies to achieve the Residential Assistance Program BMP. See Attachment W for more information provided in the contractors' Urban Water Management Plans.

4.A.3.2. Landscape Water Survey

STATUS: NOT APPLICABLE (SUPPORTING CONTRACTOR IMPLEMENTATION)

SEWD supports the urban contractors in their efforts and policies to achieve the Landscape Water Survey BMP. See Attachment W for more information provided in the contractors' Urban Water Management Plans.

4.A.3.3. High-Efficiency Clothes Washers (HECWs)

STATUS: NOT APPLICABLE (SUPPORTING CONTRACTOR IMPLEMENTATION)

SEWD supports the urban contractors in their efforts and policies to achieve the High-Efficiency Clothes Washers (HECWs) BMP. See Attachment W for more information provided in the contractors' Urban Water Management Plans.

4.A.3.4. WaterSense Specification (WSS) Toilets

STATUS: NOT APPLICABLE (SUPPORTING CONTRACTOR IMPLEMENTATION)

SEWD supports the urban contractors in their efforts and policies to achieve the WaterSense Specification Toilets BMP. See Attachment W for more information provided in the contractors' Urban Water Management Plans.

4.A.3.5. WaterSense Specifications for Residential Development

STATUS: NOT APPLICABLE (SUPPORTING CONTRACTOR IMPLEMENTATION)

SEWD supports the urban contractors in their efforts and policies to achieve the WaterSense Specification for Residential Development BMP. See Attachment W for more information provided in the contractors' Urban Water Management Plans.

4.A.4. Commercial, Industrial, and Institutional (CII)

STATUS: NOT APPLICABLE (SUPPORTING CONTRACTOR IMPLEMENTATION)

SEWD supports the urban contractors in their efforts and policies to achieve the Commercial, Industrial, and Institutional (CII) BMP. See Attachment W for more information provided in the contractors' Urban Water Management Plans.

4.A.5. Landscape

STATUS: NOT APPLICABLE (SUPPORTING CONTRACTOR IMPLEMENTATION)

SEWD supports the urban contractors in their efforts and policies to achieve the Landscape BMP. See Attachment W for more information provided in the contractors' Urban Water Management Plans.

4.B. PROVIDE A 5-YEAR BUDGET FOR EXPENDITURES AND STAFF EFFORT FOR BMPS

SEWD is a wholesale agency and does not implement urban BMPs at a retail level. SEWD supports all efforts implemented by the District's contracted retailers and assists in activities described in previous sections with their respective budgets. Through the SAWS program, SEWD will continue to engage and support BMP implementations at the retial level. Tables 4-1 through 4-5 summarize the total planned spending for all BMP implementation activities over the next five years (2018 through 2022).

Table 4-1. Amount Actually Spent for Implementing BMPs in Current Year (2018).

BMP	#	BMP Name	Projected Expenditures (not including staff hours)	Staff Hours
1		Utilities Operations		
	1.1	Operations Practices	$0[a]	0
	1.2	Water Loss Control	$0	120
	1.3	Metering	$16,500	20
	1.4	Retail Conservation Pricing	$0	0
2		Education Programs		
	2.1	Public Information Programs	$45,000[b]	250
	2.2	School Education Programs	$187,000	1,830
3		Residential	$0	0
4		CII	$0	0
5		Landscape	$0	0
		Total	248,500	2,220

[a] Expenditures in support of the SAWS program (BMP 2.1 and 2.2) do include funding for a conservation coordinator and Wholesale Agency Assistance Programs.
[b] Expenditures in support of School Education Programs (BMP 2.2) may include some costs of public handouts and materials.

Table 4-2. Projected Budget for Summary Implementing BMPs in Second Year (2019).

BMP	#	BMP Name	Projected Expenditures (not including staff hours)	Staff Hours
1		Utilities Operations		
	1.1	Operations Practices	$0[a]	0
	1.2	Water Loss Control	$0	120
	1.3	Metering	$17,300	20
	1.4	Retail Conservation Pricing	$0	0
2		Education Programs		
	2.1	Public Information Programs	$45,000[b]	250
	2.2	School Education Programs	$187,000	1,830
3		Residential	$0	0
4		CII	$0	0
5		Landscape	$0	0
		Total	249,300	2,220

[a] Expenditures in support of the SAWS program (BMP 2.1 and 2.2) do include funding for a conservation coordinator and Wholesale Agency Assistance Programs.
[b] Expenditures in support of School Education Programs (BMP 2.2) may include some costs of public handouts and materials.

Table 4-3. Projected Budget for Summary Implementing BMPs in Third Year (2020).

BMP	#	BMP Name	Projected Expenditures (not including staff hours)	Staff Hours
1		Utilities Operations		
	1.1	Operations Practices	$0[a]	0
	1.2	Water Loss Control	$0	120
	1.3	Metering	$17,600	20
	1.4	Retail Conservation Pricing	$0	0
2		Education Programs		
	2.1	Public Information Programs	$45,900[b]	250
	2.2	School Education Programs	$190,600	1,830
3		Residential	$0	0
4		CII	$0	0
5		Landscape	$0	0
		Total	$254,100	2,220

[a] Expenditures in support of the SAWS program (BMP 2.1 and 2.2) do include funding for a conservation coordinator and Wholesale Agency Assistance Programs.
[b] Expenditures in support of School Education Programs (BMP 2.2) may include some costs of public handouts and materials.

Table 4-4. Projected Budget for Summary Implementing BMPs in Fourth Year (2021).

BMP	#	BMP Name	Projected Expenditures (not including staff hours)	Staff Hours
1		Utilities Operations		
	1.1	Operations Practices	$0[a]	0
	1.2	Water Loss Control	$0	120
	1.3	Metering	$17,900	20
	1.4	Retail Conservation Pricing	$0	0
2		Education Programs		
	2.1	Public Information Programs	$46,800[b]	250
	2.2	School Education Programs	$194,300	1,830
3		Residential	$0	0
4		CII	$0	0
5		Landscape	$0	0
		Total	$259,000	2,220

[a] Expenditures in support of the SAWS program (BMP 2.1 and 2.2) do include funding for a conservation coordinator and Wholesale Agency Assistance Programs.
[b] Expenditures in support of School Education Programs (BMP 2.2) may include some costs of public handouts and materials.

Table 4-5. Projected Budget for Summary Implementing BMPs in Fifth Year (2022).

BMP	#	BMP Name	Projected Expenditures (not including staff hours)	Staff Hours
1		Utilities Operations		
	1.1	Operations Practices	$0[a]	0
	1.2	Water Loss Control	$0	120
	1.3	Metering	$18,200	20
	1.4	Retail Conservation Pricing	$0	0
2		Education Programs		
	2.1	Public Information Programs	$47,700[b]	250
	2.2	School Education Programs	$198,100	1,830
3		Residential	$0	0
4		CII	$0	0
5		Landscape	$0	0
		Total	$264,000	2,220

[a] Expenditures in support of the SAWS program (BMP 2.1 and 2.2) do include funding for a conservation coordinator and Wholesale Agency Assistance Programs.
[b] Expenditures in support of School Education Programs (BMP 2.2) may include some costs of public handouts and materials.

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SECTION 5: DISTRICT WATER INVENTORY TABLES

The Water Inventory Tables are presented on the following pages. These include all Agricultural Water Inventory Tables and all Urban Water Inventory Tables.

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Table 5-1. Surface Water Supply.

Year of Data	2018

Surface Water Supply

2018 Month	Federal Ag Water[a] (acre-feet)	Federal non-Ag Water[a] (acre-feet)	State Water (acre-feet)	Local Water (acre-feet)	Other Water (transfers) (acre-feet)	Transfers into District (acre-feet)	Upslope Drain Water (acre-feet)	Total (acre-feet)
Method	C1	C1	-	-	-	-	-	C1
January	0	2,163	0	0	0	0	0	2,163
February	40	2,406	0	0	0	0	0	2,446
March	95	2,560	0	0	0	0	0	2,655
April	1,900	3,466	0	0	0	0	0	5,366
May	13,435	3,031	0	0	0	0	0	16,466
June	15,801	4,027	0	0	0	0	0	19,828
July	15,808	4,489	0	0	0	0	0	20,297
August	13,178	4,207	0	0	0	0	0	17,385
September	10,270	4,302	0	0	0	0	0	14,572
October	4,060	5,199	0	0	0	0	0	9,259
November	0	3,873	0	0	0	0	0	3,873
December	0	2,670	0	0	0	0	0	2,670
TOTAL	74,587	42,393	0	0	0	0	0	116,980

[a] Includes both New Melones and New Hogan Supply in 2018.

Table 5-2. Groundwater Supply (2018).

Ground Water Supply

2018 Month	**District Groundwater** (acre-feet)	**Private Urban Groundwater**[a] (acre-feet)	**Private Agric Groundwater**[b] (acre-feet)
Method	M1	E1	E1
January	0	300	0
February	0	700	9,932
March	0	400	865
April	0	700	7,649
May	0	1,000	23,276
June	0	1,100	27,703
July	0	1,300	29,960
August	0	1,300	27,512
September	0	1,200	24,334
October	0	700	13,745
November	0	400	2,527
December	0	300	30
TOTAL	0	9,400	167,534

[a] Estimated based on typical rural residential irrigation and domestic usage (0.25 ac of irrigated landscape per pump and 170 gallons per day per capita, with 3.45 persons per pump) (City of Stockton, 2015).

[b] Sum of metered agricultural groundwater (+/- 6% accuracy) and estimated agricultural groundwater, based on 137,417 ac-ft groundwater assessment volume and 85% consumptive use fraction.

Table 5-3. Total Water Supply (2018).

Total Water Supply

2018 Month	Surface Water Total (acre-feet)	District Groundwater (acre-feet)	Recycled M&I Wastewater[a] (acre-feet)	Total District Water Supply (acre-feet)
Method	C1	M1	-	C1
January	2,163	0	0	2,163
February	2,446	0	0	2,446
March	2,655	0	0	2,655
April	5,366	0	0	5,366
May	16,466	0	0	16,466
June	19,828	0	0	19,828
July	20,297	0	0	20,297
August	17,385	0	0	17,385
September	14,572	0	0	14,572
October	9,259	0	0	9,259
November	3,873	0	0	3,873
December	2,670	0	0	2,670
TOTAL	116,980	0	0	116,980

[a] Recycled M&I Wastewater is treated urban wastewater that is used for agriculture.

Table 5-4. Agricultural Conveyance System Precipitation and Evaporation Worksheets (2018).

	2018	Precipitation Worksheet				2018	Evaporation Worksheet		
	inches precip[a]	ft precip	acres	AF/Year		inches evap[b]	ft evap	acres	AF/YEAR
Jan	3.03	0.25	849	1,000	**Jan**	1.25	0.10	849	4,072
Feb	0.97	0.08	849	1,000	**Feb**	2.67	0.22	849	4,072
Mar	2.41	0.20	849	1,000	**Mar**	3.27	0.27	849	4,072
Apr	1.72	0.14	849	1,000	**Apr**	5.35	0.45	849	4,072
May	0.13	0.01	849	1,000	**May**	7.32	0.61	849	4,072
Jun	0.00	0.00	849	1,000	**Jun**	8.29	0.69	849	4,072
Jul	0.00	0.00	849	1,000	**Jul**	8.75	0.73	849	4,072
Aug	0.00	0.00	849	1,000	**Aug**	7.43	0.62	849	4,072
Sept	0.00	0.00	849	1,000	**Sept**	5.84	0.49	849	4,072
Oct	1.28	0.11	849	1,000	**Oct**	4.02	0.34	849	4,072
Nov	2.25	0.19	849	1,000	**Nov**	2.02	0.17	849	4,072
Dec	2.35	0.20	849	1,000	**Dec**	1.33	0.11	849	4,072
TOTAL	**14.14**	**1.18**			**TOTAL**	**57.56**	**4.80**		

[a] Source: Stockton Metro Airport (WBAN:23237), NOAA-NCEI.
[b] Source: Manteca (#70), CIMIS station; free water surface evaporation coefficient, Ke = 1.05 (ASCE, 2016).

Table 5-5. Agricultural Conveyance System Net Losses (2018).

Agricultural Distribution System

2018 Canal, Pipeline, Lateral, Reservoir	Length (feet)	Width (feet)	Surface Area (square feet)	Precipitation (acre-feet)	Evaporation (acre-feet)	Spillage (acre-feet)	Seepage[a] (acre-feet)	Total (acre-feet)
Calaveras River	168,960	85	14,361,600	388.5	1,581.4	0	20,853	(22,046)
Mormon Slough	102,960	85	8,751,600	236.7	963.6	0	9,843	(10,569)
Potter Creek	70,752	35	2,476,320	67.0	272.7	0	2,785	(2,991)
Mosher Creek	101,904	35	3,566,640	96.5	392.7	0	4,011	(4,307)
New Melones Conveyance System	150,480	52	7,824,960	211.7	861.6	0	14,488	(15,138)
			0	0.0	0.0		0	
			0	0.0	0.0		0	
TOTAL	595,056		36,981,120	1,000.4	4,072.0	0	51,980	(55,051)

[a] Seepage along Mormon Slough, Potter Creek, and Mosher Creek calculated during agricultural deliveries. Seepage along Calaveras River and the New Melones Conveyance System calculated during agricultural and M&I deliveries.

Table 5-6. Urban Distribution System Net Losses (2018).

Urban Distribution System Losses[a]

2018 Area or Line	**Length** (feet)	**Leaks** (acre-feet)	**Breaks** (acre-feet)	**Flushing/Fire** (acre-feet)	**Total District Water Supply** (acre-feet)
None	0	0	0	0	0
	0	0	0	0	0
TOTAL	0	0	0	0	0

[a] SEWD is an urban wholesaler and thus does not have an urban distribution system.

Table 5-7. Agricultural Crop Water Needs (2018).

Crop Water Needs

2018 Crop Name	Area (crop acres)	Crop ET[a] (AF/Ac)	Leaching Requirement (AF/Ac)	Cultural Practices (AF/Ac)	Effective Precipitation[b] (AF/Ac)	Appl. Crop Water Use (acre-feet)
Walnuts	30,286	3.39	0.00	0.00	0.70	81,550
Cherries	11,417	3.27	0.00	0.00	0.67	29,619
Other Orchards	5,775	3.26	0.00	0.00	0.66	15,015
Grapes/Vineyards	5,470	2.12	0.00	0.00	0.62	8,176
Misc. Field Crops	2,861	3.22	0.00	0.00	0.60	7,498
Pasture/Alfalfa	2,169	3.34	0.00	0.00	0.61	5,930
Corn	1,126	3.14	0.00	0.00	0.59	2,875
Other	426	2.12	0.00	0.00	0.63	634
Other Grains	182	3.14	0.00	0.00	0.61	460
	0	0.0	0.0	0.0	0.0	0
	0	0.0	0.0	0.0	0.0	0
	0	0.0	0.0	0.0	0.0	0
	0	0.0	0.0	0.0	0.0	0
Crop Acres	59,711					151,756

Total Irrig. Acres 59,711

[a] Source: Manteca CIMIS Station (#70) ETo; crop coefficients from Mapping EvapoTranspiration at high Resolution with Internalized Calibration (METRIC) analysis, Irrigation Training & Research Center (ITRC), California Polytechnic State University – San Luis Obispo.

[b] Source: Stockton Metro Airport Station (WBAN:23237) precipitation; USDA-SCS R_e method (USDA-SCS, 1993).

Table 5-8. District Water Inventory (2018).

2018 District Water Inventory

Water Supply	Table 5-3		116,980
Environmental Consumptive Use	(Distribution, Drain, etc.)	minus	1,000
Groundwater recharge	(intentional - ponds, injection)	minus	3,703
Seepage	Table 5-5	minus	51,980
Evaporation - Precipitation	Table 5-5	minus	3,072
Spillage	Table 5-5	minus	0
Leaks, Breaks, Flushing / Fire	Table 5-6	minus	0
Transfers out of District[a]		minus	5,667
Water Available for sale to customers			51,559
Actual Agricultural Water Sales	2018	From District Sales Records	23,029
Private Groundwater	Table 5-2	plus	167,534
Crop Water Needs	Table 5-7	minus	151,756
Drainwater outflow	(tail and tile not recycled)	minus	0
Percolation from Agricultural Land	(calculated)		38,807
M&I Actual Water Sales	2018	From District Records	27,558
Inside Use	Feb urban use x 12		18,504
Landscape / Outside Use	(calculated)		9,054
Unaccounted for Water	(calculated)		972

[a] SEWD no longer provides surface water sales to out-of-district customers. Any out-of-district customers receiving water from SEWD as of 2019 are receiving water from OID that is wheeled by SEWD.

Table 5-9. District Influence on Groundwater and Saline Sink (2018).

Influence on Groundwater and Saline Sink

2018

Agric Land Deep Perc + Seepage[a] + Recharge - Groundwater Pumping = District Influence on Groundwater Storage	(82,444)
Estimated actual change in ground water storage, including natural recharge)	0
Irrigated Acres (from Table 5-7)	59,711
Irrigated acres over a perched water table	0
Irrigated acres draining to a saline sink	0
Portion of percolation from agri seeping to a perched water table	0
Portion of percolation from agri seeping to a saline sink	0
Portion of On-Farm Drain water flowing to a perched water table/saline sink	0
Portion of Dist. Sys. seep/leaks/spills to perched water table/saline sink	0
Total (AF) flowing to a perched water table and saline sink	0

[a] Does not include seepage from the natural streams during the times that New Melones Reservoir and New Hogan Reservoir are not releasing irrigation or M&I water.

Table 5-10. District Annual Water Supply Delivered Under All Contracts (2009-2018).

Annual Water Quantities Delivered Under All Contracts

Year	Federal Ag Water (acre-feet)	Federal Urban Water (acre-feet)	State Water (acre-feet)	Local Water (define) (acre-feet)	Transfers into District (acre-feet)	Other Water (transfers) *OID/SSJID M&I* (acre-feet)	Total (acre-feet)	Total (acre-feet)
2009	44,854	35,133	0	0	0	32,913	0	112,900
2010	51,540	39,776	0	0	0	26,900	0	118,216
2011	59,261	61,742	0	0	0	0	0	121,003
2012	72,033	56,866	0	0	0	0	0	128,899
2013	78,818	49,138	0	0	0	0	0	127,956
2014	70,320	39,381	0	0	0	0	0	109,701
2015	17,340	27,933	0	0	0	0	0	45,273
2016	47,521	30,416	0	0	0	7,498	0	85,435
2017	63,228	38,866	0	0	0	0	0	102,094
2018	74,587	42,393	0	0	0	0	0	116,980
Total	579,503	421,643	0	0	0	67,311	0	1,068,457
Average	57,950	42,164	0	0	0	6,731	0	106,846

Table 5-11. District Annual Water Supply Delivered, New Hogan Contract (2009-2018).

Annual Water Quantities Delivered Under New Hogan Contract

Year	**Federal Ag Water** (acre-feet)	**Federal Urban Water** (acre-feet)	**State Water** (acre-feet)	**Local Water (define)** (acre-feet)	**Transfers into District** (acre-feet)	**Other Water (transfers)** *OID/SSJID M&I* (acre-feet)	**Total** (acre-feet)	**Total** (acre-feet)
2009	42,903	30,864	0	0	0	0	0	73,767
2010	41,277	17,595	0	0	0	0	0	58,872
2011	46,725	14,168	0	0	0	0	0	60,893
2012	65,689	11,884	0	0	0	0	0	77,573
2013	70,781	3,051	0	0	0	0	0	73,832
2014	62,085	1,781	0	0	0	0	0	63,866
2015	17,197	25,420	0	0	0	0	0	42,617
2016	45,019	30,416	0	0	0	0	0	75,435
2017	59,209	14,684	0	0	0	0	0	73,893
2018	65,180	6,022	0	0	0	0	0	71,202
Total	516,066	155,884	0	0	0	0	0	671,950
Average	51,607	15,588	0	0	0	0	0	67,195

Table 5-12. District Annual Water Supply Delivered, New Melones Contract and OID/SSJID Temporary Water Transfer Agreements (via New Melones) (2009-2018).

Annual Water Quantities Delivered Under New Melones Contract and OID/SSJID Temporary Water Transfer Agreements (via New Melones)

Year	**Federal Ag Water** (acre-feet)	**Federal Urban Water** (acre-feet)	**State Water** (acre-feet)	**Local Water (define)** (acre-feet)	**Transfers into District** (acre-feet)	**Other Water (transfers)** *OID/SSJID M&I* (acre-feet)	**Total** (acre-feet)	**Total** (acre-feet)
2009	1,951	4,269	0	0	0	32,913	0	39,133
2010	10,263	22,181	0	0	0	26,900	0	59,344
2011	12,536	47,574	0	0	0	0	0	60,110
2012	6,344	44,982	0	0	0	0	0	51,326
2013	8,037	46,087	0	0	0	0	0	54,124
2014	8,235	37,600	0	0	0	0	0	45,835
2015	143	2,513	0	0	0	0	0	2,656
2016	2,502	0	0	0	0	7,498	0	10,000
2017	4,019	24,182	0	0	0	0	0	28,201
2018	9,407	36,371	0	0	0	0	0	45,778
Total	63,437	265,759	0	0	0	67,311	0	396,507
Average	6,344	26,576	0	0	0	6,731	0	39,651

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CONTENTS

ATTACHMENT A

District Maps

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ATTACHMENT A.1.

District Facilities Maps

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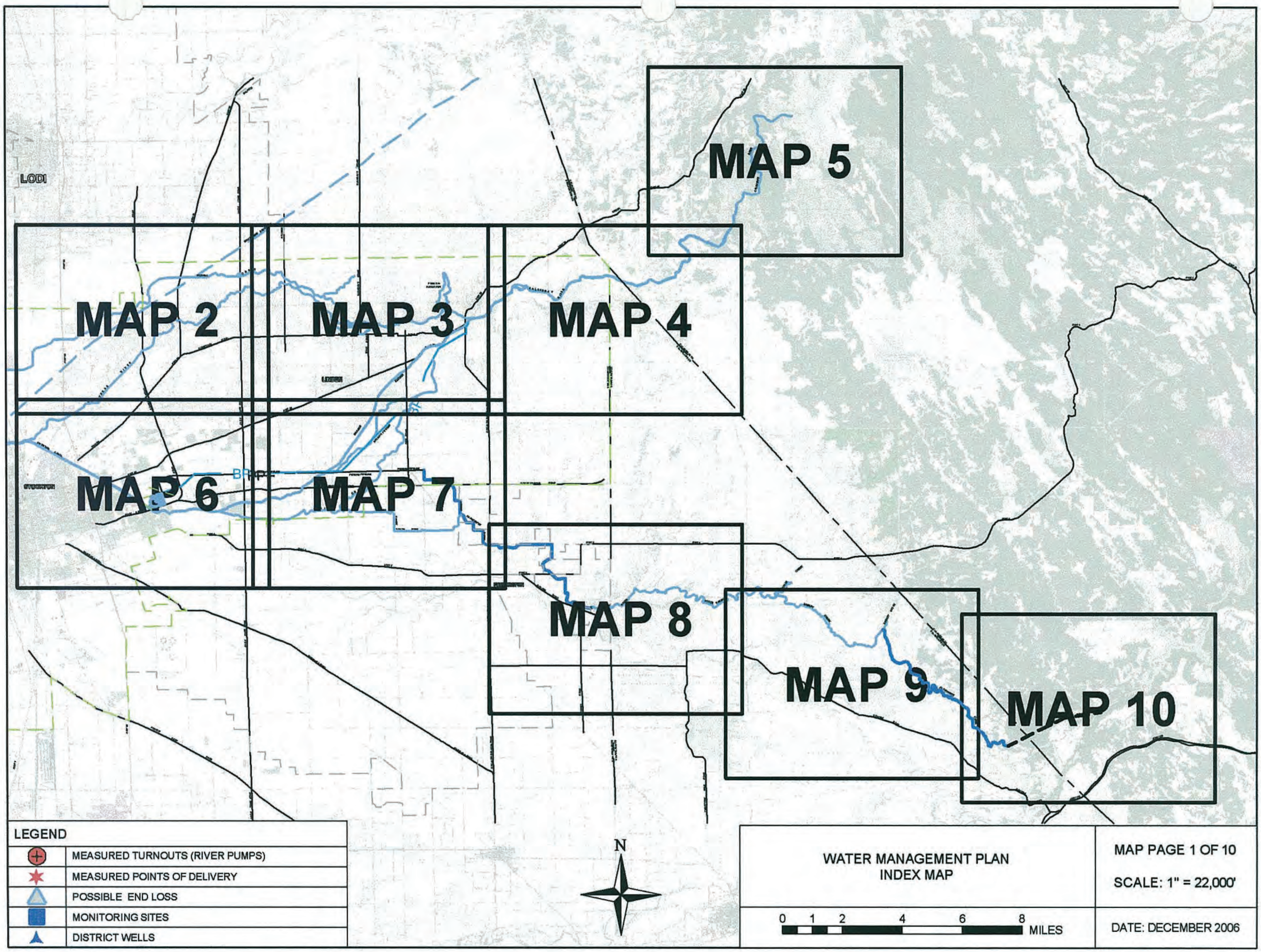

LODI
MAP 2
MAP 3
MAP 4
MAP 5
MAP 6
MAP 7
MAP 8
MAP 9
MAP 10
LEGEND
MEASURED TURNOUTS (RIVER PUMPS)
MEASURED POINTS OF DELIVERY
POSSIBLE END LOSS
MONITORING SITES
DISTRICT WELLS
N
WATER MANAGEMENT PLAN
INDEX MAP
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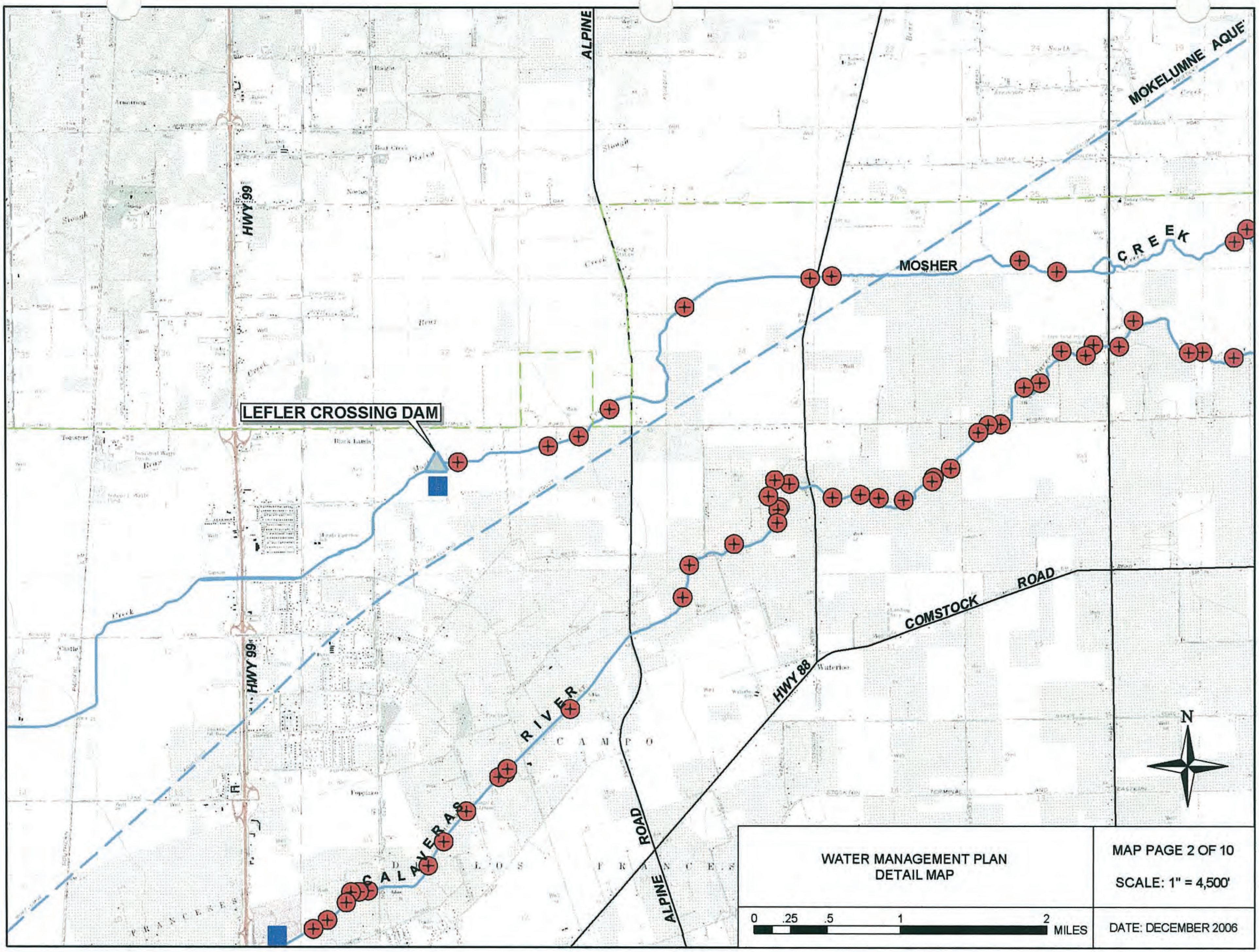
MAP PAGE 1 OF 10
SCALE: 1" = 22,000'
DATE: DECEMBER 2006



MOKELUMNE AQUE
ALPINE
HWY 99
LEFLER CROSSING DAM
MOSHER
CREEK
COMSTOCK
ROAD
HWY 88
RIVER
CAMPO
CALAVERAS
LOS
FRANCES
ROAD
ALPINE
N
0 .25 .5 1 2 MILES
WATER MANAGEMENT PLAN
DETAIL MAP
MAP PAGE 2 OF 10
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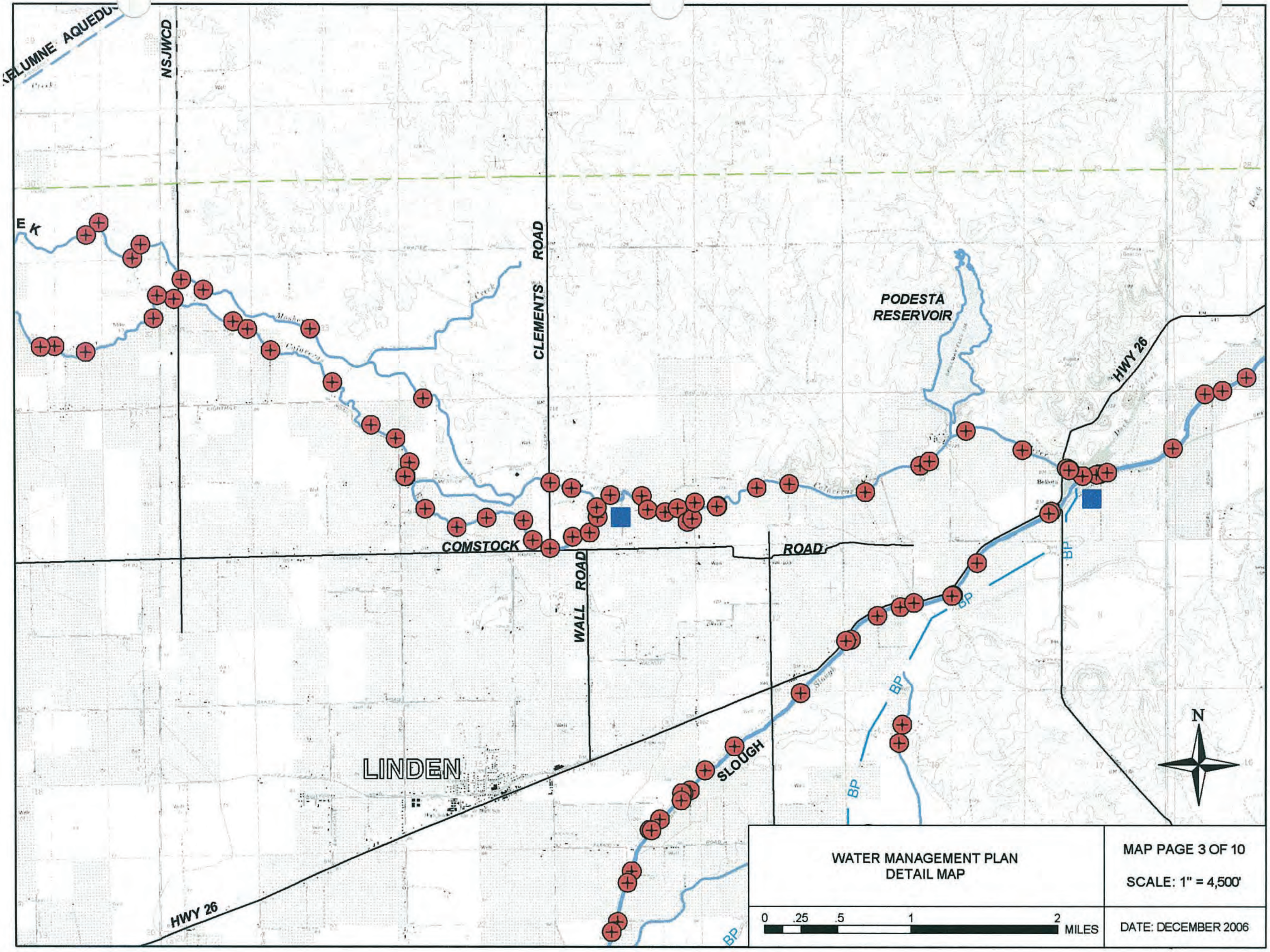
DATE: DECEMBER 2006

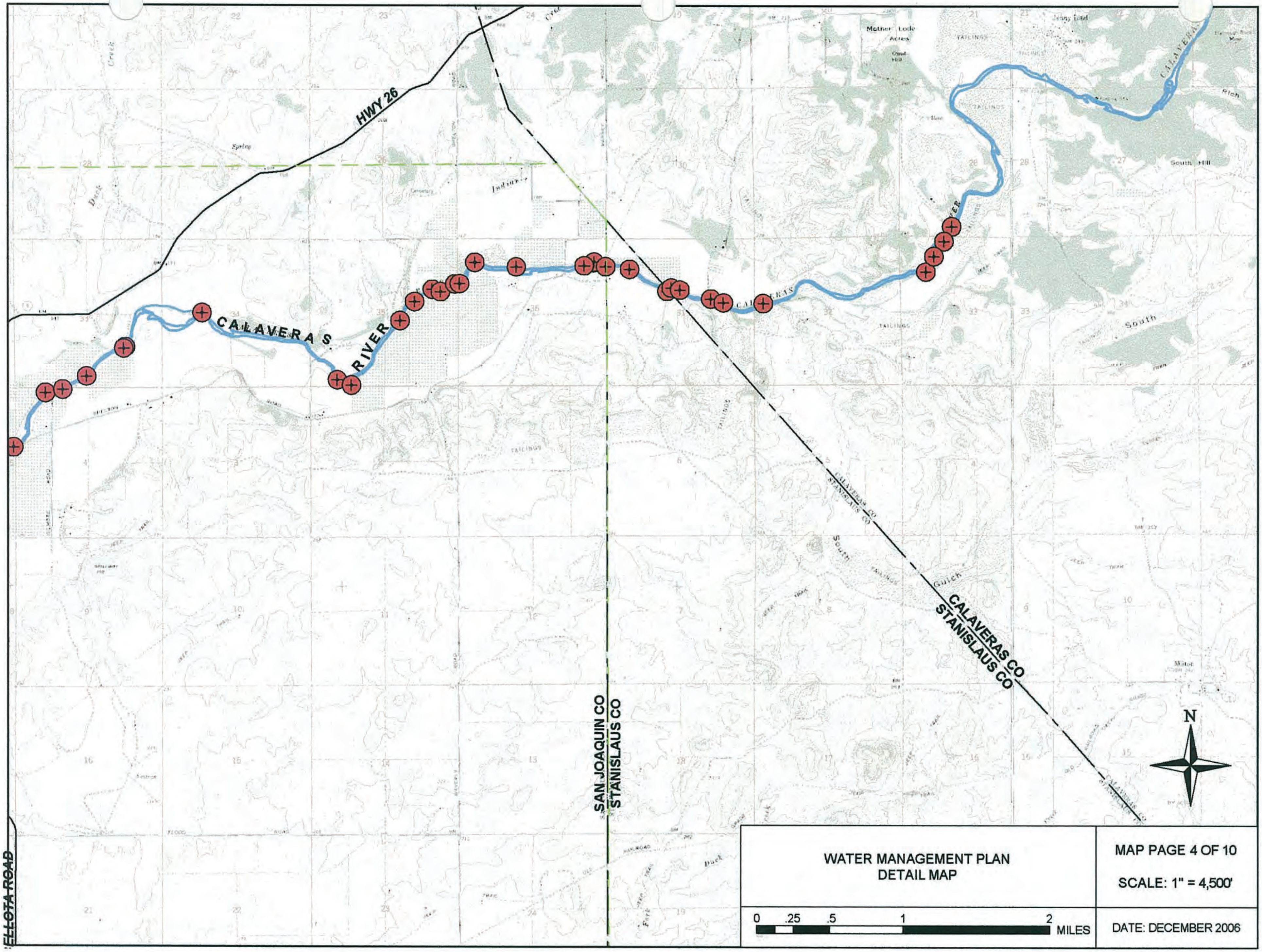


WATER MANAGEMENT PLAN
DETAIL MAP

MAP PAGE 3 OF 10

SCALE: 1" = 4,500'

DATE: DECEMBER 2006



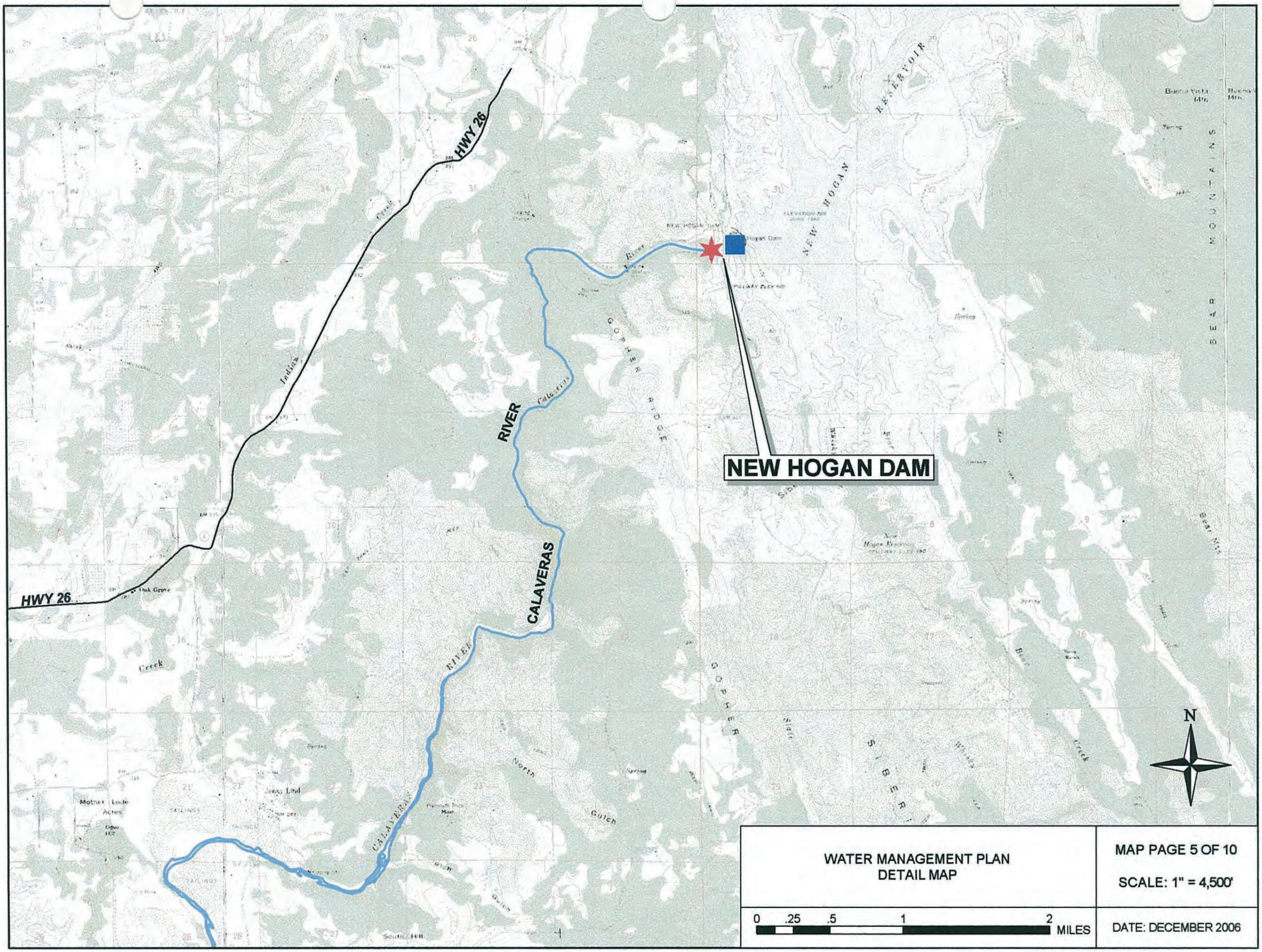
WATER MANAGEMENT PLAN
DETAIL MAP

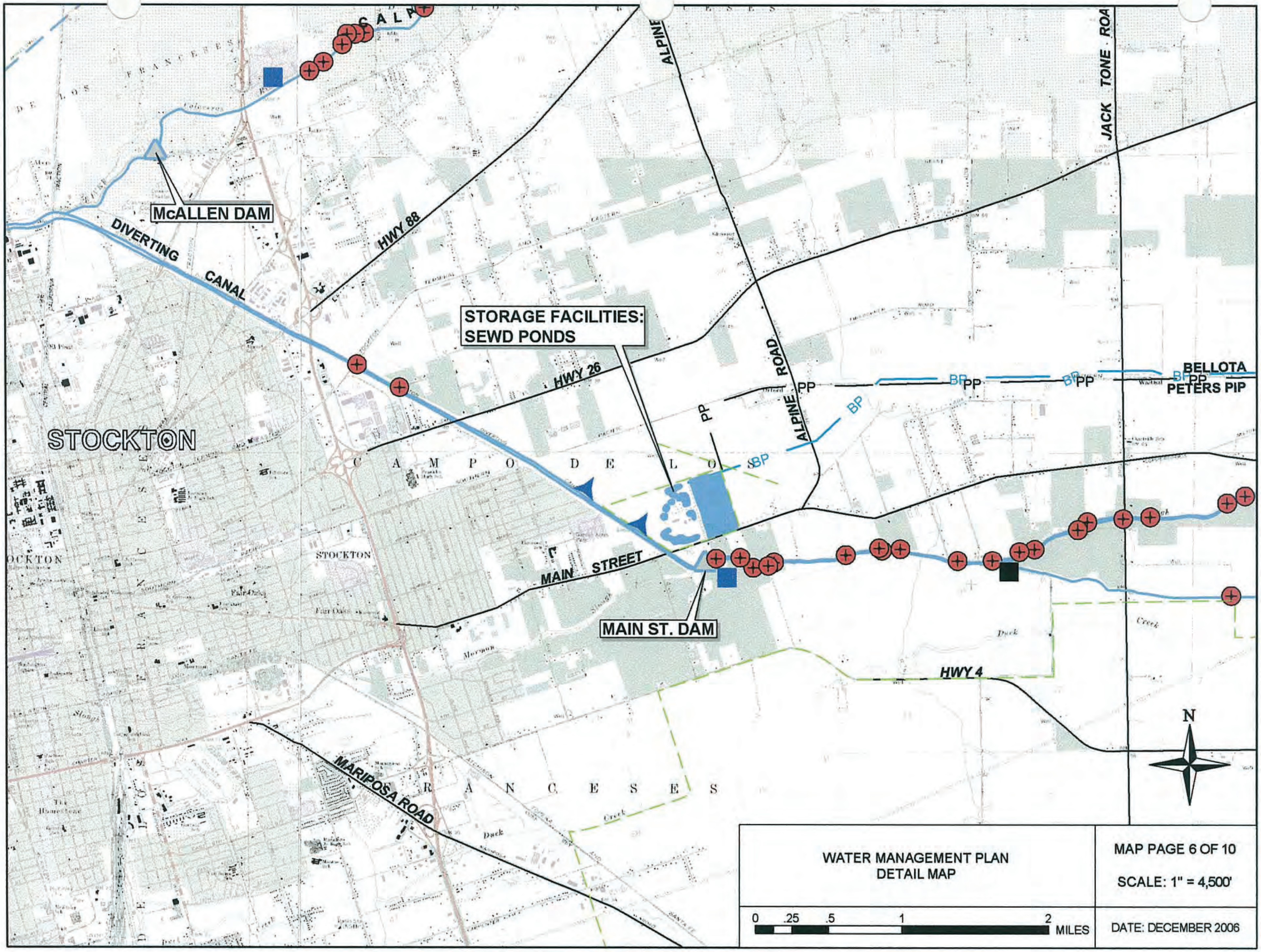
MAP PAGE 4 OF 10

SCALE: 1" = 4,500'

0 .25 .5 1 2 MILES

DATE: DECEMBER 2006


HWY 26
HWY 26
NEW HOGAN DAM
RIVER
CALAVERAS
NEW HOGAN RESERVOIR
BEAR MOUNTAINS
GOPHER RIDGE
Mother Lode Acres
North Gulch
Rich Gulch
N
WATER MANAGEMENT PLAN
DETAIL MAP
MAP PAGE 5 OF 10
SCALE: 1" = 4,500'
0 .25 .5 1 2 MILES
DATE: DECEMBER 2006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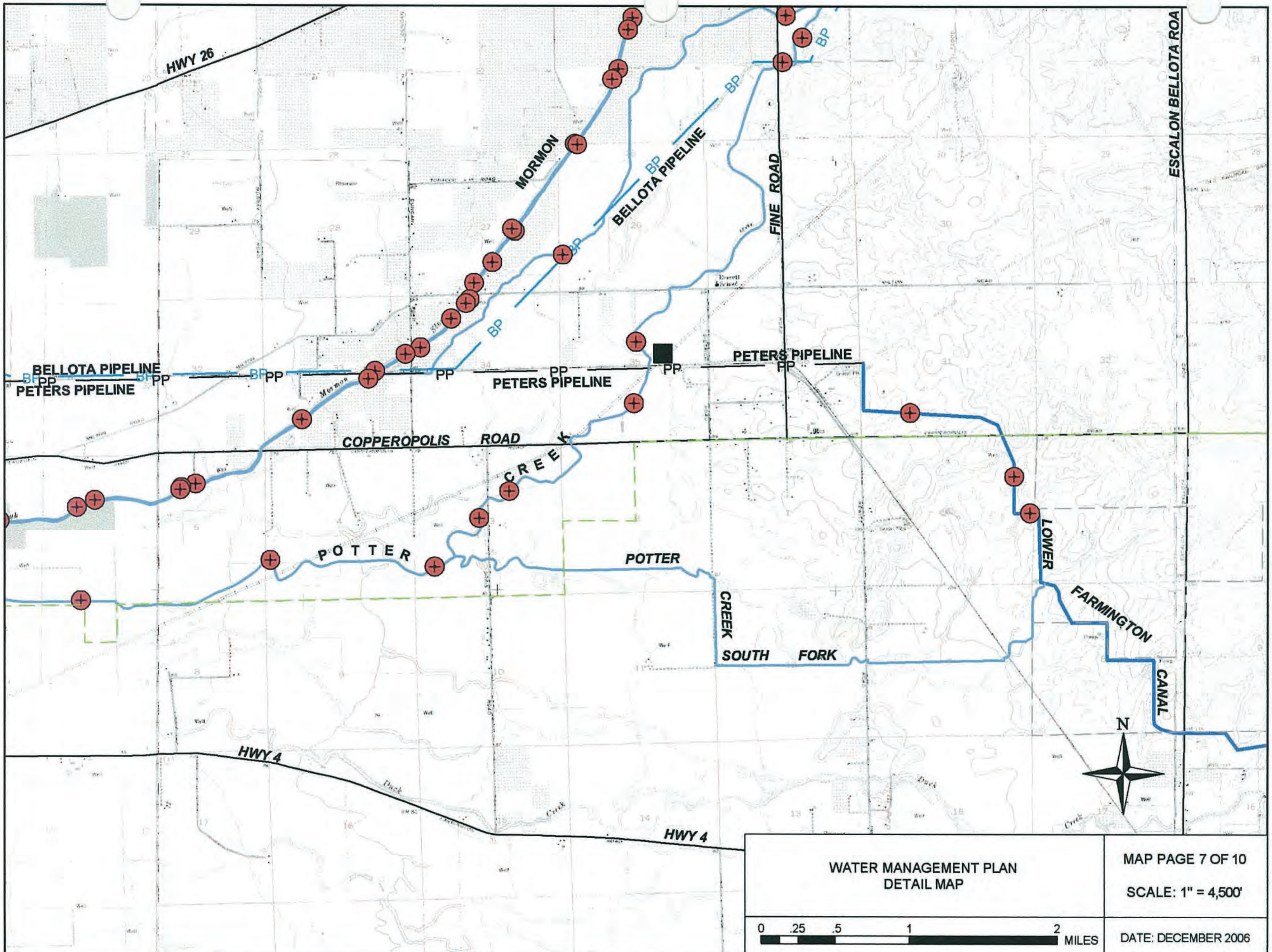
DIVERTING CANAL
HWY 88
HWY 26
STORAGE FACILITIES:
SEWD PONDS
ALPINE ROAD
JACK TONE ROA
BELLOTA PETERS PIP
PP
BP
STOCKTON
C A M P O D E L O S
MAIN STREET
MAIN ST. DAM
HWY 4
MARIPOSA ROAD
R A N C E S E S
N
WATER MANAGEMENT PLAN
DETAIL MAP
MAP PAGE 6 OF 10
SCALE: 1" = 4,500'
0 .25 .5 1 2 MILES
DATE: DECEMBER 2006



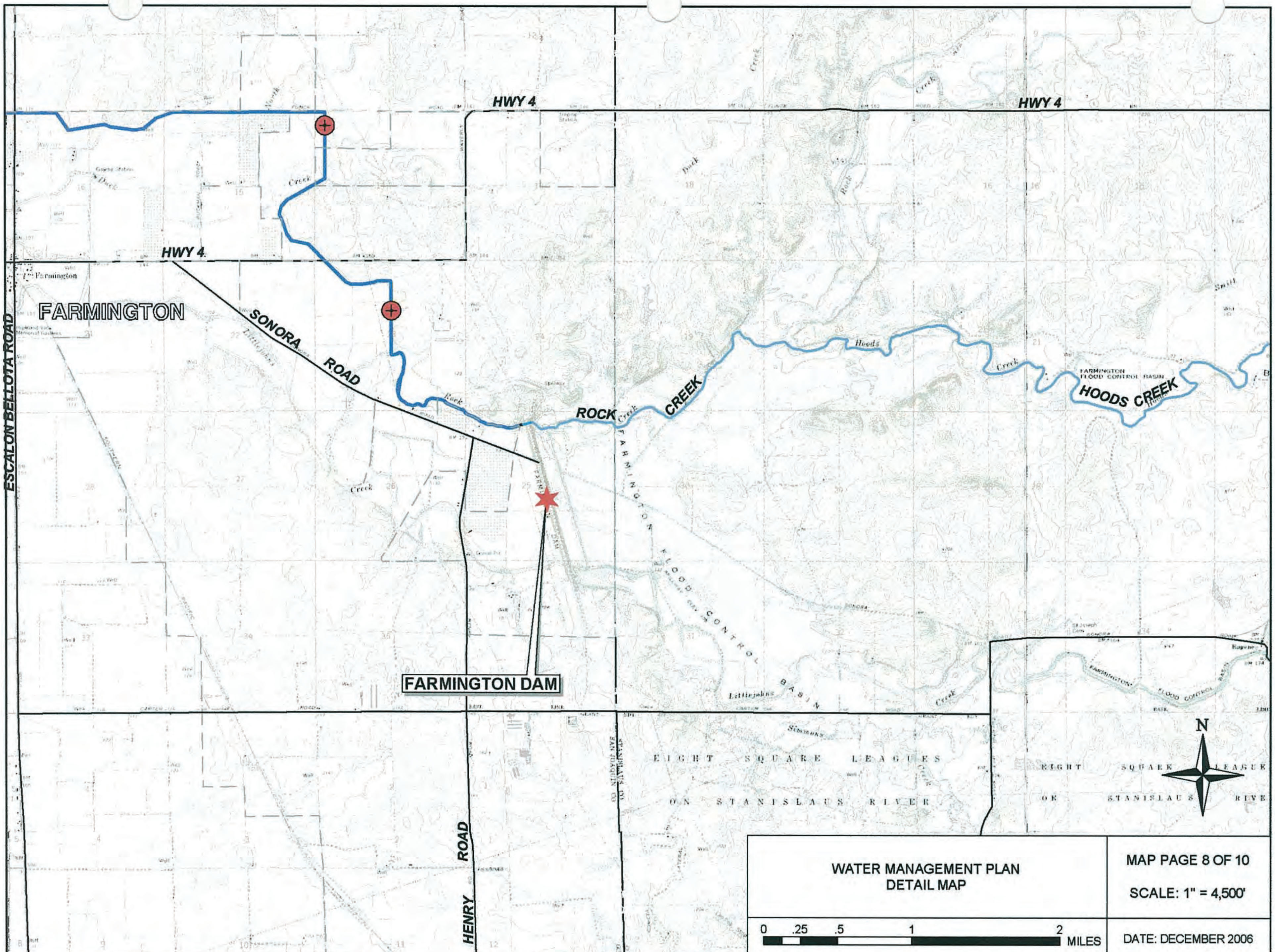
WATER MANAGEMENT PLAN
DETAIL MAP

MAP PAGE 7 OF 10

SCALE: 1" = 4,500'

0 .25 .5 1 2 MILES

DATE: DECEMBER 2006

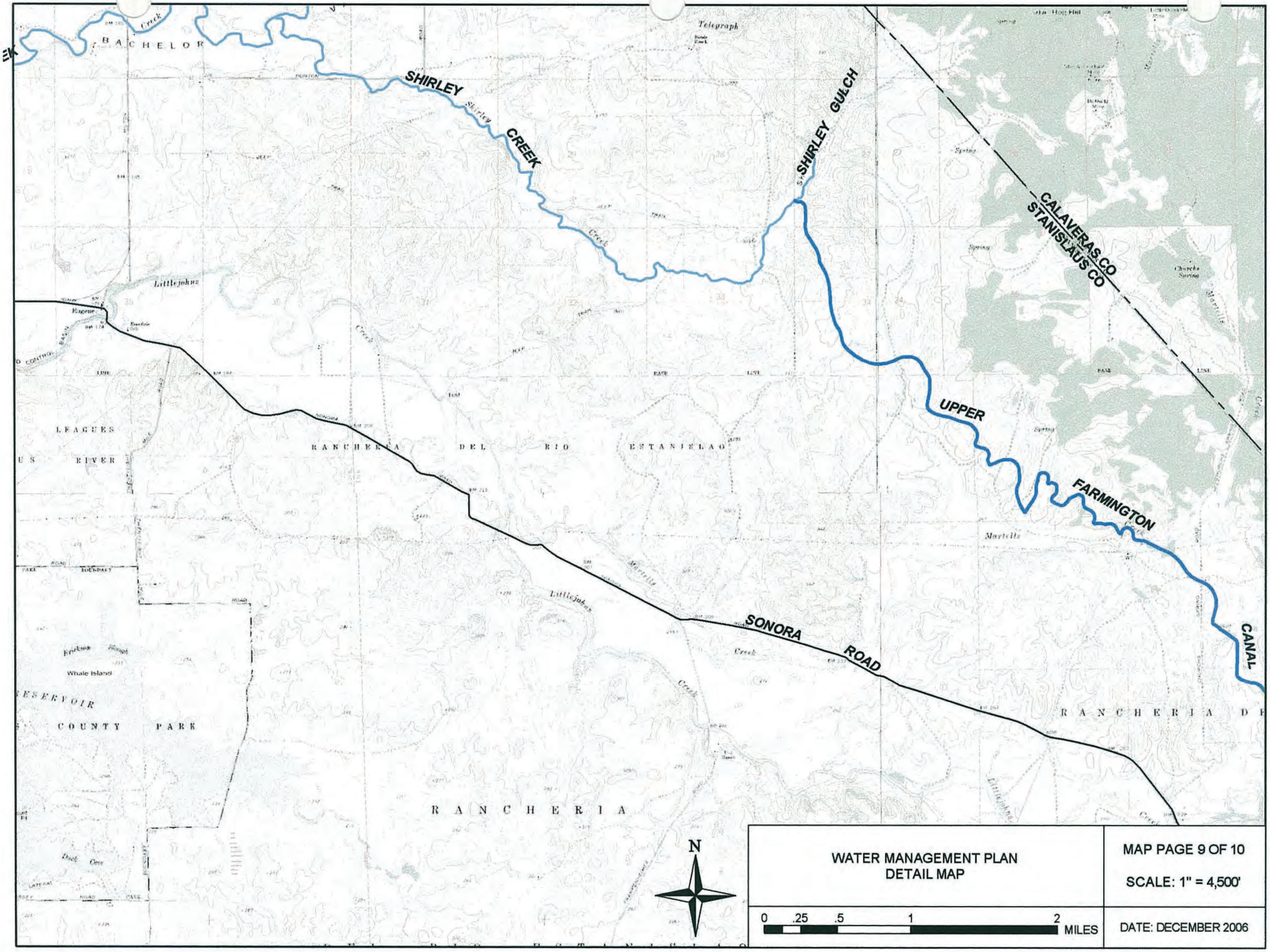


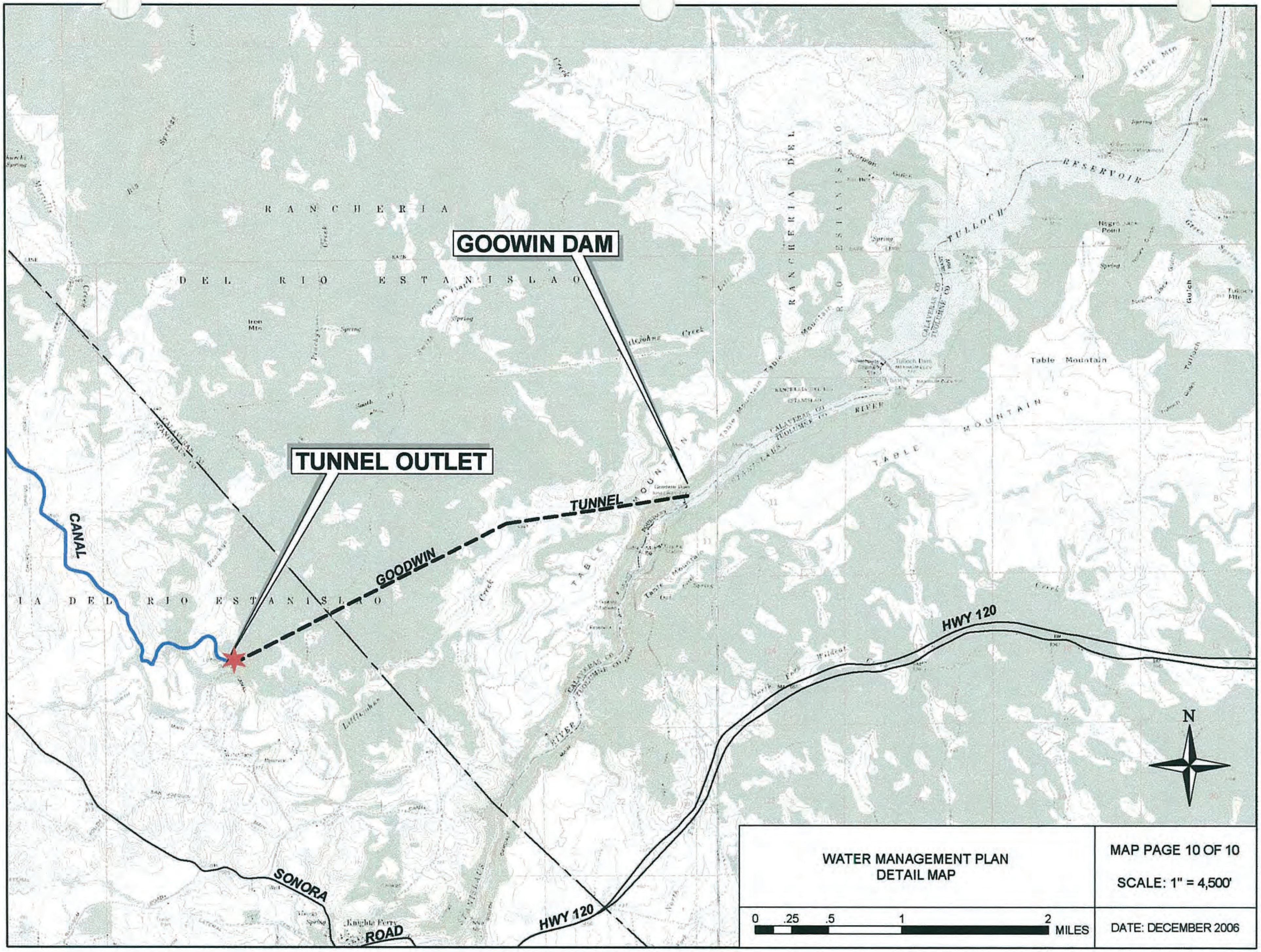
WATER MANAGEMENT PLAN
DETAIL MAP

MAP PAGE 8 OF 10

SCALE: 1" = 4,500'

DATE: DECEMBER 2006


SHIRLEY CREEK
SHIRLEY GULCH
CALAVERAS CO
STANISLAUS CO
UPPER FARMINGTON CANAL
SONORA ROAD
BACHELOR
LEAGUES
RIVER
RANCHERIA DEL RIO ESTANISLAO
RESERVOIR
COUNTY PARK
RANCHERIA
Whale Island
N
WATER MANAGEMENT PLAN
DETAIL MAP
MAP PAGE 9 OF 10
SCALE: 1" = 4,500'
0 .25 .5 1 2 MILES
DATE: DECEMBER 2006

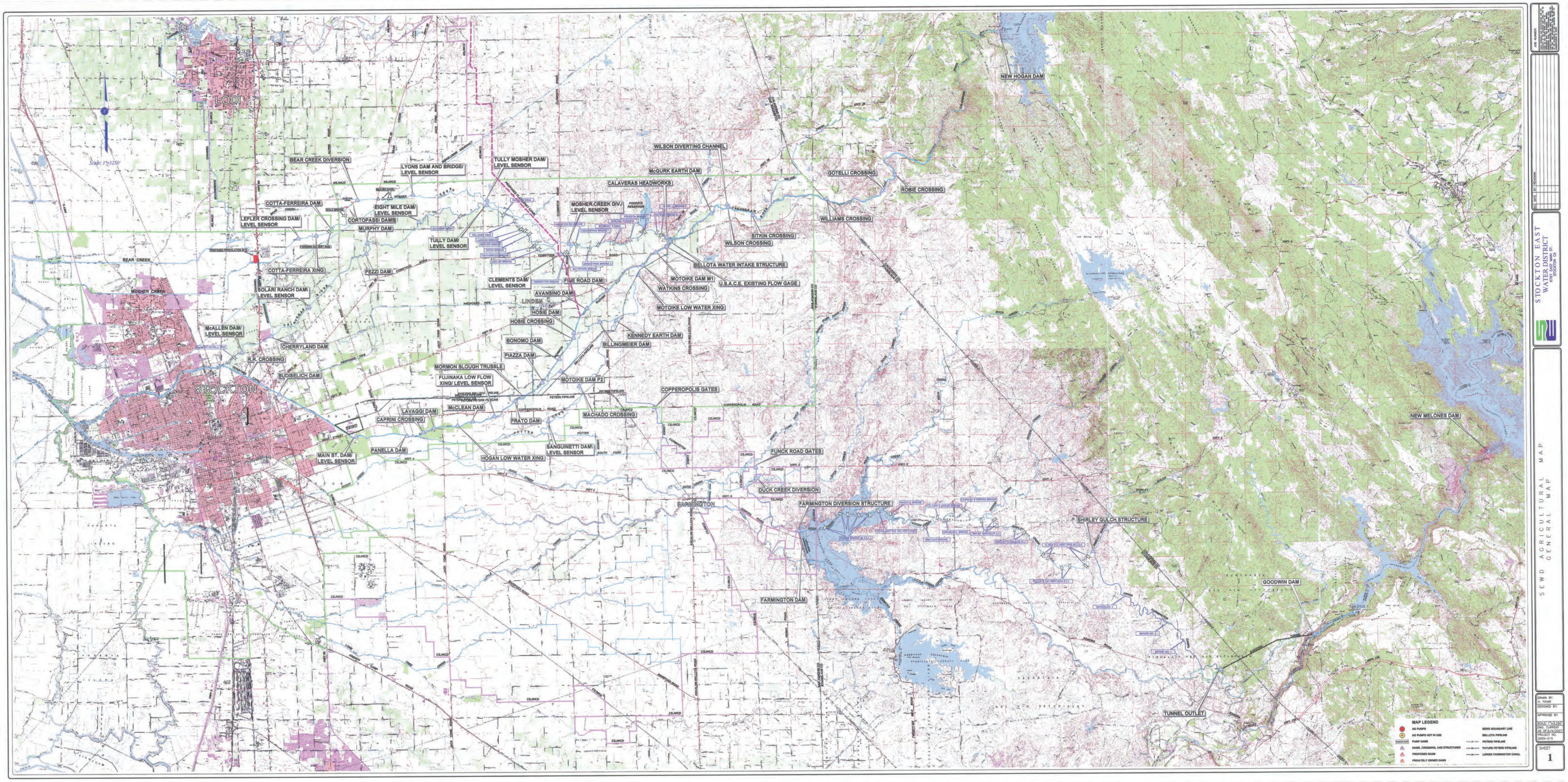


WATER MANAGEMENT PLAN
DETAIL MAP

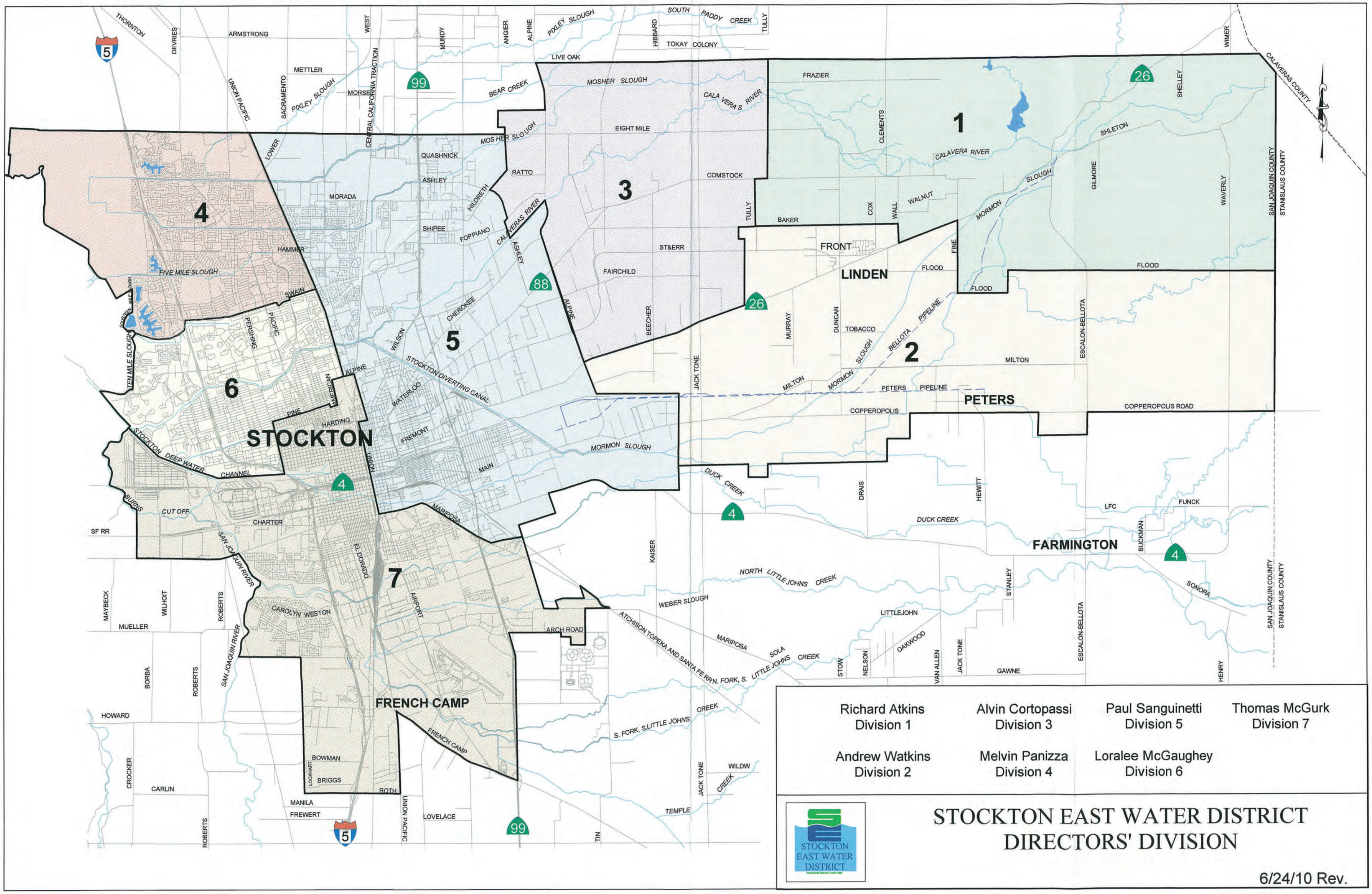
MAP PAGE 10 OF 10

SCALE: 1" = 4,500'

DATE: DECEMBER 2006



LODI
STOCKTON
BEAR CREEK DIVERSION
LYONS DAM AND BRIDGE/ LEVEL SENSOR
TULLY MOSHER DAM/ LEVEL SENSOR
WILSON DIVERTING CHANNEL
McGURK EARTH DAM
CALAVERAS HEADWORKS
GOTELLI CROSSING
ROBIE CROSSING
NEW HOGAN DAM
COTTA-FERREIRA DAM
LEFLER CROSSING DAM/ LEVEL SENSOR
CORTOPASSI DAMS
EIGHT MILE DAM/ LEVEL SENSOR
MURPHY DAM
MOSHER CREEK DIV./ LEVEL SENSOR
WILLIAMS CROSSING
SITKIN CROSSING
WILSON CROSSING
TULLY DAM/ LEVEL SENSOR
BELLOTA WATER INTAKE STRUCTURE
COTTA-FERREIRA XING
PEZZI DAM
BEAR CREEK
MOSHER CREEK
CLEMENTS DAM/ LEVEL SENSOR
FINE ROAD DAM
MOTOIKE DAM M1
WATKINS CROSSING
U.S.A.C.E. EXISTING FLOW GAGE
SOLARI RANCH DAM/ LEVEL SENSOR
AVANSINO DAM
HOSIE DAM
HOSIE CROSSING
MOTOIKE LOW WATER XING
McALLEN DAM/ LEVEL SENSOR
KENNEDY EARTH DAM
BONOMO DAM
BILLINGMEIER DAM
CHERRYLAND DAM
R.R. CROSSING
PIAZZA DAM
BUDISELICH DAM
MORMON SLOUGH TRUSSLE
FUJINAKA LOW FLOW XING/ LEVEL SENSOR
MOTOIKE DAM P2
COPPEROPOLIS GATES
LAVAGGI DAM
McCLEAN DAM
CAPRINI CROSSING
PRATO DAM
MACHADO CROSSING
SANGUINETTI DAM/ LEVEL SENSOR
PANELLA DAM
MAIN ST. DAM/ LEVEL SENSOR
HOGAN LOW WATER XING
FUNCK ROAD GATES
DUCK CREEK DIVERSION
FARMINGTON
FARMINGTON DIVERSION STRUCTURE
SHIRLEY GULCH STRUCTURE
NEW MELONES DAM
GOODWIN DAM
FARMINGTON DAM
TUNNEL OUTLET
MAP LEGEND
AG PUMPS
AG PUMPS NOT IN USE
PUMP NAME
DAMS, CROSSING, AND STRUCTURES
PROPOSED DAMS
PRIVATELY OWNED DAMS
SEWD BOUNDARY LINE
BELLOTA PIPELINE
PETERS PIPELINE
FUTURE PETERS PIPELINE
LOWER FARMINGTON CANAL
STOCKTON EAST WATER DISTRICT
SEWD AGRICULTURAL GENERAL MAP
SHEET
1



STOCKTON EAST WATER DISTRICT
DIRECTORS' DIVISION
6/24/10 Rev.
Richard Atkins
Division 1
Alvin Cortopassi
Division 3
Paul Sanguinetti
Division 5
Thomas McGurk
Division 7
Andrew Watkins
Division 2
Melvin Panizza
Division 4
Loralee McGaughey
Division 6
STOCKTON EAST WATER DISTRICT
1
2
3
4
5
6
7
STOCKTON
LINDEN
PETERS
FARMINGTON
FRENCH CAMP
SAN JOAQUIN COUNTY
STANISLAUS COUNTY
CALAVERAS COUNTY
CALAVERAS RIVER
MORMON SLOUGH
STOCKTON DIVERTING CANAL
STOCKTON DEEP WATER CHANNEL
SAN JOAQUIN RIVER
DUCK CREEK
NORTH LITTLE JOHNS CREEK
S. FORK, S.LITTLE JOHNS CREEK
FIVE MILE SLOUGH
TEN MILE SLOUGH
BEAR CREEK
MOSHER SLOUGH
PIXLEY SLOUGH
WEBER SLOUGH
BELLOTA PIPELINE
PETERS PIPELINE
ATCHISON TOPEKA AND SANTA FE RR
UNION PACIFIC
CENTRAL CALIFORNIA TRACTION
5
99
26
88
4

ATTACHMENT A.2.

District Soils Map

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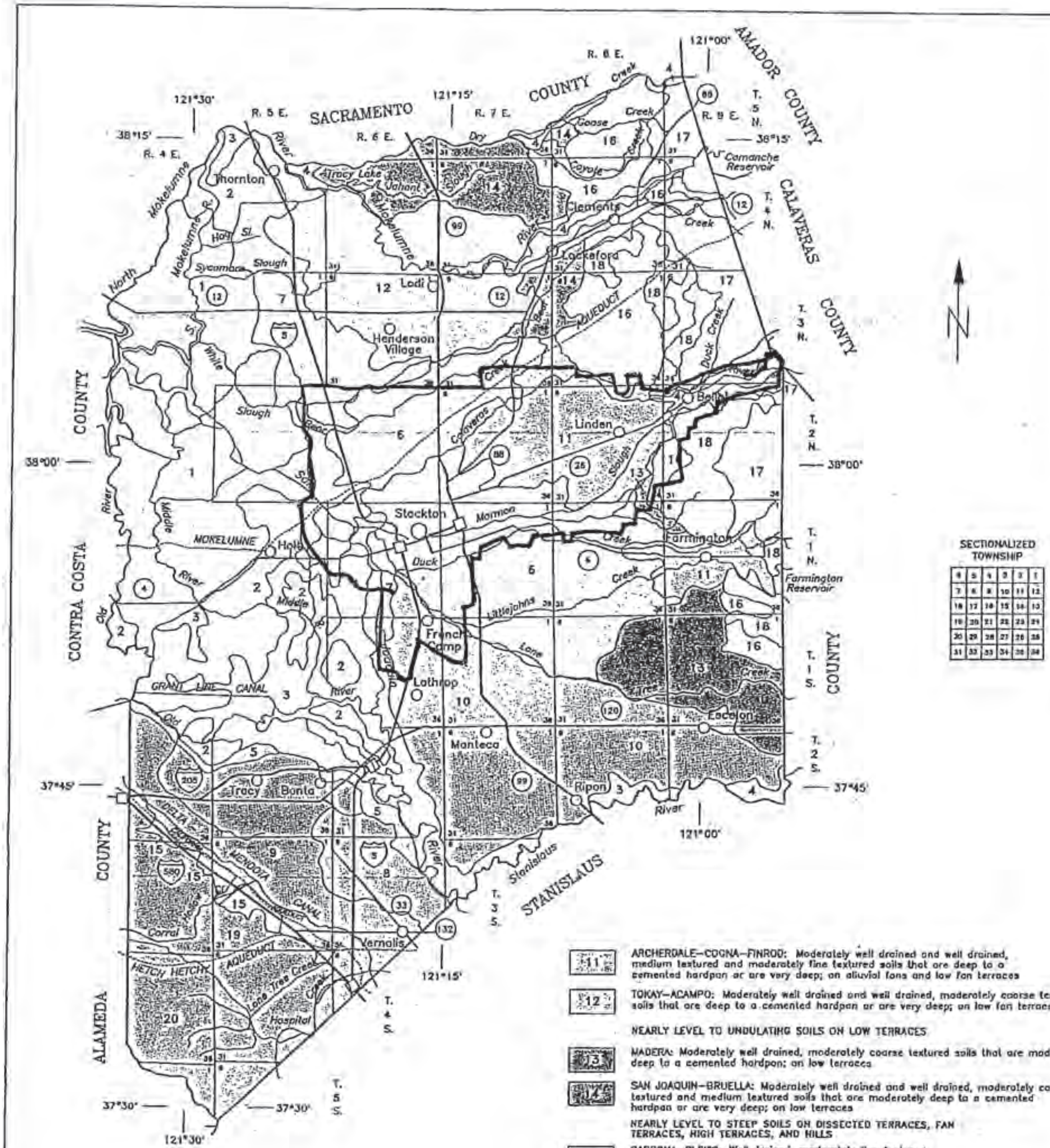

SOIL LEGEND*

NEARLY LEVEL SOILS ON DELTAS AND FLOOD PLAINS

1	RINDGE—KINGILE—RYDE: Very poorly drained, organic soils and very poorly drained, highly organic, moderately fine textured, mineral soils, all of which are very deep and have been partially drained; on deltas and flood plains
2	PELTIER—EGBERT: Poorly drained, highly organic, moderately fine textured soils that are very deep and have been partially drained; on deltas and flood plains
3	MERRITT—GRANGEVILLE—COLUMBIA: Poorly drained and somewhat poorly drained, moderately coarse textured and moderately fine textured soils that are very deep and have been partially drained or drained; on flood plains
4	COLUMBIA—VINA—COYOTECREEK: Somewhat poorly drained and well drained, moderately coarse textured and medium textured soils that are very deep and are subject to flooding or protected by levees; on flood plains

NEARLY LEVEL SOILS IN BASINS AND ON BASIN RIMS

5	WILLOWS—PESCADERO: Poorly drained, moderately fine textured and fine textured, saline—sodic soils that are very deep and have been partially drained; in basins
6	JACKTONE—HOLLENBECK—STOCKTON: Somewhat poorly drained and moderately well drained, fine textured soils that are moderately deep and deep to a cemented hardpan and that have been drained in some areas; on basin rims and in basins
7	GUARD—DEVRIES—RIOBLANCHO: Poorly drained and somewhat poorly drained, moderately coarse textured and moderately fine textured soils that are moderately deep to a cemented hardpan or are very deep and that have been drained in most areas; on basin rims

NEARLY LEVEL SOILS IN INTERFAN BASINS AND ON ALLUVIAL FANS, LOW FAN TERRACES, STREAM TERRACES, AND DUNES

8	CAPAY: Moderately well drained, fine textured soils that are very deep and have been subject to artificial wetness; mainly in interfan basins
9	CAPAY—STOMAR—ZACHARIAS: Moderately well drained and well drained, moderately fine textured, gravelly moderately fine textured, and fine textured soils that are very deep; in interfan basins and on alluvial fans and stream terraces
10	DELHI—VERITAS—TINNIN: Moderately well drained to somewhat excessively drained, coarse textured and moderately coarse textured soils that are deep to a cemented hardpan or are very deep; on dunes, alluvial fans and low fan terraces
11	ARCHERDALE—COGNA—FINROD: Moderately well drained and well drained, medium textured and moderately fine textured soils that are deep to a cemented hardpan or are very deep; on alluvial fans and low fan terraces
12	TOKAY—ACAMPO: Moderately well drained and well drained, moderately coarse textured soils that are deep to a cemented hardpan or are very deep; on low fan terraces

NEARLY LEVEL TO UNDULATING SOILS ON LOW TERRACES

13	MADERA: Moderately well drained, moderately coarse textured soils that are moderately deep to a cemented hardpan; on low terraces
14	SAN JOAQUIN—BRUELLA: Moderately well drained and well drained, moderately coarse textured and medium textured soils that are moderately deep to a cemented hardpan or are very deep; on low terraces

NEARLY LEVEL TO STEEP SOILS ON DISSECTED TERRACES, FAN TERRACES, HIGH TERRACES, AND HILLS

15	CARBONA—PLEITO: Well drained, moderately fine textured soils that are very deep; on dissected terraces
16	COMETA—SAN JOAQUIN—ROCKLIN: Moderately well drained, moderately coarse textured soils that are moderately deep to weakly cemented sediments or a cemented hardpan; on dissected terraces
17	PENTZ—PARDEE—KEYES: Moderately well drained and well drained, moderately coarse textured and gravelly medium textured soils that are shallow to sandstone, conglomerate, or a cemented hardpan; on hills and high terraces
18	REDDING—YELLOWLARK: Moderately well drained, gravelly medium textured soils that are moderately deep and deep to a cemented hardpan; mainly on fan terraces and high terraces

ROLLING TO VERY STEEP SOILS ON UPLIFTED, DISSECTED TERRACES AND MOUNTAINS

19	CALLA—CARBONA—WISFLAT: Well drained, moderately coarse textured and moderately fine textured soils that are very shallow, shallow, deep, and very deep; on uplifted, dissected terraces and mountains
20	GONZAGA—HONKER—VALLECITOS: Well drained, medium textured and gravelly medium textured soils that are shallow and moderately deep; on mountains

* Texture terms in the descriptive headings refer to the surface layer of the major soils in the map units.

Compiled 1990

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
REGENTS OF THE UNIVERSITY OF CALIFORNIA
(AGRICULTURAL EXPERIMENT STATION)
CALIFORNIA DEPARTMENT OF CONSERVATION

GENERAL SOIL MAP
SAN JOAQUIN COUNTY, CALIFORNIA

Scale 1:380,160

0 2 4 6 8 10

ATTACHMENT A.3.

District Map of Groundwater Facilities

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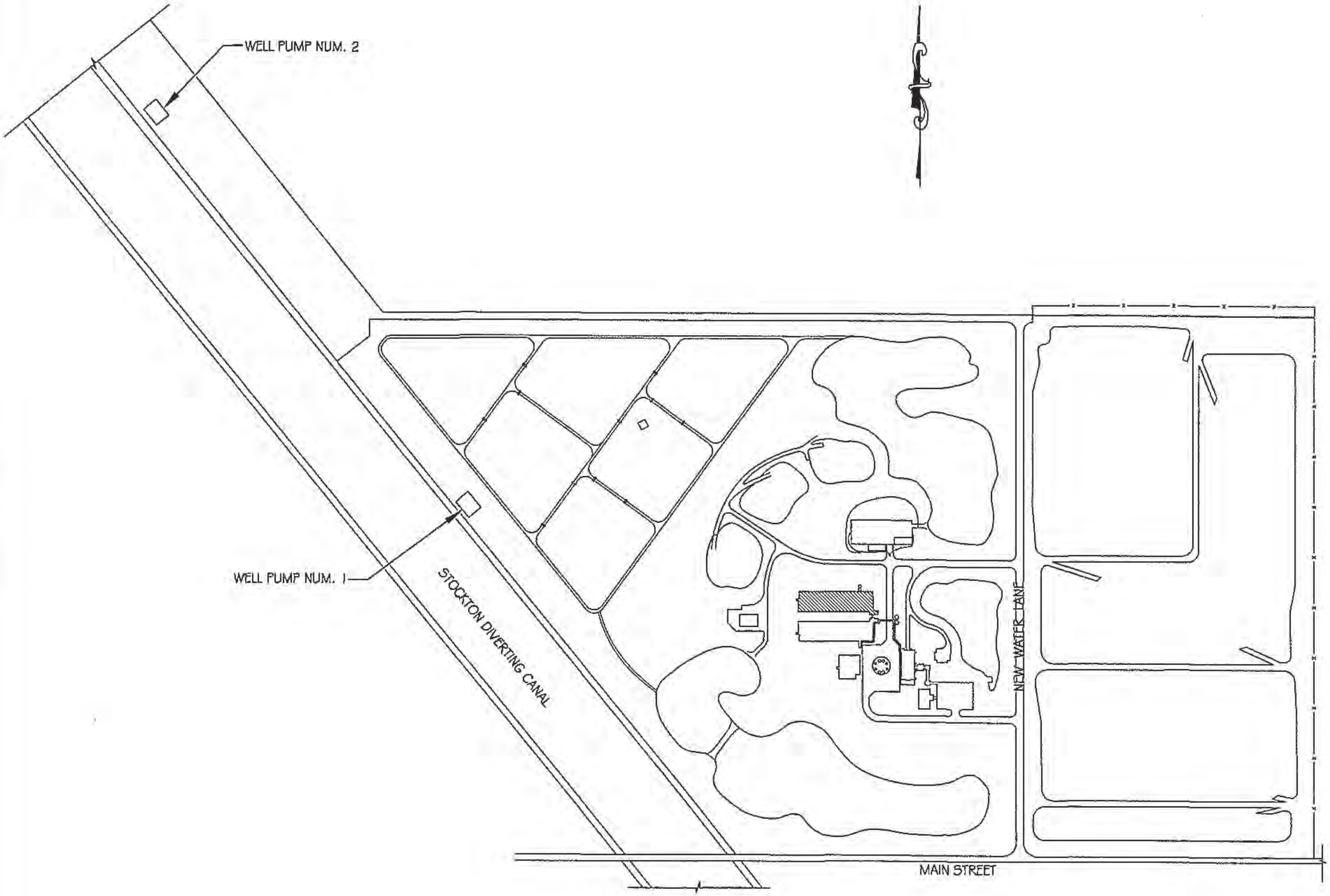

WELL PUMP NUM. 2
WELL PUMP NUM. 1
STOCKTON DIVERTING CANAL
NEW WATER LANE
MAIN STREET

Stockton East Water District
Farmington Recharge Project
Well Locations

SHEET
1

STOCKTON EAST
WATER DISTRICT
6767 EAST MAIN ST.
STOCKTON CA

NO.	DATE	BY	REVISION

JOB NUMBER:

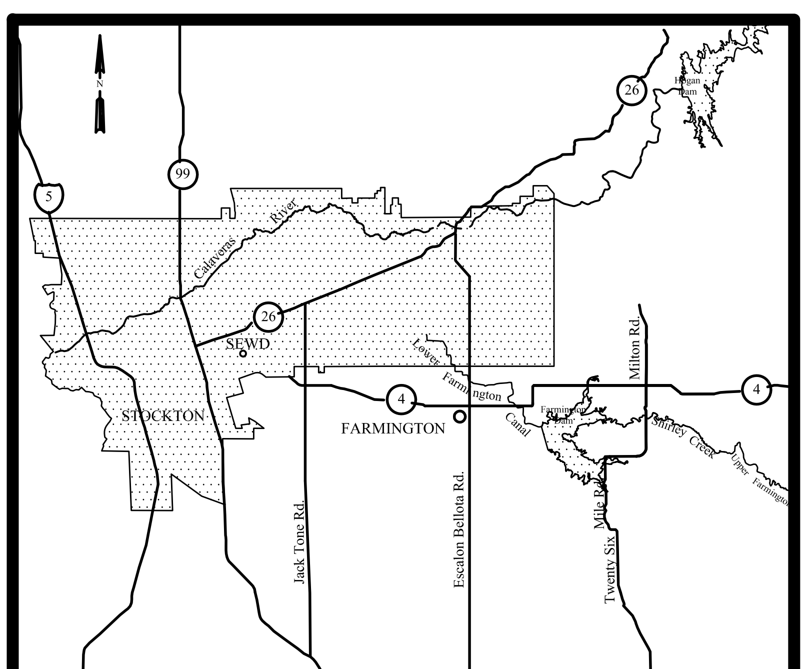
STOCKTON EAST WATER DISTRICT

STOCKTON, CALIFORNIA

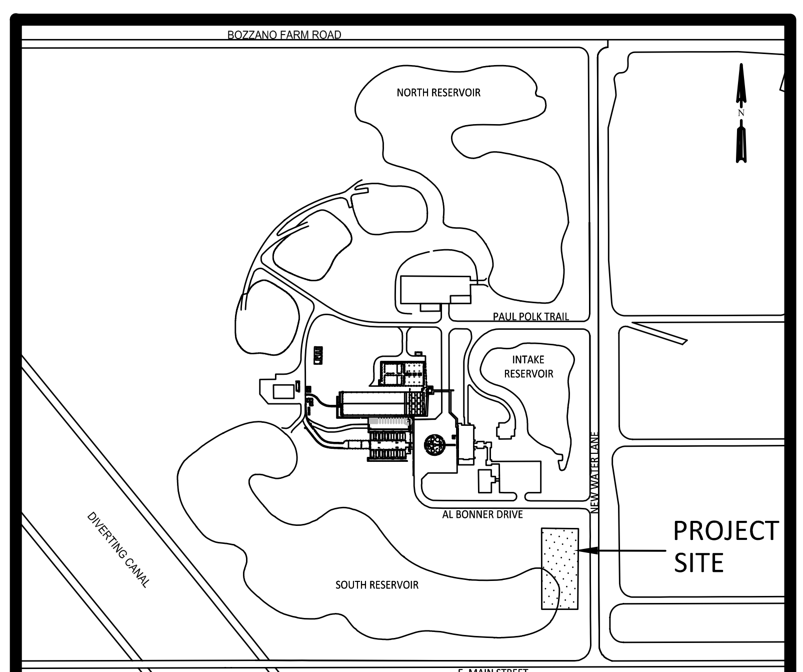
95% DRAFT

DRAWINGS FOR THE SOUTH EXTRACTION WELL #1

MAY 26, 2015



VICINITY MAP



LOCATION MAP

DRAWING LEGEND:

1 TITLE SHEET
2 SITE PLAN
3 50ft WORK AREA
4 PIPELINE PROFILE
5 PLAN AND PROFILE LAYOUTS
6 FRONT GATE AND ACCESS DRIVEWAY

PROJECT DESCRIPTION

1. INSTALLATION OF NEW TURBINE PUMP (3000 GPM) NEXT TO THE SOUTH RAW WATER POND.
2. INSTALLATION OF (1) WELL DISCHARGE MANIFOLD WITH PIPELINE APPURTENANCES.
3. INSTALLATION OF (1) ELECTRICAL SERVICES, (200 HP) MOTOR CONTROL PANELS, AND INSTRUMENTATION AT WELL SITE.
4. INSTALLATION BY PG&E OF APPROXIMATELY 190 FEET OF OVERHEAD HIGH VOLTAGE ELECTRICAL DISTRIBUTION SYSTEM, AND (1) ELECTRICAL SERVICE DROP (POLE MOUNTED TRANSFORMERS).

NO.	DATE	BY	REVISION

STOCKTON EAST WATER DISTRICT
6767 EAST MAIN ST.
STOCKTON CA

SOUTH EXTRACTION WELL #1
SITE PLAN

DRAWN BY: Q. CARTER
DESIGNED BY: A. LOZANO
APPROVED BY: NAME
SCALE: NTS
DWG. CURRENT AS OF: 5/26/15
PROJECT NO. 2015-004

SHEET 2 OF 6

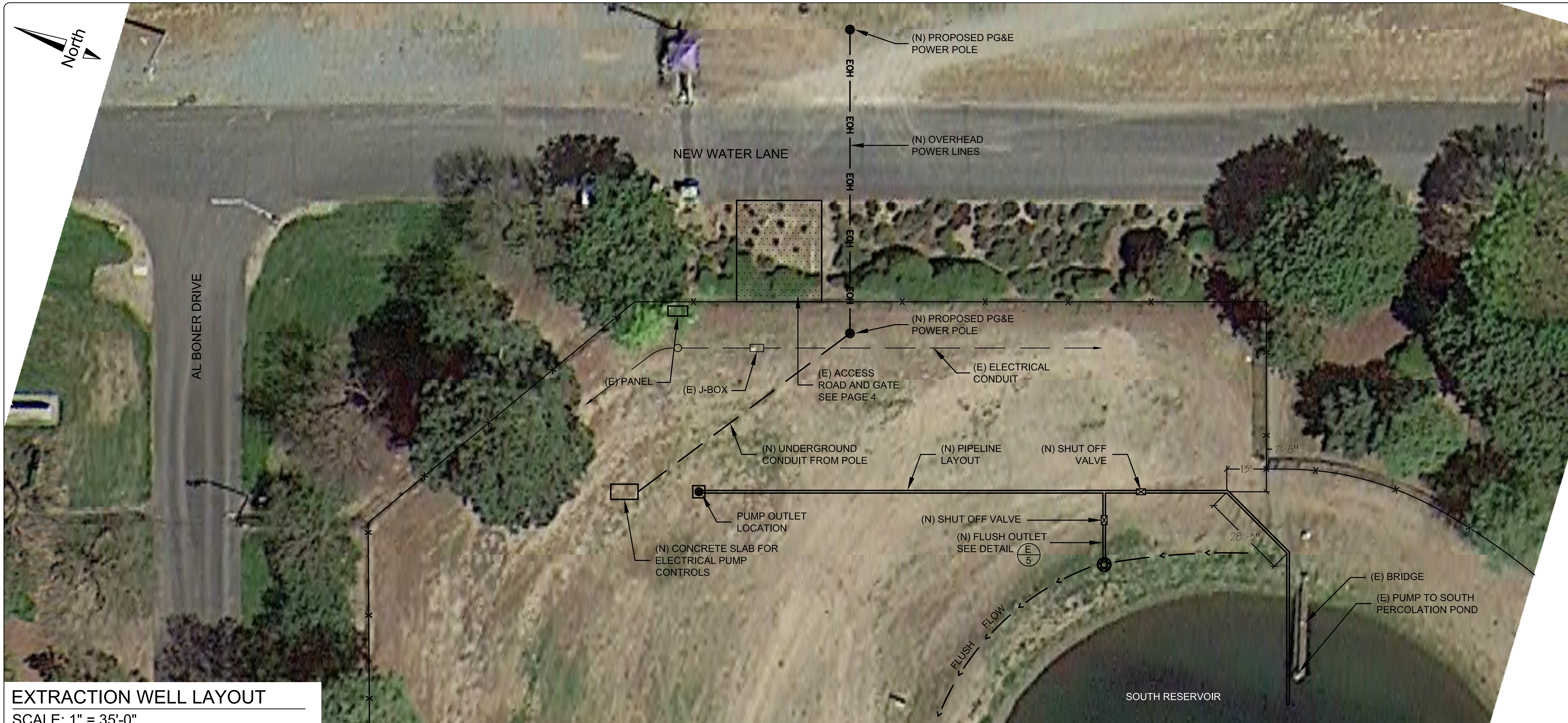
NO.	DATE	BY	REVISION

STOCKTON EAST WATER DISTRICT
6767 EAST MAIN ST.
STOCKTON CA

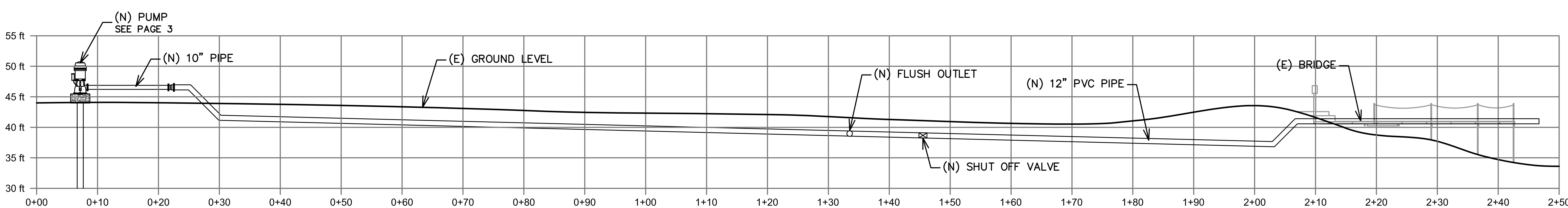
SOUTH EXTRACTION WELL #1
50ft WORK AREA

DRAWN BY: Q. CARTER
DESIGNED BY: A. LOZANO
APPROVED BY: NAME
SCALE: NTS
DWG. CURRENT AS OF: 5/26/15
PROJECT NO. 2015-004

SHEET 3 OF 6



EXTRACTION WELL LAYOUT
SCALE: 1" = 35'-0"



EXTRACTION WELL - CROSS SECTION
SCALE: 1" = 18'-0"

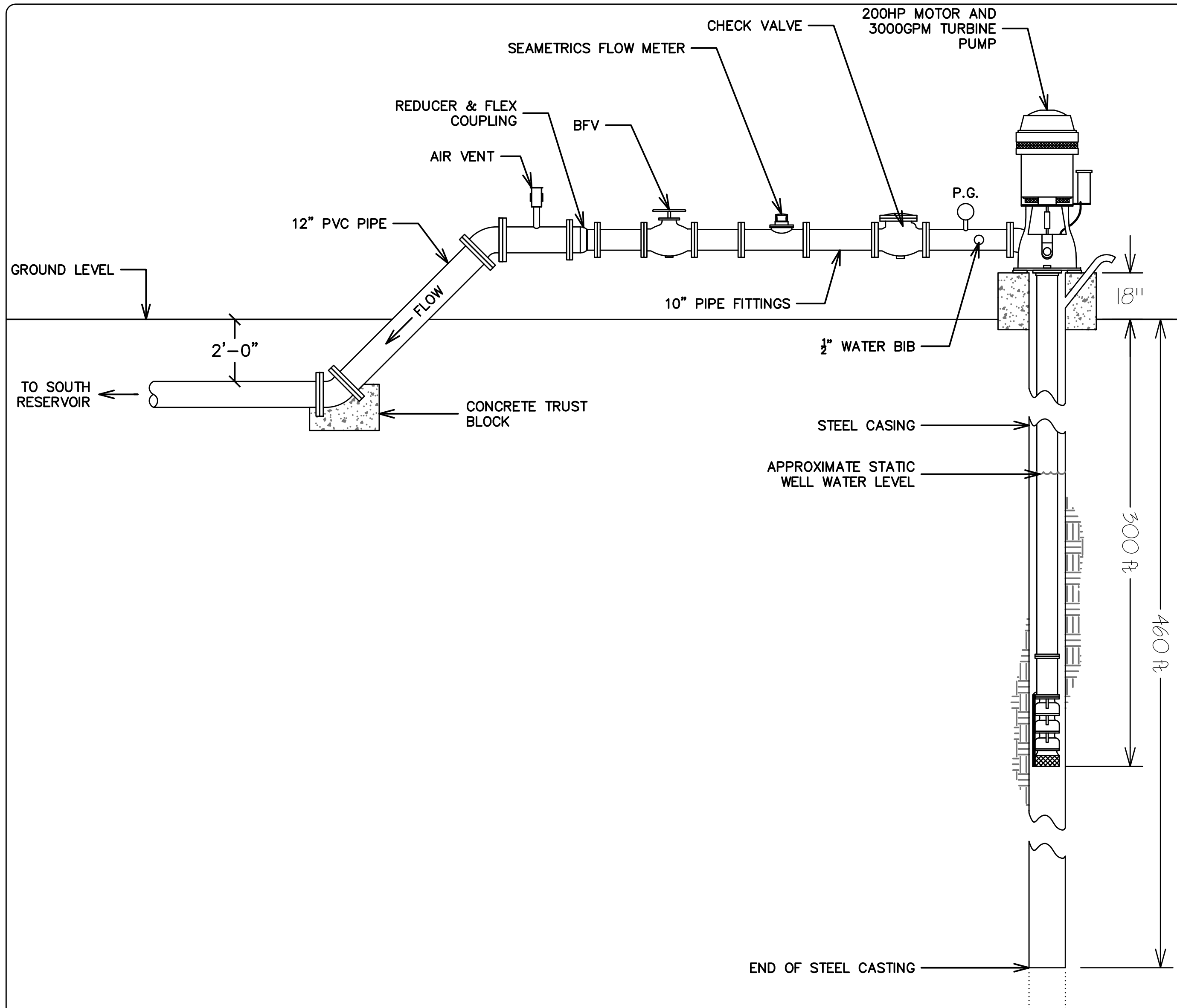
NO	DATE	BY	REVISION

STOCKTON EAST WATER DISTRICT
6767 EAST MAIN ST.
STOCKTON CA

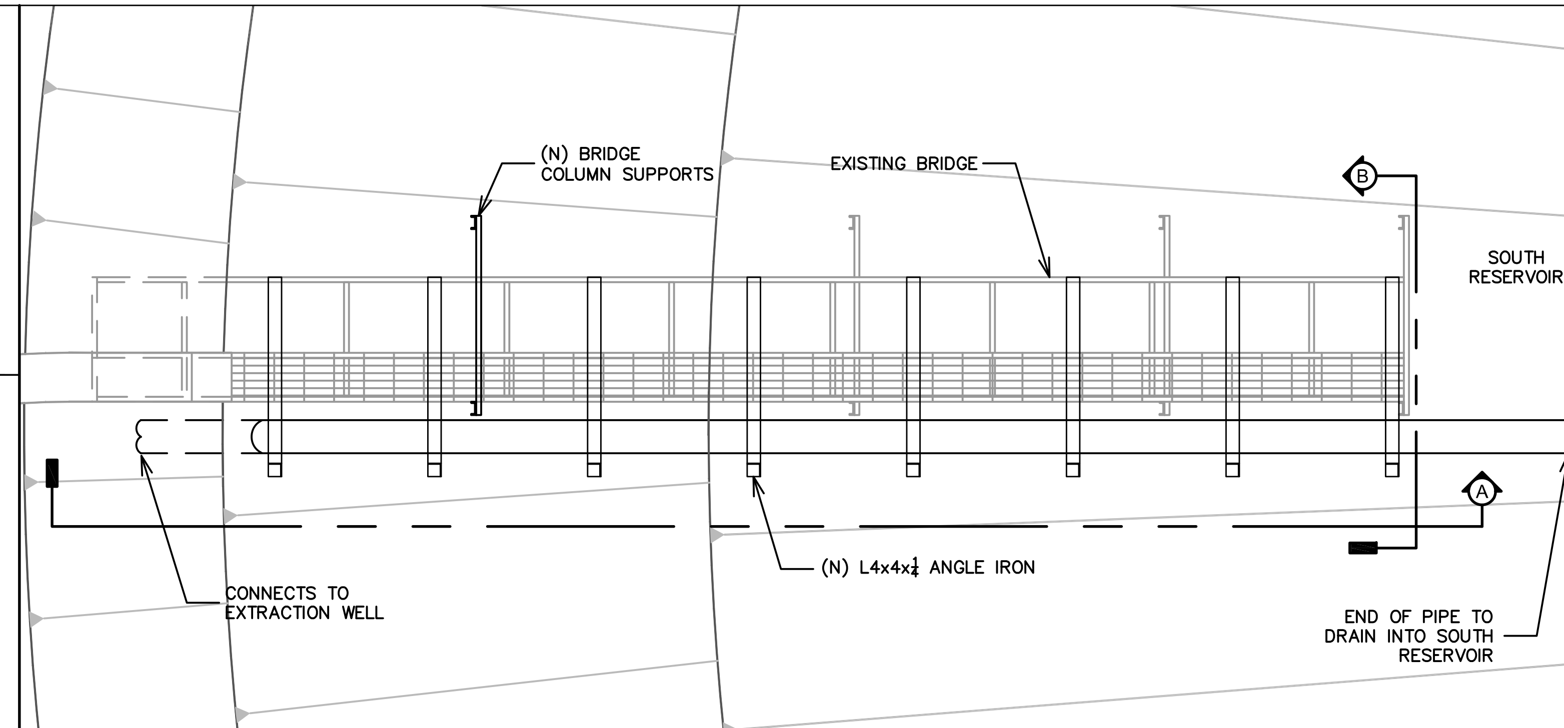
SOUTH EXTRACTION WELL #1
PIPELINE PROFILE

DRAWN BY: Q. CARTER
DESIGNED BY: A. LOZANO
APPROVED BY: NAME
SCALE: NTS
DWG. CURRENT AS OF: 5/19/15
PROJECT NO. 2015-004

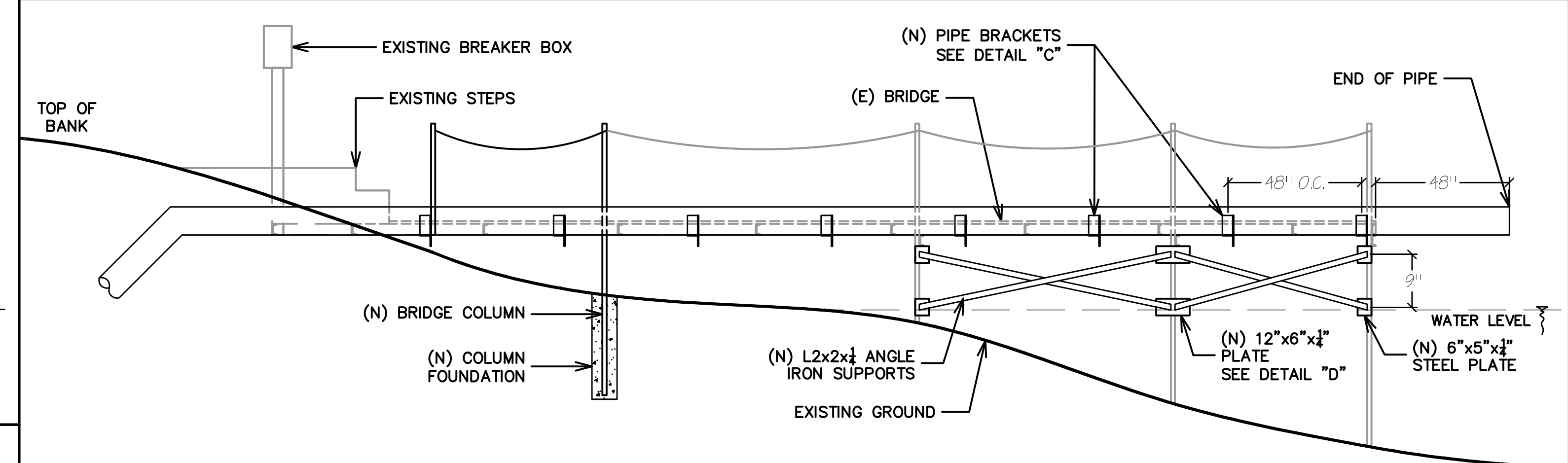
SHEET 4 OF 6



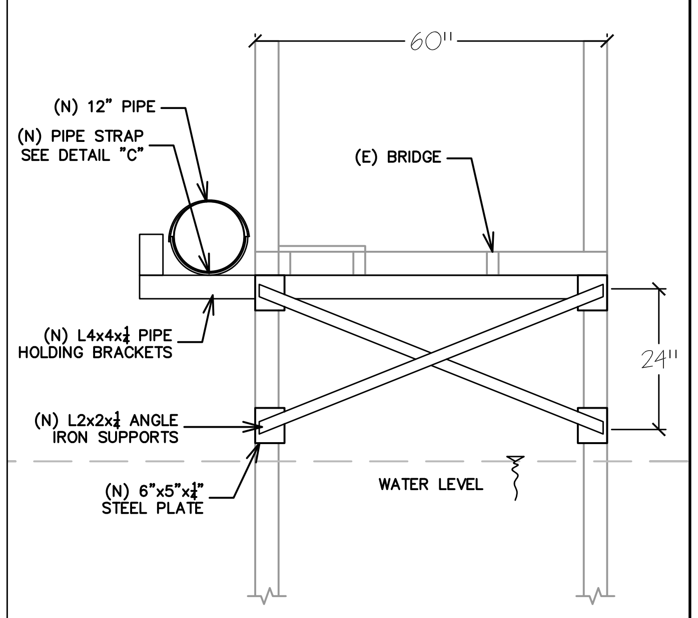
EXTRACTION WELL PIPING
NOT TO SCALE



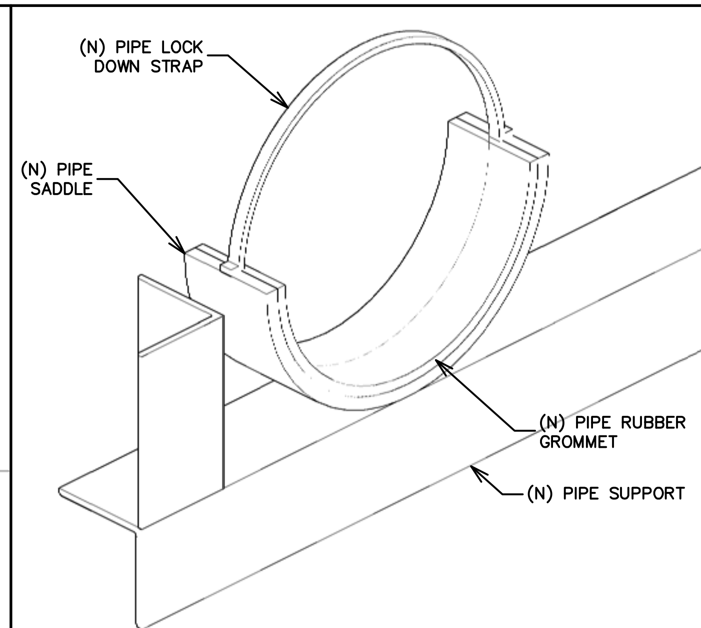
EXTRACTION WELL PIPING - PLAN VIEW
NOT TO SCALE



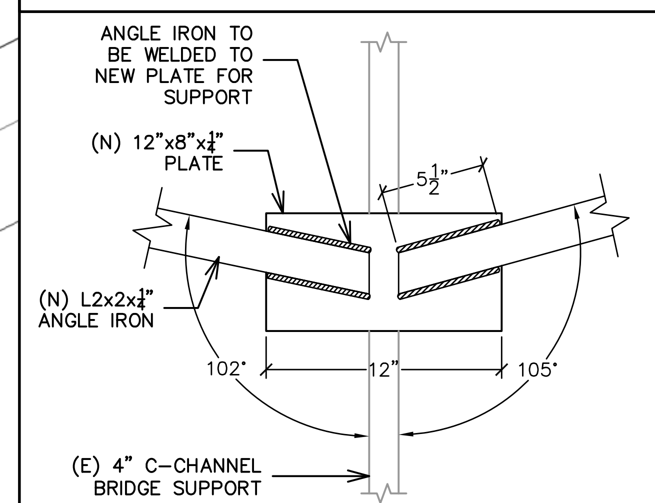
A EXTRACTION WELL PIPING - PROFILE VIEW
NOT TO SCALE



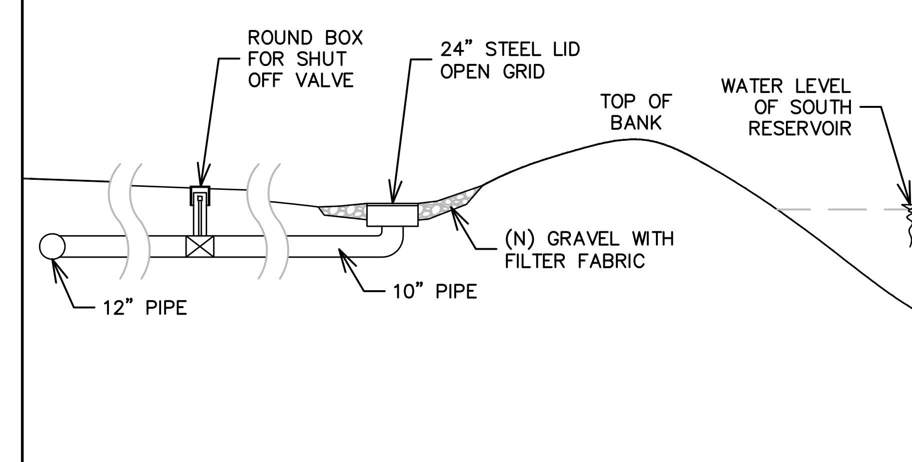
B EXTRACTION WELL PIPING - FRONT VIEW
NOT TO SCALE



C PIPE STRAP DETAIL
NOT TO SCALE



D PLATE DETAIL
NOT TO SCALE



E FLUSH VALVE DETAIL LAYOUT
NOT TO SCALE

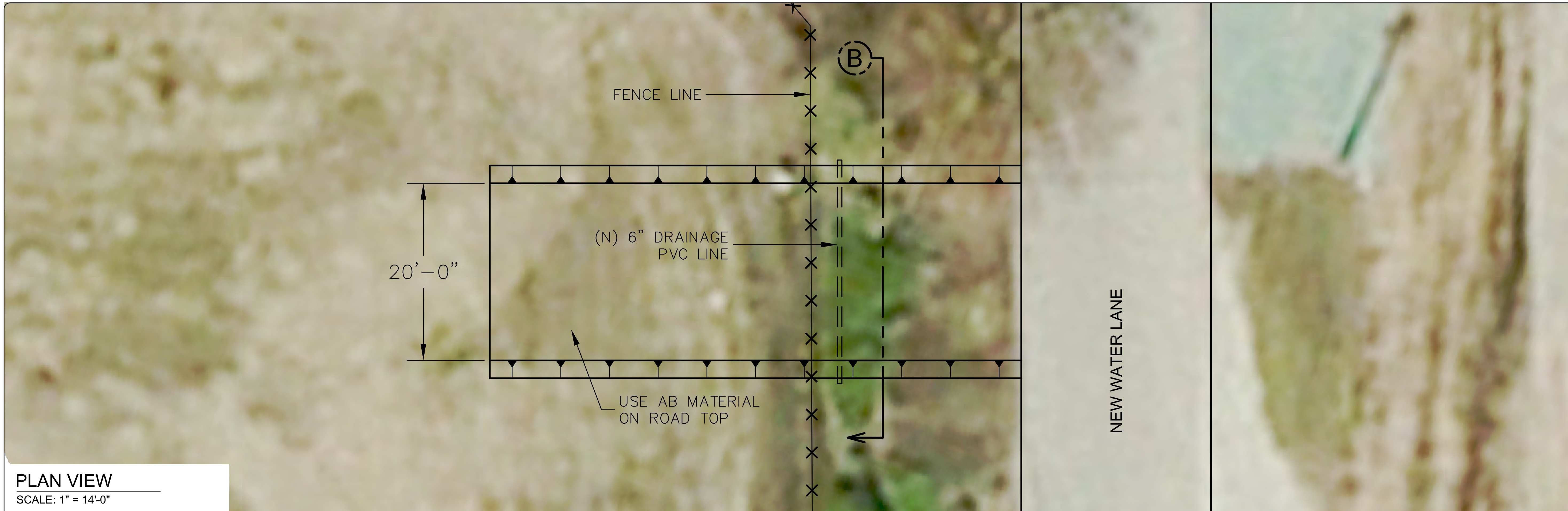
NO	DATE	BY	REVISION

STOCKTON EAST WATER DISTRICT
6767 EAST MAIN ST.
STOCKTON CA

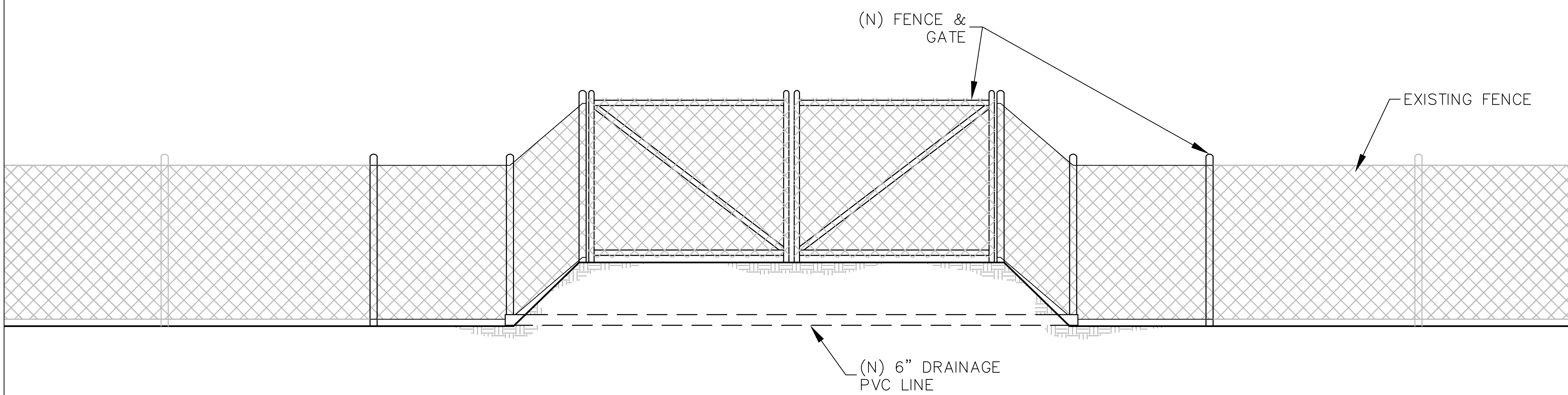
SOUTH EXTRACTION WELL #1
PLAN AND PROFILE LAYOUTS

DRAWN BY: Q. CARTER
DESIGNED BY: A. LOZANO
APPROVED BY: NAME
SCALE: NTS
DWG. CURRENT AS OF: 5/19/15
PROJECT NO. 2015-004

SHEET
5
OF 6



PLAN VIEW
SCALE: 1" = 14'-0"



B CROSS SECTION
SCALE: 1" = 5'-0"

NO.	DATE	BY	REVISION

STOCKTON EAST WATER DISTRICT
6767 EAST MAIN ST.
STOCKTON CA

SOUTH EXTRACTION WELL #1
FRONT GATE AND ACCESS DRIVEWAY

DRAWN BY: Q. CARTER
DESIGNED BY: A. LOZANO
APPROVED BY: NAME
SCALE: NTS
DWG. CURRENT AS OF: 5/19/15
PROJECT NO. 2015-004

SHEET 6 OF 6

ATTACHMENT B

District Rules and Regulations

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RULES OF THE DISTRICT

ADOPTED June 20, 1972

RULE 100. DEFINITIONS AND RULES OF INTERPRETATION.

WHEREAS, the Act authorizes the Board to make such rules and regulations as it deems necessary and proper for carrying out the provisions of the Act;

NOW, THEREFORE, THE BOARD OF DIRECTORS OF THE STOCKTON-EAST WATER DISTRICT HEREBY ENACTS AND ESTABLISHES THE FOLLOWING RULE:

For the purposes of construction and interpretation of all subsequent rules adopted by the Board, the following rules of construction and interpretation are adopted:

A. Definitions in Act. Unless otherwise provided, any word defined by Chapter 819 of the Statutes of 1971 shall have the meaning set forth in Chapter 819 of the Statutes of 1971.

B. Act. "Act" means Chapter 819 of the Statutes of 1971.

C. Domestic Water Producing Facility. "Domestic Water producing facility" means a water producing facility which produces water used solely upon a parcel of two (2) acres or less.

D. Continuation of Prior Rules. The provisions of any rule adopted by the Board, insofar as they are substantially the same as provisions contained in a prior or existing rule, are restatements and continuations of such existing rule or rules and not new enactments.

Adopted 6/20/72

RULE 103. FLASH BOARD DAMS.

WHEREAS, the Act authorizes the Board to make such rules and regulations as it deems necessary and proper for carrying out the provisions of that Act;

NOW, THEREFORE, THE BOARD OF DIRECTORS OF THE STOCKTON-EAST WATER DISTRICT HEREBY ENACTS AND ESTABLISHES THE FOLLOWING RULE:

A. Operating Levels. The Secretary-Manager shall determine the safe operating water level at each of the flash board dams under the District's jurisdiction. The selected safe operating water levels shall be at levels which will reduce any danger of property damage to a reasonable minimum and to allow the efficient operation of the District's distribution system with a maximum conservation of water. As circumstances require in the opinion of the Secretary-Manager, the safe operating water levels so established may be changed from time to time without notice.

B. Gravity Diversions Permitted if Within Safe Operating Levels.. The taking of irrigation water by means of gravity diversion shall be permitted only if such diversion can be accomplished within the limits of such safe operating water levels established pursuant to this rule.

C. Intake Levels of Pumps. The intake level of all pumping units within the District shall be approved by the Secretary-Manager.

Adopted 6/20/72.

RULE 104. THE MEASUREMENT OF WATER PRODUCED FROM BOTH GROUND AND SURFACE SOURCES AND USED ON ONE PARCEL OF LAND.

WHEREAS, the Act authorizes the Board to make such rules and regulations as it deems necessary and proper for carrying out the provisions of that Act;

NOW, THEREFORE, THE BOARD OF DIRECTORS OF THE STOCKTON-EAST WATER DISTRICT HEREBY ENACTS AND ESTABLISHES THE FOLLOWING RULE:

A. Volumetric Water Meter. In any case in which a diverter diverts surface water from the Calaveras River or one of its distributaries and also diverts ground water for use on a single parcel, the Collector may require that there be installed upon the water producing facility or facilities diverting surface water a volumetric water meter.

B. When Required. The Collector shall only require the installation provided for in Paragraph A in cases in which in his judgment it is impossible to determine the quantities of surface water diverted without the installation of such a volumetric water meter.

C. Ownership and Maintenance. All volumetric water meters required by this rule shall be purchased, installed, and owned by the District. The District shall maintain such meters and may read them from time to time.

D. Action if Meter Refused. In any case in which a diverter refuses to allow the installation of a volumetric water meter as provided in this rule, and after the Collector has given thirty (30) days written notice to such diverter of the provisions of this rule, the Collector may compute the charge for all water used thereafter on such a parcel entirely at the surface water rate.

E. Parcel. As used in this rule, "parcel" means any San Joaquin County assessor's parcel or any two or more San Joaquin County assessor's parcels which are contiguous and in identical ownership.

ADOPTED June 20, 1972

RULE 107. <u>THE MEASUREMENT OF WATER PRODUCED BY WATER PRODUCING FACILITIES WITHOUT APPROVED WATER MEASURING DEVICES.</u>

WHEREAS, the Act authorizes the Board to make such rules and regulations as it deems necessary and proper for carrying out the provisions of the Act;

NOW, THEREFORE, THE BOARD OF DIRECTORS OF THE STOCKTON-EAST WATER DISTRICT HEREBY ENACTS AND ESTABLISHES THE FOLLOWING RULE:

The calculation of the amount of water produced from a water producing facility, other than a domestic water producing facility, which is not measured by a water measuring device approved by the Collector, shall be based upon the following factors:

A. <u>Actual Efficiency of Water Producing Facility</u>. The actual efficiency of the water producing facility as determined by the Collector.

B. <u>Energy Consumed</u>. The total energy consumed in pumping based upon meter kilowatt energy consumed in pumping as measured by meter, or if another source of energy is utilized, based upon metered or volumetric fuel consumption records maintained in a manner approved by the Board of Directors.

C. <u>Acres Irrigated and Crops Produced</u>. The actual number of acres irrigated and the crops produced.

D. <u>Elapsed Time Meter</u>. Information furnished by an elapsed time meter installed and maintained by the District and metering the Collector's current requirements for such meters.

RULE 109. WATER RIGHTS CLAIMS.

WHEREAS, the Act authorizes the Board to make such rules and regulations as it deems necessary and proper for carrying out the provisions of the Act; and

WHEREAS, various diverters of surface water from the Calaveras River and its distributaries claim that a portion of the water that is so diverted by them represents natural flow water and is diverted by them under a claim of right; and

WHEREAS, the Board of Directors of this District has recognized that in some instances such claims may have validity when made by surface water diverters from the Calaveras River upstream from the divergence of the Calaveras River and the Mormon Slough, and from the Mormon Slough downstream from said point, to the beginning of the Stockton Diverting Canal; and

WHEREAS, the Board of Directors of this District has had prepared by Murray, Burns & Kienlen, Consulting Civil Engineers, a study of water use and water rights on the Calaveras River which is dated February 7, 1969, which study is hereinafter referred to as "Water Rights Study"; and

WHEREAS, that study sets forth for each surface diverter as of the date of the report a percentage of that diverter's water demand that can be considered to be taken from the natural flow of the river under a valid claim of right;

Adopted 6/20/72

that such computations are based on the findings of the report that based on the use of water during the year 1965, riparian lands are entitled to 30% of the surface water used on them under a claim of right, "use" (as defined on page 14 of said study) lands are entitled to 16% of the surface water used on them under a claim of right and appropriators are entitled to the percentage of water used on them as set out for each individual appropriator on page 31, Water Rights Study; that the irrigation of riparian land that is not now irrigated will lower the percentages of water that can be used by all classes of land under a valid claim of right and that these decreases in percentages can be calculated from the data contained in the Water Rights Study; and that if there is in the future surface irrigation of land not included in said study the percentage of water that can be used by such land under a valid claim of right, if any, can be calculated from data contained in said study which was adopted by Resolution 68-69-19 of the Board of Directors of this District on February 18, 1969; and

WHEREAS, subsequent to the completion and adoption of the aforementioned Water Rights Study, additional evidence was presented to the Board, at its invitation, showing that in that part of the Calaveras River east of Bellota and west of the San Joaquin-Stanislaus county line, that the riparian entitlement may be somewhat greater than set forth in said Water Rights Study, and that accordingly some landowners in that reach may have a claim to additional rights; and

WHEREAS, this Board considered said evidence and concluded that the riparian entitlement of those landowners east of Bellota and west of the San Joaquin-Stanislaus county line was greater than that contained in the said Study and therefore modified the riparian allowance provided to such landowners under the Study;

NOW, THEREFORE, THE BOARD OF DIRECTORS OF THE STOCKTON-EAST WATER DISTRICT HEREBY ENACTS AND ESTABLISHES THE FOLLOWING RULE:

A. (1) All assessments and charges levied for the period subsequent to January 1, 1972 shall contain allowances for the water rights of each surface water diverter from the Calaveras River as shown by the findings of the Water Rights Study, modified as follows:

(a) The entitlement of riparian diverters between the east line of the Escalon-Bellota Road Bridge and the west line of Section 4, Township 2 North, Range 9 East, M.D.B.& M. is 35%;

(b) The entitlement of riparian diverters between the west line of Section 4, Township 2 North, Range 9 East, M.D.B.& M. and the west line of Section 35, Township 3 North, Range 9 East, M.D.B.& M. is 40%;

(c) The entitlement of riparian diverters between the west line of Section 35, Township 3 North, Range 9 East, M.D.B.& M. to the San Joaquin-Stanislaus county line is 45%;

(d) The entitlement of a diverter in the areas described in subparagraphs A(1) (a), (b), and (c), may be increased by resolution of the Board of Directors on a finding based on reasonable evidence in the judgment of the Board of Directors that such diverter is entitled to additional rights, whether prescriptive, riparian, appropriative, or "use", not taken into account in the Water Rights Study.

Any reference hereinafer to said Water Rights Study is to said Water Rights Study as adjudged in the manner set forth in this subparagraph (1) of Paragraph A as to said three areas east of Bellota. Payment made to this District in conformity with these assessments shall be considered payment in full to this District.

(2) Since the percentage allowance assigned to each surface water diverter in the Water Rights Study, Table 7, is based upon water use at the time of said Study, and is subject to correction if there is additional surface water irrigation of riparian land, and since there is land which is potentially surface irrigated that may have valid water rights, that is not included in the Water Rights Study, the Secretary-Manager of this District is authorized and directed to recalculate the percentage of allowance due to each individual surface diverter based on the date contained in the Water Rights Study and changes in the use of surface water along the Calaveras River System and to calculate the percentage of allowance due to diverters of water for use on lands not covered by the Water Rights Study, which such calculations become

necessary, in the opinion of the Secretary-Manager or when directed to do so by this Board. In the event of such calculation the Secretary-Manager shall recognize the ratios established by the adjustments made in the allowances granted to riparian diverters in the three areas above Bellota.

(3) Any water right allowance granted to a diverter pursuant to this Rule and pursuant to the provisions of earlier Rules adopted by this District may be modified or abolished by a Rule adopted by this District and is granted solely for the purpose of levying a charge for surface water use and is not a determination binding either upon the District or the diverter for any other purpose.

B. Any landowner who has a water rights allowance recognized by this District may take water after October 30th and prior to the following April 1st of any consecutive years without payment and without having such taking applied in satisfaction of such a landowners water right allowance recognized by the District, provided that any such landowner shall provide such report necessary to substantiate the actual time of water use as are satisfactory to the Collector.

C. This rule succeeds former Rules 10, 15, 21, 23, and 26 of this District, and any question or dispute between an owner and the District over charges or assessments made prior to the effective date of this Rule shall be governed by the appropriate former Rule to the extent that it would have applied prior to the adoption of this Rule.

RULE 110. ALTERNATE PROCEDURES, WATER PRODUCING FACILITIES EQUIPPED WITH WATER MEASURING DEVICES.

WHEREAS, subdivision (c) of Section 11 of the Act authorizes the Board, by rule, to establish alternate procedures for the computation and payment of progress bills in the case of water producing facilities within the District, the water production of which is measured by a water measuring device approved by the Collector;

NOW, THEREFORE, THE BOARD OF DIRECTORS OF THE STOCKTON-EAST WATER DISTRICT ENACTS AND ESTABLISHES THE FOLLOWING RULE:

A. Approved Water Measuring Devices to be Read by Owner. All owners of water producing facilities within the District, the water production of which is measured by a water meas. ~~producing~~ device approved by the Collector, and who elect to report their water production based on the record maintained by such water measuring device shall on June 30 and December 31 of each calendar year, record the then current reading of such approved measuring device.

B. Readings to be Reported to Collector. The readings taken pursuant to the provisions of Paragraph A above shall be reported under penalty of perjury by the owner of the water producing facility, and shall be transmitted by the owner to the Collector within one month following the taking of such readings.

C. Progress Billing. At the time next designated for the mailing of progress bills in the Act, the Collector shall mail to the owner of a facility equipped with an approved water

Adopted 6/20/92

measuring device, a bill stating the exact amount owed by the owner based upon the current reported reading of his measurement device.

D. Payment of Progress Bill. The owner must pay the amount indicated on this bill within the same time period applicable to the payment of progress bills for non-volumetric water producing facilities under the provisions of Section 11 of the Act, and a failure to do so will subject him to penalties identical to those enumerated in said Section 11 of the Act.

E. Annual Bill. Submission and payment of the annual bill in the case of water producing facilities equipped with a water measuring device approved by the Collector shall be as provided in Section 13 of the Act.

F. Water Measuring Devices to be Read by District. The District may read all water measuring devices from time to time whether such water measuring devices were originally installed by the District or by the owner of a water producing facility.

G. Maintenance and Inspection. No water measuring device shall be deemed to be a "water meas ~~produci~~ng device approved by the Collector" unless the owner of the water producing facility on which such water measuring device is installed permits periodic inspection and maintenance of such water measuring device by the District.

RULE 111. REFUNDS OF OVERPAYMENTS.

WHEREAS, Section 19 of the Act requires that the Board establish rules providing for the making of refunds in the event of the overpayment of any ground water assessment or stream delivered water charges;

NOW, THEREFORE, THE BOARD OF DIRECTORS OF THE STOCKTON-EAST WATER DISTRICT ENACTS AND ESTABLISHES THE FOLLOWING RULE:

A. Application for Refund. The owner of any water producing facility within the District who believes he has overpaid any ground water assessment or stream delivered water charge may apply to the Secretary-Manager of the District on forms prescribed by the Secretary-Manager of the District for a refund of the amount of such overpayment. Such application must be filed within three (3) years of the making of the overpayment in question.

B. Review by Secretary-Manager. Upon receipt of an application for refund, the Secretary-Manager shall review the same and then place the matter on the agenda of the Board and shall submit to the Board the application for refund and the recommendation of the Secretary-Manager.

C. Notice of Consideration. A notice of time at which the Board will consider an application for refund shall be mailed to the person making such application at least ten (10) days before

Adopted 6/20/72

the date of the time of such consideration. After the Board has acted upon the application the Secretary-Manager shall mail a notice of the action to the person filing such application.

RULE 113. MAINTENANCE OF LIVE STREAM.

WHEREAS, the Act authorizes the Board to make such rules and regulations as it deems necessary and proper for carrying out the provisions of the Act;

NOW, THEREFORE, THE BOARD OF DIRECTORS OF THE STOCKTON-EAST WATER DISTRICT ENACTS AND ESTABLISHES THE FOLLOWING RULE:

In its operation of the Calaveras River and its distributaries, to the extent of its jurisdiction and control, the District shall observe the following policies:

A. No water shall be diverted to storage in New Hogan Reservoir at any time when a live stream does not exist in Mormon Slough from Bellota to the Stockton Diverting Canal.

B. Diversions of water into the Old Calaveras River Channel at Bellota shall be limited to times when a live stream exists in Mormon Slough from Bellota to the Stockton Diverting Canal.

C. The application of Paragraphs A and B above shall be subject to modification when necessary for purposes of repairs, maintenance, and construction.

Rule 113
Adopted 6/20/72

RULE NO. 120
ADOPTED: 02/15/1977
REVISED: 06/24/2014
REVISED: 04/02/2019

MANDATORY REQUIRED NOTICE TO DISTRICT BY OWNER OF DIVERSION OF STREAM DELIVERED WATER

Whereas, the Board of Directors hereby finds the necessity to revise Rule No. 120 by incorporating Rule No. 132 (Stream Diversion Call-In Rule; adopted 04/07/1986) and Rule No. 139 (Regulating Waste of Surface Water; adopted 04/21/1992) for the purpose of correcting contact information and outlining consequences for failure to follow mandatory notification procedures for the diversion of stream delivered water; and

Whereas, the Act authorizes the Board to make such Rules and Regulations as it deems necessary and proper for carrying out the provisions of the Act; and

NOW, THEREFORE, THE BOARD OF DIRECTORS OF THE STOCKTON EAST WATER DISTRICT HEREBY REVISES RULE NO. 120 AS FOLLOWS:

A. Mandatory Notification Required. Any person desiring to divert surface water provided by the District shall first inform the District at its office (6767 East Main Street, Stockton, California), at least forty-eight (48) hours prior to the start of such diversion. The District will receive such notice 7 days a week at the following numbers: Monday through Friday (8:00 a.m. to 5:00 p.m.) 209-948-0333; all other times, 209-469-3335 or online at www.sewd.net. The following information must be provided: name, phone number, pump ID number, diversion rate, beginning date/time, end date/time and run time.

B. The objective of Paragraph A is to avoid waste of water, which will cause loss of a valuable resource in limited supply, affecting the District and all other agricultural irrigators in the District. The District may send a warning notification and/or send a notification failure & impose a fine in the amount anywhere between $100.00 to $500.00 and possible lock-off water service, as determined by the Board of Directors in their sole discretion.

C. For the first such notification failure by any person, such person will be charged $100, and such amount will be added to such person’s account with the District.

D. For the second such notification failure by any person, that person will be charged $200, and such amount will be added to such person’s account with the District.

E. The Board may, at its discretion, lock off customer's water service upon 3rd and any subsequent violation. Water service will not be restored until forty-eight (48) hours after the order is placed, that person will be charged a $500 fine applicable for staff time to lock/unlock service, and such amount will be added to such person's account with the District.

F. Upon determination of any notification failure, the District shall notify the person who failed to follow this Rule.

G. The amount added to such person's account shall be collected as part of such person's account in the manner provided in the Act.

H. Any person charged under this Rule may appeal to the District's Board of Directors which may waive any charge imposed by this Rule, which would be inequitable under the circumstances the Board of Directors determines.

I. Diverters upon request of District shall provide District with a monthly irrigation plan to permit District to forecast irrigation demand. Diverters shall follow the plan as closely as possible.

J. Rule Nos. 102, 132 and 139 of this District are hereby repealed.

RULE 123. METERS.

WHEREAS, the Act authorizes the Board to make such rules and regulations as it deems necessary and proper for carrying out the provisions of the Act; and

WHEREAS, Section 5 of the Act allows the Board to require such measuring devices as may be necessary;

NOW, THEREFORE, THE BOARD OF DIRECTORS OF THE STOCKTON-EAST WATER DISTRICT HEREBY ENACTS AND ESTABLISHES THE FOLLOWING RULE:

A. The staff of Stockton-East Water District shall recommend to the Board installation of a meter or water-measuring device on any agricultural water-producing facility, except as noted in Paragraph G herein, where such meter or device is necessary to carry out the purposes of the Act, in the discretion of the District. This recommendation shall be accompanied by a plan for physically installing the meter and necessary engineering drawings for such installation. Prior to making such recommendations to the Board the staff shall notify the owner of the water-producing facility of the proposed recommendations so that the owner may appear and comment at the meeting in which the Board will hear that recommendation.

B. The Board shall consider the recommendations of the staff, the comments of the owner of the agricultural

Rule 123
Adopted 5/1/79

water-producing facility, and shall by resolution direct the staff to proceed with installation of its meter or water-measuring device, if in the judgment of the Board such installation is necessary to carry out the purposes of the Act.

C. Such installation, if directed by the Board, shall take place in two steps:

1. The District shall provide to the owner of the agricultural water-producing facility a meter containment tube which shall be complete with a pre-cut hole for installation of the meter or water-measuring device and shall have straightening vanes installed. Within thirty (30) days after provision of such meter containment tube (unless such time is extended by the Board) the owner shall install it in accordance with the engineering drawing and plan submitted by the staff.

2. As soon as possible thereafter the staff of the District shall install the meter or water-measuring device.

D. In the event such a meter or water-measuring device is placed on any agricultural water-producing facility, an annual charge for the installation, so long as such meter or water-measuring device is in place and operable, shall be charged to the owner as a separate charge on his annual water bill. Said charges shall be in accordance with the following schedule. For meters or water-measuring devices which are of sizes different from those shown on the schedule, the staff shall recommend an annual charge consistent with the schedule:

Size of Meter	Annual Charge
4" Meter	$37.00
6" Meter	$38.00
8" Meter	$40.00
10" Meter	$43.00
12" Meter	$45.00
14" Meter	$47.00
16" Meter	$51.00
18" Meter	$63.00
20" Meter	$67.00
22" Meter	$70.00
24" Meter	$73.00
30" Meter	$80.00

E. The meter shall remain the property of the District and shall be maintained and inspected by the District thereafter. Any person who injures, alters, removes, resets, adjusts, manipulates, obstructs or in any manner interferes or tampers with or procures, or causes or directs any person to injure, alter, remove, reset, adjust, manipulate, obstruct or in any manner interfere or tamper with any meter or water-measuring device, so as to cause such meter or water-measuring device to improperly or inaccurately measure and record water production, shall be subject to the penalties set forth in the Act.

F. If the Board determines that it is necessary in order to secure compliance with this rule by any owner, the Board shall then direct the Secretary-Manager of the District to seek appropriate remedies with the assistance of the attorneys for the District so as to obtain full enforcement of this rule. In accordance with Section 22 of the Act, it is hereby provided that the District shall not deliver or make available water to any owner who shall fail to install the meter containment tube in accordance with the engineering drawing within thirty (30) days of the time of provision of such meter containment tube to the owner (unless such time is extended by the Board), or who shall interfere with the subsequent installation of the meter or water-measuring device.

G. Paragraphs A and B of this rule shall not apply to agricultural surface water-producing facilities installed after May 1, 1979, and the installation of meters or water-measuring devices on such facilities shall be deemed to have been judged necessary, and installation of meters or water-measuring devices on such facilities shall take place in accordance with Paragraphs C, D, E and F of this Rule.

VIC SOLARI, JR.
JOSEPH L. DONDERO
JACK H. TONE
JACK LAVEN
RICHARD L. BOZZANO
BETTY L. MacNEAR
ROGER M. HUCKINS

EDWARD M. STEFFANI
GENERAL MANAGER

JOHN W STOVALL
GENERAL COUNSEL

STOCKTON EAST WATER DISTRICT

6767 EAST MAIN STREET P.O. BOX 5157 STOCKTON, CA 95205-0157 209/948-0333

AUTHORIZATION TO INSTALL AND MAINTAIN A VOLUMETRIC WATER METER ON RIVER PUMP

Date ____________________

District Account No. ____________________

River Pump No. ____________________

Name ____________________

I hereby authorize Stockton East Water District to install and maintain a volumetric water meter on my river pump in accordance with District Rule 123, adopted May 1, 1979. This Rule provides for an annual charge consistent with the following schedule:

Meter Size	Annual Charge
4 inch	$37
6 inch	$38
8 inch	$40
10 inch	$43
12 inch	$45
14 inch	$47
16 inch	$51
18 inch	$63
20 inch	$67
22 inch	$70
24 inch	$73
30 inch	$80

Signature ______________________________

Address ______________________________

____

Phone ______________________________

ADOPTED April 1, 1980

RULE 126 . PROCEDURE FOR ENACTING ORDINANCES.

WHEREAS, Chapter 819 of the Statutes of 1971, as amended (hereinafter "Act"), gives the District the power to enact ordinances to establish water rates but provides no standard procedure for enacting ordinances; and

WHEREAS, said Chapter 819 authorizes the Board to make such rules and regulations as it deems necessary and proper for carrying out the provisions of the Act;

NOW, THEREFORE, THE BOARD OF DIRECTORS OF STOCKTON-EAST WATER DISTRICT DOES HEREBY ENACT AND ESTABLISH THE FOLLOWING RULE:

A. The enacting clause of ordinances shall be: "The Board of Directors of Stockton-East Water District does ordain as follows:".

B. Ordinances shall be signed by the President of the Board of Directors and attested by the Secretary of the Board of Directors.

C. Ordinances shall require a vote of the majority of the voting members present for passage.

Rule 126
Adopted 4/1/80

D. Ordinances shall be introduced only at a regular or adjourned regular meeting of the District. On introduction, ordinances shall be read in full, except when, after reading the title, further reading is waived by regular motion adopted by unanimous vote of the voting members of the Board present. The Board may direct such changes in the introduced ordinance as it deems necessary. The Board shall set a time and place of public hearing on the ordinance, which shall be no less than 10 days from the date of introduction of the ordinance, and the Secretary of the Board shall publish notice of the public hearing in the same manner as for a public hearing on the adoption of a rule of the District, except that such notice shall include the text of the proposed ordinance, unless at the time of introduction, the Board shall determine that a summary of the proposed ordinance may be published. If such determination is made, the full text of the proposed ordinance shall be posted in the District office and shall be available for inspection during normal working hours.

E. Within 15 days after its passage, the Secretary of the Board shall cause each ordinance to be published at least once in a newspaper of general circulation published and circulated in the District.

F. The ordinance establishing water rates shall take effect 30 days after its final passage, and shall set rates for the calendar year in which it is passed, in accordance with the Act.

G. The ordinance setting water rates shall be subject to referendum, provided, however, that no referendum shall modify or affect the terms of any bond resolution issuing bonds approved by the voters.

H. If a petition, signed by a number of voters residing within the District which is equal to or greater in number than 10 percent of the entire vote cast within the District for all candidates for Governor at the last gubernatorial election, protesting the adoption of the ordinance setting water rates, is presented to the Board of Directors prior to the effective date of the ordinance, the ordinance shall be suspended and the Board of Directors shall reconsider the ordinance. If the Board of Directors does not entirely repeal the ordinance, the Board of Directors shall submit the ordinance to the voters of the District either at a regular election or a special election called for the purpose. The ordinance shall not become effective unless and until a majority of the voters vote in favor of it.

I. If the ordinance is repealed by the Board of Directors, or is not approved by the voters, the water rates for the previous year shall be in effect.

J. The petition shall be preserved until eight months after the certification of the result of the election for which the petition qualified or attempted to qualify for placement on the ballot. Public access to any such petition shall be restricted in accordance with the provisions of Section 6253.5 of the Government Code. At the end of the eight-month period, the petition shall be destroyed as soon as practicable unless it is in evidence in some action or proceeding then pending, or unless the Secretary of the Board of Directors of the District has received a written request from the Attorney General, the Secretary of State, the Fair Political Practices Commission, a district attorney, a grand jury, the Board of Supervisors of San Joaquin County, or the Board of Directors, that the petition be preserved for use in a pending or ongoing investigation into election irregularities, or in a pending or ongoing investigation into a violation of the Political Reform Act of 1974 as set forth in Title 9 (commencing with Section 81000) of the Government Code.

K. All elections shall be conducted in accordance with the California Elections Code.

adopted 8/10 1-01-80

RULE NO. 128

RATES FOR USE OF AGRICULTURAL WATER PRODUCED BY DISTRICT OPERATED DEEP WELL PUMPING PLANTS

THE BOARD OF DIRECTORS OF THE STOCKTON-EAST WATER DISTRICT FINDS AND DETERMINES THAT:

1. The Act authorizes the Board to make such rules and regulations as it deems necessary and proper for carrying out the provisions of that Act; and

2. Rule No. 119, establishing rates for charging agricultural well water produced from District operated well pumping plants is no longer equitable, since it has failed to offset District paid energy costs for said water produced as follows:

	1977	1978	1979	(8 mo.) 1980
Revenue	$2,974	$2,234	$1,519	$1,154
Energy Cost	$4,624	$4,014	$2,633	$2,599
Difference	($1,650)	($1,780)	($1,114)	($1,445)

3. The lease agreements with owner provide for a modification of rates, from time to time, by the Board of Directors; and

4. The owners have been notified by mail of the change in rates established by this Rule in accordance with the leases.

NOW, THEREFORE, the Board of Directors of the Stockton-East Water District repeals Rule No. 119 and enacts and establishes the following rule:

A. District Well Water. As used in this Rule No. 128, "District Well Water" means water produced from wells leased by the District which wells are equipped with District owned and operated pumps and motors.

B. User. As used in this Rule No. 128, "User" means the owner of a parcel of land on which District well water is being applied under the terms of a District well lease.

C. Charges. For District well water, user shall pay the following charges:

1. All P.G. & E., energy charges incurred by the District on account for water produced for owners use, plus a charge of $0.002 per K.W.H., of energy used for production of water for owners use to cover maintenance.

2. The current Pump Tax charged for all well water production.

D. Payment.

1. Energy charges incurred by the District shall be billed to the owner on a quarterly basis.

2. Pump Tax charges shall be billed on the regular District billing cycle.

Adopted by B/D 11-18-80

STOCKTON-EAST WATER DISTRICT

Comparative Cost of Water Supply
(Using P. G. & E. statistics for average pump size, plant efficiency and Rate Schedule PA-1, effective 2/13/80)

GIVEN A 10 H.P. river pump supplying 112 acre feet of water per year by using 57 KWH to pump an acre foot of water. COMPARED TO a 42 H.P. pump supplying 112 acre feet of water per year by using 236 KWH to pump an acre foot of water.

FIND The comparative cost per acre foot to operate the river pump and deep well pump.

	River Pump	Deep Well Pump
Service Charge	$ .91	$ 2.97
Energy Charge	2.53	10.46
Total Power Cost	3.44	13.43
Water Charge	7.60	1.16
Total Power & Water Costs per Acre Foot	$11.04	$14.59*

*32% more than River Pump Costs

ADOPTED SEPTEMBER 7, 1982

RULE NO. 130

STOCKTON-EAST WATER DISTRICT
POLICY FOR THE PURCHASE OF SERVICES,
SUPPLIES AND EQUIPMENT; AND FOR THE
SURPLUSING OF SUPPLIES AND EQUIPMENT

WHEREAS, Stockton-East Water District has no formal policy for the purchase of services, supplies, and equipment; or for the surplusing of supplies and equipment; and

WHEREAS, Sections 54201 through 54204 of the Government Code of the State of California requires a purchasing policy.

NOW, THEREFORE, the Board of Directors of the Stockton-East Water District, acting in compliance with Sections 54201 through 54204 of the Government Code of the State of California enacts and establishes the following rule;

1. The following procedures shall be followed for purchases made within the approved annual Fiscal Year Budget:
   A. Contracts for purchase of professional services in excess of $7,500 shall be awarded by the Board of Directors. Competitive bids shall be solicited when appropriate;
   B. Purchase of supplies and equipment in excess of $7,500 per item shall be awarded by the Board of Directors after solicitation of competitive bids; and
   C. Major chemical purchases shall be solicited by the competitive bid process and shall be awarded annually by the Board of Directors.
2. Except for <u>emergency</u> and <u>urgent</u> necessity, all purchases outside the approved annual Fiscal Year Budget shall be approved by the Board of Directors. Emergency and urgent necessity mean interruptions in the service or operations of the District which require immediate action before Board approval can be obtained.

OVER

Rule 130
Adopted
9/7/82

3. The following procedures shall be followed for surplusing supplies and equipment:

   A. An item shall be declared surplus by the General Manager when the District has no present or future use for such item;

   B. A surplus value shall be established as an appropriate percentage of new replacement cost, scrap value, public bid or auction where appropriate, or other generally accepted methods for establishing surplus value; and

   C. The General Manager shall use methods and procedures for disposing of surplus items which in his judgment will return the greatest value to the District.

RULE NO. 131

STOCKTON-EAST WATER DISTRICT
PROCEDURES AND REGULATIONS FOR ESTABLISHING
FLAT RATE AND SPECIAL CLASS WATER PRODUCTION

WHEREAS, the Act authorizes the Board to make such rules and regulations as it deems necessary and proper for carrying out the provisions of the Act; and

WHEREAS, Section 9.4 of the Act requires that the Board, at a Regular, Special, or Continued Meeting between March 15 and April 15 of each year, after giving public notice, shall hold a public hearing to consider the necessity, amount, and rates of a municipal ground water assessment, an agricultural ground water assessment, and a domestic ground water assessment, if any, to be levied for the then current calendar year and charges to be made for stream-delivered water to the extent that such charges for stream-delivered water are not controlled by contract or agreement, and that water rates shall be established by Ordinance; and

WHEREAS, Section 9.4(d) of the Act also provides for establishment, by Rule, one or more methods to be used in computing the amount of water production from water-producing facilities which are not measured by a water-measuring device approved by the Collector.

NOW, THEREFORE, the Board of Directors of the Stockton-East Water District hereby enacts and establishes Rule No. 131 which provides procedures and regulations for computing the amount of water production from water-producing facilities which are not measured by a water-measuring device approved by the Collector, and other special classes of water. Rule No. 131 repeals Rule No. 129.

A. Agricultural Classification. "Agricultural classification" means water produced and used for the commercial production of agricultural crops or livestock on parcels of land operated in units of more than two (2) acres, and shall not include water used for agricultural product processing purposes, nor water used for household and landscaping purposes.

B. Domestic Classification. "Domestic classification" means water produced by a water producing facility located upon a parcel and used entirely upon said parcel for household and landscaping purposes.

C. Municipal and Industrial Classification. "Municipal and Industrial classification" means water produced and used for any purpose other than use classified as AGRICULTURAL in paragraph A above and use classified as DOMESTIC in paragraph B above, and includes all water used for agricultural product processing purposes.

D. Rates Established. Effective for each calendar year, all water produced within the District is subject to assessment at the rates adopted by Ordinance for the current calendar year.

SCHEDULE I

SECTION I: AGRICULTURAL CLASSIFICATION - GROUND WATER (WELL WATER)

Flat Rates

1. Rice	5.3 acre feet per acre per year
2. Grain	1.0 acre feet per acre per year
3. All other crops	2.8 acre feet per acre per year

SECTION II: AGRICULTURAL CLASSIFICATION - STREAM DELIVERED WATER (RIVER WATER)

Flat Rates

1. Rice	5.3 acre feet per acre per year
2. Grain	1.0 acre feet per acre per year
3. All other crops	2.8 acre feet per acre per year

SECTION III: AGRICULTURAL CLASSIFICATION - STREAM DELIVERED WATER (RIVER WATER) SPECIAL CLASS - POTTER CREEK

Potter Creek channels now carry water during the irrigation season provided by diversion of Calaveras River water. The District heretofore claimed, and does now claim, all water in Potter Creek channels. All water diverted from Potter Creek within the District shall be metered in accordance with Order of the Board of Directors issued March 13, 1979, and District Rule No. 123, adopted May 01, 1979. No allowance or consideration shall be granted for claims of prior diversion of drainage water not originating upon claimants property. The diversion of water into Potter Creek by the District is subject to complete termination or reduction if it becomes necessary to adopt priority schedules for water use in the event demand exceeds available supply or in the event dry year conditions limit District water supply.

SECTION IV: EXEMPTIONS FROM PUMP ASSESSMENTS

In recognition of the fact that full beneficial use of certain wells within certain portions of the District may be adversely affected by ground water conditions not under the control of the well owner or the District, exemptions to the current pump tax assessments which would otherwise be applicable to the use of an individual well may be granted by the District, on a case by case basis, under the provision of this Rule, as follows:

A. Wells otherwise subject to Municipal or Domestic pump tax assessments which produce water with specific conductivity greater than 600 micromhos per centimeter are exempted from the applicable pump tax assessment.

B. Wells otherwise subject to Agricultural pump tax assessments which produce water with specific conductivity greater than 1,300 micromhos per centimeter are exempted from the applicable pump tax assessment.

C. Wells which provide water for both Municipal or Domestic and Agricultural uses are exempted from that portion of the total pump tax assessments that would otherwise be applicable due to its use for Municipal or Domestic purposes if such well produces water with specific conductivity greater than 600 micromhos per centimeter but less than 1,300 micromhos per centimeter.

D. Determination of the specific conductivity of water produced by a well will be made by the District at no charge to the owner, except as provided in (E)(3), upon receipt from the owner of a written request for such determination, not later than June 20, of the year for which the request is being made, to permit testing during the month of July and August. Wells which supply water to a public water system, as defined in Section 64411, Title 22, California Administrative Code, may be exempted from applicable pump tax assessments based on the results of tests for specific conductivity performed by an approved water laboratory, as defined in the same Section 64411, provided to the District by the owner.

E. A well that has been tested and has been classified as either exempt or not exempt from the applicable pump tax assessment will normally retain that classification for a period of four (4) years, and not be retested during that period, except that:

   (1) The District may at its sole expense, test wells more frequently than every four (4) years if more frequent testing is necessary to reflect changing conditions in local ground water quality;

(2) The District may extend to more than four (4) years the exemption status wells located in areas for which no evidence of sufficient improvement in local ground water quality exists as would indicate a change in classification to be likely;

(3) An owner may request, in writing, that water from a well be reanalyzed at an interval of less than four (4) years provided that the owner agrees, prior to the requested analysis being performed, to reimburse the District for its actual expenses for the analysis if no change in the status of the well is appropriate based on the results of the reanalysis.

F. This rule shall apply only to those wells located in the following areas of the District:

(1) That portion of the Metropolitan Stockton Area located west of Highway 99;

(2) That portion of the District designated as the South Planning Area; and

(3) That portion of the District designated as the North Planning Area.

SECTION V: UNIT VALUES FOR FLAT RATE DOMESTIC AND MUNICIPAL GROUND WATER

A. Single Family Residence; Commercial Building; First Unit of a Multiple Commercial Building, Motels, Trailer Parks, or Multiple Family Residences, including landscaping on sites two (2) acres or less	1 Unit
B. Each additional housing unit of Motels, Multiple Commercial Buildings, Multiple Family Residences, or Trailers in Trailer Parks	1/3 Unit

RULE NO. 139

ADOPTED 4/21/92

RULE REGULATING WASTE OF SURFACE WATER

The Board of Directors of the Stockton East Water District finds and determines that:

1. The Act authorizes the Board to make such rules and regulations as it deems necessary and proper for carrying out the provisions of that Act.

2. The District finds and determines that proper notice of the need for, and regulation of, provision of surface water provided to agricultural irrigators is a means of conserving water, and therefore of benefit to all water users within the District.

3. The District therefore establishes the following procedures:

(a) Any person desiring to use surface water provided by the District shall first inform the District by telephone of the desired place, time, and amount of use.

(b) The information must be received at least 24 hours before the intended use.

(c) Any person desiring to cease use of such surface water shall inform the District of the time of intended cessation of use.

(d) The information must be received at least 24 hours before the intended cessation.

(e) The District will receive such calls 7 days a week at the following numbers: Monday through Friday (8:00 a.m. to 5:00 p.m.) 948-0333; all other times, 948-0337.

4. Failure to follow the above procedure is, and will be conclusively presumed to cause a waste of water, which will cause loss of a valuable resource in limited supply, affecting the District and all other water users in the District, in an amount which cannot be accurately determined but shall be conclusively presumed to cause the loss of $500.00 worth of water.

5. For the first such failure by any person, such person will be charged for $100 worth of water, and such amount will be added to such person's account with the District.

6. For the second such failure by any person, that person will be charged for $200 worth of water, and such amount will be added to such person's account with the District.

7. For the third and any subsequent such failure by any person, that person will be charged for the full $500 worth of water, conclusively presumed to be wasted, and such amount will be added to such person's account with the District.

8. Upon the determination of any failure, the District shall notify the person who failed to follow this rule of the failure.

9. The amount added to such person's account shall be collected as part of such person's account in the manner provided in the Act.

10. Notwithstanding the above, the minimum time required for notice to the District when the surface water taken or used is used for frost protection purposes shall be upon the commencement of such use, or as soon thereafter as possible, rather than 24 hours ahead of time.

11. In the event any person who has been deemed to have wasted water under this rule shall request water, and it shall not be provided, that person shall inform the District of the facts and circumstances, and all such facts and circumstances shall be reviewed, with the possible application of a credit to such person's account at the end of the irrigation season.

12. Any person charged under this rule may appeal to the District's Agricultural Committee which committee may waive any charge imposed by this rule which would be inequitable under the circumstances the committee determines.

RULE NO. 140

ADOPTED 4/21/92

ALLOCATION OF NEW HOGAN WATER - 1992

WHEREAS, the District Act authorizes the Board to adopt rules and regulations as it deems necessary and proper for carrying out the provisions of the Act; and

WHEREAS, the current six-year drought has caused groundwater levels to fall, and has decreased the amount of New Hogan Reservoir water available for treatment plant and irrigation purposes; and

WHEREAS, approximately 25,240 acre feet (AF) of New Hogan water (17,000 acre feet net after percolation losses) are available for irrigation use, and 22,700 AF will be required for the treatment plant; and

WHEREAS, delivery of these amounts of water can be made efficiently with minimum conveyance losses if irrigation releases are made during ten-day periods each month during the months of May through August, and if treatment plant releases are made continuously during the months of May through October; and

WHEREAS, controls are necessary, to assure no irrigation use of water released for the treatment plant;

NOW, THEREFORE, THE BOARD OF DIRECTORS OF STOCKTON EAST WATER DISTRICT HEREBY ENACTS AND ESTABLISHES THE FOLLOWING RULES TO ASSURE NO IRRIGATION USE OF WATER RELEASED FROM NEW HOGAN RESERVOIR FOR THE TREATMENT PLANT DURING THE PERIOD OF MAY 1, 1992 - OCTOBER 31, 1992:

1. Diversion of water from the Calaveras River above Bellota for agricultural irrigation shall be prohibited except during ten-day periods designated by the District each month, during the months of May through August.

2. The District, through it's Board of Directors, General Manager and General Counsel, may take such legal actions as may be necessary to enjoin the taking of water contrary to this rule.

RULE NO. 142

ADOPTED 6/17/92

REVISED RULE FOR METERS

WHEREAS, the District Act authorizes the Board to make such rules and regulations as it deems necessary and proper for carrying out the provisions of the Act; and

WHEREAS, Section 5 of the Act allows the Board to require such measuring devices as may be necessary:

NOW, THEREFORE, THE BOARD OF DIRECTORS OF THE STOCKTON EAST WATER DISTRICT HEREBY ENACTS AND ESTABLISHES THE FOLLOWING RULE:

A. The staff of Stockton East Water District shall recommend to the Board installation of a meter or water-measuring device on any agricultural water-producing facility, except as noted in Paragraph G herein, where such meter or device is necessary to carry out the purposes of the Act, in the discretion of the District. This recommendation shall be accompanied by a plan for physically installing the meter and necessary engineering drawings for such installation. Prior to making such recommendations to the Board, the staff shall notify the owner of the water-producing facility of the proposed recommendations so that the owner may appear and comment at the meeting in which the Board will hear that recommendation.

B. The Board shall consider the recommendations of the staff, the comments of the owner of the agricultural water-producing facility, and shall by resolution direct the staff to proceed with installation of its meter or water-measuring device, if in the judgment of the Board such installation is necessary to carry out the purposes of the Act.

C. Such installation, if directed by the Board, shall take place in two steps:

    1. The District shall provide to the owner of the agricultural water-producing facility, a meter containment tube which shall be complete with a pre-cut hole for installation of the meter or water-measuring device and shall have straightening vanes installed. Within thirty (30) days after provision of such meter containment tube (unless such time is extended by the Board) the owner shall install it in accordance with the engineering drawing and plan submitted by the staff.

2. As soon as possible thereafter, the staff of the District shall install the meter or water-measuring device.

D. In the event such a meter or water-measuring device is placed on any agricultural water-producing facility, the meter or device shall remain on the facility as long as the water-producing facility is in place. An annual charge for the installation, so long as such meter or water-measuring device is in place, is operable and is used, shall be charged to the owner as a separate charge on his annual water bill. Said charges shall be in accordance with the following schedule. For meters of water-measuring devices which are of sizes different from those shown on the schedule, the staff shall recommend an annual charge consistent with the schedule:

Size of Meter	Annual Charge
4" Meter	$37.00
6" Meter	$38.00
8" Meter	$40.00
10" Meter	$43.00
12" Meter	$45.00
14" Meter	$47.00
16" Meter	$51.00
18" Meter	$63.00
20" Meter	$67.00
22" Meter	$70.00
24" Meter	$73.00
30" Meter	$80.00

E. The meter shall remain the property of the District and shall be maintained and inspected by the District thereafter. Any person who injures, alters, removes, resets, adjusts, manipulates, obstructs or in any manner interferes or tampers with or procures, or causes or directs any person to injure, alter, remove, reset, adjust, manipulate, obstruct or in any manner interfere or tamper with any meter or water-measuring device, so as to cause such meter or water-measuring device to improperly or inaccurately measure and record water production, shall be subject to the penalties set forth in the Act.

F. If the Board determines that it is necessary in order to secure compliance with this rule by any owner, the Board shall then direct the Secretary-Manager of the District to seek appropriate remedies with the assistance of the attorneys for the District so as to obtain full enforcement of this rule. In accordance with Section 22 of the Act, it is hereby provided that the District shall not deliver or make available water to any owner who shall fail to install the meter containment tube in accordance with the engineering drawing within thirty (30) days of the time of provision of such meter containment tube to the owner (unless such time is extended by the Board), or who shall interfere with the subsequent installation of the meter or water-measuring device.

G. Paragraphs A and B of this rule shall not apply to agricultural surface water-producing facilities installed after May 1, 1979, and the installation of meters or water-measuring devices on such facilities shall be deemed to have been judged necessary, and installation of meters or water-measuring devices on such facilities shall take place in accordance with paragraphs C, D, E and F of this Rule.

RULE NO. 143

ADOPTED 04/06/93

RULE FOR RATE EQUALIZATION - CALENDAR YEAR 1993

WHEREAS, the District Act authorizes the Board to adopt rules and regulations as it deems necessary and proper for carrying out the provisions of the Act; and

WHEREAS, paragraph 6D (3) of the Second Amended Contract among SEWD, City of Stockton, County of San Joaquin and California Water Service Company states that "Stockton East shall annually levy a municipal groundwater assessment, pursuant to its enabling legislation such that the cost of groundwater use is equivalent to the cost of surface water use"; and

WHEREAS, SEWD has conducted a survey with the municipal groundwater users to determine the cost of groundwater production;

NOW, THEREFORE, THE BOARD OF DIRECTORS OF STOCKTON EAST WATER DISTRICT HEREBY ENACTS AND ESTABLISHES THE FOLLOWING RULES TO LEVY A GROUND WATER ASSESSMENT TO EQUALIZE THE COST OF GROUNDWATER AND SURFACE WATER FOR 1993:

1. POWER COST - Use actual power costs submitted by owner to accomodate for differences in water depth, pumping efficiency, system pressure, etc. In the absence of actual power costs, the cost of $50 per acre foot will be assumed.

2. OPERATION AND MAINTENANCE COST - Includes labor, repairs, chemicals, treatment costs and the current $3.60 assessment. The cost of $30 per acre foot will be assumed.

3. AMORTIZATION AND DEPRECIATION COST - Includes well and equipment replacement. The cost of $10 per acre foot will be assumed.

4. FORMULA FOR RATE EQUALIZATION - Surface water costs plus Groundwater costs divided by total M & I water production equals cost per acre foot. The assumed costs and water production for 1993 are as follows:

Ground water	15,000 af X $90.00 =	$1,350,000
Surface water	40,000 af X $165.00 =	$6,599,971
Totals	55,000 af	$7,949,971

The total cost of $7,949,971 divided by total use of 55,000 af equals $144.54 per acre foot. The assumed 1993 additional groundwater assessment is $144.54 less $90, or $54.54.

5. Any municipal groundwater user has the right to appeal the amount of this additional $54.54 per acre foot rate equalization assessment if it can be demonstrated that actual groundwater production costs are higher than the assumed $90 per acre foot. The appeal process will begin with the Water Policy Committee of the District Board and if necessary can be appealed to the full Board.

6. Any appeal which is granted shall entitle the appellant to a refund of the amount demonstrated to have been overcollected, less the actual cost to the District of processing the appeal and refund, provided that no overpayment shall be refunded unless the request for appeal has been filed with the Secretary of the District within three years of such overpayment

RULE NO. 155

ADOPTED 03/29/05

RULE FOR RATE EQUALIZATION - CALENDAR YEAR 2005

WHEREAS, the District Act authorizes the Board to adopt rules and regulations as it deems necessary and proper for carrying out the provisions of the Act; and

WHEREAS, paragraph 6D (3) of the Second Amended Contract among SEWD; City of Stockton, County of San Joaquin and California Water Service Company states that "Stockton East shall annually levy a municipal groundwater assessment, pursuant to its enabling legislation such that the cost of groundwater use is equivalent to the cost of surface water use";

NOW, THEREFORE, THE BOARD OF DIRECTORS OF STOCKTON EAST WATER DISTRICT HEREBY ENACTS AND ESTABLISHES THE FOLLOWING RULES TO LEVY A GROUNDWATER ASSESSMENT TO EQUALIZE THE COST OF GROUNDWATER AND SURFACE WATER FOR 2005:

1. POWER COST -- Use actual power costs submitted by owner to accommodate for differences in water depth, pumping efficiency, system pressure, etc. In the absence of actual power costs, the cost of $70 per acre foot will be assumed.

2. OPERATION AND & MAINTENANCE COST -- Includes labor, repairs, chemicals, treatment costs and the current $3.60 assessment. The cost of $30 per acre foot will be assumed.

3. AMORTIZATION AND DEPRECIATION COST -- Includes well and equipment replacement. The cost of $10 per acre foot will be assumed.

4. FORMULA FOR RATE EQUALIZATION -- Surface water costs plus Groundwater costs divided by total M & I water production equals cost per acre foot. The assumed costs and water production for 2005 are as follows:

Ground water	26,435 AF X $110.00 =	$2,907,850
Surface water	42,000 AF X $293.73 =	$12,336,602
Totals	68,435 AF	$15,244,452

   The total cost of $15,244,452 divided by total use of 68,435 AF equals $222.76 per acre foot. The assumed 2005 additional groundwater assessment is $222.76 less $110 (total of items 1-3 above), or $112.76.

5. Any municipal groundwater user has the right to appeal the amount of this additional $112.76 per acre foot rate equalization assessment if it can be demonstrated that actual groundwater production costs are higher than the assumed $110 per acre foot. The appeal process will begin with the Administration Committee of the District Board and if necessary can be appealed to the full Board.

6. Any appeal which is granted shall entitle the appellant to a refund of the amount demonstrated to have been over-collected, less the actual costs to the District of processing the appeal and refund, provided that no overpayment shall be refunded unless the request for appeal has been filed with the Secretary of the District within three years of such overpayment.

RULE NO. 166
ADOPTED MARCH 31, 2015

ALLOCATION OF NEW HOGAN WATER – 2015

WHEREAS, the Special Act governing the Stockton East Water District ("**Stockton East**") authorizes the Board of Stockton East to adopt rules and regulations as it deems necessary and proper for carrying out the provisions of the Act; and

WHEREAS, the current four-year drought has caused groundwater levels to fall, and has decreased the amount of New Hogan Reservoir water available for municipal and irrigation purposes; and

WHEREAS, approximately 12,650 AF of New Hogan water (7,300 AF net after percolation losses) are available for irrigation use by holders of prior rights ("**Prior Right Holders**") as determined by that Water Rights Study dated February 7, 1969 prepared by Murray, Burns & Kienlen ("**Water Rights Study**"); and

WHEREAS, there is water available on a case by case basis for emergency situations only, as determined by the Board of Directors; and

WHEREAS, approximately 20,000 AF will be required for delivery to the Dr. Joe Waidhofer Water Treatment Plant ("**Plant**"); and

WHEREAS, delivery of these amounts of water can be made efficiently, and with minimum conveyance losses, only if irrigation releases are made during ten-day periods each month during the months of May through August, and if releases for delivery to the Plant are made continuously during the months of May through October; and

WHEREAS, controls are necessary to assure that water released for diversion by Prior Right Holders is not diverted by other surface water diverters; and

WHEREAS, controls are necessary to assure that water released for delivery to the Plant is not diverted for irrigation.

NOW, THEREFORE, THE BOARD OF DIRECTORS OF STOCKTON EAST HEREBY ENACTS AND ESTABLISHES THE FOLLOWING RULE TO BE EFFECTIVE MAY 1, 2015 THROUGH OCTOBER 31, 2015:

1. Irrigation water released from New Hogan Reservoir during the 2015 irrigation season shall be available for diversion and use only by Prior Right Holders in accordance with their historical rights.

2. Irrigation water released from New Hogan Reservoir during the 2015 irrigation season shall be made during one (1) ten-day period each month from the 1st to the 10th day of each month in May through August.

3. Prior Right Holders shall work cooperatively to insure that diversions are made on a correlative basis.

4. Water released from New Hogan Reservoir during 2015 for delivery to the Plant shall be available for diversion and use only by Stockton East Water District for delivery to the Plant releases are made continuously during the months of May through October.

5. Surface water diverters diverting water to which they are not entitled shall be subject to citation by Stockton East and a fine of $500 per AF.

6. Surface water diverters who continue to divert water to which they are not entitled after citation are subject to locks being installed on their surface water diversions for the remainder of the 2015 irrigation season.

RULE NO. 170

ADOPTED 04/03/2018

RULE FOR RATE EQUALIZATION - CALENDAR YEAR 2018

WHEREAS, the District Act authorizes the Board to adopt rules and regulations as it deems necessary and proper for carrying out the provisions of the Act; and

WHEREAS, paragraph 6D (3) of the Second Amended Contract among SEWD; City of Stockton, County of San Joaquin and California Water Service Company states that "Stockton East shall annually levy a municipal groundwater assessment, pursuant to its enabling legislation such that the cost of groundwater use is equivalent to the cost of surface water use";

NOW, THEREFORE, THE BOARD OF DIRECTORS OF STOCKTON EAST WATER DISTRICT HEREBY ENACTS AND ESTABLISHES THE FOLLOWING RULES TO LEVY A GROUNDWATER ASSESSMENT TO EQUALIZE THE COST OF GROUNDWATER AND SURFACE WATER FOR 2018:

1. POWER COST -- Use actual power costs submitted by owner to accommodate for differences in water depth, pumping efficiency, system pressure, etc. In the absence of actual power costs, the cost of $70 per acre foot will be assumed.

2. OPERATION AND & MAINTENANCE COST -- Includes labor, repairs, chemicals, treatment costs and the current $3.60 assessment. The cost of $36 per acre foot will be assumed.

3. AMORTIZATION AND DEPRECIATION COST -- Includes well and equipment replacement. The cost of $10 per acre foot will be assumed.

4. FORMULA FOR RATE EQUALIZATION -- Surface water costs plus Groundwater costs divided by total M & I water production equals cost per acre foot. The assumed costs and water production for 2018 are as follows:

Ground water	14,100 AF X $116.0000	=	$ 1,635,600.00
Surface water	55,000 AF X $520.9493	=	$28,652,211.77
Totals	69,100 AF		$30,287,811.77

The total cost of $30,287,811.77 divided by total use of 69,100 AF equals $438.32 per acre foot. The assumed 2018 additional groundwater assessment is $438.32 less $116 (total of items 1-3 above), or $322.32.

5. Any municipal groundwater user has the right to appeal the amount of this additional $322.32 per acre foot rate equalization assessment if it can be demonstrated that actual groundwater production costs are higher than the assumed $116 per acre foot. The appeal process will begin with the Administration Committee of the District Board and if necessary can be appealed to the full Board.

6. Any appeal which is granted shall entitle the appellant to a refund of the amount demonstrated to have been over-collected, less the actual costs to the District of processing the appeal and refund, provided that no overpayment shall be refunded unless the request for appeal has been filed with the Secretary of the District within three years of such overpayment.

RULE NO. 171

ADOPTED 04/09/2019

RULE FOR RATE EQUALIZATION - CALENDAR YEAR 2019

WHEREAS, the District Act authorizes the Board to adopt rules and regulations as it deems necessary and proper for carrying out the provisions of the Act; and

WHEREAS, paragraph 6D (3) of the Second Amended Contract among SEWD; City of Stockton, County of San Joaquin and California Water Service Company states that "Stockton East shall annually levy a municipal groundwater assessment, pursuant to its enabling legislation such that the cost of groundwater use is equivalent to the cost of surface water use";

NOW, THEREFORE, THE BOARD OF DIRECTORS OF STOCKTON EAST WATER DISTRICT HEREBY ENACTS AND ESTABLISHES THE FOLLOWING RULES TO LEVY A GROUNDWATER ASSESSMENT TO EQUALIZE THE COST OF GROUNDWATER AND SURFACE WATER FOR 2019:

1. POWER COST -- Use actual power costs submitted by owner to accommodate for differences in water depth, pumping efficiency, system pressure, etc. In the absence of actual power costs, the cost of $70 per acre-foot will be assumed.

2. OPERATION AND & MAINTENANCE COST -- Includes labor, repairs, chemicals, treatment costs and the current $3.60 assessment. The cost of $36 per acre-foot will be assumed.

3. AMORTIZATION AND DEPRECIATION COST -- Includes well and equipment replacement. The cost of $10 per acre-foot will be assumed.

4. FORMULA FOR RATE EQUALIZATION -- Surface water costs plus Groundwater costs divided by total M & I water production equals cost per acre-foot. The assumed costs and water production for 2019 are as follows:

Ground water	14,100 AF X $116.0000	=	$ 1,635,600.00
Surface water	55,000 AF X $532.3179	=	$29,277,486.55
Totals	69,100 AF		$30,913,086.55

   The total cost of $30,913,086.55 divided by total use of 69,100 AF equals $447.37 per acre-foot. The assumed 2019 additional groundwater assessment is $447.37 less $116 (total of items 1-3 above), or $331.37.

5. Any municipal groundwater user has the right to appeal the amount of this additional $331.37 per acre-foot rate equalization assessment if it can be demonstrated that actual groundwater production costs are higher than the assumed $116 per acre-foot. The appeal process will begin with the Administration Committee of the District Board and if necessary can be appealed to the full Board.

6. Any appeal which is granted shall entitle the appellant to a refund of the amount demonstrated to have been over-collected, less the actual costs to the District of processing the appeal and refund, provided that no overpayment shall be refunded unless the request for appeal has been filed with the Secretary of the District within three years of such overpayment.

RESOLUTIONS 2018-2019
Dates and Descriptions Index

RESOLUTION	ADOPTED	RESOLUTION TITLE
18-19-01	05/15/18	A Resolution Of The Board Of Directors Of Stockton East Water District Approving The Disposal Of Surplus Property
18-19-02	06/26/18	Resolution Of The Stockton East Water District Board Of Directors Adopting Appropriations Limit For Fiscal Year 2018-2019
18-19-03	09/25/18	Resolution Of The Board Of Directors Of Stockton East Water District Setting A Preliminary Base Monthly Payment For Period April 1, 2019 To March 31, 2020, Pursuant To The Second Amended Contract Among This District And The California Water Service Company, The City Of Stockton, The Lincoln Village Maintenance District, And The Colonial Heights Maintenance District, Providing For The Sale Of Treated Water
18-19-04	12/11/18	Resolution Of The Board Of Directors Of Stockton East Water District Adopting Proposed Budget For Fiscal Year 2019-2020
18-19-05	12/18/18	Setting A Revised Base Monthly Payment For The Period April 1, 2019 To March 31, 2020, Pursuant To The Second Amended Contract Among Stockton East Water District, California Water Service Company, City Of Stockton, Lincoln Village Maintenance District And The Colonial Heights Maintenance District, Providing For The Sale Of Treated Water
18-19-06	12/18/18	Approval For The Stockton East Water District To Proceed With Submission Of Inclusion Request To The United States Bureau Of Reclamation For The Parcels As Detailed In The Parcel Legal Descriptions
18-19-07	12/18/18	Designating Contractor Representatives For Negotiation Of Conversion Of Repayment Contract To A 9(D) Contract For Water Service With The Central Valley Project
18-19-08	01/29/19	Resolution Of The Board Of Directors Of Stockton East Water District Re-Authorizing Yearly Investment Policy
18-19-09	02/14/19	Resolution Of The Board Of Directors Of Stockton East Water District Approving The Disposal Of Surplus Property
18-19-10	03/12/19	Resolution Of The Board Of Directors Of Stockton East Water District Authorizing The San Joaquin County Auditor-Controller's Office To Make Direct Deposits Out Of Water Fund No. 46097 To Various Funds And To US Bank For Distribution To Cop Series 2002a And 2002b Bondholders During Fiscal Year April 1, 2019 To March 31, 2020

RESOLUTION OF THE BOARD OF DIRECTORS
OF STOCKTON EAST WATER DISTRICT

RESOLUTION NO. 18-19-03

SETTING A PRELIMINARY BASE MONTHLY PAYMENT
FOR PERIOD APRIL 1, 2019 TO MARCH 31, 2020,
PURSUANT TO THE SECOND AMENDED CONTRACT AMONG THIS DISTRICT
AND THE CALIFORNIA WATER SERVICE COMPANY, THE CITY OF STOCKTON,
THE LINCOLN VILLAGE MAINTENANCE DISTRICT,
AND THE COLONIAL HEIGHTS MAINTENANCE DISTRICT,
PROVIDING FOR THE SALE OF TREATED WATER

WHEREAS, on September 25, 1987, the Stockton East Water District entered into a Second Amended Contract among the California Water Service Company, the City of Stockton, the Lincoln Village Maintenance District, and the Colonial Heights Maintenance District, providing for the sale of treated water; and

WHEREAS, the Stockton East Water District pursuant to Section 6D(1) of the Second Amended Contract shall announce an estimated new base monthly payment on or before the first day of October annually and this estimated base monthly payment is subject to revision upon the adoption of the Stockton East Water District Annual Budget prior to December 15 of each year under Sec. 9.2(d) of the District Act; and

WHEREAS, the Board of Directors of the Stockton-East Water District has determined that the budgeted costs for the Contract period April 1, 2019 to March 31, 2020 should be as follows:

6A(1)	Debt Service	$ 5,836,763
6A(3)	Operation & Maintenance	17,132,738
6A(4)	Administration	4,900,000
6A(7)	Payment into the Major Repair & Replacement Fund	35,000
6A(8)	Payment into the Water Treatment Facilities Reserve Fund	100,000
		$28,004,501; and

WHEREAS, paragraph 6D(3) of said Second Amended Contract states that Stockton East shall annually levy a municipal groundwater assessment, pursuant to its enabling legislation such that the cost of groundwater use is equivalent to the cost of surface water use; and

WHEREAS, the preliminary 2019-2020 budget estimates the amount of $28,004,501 to be paid from base monthly payments, municipal groundwater assessments and other revenue as follows:

Base Monthly Payments	$19,985,823
Municipal Groundwater Assessments (11,000 AF X $327.64)	3,604,040
Prior Fiscal Year BMP adjustment	4,059,638
Other Revenue	355,000
Total	$28,004,501

NOW, THEREFORE, BE IT RESOLVED, that pursuant to said Second Amended Contract, this Board hereby establishes the Preliminary Base Monthly Payment to be paid by the Contractors pursuant to said Contract for the period April 1, 2019 to March 31, 2020, at \$19,985,823/12 = \$1,665,485.30

Passed and adopted by the Board of Directors of the Stockton East Water District on the 25th day of September 2018 by the following vote of the members thereof:

AYES:	Atkins, Cortopassi, McGaughey, McGurk, Panizza, Sanguinetti, Watkins
NAYES:	None
ABSENT:	None
ABSTAIN:	None

Thomas McGurk

Thomas McGurk, President

ATTEST:

Scot A. Moody, Secretary

RESOLUTION OF THE BOARD OF DIRECTORS
OF STOCKTON EAST WATER DISTRICT

RESOLUTION NO. 18-19-05

SETTING A **REVISED** BASE MONTHLY PAYMENT FOR THE PERIOD APRIL 1, 2019 TO MARCH 31, 2020, PURSUANT TO THE SECOND AMENDED CONTRACT AMONG STOCKTON EAST WATER DISTRICT, CALIFORNIA WATER SERVICE COMPANY, CITY OF STOCKTON, LINCOLN VILLAGE MAINTENANCE DISTRICT AND THE COLONIAL HEIGHTS MAINTENANCE DISTRICT, PROVIDING FOR THE SALE OF TREATED WATER

WHEREAS, on September 25, 1987, the Stockton East Water District entered into a Second Amended Contract among the California Water Service Company, the City of Stockton, the Lincoln Village Maintenance District, and the Colonial Heights Maintenance District, providing for the sale of treated water; and

WHEREAS, the Stockton East Water District pursuant to Section 6D (1) of the Second Amended Contract shall announce an estimated new base monthly payment on or before the first day of October annually and this estimated base monthly payment is subject to revision upon the adoption of the Stockton East Water District Annual Budget prior to December 15 of each year under Section 9.2 (d) of the District Act; and

WHEREAS, the Board of Directors of the Stockton East Water District has determined that the budgeted costs for the Contract period April 1, 2019 to March 31, 2020 should be as follows:

6A(1)	Debt Service	$ 5,836,763
6A(3)	Operation & Maintenance	17,401,690
6A(4)	Administration	5,904,034
6A(7)	Payment into the Major Repair & Replacement Fund	35,000
6A(8)	Payment into the Water Treatment Facilities Reserve Fund	100,000
		$29,277,487; and

WHEREAS, paragraph 6D(3) of said Second Amended Contract states that Stockton East shall annually levy a municipal groundwater assessment, pursuant to its enabling legislation such that the cost of groundwater use is equivalent to the cost of surface water use; and

WHEREAS, the 2019-2020 budget estimates the amount of $29,277,487 to be paid from base monthly payments, municipal groundwater assessments and other revenue as follows:

Base Monthly Payments	$21,416,892
Municipal Groundwater Assessments (14,100 AF X $331.37)	4,672,317
Prior Fiscal Year 2017-2018 Adjustment	2,838,278
Other Revenue	350,000
Total	$29,277,487

NOW, THEREFORE, BE IT RESOLVED, that pursuant to said Second Amended Contract, this Board hereby establishes the **Revised** Base Monthly Payment to be paid by the Contractors pursuant to said Contract for the period April 1, 2019 to March 31, 2020, at $21,416,892/12 = $1,784,740.97.

Passed and adopted by the Board of Directors of the Stockton East Water District on the 18th day of December 2018, by the following votes of the members thereof:

AYES:	Atkins, Cortopassi, McGaughey, McGurk, Panizza, Sanguinetti, Watkins
NAYES:	None
ABSENT:	None
ABSTAIN:	None

Melvin Panizza, President
Board of Directors
Stockton East Water District

Attest:

Scot A. Moody, Secretary
Board of Directors
Stockton East Water District

Stockton East Water District
Annual Budget Fiscal Year 2019-2020

	94 - M&I FUND	FY 2017-2018 Actual	FY 2018-2019 Budget	FY 2019-2020 Budget	Source Note
	REVENUES				
	WATER ASSESSMENTS REVENUE				
10-4120-0, 97	Income - City of Stockton	10,721,133	10,594,596	11,248,606	*BMP*
10-4121-0, 97	Income - California Water Service Co.	9,086,280	9,083,267	9,516,259	*BMP*
10-4122-0, 97	Income - Lincoln Village	455,130	461,842	507,832	*BMP*
10-4123-0, 97	Income - Colonial Heights	154,939	140,206	144,195	*BMP*
10-4131-0, 97	Income - GW Rate Equalizations	3,098,825	4,544,712	4,672,317	*Sch C*
	TOTAL WATER ASSESSMENTS	**23,516,307**	**24,824,622**	**26,089,209**	
	OTHER REVENUES				
10-4301-0	Interest Income - M & I	170,263	3,000	100,000	
10-4301-0, 97	Interest Income - Water Fund	12,654	2,500	10,000	
10-4141-0, 97	Payment from CSJWCD	240,000	240,000	240,000	
10-4701-0	Miscellaneous Income-M&I Fund	486	0	0	
	TOTAL OTHER REVENUES	**423,403**	**245,500**	**350,000**	
	REVENUES	**23,939,710**	**25,070,122**	**26,439,209**	
	PLUS/(MINUS) BMP PRIOR YEAR ADJ	**4,077,795**	**3,582,090**	**2,838,278**	
	NET TOTAL REVENUES	**28,017,505**	**28,652,212**	**29,277,487**	
	EXPENSES				
	SALARIES & BENEFITS				
	Total Salaries	**1,985,881**	**2,238,127**	**2,217,775**	
	Total Benefits	**1,248,098**	**1,592,473**	**1,667,945**	
	TOTAL SALARIES AND BENEFITS	**3,233,979**	**3,830,599**	**3,885,720**	
	ADMINISTRATIVE AND WATER SUPPLY COSTS				
10-5211-0	New Melones Contract Water-USBR	993,927	2,162,000	2,397,000	
10-5211-0	Goodwin Dam Property Self Insurance	69,750	69,750	69,750	
10-8041-0	Water Cost Allocation O&M NM	1,272,390	1,908,667	1,720,099	
10-8041-0	Water Cost Allocation O&M NH	200,531	277,431	300,780	
10-8031-0	Admin Division - Expense Allocation	3,052,260	4,933,517	5,904,034	
10-6901-0	Allocated Pension Expense	1,221,361	0	300,000	
	TOTAL ADMINISTRATIVE AND WATER SUPPLY COSTS	**6,810,219**	**9,351,365**	**10,691,663**	
	OPERATIONS				
10-5301-0	Chemicals	485,803	1,000,000	1,000,000	
10-5302-0	Electricity	1,404,927	1,300,000	1,200,000	
10-5303-0	Natural Gas	8,474	9,000	9,000	
10-5304-0	Utilities - Others (Bellota Headworks)	8,211	10,000	10,000	
10-5305-0	Diesel and Oil (Backup Generators)	0	5,000	5,000	
10-5306-0	Filter Media	0	500,000	500,000	
10-5307-0	Laboratory Equipment and Supplies	16,104	23,000	20,000	*1*
10-5308-0	Analytical Services	15,880	25,000	20,000	
10-5329-0	Sludge Disposal	18,768	150,000	150,000	
10-5181-0	Vehicle Usage M&I	33,568	42,000	42,000	
	TOTAL OPERATIONS	**1,991,736**	**3,064,000**	**2,956,000**	

	94 - M&I FUND	FY 2017-2018 Actual	FY 2018-2019 Budget	FY 2019-2020 Budget	Source Note
	MAINTENANCE				
10-5321-0	General Maintenance	107,330	150,000	140,000	
10-5322-0	Electrical , Instrumentation & Controls	88,868	435,000	130,000	2
10-5323-0	Maintenance & Repair - Treatment Plant	241,912	1,720,000	1,829,000	3
10-5324-0	Maintenance & Repair - Plant Grounds	56,528	96,500	65,000	4
10-5326-0	Maintenance & Repair - Buildings	67,442	30,000	30,000	5
10-5328-0	Equipment Rental	2,335	15,000	15,000	
10-5341-0	Protective Gear and Clothing	3,997	10,000	10,000	
10-5342-0	Uniform and Laundry	9,347	10,000	12,000	
10-5343-0	Tools and Equipment	15,433	30,000	25,000	
10-5344-0	Treatment Plant Consumables	8,292	10,000	15,000	
	TOTAL MAINTENANCE	**601,484**	**2,506,500**	**2,271,000**	
	DEBT SERVICE				
10-5423-0	NM Debt Service - 1997 Series	895,071	926,988	925,413	
10-8011-0, 97	2002A Interest Payment	405,264	335,450	258,700	
10-8012-0, 97	2002A Principal Payment	1,470,000	1,535,000	1,615,000	
10-5431-0	2002A Reimbursement - Fund 67	(364,131)	(363,194)	(363,194)	
10-8013-0, 97	Transfer for 2002A Repair and Maintenance	35,000	35,000	35,000	
10-8014-0, 97	Transfer for 2002B Interest Payment	2,766,990	2,883,713	2,994,516	
10-8014-0, 97	Transfer for 2002B Principal Payment	1,823,010	1,706,287	1,595,484	
10-8014-0, 97	Development Fees Received 2002B Debt Service	0	(1,924,069)	(2,285,266)	
10-2242-0	2005 Series - Principal -Balance Sheet	369,744	385,625	402,189	
10-5411-0	2005 Series - Interest	153,322	137,441	120,878	
10-2231-0	Transfer to Loan Repayment - State Revolving Fund	572,674	572,674	573,044	
	TOTAL DEBT SERVICE	**8,126,944**	**6,230,914**	**5,871,763**	
	TRANSFERS				
10-8021-0	Transfer to Bellota Fish Screen Project Fund 89	2,500,000	2,500,000	2,500,000	
10-8021-0	Transfer Water Treatment Plant Reserve	100,000	100,000	100,000	
10-8021-0	Transfer Out GWPS (68)	1,465,629	1,068,833	1,001,341	
	TOTAL TRANSFERS	**3,917,272**	**3,668,833**	**3,601,341**	
	UNBUDGETED EXPENSES				
	Depreciation	1,074,512	0	0	
	TOTAL EXPENSES	**25,756,145**	**28,652,212**	**29,277,487**	
	NET REVENUES OVER EXPENSES	**2,261,360**	**0**	**0**	

1 *Lab Supplies and Chemicals budgeted expenses include:*

General Supplies and Chemicals	$20,000
	$20,000

2 *Electrical, Instrumentation and Controls budgeted expenses include:*

Routine maintenance	$45,000
Instrument calibration (Cooper/Hach/AMS)	$85,000
	$130,000

3 *The Treatment Plant maintenance includes the following expenses:*

Constant head vault & 48" valve/gate	$1,000,000
North Site fence (includes survey)	$305,000
Filter Actuator Replacement	$150,000

94 - M&I FUND	FY 2017-2018 Actual	FY 2018-2019 Budget	FY 2019-2020 Budget	Source *Note*
East Reservoir influent chem. Building			$250,000	
Sludge Pond Expansion			$60,000	
Lighting Pilot Program			$64,000	
			$1,829,000	
4 *The Plant Grounds budget includes: routine maintenance, tree-trimming,vermin control, contract for chemical control, sprinklers & filters, plants & miscellaneous expenses*			**$65,000**	
5 *Building budgeted expenses include: Building maintenance; Floors, Doors, Roofs, HVAC*			**$40,000**	

SCHEDULE C

STOCKTON EAST WATER DISTRICT
CALCULATION OF RATE EQUALIZATION GROUND WATER ASSESSMENT & BASE MONTHLY PAYMENT
FISCAL YEAR 2019-2020

CALCULATION OF RATE EQUALIZATION GROUND WATER(GW) ASSESSMENT

(A) Assumed Groundwater Pumping Cost:

Power cost per acre foot	$	70.00
Operation & Maintenance cost	$	36.00
Replacement costs	$	10.00
Total GW Pumping Cost	$	116.00

(B) Calculation of Rate Equalization Groundwater Assessment:

2018 - 2019 (Budget)	Water Production	$ Cost/AF	Amount
Ground water	14,100 AF	$ 116.00	$ 1,635,600.00
Surface water	55,000 AF	$ 520.95	$ 28,652,211.77
Totals	69,100 AF		$ 30,287,811.77
GW Rate Equalization Assessment:	69,100	$ 30,287,811.77	$ 438.32
Less: GW Pumping Cost			$ (116.00)
2018-2019 GW Rate Equalization Assessment			**$ 322.32**

2019 - 2020 (Budget)	Water Production	$ Cost/AF	Amount
Ground water	14,100 AF	$ 116.00	$ 1,635,600.00
Surface water	55,000 AF	$ 532.32	$ 29,277,486.55
Totals	69,100 AF		$ 30,913,086.55
GW Rate Equalization Assessment:	69,100	$ 30,913,086.55	$ 447.37
Less: GW Pumping Cost			$ (116.00)
2019-2020 GW Rate Equalization Assessment			**$ 331.37**

BASE MONTHLY PAYMENT (BMP) \CALCULATION

Treatment Plant Budget - FY 2019-2020			(a)	**$ 29,277,486.55**
Revenue - Groundwater Rate Equalization	14,100 AF	$ 331.37		$ 4,672,317.00
Other Sources of Revenue - M&I				$ 350,000.00
Total Revenues before Base Monthly Payment			(b)	**$ 5,022,317.00**
Total Annual Payment (a)-(b)			(c)	$ 24,255,169.55
Less: Prior Fiscal Year BMP adjustment (credit)			(d)	$ (2,838,278.00)
Total - Adjusted Annual Payment - FY 2019-2020				**$ 21,416,891.55**

SCHEDULE D

STOCKTON EAST WATER DISTRICT
PRORATION OF BASE MONTHLY PAYMENT
FOR FISCAL YEAR 2019-2020 (04/01/19 - 03/31/20)

Total Base Monthly Payment (BMP) FY 2019 - 2020	21,416,891.55
Less: State Revolving Fund (SRF) Loan Repayment - FY 2019-2020	(572,674.49)
Base Monthly Payment FY 2019-2020 (excluding State Revolving Fund loan repayment)	**20,844,217.06**
Base Monthly Payment (BMP) FY 2019-2020 (per month)	**$1,737,018.09**

	2017-2018 Water Produced (AF)				Percentage	2019-2020 Monthly BMP	Previous 2018-2019 Monthly BMP	Difference
	DWSP	Surface	Well	Total				
City of Stockton	21,139	4,640	2,699	28,479	53.1381%	**$ 923,019.21**	880,003.84	43,015.37
Lincoln Village	0	898	368	1,266	2.3621%	**$ 41,030.83**	36,723.40	4,307.43
Colonial Heights	0	211	149	360	0.6725%	**$ 11,682.16**	12,599.39	(917.23)
California Water Service	0	20,969	2,519	23,489	43.8272%	**$ 761,285.89**	727,532.59	33,753.30
Totals	21,139	26,718	5,736	53,594	100.0000%	**$1,737,018.09**	1,656,859.22	80,158.87

**Proration of the State Revolving Fund Loan is under the provisions of the Agreement dated May 1, 2012 signed by the Urban Contractors with the following breakdown:*

Annual State Revolving Fund (SRF) Loan Payment	**$572,674.49**
Monthly Repayment	$47,722.88

	% Share	Monthly SRF
City of Stockton	30.10%	**$14,364.59**
Lincoln Village	2.70%	**$1,288.52**
Colonial Heights	0.70%	**$334.06**
California Water Service	66.50%	**$31,735.71**
	100.00%	**$47,722.88**

	BMP FY 2019-2020	SRF Loan Repayment FY 2019-2020	Adjusted BMP Calculation FY 2019-2020
City of Stockton	$923,019.21	$14,364.59	**$937,383.80**
Lincoln Village	$41,030.83	$1,288.52	**$42,319.35**
Colonial Heights	$11,682.16	$334.06	**$12,016.22**
California Water Service	$761,285.89	$31,735.71	**$793,021.60**
Total	**$1,737,018.09**	**$47,722.88**	**$1,784,740.97**

RESOLUTION 90-91-02

RESOLUTION FINDING NO GROUNDWATER BENEFIT AND ASSESSING NO GROUNDWATER ASSESSMENT

WHEREAS, the Stockton East Water District ("District") is engaged in a project to convey water from New Melones Dam and Reservoir, via the Goodwin Dam, to the geographical area of the District in San Joaquin County, for the benefit of the inhabitants of the District, through relief of the critically overdrafted groundwater basin, of the inhabitants of San Joaquin County ("Project"); and

WHEREAS, in pursuit of the common benefit of their inhabitants, District and the County of San Joaquin, a political subdivision of the State of California, have entered into a joint exercise of powers agreement pursuant to California Government Code Section 6500 et seq., and have created the Goodwin Tunnel Financing Authority ("Authority"); and

WHEREAS, the Authority and District are purchasing real property in Stanislaus, Calaveras and San Joaquin County which is required for construction of the Project ("Property"); and

WHEREAS, the Owners of the Property wish to annex to the District in order to obtain water service; and

WHEREAS, the District is required by Section 9.4 of Chapter 819 of the Statutes of 1971, as amended, to annually determine groundwater assessments within the District; and

WHEREAS, the District's special consultant, Woodward-Clyde engineers, has completed seepage estimates for the groundwater basin along the canals and creeks (12/19/89 Study for the Upper Farmington Canal, and 1/30/90 Study for the Lower Canal and Creeks which studies are available for review at the District office and which are incorporated herein by reference) and has concluded that, ". . . the amount of seepage recovered by any pumping well will be small and will be on the order of about 5 gpm"; and

WHEREAS, since agricultural wells within the present boundaries of the District produce approximately 1000 gpm, it is reasonable to find that the owners of the potential 5 gpm wells should not be assessed, NOW, THEREFORE, be it resolved and it is resolved by the Board of Directors of the District as follows:

1. Based upon the groundwater seepage estimates calculated by Woodward-Clyde, the New Melones/Goodwin Canal and Tunnel Project will not significantly improve groundwater conditions under property in the vicinity of the Upper and Lower Canals, and those portions of Shirley, Hoods, and Rock Creeks to be used to convey Project water.

2. No groundwater assessments will be levied on property within five miles of the Project, including such canals and creeks which may be part of the Project, and which may be annexed to the District.

3. The gro ndwater assessment will be reevaluated by the District in five (5) years to determine whether or not the Project has provided any actual benefits to the Property.

Adopted this 1st day of May, 1990, by the Board of Directors of the Stockton East Water District at a regular meeting thereof.

AYES: Dondero, Laven, Bozzano, MacNear, Huckins

NOES: George, Tone

ABSENT: None

ABSTENTIONS: None

Roger M. Huckins
PRESIDENT, Board of Directors
of Stockton-East Water
District

ATTEST:

SECRETARY, Board of Directors
of Stockton-East Water
District

SECRETARY'S CERTIFICATE

I, EDWARD M. STEFFANI, Secretary of the Board of Directors of the STOCKTON-EAST WATER DISTRICT, Stockton, California, do hereby certify as follows:

The foregoing is a full, true and correct copy of a resolution duly adopted at a Regular Meeting of the Board of Directors of said District duly and regularly and legally held at the regular meeting place thereof on Tuesday, May 1, 1990, of which meeting all of the members of said Board of Directors had due notice and at which a majority thereof were present.

I have carefully compared the same with the original minutes of said meeting on file and of record in my office, and the foregoing is a full, true, and correct copy of the original resolution adopted at said meeting and entered in said minutes.

Said resolution has not been amended, modified, or rescinded since the date of its adoption, and the same is now in full force and effect.

Dated: 5/1/90

EDWARD M. STEFFANI
Secretary of the Board
STOCKTON-EAST WATER DIST

(SEAL)

RESOLUTION NO. 92-93-01A
OF THE STOCKTON EAST WATER DISTRICT BOARD OF DIRECTORS
RELATING TO BOARD AND DISTRICT
PROCEDURES AND ORGANIZATION

WHEREAS, it is necessary and desirable to reevaluate and revise certain Board procedures, certain administrative procedures, and the administrative organization for the operation and government of the District;

NOW, THEREFORE, BE IT RESOLVED AS FOLLOWS:

I

REPEAL OF CONFLICTING RESOLUTIONS

Resolution 79-80-19, 83-84-17, 84-85-08, 90-91-13 and all other Resolutions, or portions thereof, in conflict with this Resolution are hereby repealed; and

II

1. Regular Meetings. The Board of Directors of the Stockton East Water District (hereinafter referred to as Board) shall hold regular meetings at its office at 6767 East Main Street, Stockton, California on the first and third Tuesday of each month. Said regular meetings shall be at noon during the portion of the year in which Standard time is in effect and at 7:00 P.M. during the portion of the year in which Daylight Savings time is in effect.

2. Adjournment of Meetings. The Board may adjourn any regular, adjourned regular, special or adjourned special meeting to a time and place specified in the order of adjournment. Less

than a quorum may so adjourn from time to time. If all Directors are absent from any regular or adjourned regular meeting, the Secretary of the Board may declare the meeting adjourned to a stated time and place and shall cause a written notice of the adjournment to be given in the same manner as provided in Section 3 below for special meetings, unless such notice is waived as provided for special meetings. A copy of the order or notice of adjournment shall be conspicuously posted on or near the door of the place where the regular, adjourned regular, special or adjourned special meeting was held within 24 hours after the time of the adjournment. When a regular or adjourned regular meeting is adjourned as provided in this section, the resulting adjourned regular meeting is a regular meeting for all purposes. When an order of adjournment of any meeting fails to state the hour at which the adjourned meeting is to be held, it shall be held at the hour specified for regular meetings.

3. Special Meetings. Special meetings may be ordered by the President, or by a majority of the members of the Board, specifying in writing the business to be transacted. Any order calling for a special meeting shall be entered in the minutes of the Board. The Secretary shall give three days' notice of any special meeting to any member of the Board not joining in the order calling the special meeting by mailing written notice to the member at the member's address as disclosed by the District records. Such written notice may be waived by any Director by filing a written waiver of notice with the Secretary. Additionally, such written notice is waived as to any Director who is actually present at the meeting at the time it convenes.

On the day prior to any special meeting, or earlier if possible, but at least 24 hours before the time of such special meeting, the Secretary shall mail a notice of the special meeting to the Stockton Record. The Secretary shall also give notice to any other parties as may be required by law. Only the business specified in the notice may be considered at such special meeting.

4. Oath of Office, Bonds and Effective Date of Taking Office. Elected officials of the District shall take office effective upon the taking and subscribing to an official oath and executing and filing the bond required by law; the newly elected official shall take the Oath of Office and execute the required bond at a meeting of the Board after the general district election, but in no event later than the last day of December.

5. Organization Meetings. At the first meeting of the Board following the time of taking office of the directors elected in the general District election, but in no event later than the last day of December, the Directors then holding office shall meet and organize as a Board.

5.1 Annual Organization Meetings. Notwithstanding any other provision of this Resolution, the Directors shall hold an organizational meeting at least annually.

6. Officers. At each of its organizational meetings, the Board shall elect a President and a Vice-President from among their number and shall appoint a Secretary, who need not be a member of the Board. Unless otherwise specifically provided by the Board, the General Manager of the District shall automatically serve as Secretary. Each of the foregoing officers

shall hold office at the pleasure of the Board. The duty of the Vice-President shall be to preside at any meeting, or portion thereof, at which the President is not present.

It is the intention of the Board that the offices of President and Vice-President shall be rotated annually among members of the Board. The President shall be chosen from those Directors serving the last two years of his or her term.

7. Voting at Board Meetings.

A. All voting members of the Board present shall vote on all questions coming before the Board either in the affirmative or in the negative, except that on any matter coming before the Board which may present a conflict of interest to one or more members, such member or members shall announce that they have a conflict of interest at the time of the commencement of discussion on the question and said member or members having a conflict shall thereafter refrain from discussion and voting on anything pertaining to such a matter; and further, except that any member of the Board who has not been present to participate in all, or a portion, of the discussion relating to a matter may abstain for that reason. If a member of the Board chooses not to vote on a question coming before the Board when there is no conflict of interest with respect to that member, by absenting himself or herself from the meeting room at the time of the vote, then that member shall not be entitled to discuss the matter either prior to or after the vote. Any member who chooses to discuss a matter shall vote on that matter. Any member who chooses to discuss a matter and then absents himself or herself to avoid the vote shall be considered, and his or her vote shall be recorded, as voting with the majority, or in the case of no majority, in the affirmative.

B. All votes may be by voice vote with both the "ayes" and "nays" being called. In the event that upon a voice vote being taken it appears to the President, or to any member of the Board, that the vote is not unanimous, a roll call shall then be taken.

8. Agendas. On or before the Friday preceding each regular or adjourned regular meeting, the Secretary shall mail an agenda for the forthcoming meeting. Said agenda shall be prepared by the Secretary and upon mailing the same, the Secretary shall accompany the agenda with as much explanatory material relating to the items on the agenda as is reasonably possible. An agenda for each special meeting shall be mailed as early in advance of the special meeting as is reasonably possible and shall be accompanied by such explanatory material as is necessary to advise the Board of the nature of the matter or matters coming before the Board at the special meeting.

9. Records. The Secretary of the Board shall keep, and make available to the public, accurate minutes of all proceedings of the Board. The proceedings of the Board shall be recorded by a tape recorder and the Secretary shall then, from the tape record, prepare minutes in summary form. Minutes shall not be read at Board meetings but shall be mailed in advance of meetings to the Board members, so that the same may be considered for approval without being read aloud at Board meetings. Tapes of Board meetings shall be kept by the Secretary for two years and thereafter may be erased or otherwise destroyed.

10. Order of Business. The order of business at each meeting of the Board, unless suspended or varied, upon order of the President or by majority vote of the board, shall be as follows:

A. Roll Call;

B. Consent Calendar;

C. Public Comment (Non-agenda items);

D. Scheduled presentations and agenda items (to be considered in this order:

1. Staff report

2. Board discussion

3. Public comment on the specific item, with time limitations determined by the chair-person;

4. Board action);

E. Committee Reports (detailed committee minutes);

F. Report of the General Manager (information items listed on the agenda, but bound separately from the other agenda material);

G. Report of the Counsel, if any;

H. Communications;

I. Agenda planning for next meeting;

J. Director Reports;

K. Adjournment.

All items of business which, in the judgment of the Secretary require neither Board discussion nor a public hearing, shall be included in the Consent Calendar; provided that the agenda indicate on its face for each such items that such items is included in the Consent Calendar, and provided further that a written report and recommendation of the General Manager on each item so included has been mailed to the Board members with the agenda. The Consent Calendar may include the approval of minutes and expenses. Any Board member or the General Manager may request that any item on the Consent Calendar be removed therefrom for discussion and separate consideration.

11. Committees. There shall be standing committees of the Board as follows: Administration, Agricultural Operations and Municipal Operations. Other committees may be established from time to time by the President as required in the opinion of the President. The members of all committees shall be appointed by the President from among the members of the Board. All Directors shall serve on at least one committee, and should there be a minimum of five committees, Directors shall serve on at least two committees.

12. Quorum and Tie Votes. In conducting the business of the Board, the following shall apply with respect to quorum requirements:

A. A majority of the Board shall constitute a quorum for the transaction of business;

B. All board actions shall require a vote of the majority of the members present unless other wise provided by law or this Resolution; and

C. A tie vote shall be considered a negative vote, provided that in the event of a tie vote, while the matter shall be considered determined in the negative, the General Manager shall place the matter on the agenda for reconsideration at the next succeeding meeting.

13. Conduct of Business. The procedure for the conduct of business shall be as follows:

A. Each agenda item shall be taken up in order by the presiding officer except that all items designated as consent items shall be taken up under the Consent Calendar;

B. The presiding officer shall call upon the General Manager or such other person or persons as may be appropriate to the present the matter to the Board;

C. The matter shall then be discussed by the Board members and such other Staff persons or consultants as may be called upon by the President;

D. As to all matters not included within the Consent Calendar, and including those matters which have been removed from the Consent Calendar as provided herein, if a motion is made in connection with a matter, prior to vote on the motion, the President shall call for comments on the proposed motion from members of the public. Public comments shall be limited to the motion then before the Board. The President shall have the authority to limit the duration of or refuse to permit public comment if such public comment is repetitive, disorderly, or otherwise not in furtherance of a reasonably expeditious review of the merits of the pending motion;

E. It shall be understood that any member of the public desiring further discussion on an item after a vote is taken, or on an item on which no motion is made, shall take the matter up with the Board member representing the division of the District in which said member of the pubic resides, or owns or operates property, or with any other Board member after adjournment of the meeting;

F. At the conclusion of public comment on any pending motion, the President shall announce that the time for public discussion of the matter is closed;

G. The foregoing procedure shall not apply to the conduct of "public hearings", and in the case of "public hearings", the requirements of statutes and the duly adopted rules of the District shall prevail;

H. Prior to the commencement of any "public hearing", the President shall request that an attorney for the District, and in the attorney's absence the General Manager, outline the procedure to be observed in the conduct of the "public hearing";

I. The foregoing procedure shall not apply to the Consent Calendar which shall be governed by this subparagraph. the Consent Calendar shall be approved without discussion by a single vote of those Board members present, except as to items removed from the Consent Calendar as provided herein. In the event of removal, any such items shall be considered in accordance with the procedures outlined in the foregoing subparagraph of this section at the appropriate place on the agenda; and

J. The foregoing procedure shall not apply to the Public Comment Section of the Agenda, which shall be governed by this subparagraph. The Public Comment Section of the Agenda shall be reserved for any member of the public wishing to comment on any matter pertaining to District business other than matters which appear on the same agenda. The President shall have the authority to limit the duration of or refuse to permit public comment if it is repetitive, disorderly, or otherwise not in furtherance of a reasonably expeditious review of District business.

14. Roberts Rules of Order. Roberts Rules of Order Revised are hereby adopted by the Board in all cases not otherwise provided for in this Resolution and not otherwise provided for by applicable law.

III

DUTIES OF THE GENERAL MANAGER

1. Responsibility. The General Manager shall be directly responsible to the Board and subject to the general supervision of the Board. The General Manager shall carry out and execute all policies and directives of the Board. As to matters concerning District policies (as opposed to non-substantive matters of detail), it is understood that the General Manager is subject to the direction of the Board, acting as a Board, and not to the direction of an individual Board member or group of Board members not acting as a committee.

2. Duties. The General Manager shall, among other things, do the following:

A. Have charge of all activities and functions of the District and all of the office and field personnel of the District;

B. In her or his discretion, appoint and discharge all employees of the District and from time to time, as she or he deems proper, make salary and wage change recommendations to the Board;

C. Receive all communications addressed to the District;

D. Unless another person has been appointed as Secretary, fulfill the duties of Secretary of the District as prescribed by law and in that capacity, have authority to appoint Deputy Secretaries;

E. When he or she deems it necessary, request the President to call special meetings of the Board;

F. Enforce all rules of the District;

G. Prepare and present proposed budgets and recommend replenishment and assessment rates and surface water charges to the Board, in accordance with the requirements of statutes;

H. From time to time, recommend to the Board proposed capital improvements necessary to carry out the purposes and programs of the District;

I. Advise the Board as to when engineering and legal services are required by the District;

J. On behalf of the District, without further action of the Board, be authorized to file protests to any application filed with the State Water Resources Control Board for appropriation of water from the Calaveras River or any tributary or distributary thereof. Any such protest so filed shall thereafter be subject to the control and direction of the Board; and

K. Be authorized to call such committee meetings as from time to time may be necessary, to carry on the business of the District.

IV

POLITICAL ACTIVITY

It is hereby declared by this Board that the General Manager of this District, the General Counsel for the District, and all of their subordinate employees are employed for the purpose of administering and executing the policies, rules, programs, and directives established by the Board as the policy making agency of the District. They shall not be subjected to personal or political pressure nor shall they participate in any of the political affairs of the District, including but not limited to any election campaign for a District office.

V

FLEXIBILITY

The foregoing policies, procedures, and requirements are intended to be applied flexibly to meet the needs of the District and it is intended by the Board that they shall be revised from time to time as is necessary and appropriate to further meet the needs of the District.

PASSED AND ADOPTED by the Board of Directors of the Stockton East Water District on the 14th Day of April, 1992, by the following vote:

AYES: Directors Alonzo, Clayton, Dondero, Laven, Tone, MacNear

NOES: None

ABSTENTIONS: None

ABSENT: Director George

JACK LAVEN, President
Board of Directors
Stockton East Water District

ATTEST:

EDWARD M. STEFFANI, Secretary
Board of Directors
Stockton East Water District

RESOLUTION NO. 92-93-01A

SECRETARY'S CERTIFICATE

I, EDWARD M. STEFFANI, Secretary of the Board of Directors of the STOCKTON EAST WATER DISTRICT, Stockton, California, do hereby certify as follows:

The foregoing is a full, true and correct copy of a resolution duly adopted at a Regular (Regular/Special) Meeting of the Board of Directors of said District duly and regularly and legally held at the regular meeting place thereof on April 14, 1992, of which meeting all of the members of said Board of Directors had due notice and at which a majority thereof were present.

I have carefully compared the same with the original minutes of said meeting on file and of record in my office, and the foregoing is a full, true, and correct copy of the original resolution adopted at said meeting and entered in said minutes.

Said resolution has not been amended, modified, or rescinded since the date of its adoption, and the same is now in full force and effect.

Dated: 4/14/92

EDWARD M. STEFFANI
Secretary of the Board
STOCKTON EAST WATER DISTRICT

(SEAL)

2-RESCER

THIS COPY SHOWS CHANGES MADE

RESOLUTION NO. 92-93-01A

TO REVISE RESOLUTION NO. 83-84-17
WITH RESOLUTION NOS. 84-85-08
AND 90-91-13 INCORPORATED

RELATING TO BOARD AND DISTRICT
PROCEDURES AND ORGANIZATION

WHEREAS, it is necessary and desirable to reevaluate and revise certain Board procedures, certain administrative procedures, and the administrative organization for the operation and government of the District;

NOW, THEREFORE, BE IT RESOLVED AS FOLLOWS:

I

REPEAL OF CONFLICTING RESOLUTIONS

Resolution 79-80-19 and all other Resolutions, or portions thereof, in conflict with this Resolution are hereby repealed; and

II

1. **Regular Meetings.** The Board of Directors of the Stockton East Water District (hereinafter referred to as Board) shall hold regular meetings at its office at ~~2526 East Fremont~~ 6767 East Main Street, Stockton, California on the first and third Tuesday of each month. Said regular meetings shall be at ~~7:30 P.M.~~ noon during the portion of the year in which Standard time is in effect and at ~~8:00~~ 7:00 P.M. during the portion of the year in which Daylight Savings time is in effect.

2. **Adjournment of Meetings.** The Board may adjourn any regular, adjourned regular, special or adjourned special meeting to a time and place specified in the order of adjournment. Less

than a quorum may so adjourn from time to time. If all Directors are absent from any regular or adjourned regular meeting, the Secretary of the Board may declare the meeting adjourned to a stated time and place and shall cause a written notice of the adjournment to be given in the same manner as provided in Section 3 below for special meetings, unless such notice is waived as provided for special meetings. A copy of the order or notice of adjournment shall be conspicuously posted on or near the door of the place where the regular, adjourned regular, special or adjourned special meeting was held within 24 hours after the time of the adjournment. When a regular or adjourned regular meeting is adjourned as provided in this section, the resulting adjourned regular meeting is a regular meeting for all purposes. When an order of adjournment of any meeting fails to state the hour at which the adjourned meeting is to be held, it shall be held at the hour specified for regular meetings.

3. **Special Meetings.** Special meetings may be ordered by the President, or by a majority of the members of the Board, specifying in writing the business to be transacted. Any order calling for a special meeting shall be entered in the minutes of the Board. The Secretary shall give three days' notice of any special meeting to any member of the Board not joining in the order calling the special meeting by mailing written notice to the member at the member's address as disclosed by the District records. Such written notice may be waived by any Director by filing a written waiver of notice with the Secretary. Additionally, such written notice is waived as to any Director who is actually present at the meeting at the time it convenes.

On the day prior to any special meeting, or earlier if possible, but at least 24 hours before the time of such special meeting, the Secretary shall mail a notice of the special meeting to the Stockton Record. The Secretary shall also give notice to any other parties as may be required by law. Only the business specified in the notice may be considered at such special meeting.

4. **Oath of Office, Bonds and Effective Date of Taking Office.** Elected officials of the District shall take office effective upon the taking and subscribing to an official oath and executing and filing the bond required by law; the newly elected official shall take the Oath of Office and execute the required bond at ~~the/next/regular~~ a meeting ~~held~~ of the Board after the ~~date/of~~ general district election, but in no event later than the last day ~~in/November~~ of December.

5. **Organization Meetings.** At the ~~next///regularly scheduled~~ first meeting of the Board following the time of taking office of the directors elected in the general District election, but in no event later than the last day of ~~November~~ December, the Directors then holding office shall meet and organize as a Board.

5.1 **Annual Organization Meetings.** Notwithstanding any other provision of this Resolution, the Directors shall hold an organizational meeting at least annually.

6. **Officers.** At each of its organizational meetings, the Board shall elect a President and a Vice-President from among their number and shall appoint a Secretary, who need not be a member of the Board. Unless otherwise specifically provided by

the Board, the General Manager of the District shall automatically serve as Secretary. Each of the foregoing officers shall hold office at the pleasure of the Board. The duty of the Vice-President shall be to preside at any meeting, or portion thereof, at which the President is not present.

It is the intention of the Board that the offices of President and Vice-President shall be rotated annually among members of the Board. The President shall be chosen from those Directors serving the last two years of his or her term.

7. **Voting at Board Meetings.**

A. All voting members of the Board present shall vote on all questions coming before the Board either in the affirmative or in the negative, except that on any matter coming before the Board which may present a conflict of interest to one or more members, such member or members shall announce that they have a conflict of interest at the time of the commencement of discussion on the question and said member or members having a conflict shall thereafter refrain from discussion and voting on anything pertaining to such a matter; and further, except that any member of the Board who has not been present to participate in all, or a portion, of the discussion relating to a matter may abstain for that reason. If a member of the Board chooses not to vote on a question coming before the Board when there is no conflict of interest with respect to that member, by absenting himself or herself from the meeting room at the time of the vote, then that member shall not be entitled to discuss the matter either prior to or after the vote. Any member who chooses to discuss a matter shall vote on that matter. Any member who chooses to discuss a matter and then absents himself or herself to avoid the vote shall be considered, and his or her vote shall be recorded, as voting with the majority, or in the case of no majority, in the affirmative.

B. All votes may be by voice vote with both the "ayes" and "nays" being called. In the event that upon a voice vote being taken it appears to the President, or to any member of the Board, that the vote is not unanimous, a roll call shall then be taken.

8. **Agendas.** On or before the Friday preceding each regular or adjourned regular meeting, the Secretary shall mail an agenda for the forthcoming meeting. Said agenda shall be prepared by the Secretary and upon mailing the same, the Secretary shall accompany the agenda with as much explanatory material relating to the items on the agenda as is reasonably possible. An agenda for each special meeting shall be mailed as early in advance of the special meeting as is reasonably possible and shall be accompanied by such explanatory material as is necessary to advise the Board of the nature of the matter or matters coming before the Board at the special meeting.

9. **Records.** The Secretary of the Board shall keep, and make available to the public, accurate minutes of all proceedings of the Board. The proceedings of the Board shall be recorded by a tape recorder and the Secretary shall then, from the tape record, prepare minutes in summary form. Minutes shall not be read at Board meetings but shall be mailed in advance of meetings to the Board members, so that the same may be considered for approval without being read aloud at Board meetings. Tapes

of Board meetings shall be kept by the Secretary for two years and thereafter may be erased or otherwise destroyed.

10. **Order of Business.** The order of business at each meeting of the Board, unless suspended or varied, upon order of the President or by majority vote of the board, shall be as follows:

A. Roll Call;

B. Consent Calendar;

C. Public Comment (for non-agenda items);

D. Scheduled presentations and agenda items (to be considered in this order:

1. Staff report
2. Board discussion
3. Public comment on the specific item, with time limitations determined by the chairperson
4. Board action);

E. Committee Reports (eliminate the committee summary, but increase the detail of the committee minutes);

F. Report of the General Manager (continue to list the information items on the agenda, but bind this material separately from the other agenda material);

G. Report of the Counsel, if any;

H. Communications;

I. ~~Other Business~~ Agenda planning for next meeting;

J. ~~Agenda/planning/for/next/meeting~~ Director Reports;

K. Adjournment.

All items of business which, in the judgment of the Secretary require neither Board discussion nor a public hearing, shall be included in the Consent Calendar; provided that the agenda indicate on its face for each such items that such items is included in the Consent Calendar, and provided further that a written report and recommendation of the General Manager on each item so included has been mailed to the Board members with the agenda. The Consent Calendar may include the approval of minutes and expenses. Any Board member or the General Manager may request that any item on the Consent Calendar be removed therefrom for discussion and separate consideration.

11. **Committees.** There shall be standing committees of the Board as follows: ~~The/Water/Contract/Committee;/the/Finance Committee;/the/Agricultural/Operations/Committee;//the//Municipal Operations//Committee;//the/Water/Action/Committee;/the/Personnel Committee;/the/Administration/Committee;/and/the/Legislative//and Public////Relations////Committee~~ Administration, Agricultural Operations and Municipal Operations. ~~Special~~ Other committees may be established from time to time by the President as ~~is~~ required in the opinion of the President. The members of all committees shall be appointed by the President from among the members of the Board. All Directors shall serve on at least one committee, and should there be a minimum of five committees, Directors shall serve on at least two committees.

12. **Quorum and Tie Votes.** In conducting the business of the Board, the following shall apply with respect to quorum requirements:

A. A majority of the Board shall constitute a quorum for the transaction of business;

B. All board actions shall require a vote of the majority of the members present unless other wise provided by law or this Resolution; and

C. A tie vote shall be considered a negative vote, provided that in the event of a tie vote, while the matter shall be considered determined in the negative, the General Manager shall place the matter on the agenda for reconsideration at the next succeeding meeting.

13. **Conduct of Business.** The procedure for the conduct of business shall be as follows:

A. Each agenda item shall be taken up in order by the presiding officer except that all items designated as consent items shall be taken up under the Consent Calendar;

B. The presiding officer shall call upon the General Manager or such other person or persons as may be appropriate to the present the matter to the Board;

C. The matter shall then be discussed by the Board members and such other Staff persons or consultants as may be called upon by the President;

D. As to all matters not included within the Consent Calendar, and including those matters which have been removed from the Consent Calendar as provided herein, if a motion is made in connection with a matter, prior to vote on the motion, the President shall call for comments on the proposed motion from members of the public. Public comments shall be limited to the motion then before the Board. The President shall have the authority to limit the duration of or refuse to permit public comment if such public comment is repetitive, disorderly, or otherwise not in furtherance of a reasonably expeditious review of the merits of the pending motion;

E. It shall be understood that any member of the public desiring further discussion on an item after a vote is taken, or on an item on which no motion is made, shall take the matter up with the Board member representing the division of the District in which said member of the pubic resides, or owns or operates property, or with any other Board member after adjournment of the meeting;

F. At the conclusion of public comment on any pending motion, the President shall announce that the time for public discussion of the matter is closed;

G. The foregoing procedure shall not apply to the conduct of "public hearings", and in the case of "public hearings", the requirements of statutes and the duly adopted rules of the District shall prevail;

H. Prior to the commencement of any "public hearing", the President shall request that an attorney for the District, and in the attorney's absence the General Manager, outline the procedure to be observed in the conduct of the "public hearing";

I. The foregoing procedure shall not apply to the Consent Calendar which shall be governed by this subparagraph.

the Consent Calendar shall be approved without discussion by a single vote of those Board members present, except as to items removed from the Consent Calendar as provided herein. In the event of removal, any such items shall be considered in accordance with the procedures outlined in the foregoing subparagraph of this section at the appropriate place on the agenda; and

J. The foregoing procedure shall not apply to the Public Comment Section of the Agenda, which shall be governed by this subparagraph. The Public Comment Section of the Agenda shall be reserved for any member of the public wishing to comment on any matter pertaining to District business other than matters which appear on the same agenda. The President shall have the authority to limit the duration of or refuse to permit public comment if it is repetitive, disorderly, or otherwise not in furtherance of a reasonably expeditious review of District business.

14. **Roberts Rules of Order.** Roberts Rules of Order Revised are hereby adopted by the Board in all cases not otherwise provided for in this Resolution and not otherwise provided for by applicable law.

III

DUTIES OF THE GENERAL MANAGER

1. **Responsibility.** The General Manager shall be directly responsible to the Board and subject to the general supervision of the Board. The General Manager shall carry out and execute all policies and directives of the Board. As to matters concerning District policies (as opposed to

non-substantive matters of detail), it is understood that the General Manager is subject to the direction of the Board, acting as a Board, and not to the direction of an individual Board member or group of Board members not acting as a committee.

2. **Duties**. The General Manager shall, among other things, do the following:

A. Have charge of all activities and functions of the District and all of the office and field personnel of the District;

B. In her or his discretion, appoint and discharge all employees of the District and from time to time, as she or he deems proper, make salary and wage change recommendations to the Board;

C. Receive all communications addressed to the District;

D. Unless another person has been appointed as Secretary, fulfill the duties of Secretary of the District as prescribed by law and in that capacity, have authority to appoint Deputy Secretaries;

E. When he or she deems it necessary, request the President to call special meetings of the Board;

F. Enforce all rules of the District;

G. Prepare and present proposed budgets and recommend replenishment and assessment rates and surface water charges to the Board, in accordance with the requirements of statutes;

H. From time to time, recommend to the Board proposed capital improvements necessary to carry out the purposes and programs of the District;

I. Advise the Board as to when engineering and legal services are required by the District;

J. On behalf of the District, without further action of the Board, be authorized to file protests to any application filed with the State Water Resources Control Board for appropriation of water from the Calaveras River or any tributary or distributary thereof. Any such protest so filed shall thereafter be subject to the control and direction of the Board; and

K. Be authorized to call such committee meetings as from time to time may be necessary, to carry on the business of the District.

IV

POLITICAL ACTIVITY

It is hereby declared by this Board that the General Manager of this District, the General Counsel for the District, and all of their subordinate employees are employed for the purpose of administering and executing the policies, rules, programs, and directives established by the Board as the policy making agency of the District. They shall not be subjected to personal or political pressure nor shall they participate in any of the political affairs of the District, including but not limited to any election campaign for a District office.

V

FLEXIBILITY

The foregoing policies, procedures, and requirements are intended to be applied flexibly to meet the needs of the District and it is intended by the Board that they shall be revised from time to time as is necessary and appropriate to further meet the needs of the District.

PASSED AND ADOPTED by the Board of Directors of the Stockton East Water District on the 14th Day of April, 1992, by the following vote:

AYES: Directors Alonzo, Clayton, Dondero, Laven, Tone and MacNear

NOES: None

ABSTENTIONS: None

ABSSENT: Director George

JACK LAVEN, President
Board of Directors
Stockton East Water District

ATTEST:

EDWARD M. STEFFANI, Secretary
Board of Directors
Stockton East Water District

Agenda 9/15/92
D - 2

RESOLUTION OF THE BOARD OF DIRECTORS OF STOCKTON EAST WATER DISTRICT

RESOLUTION NO. 92-93-05

SETTING A BASE MONTHLY PAYMENT
FOR PERIOD APRIL 1, 1993 TO MARCH 31, 1994,
PURSUANT TO THE SECOND AMENDED CONTRACT AMONG THIS DISTRICT
AND THE CALIFORNIA WATER SERVICE CO., THE CITY OF STOCKTON,
THE LINCOLN VILLAGE MAINTENANCE DISTRICT,
AND THE COLONIAL HEIGHTS MAINTENANCE DISTRICT,
PROVIDING FOR THE SALE OF TREATED WATER

WHEREAS, on September 25, 1987, the Stockton East Water District entered into a Second Amended Contract among the California Water Service Company, the City of Stockton, the Lincoln Village Maintenance District, and the Colonial Heights Maintenance District, providing for the sale of treated water; and

WHEREAS, the Board of Directors of the Stockton-East Water District has determined that the revised budgeted costs for the Contract period April 1, 1993 to March 31, 1994 should be as follows:

6A(1)	Debt Service	$3,698,448
	Debt Service Surcharge	341,361
6A(2)	Raw Water	105,871
6A(3)	Operation & Maintenance	1,837,265
6A(4)	Administration	161,048
6A(5)	Insurance	50,000
6A(7)	Reserve Fund Payment Pursuant to Paragraphs 8 & 9 of said Contract	35,000
6A(8)	Payment into the Water Treatment Facilities Reserve Fund	100,000
		$6,328,993; and

WHEREAS, paragraph 6D(3) of said Second Amended Contract states that Stockton East shall annually levy a municipal groundwater assessment, pursuant to its enabling legislation such that the cost of groundwater use is equivalent to the cost of surface water use; and

WHEREAS, the proposed 1993-94 budget estimates the amount of $5,505,881 to be paid from municipal groundwater assessments and base monthly payments as follows:

Municipal Groundwater Assessments (35,000 AF X $76.15)	$2,665,250
Base Monthly Payments	2,840,361
Total	$5,505,881

NOW, THEREFORE, BE IT RESOLVED, that pursuant to said Second Amended Contract, this Board hereby establishes the Base Monthly Payment to be paid by the Contractors pursuant to said Contract for the period April 1, 1993 to March 31, 1994, at $2,840,631/12 $236,719.25, which is the same amount as for the 1992-93 fiscal year.

4-BMPRES

PASSED AND ADOPTED BY THE BOARD OF DIRECTORS OF THE STOCKTON-EAST WATER DISTRICT ON THE 15TH DAY OF SEPTEMBER, 1993, BY THE FOLLOWING VOTE:

AYES: Directors Dondero, Tone, Laven, Clayton, MacNear, Alonzo

NOES: None

ABSENT: Director George

ABSTENTIONS: None

Jack Laven

JACK LAVEN, President
Board of Directors
Stockton-East Water District

ATTEST:

EDWARD M. STEFFANI, Secretary
Board of Directors
Stockton-East Water District

RESOLUTION NO. 92-93-05

SECRETARY'S CERTIFICATE

I, EDWARD M. STEFFANI, Secretary of the Board of Directors of the STOCKTON EAST WATER DISTRICT, Stockton, California, do hereby certify as follows:

The foregoing is a full, true and correct copy of a resolution duly adopted at a Regular/Special Meeting of the Board of Directors of said District duly and regularly and legally held at the regular meeting place thereof on ______________________________, of which meeting all of the members of said Board of Directors had due notice and at which a majority thereof were present.

I have carefully compared the same with the original minutes of said meeting on file and of record in my office, and the foregoing is a full, true, and correct copy of the original resolution adopted at said meeting and entered in said minutes.

Said resolution has not been amended, modified, or rescinded since the date of its adoption, and the same is now in full force and effect.

Dated: 9/16/92

EDWARD M. STEFFANI
Secretary of the Board
STOCKTON EAST WATER DISTRICT

(SEAL)

RESCER

Proration of Base Monthly Payment for 1993-94 Fiscal Year (4/1/93 - 3/31/94)

Amounts required - $2,840,631/12 = $236,719.25 monthly

	1990-91 Water Use (AF)			Percentage	Amount	Monthly 15 Year Adjustment as per Second Amended Contract	1992-93 Base Monthly Payment
	Surface	Well	Total				
City of Stockton	4,624	14,283	18,907	35.6	$ 84,272.05	$ 35,451.38	$119,723.43
Lincoln Village	351	1,054	1,405	2.6	6,154.70	2,343.31	8,498.01
Colonial Heights	88	418	506	1.0	2,367.19	739.99	3,107.18
Cal Water	9,423	22,876	32,299	60.8	143,925.31	<38,534.68>	105,390.63
Totals	14,486	38,631	53,117	100%	$236,719.25	$ 0	$236,719.25

4-BMPSD6

STOCKTON EAST WATER DISTRICT
Treatment Plant Section
Projected Expenses
Fiscal Year 1993-94

	1992-93 Revised Budget 20,000 AF	1993-94 Proposed Budget 20,000 AF
Contract Paragraph		
Debt Service		
1975 Revenue Bonds		
Principal Account	$ 700,000	$ 750,000
Interest Account	1,005,937	955,188
Bondholders Reserve (20%)	340,612	341,361
1990 Certificates of Participation		
Principal	295,000	295,000
Interest	1,698,260	1,698,260
Less CSJWCD Contribution (20,000 AF)	0	0
Debt Service Totals	4,039,809	4,039,809
Raw Water		
New Hogan (20,000 AF)		105,871
New Melones (0 AF)	0	0
	105,871	105,871
Operation & Maintenance Account		
Salaries:		
Muni Operation Supt.	55,650	55,650
Treated Water Supervisor	44,700	44,700
Treatment Plant Operator III	160,000	160,000
Maintenance Foreman	48,350	48,350
Maintenance Mechanic II (2)	72,500	72,500
Water Quality Supervisor	50,300	50,300
Laboratory Technician II	36,600	36,600
Maintenance Mechanic I	31,300	31,300
Landscape Person	30,300	30,300
Temporary Labor	0	0
Systems Foreman - 10%	4,000	4,000
Agri. Operator-10%	8,000	8,000
Contingencies	42,000	42,000
	583,700	583,700
Payroll Taxes	2,000	2,000
Employee Insurance	70,000	70,000
Retirement	50,000	50,000
Worker's Compensation	24,000	24,000
Deferred Compensation	14,000	14,000
	160,000	160,000

	1992-93 Revised Budget 20,000 AF	1993-94 Proposed Budget 20,000 AF
Operations & Maintenance:		
Chemicals	225,000	225,000
Electricity	250,000	250,000
Diesel & Oil	150,000	150,000
Natural Gas	10,000	10,000
Other Utilities	15,000	15,000
Laboratory Supplies	12,000	12,000
Analytical Services	30,000	30,000
Small Tools & Equipment	5,000	5,000
Equipment Rental	5,000	5,000
Protective Clothing & Laundry	3,000	3,000
Vehicle Operation	5,000	5,000
Vehicle Maintenance & Repair	5,000	5,000
Maintenance & Repair:		
Treatment Plant	50,000	50,000
Grounds	5,000	5,000
Headworks	5,000	5,000
Existing R-O-W Maint.	3,000	3,000
New Tunnel, Canals, Pipeline Maintenance	33,000	33,000
Goodwin Dam Operations & Maintenance Costs	75,000	75,000
Goodwin Dam Property Self Ins.	75,000	75,000
Legal	3,000	3,000
Auditing	6,000	6,000
Fiscal Agent	12,000	12,000
Travel & Education	4,000	4,000
Books & Periodicals	1,000	1,000
Office Supplies	1,000	1,000
Advertising/Public Relations	2,000	2,000
Safety Signs & Equipment	1,000	1,000
Dry Year Assessment Reserve	3,000	3,000
Interest Expense on M & I Use of Water	25,000	25,000
"Sally-Save-Water" Program	34,565	34,565
Contingencies	40,000	40,000
Operation & Maintenance Totals	1,093,565	1,093,565
6A(4) Administration	161,048	161,048
6A(5) Insurance	50,000	50,000
6A(7) Reserve Fund Payments Pursuant to Paragraphs 8 & 9 of said Contract	35,000	35,000
6A(8) Payment into the Water Treatment Facilities Reserve Fund	100,000	100,000
Total	$6,328,993	$6,328,993

STOCKTON EAST WATER DISTRICT
Treatment Plant Section
Projected Revenue
Fiscal Year 1993-94

	1992-93 Revised Budget 20,000 AF	1993-94 Proposed Budget 20,000 AF
Revenue required	$6,328,993	$6,328,993
Less 20% Bondholders Surcharge	(340,612)	(340,612)
	$5,988,381	$5,988,381
Sources and amounts of revenue:		
Interest Income	400,000	400,000
Income from land lease and misc.	7,500	7,500
Surplus from Bond Reserve Fund	75,000	75,000
Revenue from municipal groundwater assessments	2,665,250**	2,665,250**
Base Monthly Payments	2,840,631	2,840,631
	$5,988,381	$5,988,381

Rate Equalization Summary

Surface Water	20,000 AF	20,000 AF
Ground Water	35,000	35,000
	55,000 AF	55,000 AF

Calculation of Rate Equalization Groundwater Assessment

20,000 AF X $299.42	=	$5,988,381	$5,988,381
35,000 AF X 90.00	=	3,150,000	3,150,000
55,000 AF		$9,138,381	$9,138,381

$9,138,381/55,000-$90.00=76.15 X 35,000=$2,665,250**

4-BUDG94

Agenda 3/19/93
O-3

RESOLUTION OF THE BOARD OF DIRECTORS
OF STOCKTON EAST WATER DISTRICT

RESOLUTION NO. 92-93- 20

SETTING A REVISED BASE MONTHLY PAYMENT
FOR PERIOD APRIL 1, 1993 TO MARCH 31, 1994,
PURSUANT TO THE SECOND AMENDED CONTRACT AMONG THIS DISTRICT
AND THE CALIFORNIA WATER SERVICE CO., THE CITY OF STOCKTON,
THE LINCOLN VILLAGE MAINTENANCE DISTRICT,
AND THE COLONIAL HEIGHTS MAINTENANCE DISTRICT,
PROVIDING FOR THE SALE OF TREATED WATER

WHEREAS, on September 25, 1987, the Stockton East Water District entered into a Second Amended Contract among the California Water Service Company, the City of Stockton, the Lincoln Village Maintenance District, and the Colonial Heights Maintenance District, providing for the sale of treated water; and

WHEREAS, the Board of Directors of the Stockton-East Water District has determined that the revised budgeted costs for the Contract period April 1, 1993 to March 31, 1994 should be as follows:

6A(1)	Debt Service	$3,611,022
	Debt Service Surcharge	310,364
6A(2)	Raw Water	102,301
6A(3)	Operation & Maintenance	2,527,533
6A(4)	Administration	174,115
6A(5)	Insurance	50,000
6A(7)	Reserve Fund Payment Pursuant to Paragraphs 8 & 9 of said Contract	35,000
6A(8)	Payment into the Water Treatment Facilities Reserve Fund	100,000
		$6,910,335; and

WHEREAS, paragraph 6D(3) of said Second Amended Contract states that Stockton East shall annually levy a municipal groundwater assessment, pursuant to its enabling legislation such that the cost of groundwater use is equivalent to the cost of surface water use; and

WHEREAS, the revised 1993-94 budget estimates the amount of $6,149,471 to be paid from municipal groundwater assessments and base monthly payments as follows:

Municipal Groundwater Assessments (15,000 AF X $54.54)	$ 818,100
Base Monthly Payments	5,331,371
Total	$6,149,471

NOW, THEREFORE, BE IT RESOLVED, that pursuant to said Second Amended Contract, this Board hereby establishes the Revised Base Monthly Payment to be paid by the Contractors pursuant to said Contract for the period April 1, 1993 to March 31, 1994, at $5,331,371/12 = $444,280.92.

4-BMPRER

SECRETARY'S CERTIFICATE

I, EDWARD M. STEFFANI, Secretary of the Board of Directors of the STOCKTON EAST WATER DISTRICT, Stockton, California, do hereby certify as follows:

The foregoing is a full, true and correct copy of a resolution duly adopted at a Regular (Regular/Special) Meeting of the Board of Directors of said District duly and regularly and legally held at the regular meeting place thereof on March 16, 1993, of which meeting all of the members of said Board of Directors had due notice and at which a majority thereof were present.

I have carefully compared the same with the original minutes of said meeting on file and of record in my office, and the foregoing is a full, true, and correct copy of the original resolution adopted at said meeting and entered in said minutes.

Said resolution has not been amended, modified, or rescinded since the date of its adoption, and the same is now in full force and effect.

Dated: March 16, 1993

EDWARD M. STEFFANI
Secretary of the Board
STOCKTON EAST WATER DISTRICT

(SEAL)

ATTACHMENT C

Measurement Device Documentation

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ATTACHMENT C.1.

Example of Factory Certification for Propeller Meters

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Propeller Meter

CERTIFIED TEST REPORT

CUSTOMER: KIRKPATRICK ASSOCIATES
MODEL NO: M0312
METER SERIAL NO: 12-10330

CONFIGURATION

METER INSIDE DIAMETER: 11.875
METER OUTSIDE DIAMETER: 12.25
TEST DATE: 11/21/2012
TEST FACILITY: Volumetric
IDEAL TEST CONSTANT: 1542

CALIBRATION DATA

	Tested TC	GPM	Accuracy
1	1546	2554	100.3

3/12/11

CERTIFIED BY: Paul Hobbs DATE: 11/26/2012

This calibration was performed on a gravimetric or volumetric test facility, traceable to the National Institute of Standards and Technology, USA. The estimated flow measurement uncertainty of the calibration facilities are Gravimetric +/- 0.15% Volumetric +/- 0.5%

McCROMETER
3255 WEST STETSON AVENUE
HEMET, CA 92545 USA
PHONE (951) 652-6811 / FAX (951) 652-3078
WEB SITE: http://www.mccrometer.com E-MAIL: info@mccrometer.com

ATTACHMENT C.2.

Sample Meter Calibration Documents

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C-18A

Propeller Meter

CERTIFIED TEST REPORT

CUSTOMER: KIRKPATRICK ASSOCIATES

MODEL NO: M0308

METER SERIAL NO: 15-07325

CONFIGURATION

METER INSIDE DIAMETER: 8.125

METER OUTSIDE DIAMETER: 8.625

TEST DATE: 4/30/2015

TEST FACILITY: Volumetric

IDEAL TEST CONSTANT: 3746

CALIBRATION DATA

	Tested TC	GPM	Accuracy
1	3754	1544	100.2

CERTIFIED BY: Paul Hobbs DATE: 5/4/2015

This calibration was performed on a gravimetric or volumetric test facility, traceable to the National Institute of Standards and Technology, USA. The estimated flow measurement uncertainty of the calibration facilities are:
Gravimetric +/- 0.15% Volumetric +/- 0.5%

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15-07325

Propeller Meter

C-20 A

CERTIFIED TEST REPORT

CUSTOMER: KIRKPATRICK ASSOCIATES

MODEL NO: M0310

METER SERIAL NO: 15-08075

CONFIGURATION

METER INSIDE DIAMETER: 10.4

METER OUTSIDE DIAMETER: 10.75

TEST DATE: 5/14/2015

TEST FACILITY: Volumetric

IDEAL TEST CONSTANT: 2442

CALIBRATION DATA

	Tested TC	GPM	Accuracy
1	2460	1785	100.7

CERTIFIED BY: Paul Hobbs DATE: 5/19/2015

This calibration was performed on a gravimetric or volumetric test facility, traceable to the National Institute of Standards and Technology, USA. The estimated flow measurement uncertainty of the calibration facilities are:
Gravimetric +/- 0.15% Volumetric +/- 0.5%

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15-08075

CR-1 *

Propeller Meter

CERTIFIED TEST REPORT

CUSTOMER: STOCKTON EAST WATER

MODEL NO: M0310

METER SERIAL NO: 17-10532

CONFIGURATION

METER INSIDE DIAMETER: 10.26

METER OUTSIDE DIAMETER: 10.76

TEST DATE: 8/8/2017

TEST FACILITY: Volumetric

IDEAL TEST CONSTANT: 2344

CALIBRATION DATA

	Tested TC	GPM	Accuracy
1	2360	1813	100.7

CERTIFIED BY: Robert Galusha ID#: 176785 DATE: 8/9/2017

This calibration was performed on a gravimetric or volumetric test facility, traceable to the National Institute of Standards and Technology, USA. The estimated flow measurement uncertainty of the calibration facilities are:
Gravimetric +/- 0.15% Volumetric +/- 0.5%

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17-10532

CR-11A

McCROMETER INC.

CERTIFIED TEST REPORT
SERIAL NUMBER: 00-02703-8

PRINT DATE: 03-30-2000

MODEL:	M0308
CUSTOMER NAME:	SAME
SOLD TO:	STOCKTON EAST WTR. DIST.
INVOICE:	
METER SIZE:	8"
METER INSIDE DIAMETER:	8.375"
METER OUTSIDE DIAMETER:	8.625"
TEST FACILITY:	Volumetric
TEST TECHNICIAN:	PL
TEST DATE:	3/30/00
TEST CONFIGURATION:	Mech

:

#	REV./GAL	FEET/SEC	GPM	% ACCURACY
1	0.36965	9.559	1500.0	100.39

CERTIFIED BY: ______ DATE: 3-30-00

This calibration was performed on a gravimetric or volumetric test facility, traceable to the National Institute of Standards and Technology, USA.
The estimated flow measurement uncertainty of the calibration facilities are:
Gravimetric +/-0.15% Volumetric +/-0.5%

CR-15 *

Propeller Meter

CERTIFIED TEST REPORT

CUSTOMER: STOCKTON EAST WATER
MODEL NO: M0310
METER SERIAL NO: 17-10531

CONFIGURATION

METER INSIDE DIAMETER: 10.26
METER OUTSIDE DIAMETER: 10.76
TEST DATE: 8/8/2017
TEST FACILITY: Volumetric
IDEAL TEST CONSTANT: 2344

CALIBRATION DATA

	Tested TC	GPM	Accuracy
1	2354	1813	100.4

CERTIFIED BY: Robert Galusha ID#: 176785 DATE: 8/9/2017

This calibration was performed on a gravimetric or volumetric test facility, traceable to the National Institute of Standards and Technology, USA. The estimated flow measurement uncertainty of the calibration facilities are:
Gravimetric +/- 0.15% Volumetric +/- 0.5%

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WEB SITE: http://www.mccrometer.com E-MAIL: customerservice@mccrometer.com

17-10531

ATTN: Mike Burns CR-86
from Chris Donis

Propeller Meter

CERTIFIED TEST REPORT

CUSTOMER: KIRKPATRICK & ASSOC.

MODEL NO: M0314

METER SERIAL NO: 99-02450

CONFIGURATION

METER INSIDE DIAMETER: 13.625

METER OUTSIDE DIAMETER: 14

TEST DATE: 6/25/2018

TEST FACILITY: Volumetric

IDEAL TEST CONSTANT: 1363

CALIBRATION DATA

	Tested TC	GPM	Accuracy
1	1374	3002	100.8

CERTIFIED BY: Robert Galusha ID#: 176785 DATE: 6/28/2018

This calibration was performed on a gravimetric or volumetric test facility, traceable to the National Institute of Standards and Technology, USA. The estimated flow measurement uncertainty of the calibration facilities are:
Gravimetric +/- 0.15% Volumetric +/- 0.5%

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99-02450

M-9 June 19, 2018

Calibration Report

McCROMETER

Serial Number: AG18-0471 | Test Number: AG18-0471

Converter Serial Number: McMag3000

Model: G310-6 | Calibration Date: 6/4/2018

Report Date: 6/4/2018

Sold To: STOCKTON EAST WATER

Description: MC MAG 3000,10"

Notes:

Customer I.D.: 9.625 in | KA: 1.8132

244 mm | KZ: 1438

Any difference between the customer specified application dimension and test pipe dimension is accounted for by the flow converter.
The reported velocities shown on this report indicate actual meter performance and are independent of the inside diameter used in the calibration.

Calibration Report

	Velocity (m/s) min	max	PLBF Accuracy (as % of reading)
1	0.34	0.64	100.26
2	0.64	0.94	100.17
3	0.94	1.24	100.07
4	1.24	1.54	99.97
5	1.54	1.84	99.86
6	1.84	2.15	99.75
7	2.15	2.45	99.64
8	2.45	2.75	99.53
9	2.75	3.05	99.42
10	3.05	3.35	99.31

KL Values

KL00:	033249034
KL01:	182086188
KL02:	338000338
KL03:	000000000
KL04:	000000000
KL05:	000000000
KL06:	000000000
KL07:	000000000
KL08:	000000000
KL09:	000000000
KL10:	000000000
KL11:	000000000

Approved By: [signature]

Vince H. Morton
ID#: 117110

Test Fluid: Water

Instrumentation Traceability Kit Number: V0143

Standard Used: Secondary

Test Data

	Water Temperature (°C)	Test Time (seconds)	Air Temperature (°C)	Barometric Pressure (kPa)	Relative Humidity (%)	Viscosity (cP)	Average Rate of Flow (m3/sec)	Test Pipe Inside Diameter (in)
1	27.3	30.321	26.0	99.10	58	1	0.17362	10.120
2	27.3	30.351	26.0	99.10	58	1	0.13381	10.120
3	27.3	30.413	26.0	99.10	58	1	0.09637	10.120
4	27.3	30.299	26.0	99.10	58	1	0.05808	10.120
5	27.3	30.274	26.0	99.10	58	1	0.01763	10.120

This calibration was performed using standards traceable to the National Institute of Standards and Technology (NIST), USA. Certificates of traceability for the individual test measurements listed in this report are documented and serialized by the Test Stand Instrumentation Traceability Kit Number identified above and are available upon request. Combined Uncertainty to a 95% confidence level is developed for each test point according to the methods described in the ANSI/NCSL Z540-2-1997. Methods and procedures used in this calibration are in accordance with the McCrometer Flow Laboratory Technical Manual, revision 2.0.

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Serial Number: AG18-0471

M-13 11-09-18

Calibration Report

McCROMETER

Serial Number: AG18-0466 Test Number: AG18-0466

Converter Serial Number: McMag3000

Model: G308-4 Calibration Date: 6/7/2018

Report Date: 6/7/2018

Sold To: STOCKTON EAST WATER

Description: MC MAG 3000,8"

Notes:

Customer I.D.: 7.656 in KA: 1.8033

194 mm KZ: 2824

Any difference between the customer specified application dimension and test pipe dimension is accounted for by the flow converter.
The reported velocities shown on this report indicate actual meter performance and are independent of the inside diameter used in the calibration.

Calibration Report

	Velocity (m/s) min	Velocity (m/s) max	PLBF Accuracy (as % of reading)
1	0.50	0.95	98.51
2	0.95	1.41	98.77
3	1.41	1.86	99.01
4	1.86	2.32	99.23
5	2.32	2.77	99.46
6	2.77	3.22	99.68
7	3.22	3.68	99.90
8	3.68	4.13	100.12
9	4.13	4.58	100.34
10	4.58	5.04	100.56

KL Values

KL00:	049001050
KL01:	271078276
KL02:	502000502
KL03:	000000000
KL04:	000000000
KL05:	000000000
KL06:	000000000
KL07:	000000000
KL08:	000000000
KL09:	000000000
KL10:	000000000
KL11:	000000000

Approved By: [signature]

Vince H. Morton
ID#: 117110

Test Fluid: Water

Instrumentation Traceability Kit Number: V0143

Standard Used: Secondary

Test Data

	Water Temperature (°C)	Test Time (seconds)	Air Temperature (°C)	Barometric Pressure (kPa)	Relative Humidity (%)	Viscosity (cP)	Average Rate of Flow (m3/sec)	Test Pipe Inside Diameter (in)
1	24.7	79.595	25.7	95.49	40	1	0.16549	8.070
2	24.7	30.263	25.7	95.49	40	1	0.12621	8.070
3	24.7	30.418	25.7	95.49	40	1	0.09111	8.070
4	24.7	30.394	25.7	95.49	40	1	0.05482	8.070
5	24.6	30.351	25.7	95.49	40	1	0.01666	8.070

This calibration was performed using standards traceable to the National Institute of Standards and Technology (NIST), USA. Certificates of traceability for the individual test measurements listed in this report are documented and serialized by the Test Stand Instrumentation Traceability Kit Number identified above and are available upon request. Combined Uncertainty to a 95% confidence level is developed for each test point according to the methods described in the ANSI/NCSL Z540-2-1997. Methods and procedures used in this calibration are in accordance with the McCrometer Flow Laboratory Technical Manual, revision 2.0.

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Serial Number: AG18-0466

M-14

Calibration Report

McCROMETER

Serial Number: AG18-0464 Test Number: AG18-0464

Converter Serial Number: McMag3000

Model: G306-2 Calibration Date: 5/30/2018

Report Date: 5/30/2018

Sold To: STOCKTON EAST WATER

Description: MC MAG 3000: 6"

Notes:

Customer I.D.: 6.375 in KA: 1.6502

162 mm KZ: 2635

Any difference between the customer specified application dimension and test pipe dimension is accounted for by the flow converter.
The reported velocities shown on this report indicate actual meter performance and are independent of the inside diameter used in the calibration.

Calibration Report

	Velocity (m/s) min	max	PLBF Accuracy (as % of reading)
1	0.44	0.81	100.31
2	0.81	1.18	99.43
3	1.18	1.55	99.18
4	1.55	1.92	99.14
5	1.92	2.29	99.19
6	2.29	2.66	99.30
7	2.66	3.03	99.44
8	3.03	3.40	99.60
9	3.40	3.77	99.78
10	3.77	4.15	99.96

KL Values

KL00:	043105044
KL01:	226940229
KL02:	415000415
KL03:	000000000
KL04:	000000000
KL05:	000000000
KL06:	000000000
KL07:	000000000
KL08:	000000000
KL09:	000000000
KL10:	000000000
KL11:	000000000

Approved By: [signature]

Vince H. Morton
ID#: 117110

Test Fluid: Water

Instrumentation Traceability Kit Number: V0143

Standard Used: Secondary

Test Data

	Water Temperature (°C)	Test Time (seconds)	Air Temperature (°C)	Barometric Pressure (kPa)	Relative Humidity (%)	Viscosity (cP)	Average Rate of Flow (m3/sec)	Test Pipe Inside Diameter (in)
1	22.8	30.426	26.0	99.10	58	1	0.07699	6.060
2	22.8	30.424	26.0	99.10	58	1	0.06014	6.060
3	22.8	30.427	26.0	99.10	58	1	0.04270	6.060
4	22.8	30.458	26.0	99.10	58	1	0.02560	6.060
5	22.8	30.373	26.0	99.10	58	1	0.00821	6.060

This calibration was performed using standards traceable to the National Institute of Standards and Technology (NIST), USA. Certificates of traceability for the individual test measurements listed in this report are documented and serialized by the Test Stand Instrumentation Traceability Kit Number identified above and are available upon request. Combined Uncertainty to a 95% confidence level is developed for each test point according to the methods described in the ANSI/NCSL Z540-2-1997. Methods and procedures used in this calibration are in accordance with the McCrometer Flow Laboratory Technical Manual, revision 2.0.

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Mag 3000

M-15 11-08-18

Calibration Report

McCROMETER

Serial Number: AG18-0472 Test Number: AG18-0472

Converter Serial Number: McMag3000

Model: G310-6 Calibration Date: 6/4/2018

Report Date: 6/4/2018

Sold To: STOCKTON EAST WATER

Description: MC MAG 3000,10"

Notes:

Customer I.D.: 9.641 in KA: 1.8383

245 mm KZ: 1470

Any difference between the customer specified application dimension and test pipe dimension is accounted for by the flow converter.
The reported velocities shown on this report indicate actual meter performance and are independent of the inside diameter used in the calibration.

Calibration Report

	Velocity (m/s) min	Velocity (m/s) max	PLBF Accuracy (as % of reading)
1	0.33	0.63	100.51
2	0.63	0.94	100.71
3	0.94	1.24	100.83
4	1.24	1.54	100.93
5	1.54	1.84	101.01
6	1.84	2.14	101.09
7	2.14	2.44	101.17
8	2.44	2.74	101.24
9	2.74	3.05	101.32
10	3.05	3.35	101.39

KL Values

KL00:	032852033
KL01:	183439186
KL02:	334000334
KL03:	000000000
KL04:	000000000
KL05:	000000000
KL06:	000000000
KL07:	000000000
KL08:	000000000
KL09:	000000000
KL10:	000000000
KL11:	000000000

Approved By: [signature]

Vince H. Morton
ID#: 117110

Test Fluid: Water

Instrumentation Traceability Kit Number: V0143

Standard Used: Secondary

Test Data

	Water Temperature (°C)	Test Time (seconds)	Air Temperature (°C)	Barometric Pressure (kPa)	Relative Humidity (%)	Viscosity (cP)	Average Rate of Flow (m3/sec)	Test Pipe Inside Diameter (in)
1	27.0	30.455	26.0	99.10	58	1	0.17356	10.120
2	27.0	30.410	26.0	99.10	58	1	0.13354	10.120
3	27.0	30.267	26.0	99.10	58	1	0.09606	10.120
4	27.0	30.327	26.0	99.10	58	1	0.05773	10.120
5	27.0	30.411	26.0	99.10	58	1	0.01735	10.120

This calibration was performed using standards traceable to the National Institute of Standards and Technology (NIST), USA. Certificates of traceability for the individual test measurements listed in this report are documented and serialized by the Test Stand Instrumentation Traceability Kit Number identified above and are available upon request. Combined Uncertainty to a 95% confidence level is developed for each test point according to the methods described in the ANSI/NCSL Z540-2-1997. Methods and procedures used in this calibration are in accordance with the McCrometer Flow Laboratory Technical Manual, revision 2.0.

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M-18 11-08-18

Calibration Report

McCROMETER

Serial Number: AG18-0467 Test Number: AG18-0467

Converter Serial Number: McMag3000

Model: G308-4 Calibration Date: 6/7/2018

Report Date: 6/7/2018

Sold To: STOCKTON EAST WATER

Description: MC MAG 3000,8"

Notes:

Customer I.D.: 8.578 in KA: 1.9162

218 mm KZ: 1589

Any difference between the customer specified application dimension and test pipe dimension is accounted for by the flow converter.
The reported velocities shown on this report indicate actual meter performance and are independent of the inside diameter used in the calibration.

Calibration Report

	Velocity (m/s) min	Velocity (m/s) max	PLBF Accuracy (as % of reading)
1	0.41	0.77	99.25
2	0.77	1.12	99.59
3	1.12	1.48	99.67
4	1.48	1.84	99.66
5	1.84	2.20	99.61
6	2.20	2.56	99.53
7	2.56	2.92	99.44
8	2.92	3.28	99.35
9	3.28	3.63	99.25
10	3.63	3.99	99.14

KL Values

KL00:	041522042
KL01:	217253221
KL02:	397000397
KL03:	000000000
KL04:	000000000
KL05:	000000000
KL06:	000000000
KL07:	000000000
KL08:	000000000
KL09:	000000000
KL10:	000000000
KL11:	000000000

Approved By: [signature]
Vince H. Morton
ID#: 117110

Test Fluid: Water

Instrumentation Traceability Kit Number: V0143

Standard Used: Secondary

Test Data

	Water Temperature (°C)	Test Time (seconds)	Air Temperature (°C)	Barometric Pressure (kPa)	Relative Humidity (%)	Viscosity (cP)	Average Rate of Flow (m3/sec)	Test Pipe Inside Diameter (in)
1	24.7	35.111	25.7	95.49	40	1	0.13112	8.070
2	24.7	32.151	25.7	95.49	40	1	0.10315	8.070
3	24.8	30.247	25.7	95.49	40	1	0.07299	8.070
4	24.7	32.545	25.7	95.49	40	1	0.04305	8.070
5	24.7	30.250	25.7	95.49	40	1	0.01358	8.070

This calibration was performed using standards traceable to the National Institute of Standards and Technology (NIST), USA. Certificates of traceability for the individual test measurements listed in this report are documented and serialized by the Test Stand Instrumentation Traceability Kit Number identified above and are available upon request. Combined Uncertainty to a 95% confidence level is developed for each test point according to the methods described in the ANSI/NCSL Z540-2-1997. Methods and procedures used in this calibration are in accordance with the McCrometer Flow Laboratory Technical Manual, revision 2.0.

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Serial Number: AG18-0467

Not Installed Yet, For Test

M-36

Calibration Report

McCROMETER

Serial Number: AG18-0463

Test Number: AG18-0463

Converter Serial Number: McMag3000

Model: G304-1

Calibration Date: 5/31/2018

Report Date: 5/31/2018

Sold To: STOCKTON EAST WATER

Description: MC MAG 3000,4"

Notes:

Customer I.D.: 4 in / 102 mm

KA: 1.5574

KZ: -2134

Any difference between the customer specified application dimension and test pipe dimension is accounted for by the flow converter.
The reported velocities shown on this report indicate actual meter performance and are independent of the inside diameter used in the calibration.

Calibration Report

	Velocity (m/s) min	max	PLBF Accuracy (as % of reading)
1	0.45	0.88	100.83
2	0.88	1.31	99.44
3	1.31	1.74	99.08
4	1.74	2.17	99.04
5	2.17	2.60	99.15
6	2.60	3.03	99.33
7	3.03	3.46	99.57
8	3.46	3.89	99.84
9	3.89	4.32	100.13
10	4.32	4.74	100.44

KL Values

KL00:	043570045
KL01:	253761256
KL02:	472000472
KL03:	000000000
KL04:	000000000
KL05:	000000000
KL06:	000000000
KL07:	000000000
KL08:	000000000
KL09:	000000000
KL10:	000000000
KL11:	000000000

Approved By: [signature]

Vince H. Morton
ID#: 117110

Test Fluid: Water

Instrumentation Traceability Kit Number: V0143

Standard Used: Secondary

Test Data

	Water Temperature (°C)	Test Time (seconds)	Air Temperature (°C)	Barometric Pressure (kPa)	Relative Humidity (%)	Viscosity (cP)	Average Rate of Flow (m3/sec)	Test Pipe Inside Diameter (in)
1	22.4	30.235	26.0	99.10	58	1	0.03879	4.020
2	22.4	30.450	26.0	99.10	58	1	0.02978	4.020
3	22.4	31.434	26.0	99.10	58	1	0.02104	4.020
4	22.4	30.437	26.0	99.10	58	1	0.01225	4.020
5	22.4	30.422	26.0	99.10	58	1	0.00373	4.020

This calibration was performed using standards traceable to the National Institute of Standards and Technology (NIST), USA. Certificates of traceability for the individual test measurements listed in this report are documented and serialized by the Test Stand Instrumentation Traceability Kit Number identified above and are available upon request. Combined Uncertainty to a 95% confidence level is developed for each test point according to the methods described in the ANSI/NCSL Z540-2-1997. Methods and procedures used in this calibration are in accordance with the McCrometer Flow Laboratory Technical Manual, revision 2.0.

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Mag 3000

Calibration Report

M-45
6/13/2018

McCROMETER

Serial Number: AG18-0473 Test Number: AG18-0473

Converter Serial Number: McMag3000

Model: G310-6 Calibration Date: 6/5/2018

Report Date: 6/5/2018

Sold To: STOCKTON EAST WATER

Description: MC MAG 3000,10"

Notes:

Customer I.D.: 9.625 in KA: 2.0285

244 mm KZ: 595

Any difference between the customer specified application dimension and test pipe dimension is accounted for by the flow converter.
The reported velocities shown on this report indicate actual meter performance and are independent of the inside diameter used in the calibration.

Calibration Report

	Velocity (m/s) min	max	PLBF Accuracy (as % of reading)
1	0.34	0.65	101.19
2	0.65	0.95	100.26
3	0.95	1.25	99.94
4	1.25	1.55	99.82
5	1.55	1.86	99.79
6	1.86	2.16	99.82
7	2.16	2.46	99.87
8	2.46	2.76	99.94
9	2.76	3.07	100.02
10	3.07	3.37	100.12

KL Values

KL00:	000000000
KL01:	000000000
KL02:	000000000
KL03:	000000000
KL04:	000000000
KL05:	000000000
KL06:	000000000
KL07:	000000000
KL08:	000000000
KL09:	000000000
KL10:	000000000
KL11:	000000000

Approved By: [signature]
Vince H. Morton
ID#: 117110

Test Fluid: Water

Instrumentation Traceability Kit Number: V0143

Standard Used: Secondary

Test Data

	Water Temperature (°C)	Test Time (seconds)	Air Temperature (°C)	Barometric Pressure (kPa)	Relative Humidity (%)	Viscosity (cP)	Average Rate of Flow (m3/sec)	Test Pipe Inside Diameter (in)
1	26.2	81.219	26.0	99.10	58	1	0.17455	10.120
2	26.2	30.289	26.0	99.10	58	1	0.13454	10.120
3	26.2	30.438	26.0	99.10	58	1	0.09685	10.120
4	26.2	30.400	26.0	99.10	58	1	0.05863	10.120
5	26.2	30.261	26.0	99.10	58	1	0.01794	10.120

This calibration was performed using standards traceable to the National Institute of Standards and Technology (NIST), USA. Certificates of traceability for the individual test measurements listed in this report are documented and serialized by the Test Stand Instrumentation Traceability Kit Number identified above and are available upon request. Combined Uncertainty to a 95% confidence level is developed for each test point according to the methods described in the ANSI/NCSL Z540-2-1997. Methods and procedures used in this calibration are in accordance with the McCrometer Flow Laboratory Technical Manual, revision 2.0.

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Calibration Report

M-49
6/18/2018

McCROMETER

Serial Number: AG18-0470 Test Number: AG18-0470

Converter Serial Number: McMag3000

Model: G308-4 Calibration Date: 6/13/2018

Report Date: 6/13/2018

Sold To: STOCKTON EAST WATER

Description: MC MAG 3000,8"

Notes:

Customer I.D.: 7.625 in KA: 1.7847

194 mm KZ: 1341

Any difference between the customer specified application dimension and test pipe dimension is accounted for by the flow converter.
The reported velocities shown on this report indicate actual meter performance and are independent of the inside diameter used in the calibration.

Calibration Report

	Velocity (m/s) min	max	PLBF Accuracy (as % of reading)
1	0.50	0.95	99.93
2	0.95	1.40	100.52
3	1.40	1.85	100.62
4	1.85	2.31	100.54
5	2.31	2.76	100.39
6	2.76	3.21	100.20
7	3.21	3.66	99.98
8	3.66	4.11	99.75
9	4.11	4.56	99.51
10	4.56	5.02	99.27

KL Values

KL00:	048433050
KL01:	266226275
KL02:	500000500
KL03:	000000000
KL04:	000000000
KL05:	000000000
KL06:	000000000
KL07:	000000000
KL08:	000000000
KL09:	000000000
KL10:	000000000
KL11:	000000000

Approved By: [signature]
Vince H. Morton
ID#: 117110

Test Fluid: Water

Instrumentation Traceability Kit Number: V0143

Standard Used: Secondary

Test Data

	Water Temperature (°C)	Test Time (seconds)	Air Temperature (°C)	Barometric Pressure (kPa)	Relative Humidity (%)	Viscosity (cP)	Average Rate of Flow (m3/sec)	Test Pipe Inside Diameter (in)
1	27.9	30.276	21.6	95.54	48	1	0.16490	8.070
2	27.9	30.458	21.6	95.54	48	1	0.12678	8.070
3	27.9	80.952	21.6	95.54	48	1	0.09107	8.070
4	27.9	30.384	21.6	95.54	48	1	0.05503	8.070
5	27.8	46.957	21.6	95.54	48	1	0.01660	8.070

This calibration was performed using standards traceable to the National Institute of Standards and Technology (NIST), USA. Certificates of traceability for the individual test measurements listed in this report are documented and serialized by the Test Stand Instrumentation Traceability Kit Number identified above and are available upon request. Combined Uncertainty to a 95% confidence level is developed for each test point according to the methods described in the ANSI/NCSL Z540-2-1997. Methods and procedures used in this calibration are in accordance with the McCrometer Flow Laboratory Technical Manual, revision 2.0.

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Serial Number: AG18-0470

M-52
11/9/18

Calibration Report

McCROMETER

Serial Number: AG18-0465
Test Number: AG18-0465
Converter Serial Number: McMag3000
Model: G306-2
Calibration Date: 5/31/2018
Report Date: 5/31/2018
Sold To: STOCKTON EAST WATER

Description: MC MAG 3000,6"
Notes:

Customer I.D.: 5.732 in
146 mm
KA: 1.6641
KZ: 1084

Any difference between the customer specified application dimension and test pipe dimension is accounted for by the flow converter.
The reported velocities shown on this report indicate actual meter performance and are independent of the inside diameter used in the calibration.

Calibration Report

	Velocity (m/s) min	max	PLBF Accuracy (as % of reading)
1	0.53	0.97	98.59
2	0.97	1.42	99.23
3	1.42	1.86	99.65
4	1.86	2.31	99.99
5	2.31	2.75	100.30
6	2.75	3.19	100.59
7	3.19	3.64	100.87
8	3.64	4.08	101.14
9	4.08	4.52	101.40
10	4.52	4.97	101.67

KL Values

KL00:	052327053
KL01:	268171271
KL02:	496000496
KL03:	000000000
KL04:	000000000
KL05:	000000000
KL06:	000000000
KL07:	000000000
KL08:	000000000
KL09:	000000000
KL10:	000000000
KL11:	000000000

Approved By: [signature]
Vince H. Morton
ID#: 117110

Test Fluid: Water
Instrumentation Traceability Kit Number: V0143
Standard Used: Secondary

Test Data

	Water Temperature (°C)	Test Time (seconds)	Air Temperature (°C)	Barometric Pressure (kPa)	Relative Humidity (%)	Viscosity (cP)	Average Rate of Flow (m3/sec)	Test Pipe Inside Diameter (in)
1	22.7	30.435	26.0	99.10	58	1	0.09222	6.060
2	22.7	30.413	26.0	99.10	58	1	0.07085	6.060
3	22.7	30.419	26.0	99.10	58	1	0.05068	6.060
4	22.7	30.352	26.0	99.10	58	1	0.03021	6.060
5	22.7	30.294	26.0	99.10	58	1	0.00991	6.060

This calibration was performed using standards traceable to the National Institute of Standards and Technology (NIST), USA. Certificates of traceability for the individual test measurements listed in this report are documented and serialized by the Test Stand Instrumentation Traceability Kit Number identified above and are available upon request. Combined Uncertainty to a 95% confidence level is developed for each test point according to the methods described in the ANSI/NCSL Z540-2-1997. Methods and procedures used in this calibration are in accordance with the McCrometer Flow Laboratory Technical Manual, revision 2.0.

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Serial Number: AG18-0465

Propeller Meter

Replacement M155

CERTIFIED TEST REPORT

CUSTOMER: KIRKPATRICK ASSOCIATES
MODEL NO: M0306
METER SERIAL NO: 16-08909

CONFIGURATION

METER INSIDE DIAMETER: 6.065
METER OUTSIDE DIAMETER: 6.625
TEST DATE: 6/24/2016
TEST FACILITY: Volumetric
IDEAL TEST CONSTANT: 6738

CALIBRATION DATA

	Tested TC	GPM	Accuracy
1	6789	1280	100.8

CERTIFIED BY: Paul Hobbs   DATE: 6/28/2016

This calibration was performed on a gravimetric or volumetric test facility, traceable to the National Institute of Standards and Technology, USA. The estimated flow measurement uncertainty of the calibration facilities are:
Gravimetric +/- 0.15%   Volumetric +/- 0.5%

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HEMET, CA 92545 USA
PHONE (951) 652-6811 / FAX (951) 652-3078
WEB SITE: http://www.mccrometer.com E-MAIL: info@mccrometer.com

16-08909

Calibration Report

MS-9 6/19/2018

McCROMETER

Serial Number: AG18-0468 Test Number: AG18-0468

Converter Serial Number: McMag3000

Model: G308-4 Calibration Date: 6/8/2018

Report Date: 6/8/2018

Sold To: STOCKTON EAST WATER

Description: MC MAG 3000,8"

Notes:

Customer I.D.: 8.375 in KA: 1.8339

213 mm KZ: 1831

Any difference between the customer specified application dimension and test pipe dimension is accounted for by the flow converter.
The reported velocities shown on this report indicate actual meter performance and are independent of the inside diameter used in the calibration.

Calibration Report

	Velocity (m/s) min	Velocity (m/s) max	PLBF Accuracy (as % of reading)
1	0.41	0.79	100.57
2	0.79	1.16	100.69
3	1.16	1.54	100.68
4	1.54	1.91	100.62
5	1.91	2.29	100.55
6	2.29	2.67	100.46
7	2.67	3.04	100.37
8	3.04	3.42	100.27
9	3.42	3.79	100.17
10	3.79	4.17	100.07

KL Values

KL00:	041530042
KL01:	227784231
KL02:	411000411
KL03:	000000000
KL04:	000000000
KL05:	000000000
KL06:	000000000
KL07:	000000000
KL08:	000000000
KL09:	000000000
KL10:	000000000
KL11:	000000000

Approved By:
Vince H. Morton
ID#: 117110

Test Fluid: Water

Instrumentation Traceability Kit Number: V0143

Standard Used: Secondary

Test Data

	Water Temperature (°C)	Test Time (seconds)	Air Temperature (°C)	Barometric Pressure (kPa)	Relative Humidity (%)	Viscosity (cP)	Average Rate of Flow (m3/sec)	Test Pipe Inside Diameter (in)
1	25.0	52.667	25.7	95.49	40	1	0.13694	8.070
2	25.0	30.330	25.7	95.49	40	1	0.10615	8.070
3	25.0	30.306	25.7	95.49	40	1	0.07590	8.070
4	24.8	57.262	25.7	95.49	40	1	0.04294	8.070
5	24.9	30.288	25.7	95.49	40	1	0.01365	8.070

This calibration was performed using standards traceable to the National Institute of Standards and Technology (NIST), USA. Certificates of traceability for the individual test measurements listed in this report are documented and serialized by the Test Stand Instrumentation Traceability Kit Number identified above and are available upon request. Combined Uncertainty to a 95% confidence level is developed for each test point according to the methods described in the ANSI/NCSL Z540-2-1997. Methods and procedures used in this calibration are in accordance with the McCrometer Flow Laboratory Technical Manual, revision 2.0.

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Serial Number: AG18-0468

Calibration Report

MS-22B

McCROMETER

Serial Number: AG18-0474 Test Number: AG18-0474

Converter Serial Number: McMag3000

Model: G312-8 Calibration Date: 6/8/2018

Report Date: 6/8/2018

Sold To: STOCKTON EAST WATER

Description: 12" MCMAG 3000

Notes:

Customer I.D.: 12 in KA: 1.9371

310.896 mm KZ: 804

Any difference between the customer specified application dimension and test pipe dimension is accounted for by the flow converter.
The reported velocities shown on this report indicate actual meter performance and are independent of the inside diameter used in the calibration.

Calibration Report

	Velocity (m/s) min	max	PLBF Accuracy (as % of reading)
1	0.31	0.51	99.04
2	0.51	0.71	99.18
3	0.71	0.90	99.35
4	0.90	1.10	99.53
5	1.10	1.30	99.71
6	1.30	1.50	99.90
7	1.50	1.70	100.10
8	1.70	1.90	100.29
9	1.90	2.10	100.49
10	2.10	2.29	100.69

KL Values

KL00:	030200031
KL01:	061480063
KL02:	094140096
KL03:	125928129
KL04:	160650162
KL05:	000000000
KL06:	000000000
KL07:	000000000
KL08:	000000000
KL09:	000000000
KL10:	000000000
KL11:	000000000

Approved By: Luis Oiz Leon

Luis Leon
ID#: 266234

Test Fluid: Water

Instrumentation Traceability Kit Number: V0189

Standard Used: Secondary

Test Data

	Water Temperature (°C)	Test Time (seconds)	Air Temperature (°C)	Barometric Pressure (kPa)	Relative Humidity (%)	Viscosity (cP)	Average Rate of Flow (m3/sec)	Test Pipe Inside Diameter (in)
1	29.7	52.756	25.7	95.49	40	1	0.17372	12.240
2	29.7	41.006	25.7	95.49	40	1	0.12616	12.240
3	29.7	34.344	25.7	95.49	40	1	0.09508	12.240
4	29.8	35.114	25.7	95.49	40	1	0.06356	12.240
5	29.8	59.937	25.7	95.49	40	1	0.02360	12.240

This calibration was performed using standards traceable to the National Institute of Standards and Technology (NIST), USA. Certificates of traceability for the individual test measurements listed in this report are documented and serialized by the Test Stand Instrumentation Traceability Kit Number identified above and are available upon request. Combined Uncertainty to a 95% confidence level is developed for each test point according to the methods described in the ANSI/NCSL Z540-2-1997. Methods and procedures used in this calibration are in accordance with the McCrometer Flow Laboratory Technical Manual, revision 2.0.

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Mag 3000

Calibration Report

Pc2A
June 25th 2018

McCROMETER

Serial Number: AG18-0488 | Test Number: AG18-0488

Converter Serial Number: McMag3000

Model: G308-4 | Calibration Date: 6/18/2018

Report Date: 6/18/2018

Sold To: STOCKTON EAST WATER

Description: 8" MCMAG 3000

Notes:

Customer I.D.: 8.125 in | KA: 1.8166

206 mm | KZ: 2550

Any difference between the customer specified application dimension and test pipe dimension is accounted for by the flow converter.
The reported velocities shown on this report indicate actual meter performance and are independent of the inside diameter used in the calibration.

Calibration Report

	Velocity (m/s) min	Velocity (m/s) max	PLBF Accuracy (as % of reading)
1	0.42	0.82	100.63
2	0.82	1.23	99.63
3	1.23	1.64	99.34
4	1.64	2.04	99.27
5	2.04	2.45	99.29
6	2.45	2.86	99.37
7	2.86	3.27	99.48
8	3.27	3.67	99.61
9	3.67	4.08	99.75
10	4.08	4.49	99.90

KL Values

KL00:	000000000
KL01:	000000000
KL02:	000000000
KL03:	000000000
KL04:	000000000
KL05:	000000000
KL06:	000000000
KL07:	000000000
KL08:	000000000
KL09:	000000000
KL10:	000000000
KL11:	000000000

Approved By: Robert Galusha

Robert Galusha
ID#: 176785

Test Fluid: Water

Instrumentation Traceability Kit Number: V0143

Standard Used: Secondary

Test Data

	Water Temperature (°C)	Test Time (seconds)	Air Temperature (°C)	Barometric Pressure (kPa)	Relative Humidity (%)	Viscosity (cP)	Average Rate of Flow (m3/sec)	Test Pipe Inside Diameter (in)
1	23.5	33.373	21.6	95.54	48	1	0.14729	8.070
2	23.9	34.326	21.6	95.54	48	1	0.11339	8.070
3	23.7	32.109	21.6	95.54	48	1	0.08233	8.070
4	23.9	31.636	21.6	95.54	48	1	0.04775	8.070
5	23.8	32.721	21.6	95.54	48	1	0.01373	8.070

This calibration was performed using standards traceable to the National Institute of Standards and Technology (NIST), USA. Certificates of traceability for the individual test measurements listed in this report are documented and serialized by the Test Stand Instrumentation Traceability Kit Number identified above and are available upon request. Combined Uncertainty to a 95% confidence level is developed for each test point according to the methods described in the ANSI/NCSL Z540-2-1997. Methods and procedures used in this calibration are in accordance with the McCrometer Flow Laboratory Technical Manual, revision 2.0.

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PC 4/A June 19 2018

Calibration Report

McCROMETER

Serial Number: AG18-0469 Test Number: AG18-0469

Converter Serial Number: McMag3000

Model: G308-4 Calibration Date: 6/8/2018

Report Date: 6/8/2018

Sold To: STOCKTON EAST WATER

Description: MC MAG 3000,8"

Notes:

Customer I.D.: 8.416 in KA: 1.92

214 mm KZ: 1363

Any difference between the customer specified application dimension and test pipe dimension is accounted for by the flow converter.
The reported velocities shown on this report indicate actual meter performance and are independent of the inside diameter used in the calibration.

Calibration Report

	Velocity (m/s) min	max	PLBF Accuracy (as % of reading)
1	0.42	0.79	100.04
2	0.79	1.16	101.31
3	1.16	1.54	101.63
4	1.54	1.91	101.63
5	1.91	2.29	101.47
6	2.29	2.66	101.24
7	2.66	3.03	100.96
8	3.03	3.41	100.65
9	3.41	3.78	100.32
10	3.78	4.16	99.97

KL Values

KL00:	040468042
KL01:	224702231
KL02:	413000413
KL03:	000000000
KL04:	000000000
KL05:	000000000
KL06:	000000000
KL07:	000000000
KL08:	000000000
KL09:	000000000
KL10:	000000000
KL11:	000000000

Approved By: [signature]

Vince H. Morton
ID#: 117110

Test Fluid: Water

Instrumentation Traceability Kit Number: V0143

Standard Used: Secondary

Test Data

	Water Temperature (°C)	Test Time (seconds)	Air Temperature (°C)	Barometric Pressure (kPa)	Relative Humidity (%)	Viscosity (cP)	Average Rate of Flow (m3/sec)	Test Pipe Inside Diameter (in)
1	24.9	126.663	25.7	95.49	40	1	0.13633	8.070
2	24.9	30.361	25.7	95.49	40	1	0.10602	8.070
3	24.9	30.375	25.7	95.49	40	1	0.07616	8.070
4	24.9	30.428	25.7	95.49	40	1	0.04312	8.070
5	24.9	30.388	25.7	95.49	40	1	0.01383	8.070

This calibration was performed using standards traceable to the National Institute of Standards and Technology (NIST), USA. Certificates of traceability for the individual test measurements listed in this report are documented and serialized by the Test Stand Instrumentation Traceability Kit Number identified above and are available upon request. Combined Uncertainty to a 95% confidence level is developed for each test point according to the methods described in the ANSI/NCSL Z540-2-1997. Methods and procedures used in this calibration are in accordance with the McCrometer Flow Laboratory Technical Manual, revision 2.0.

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Serial Number: AG18-0469

PC 11 A 11-09-18

Calibration Report

McCROMETER

Serial Number: AG18-0527 Test Number: AG18-0527

Converter Serial Number: McMag3000

Model: G306-2 Calibration Date: 6/26/2018

Report Date: 6/26/2018

Sold To: STOCKTON EAST WATER

Description: MC MAG 3000, 6"

Notes:

Customer I.D.: 5.93 in KA: 1.6693

151 mm KZ: 2662

Any difference between the customer specified application dimension and test pipe dimension is accounted for by the flow converter.
The reported velocities shown on this report indicate actual meter performance and are independent of the inside diameter used in the calibration.

Calibration Report

	Velocity (m/s) min	Velocity (m/s) max	PLBF Accuracy (as % of reading)
1	0.45	0.88	100.89
2	0.88	1.32	100.03
3	1.32	1.75	99.70
4	1.75	2.18	99.54
5	2.18	2.61	99.46
6	2.61	3.04	99.42
7	3.04	3.47	99.40
8	3.47	3.91	99.40
9	3.91	4.34	99.40
10	4.34	4.77	99.42

KL Values

KL00:	043501045
KL01:	260755266
KL02:	477000477
KL03:	000000000
KL04:	000000000
KL05:	000000000
KL06:	000000000
KL07:	000000000
KL08:	000000000
KL09:	000000000
KL10:	000000000
KL11:	000000000

Approved By: [signature]
Vince H. Morton
ID#: 117110

Test Fluid: Water

Instrumentation Traceability Kit Number: V0143

Standard Used: Secondary

Test Data

	Water Temperature (°C)	Test Time (seconds)	Air Temperature (°C)	Barometric Pressure (kPa)	Relative Humidity (%)	Viscosity (cP)	Average Rate of Flow (m3/sec)	Test Pipe Inside Diameter (in)
1	27.0	31.772	21.6	95.54	48	1	0.08851	6.060
2	27.0	30.399	21.6	95.54	48	1	0.06790	6.060
3	27.0	30.290	21.6	95.54	48	1	0.04926	6.060
4	27.0	30.363	21.6	95.54	48	1	0.02900	6.060
5	27.0	30.341	21.6	95.54	48	1	0.00847	6.060

This calibration was performed using standards traceable to the National Institute of Standards and Technology (NIST), USA. Certificates of traceability for the individual test measurements listed in this report are documented and serialized by the Test Stand Instrumentation Traceability Kit Number identified above and are available upon request. Combined Uncertainty to a 95% confidence level is developed for each test point according to the methods described in the ANSI/NCSL Z540-2-1997. Methods and procedures used in this calibration are in accordance with the McCrometer Flow Laboratory Technical Manual, revision 2.0.

McCrometer, Inc. • 3255 West Stetson Avenue, Hemet, CA 92545, USA
Tel (951) 652-6811 • Fax (951) 652-3078 • Website: www.mccrometer.com
Hours: 8am – 4:30pm PST, Monday - Friday

Mag 3000

ATTACHMENT C.3.

Rubicon BladeMeter Data Sheet

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BladeMeter™

RUBICON™

Overview

The BladeMeter is a major advance in valve technology. It is now possible to automatically deliver precise quantities of water at both high and low flow rates in pipelines using only gravity pressure and solar energy.

The BladeMeter's integrated actuation and meter controls and measures flow at the outlet end of a gravity pressure pipe. It modulates to maintain a constant flow rate, even when the supply pressure fluctuates. With remote control built-in, it can be remotely operated or pre-set to turn on and off automatically to deliver a constant and accurately measured flow rate and volume, day or night.

Its compact, all-in-one design ensures rapid installation, reliable operation and easy maintenance. Using only renewable energy, the BladeMeter has an extremely low cost of operation. Its unique actuation mechanism and large diameter reduces head loss, helps to prevent weed fouling and is easy to visually inspect, service and clean.

And by using Sonaray® flow measurement technology it measures accurately at high and very low flow rates, so it has the flexibility to deliver water at rates suited to a wide range of applications.

The built-in software provides the following control options:

Control objective		Valve action
Local	Position	Opens to a desired position and stays there
	Flow	Maintains a desired flow rate
Network*	Demand	Incorporates knowledge of pipe network dynamics and overall demand to maintain desired flow rates through multiple turnouts

* Network operation is available when used with other BladeMeters in a Rubicon Low Energy Pipeline Solution.

When used with Rubicon's Low Energy Pipeline Solution, the BladeMeter is able to manage large flows in situations where static head is frequently below 33' (14 PSI).

A TCC® product

The BladeMeter is one of the products making up a modular family of precision hardware and software called TCC (Total Channel Control®). TCC is an advanced technology set designed to improve the management and productivity of water in open canal and gravity pipeline distribution. Unlike traditional infrastructure, TCC products can interact and work together to help managers improve:

- the availability of water
- service and equity to users
- management and control
- health and safety for canal operators

Features

- Large 2' diameter for high flow gravity irrigation
- Fully submersible
- Wide flow measurement range
- Sonaray flow measurement accuracy of ±2.5%†
- Solar powered
- SCADA-ready communication system

An ideal solution for turnouts...

- Connected to hydrostatic (gravity) pressure pipes
- Connected to open canal supply networks
- That need to pass a wide range of flow rates
- Requiring remote operation and accurate metering
- That need to be fully accessible for easy maintenance

Data Sheet

BladeMeter™

Local control pedestal

Each BladeMeter installation includes a robust pedestal that provides power and control to the valve and is a secure, weather proof housing for electronic components and batteries.

The pedestal also serves as a local user interface. A keypad and LCD display are located under the lockable pedestal lid, allowing farmers to monitor, or operators to control and troubleshoot on-site.

Valve control technology

The BladeMeter's drive mechanism is a nut and shaft system that uses opposing threads machined into a high grade stainless-steel shaft to provide positive drive for valve opening and closing. Together with integrated digital valve position sensing, the BladeMeter precisely modulates to deliver a required flow rate, even with fluctuating supply pressure.

The control plates are driven by a long-life brushless motor and gearbox located within a fully submersible housing and an integrated water detection sensor provides peace of mind against water ingress.

Rubicon's SolarDrive® technology – a purpose built integrated circuit board – manages valve positioning, solar power regulation, battery charge, fusing and the pedestal keypad interface.

Remote management

The BladeMeter can be managed remotely with Rubicon's SCADAConnect® software or third party SCADA systems. Authorized users can remotely set the BladeMeter to turn on and off automatically, view real-time and historical flow information and configure alarms that can be sent via text message to nominated mobile phones.

Low maintenance

The BladeMeter's compact, all-in-one design allows it to be maintained in the field with minimal tools, training, and easily replaceable parts.

- High quality components designed for long-life
- Unique dual-plate design helps prevent weed fouling
- Built-in on-site diagnostic software and remote alerts
- Control and meter components easily accessible for visual inspection

Local user interface

Keypad and display

Submersible motor housing

SCADAConnect® software

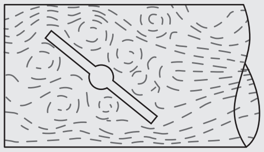
Unique low head loss design

Traditional butterfly valves use a circular disc in the flow path to control flow though the conduit. This creates substantial flow disturbance, resulting in head loss, particularly at lower flow rates when the valve is only open by a small amount. Many valves are inherently unstable at lower opening angles, which limits their ability to precisely control flows. The disc also forms an obstruction upon which debris can easily become wedged.

The BladeMeter's unique dual-plate design provides excellent hydraulic performance, minimizing flow disturbance and maximizing flow capacity. The controlplates sit downstream of the flow path and their contoured surfaces promote a smooth and symmetrical flow profile, making it ideal for gravity applications where it is essential to minimize head loss.

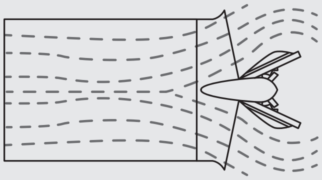
Additionally the dual plate design minimizes the opportunity for weeds and other debris to accumulate and clog the meter.

Traditional valve (Plan view)



Traditional valve designs, such as butterfly valves cause swirling eddies resulting in friction losses and create an obstruction for weeds and other debris to catch on

BladeMeter™ (Plan view)



The BladeMeter's control plates have been designed to minimize head loss by maintaining a uniform flow profile

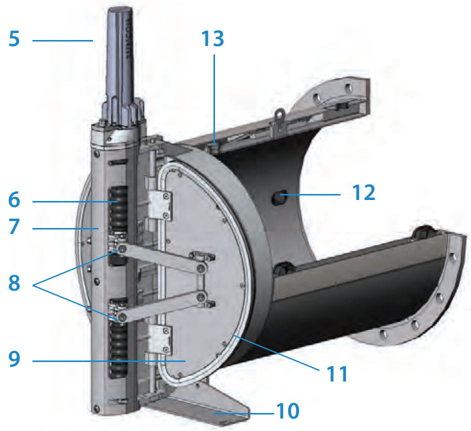
BladeMeter™ components

Control pedestal

1 Antenna
2 Solar panel
3 Hinged mast
4 Secure controller housing with LCD display

Meter/control unit

5 Motor housing with integrated water detection sensor
6 Drive shaft
7 Shaft cover
8 Actuator arms
9 Control plate
10 Foot
11 Seals
12 Sonaray sensors
13 Pipe-not-full sensor



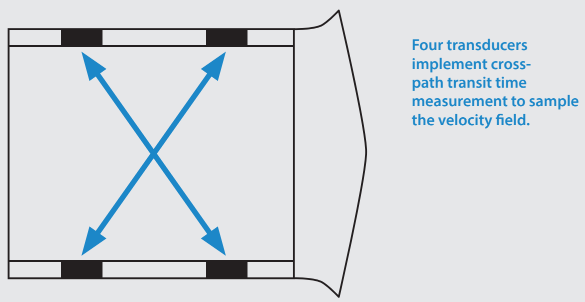
Sonaray® flow measurement technology

The BladeMeter employs Rubicon's Sonaray cross-path ultrasonic flow measurement technology. Four transducers on a horizontal plane send and receive ultrasonic pulses to determine velocity by measuring the transit time taken for the pulses to travel between transducers.

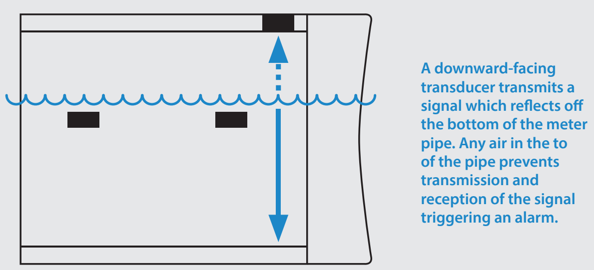
Cross-path measurement means that the control valve can be located directly downstream from the measurement area without affecting accuracy. It also eliminates the need for flow profile calibrations that are required for single-point, single-path and doppler flow meters.

The BladeMeter also has a downward facing transducer to verify that the pipe is completely full, eliminating flow measurement error caused by partially full conduits.

Cross-path measurement (Plan view of measurement plane)



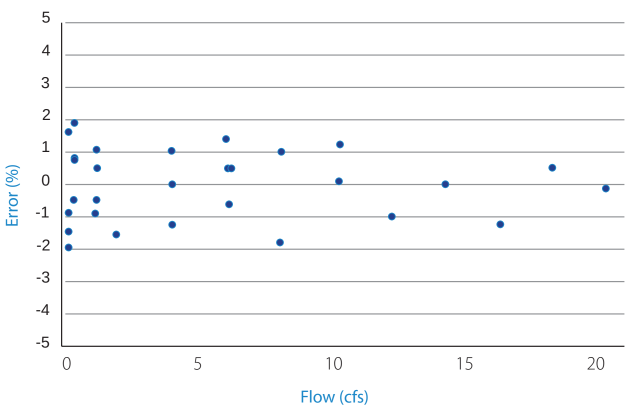
Pipe-not-full sensor (Side view)



The BladeMeter's Sonaray technology enables it to measure to within ±2.5% at flow rates ranging from 0.4 to 20 cfs.

BladeMeter™ flow measurement accuracy

(2' BladeMeter prototype relative to ABB Magmaster at Rubicon hydraulics laboratory)



BladeMeter™ specifications

General	
K-factor (head loss coefficient)	1.0 The BladeMeter's head loss characteristics are similar to those of a normal pipe exit
Data interface	Local display (4 line LCD), Modbus serial data interface
Units of measurement	User definable (metric/imperial (US))
Keypad language	English, Spanish, French, Chinese and Italian
Data tags	140+ available for integration into SCADA systems
Data storage	All volumetric usage is accumulated and backed up internally in non-volatile memory
Not full alarm	Alarm indicates when pipe is not full
Control	Local or remote via SCADA
Drive mechanism	Opposing thread nut and shaft system
Electronics	SolarDrive® power management and control technology housed in the local control pedestal. Each unit passes a 12 hour heat pre-stress and 100% functional test.
Motor	Brushless 12V DC
Valve position	Hall effect sensor
Seal performance	Less than 0.1 gallons / minute / foot of seal (exceeds AWWA C513 standard)
Actuation options	12V DC powered (solar); 120-240V AC powered
Typical stroke time	4-5 minutes
Enclosure rating	NEMA 6
Flow measurement	
Flow measurement range	0.4 to 20 cfs
Technique	Cross-path ultrasonic transit-time
Transit time measurement resolution	100 picoseconds
Measurement frequency	0.5 seconds
Accuracy	±2.5% † Accuracy of 2' BladeMeter verified by Rubicon Hydraulics Laboratory, February 2014
Velocity measurement range	Accuracy listed above is achieved at flow velocities greater than 1" per second
Sensor quantity	5 ultrasonic transducers
Calibration method	Factory pre-calibrated with simple in-field verification process
Material	
Meter body	Marine grade aluminum
Valve	Die cast aluminum
Hardware	Stainless steel
Drive shaft	Stainless steel
Drive nuts	Phosphor bronze
Seals	EDPM rubber (Durometer 50 (Shore A))
Transducer housing	Injection moulded xenoy
Power	
Power supply	12V sealed gel lead acid battery charged from solar panel or AC line power
Solar panel	85W monocrystalline
Batteries	2 or 3 12V 28 Ah sealed gel lead acid with temperature sensor (~5yr life, provides ~5 days of operation without solar or AC line power)
Communications	
Protocols	Modbus, DNP3, MDLC

Specifications subject to change

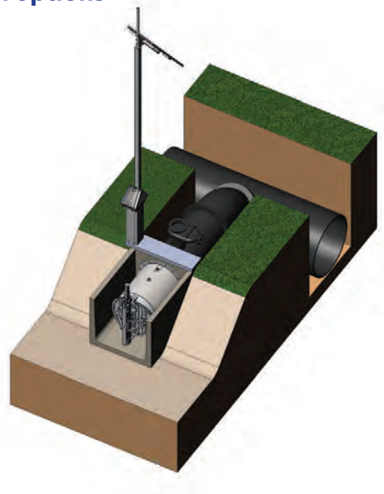
RUBICON™

Dimensions

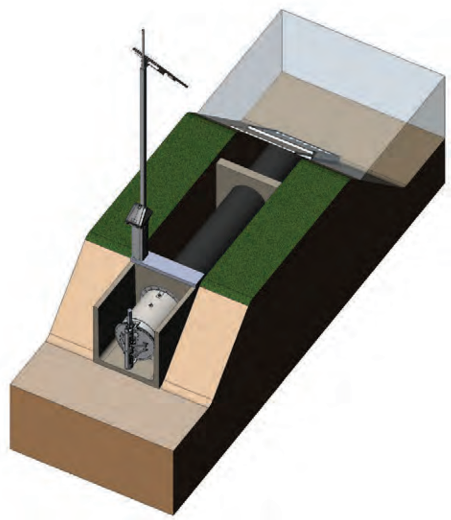
Model	A	B	C	D	E	F	Weight
	in	in	in	in	in	in	lbs
BM-2	51	46	18	30	32	24	265

A Height
B Length
C Min height from structure floor
D External diameter (excluding flange)
E External diameter (including flange)
F Internal diameter

Installation options

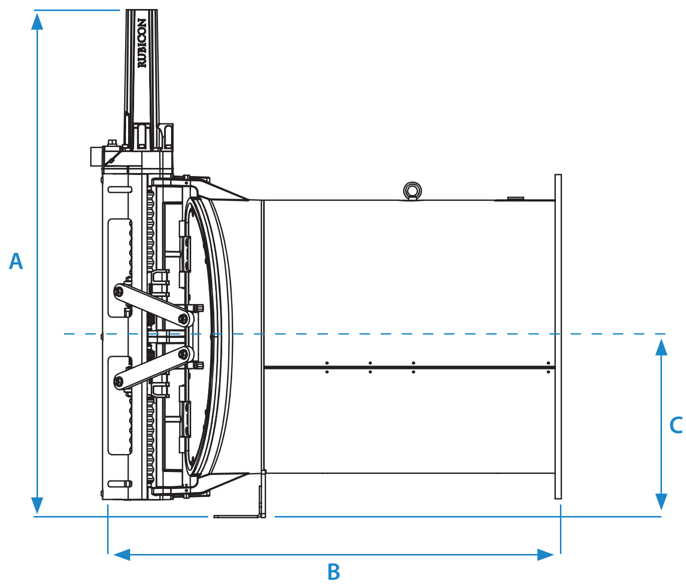


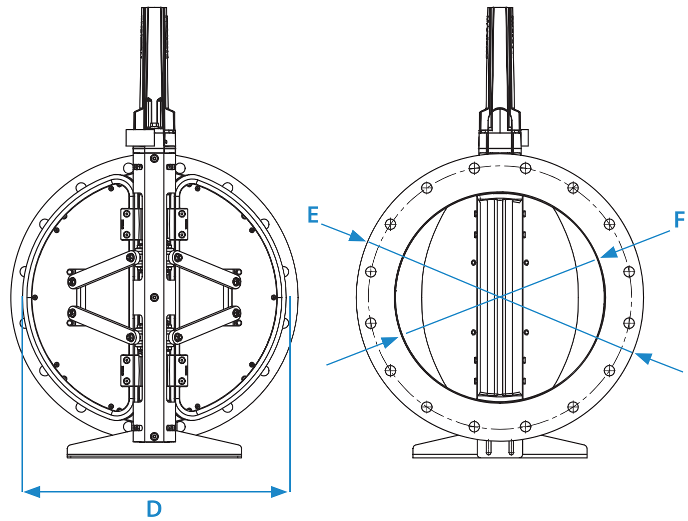
Pipe network turnout



Canal turnout

Front, rear and side views





About Rubicon Water

Rubicon Water delivers advanced technology that optimizes gravity-fed irrigation, providing unprecedented levels of operational efficiency and control, increasing water availability and improving farmers' lives.

Founded in 1995, Rubicon has more than 20,000 gates installed in TCC systems in 10 countries.

DS-BM-07/17-US

1501 S. Lemay Avenue
Suite 101
Fort Collins, CO 80524

615 Kansas Avenue, Unit B
Modesto, CA 95351

415 W Aten Road
Imperial, CA 92251

Toll free: 1 877 440 6080
Telephone: +1 970 482 3200
Fax: +1 970 482 3222
inquiry@rubiconwater.com

www.rubiconwater.com

ATTACHMENT D

District Sample Bills

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ATTACHMENT D.1.

2018 District Sample Bill

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2018 Final Bill

Stockton East Water District
6767 E. Main Street Stockton, CA 95215
P.O. Box 5157 Stockton, CA 95205
(209) 948-0333 Phone
(209) 948-0423 Fax
Website: www.sewd.net
E-mail: sewd@sewd.net

Account No.	[redacted]
Net Ag Acres	18
Billing Date	2/28/2019
Payment Due Upon Receipt	

Site: [redacted]

Pump ID: MS-09A

[redacted]
LINDEN CA 95236

Description	Qty	Unit	Unit Charge	Water Rights (%)	Extended Amount	Invoice Total
Permanent Pasture - Metered Surface	40.740	Acre Feet	$23.00		$937.02	
						$937.02
Payment					($431.71)	
Payment					($505.31)	
						($937.02)

Meter Number	***Beginning***	***Ending***	***Net***
1	899.161	280.016	380.860

AMOUNT DUE $0.00

A PENALTY OF 5% WILL BE ASSESSED IF PAID AFTER 4/30/2019.

Please detach and return with payment.

Stockton East Water District
6767 E. Main Street Stockton, CA 95215
P.O. Box 5157 Stockton, CA 95205
(209) 948-0333 Phone
(209) 948-0423 Fax
Website: www.sewd.net
E-mail: sewd@sewd.net

2018 Final Bill

Account: [redacted]

Class: AG

Site Address: [redacted]

[redacted]
LINDEN CA 95236

A PENALTY OF 5% WILL BE ASSESSED IF PAID AFTER 4/30/2019.

Payment Due Upon Receipt.

Thank You for Your Prompt Payment

AMOUNT DUE $0.00

AMOUNT ENCLOSED

ATTACHMENT D.2.

2018 and 2019 Rate Ordinance, and Rate Equalization Groundwater Assessment and Base Monthly Payment

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ORDINANCE NO.44
Adopted 04/03/2018

AN ORDINANCE ESTABLISHING MUNICIPAL GROUNDWATER ASSESSMENTS, AGRICULTURAL GROUNDWATER ASSESSMENTS, DOMESTIC GROUNDWATER ASSESSMENTS, CHARGES FOR STREAM-DELIVERED WATER AND CHARGES FOR OUT-OF-DISTRICT WATER FOR CALENDAR YEAR 2018

The Board of Directors of Stockton East Water District does hereby ordain as follows:

Section 1: The Municipal Groundwater Assessment for calendar year 2018 shall be Three Hundred Twenty Two Dollars and Thirty Two Cents ($322.32) for Rate Equalization and Three Dollars and Sixty Cents ($3.60) for base Groundwater Production Assessment for a Total Municipal Groundwater Assessment of Three Hundred Twenty Five Dollars and Ninety Two Cents ($322.32 + $3.60= $325.92) per acre-foot of water.

Section 2: The Agricultural Groundwater Assessment for calendar year 2018 shall be Five Dollars and Twenty-Three Cents ($5.23) per acre-foot of water.

Section 3: The Domestic Groundwater Assessment for calendar year 2018 shall be Forty-Four Dollars ($44.00) per Domestic Use Unit.

Section 4: The rate for sales of Stream-Delivered Water for calendar year 2018 shall be Twenty-Three Dollars ($23.00) per acre-foot of water.

Section 5: The rate for sales of Out-Of-District Water from New Hogan Reservoir, or from New Melones Reservoir pursuant to the District's Central Valley Project Contract, for calendar year 2018 shall be One Hundred Dollars ($100.00) per acre-foot of water.

Section 6: This ordinance shall take effect thirty (30) days after its final passage, and shall be published at least once in a newspaper of general circulation within fifteen (15) days after its final passage, with the names of the members of the Board of Directors voting for and against the same.

AYES: Atkins, Cortopassi, McGaughey, McGurk, Panizza, Sanguinetti, Watkins
NAYES: None
ABSTAIN: None
ABSENT: None

Thomas McGurk

Thomas McGurk, President
Board of Directors

ATTEST:

Scot A. Moody, Secretary
Board of Directors

ORDINANCE NO.45
Adopted 04/09/2019

AN ORDINANCE ESTABLISHING MUNICIPAL GROUNDWATER ASSESSMENTS, AGRICULTURAL GROUNDWATER ASSESSMENTS, DOMESTIC GROUNDWATER ASSESSMENTS, CHARGES FOR STREAM-DELIVERED WATER AND CHARGES FOR OUT-OF-DISTRICT WATER FOR CALENDAR YEAR 2019

The Board of Directors of Stockton East Water District does hereby ordain as follows:

Section 1: The Municipal Groundwater Assessment for calendar year 2019 shall be Three Hundred Thirty-One and Thirty-Seven Cents ($331.37) for Rate Equalization and Three Dollars and Sixty Cents ($3.60) for base Groundwater Production Assessment for a Total Municipal Groundwater Assessment of Three Hundred Thirty-Four Dollars and Ninety-Seven Cents ($331.37 + $3.60= $334.97) per acre-foot of water.

Section 2: The Agricultural Groundwater Assessment for calendar year 2019 shall be Five Dollars and Thirty-Six Cents ($5.36) per acre-foot of water.

Section 3: The Domestic Groundwater Assessment for calendar year 2019 shall be Forty-Five Dollars and Fifty Cents ($45.50) per Domestic Use Unit.

Section 4: The rate for sales of Stream-Delivered Water for calendar year 2019 shall be Twenty-Three Dollars ($23.00) per acre-foot of water.

Section 5: This ordinance shall take effect thirty (30) days after its final passage, and shall be published at least once in a newspaper of general circulation within fifteen (15) days after its final passage, with the names of the members of the Board of Directors voting for and against the same.

AYES:	Atkins, Cortopassi, McGaughey, McGurk, Panizza
NAYES:	None
ABSTAIN:	None
ABSENT:	Sanguinetti, Watkins

Melvin Panizza, President
Board of Directors

ATTEST:

Scot A. Moody, Secretary
Board of Directors

ATTACHMENT E

District Water Shortage Plan

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ATTACHMENT E.1.

Drought Management Plan

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Supplemental Information for
CA DWR Agricultural Water Management Plan

Drought Management Plan

Additional Documentation as Required by California Department of Water Resources and Executive Order B-29-15.

STOCKTON EAST WATER DISTRICT
PROVIDING SERVICE SINCE 1948

July 2017

TABLE OF CONTENTS

Attachment

1 Introduction

1.1 Purpose of Drought Management Plan

On April 1, 2015 Governor Brown signed Executive Order B-29-15, directing agricultural water suppliers to prepare an *Agricultural Water Management Plan* which consists of two parts: 1) a *Drought Management Plan*, and 2) a *Quantification of Water Demands*. The purpose of the drought management plan is to detail how water suppliers prepare for droughts and manage water supplies and allocations during drought conditions. This document is intended to serve as the additional documentation that Stockton East Water District (SEWD) must include with the United States Bureau of Reclamation (USBR) water management plan and submit to the California Department of Water Resources (DWR) to document compliance with specified requirements of the Executive Order.

As a Central Valley Project contractor, the District is required by USBR to prepare a water management plan in accordance with USBR criteria. SEWD's current USBR-approved plan was prepared under USBR's 2011 Standard Criteria. The District also prepares annual updates each year in compliance with the USBR criteria.

Senate Bill X7-7 (SBx7-7), the Water Conservation Act of 2009, mandated water conservation and measurement and reporting activities for certain agricultural water suppliers, including the preparation of water management plans. The provisions of SBx7-7 were incorporated in California Water Code §10828, which now allows agricultural water suppliers subject to the USBR water management plan process to submit their current accepted plan along with additional documentation to DWR to meet SBx7-7 requirements. SEWD prepared and submitted this additional documentation to DWR under Attachment R of the 2014 USBR Plan. Subject to Executive Order B-29-15, a Drought Management Plan must also accompany the USBR water management plan when submitted to the DWR as part of the Agricultural Water Management Plan. In addition, Executive Order B-29-15 requires the submission of water supply and demand data for 2013-2015.

1.2 District Background

Stockton East Water District, as currently structured, was formed in 1948 under the 1931 Water Conservation Act of the State of California. As such, SEWD is responsible for acquiring a supplemental water supply and developing water use practices that would secure a balance between the District's surface water and its customer's groundwater supplies.

From 1948 to 1963, the District focused its efforts on water resource planning by evaluating groundwater conditions and determining requirements for supplemental water. These intensive efforts by the District and other local agencies resulted in the construction of New Hogan Dam in 1964. The reservoir is owned and operated by the United States Army Corps of Engineers (USACE). The District's first supply of supplemental surface water was obtained through a contract with Reclamation, and a final agreement in 1970, which guaranteed 56.5% of New Hogan Reservoir's yield to the District, was put in place between SEWD and the Calaveras County Water District. SEWD is also the reservoir water master.

In 1971 by Special Act of the Legislature, District boundaries were expanded to include the entire Stockton urban area, and plans were initiated for a 30 million gallon per day drinking water treatment plant. In 1975, a District-wide election resulted in the approval of a $25 million bond to fund the new plant. The Dr. Joe Waidhofer Water Treatment Plant (DJW WTP) was constructed in 1977 and began operation in 1978. In 1979, the Independent Benefit Commission concluded that the new drinking water treatment plant was a benefit to Stockton's planning areas. In 2005, annexed an additional 27,000 acres into the district. Today, SEWD's area encompasses approximately 143,300 acres.

From its formation until 1962, the District's basic financial structure was dependent upon property taxes. In 1963, the Governor of California signed a bill establishing the District's right to levy groundwater use fees and surface water charges. The District used the additional revenue to contract for New Hogan water. About this time, SEWD began registering wells within the district, while check dams were built on the Calaveras River and Mormon, and Mosher Sloughs to control surface irrigation water and promote groundwater recharge. The District also became actively involved in the pursuit of projects to mitigate significant groundwater issues, which included declining aquifer levels, pumping depressions under urban Stockton, and the continuing threat of saline intrusion in wells near the Delta.

Since its inception, SEWD has actively sought supplemental surface water from the American River via the Folsom South Canal. Reclamation directed the District to the Stanislaus River when they were applying for the water permits for New Melones Reservoir. Since the mid-1990's, SEWD has been receiving surface water supplies from the Stanislaus River to supplement its Calaveras River supply. SEWD is currently attempting to secure the right to divert a portion of the flood flows from the Calaveras River, and from Littlejohn, Shirley, Hood, and Rock Creek that can utilize the existing New Melones conveyance facilities.. The goal of this pursuit is to provide the sources of water needed to fully address the overdraft condition of the Eastern San Joaquin County Groundwater Basin.

Recently, East Bay Municipal Utility District built a costly alternative to their right to American River water diverted into the Folsom South Canal. This Freeport Regional Water Project was completed in 2010. San Joaquin County continues to pursue a permit for a portion of the American River flows. Conveying these flows into San Joaquin County could occur by wheeling through the Freeport Project or by completion of the Folsom South Canal.

In 1983, SEWD and Central San Joaquin Water Conservation District (CSJWCD) contracted with Reclamation for allocation of 75,000 and 80,000 acre-feet, respectively, from the New Melones Reservoir. This is known as the District's Central Valley Project contract. That same year, SEWD expanded its surface water distribution system for irrigation water by constructing a 16,000 gallon-per-minute diversion from Calaveras River and Mormon Slough to Potter Creek Under current Reclamation operation of New Melones, SEWD and CSJWCD are provided up to 155,000 acre-feet of water from New Melones annually.

In 1997, SEWD entered into a water transfer agreement with Oakdale Irrigation District (OID) and South San Joaquin Irrigation District (SSJID). This agreement allocates 8,000 to 30,000 acre-feet annually, based on New Melones storage and inflow as of April 1 of each year. The OID & SSJID contract period for the allocation of New Melones water to SEWD ended in 2009. This Agreement and shared ownership of Goodwin Dam have led to many opportunities for cooperative efforts to protect water rights and contracts of the Stanislaus River.

In 2001, SEWD completed the Farmington Groundwater Recharge and Seasonal Habitat Study in conjunction with the United States Army Corps of Engineers and other local agencies. The Farmington Study identified areas suitable for recharge and seasonal habitat development, evaluated recharge techniques, conducted pilot recharge tests, developed a final report and recharge guide, and recommended an implementation strategy for the phased Farmington Program.

In 2003, the District completed the Pilot Phase of the Farmington Program, which consists of 60 acres of recharge ponds and fields adjacent to the Dr. Joe Waidhofer Drinking Water Treatment Plant. The Demonstration Phase, which began in 2003, will investigate and construct up to 1,200 acres of recharge ponds and fields. To date, over 13 sites have been investigated and two sites are moving forward to a demonstration study. In 2006, construction began on another 30-acre recharge site at the drinking water treatment plant.

2 Water Shortage Allocation Practices and Policies

2.1 Current Practices and Policies

SEWD maintains Board adopted rules, ordinances, and regulations that govern water diversions, measurements, rates and rights. Full text on this information is explained in detail in Appendix F of the approved Reclamation Water Management Plan.

Riparian right users have first call on up to 13,000 acre-feet of water from New Hogan Reservoir. Through contract, the urban area is guaranteed 20,000 ac-ft of water, if supplies are available. Water is then allocated to all other surface water users. The agricultural water shortage plan for dry year or drought conditions is described below.

As Water Master of New Hogan Reservoir, SEWD assesses the water supply by April of each year. A sufficient volume to supply enough water for a full irrigation season is 152,000 to 161,000 acre-feet based on an irrigation demand of 3 feet per acre and the number of acres under cultivation. SEWD generally has sufficient water to withstand two to three dry years. If a water year has been identified as a dry year, SEWD asks its customers for voluntary reductions in use. If a second subsequent year is identified as a dry year, SEWD still requests voluntary reductions, but identifies these reductions as critical. A third subsequent dry year may result in continued voluntary reductions, or may require mandatory reductions—SEWD makes this determination at the beginning of the water year. The district informs its customers of the available water supply, and any need for reductions, through its newsletter, as well as postcard reminders and the SEWD website. A final option is to allow diversions only by riparian users and the water treatment plant.

In all water years, SEWD requests that its customers call the district in advance of diverting water, so that SEWD can adjust releases at the dam. Customers are asked to provide the following information 24 hours in advance of the diversion: location of diversion, name of owner or operator, beginning diversion time, pumping rate, and ending diversion time. In non-dry years, this request is voluntary. In dry years, the advance notice is mandatory, and the district may enforce penalties on customers who do not advise the district prior to their water use.

3 Drought Management Plan

3.1 Hydraulic Levels or Conditions

Urban and agricultural water users in the SEWD rely on a combination of surface water and groundwater to meet their water demands. As such, SEWD manages the surface water and groundwater supplies in its service area conjunctively. Since its inception, SEWD has aggressively sought to acquire supplemental surface water supplies for its customers and has been proactive in developing programs to augment and protect its service area groundwater.

SEWD obtains its annual surface water supply from two different sources (contractual agreements): New Hogan Reservoir and New Melones Reservoir. Water obtained from New Hogan Reservoir is distributed within SEWD by its New Hogan Water Conveyance System. Similarly, water obtained from New Melones Reservoir is distributed within SEWD by its New Melones Water Conveyance System. In general, most of the surface water used for agricultural irrigation in SEWD originates from New Hogan Reservoir. The balance of the agricultural water demands not met by available surface water each year is satisfied with pumped groundwater. The following sections provide a brief description of SEWD's conjunctive management of its surface water and groundwater supplies with respect to dry water years and long-term drought conditions.

New Hogan Reservoir Surface Water Supply

The New Hogan Reservoir has a capacity of 317,100 acre-feet (AF) and a 10-year average storage of 152,662 AF. Riparian water rights holders on the Calaveras River below New Hogan Dam have first priority for taking and using water from the Calaveras River. Annual riparian water use is estimated to be about 13,000 AF. The City of Stockton has a firm supply of 20,000 AF from the New Hogan Reservoir. The estimated total annual irrigation volume required to meet the agricultural water demands in SEWD range from 152,000 AF – 161,000 AF. The total annual supply available to SEWD and Calaveras County Water District during normal water years is about 84,100 AF. The annual use by Calaveras County Water District is typically between 3,500 to 3,700 AF. Therefore, in normal water years SEWD can rely on an annual supply of about 80,000 AF which is equivalent to the reservoir's operational safe yield. As the Water Master, SEWD assesses the water supply in New Hogan Reservoir by April of each year and determines how much water from the reservoir is available for sale to farmers in its service area.

New Melones Reservoir Surface Water Supply

As mentioned previously, SEWD contracted with USBR in 1983 for an annual allocation of 75,000 AF from the New Melones Reservoir. Annual water allocation amounts to SEWD are determined by USBR and are based on its March-September water forecast inflow and the February end-of-month storage in New Melones Reservoir each year and the terms of SEWD's long-term contract with USBR. Due to environmental flow requirements on New Melones Reservoir, annual allocations to SEWD from New Melones Reservoir have fluctuated from year-to-year from full allocation to zero allocation.

Groundwater Supply

The boundaries of SEWD are located within the Eastern San Joaquin Groundwater Basin (Basin), a subbasin of the greater San Joaquin Valley Groundwater Basin. During the 2010 water year, agricultural groundwater pumping accounted for more than 90 percent of the irrigation requirement to satisfy crop water demands in SEWD. Long-term dependence of farmers on groundwater as the primary source of irrigation water has led to significant overdraft conditions in eastern San Joaquin County and a large groundwater depression east of Stockton.

To address the overdraft conditions and to improve water supply reliability in the region, the Eastern San Joaquin County Groundwater Basin Authority (GBA) was formed in 2001 as a joint powers authority comprised of the agencies (including SEWD) overlying the Basin. In 2005, SEWD adopted the Eastern San Joaquin Groundwater Basin Groundwater Management Plan prepared by the North-eastern San Joaquin County Groundwater Banking Authority. The plan objectives are to review existing groundwater management policies and programs in eastern San Joaquin County, and develop new policies and programs to ensure the long-term sustainability of groundwater resources in this area.

In 2014, the DWR California Statewide Groundwater Elevation Monitoring (CASGEM) Program identified the Eastern San Joaquin Subbasin as a high priority basin in need of a groundwater elevation monitoring program to track seasonal and long-term trends in groundwater elevations in the Basin. Early in the development of the CASGEM Program, the San Joaquin County Flood Control and Water Conservation District (SJCFCWCD) was designated as the entity to oversee groundwater elevation monitoring and reporting on behalf of the GBA. Currently, SJCFCWCD monitors groundwater elevations in 128 wells located throughout the Basin.

Also in 2014, the California Legislature passed the landmark Sustainable Groundwater Management Act (SGMA). Under SGMA, all basins designated as high or medium priority and critically overdrafted shall be managed under a groundwater sustainability plan enforced by a Groundwater Sustainability Agency (GSA). In 2016, SEWD adopted a resolution to become the GSA under the SGMA requirements for the area of the Basin for which its service area overlies. In 2017, SEWD entered into a Joint Powers Agreement (JPA) forming the Eastern San Joaquin Groundwater Authority to work to prepare the Groundwater Sustainability Plan for the basin. The ultimate objective of the SGMA process and the utility of monitoring data generated by the CASGEM Program is for SEWD as the GSA to sustainably manage its groundwater resources; while protecting existing surface water and groundwater rights within its boundaries. The structured approach required by the SGMA process will provide SEWD with the authority it needs to continue improving its conjunctive management of surface water, and groundwater in its service area under increasing uncertainty of future hydrologic conditions in the state (e.g., long-term droughts, climate change impacts).

3.2 Stages of Actions

Riparian right users have first call on up to 13,000 acre-feet of water from New Hogan Reservoir. Through contract, the urban area is guaranteed 20,000 acre-feet, if supplies are available. Water is then allocated to all other surface water users. The agricultural water shortage plan for dry year or drought conditions is described below.

As Water Master of New Hogan Reservoir, SEWD assesses the water supply by April of each year. A sufficient volume to supply enough water for a full irrigation season is 152,000 – 161,000 acre-feet. SEWD generally has sufficient water to withstand two to three dry years. If a water year has been identified as a dry year, SEWD asks its customers for voluntary reductions in use. If a second subsequent year is identified as a dry year, SEWD still requests voluntary reductions, but identifies these reductions as critical. A third subsequent dry year may result in continued voluntary reductions, or may require mandatory reductions—SEWD makes this determination at the beginning of the water year. The District informs its customers of the available water supply, and any need for reductions, through its newsletter, as well as postcard reminders and the SEWD website. A final option is to allow diversions only by riparian users and the water treatment plant.

In all water years, SEWD requests that its customers call the District in advance of diverting water, so that SEWD can adjust releases at the dam. Customers are asked to provide the following information 24 hours in advance of the diversion: location of diversion, name of owner or operator, beginning diversion time, pumping rate, and ending diversion time. In non-dry years, this request is voluntary. In dry years, the advance notice is mandatory, and the district may enforce penalties on customers who do not advise the district prior to their water use. The postcard reminds customers of this penalty.

3.3 Operational Adjustments

The mission of SEWD is the management and protection of the groundwater supplies, and to provide a reliable supply of surface water to its urban and agricultural customers. SEWD attempts to achieve those goals by managing the surface water and groundwater supplies in its service area conjunctively.

During water years when surface water supplies from the New Hogan and New Melones reservoirs are ample, SEWD encourages its agricultural customers to purchase surface water to meet their irrigation demands in lieu of pumping groundwater (in-lieu recharge). SEWD has also promoted the use of surface water by expanding its conveyance system into areas of its service area where farmers traditionally pump groundwater. By using available surface water instead of pumping, farmers conserve the groundwater in storage that will then be available for use in years of limited surface water supply. In addition to in-lieu recharge, groundwater recharge also occurs passively as seepage losses in unlined rivers and canals of the SEWD conveyance system and as intentional recharge in percolation basins located on SEWD property. Operationally, conjunctive use management takes advantage of abundant surface water supplies during wet water years to decrease groundwater use and increase groundwater recharge, so that increased groundwater reserves can be more heavily relied on in dry years, or during long-term drought when surface water supplies are chronically limited.

SEWD operates two intentional recharge projects in particular: the North Site Groundwater Recharge Basins Program and the Farmington Groundwater Recharge Program. The North Site Program consists of a 60-acre recharge site located adjacent to the Dr. Joe Waidhofer Water Treatment Plant (DJW WTP). The recharge site of the Farmington Program is located below the Farmington Dam and is also 60-acres in size. Between 2003 and 2015, SEWD has recharged 54,889 AF of surface water through these two programs. SEWD is currently planning to expand the North Site Program by the addition of a recently purchased 230-acre parcel located adjacent to DJ WTP. In addition, SEWD continues to seek willing landowners to volunteer the use of their land to expand the recharge activities of the Farmington Program.

In 2003, SEWD received a Proposition 13 Groundwater Recharge Storage Construction Grant for the Peters Pipeline portion of the Farmington Groundwater Recharge Program. The Peters Pipeline receives surface water from the Lower Farmington Canal (i.e., part of New Melones Water Conveyance System) and conveys it to the recharge site at DJW WTP. In dry years when surface water supplies are limited, the recharged groundwater can be pumped from the site and treated for use in the Stockton urban area. Also, to improve distribution efficiency, SEWD has installed a Supervisory Control and Data Acquisition system on its agricultural surface water conveyance system for the purpose of monitoring, and ultimately minimizing any spills or system end losses that could occur during any water year type.

Overall, the recharge programs (in-lieu, conveyance seepage losses, intentional recharge) and improvements in conveyance system distribution efficiency (spill reductions, Peters Pipeline) all contribute to improving the conjunctive management of surface water and groundwater supplies by SEWD.

3.4 Demand Management

SEWD makes available several programs to farmers that promote on-farm water conservation and water use efficiency. First, using grant funding from USBR, SEWD has provided on-farm irrigation and drainage system evaluations free to its customers, since 1999. The irrigation and drainage system evaluation program is voluntary, but is encouraged and supported by SEWD. Second, SEWD makes available real-time and normal irrigation scheduling and crop evapotranspiration (ET) information. A list of crops and crop evapotranspiration (ETc) values was compiled specifically for SEWD to provide growers with a resource for irrigation management. Third, SEWD currently offers a Surface Water Incentive Program. This program utilizes water pricing to encourage farmers to switch from pumping groundwater to meet their crop water demands to purchasing surface water from SEWD. While not directly lowering on-farm water use, farmers using surface water when available rather than pumping groundwater supports SEWD’s overall mission of protecting basin groundwater resources through conjunctive use management.

3.5 Alternative Water Supplies

The District provides surface water for both agricultural and urban uses, and encourages the continued expansion of surface water diversions instead of pumping groundwater for the benefit of the groundwater basin. By providing surface water for agricultural irrigation, the District supports a reliable water supply for a San Joaquin County’s agricultural industry.

From 1948 to 1963, SEWD focused its efforts on water resource planning by evaluating groundwater conditions and determining requirements for supplemental water. These intensive efforts on the part of SEWD and other local agencies resulted in the construction of New Hogan Dam in 1964. SEWD signed a contract for supplemental surface water with the United States Bureau of Reclamation in 1970. Also in 1970, SEWD and Calaveras County Water District signed a contract, which assigned SEWD 56.5 percent of the yield from New Hogan Reservoir.

In 1983, SEWD and the Central San Joaquin Water Conservation District contracted with USBR for annual allocations of 75,000 and 80,000 acre-feet (ac-ft), respectively, from New Melones Reservoir. Also in 1983, SEWD expanded its surface water irrigation capabilities by constructing the 12,000 gallons per minute Potter Creek Pump Facility to facilitate diversions from New Melones Reservoir. Construction of the New Melones Conveyance System, in anticipation of a new water supply from the New Melones Reservoir, was completed in 1994.

The New Melones Conveyance System, which supplies water to the Dr. Joe Waidhofer WTP, consists, sequentially, of a diversion structure at Goodwin Dam, the Goodwin Tunnel, the Upper Farmington Canal, Shirley Creek, Hoods Creek, Rock Creek, the Lower Farmington Canal, and Peters Pipeline to the existing 54-inch-diameter Bellota Pipeline, or to the 6-mile Peters Pipeline extension. A 78-inch-diameter section of Peters Pipeline extends 3 miles from the terminus of the Lower Farmington Canal to the existing 54-inch-diameter pipeline from Bellota to the WTP.

Under this Groundwater Recharge Storage Project, SEWD built a six-mile, 60-inch diameter extension to the Peters Pipeline. Construction on the Peters Pipeline Project was completed in 2006.

This extension provides water for agricultural irrigation, groundwater recharge, and drinking water treatment. In dry years, well water resulting from wet year recharge is pumped into the pipeline for use in the Stockton urban area. The availability of both the Bellota Pipeline and the Peters Pipeline extension gives SEWD redundancy and flexibility in supplying water to the Dr. Joe Waidhofer WTP. This conjunctive use project enables the treatment of a greater percentage of available surface water, and benefits the groundwater basin by banking water in-lieu of pumping it by the construction of the 6-mile extension to the Peters Pipeline.

Another project, The Farmington Groundwater Recharge Program is led by SEWD, in partnership with the Sacramento division of the US Army Corps of Engineers. SEWD created the Farmington Groundwater Recharge Program with the intent of replenishing the aquifer to help ensure future groundwater supply and protect against further saltwater intrusion. The program primarily benefits the regional aquifer, or groundwater basin. As the program is implemented, local groundwater availability and quality will also improve as aquifer levels stabilize. Water quality and abundance will also improve in the Calaveras River with the recharging of the groundwater aquifer.

The goal of the program is to recharge an average of 35,000 acre-feet of water annually into the Eastern San Joaquin Basin by (1) directly recharging surface water to the groundwater aquifer on 800 to 1,200 acres of land and, (2) increasing surface water deliveries in-lieu of groundwater pumping to reduce overdraft and establish a barrier to saline water intrusion. Spreading water on agricultural fields and other recharge basins provides seasonal migratory waterfowl habitat.

A network of agricultural wells is needed to pump stored surface water from recharge efforts and assure reliability of water supply in years when ample surface water is not available. Based on the hydrologic history of the region, more average to wet years occur than below average to critically dry years. Therefore, over the long-term, if the aquifer is recharged during all average to wet years, and groundwater pumping reliance is limited to below average to critically dry years, aquifer levels are expected to rise and stabilize.

The Farmington Groundwater Recharge Program identifies areas suitable for recharge and seasonal habitat development, evaluates recharge techniques, and conducts pilot recharge tests. SEWD is continuing to identify and develop new recharge sites for this phased program. Available surplus water from SEWD’s conveyance systems is diverted into recharge cells at the project site. Stored surface water would be pumped from the aquifer for agricultural, municipal, and industrial use.

3.6 Coordination and Collaboration

Through a web presence and several scheduled publications. SEWD coordinates and collaborates with its customers, and surrounding agencies. SEWD’s website contains contact information regarding District staff and programs along with links to support programs for agricultural water users. Specific publications that SEWD publishes include Water Supply Conditions, Dam Removal Schedule, Ag Report, Water Rates, High and Dry Book, useful links, and a newsletter.

The Water Supply conditions provides timely information regarding reservoir conditions at both New Hogan and New Melones. Information includes status of storage and projected storage as information becomes available. Irrigators in turn use this information to manage their use of water.

3.7 Revenue and Expenditures

Stockton East Water District charges on a per acre foot basis. As part of its rate structure, the District charges a higher rate for surface water than for ground water. Furthermore, the District has access for two surface water sources, which are New Melones and New Hogan Dam. During 2013 and 2014, the District's surface water supply was fairly constant despite the drought and thus revenues were also fairly constant.

However, in 2015, SEWD received zero allocation from New Melones Reservoir.. As a result, surface water deliveries were significantly reduced and consequently total revenues were adversely affected by as-much-as 23%.

The District's operational expenses have remained relatively constant, and ongoing maintenance is performed throughout the year for both surface water conveyance systems. From 2013 thru 2015, revenues have sufficiently covered operational expenses.

On an annual basis, the District evaluates the sufficiency of rates as-well-as possible increases under its enabling legislation and as otherwise required by California law. Therefore, the District will continue to monitor financial results to anticipate future necessary changes to its rate structure.

4 2013-2015 Water Supply and Demand Data

As required under Executive Order B-29-15

The following tables provide water supply and use information for SEWD for the period of 2013-2015. Table 1 is a rollup of supporting tables based on DWR's 2015 AWMP Guidebook.

Following Table 1 the supporting tables are listed in numeric order used by DWR.

Table 1. Water budget summary for 2013-2015.

Water Budget Summary (AF)			
Water Accounting	2013	2014	2015
1 Water Supplies (refer to Worksheet 47)	227,507	281,631	227,353
2 Water Uses/Demand (refer to Worksheet 44)	205,202	199,908	190,979

Worksheet 21. Agricultural Crop Data For 2013		
Crop	Total Acreage	Total Crop Water Needs (AF)
Walnut	25,169	70,472
Cherries	11,033	30,893
Vineyard	4,819	13,492
Tomatoes	1,168	3,271
Pasture	1,804	5,052
Apples	1,037	2,904
Corn	1,686	4,721
Other	8,139	21,155
TOTAL	54,855	151,960

Worksheet 21. Agricultural Crop Data For 2014		
Crop	Total Acreage	Total Crop Water Needs (AF)
Walnut	26,708	74,782
Cherries	11,021	30,858
Vineyard	5,174	14,486
Tomatoes	1,209	3,384
Pasture	1,760	4,928
Apples	1,013	2,837
Corn	1,487	4,164
Other	8,466	21,536
TOTAL	56,837	156,975

Worksheet 21. Agricultural Crop Data For 2015		
Crop	Total Acreage	Total Crop Water Needs (AF)
Walnut	28,142	78,797
Cherries	11,108	31,103
Vineyard	5,517	15,447
Tomatoes	1,415	3,962
Pasture	1,345	3,766
Apples	1,008	2,821
Corn	782	2,190
Other	8,796	22,822
TOTAL	58,113	160,909

Worksheet 24. Environmental Water Uses. not shown – no uses.
Worksheet 25. Recreational Water Uses. not shown – no uses.

Worksheet 26. Municipal/Industrial Water Uses (AF)				
Municipal/Industrial Entity	Representative Year	Planning Cycle		
		2013	2014	2015
Municipal Entity		46,087	37,600	2,513
		3,051	1,781	25,428
Industrial Entity				
TOTAL		49,138	39,381	27,941

Worksheet 27. Groundwater Recharge Water Uses (AF)				
Location/ Groundwater Basin	Method of Recharge	Planning Cycle		
		2013	2014	2015
Commitments/Dedicated	Percolation	4,104	3,552	2,129
TOTAL		4,104	3,552	2,129

Worksheet 28. Transfers and Exchanges Water Uses. not shown – no uses.
Worksheet 29. Other Water Uses. not shown – no uses.

Worksheet 40. Surface Water Supplies (AF)			
Source	2013	2014	2015
CVP Class 1 Contracts	8,037	8,235	143
Pre-1914 Rights			
SWP			
Local Surface Water	70,781	62,085	17,189
Upslope Drain Water			
Transfers & Exchanges			
Recycled Water			
Other [Identify]			
Total	78,818	70,320	17,332

Worksheet 41. Groundwater Supplies Summary For 2013-2015 (AF)						
	2013		2014		2015	
Month	Supplier	Customers	Supplier	Customers	Supplier	Customers
January					0	
February					0	
March					0	
April					0	
May					184	
June					206	
July					848	
August					949	
September					967	
October					1015	
November					972	
December					841	
sub-total		122,999		126,481	5982	140,357
Total	122,999		126,481		146,340	

Worksheet 42. Effective Precipitation Summary (AF)			
	Planning Cycle		
Month	2013	2014	2015
TOTAL	25,691	84,829	63,682

Worksheet 44. Quantify Water Use (AF)			
Water Use	2013	2014	2015
Crop Water Use (Worksheet 21)			
1 Crop Evapotranspiration	151,960	156,975	160,909
Conveyance & Storage System			
2 Leaching			
3 Cultural Practices			
4 Conveyance seepage			
5 Conveyance evaporation			
6 Conveyance operational spills			
7 Reservoir evaporation			
8 Reservoir seepage			
Environmental Use (Consumptive)			
9 Environmental use – wetlands (Worksheet 24)			
10 Environmental use – Other (Worksheet 24)			
11 Riparian vegetation (Worksheet 24)			
12 Recreational use (Worksheet 25)			
Municipal and Industrial			
13 Municipal (Worksheet 26)	49,138	39,381	27,941
14 Industrial (Worksheet 26)			
Outside the District			
15 Transfers or Exchanges out of the service area (Worksheet 28)			
Conjunctive Use			
16 Groundwater recharge (Worksheet 27)	4,104	3,552	2,129
Other (Worksheet 29)			
Subtotal	205,202	199,908	190,979

Worksheet 47. Quantify Water Supplies (AF)			
Water Supplies	Planning Cycle		
	2013	2014	2015
1 Surface Water (Worksheet 40)	78,818	70,320	17,332
2 Groundwater (Worksheet 41)	122,999	126,481	146,340
3 Annual Effective Precipitation (Worksheet 42)	25,691	84,829	63,682
4 Water purchases			
Subtotal	227,507	281,631	227,353

Attachment A

District Rules and Regulations

(see Attachment F from the 2014 USBR Plan; note Rule 139 repealed)

and

Revision of Rule 120

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RULE NO. 120
ADOPTED: 02/15/1977
REVISED: 06/24/2014

MANDATORY REQUIRED NOTICE TO DISTRICT BY OWNER OF DIVERSION OF STREAM DELIVERED WATER

Whereas, the Board of Directors hereby finds the necessity to revise Rule No. 120 by incorporating Rule No. 132 (Stream Diversion Call-In Rule; adopted 04/07/1986) and Rule No. 139 (Regulating Waste of Surface Water; adopted 04/21/1992) for the purpose of correcting contact information and outlining consequences for failure to follow mandatory notification procedures for the diversion of stream delivered water; and

Whereas, the Act authorizes the Board to make such Rules and Regulations as it deems necessary and proper for carrying out the provisions of the Act; and

NOW, THEREFORE, THE BOARD OF DIRECTORS OF THE STOCKTON EAST WATER DISTRICT HEREBY REVISES RULE NO. 120 AS FOLLOWS:

A. Mandatory Notification Required. Any person desiring to divert surface water provided by the District shall first inform the District at its office (6767 East Main Street, Stockton, California), at least forty-eight (48) hours prior to the start of such diversion. The District will receive such notice 7 days a week at the following numbers: Monday through Friday (8:00 a.m. to 5:00 p.m.) 209-948-0333; all other times, 209-469-3335 or online at www.sewd.net. The following information must be provided: name, phone number, pump ID number, diversion rate, beginning date/time, end date/time and run time.

B. The objective of Paragraph A is to avoid waste of water, which will cause loss of a valuable resource in limited supply, affecting the District and all other agricultural irrigators in the District, in an amount which cannot be accurately determined but shall be conclusively presumed to cause loss of $500 worth of water.

C. For the first such notification failure by any person, such person will be charged for $100 worth of water, and such amount will be added to such person's account with the District.

D. For the second such notification failure by any person, that person will be charged for $200 worth of water, and such amount will be added to such person's account with the District.

E. For the third and any subsequent such notification failure by any person, that person will be charged for the full $500 worth of water, conclusively presumed to be wasted, and such amount will be added to such person's account with the District.

F. Upon determination of any notification failure, the District shall notify the person who failed to follow this Rule.

G. The amount added to such person's account shall be collected as part of such person's account in the manner provided in the Act.

H. Any person charged under this Rule may appeal to the District's Board of Directors which may waive any charge imposed by this Rule, which would be inequitable under the circumstances the Board of Directors determines.

I. Diverters upon request of District shall provide District with a monthly irrigation plan to permit District to forecast irrigation demand. Diverters shall follow the plan as closely as possible.

J. Rule Nos. 102, 132 and 139 of this District are hereby repealed.

ATTACHMENT E.2.

Urban Water Shortage Contingency Plan

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Urban Water Shortage Contingency Plan

STOCKTON EAST WATER DISTRICT
URBAN WATER SHORTAGE CONTINGENCY PLAN

Section 1 - Coordinated planning

Stockton East Water District was formed in 1948 under the 1931 Water Conservation Act of the State of California. In 191, the District was granted additional powers to acquire a supplemental water supply and to promote water use practices leading to a balance between surface water and ground water use.

In 1964 with the completion of New Hogan Reservoir on the Calaveras River, the District signed an Interim Contract with the U.S. Bureau of Reclamation for use of New Hogan Water for Agricultural irrigation. In 1970 Permanent Contracts with the U.S. Bureau of Reclamation and Calaveras County Water District were signed for the safe yield of New Hogan Reservoir. These Contracts provide the District with 56.5% and Calaveras County Water District with 43.5% of the normal year 84,100 AF safe yield of New Hogan Reservoir.

In 1977 the District completed construction of a 30 MGD Water Treatment Plant and entered into a contract with the City of Stockton, California Water Service Company, Lincoln Village County Maintenance District and Colonial Heights County Maintenance District for the use of treated surface water. This Contract is for a minimum annual delivery of 20,000 AF during normal years.

In 1983 the District entered into a contract with the U.S. Bureau of Reclamation for 75,000 AF of Interim water from New Melones Reservoir on the Stanislaus River. 40,000 AF have been designated for urban use with the rest to be used for agricultural irrigation. The District is now in the final construction phase of a $60 million Conveyance Project to convey New Melones water to the District.

The District's governing board consists of 7 directors elected at large to represent 7 Divisions within the District. The Board of Directors holds meetings on the first and third Tuesdays of each month.

The District encompasses a land area of approximately 115,000 acres and includes a population of 250,000. Normal year urban water demands are 65,000 AF and agricultural demands are 225,000 AF.

Stockton Area Water Suppliers (SAWS) was formed as an association of Stockton urban area retail water suppliers and Stockton East Water District. SAWS members include Stockton East Water District, City of Stockton Water Utility District, San Joaquin County (representing Lincoln and Colonial Heights Maintenance

Districts) and the California Water Service Company, an investor-owned utility. SAWS members meet regularly to discuss water related matters, including water supply, use, conservation and the development of water shortage contingency plans. SAWS members consulted during the preparation of Urban Water Shortage Contingency Plans for the City of Stockton, the California Water Service Company and Stockton East Water District.

Section 2 - Past, Current and Projected Water Use

The District as stated above, wholesales delivery of a normal year minimum of 20,000 AF of treated surface water. The amounts delivered to each of 4 retailers is based on the percentage of total water used (well and surface) in each retailer area during the previous year. The current year percentage and amount entitlements are as follows:

City of Stockton	35.6%	=	7,120 AF
Lincoln Village Maintenance District	2.6%	=	520 AF
Colonial Heights Maintenance District	1.0%	=	200 AF
California Water Service Company	60.6%	=	12,160 AF

Upon completion of the New Melones Water Conveyance Project (expected during the spring of 1993), an additional 40,000 AFA of treated water will be available to the retailers.

Section 3 - Worst Case Water Supply Availability for 12, 24, and 36 Months

New Hogan Reservoir has a capacity of 317,000 AF; however, due to the need to operate under flood control criteria, the average long term conservation yield to the District is approximately 84,100 AF. This yield is divided between M&I users and agricultural users. The first 13,000 AF of yield is available to water rights holders and the next 20,000 AF are contractually committed to the treatment plant. An additional 52,000 AF is needed to meet normal year agricultural demands. Any additional available yield above 72,000 AF is normally used for M&I purposes.

Since the treatment plant began operating in March 1977, there have been two drought periods when deliveries of treated water had to be curtailed. Annual deliveries have ranged from as low as 5,000 AF in 1977 to 29,000 AF in 1986.

The District policy has been to provide as much treated surface water to the urban area as possible because of the danger of saline intrusion into the groundwater basin from the Delta. It is estimated that the groundwater basin is being over-drafted 30,000 AF during a normal year. Any deficiencies in treated water deliveries from the treatment plant are reflected in additional groundwater pumping by the contractors to make up the difference.

In addition to New Hogan Reservoir, the District has contracted for 75,000 AF of interim water from New Melones Reservoir. This water, when it is available, will be used to reduce groundwater pumping within the District.

Section 4 - Stages of Action

The District coordinates on a regular basis with the urban area Contractors for the delivery of treated surface water. The District can only deliver what is available. The balance has to be made up by the Contractors from groundwater pumping. The District coordinates and supports the urban area retailers in developing voluntary and mandatory rationing.

Section 5 - Mandatory Prohibitions on Water Use

The District is a wholesaler only of treated water and has no authority over mandatory prohibitions on water use. The District does coordinate with and support the efforts of the urban area retailers.

Section 6 - Consumption Limits in the Most Restrictive Stages

Same response as Section 5

Section 7 - Penalties or Charges for Excessive Use

Same response as Section 5

Section 8 - Revenue and Expenditure Analysis

Each year a budget is adopted at a public hearing to determine the amount of revenue needed from the Contractors to meet treatment plant related expenses for the succeeding year. Revenue requirements are adjusted for over or under collection from the previous year which are generally related to the amount of water treated.

Section 9 - Monitoring mechanisms

Same response as Section 5

Section 10 - Public Noticing and Adoption

On 1/21/92 the District Board of Directors voted unanimously to endorse the City of Stockton and California Water Service Company Plans, made a firm commitment to continue to monitor groundwater levels in the urban area, and to cooperate with the retailers to determine groundwater pumping patterns which will provide for maximum protection against saline intrusion.

Section 7

Water Shortage Contingency Planning

This section describes the City's water shortage contingency planning process and how the City responds to water shortages. The City's water shortage contingency plan consists of the City's adopted Water Conservation Ordinance (1988) and Water Shortage Emergency Ordinance (1991) in the City Municipal Code Section 13.28, provided in Appendix G.

7.1 Stages of Action

The City will implement an appropriate water shortage contingency stage based on the City's water supply conditions, as listed for the five stages defined in Table 7-1. Approximately three months prior to the beginning of the water year the City will know its expected purchased water and surface water supplies. Based on the total normal year availability of those supplies combined with the City's groundwater supply the City will determine what water supply stage will apply during the year. Other conditions such as statewide water supply conditions, Governor's executive orders, and actions by surrounding agencies could also have an impact on the stage determined by the City.

Table 7-1. (DWR Table 8-1) Retail: Stages of Drought Contingency Plan			
Stage	Target conservation (water savings)	Percent supply reduction (numerical value as a percentage) [a]	Water supply condition
Stage 1 Mandatory Water Conservation	10%	45 to 50%	• WID, Delta, and/or North wells capacity reduction • DWSP issues • Intake structure issues • SEWD and /or South wells capacity reduction
Stage 2 Water Shortage Emergency	20%	50 to 55%	• WID, Delta, and/or North wells capacity reduction • DWSP issues • Intake structure issues • SEWD and /or South wells capacity reduction
Stage 3 Water Shortage Emergency	30%	55 to 60%	• WID, Delta, and/or North wells capacity reduction • DWSP issues • Intake structure issues • SEWD and /or South wells capacity reduction
Stage 4 Water Shortage Emergency	40%	60 to 65%	• WID, Delta, and/or North wells capacity reduction • DWSP issues • Intake structure issues • SEWD and /or South wells capacity reduction
Stage 5 Water Shortage Emergency	50%	65 to 70%	• WID, Delta, and/or North wells capacity reduction • DWSP issues • Intake structure issues • SEWD and /or South wells capacity reduction

[a] *Percent supply reduction is based on the current normal year supplies and target conservation of 2020 demands.*

7.2 Prohibitions on End Uses

The City's water shortage contingency plan includes mandatory prohibitions on water uses. DWR categorizes the types of restrictions and prohibitions as landscape irrigation, commercial/ institutional/ industrial (CII), water features and swimming pools, and other. A summary of the City's restrictions and prohibitions are provided in Table 7-2.

Table 7-2. (DWR Table 8-2)
Restrictions and Prohibitions on End Uses

Stage	Restrictions and prohibitions to end users (from drop down list)	Additional explanation	Penalty, charge, or other enforcement?
All stages	Landscape - Restrict or prohibit runoff from landscape irrigation		Warning, surcharge, disconnection (See Section7.3)
2,3,4,5	Landscape - Limit landscape irrigation to specific times and days	Prohibit/ restrict landscape irrigation except by drip or mist systems From May 1 through November 1 irrigation is prohibited during specific hours and days	Warning, surcharge, disconnection (See Section7.3)
2,3,4,5	Landscape - Other landscape restriction or prohibition	Prohibit irrigation runoff or waste at all times	Warning, surcharge, disconnection (See Section7.3)
All stages	CII - Restaurants may only serve water upon request	CII water use prohibitions are requested in State 1 and enforced in Stage 2 and later. In all stages from May 1 to November 1 restaurant owners are not to serve water unless requested by the customer.	Warning, surcharge, disconnection (See Section7.3)
All stages	Water Features - Restrict water use for decorative water features, such as fountains	Use of water in ornamental fountains in public and commercial establishments shall be prohibited unless the water is recirculated.	Warning, surcharge, disconnection (See Section7.3)
All stages	Pools - Allow filling of swimming pools only when an appropriate cover is in place	It is prohibited in all stages to drain or refill existing swimming pools, except for protection of public health and safety.	Warning, surcharge, disconnection (See Section7.3)
All stages	Other - Customers must repair leaks, breaks, and malfunctions within 48 hours		Warning, surcharge, disconnection (See Section7.3)
All stages (May 1 to Nov 1)	Other - Require automatic shut off hoses	In all stages customers must use automatic shutoff hose nozzles and repair leaks, breaks, and malfunctions in a timely manner.	Warning, surcharge, disconnection (See Section7.3)
2, 3, 4, 5	Other - Prohibit use of potable water for construction and dust control	In stages 2, 3, 4, and 5, water use for dust control is prohibited.	Warning, surcharge, disconnection (See Section7.3)
2, 3, 4, 5	Other	Use of potable water from any fire hydrant for use other than suppression purposes or with permit	Warning, surcharge, disconnection (See Section7.3)

7.3 Penalties, Charges, Other Enforcement

Whenever the City becomes aware of a person violating, causing, or permitting a violation of the prohibitions presented in Table 7-2, a notice shall be provided that describes the nature of the violation and order that said violation be corrected within a stated period. Upon occurrence of a second violation or failure to correct the initial violation, a second notice shall be served ordering immediate correction and imposing a surcharge of $100 per day for each day the violation continues. The Director may issue an order to cease and desist until appropriate remedial actions are taken. A violation shall constitute an offense in addition to surcharges and disconnection procedure.

7.4 Consumption Reduction Methods

Consumption reduction methods are actions taken by the City to reduce water demand within the service area, whereas prohibitions, addressed in Section 7.2 limit specific uses of water. All connections in the City service area are metered. Actual reductions in water use can be monitored as necessary to achieve the goals of the demand reduction program implemented during water shortages. During Stage 1 the City increases its public outreach and drought awareness in order to communicate voluntary (Stage 1) and mandatory (Stages 2, 3, and 4) reduction targets to retail customers.

Table 7-3 summarizes the City's consumption reduction methods to reduce water demand in the service area.

Table 7-3. (DWR Table 8-3) Retail Only: Stages of Water Shortage Contingency Plan - Consumption Reduction Methods

Stage	Consumption reduction methods by water supplier ***Drop down list*** *These are the only categories that will be accepted by the WUE data online submittal tool*	Additional explanation or reference *(optional)*
1	Expand public information campaign	
1	Offer water use surveys	
2	Decrease line flushing	
1	Reduce water system loss	
2	Implement or modify drought rate structure or surcharge	In process

7.5 Determining Water Shortage Reductions

Since the COSMUD service area is fully metered, reductions in water use can be quantified and compared with previous years' water use.

7.6 Revenue and Expenditure Impacts

The City maintains an adequate operational reserve to protect against a temporary water shortage. The City is in the process of developing a drought rate structure. The City's proposed updated rate structure includes a schedule of drought rates. The goal of drought rates is to recover the temporary loss of revenue due to reduction of water sales during a period of drought. The City Council adopted a resolution approving a Proposition 218 Public Notice and Protest Hearing to occur in June 2016.

7.7 Resolution or Ordinance

The City's water shortage contingency plan consists of the City's adopted Water Conservation Ordinance (1988) and Water Shortage Emergency Ordinance (1991) in the City Municipal Code Section 13.28, provided in Appendix G.

7.8 Catastrophic Supply Interruption Plan

Water shortage emergency response is coordinated with the County's Advisory Water Commission. Actions to be taken in the event of loss of water facilities are incorporated into the City's Emergency Plan. The City's response planning includes the use of standby generators, water purification supplies and equipment, emergency drinking water storage, and water trucks. Water storage, treatment, and pumping facilities have been constructed to meet earthquake safety standards and are inspected regularly. The City has entered into a Memorandum of Understanding (MOU) with Cal WARN for mutual aid and assistance during times of emergency.

7.9 Three-Year Minimum Water Supply

An estimate of the minimum water supply for 2016, 2017, and 2018 is based on the combined availability of all water sources available during the City's historical multiple-dry year sequence, 2013, 2014, and 2015.

Table 7-4. (DWR Table 8-4) Retail: Three-Year Minimum Water Supply, ac-ft/yr

	2016	2017	2018
Available water supply	69,200	69,200	65,200

Chapter 8
Water Shortage Contingency Planning

This chapter describes the water shortage contingency plan for the Stockton District. The water shortage contingency plan includes the stages of response to a water shortage, such as a drought, that occur over a period of time, as well as catastrophic supply interruptions which occur suddenly. The primary objective of the water shortage contingency plan is to ensure that the District has in place the necessary resources and management responses needed to protect health and human safety, minimize economic disruption, and preserve environmental and community assets during water supply shortages and interruptions.

Rule 14.1, as filed with the California Public Utilities Commission (CPUC), serves as Cal Water's Water Shortage Contingency Plan (WSCP) and includes Mandatory Staged Restrictions of Water Use. In the event that more stringent measures are required, Cal Water may request the addition of Schedule 14.1 which includes Staged Mandatory Water Use Reductions.

On April 1, 2016, Cal Water filed its current Schedule 14.1 with the California Public Utilities Commission (CPUC).[9] The Schedule lays out the staged mandatory reductions and drought surcharges associated with Cal Water's Water Shortage Contingency Plan. This filing is consistent with Resolution W-5034, adopted by the Commission on April 9, 2015, ordering compliance with requirements of the State Water Resources Control Board (SWRCB).

Schedule 14.1 is an extension of the Water Shortage Contingency Plan provided in Rule 14.1. The information presented in this chapter, is based on the current versions of both Rule 14.1 and Schedule 14.1 which are based, in part, on the specific SWRCB requirements associated with the Governor's Executive Order requiring statewide cutbacks to address the unprecedented drought.

8.1 Stages of Action

Table 8-1 defines the four stages of action in Cal Water's WSCP.

[9] Schedule 14.1, along with the underlying Cal Water Rule 14.1 are included as Appendix J.

Table 8-1 Retail: Stages of WSCP		
Stage	Complete One or Both	
	Percent Supply Reduction[1]	Water Supply Condition
	numerical value as percent	*narrative description*
1	Up to 10%	Minimal shortage
2	Up to 20%	Moderate shortage
3	Up to 35%	Severe shortage
4	Greater than 35%	Critical shortage
[1] *One stage in the WSCP must address a water shortage of 50%.*		

8.2 Prohibitions on End Uses

Except where necessary, to address an immediate health or safety need, or to comply with a term or condition in a permit issued by a state or federal agency, customers are prohibited, at all times, from using potable water for the following actions, as each is declared a non-essential, wasteful use of water:

1. Use of potable water through a broken or defective plumbing fixture or irrigation system when Cal Water has notified the customer in writing to repair the broken or defective plumbing fixture or irrigation system, and the customer has failed to effect such repairs within seven (7) business days of receipt of such notice;

2. The application of potable water to landscapes in a manner that causes runoff such that water flows onto adjacent property, non-irrigated areas, private and public walkways, roadways, parking lots, or structures; and,

3. The use of a hose that dispenses potable water to wash vehicles, including cars, trucks, buses, boats, aircraft, and trailers, whether motorized or not, except where the hose is fitted with a shut-off nozzle or device attached to it that causes it to cease dispensing water immediately when not in use.

Restrictions of water use by Stage of the Water Shortage Contingency Plan are included in Table 8-2.

Table 8-2 Retail: Restrictions and Prohibitions on End Uses			
Stage	Restrictions and Prohibitions on End Users	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement?
1	Landscape - Limit landscape irrigation to specific days	Limited to no more than 3 days per week	Yes
1	Landscape - Limit landscape irrigation to specific times	Limited to 8 am and 6pm	Yes
1	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Must be repaired within 5 business days	Yes
1	Landscape - Restrict or prohibit runoff from landscape irrigation		Yes
1	Landscape - Other landscape restriction or prohibition	Prohibit application of potable water to outdoor landscapes within 48 hours of measurable rainfall.	Yes
1	Other - Require automatic shut off hoses		Yes
1	Other - Prohibit use of potable water for washing hard surfaces		Yes
1	Other	Limits filling ornamental lakes or ponds; prohibit use of potable water in a water feature except where the water is recirculated	Yes
2	Landscape - Limit landscape irrigation to specific days	Limited to no more than 3 days per week	Yes
2	Landscape - Limit landscape irrigation to specific times	Limited to 8 am and 6pm	Yes
2	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Must be repaired within 3 business days	Yes
2	Landscape - Restrict or prohibit runoff from landscape irrigation		Yes
2	Landscape - Other landscape restriction or prohibition	Prohibits irrigation of ornamental turf on public street medians with potable water; prohibit application of potable water to outdoor	Yes

Table 8-2 Retail: Restrictions and Prohibitions on End Uses			
Stage	Restrictions and Prohibitions on End Users	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement?
		landscapes within 48 hours of measurable rainfall.	
2	CII - Lodging establishment must offer opt out of linen service		Yes
2	CII - Restaurants may only serve water upon request		Yes
2	Other - Require automatic shut off hoses		Yes
2	Other - Prohibit use of potable water for washing hard surfaces		Yes
2	Other	Limits filling ornamental lakes or ponds; prohibit use of potable water in a water feature except where the water is recirculated	Yes
3	Landscape - Limit landscape irrigation to specific days	Limited to no more than 2 days per week	Yes
3	Landscape - Limit landscape irrigation to specific times	Limited to 8 am and 6pm	Yes
3	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Must be repaired within 2 business days	Yes
3	Landscape - Restrict or prohibit runoff from landscape irrigation		Yes
3	Landscape - Other landscape restriction or prohibition	Prohibits irrigation of ornamental turf on public street medians with potable water; prohibit application of potable water to outdoor landscapes within 48 hours of measurable rainfall.	Yes
3	CII - Lodging establishment must offer opt out of linen service		Yes
3	CII - Restaurants may only serve water upon request		Yes

Table 8-2 Retail: Restrictions and Prohibitions on End Uses			
Stage	Restrictions and Prohibitions on End Users	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement?
3	Other - Require automatic shut off hoses		Yes
3	Other - Prohibit use of potable water for washing hard surfaces	Prohibits use of potable water for street cleaning with trucks except for initial wash-down for construction purposes if street sweeping is not feasible	Yes
3	Other	Limits filling ornamental lakes or ponds; prohibit use of potable water in a water feature except where the water is recirculated	Yes
3	Other - Prohibit use of potable water for construction and dust control	Prohibited unless no other method or source of water can be used	Yes
4	Landscape - Prohibit all landscape irrigation	Prohibited except with hand-held bucket nozzle to maintain trees and shrubs.	Yes
4	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Must be repaired within 1 business day	Yes
4	Landscape - Restrict or prohibit runoff from landscape irrigation		Yes
4	CII - Lodging establishment must offer opt out of linen service		Yes
4	CII - Restaurants may only serve water upon request		Yes
4	Other - Require automatic shut off hoses		Yes
4	Other - Prohibit use of potable water for washing hard surfaces	Prohibits use of potable water for street cleaning with trucks	Yes
4	Other	Limits filling ornamental lakes or ponds; prohibit use of potable water in a	Yes

Table 8-2 Retail: Restrictions and Prohibitions on End Uses			
Stage	Restrictions and Prohibitions on End Users	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement?
		water feature except where the water is recirculated	
4	Other - Prohibit use of potable water for construction and dust control	No exceptions	Yes

8.3 Penalties, Charges, Other Enforcement of Prohibitions

In accordance with Rule 14.1, Cal Water is authorized to take the following actions to enforce restrictions of water use that are in effect:

First Violation: Cal Water shall provide the customer with a written notice of violation.

Second Violation: If Cal Water verifies that the customer has used potable water for non-essential, wasteful uses after having been notified of the first violation, Cal Water shall provide the customer with a second written notice of violation and is authorized to install a flow-restricting device on the customer’s service line.

If Schedule 14.1 is implemented, Cal Water is authorized to take the following actions when its personnel verify a customer is using potable water for non-essential, wasteful uses.

First Violation: Cal Water shall provide the customer with a written notice of violation. In addition, Cal Water is authorized to take the following actions:

A. If the customer currently receives service through a metered connection, install a real-time water measurement device on the customer’s service line and provide the customer with access to information from the device. The cost of the device, including installation and ongoing operating costs, may be billed to the customer, and nonpayment may result in discontinuance of service.

B. If the customer does not currently receive service through a metered connection, install a water meter on the customer’s service line, charge the customer for water use pursuant to Cal Water’s metered service tariffs and rules, and install a real-time water measurement device on the customer’s service line and provide the customer with access to information from the device. The cost of the device, including installation and ongoing operating costs, may be billed to the customer, and nonpayment may result in discontinuance of service.

Second Violation: If Cal Water verifies that the customer has used potable water for non-essential, wasteful uses after having been notified of the first violation, Cal Water shall provide the customer with a second written notice of violation. In addition to the actions prescribed under the first violation above, Cal Water is authorized to take the following actions:

A. Apply the following waste of water penalties, which are in addition to any other charges authorized by this Schedule or other Cal Water tariffs.

   i. If Stage 1 is in effect, $25
   ii. If Stage 2 is in effect, $50
   iii. If Stage 3 is in effect, $100
   iv. If Stage 4 is in effect, $200

B. At its sole discretion, waive the waste of water penalty if the customer participates in a water use evaluation provided by Cal Water and/or provides documentation to Cal Water proving that a drip irrigation system, micro spray irrigation system, high-efficiency sprinkler system, or properly programmed smart irrigation controller has been installed, after a notice of violation was delivered, and is in use at the customer's service address.

Third Violation: If Cal Water verifies that the customer has used potable water for non-essential, wasteful uses after having been notified of the second violation, Cal Water shall provide the first and second violations above, Cal Water is authorized to take the following actions:

A. Apply the following waste of water penalties, which are in addition to any other charges authorized by this Schedule or other Cal Water tariffs.

   i. If Stage 1 is in effect, $50
   ii. If Stage 2 is in effect, $100
   iii. If Stage 3 is in effect, $200
   iv. If Stage 4 is in effect, $400

B. At its sole discretion, waive the waste of water surcharge if the customer participates in a water use evaluation provided by Cal Water and/or provides documentation to Cal Water proving that a drip irrigation system, micro spray irrigation system, high-efficiency sprinkler system, or properly programmed smart irrigation controller has been installed, after notice of violations have been delivered, and is in use at the customer's service address.

Fourth Violation: If Cal Water verifies that the customer has used potable water for non-essential, wasteful uses after having been notified of the third violation, Cal Water shall provide the customer with a fourth written notice of violation. In addition to actions set forth in previous violations prescribed above, Cal Water is authorized to install a flow-restricting device on the customer's service line.

Egregious Violations: Notwithstanding the foregoing framework for penalties, customers who Cal Water has verified are egregiously using potable water for non-essential, wasteful uses are subject to having a flow- restricting device installed on their service line. After providing the customer with one notice of egregious violation, either by direct mail or door hanger, which documents the egregious use of potable water for non-essential, wasteful uses and explains that failure to correct the violation may result in the installation of a flow-restricting device on the customer's service line, Cal Water is authorized to install a flow-restricting device on the customer's service line.

DROUGHT SURCHARGES

Cal Water may elect to implement actions such as water budgets with associated surcharges through the implementation of Schedule 14.1. An example of such a program is included in Appendix J.

8.4 Consumption Reduction Methods by Agencies

Table 8-3 Retail: Stages of WSCP - Consumption Reduction Methods		
Stage	Consumption Reduction Methods by Water Supplier	Additional Explanation or Reference *(optional)*
2	Expand Public Information Campaign	
2	Offer Water Use Surveys	Offered as part of standard conservation program. Will expand as needed to achieve additional savings.
2	Provide Rebates or Giveaways of Plumbing Fixtures and Devices	Offered as part of standard conservation program. Will expand as needed to achieve additional savings.
2	Provide Rebates for Landscape Irrigation Efficiency	Offered as part of standard conservation program. Will expand as needed to achieve additional savings.
2	Decrease Line Flushing	

Table 8-3 Retail: Stages of WSCP - Consumption Reduction Methods		
Stage	Consumption Reduction Methods by Water Supplier	Additional Explanation or Reference *(optional)*
2	Reduce System Water Loss	
2	Increase Water Waste Patrols	
2	Other	Mandatory water budgets and banking--Water budgets will be based on a customer's consumption during a historical base period and will include a percentage reduction designed to meet necessary water-use reductions.
2	Implement or Modify Drought Rate Structure or Surcharge	Drought surcharges charged to customers for each unit of water used over the established water budget for the billing period. For Stage 2 surcharges are two times the highest residential tier rate, with exceptions discussed in Section 8.3
3	Expand Public Information Campaign	
3	Offer Water Use Surveys	Offered as part of standard conservation program. Will expand as needed to achieve additional savings.
3	Provide Rebates or Giveaways of Plumbing Fixtures and Devices	Offered as part of standard conservation program. Will expand as needed to achieve additional savings.
3	Provide Rebates for Landscape Irrigation Efficiency	Offered as part of standard conservation program. Will expand as needed to achieve additional savings.
3	Decrease Line Flushing	
3	Reduce System Water Loss	
3	Increase Water Waste Patrols	
3	Other	Mandatory water budgets and banking
3	Implement or Modify Drought Rate Structure or Surcharge	Drought surcharges charged to customers for each unit of water used over the established water budget for the billing period.
4	Expand Public Information Campaign	
4	Offer Water Use Surveys	Offered as part of standard conservation program. Will expand as needed to achieve additional savings.

Table 8-3 Retail: Stages of WSCP - Consumption Reduction Methods		
Stage	Consumption Reduction Methods by Water Supplier	Additional Explanation or Reference *(optional)*
4	Provide Rebates or Giveaways of Plumbing Fixtures and Devices	Offered as part of standard conservation program. Will expand as needed to achieve additional savings.
4	Provide Rebates for Landscape Irrigation Efficiency	Offered as part of standard conservation program. Will expand as needed to achieve additional savings.
4	Decrease Line Flushing	
4	Reduce System Water Loss	
4	Increase Water Waste Patrols	
4	Other	Mandatory water budgets and banking
4	Other	Mandatory water budgets and banking
4	Implement or Modify Drought Rate Structure or Surcharge	Drought surcharges charged to customers for each unit of water used over the established water budget for the billing period.
NOTES: The actions included may be implemented through a combination of Rule 14.1 and Schedule 14.1 and would be evaluated based on specific need.		

8.5 Determining Water Shortage Reductions

All customers in the District are metered. The metered demands will be used to monitor reductions that result from actions taken by Cal Water when implementing its WSCP.

8.6 Revenue and Expenditure Impacts

In 2008 the CPUC allowed for the creation of a Water Revenue Adjustment Mechanism (WRAM) and Modified Cost Balancing Accounts (MCBA). The goals of the WRAM and MCBA are to sever the relationship between sales and revenue to remove the disincentive to reduce water use. The WRAM and MCBA are designed to be revenue neutral in order to ensure that both the utility and ratepayers are neither harmed nor benefitted.

During the current drought, the CPUC authorized a memorandum account through Resolution W-4976 to track incremental drought-related costs and waste of water penalties which may be recovered through rates if deemed appropriate by the Commission.

8.7 Resolution or Ordinance

Cal Water is an investor-owned water utility that is regulated by the California Public Utilities Commission (CPUC). As such, it does not have the authority to adopt resolutions or ordinances. As described above, Rule 14.1, as filed with the California Public Utilities Commission (CPUC), serves as Cal Water's Water Shortage Contingency Plan and includes Mandatory Staged Restrictions of Water Use. In the event that more stringent measures are required, Cal Water may request the addition of Schedule 14.1 which includes Staged Mandatory Water Use Reductions. Cal Water will work with local planning and enforcement departments to ensure consistency with local resolutions and ordinances.

8.8 Catastrophic Supply Interruption

Cal Water has an Emergency Response Plan (ERP) in place that coordinates the overall company response to a disaster in any or all of its districts. In addition, the ERP requires each District to have a local disaster plan that coordinates emergency responses with other agencies in the area.

Cal Water also inspects its facilities annually for earthquake safety. To prevent loss of these facilities during an earthquake, auxiliary generators and improvements to the water storage facilities have been installed as part of Cal Water's annual budgeting and improvement process.

During an emergency the District can transfer water through four interconnections to or from the neighboring water system owned by the City of Stockton. These interconnections can be used to help offset the impact of interrupted service to District customers or, being two way connections, these facilities can be used to supply either imported water or pumped groundwater from the Stockton District to the City of Stockton water system.

SEWD has emergency backup power generators and will be able to supply normal amounts of finished water with their boosters through the 42" transmission main. Cal Water also has backup generators and auxiliary engines at well sites throughout the service area. These will be able to supply 9.2 MGD if a system-wide power failure occurs. An additional backup generator is budgeted for 2010. These facilities are routinely tested, maintained, and replaced when needed. Cal Water is in process of installing additional backup generators at several sites to more adequately meet the system demand in the event of a widespread outage.

8.9 Minimum Supply Next Three Years

Table 8-4 provides estimates of total supply volumes that would be produced if the hydrology of the multi-year drought period discussed in Chapter 7 were to occur in the immediate future. These volumes are equal to the projected 2020 supplies in Table 7-4. Since District near-term supplies over a multi-year dry period are projected to be at least sufficient to serve demands, it is likely that current supply sources could produce more water. Cal Water does not have sufficient information to estimate how much more.

Table 8-4 Retail: Minimum Supply Next Three Years			
	2016	2017	2018
Available Water Supply	30,990	29,465	30,883

ATTACHMENT F

Groundwater Management Plan

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ATTACHMENT F.1.

Eastern San Joaquin Groundwater Subbasin Groundwater Sustainability Plan

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EASTERN SAN JOAQUIN GROUNDWATER AUTHORITY

Eastern San Joaquin
Groundwater Subbasin

GROUNDWATER SUSTAINABILITY PLAN

PUBLIC DRAFT
JULY 2019

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Eastern San Joaquin Groundwater Subbasin

Draft Groundwater Sustainability Plan: Complete Executive Summary and Main Report

Prepared by:

July 2019

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Acronyms

µg/L	micrograms per liter
1,2,3-TCP	1,2,3-Trichloropropane
AB	Assembly Bill
ACS	American Community Survey
AF	acre-feet
AF/day	acre-feet per day
AF/year	acre-feet per year
ALOS	Advanced Land Observing Satellite
AMI	Advanced Metering Infrastructure
AWMPs	Agricultural Water Management Plans
B.P.	before present
bgs	below ground surface
BMP	best management practice
BTEX	benzene, toluene, ethylbenzene, and xylenes
Cal Water	California Water Services Company Stockton District
California State Parks	California Department of Parks and Recreation
CALSIMETAW	California Simulation of Evapotranspiration of Applied Water
CASGEM	California Statewide Groundwater Elevation Monitoring
CCR	Consumer Confidence Reporting
CCWD	Calaveras County Water District
CDEC	California Data Exchange Center
CDFW	California Department of Fish and Wildlife
CDPH	California Department of Public Health
CDPR	California Department of Pesticide Regulation
CDPs	census designated places
CEDEN	California Environmental Data Exchange Network
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CGPF	CalSim II Generated Perturbation Factors
CGPS	continuously operating Global Positioning System
CNRA	California Natural Resources Agency
CSJWCD	Central San Joaquin Water Conservation District
CVFPB	Central Valley Flood Protection Board
CVRWQCB	Central Valley Regional Water Quality Control Board
CV-SALTS	Central Valley Salinity Alternatives for Long-Term Sustainability
CWC	California Water Code
DACs	Disadvantaged Communities
DDW	Division of Drinking Water
DER	Department of Environmental Resources
DFW	Department of Fish and Wildlife
DMS	data management system
DOGGR	Division of Oil, Gas, and Geothermal Resources
DPR	Department of Pesticide Regulations
DTSC	Department of Toxic Substances Control
DWR	Department of Water Resources
EBMUD	East Bay Municipal Utility District
EC	electrical conductivity
EPA	Environmental Protection Agency
ERTs	Encoder Receiver Transmitters

ESJWRM	Eastern San Joaquin Water Resources Model
ETo	evapotranspiration
EWMPs	efficient water management practices
GAMA	groundwater ambient monitoring and assessment
GBA	Groundwater Basin Authority
GCM	global climate model
GDE	groundwater dependent ecosystem
GICIMA	Groundwater Information Center Interactive Mapping Application
GIS	Geographic Information System
GMP	Groundwater Management Plan
gpm	gallons per minute
GPS	Global Positioning System
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
GWA Board	Groundwater Authority Board of Directors
GWA	Groundwater Authority
HCM	Hydrogeologic Conceptual Model
ICU Program	Integrated Conjunctive Use Program
ILRP	Irrigated Lands Regulatory Program
InSAR	Interferometric Synthetic Aperture Radar
IRWMP	Integrated Regional Water Management Plan
IWFM	Integrated Water Flow Model
JPA	Joint Powers Agreement
LCSD	Lockeford Community Services District
LLNL	Lawrence Livermore National Laboratory
LOCA	local analogs
Ma	millions of years ago
MAC	Mokelumne-Amador-Calaveras
MAF	million acre-feet
MAR	managed aquifer recharge
Margin	Margin of Operational Flexibility
MCL	maximum contaminant level
mg/L	milligrams per liter
MGD	million gallons per day
MHI	median household income
MOA	memorandum of agreement
MokeWISE	Mokelumne Watershed Interregional Sustainability Evaluation
MSL	mean sea level
MtBE	methyl tertiary-butyl ether
MUD	Municipal Utilities Department
MWH	Montgomery Watson Harza
NAD 83	North American Datum of 1983
NAVD 88	North American Vertical Datum of 1988
NAVSTAR	Navigation Satellite Timing and Ranging
NCCAG	Natural Communities Commonly Associated with Groundwater
NDWA	North Delta Water Agency
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
NSJWCD	North San Joaquin Water Conservation District

NWIS	National Water Information System
OID	Oakdale Irrigation District
OSWCR	Online System for Well Completion Reports
PCE	perchloroethylene
PDA	Protest Dismissal Agreement
pdf	portable document format
PFOA	perfluorooctantoic acid
PFOS	perfluorooctanesulfonic acid
PG&E	Pacific Gas and Electric Company
PRISM	Precipitation-Elevation Regressions on Independent Slopes Model
PS	persistent scatter
RCP	representative climate pathways
RL	Reporting Limit
RWQCB	Regional Water Quality Control Board
SAGBI	Soil Agricultural Groundwater Banking Index
SB	Senate Bill
SCDER	Stanislaus County Department of Environmental Resources
SCWSP	South County Water Supply Program
SDACs	Severely Disadvantaged Communities
SDWA	South Delta Water Agency
SEWD	Stockton East Water District
SGMA	the Sustainable Groundwater Management Act
SJC	San Joaquin County
SJCFCWCD	San Joaquin County Flood Control and Water Conservation District
SJV	San Joaquin Valley
SMCL	secondary maximum contaminant levels
SNMP	Salt and Nutrient Management Plan
SRA	State Recreation Area
SS	specific storage
SSJ	South San Joaquin
SSJID	South San Joaquin Irrigation District
SVRA	State Vehicular Recreation Area
SWRCB	State Water Resources Control Board
SWTF	Surface Water Treatment Facility
SY	specific yield
TCE	trichloroethene
TDS	total dissolved solids
TNC	The Nature Conservancy
TSS	Technical Support Services
UNAVCO	University NAVSTAR Consortium
USACE	U.S. Army Corps of Engineers
USBR	United States Bureau of Reclamation
USFW	United States Fish & Wildlife Service
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
UWMPs	Urban Water Management Plans
VIC	Variable Infiltration Capacity
VOC	volatile organic compound
WDL	Water Data Library
WDR	Waste Discharge Requirement

WID	Woodbridge Irrigation District
Workgroup	Groundwater Sustainability Workgroup
WPCF	Water Pollution Control Facility
WRIMS	Water Resource Integrated Modeling System

EASTERN SAN JOAQUIN GROUNDWATER AUTHORITY

EXECUTIVE SUMMARY

ES-1. INTRODUCTION

In 2014, the California legislature enacted the Sustainable Groundwater Management Act (SGMA) in response to continued overdraft of California's groundwater resources. The Eastern San Joaquin Groundwater Subbasin (Eastern San Joaquin Subbasin, or Subbasin) is one of 21 basins and subbasins identified by the California Department of Water Resources (DWR) as being in a state of critical overdraft. SGMA requires preparation of a Groundwater Sustainability Plan (GSP) to address measures necessary to attain sustainable conditions in the Subbasin. Within the framework of SGMA, sustainability is generally defined as long-term reliability of the groundwater supply and the absence of undesirable results.

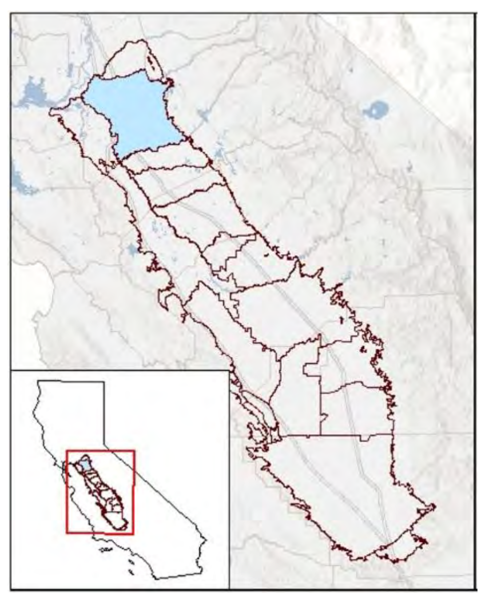
Critical Dates for the Eastern San Joaquin Subbasin

- 2020 By January 31: Submit GSP to DWR
- 2025 Review and update GSP
- 2030 Review and update GSP
- 2035 Review and update GSP
- 2040 Achieve sustainability for the Subbasin

In 2017, in response to SGMA, the Eastern San Joaquin Groundwater Authority (GWA) was formed. A Joint Exercise of Powers Agreement establishes the GWA, which is comprised of 15 Groundwater Sustainability Agencies (GSAs): Central Delta Water Agency, Central San Joaquin Water Conservation District, City of Lodi, City of Manteca, City of Stockton, Eastside San Joaquin GSA (comprised of Calaveras County Water District, Stanislaus County, and Rock Creek Water District), Linden County Water District, Lockeford Community Services District, North San Joaquin Water Conservation District, Oakdale Irrigation District, San Joaquin County #1, San Joaquin County #2 (with participation from California Water Services Company Stockton District), South Delta Water Agency, South San Joaquin GSA (comprised of South San Joaquin Irrigation District, City of Ripon, and City of Escalon), and Stockton East Water District. The GWA is governed by a 15-member Board of Directors (GWA Board), with one representative from each GSA. The Board is guided by an Advisory Committee, also with one representative from each GSA, that is tasked with making recommendations to the GWA Board on technical and substantive matters.

The Draft Eastern San Joaquin Subbasin GSP has been prepared and is now available for public review and comment. SGMA requires development of a GSP that achieves groundwater sustainability in the Subbasin by 2040. The Draft GSP outlines the need to reduce overdraft conditions and has identified 23 projects for potential development to offset reliance on groundwater to meet current and future water demands. Although current analysis indicates that groundwater pumping offsets and/or recharge on the order of 78,000 acre-feet per year (AF/year) may be required to achieve sustainability, additional efforts are needed to confirm the level of pumping reduction and/or recharge required to achieve sustainability. These efforts include collecting additional data and a review of the Subbasin model, along with other efforts as outlined in the Draft GSP.

Figure ES-1: GSP Plan Area within the San Joaquin Valley



ES-2. PLAN AREA

The GWA's jurisdictional area is defined by DWR's 2003 Bulletin 118 and updated in 2016 and 2018. The Subbasin underlies the San Joaquin Valley, as shown in Figure ES-1.

ES-3. OUTREACH EFFORTS

A stakeholder engagement strategy was developed to enable the interests of all beneficial users of groundwater in the Subbasin to be considered. The strategy incorporated monthly Groundwater Sustainability Workgroup (Workgroup) meetings, monthly Advisory Committee meetings, monthly GWA Board meetings, approximately quarterly informational open house events, outreach presentations to community groups, and information distribution to property owners and residents in the Subbasin. Figure ES-2 shows attendees at one of the informational open house events conducted during development of the GSP.

Figure ES 2 - Informational Open House Events

Public Meeting Type	Number of Meetings
Eastern San Joaquin GWA Board Meetings	23
Eastern San Joaquin Advisory Committee Meetings	15
Groundwater Sustainability Workgroup Meetings	12
Informational Open House Events	4
Outreach Presentations to Community Groups	6

The Workgroup was established to encourage active involvement from diverse social, cultural, and economic elements of the population in the Subbasin. The Workgroup members represent large and small landowners and growers from different geographic locations in the Subbasin, longtime residents, representatives from non-governmental organizations, disadvantaged community policy advocates, and outreach coordinators. Spanish translation was provided at informational open house events, creating an opportunity for local Spanish-speaking individuals to engage in the GSP development process.

ES-4. BASIN SETTING

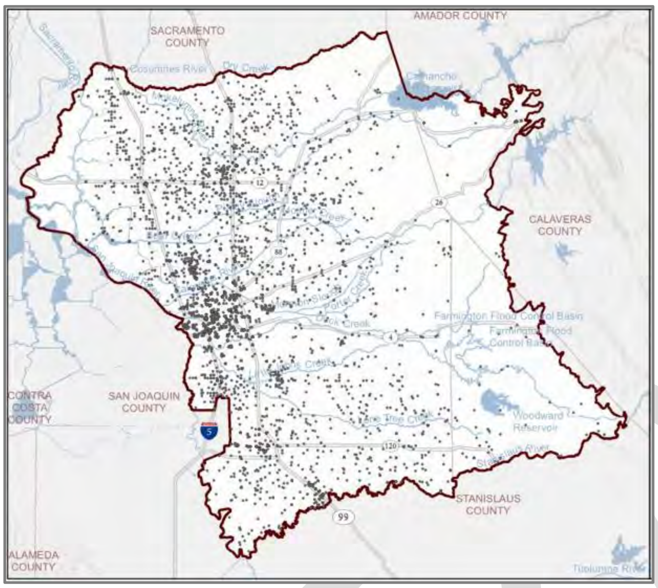
The Subbasin is located to the west of the San Joaquin Delta, and is bounded by the Sierra Nevada foothills to the east, San Joaquin River to the west, Dry Creek to the north, and Stanislaus River to the south. In the eastern portion of the Subbasin, groundwater flows from east to west and generally mirrors the eastward sloping topography of the geologic formations. In the western portion of the Subbasin, groundwater flows eastward toward areas with relatively lower groundwater elevation. Surface water flows from east to west, with the major river systems traversing the Subbasin being the Calaveras, Mokelumne, and Stanislaus rivers. Multiple smaller streams flow into the San Joaquin River, which runs south to north. The location of the Subbasin is shown in Figure ES-3.

Figure ES-3: Basin Setting

ES-5. EXISTING GROUNDWATER CONDITIONS

Groundwater levels in some portions of the Subbasin have been declining for many years, while groundwater levels in other areas of the Subbasin have remained stable or increased in recent years. The change in groundwater levels varies across the Subbasin, with the greatest declines occurring in the central portion of the Subbasin. The western and southern portions of the Subbasin have experienced less change in groundwater levels, in part due to the effects of the San Joaquin Delta and the import of surface water for in-lieu use.

Figure ES-4: GAMA Water Quality Sampling Locations



Groundwater quality in the Subbasin varies by location. Areas along the western margin have historically had higher levels of salinity. Total dissolved solids (TDS), which is a measure of all inorganic and organic substances present in a liquid in molecular, ionized, or colloidal suspended form, is commonly used to measure salinity. The Groundwater Ambient Monitoring and Assessment Program (GAMA) includes numerous water quality monioring sites in the Subbasin, shown in Figure ES-4. Maximum TDS concentrations across the Subbasin have been reported as high as 2,500 milligrams per liter (mg/L) along portions of the Subbasin's western boundary. California has three secondary maximum contaminant level (SMCL) standards for TDS, all based on aestheic considerations such as taste and odor, not public health cocnerns. These are 500 mg/L (recommended limit), 1,000 mg,L (upper limit), and 2,500 mg/L (short-term limit). The maimum value of 2,500 mg/L exceeds the California recommended secondary MCLs. TDS concentrations decrease significantly to the east, to typically less than 500 mg/L (the recommended limit for aethetic considerations). Elevated concentrations of other constituents, such as nitrate, arsenic, and point source contaminants are generally localized and not widespread and have not been able to be tied to groundwater management activities.

While the total volume of groundwater in storage in the Subbasin has declined over time, groundwater storage reduction has not historically been an area of concern in the Subbasin, as there are large volumes of fresh water stored in the aquifer. The total fresh groundwater in storage was estimated as over 50 million-acre-feet (MAF) in 2015. Between 1995 and 2015, the amount of groundwater in storage decreased by less than 0.1 percent. As such, there is no expected condition under which the colume of stored groundwater poses a cocnern to the Subbasin.

Land subsidence has not historically been an area of concern in the Subbasin, and there are no records of land subsidence caused by groundwater pumping in the Subbasin.

Seawater intrusion is not present in the Subbasin. While the San Joaquin Delta ecosystem evolved with a natural salinity cycle that brought brackish tidal water in from the San Francisco Bay, current management practices maintain freshwater surface flows through a combination of hydraulic and physical barriers, and alternations to existing channels. However, the GSP establishes management criteria to address the potential for future seawater intrusion.

Interconnected surface waters are surface water features that are hydraulically connected by a saturated zone to the groundwater system. If the water table adjacent to a river or stream goes down as a result of groundwater pumping, the river or stream may "lose" water to the underlying aquifer. Major river systems in the Subbasin are highly managed to meet instream flow requirements for fisheries, water quality standards, and water rights of users downstream. Streams identified as losing streams will be managed to protect against significant and unreasonable stream depletion.

ES-6. SUSTAINABLE MANAGEMENT CRITERIA INDICATORS

SGMA introduces several terms to measure sustainability, including:

Sustainability Indicators – Sustainability indicators refer to adverse effects caused by groundwater conditions occurring throughout the Subbasin that, when significant and unreasonable, cause undesirable results. The six sustainability indicators identified by DWR are the following:

- Chronic lowering of groundwater levels
- Reduction in groundwater storage
- Seawater intrusion
- Degraded water quality
- Land subsidence
- Depletion of interconnected surface water

Sustainability Goal – This goal is the culmination of conditions resulting in a sustainable condition (absence of undesirable results) within 20 years.

Undesirable Results – Undesirable results are the significant and unreasonable occurrence of conditions that adversely affect groundwater use in the Subbasin, including reduction in the long-term viability of domestic, agricultural, municipal, or environmental uses of the Subbasin's groundwater. Categories of undesirable results are shown in the adjacent callout.

Minimum Thresholds – Minimum thresholds are a numeric value for each sustainability indicator and are used to define when undesirable results occur. Undesirable results occur if minimum thresholds are exceeded in an established percentage of sites in the Subbasin's monitoring network.

Measurable Objectives – Measurable objectives are a specific set of quantifiable goals for the maintenance or improvement of groundwater conditions.

The method prescribed by SGMA to measure undesirable results involves setting minimum thresholds and measurable objectives for a series of representative wells.

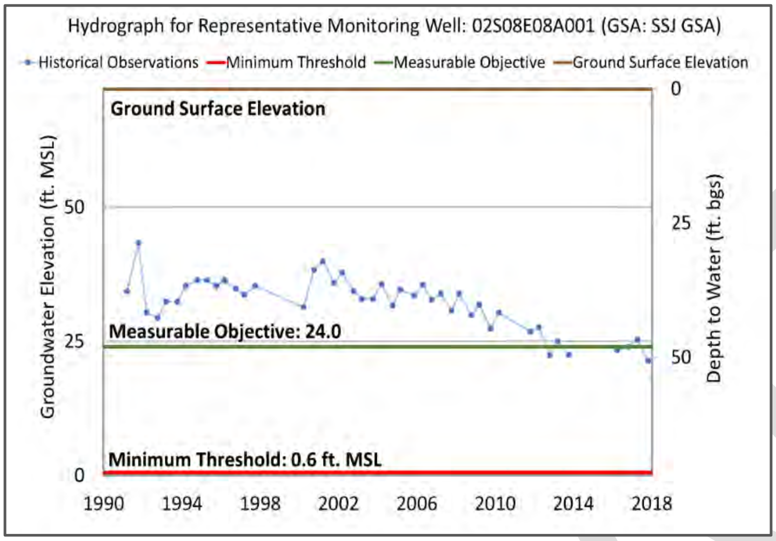
Categories of Undesirable Results

- Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon
- Significant and unreasonable reduction of groundwater storage
- Significant and unreasonable seawater intrusion
- Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies
- Significant and unreasonable land subsidence that substantially interferes with surface land uses
- Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water

- Representative wells were identified to provide a basis for measuring groundwater conditions throughout the Subbasin without having to measure each well, which would be cost prohibitive. Representative wells were selected based on history of recorded groundwater levels and potential to effectively represent the groundwater conditions.

A total of 20 representative wells have been identified for measurement of groundwater levels in the Subbasin, and 10 representative wells have been identified for groundwater quality monitoring. The GSP uses groundwater quality data as the basis for evaluating conditions for seawater intrusion and uses groundwater level data as the basis for evaluating conditions for groundwater storage, depletion of interconnected surface water, and land subsidence. As such, these representative wells provide the basis for measuring the six potential undesirable results across the Subbasin.

Figure ES-5: Sample Relationship Between Minimum Threshold and Measurable Objective



Minimum thresholds and measurable objectives were developed for each of the representative wells. Figure ES-5 shows a typical relationship of the minimum thresholds, measurable objectives, and other data for a sample groundwater level well.

Minimum thresholds for groundwater levels were developed with reference to historical drought low conditions and domestic well depths. Specifically, minimum thresholds were established based on the deeper of the historical drought low plus a buffer of the historical fluctuation *or* the 10th percentile domestic well depth, whichever is shallower – establishing levels that are protective of 90 percent of domestic wells. Measurable objectives were established based on the historical drought low and provide a buffer above the minimum threshold. A table summarizing minimum thresholds and measurable objectives is included in the GSP. Graphs showing the minimum threshold and measurable objective for each of the representative wells are contained in an appendix to the GSP.

Minimum thresholds for water quality were defined by considering two primary beneficial uses as risk of undesirable results related to salinity: drinking water quality and agriculture uses. Minimum thresholds are 1,000 mg/L for each representative monitoring well, consistent with the upper limit SMCL for TDS. Crop tolerances in the Subbasin range by crop type from 900 mg/L TDS for almonds up to 4,000 mg/L TDS for wheat.

The minimum threshold for seawater intrusion is a 2,000 mg/L chloride isocontour line eastablished at the western edge of the subbasin between sentinel monitoring locations. 2,000 mg/L chloride is approximately 10 percent of seawater chloride concentrations (19,500 mg/L) and was developed as a minimum threshold based on consideration of existing management practices in other areas of the state.

Minimum thresholds for depletion of interconnection of surface water systems default to the minimum thresholds for groundwater elevations.

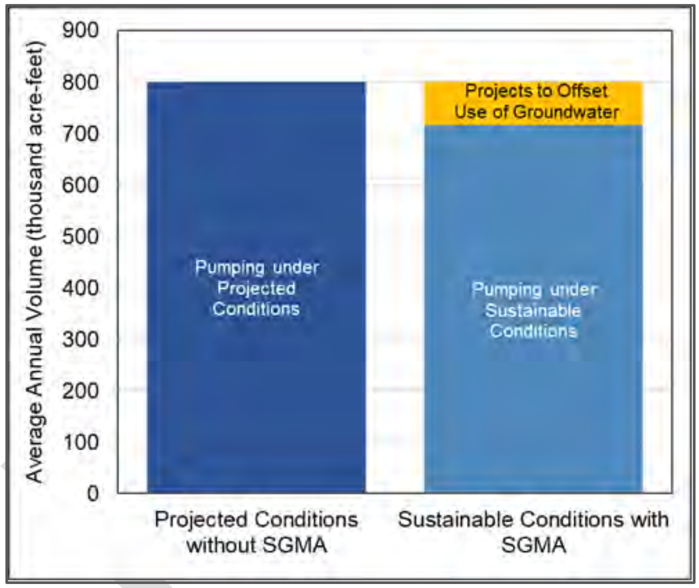
ES-7. WATER BUDGETS

The Eastern San Joaquin Subbasin has been in an overdraft condition for many years. Overdraft occurs when the amount of groundwater extracted exceeds the long-term average groundwater recharged.

The groundwater evaluations conducted as a part of GSP development have provided estimates of the historical, current, and future groundwater budget conditions.

Based on these analyses, at projected groundwater pumping levels, the long-term groundwater pumping offest and/or recharge required to achieve sustainability is approximately 78,000 AF/year. Future groundwater conditions in the Subbasin will continue to show decreased groundwater levels based on projections of current land and water uses. Projects that offset projected groundwater pumping and/or increase recharge will help the Subbasin reach sustainability. These changes are shown in Figure ES-6.

Figure ES-6: Subbasin-Wide Groundwater Pumping and Offsets Required to Achieve Sustainability



The projected Subbasin water budget was also evaluated under climate change conditions. Under the intermediate climate change scenario prescribed by DWR, the annual groundwater overdraft is projected to increase to approximately 57,000 AF/year.

The current analysis was prepared using the best available information and through development of a new groundwater modeling tool, the Eastern San Joaquin Water Resources Model. It is anticipated that as additional information becomes available, the new model can be updated, and more refined estimates of annual pumping and overdraft can be developed.

ES-8. MONITORING NETWORKS

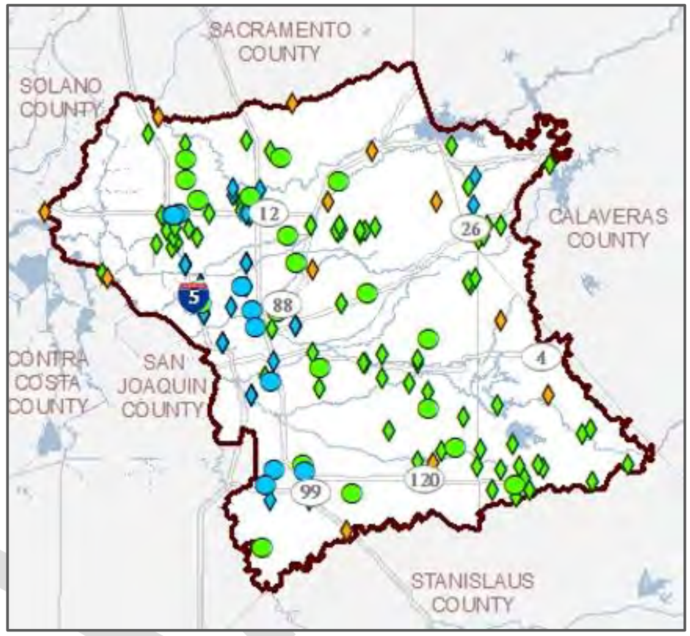
The Draft GSP outlines the monitoring networks for the six sustainability indicators. The objective of these monitoring networks is to monitor conditions across the Subbasin and to detect trends toward undesirable results. Specifically, the monitoring network was developed to do the following:

- Monitor impacts to the beneficial uses or users of groundwater
- Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds
- Demonstrate progress toward achieving measurable objectives described in the GSP

There are four networks in the Eastern San Joaquin Subbasin: a representative network for water levels, a broad network for water levels, a representative network for water quality, and a broad network for water quality. The two monitoring networks for water quality will additionally be used to monitor for seawater intrusion. Representative networks are used to determine compliance with the measurable objectives and minimum thresholds, while the broad networks collect data for informational purposes.

The monitoring networks were designed by evaluating data sources provided by DWR, including the California Statewide Groundwater Elevation Monitoring (CASGEM) Program, the United States Geological Survey (USGS), and from participating GSAs. The monitoring network consists largely of wells that are already being used for monitoring in the Subbasin. Additional wells are being added, and there is the potential for installing new dedicated monitoring wells through DWR's Technical Support Services (TSS) program. Figure ES-7 shows the location of existing and planned groundwater monitoring wells.

Figure ES-7: Groundwater Monitoring Wells



Wells in the monitoring network will be measured on a semi-annual schedule. Historical measurements have been entered into the Subbasin Data Management System (DMS), and future data will also be stored in the DMS.

A summary of the existing monitoring wells is shown in the table below.

Summary of Monitoring Network Wells	
Representative Networks	
Groundwater Level Wells	20
Groundwater Quality Wells	10
Broad Networks	
CASGEM (GW Levels)	76
Nested or Clustered Wells (GW Level & Quality)	16
Agency Wells (GW Quality)	5
Planned Wells (GW Level & Quality)	12

ES-9. DATA MANAGEMENT SYSTEM

The Eastern San Joaquin DMS was built on a flexible, open software platform that uses familiar Google maps and charting tools for analysis and visualization. The DMS serves as a data-sharing portal that enables use of the same data and tools for visualization and analysis. These tools support sustainable groundwater management and create transparent reporting about collected data and analysis results.

The DMS is web-based; the public can easily access this portal using common web browsers such as Google Chrome, Firefox, and Microsoft Edge. The DMS is currently populated with available historical data. Additional data will be entered into the system as it is collected.

The DMS portal provides easy access and the ability to query information stored in the system. Groundwater data can be plotted for any of the available data points, providing a pictorial view of historical and current data.

The DMS can be accessed here: https://opti.woodardcurran.com/esj/

Figure ES-8: Opti DMS Screenshot

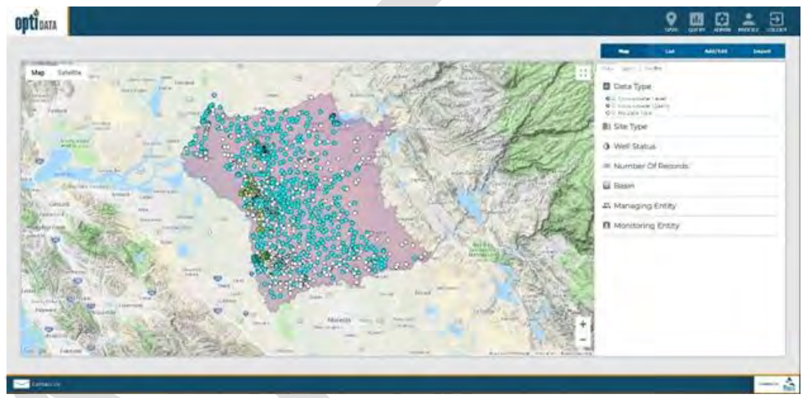
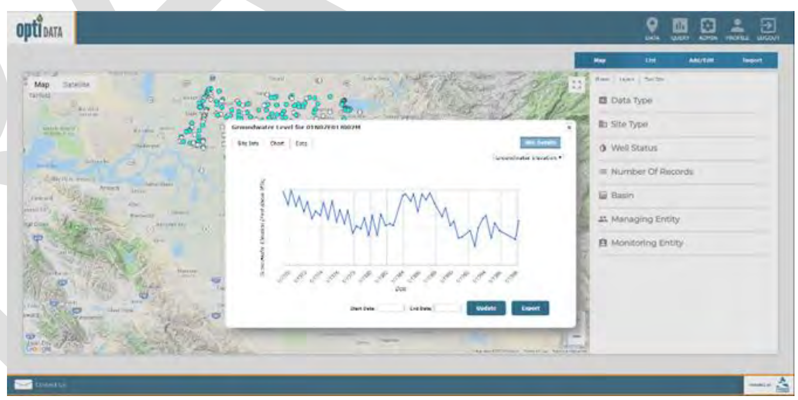


Figure ES-9: Typical DMS Data Display



ES-10. PROJECTS AND MANAGEMENT ACTIONS

Achieving sustainability in the Subbasin requires implementation of projects and management actions. The Subbasin will achieve sustainability by implementing water supply projects that either replace (offset) or supplement (recharge) groundwater to attain the estimated pumping offest and/or recharge need of 78,000 AF/year. It should be noted that this number will be reevaluated after additional data are collected and analyzed. These additional evaluations may lead to modification of levels of pumping reduction associated with the attainment of reliability. Currently, no pumping restrictions have been proposed for the Subbasin; however, GSAs maintain the flexibility to implement such demand-side management actions in the future if need is determined.

Additional management activities included in the Draft GSP include the following:

- Monitoring and recording of groundwater levels and groundwater quality data
- Maintaining and updating the Subbasin DMS with newly collected data
- Monitoring groundwater use through use of satellite imagery
- Annual monitoring of progress toward sustainability
- Annual reporting of Subbasin conditions to DWR as required by SGMA

Several projects to increase water supply availability in the Subbasin have been identified. The initial set of projects were reviewed with the GWA Board, Advisory Committee, and Workgroup. A final list of 23 potential projects are included in the Draft GSP, representing a variety of project types including direct and in-lieu recharge, intra-basin water transfers, demand conservation, water recycling, and stormwater reuse. Projects are classified into three categories based on project status: Planned, Potential, and Longer-term/Conceptual. Planned projects are anticipated to be completed and implemented prior to 2040. The projected supply of projects in this category provide enough water to offset the projected 2040 supply imbalance, bringing the basin into balance and achieving sustainability. Potential projects provide a menu of options for additional water supply projects that can be implemented in the Subbasin. These projects require further analysis and permitting to determine feasibility and cost effectiveness. Longer-term/Conceptual projects are in the early conceptual planning stages and would require significant additional work to move forward. Projects are summarized in the table below.

Project Description	Project Type	Project Proponent	Estimated Demand Reduction (AFY)
Planned Projects:			
Lake Grupe In-lieu Recharge	In-lieu Recharge	Stockton East Water District	10,000
SEWD Surface Water Implementation Expansion	In-lieu Recharge	Stockton East Water District	19,000
City of Manteca Advanced Metering Infrastructure Project	Conservation	City of Manteca	272
City of Lodi Surface Water Facility Expansion & Delivery Pipeline	In-lieu Recharge	City of Lodi	4,750
White Slough Water Pollution Control Facility Expansion	Recycling/In-lieu Recharge	City of Lodi	115
CSJWCD Capital Improvement Program	In-lieu Recharge	Central San Joaquin Water Conservation District	5,000
NSJWCD South System Modernization	In-lieu Recharge	North San Joaquin Water Conservation District	4,500
Long-term Water Transfer to SEWD and CSJWCD	Transfers/In-lieu Recharge	South San Joaquin GSA	45,000
Potential Projects			
BNSF Railway Company Intermodal Facility Recharge Pond	Direct Recharge	Central San Joaquin Water Conservation District	1,000
Stockton Advanced Metering Infrastructure	Conservation	City of Stockton	2,000
South System Groundwater Banking with EBMUD	In-lieu Recharge	North San Joaquin Water Conservation District	4,000
NSJWCD North System Modernization/Lasko Recharge	In-Lieu Recharge/Direct Recharge	North San Joaquin Water Conservation District	2,600
Manserro Recharge Project	Direct Recharge	North San Joaquin Water Conservation District	8,000
Tecklenburg Recharge Project	Direct Recharge	North San Joaquin Water Conservation District	8,000
City of Escalon Wastewater Reuse	Recycling/In-lieu Recharge/Transfers	South San Joaquin GSA	672
City of Ripon Surface Water Supply	In-lieu Recharge	South San Joaquin GSA	6,000
City of Escalon Connection to Nick DeGroot Water Treatment Plant	In-lieu Recharge	South San Joaquin GSA	2,015
Longer-term/Conceptual Projects			
Farmington Dam Repurpose Project	Direct Recharge	Stockton East Water District	30,000
Recycled Water Transfer to Agriculture	Recycling/Transfers/ In-lieu Recharge	City of Manteca	5,193
Mobilizing Recharge Opportunities	Direct Recharge	San Joaquin County	Not determined
NSJWCD Winery Recycled Water	Recycling/In-Lieu Recharge/Direct Recharge	North San Joaquin Water Conservation District	750
Pressurization of SSJID Facilities	Conservation	South San Joaquin GSA	30,000
SSJID Storm Water Reuse	Stormwater/In-lieu Recharge/Direct Recharge	South San Joaquin GSA	1,100

ES-11. GSP IMPLEMENTATION

The overdraft condition in the Subbasin requires projects to offset groundwater pumping and/or increase recharge. The exact amount of required offset/recharge will be reevaluated after additional data are collected and analyzed. Based on current information, total Subbasin-wide offset/recharge needed is estimated to be 78,000 AF/year.

Projects will be administered by the GSA project proponents. GSAs may elect to implement projects individually or jointly with one or more GSAs or with the GWA.

Implementing the GSP will require numerous management activities that will be undertaken by the GWA, including the following:

- Preparing annual reports summarizing the conditions of the Subbasin and progress towards sustainability and submitting them to DWR
- Monitoring groundwater conditions semi-annually
- Entering updated groundwater data into the DMS
- Refining Subbasin model and water budget planning estimates
- Monitoring basin-wide groundwater use using satellite imagery
- Updating the GSP once every 5 years

The GWA Board adopted a preliminary schedule for project implementation. Project implementation is scheduled to begin in 2020, with full implementation by 2040. This approach provides adequate time to put in place methods necessary to refine model estimates and verify project cost effectiveness.

Implementation of the 8 identified Planned Projects has begun and will continue through 2030. Evaluation and possible implementation of the 9 Potential Projects and 6 Longer-term/Conceptual Projects will be based on long-term management or changing needs of the GSA or Subbasin. Further evaluation is necessary to determine technical, economic, and institutional feasibility.

ES-12. FUNDING

Implementation of the GSP requires funding sources. To the degree they become available, outside grants will be sought to assist in reducing cost of implementation to participating agencies, residents, and landowners of the Subbasin. However, there will be a need to collect funds to support implementation.

The areas associated with GWA-wide management and GSP implementation will be borne by the GWA through contributions from the member GSAs, under a cost-sharing arrangement to be developed following GSP adoption. These costs include:

- GWA administration
- Groundwater level monitoring and reporting
- Groundwater quality monitoring and reporting
- Water use estimation

- Data management
- Stakeholder engagement
- Annual report preparation and submittal to DWR
- Developing and implementing a funding mechanism
- Grant applications
- GSP updates (every 5 years)

For budgetary purposes, the estimated initial cost of these activities is on the order of $450,000 to $900,000 per year excluding projects and management actions costs. Additional one-time costs are estimated to be on the order of $415,000.

GSAs will individually fund implementation of projects in their respective areas. Options for GSA funding include fees based on groundwater pumping, acreage, or combinations of these, and pursuit of any available grant funds. The GSAs will evaluate options for securing the needed funding on an individual basis.

- Developing and implementing a funding mechanism
- Evaluation and implementing water supply projects

The estimated initial costs of projects range from on the order of $50,000 to $328 million, depending on the project. Annual project costs range from $3,000 to $9 million per year to provide funds for operations and maintenance.

1. AGENCY INFORMATION, PLAN AREA, AND COMMUNICATION

1.1 INTRODUCTION AND AGENCY INFORMATION

1.1.1 Purpose of the Groundwater Sustainability Plan

The purpose of this Groundwater Sustainability Plan (GSP) is to meet the regulatory requirements set forth in the three-bill legislative package consisting of Assembly Bill (AB) 1739 (Dickinson), Senate Bill (SB) 1168 (Pavley), and SB 1319 (Pavley), collectively known as the Sustainable Groundwater Management Act (SGMA). SGMA defines sustainable groundwater management as “management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results”, which are defined by SGMA as any of the following effects caused by groundwater conditions occurring throughout the basin (CA DWR, 2018):

- Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply
- Significant and unreasonable reduction of groundwater storage
- Significant and unreasonable seawater intrusion
- Significant and unreasonable degraded water quality
- Significant and unreasonable land subsidence
- Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water

The Eastern San Joaquin Groundwater Subbasin (Eastern San Joaquin Subbasin or Subbasin) has been identified by the Department of Water Resources (DWR) as critically overdrafted. The Eastern San Joaquin Groundwater Sustainability Plan (Eastern San Joaquin GSP or the Plan) has been developed to meet SGMA regulatory requirements by the January 31, 2020, deadline for critically-overdrafted basins while reflecting local needs and preserving local control over water resources. The Eastern San Joaquin GSP provides a path to achieve and document sustainable groundwater management within 20 years following Plan adoption, promoting the long-term sustainability of locally-managed groundwater resources now and into the future.

While the Eastern San Joaquin GSP offers a new and significant approach to groundwater resource protection, it was developed within an existing framework of comprehensive planning efforts. Throughout the Eastern San Joaquin Region, several separate yet related planning efforts are concurrently proceeding. The following figure (Figure 1-1) shows flagship reports from these efforts, which include Integrated Regional Water Management, Urban Water Management, watershed, and Habitat Conservation Plans. The Eastern San Joaquin GSP fits in with these prior planning efforts, building on existing local management and basin characterization. A description of prior planning efforts can be found in Section 1.2.2.7 of this document.

Figure 1-1: Interconnected Planning and Modeling Efforts for Water Resource Protection

1.1.2 Sustainability Goal

A sustainability goal is the culmination of conditions resulting in a sustainable condition (absence of undesirable results) within 20 years. The sustainability goal reflects this requirement and succinctly states the GSAs' objectives and desired conditions of the Subbasin.

The sustainability goal description for the Eastern San Joaquin Subbasin is *to maintain an economically-viable groundwater resource for the beneficial use of the people of the Eastern San Joaquin Subbasin by operating the basin within its sustainable yield or by modification of existing management to address future conditions. This goal will be achieved through the implementation of a mix of supply and demand type projects consistent with the GSP implementation plan* (see Chapter 6).

See Chapter 3: Sustainable Management Criteria for additional discussion of the sustainability goal.

1.1.3 Contact Information

The San Joaquin County Public Works Director has been designated as Plan Manager and record keeper. As Plan Manager, the Public Works Director is tasked with submitting a single, jointly-composed GSP to DWR on behalf of the entire Subbasin. Contact information for the submitting agency and Plan Manager is provided below in Figure 1-2.

Figure 1-2: Plan Manager and Agency Contact Information

1.1.4 Agency Information

The Eastern San Joaquin GSP was developed jointly by the Eastern San Joaquin Groundwater Authority (GWA), which is a joint powers authority formed by the 15 groundwater sustainability agencies (GSAs) within the Eastern San Joaquin Subbasin. The GWA includes the Central Delta Water Agency, Central San Joaquin Water Conservation District (CSJWCD), City of Lodi, City of Manteca, City of Stockton, Eastside San Joaquin GSA (comprised of Calaveras County Water District, Stanislaus County, and Rock Creek Water District), Linden County Water District, Lockeford Community Services District, North San Joaquin Water Conservation District (NSJWCD), Oakdale Irrigation District (OID), San Joaquin County, San Joaquin County No. 2, South Delta Water Agency (SDWA), South San Joaquin GSA (comprised of South San Joaquin Irrigation District (SSJID) including Woodward Reservoir, City of Ripon, and City of Escalon), and Stockton East Water District (SEWD). Collectively, these 15 GSAs will be referred to as “GSAs”. Figure 1-3 below indicates the jurisdictional boundaries of the individual GSAs.

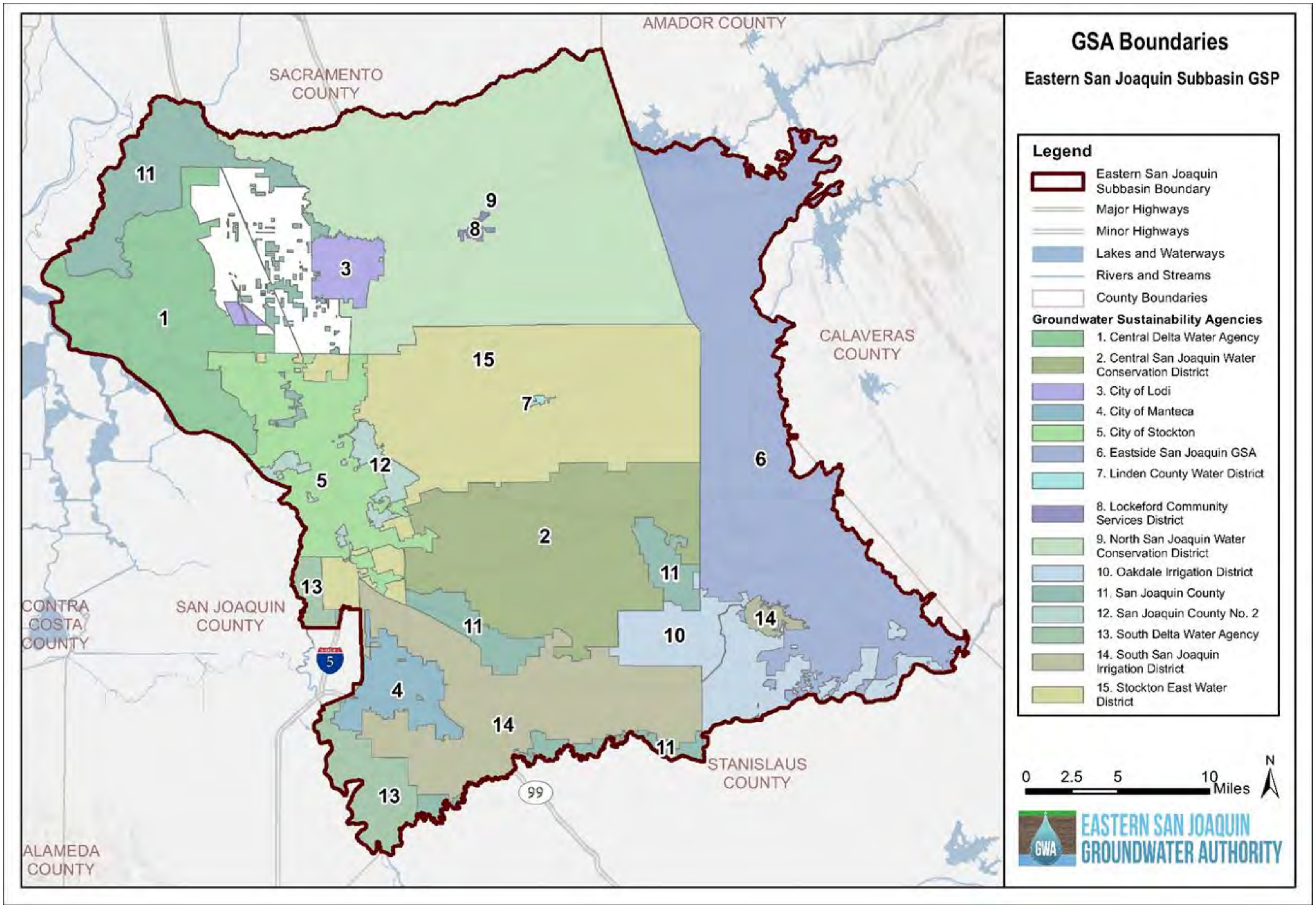
The GSAs represent a diverse range of water management organizations. The agencies include water agencies, irrigation districts, water conservation districts, and local governments at the city and county level. The GSAs will work through the GWA to implement this GSP to cover the entire geographic extent encompassed by the boundaries of the Eastern San Joaquin Subbasin.

California Water Services Company Stockton District (Cal Water) has formed a partnership with San Joaquin County to participate in the process as part of the San Joaquin County No. 2 GSA, since its status as an investor-owned utility prohibits it from forming its own GSA under SGMA regulations. As a major purveyor of water in the Stockton region, Cal Water’s participation is considered essential to the development of a comprehensive plan for sustainable groundwater management in the Subbasin.

Water Code Section 10724 provides that, for areas within a high- or medium-priority basin not within the management area of a GSA, the county within which that unmanaged area lies will be presumed to be the GSA for that area. The county is presumed to be the GSA for the unmanaged area. The county must either opt-out of its presumptive role or file a GSA formation notice with DWR. The notification of intent to be the GSA must include all of the information required by Water Code section 10723.8, subdivision (a). Upon acceptance of the complete notice by DWR, the county becomes the exclusive GSA for the unmanaged area. Alternatively, the county may opt-out of its presumptive role by notifying DWR that it will not be the GSA for the unmanaged area. If the County notifies the department that it will not be the GSA for an unmanaged area, and no other entity with authority to serve as the GSA for the unmanaged area indicates is intent to do so, extractors of groundwater in the unmanaged area may be required to report extractions and pay fees to the State Water Board pursuant to Water Code Section 5202.

The area of the Subbasin within the Woodbridge Irrigation District (WID) service area, shown in white on the map below, is not within the management area of a GSA. The WID area is located within San Joaquin County. San Joaquin County has neither opted-out of its presumptive role nor filed a GSA formation notice with DWR.

Figure 1-3: Eastern San Joaquin Groundwater Sustainability Agencies



1.1.4.1 Eastern San Joaquin Groundwater Authority Joint Powers Agreement

The Joint Powers Agreement (JPA) provides the basis for forming the GWA. The GWA submitted an Initial Notification to jointly develop a GSP for the Eastern San Joaquin Subbasin on February 8, 2017. The agreement and bylaws are provided in Appendix 1-A.

The purpose of the GWA is to act as the coordinating agency and cooperatively carry out the purposes of SGMA in the Eastern San Joaquin Subbasin. The GWA is a public entity separate from the member organizations and holds the authority to coordinate and exercise the common powers of its members within the geographical area of the Eastern San Joaquin Subbasin consistent with the terms and conditions of the JPA.

Since its formation, the GWA has employed a consensus-based approach in its goal to provide a dynamic, cost-effective, and collegial organization to achieve initial and ongoing SGMA compliance within the Basin. Collaboration among the GWA member agencies has strengthened the potential for broad public support for groundwater management activities as well as the ability to leverage local, State, and federal funds (Eastern San Joaquin GWA, 2017b).

1.1.4.2 Organization and Management Structure of the GSAs

The governing body of the GWA, the GWA Board of Directors (GWA Board), convenes every second Wednesday of the month at 11:00 a.m. to formulate the GSP by debating and finalizing key discussion points and decisions incorporated into the Plan. Each of the 15 GSAs has a voice on the GWA Board and have appointed two representatives to serve: one Board member and one Alternate member to attend in the Board member's absence.

The GWA Board is tasked with developing actions including, but not limited to, the following:

- Approval of budget(s) and appropriate cost sharing for any project or program that requires funding from the GSAs
- Proposing guidance and options for obtaining grant funding
- Adoption of rules, regulations, policies, and procedures related to the JPA
- Approval of any contracts with consultants or subcontractors that would undertake work on behalf of the GSAs and/or relate to Basin-wide issues and, if applicable, recommend the funding that each GSA should contribute towards the costs of such contracts
- Reporting to the GSAs' respective governing boards
- Approval and implementation of a GSP

The GWA Board is guided by an Advisory Committee that is made up of one representative from each GSA and convenes every second Wednesday of the month at 9:00 a.m. The Advisory Committee is responsible for developing recommendations on technical and substantive Subbasin-wide matters. The Advisory Committee is tasked with developing actions including, but not limited to, the following:

- Recommend the action and/or approval of technical or policy elements for the development of a GSP, including groundwater conditions, thresholds, and projects and management actions
- Recommend action and/or approval of a GSP

The GWA Board is also informed by a Groundwater Sustainability Workgroup (Workgroup) which consists of 23 community representatives of agricultural communities, groundwater users, environmental groups, businesses, industry, and the community at large. The Workgroup is tasked with reviewing groundwater conditions, management issues and needs, and projects and management actions to improve sustainability in the basin. The Workgroup meets approximately monthly in sessions that provide a forum for the exchange of information and feedback from members and their respective organizations. An application to join the Workgroup was disseminated in early 2018. 22 applications were received, and all applicants were approved based on their ability to represent the broad interests and geography of the region. An additional member was added with approval of the Workgroup members after attending the first meeting, totaling to 23 members. Additional information on the Workgroup can be found in Section 1.3.4.2.

Decisions of the GWA Board are made by an affirmative majority of Board members, except in the following cases which require a two-thirds supermajority vote: approval or modification or amendment of the GWA annual budget; decisions related to the levying of taxes, assessments, or property-related fees and charges; decisions related to the expenditure of funds by the GWA beyond expenditures approved in the annual budget; adoption of rules, regulations, policies, bylaws, and procedures related to the function of the GWA; decisions related to the establishment of the members' percentage obligations for payment of the GWA's operating and administrative costs; approval of any contract over $250,000 or contracts for terms that exceed two years; decisions regarding the acquisition and the holding, use, sale, letting, and disposal of real and personal property including water rights, and the construction, maintenance, alteration, and operation of works or improvements; decisions related to the limitation or curtailment of groundwater pumping; and approval of a GSP. Each member of the GWA Board has one vote. A process for dispute resolution and noncompliance, including internal resolution and mediation prior to judicial or administrative remedies, is set forth in the GWA Bylaws in Appendix 1-A.

GSAs share in the general operating and administrative costs of the GWA in accordance with percentages determined by the GWA Board.

1.1.4.3 Description of Participating Agencies

A brief description of each of the GSAs that make up the GWA is provided in the sections below.

Central Delta Water Agency – The Central Delta Water Agency service area encompasses a total of 52,000 acres in the northwestern portion of the Eastern San Joaquin Subbasin. The primary land use in this area is agriculture with crops such as vineyards, trees, row crops, and field crops. The Central Delta Water Agency protects water supply within its service area (which extends outside of the Subbasin), assists landowners and reclamation districts with water issues, and represents landowners in flood control matters. The Central Delta Water Agency does not own any facilities, and surface water from the Delta is the area's only source of water, along with limited private groundwater pumping. Approximately 5,000 acres of the GSA overlap with the sphere of influence of the City of Stockton (Eastern San Joaquin County GBA, 2014).

Central San Joaquin Water Conservation District – CSJWCD was formed in 1959 under provisions of the California Water Conservation Act of 1931. The CSJWCD includes approximately 73,000 largely agricultural acres, of which 6,300 acres are within the sphere of influence of the City of Stockton. To mitigate declining groundwater levels, the CSJWCD contracted with the US Bureau of Reclamation (USBR) for 80,000 acre-feet per year (AF/year) from New Melones Reservoir on the Stanislaus River. Irrigation facilities have been installed and operated by individual landowners through a surface water incentive program sponsored by the CSJWCD. At the regional level, CSJWCD has participated as a member agency of the Eastern Water Alliance and the Groundwater Basin Authority (GBA), two preceding efforts to the GWA that focused on groundwater management (Eastern San Joaquin County GBA, 2014).

City of Lodi – The City of Lodi is located northeast of the City of Stockton along Highway 99. The City relies on both groundwater and surface water to satisfy customer needs. In 2003, Lodi entered into a 40-year agreement with WID for up to 6,000 AF/year of Mokelumne River Water. The City of Lodi built the Lodi Surface Water Treatment Plant and associated conveyance facilities necessary to deliver this supply, which were completed and operational at the end of 2012. The City of Lodi currently provides up to 3,000 AF/year of treated wastewater to agricultural land in the vicinity of the wastewater treatment plant, White Slough Water Pollution Control Facility. The GSA for the City of Lodi covers 9,000 acres and includes the White Slough Water Pollution Control Facility area (City of Lodi, 2015).

City of Manteca – The approximately 13,000 acres of the City of Manteca straddles Highway 99 south of the City of Stockton. Potable water supplies consist of a combination of groundwater and treated surface water from the South County Water Supply Program (SCWSP). Manteca currently receives up to 11,500 AF/year and ultimately can receive up to 18,500 AF/year in Phase II of the SCWSP. Up to 4,000 AF/year of reclaimed wastewater is applied to fodder crops on City-owned and leased lands. The City of Manteca is a member of the California Water Efficiency Partnership (City of Manteca, 2015).

City of Stockton – The City of Stockton Municipal Utilities Department (MUD) service area generally encompasses portions of the City of Stockton north of the Calaveras River and south of the Cal Water service area. Water use measured in 2015 shows approximately 27 percent of the Stockton MUD's water deliveries come from groundwater, with 73 percent from treated surface water from SEWD and the Delta Water Supply Project. The Delta Water Supply Project came online in 2012 and utilizes surface water both from the San Joaquin River (City of Stockton water right) and Mokelumne River through a 40-year agreement with WID initiated in 2008 for up to 6,500 AF/year with more water as the City grows. The City of Stockton GSA (approximately 39,000 acres) overlaps with the extent of the Cal Water service area (City of Stockton, 2015).

Eastside San Joaquin GSA – Eastside San Joaquin GSA is comprised of a partnership between Calaveras County Water District, Stanislaus County, and Rock Creek Water District. The area covers over 126,000 acres, stretching into the western portion of Calaveras County and northern portion of Stanislaus County.

- Calaveras County Water District – The Calaveras County Water District (CCWD) serves a population of 20,700 through 17,000 service connections and shares the same boundaries as Calaveras County. However, not all customers in the county are served by CCWD. Supply for the District comes from reservoir releases on the Calaveras, Stanislaus, and Mokelumne Rivers for a total of approximately 6,000 AF/year for primarily agricultural and residential use. Though not a reliable source of supply in Calaveras County, groundwater does provide the sole supply for residential use in some areas. CCWD also relies heavily on recycled water to reduce potable water demand. Calaveras County had one of the fastest growing annual percent increase in populations in California between 2000 and 2010 (CCWD, 2015). For the portion of Calaveras County that falls within the Eastern San Joaquin Subbasin, the land is mostly unirrigated with the few crops irrigated by either riparian rights along Calaveras River or private groundwater wells. The population is estimated to be small and served by private residential pumping.

- Stanislaus County – Stanislaus County has a total area of 973,000 acres and nine incorporated cities that extends beyond Eastern San Joaquin Subbasin. There are approximately 30 water suppliers that serve water to Stanislaus County for domestic, commercial, and agricultural uses. The majority of the County's population resides in incorporated cities due to urban development and steady population growth within city boundaries. The portions of Stanislaus County that fall within the Eastern San Joaquin Subbasin not already included in a GSA have partnered with the CCWD and Rock Creek Water District as the Eastside San Joaquin GSA. The land is mostly unirrigated, and water needs are met by private pumping.

- Rock Creek Water District – Rock Creek Water District was formed in 1941 and covers approximately 1,800 acres in northeastern Stanislaus County. Through the Salt Spring Valley Reservoir in Calaveras County, the District delivers agricultural water for irrigation (Stanislaus LAFCO, 2018).

Linden County Water District – Linden County Water District provides water and wastewater services to the 300 acres of the unincorporated community of Linden, located approximately 12 miles northeast of the City of Stockton along State Route 26. The District lies entirely within the boundaries of the SEWD. Between 2000 and 2010, the population in Linden increased by 61 percent from approximately 1,100 to 1,800 residents. The Linden County Water District relies on groundwater to meet residential demands in Linden (SJC, 1992).

Lockeford Community Services District – Lockeford Community Services District was established in 1976 and superseded the San Joaquin County Water Works District No. 1 and Lockeford Sanitary District. The District currently provides water and wastewater services to approximately 3,200 residents in 2010 in the unincorporated urban community of Lockeford located 17 miles northeast of the City of Stockton on State Routes 12 and 88. The District lies within the boundaries of the NSJWCD; however, the District's jurisdiction area is its own GSA and is not part of the NSJWCD GSA. The District's GSA area is approximately 800 acres and encompasses primarily residential and agricultural land uses. The District anticipates that, as community build-out occurs, it may serve over 5,000 residents. Groundwater from the Eastern San Joaquin Subbasin is the District's only source of potable water (SJC, 2016a).

North San Joaquin Water Conservation District GSA – NSJWCD, organized in 1948 under provisions of the Water Conservation District Act of 1931, includes approximately 149,000 acres east of the City of Lodi, including about 70,000 acres of irrigated agriculture. NSJWCD also includes approximately 4,740 acres within the Lodi city limits and the community of Lockeford. Pursuant to agreements between NSJWCD, Lockeford, and Lodi, the Lodi and Lockeford acreage is excluded from the NSJWCD GSA. NSJWCD straddles the Mokelumne River and has Dry Creek as its northern boundary. Prior to a basin boundary modification approved in 2016, the District was located in both the Cosumnes and the Eastern San Joaquin Subbasins. The District has a 20,000 AF Mokelumne River surface water right which is generally available in normal to wet years. NSJWCD provides surface water deliveries to irrigated acreage and conducts groundwater recharge, but much of the NSJWCD area relies on private groundwater pumping. At the regional level, NSJWCD has participated as a member agency of the Eastern Water Alliance and the GBA, two preceding efforts to the GWA that focused on groundwater management (Eastern San Joaquin County GBA, 2014).

Oakdale Irrigation District – OID comprises about 81,000 acres, primarily located in the northern portion of Stanislaus County, but with a small portion located within San Joaquin County. A little less than 40 percent of the District's area overlies the Eastern San Joaquin Subbasin (over 31,000 acres), and the remaining portion overlies the Modesto Subbasin. SSJID and OID jointly own facilities to provide water from the Stanislaus River for agricultural use (Eastern San Joaquin County GBA, 2014).

San Joaquin County – The San Joaquin County GSA is comprised of 51,000 acres of areas within the Eastern San Joaquin Subbasin not covered by the other 14 GSAs. Overlapping agencies include North Delta Water Agency (NDWA), unincorporated county, riparian land along Stanislaus River, and areas in the City of Stockton served by the City of Stockton MUD. In collaboration with the Northeast San Joaquin County Groundwater Banking Authority, San Joaquin County led the development of the Eastern San Joaquin Groundwater Basin Groundwater Management Plan in 2004 to review, enhance, and coordinate existing groundwater management policies and programs in the region and to develop new policies and programs for the long-term sustainability of groundwater resources. Additionally, San Joaquin County has supported the development of studies and plans in the region, such as the Groundwater Basin Authority System Plan and San Joaquin County Water Management Plan.

- North Delta Water Agency – The NDWA was formed by a special act of the Legislature in 1973 to protect the water supply against sea water intrusion and to ensure a reliable water supply to meet current and future water needs. The NDWA service area now includes approximately 277,000 acres within the counties of Sacramento, San Joaquin, Solano, and Yolo. Most of the land is devoted to agriculture use and supplied with surface water from the Delta (NDWA, 2015).

San Joaquin County No. 2 (Cal Water) – San Joaquin County No. 2 GSA is comprised of almost 7,000 acres of San Joaquin County and Cal Water. Cal Water is an investor-owned public utility regulated by the California Public Utilities Commission; it is a signatory to the California Urban Water Conservation Council. Cal Water has approximately 42,000 connections in the greater Stockton area, primarily south of the Calaveras River. Cal Water utilizes surface water delivered from SEWD and groundwater pumped by Cal Water wells to meet customer demands. Cal Water's Stockton District was formed in 1927 with the purchase of the water system from Pacific Gas and Electric Company (PG&E).

South Delta Water Agency – The SDWA was originally formed to address local water supply and water quality concerns in the south Delta area. The SDWA encompasses a total of approximately 150,000 acres within its boundaries, and almost 18,000 acres overlap with the southwestern portion of the Eastern San Joaquin Subbasin. The SDWA does not own any facilities or water rights. Instead, the Agency protects property owners who have individual water rights. Surface water is the primary source of water used within the agency boundaries given that most of the groundwater is unusable due to high salinity (Eastern San Joaquin County GBA, 2014).

South San Joaquin GSA – South San Joaquin GSA's 64,000 acres is comprised of SSJID (including Woodward Reservoir and canals leading to the District), City of Ripon, and City of Escalon.

- South San Joaquin Irrigation District – SSJID was formed in 1909 under the Irrigation District Act and covers approximately 72,000 acres in the southeastern portion of San Joaquin County located within the Eastern San Joaquin Subbasin boundaries. The cities of Manteca, Ripon, and Escalon comprise approximately 20,000 acres of the District area. SSJID in 2005 began the delivery of up to 32,000 AF/year currently (and up to 43,000 AF/year in Phase II) of treated surface water from Woodward Reservoir to the cities of Escalon, Manteca, Lathrop, and Tracy for the SCWSP (Eastern San Joaquin County GBA, 2014).

- City of Ripon – The City of Ripon is located at the southern edge of San Joaquin County along Highway 99. The population in 2015 was approximately 14,700 and is expected to grow to about 30,800 by 2040. The City's potable water is provided by City groundwater wells and supplied over 4,000 acre-feet (AF) in 2015. Non-potable groundwater and surface water from SSJID are used for irrigation purposes and recharge (City of Ripon, 2015).

- City of Escalon – The City of Escalon is located within the San Joaquin County boundaries along State Route 120. Incorporated in 1957, the City of Escalon was home to approximately 7,400 residents in 2015. The City of Escalon has an allotment of 2,015 AF of treated water from the SSJID and the SCWSP; however, the City is not utilizing its allotment and currently relies solely on groundwater wells to serve the City's population as well as commercial customers. The City of Escalon is selling its allotment of treated water to the City of Tracy but intends to construct a pipeline to convey SSJID water to meet domestic and industrial needs in the City (SSJID, 2015b).

Stockton East Water District – SEWD was formed in 1948 and includes a total of 143,300 acres, with overlaps with portions of WID, and includes the entire City of Stockton and the entire Cal Water service area. The SEWD GSA covers 101,000 acres of the District. The District is guaranteed 56.5 percent of New Hogan Reservoir's yield and provided a total amount of 75,000 AF annually from New Melones Reservoir through agreements with USBR. SEWD delivers wholesale drinking water to the City of Stockton, Cal Water, and San Joaquin County areas in the Stockton MUD (Eastern San Joaquin County GBA, 2014). At the regional level, SEWD has participated as a member agency of the Eastern Water Alliance and the GBA, two preceding efforts to the GWA that focused on groundwater management (Eastern San Joaquin County GBA, 2014).

1.1.4.4 Legal Authority

Under SGMA, any local public agency that has water supply, water management, or land use responsibilities in a basin can decide to become a GSA. A single local agency can become a GSA, or a combination of local agencies can decide to form a GSA by using either a JPA, a memorandum of agreement (MOA), or other legal agreement (CA DWR, 2016a).

In the Eastern San Joaquin Subbasin, the GWA has legal authority to jointly prepare, adopt, and implement a GSP consistent with the terms of the JPA Agreement and the GWA Bylaws (Eastern San Joaquin GWA, 2017a).

The GWA's JPA describes the following powers granted to GSAs:

- Become a GSA individually or collectively;
- Approve any portion, section, or chapter of the GSP adopted by the GWA;
- Act through GSAs to implement SGMA and the GSP;

- Exercise the powers conferred to GSAs by SGMA.

Each GSA that is a member of the GWA has its own legal authorities. For example, NSJWCD has the legal authorities granted to a GSA under the Water Code as well as the legal authorities granted to a Water Conservation District pursuant to Water Code sections 74000 et seq. The legal authorities of each GSA are listed in Appendix 1-B. Agency resolutions to become GSAs are provided in Appendix 1-C.

1.1.4.5 Estimated Costs and Approach to Meeting Costs

Implementation of the GSP requires funding sources. To the degree they become available, outside grants will be sought to assist in reducing cost of implementation to participating agencies, residents, and landowners of the Subbasin. However, there will be a need to collect funds to support implementation.

For budgetary purposes, the estimated initial cost of these activities is on the order of $450,000 to $900,000 per year excluding projects and management actions costs. Additional one-time costs are estimated to be on the order of $415,000. The GWA Board will evaluate options for securing the needed funding. See Chapter 7: Plan Implementation for additional detail on GSP implementation costs and funding sources.

1.1.5 GSP Organization

This GSP is organized according to DWR's "GSP Annotated Outline" for standardized reporting (CA DWR, 2016b). The Preparation Checklist for GSP Submittal in DWR formatting can be found in Appendix 1-D (CA DWR, 2016d).

1.2 PLAN AREA

1.2.1 Description of Plan Area

This Section provides a detailed description of the Eastern San Joaquin Subbasin, including major streams and creeks, institutional entities, agricultural and urban land uses, locations of groundwater wells, and locations of state lands. The Plan Area document also describes existing surface water and groundwater monitoring programs, existing water management programs, and general plans in the Plan Area.

1.2.1.1 Summary of Jurisdictional Areas and Other Features

The Eastern San Joaquin Subbasin falls within the larger San Joaquin Valley Groundwater Basin (see Figure 1-4). Basin and Subbasin designations by DWR were first published in 1952 in Bulletin 118, and subsequently updated in 1975, 1980, and 2003. The San Joaquin River Hydrologic Region contains 11 distinct subbasins, where the Eastern San Joaquin Subbasin (Bulletin 118 Basin Number 5-022.01) is bordered to the north by the Cosumnes Subbasin (Bulletin 118 Basin Number 5-022.16), the South American Subbasin (Bulletin 118 Basin Number 5-021.65), and the Sacramento Subbasin (Bulletin 118 Basin Number 5-021.66); to the south by the Modesto Subbasin (Bulletin 118 Basin Number 5-022.02); and to the west by the Tracy Subbasin (Bulletin 118 Basin Number 5-022.15) (see Figure 1-5).

The Eastern San Joaquin Subbasin includes lands south of Dry Creek between the San Joaquin River on the west and the crystalline basement rock of the Sierra Nevada foothills on the east. The Eastern San Joaquin Subbasin boundary to the south stretches along the San Joaquin County line and continues along the Stanislaus River into Calaveras County to the east. Geologic units in the Eastern San Joaquin Subbasin consist of consolidated rocks and unconsolidated deposits (CA DWR, 2006).

No adjudicated areas or areas covered by an Alternative Plan exist within the Eastern San Joaquin Subbasin.

Figure 1-4: San Joaquin Valley Groundwater Basin

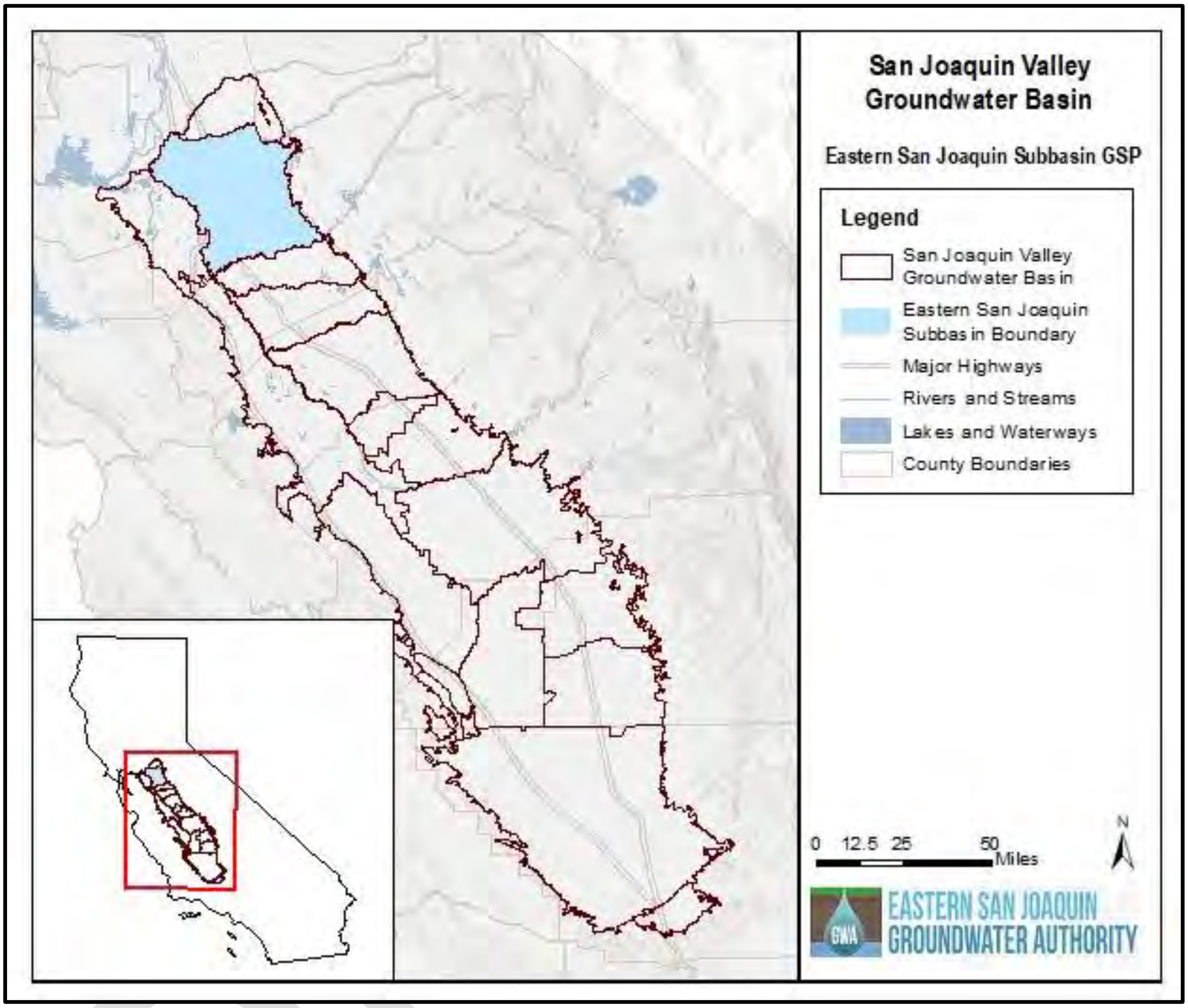
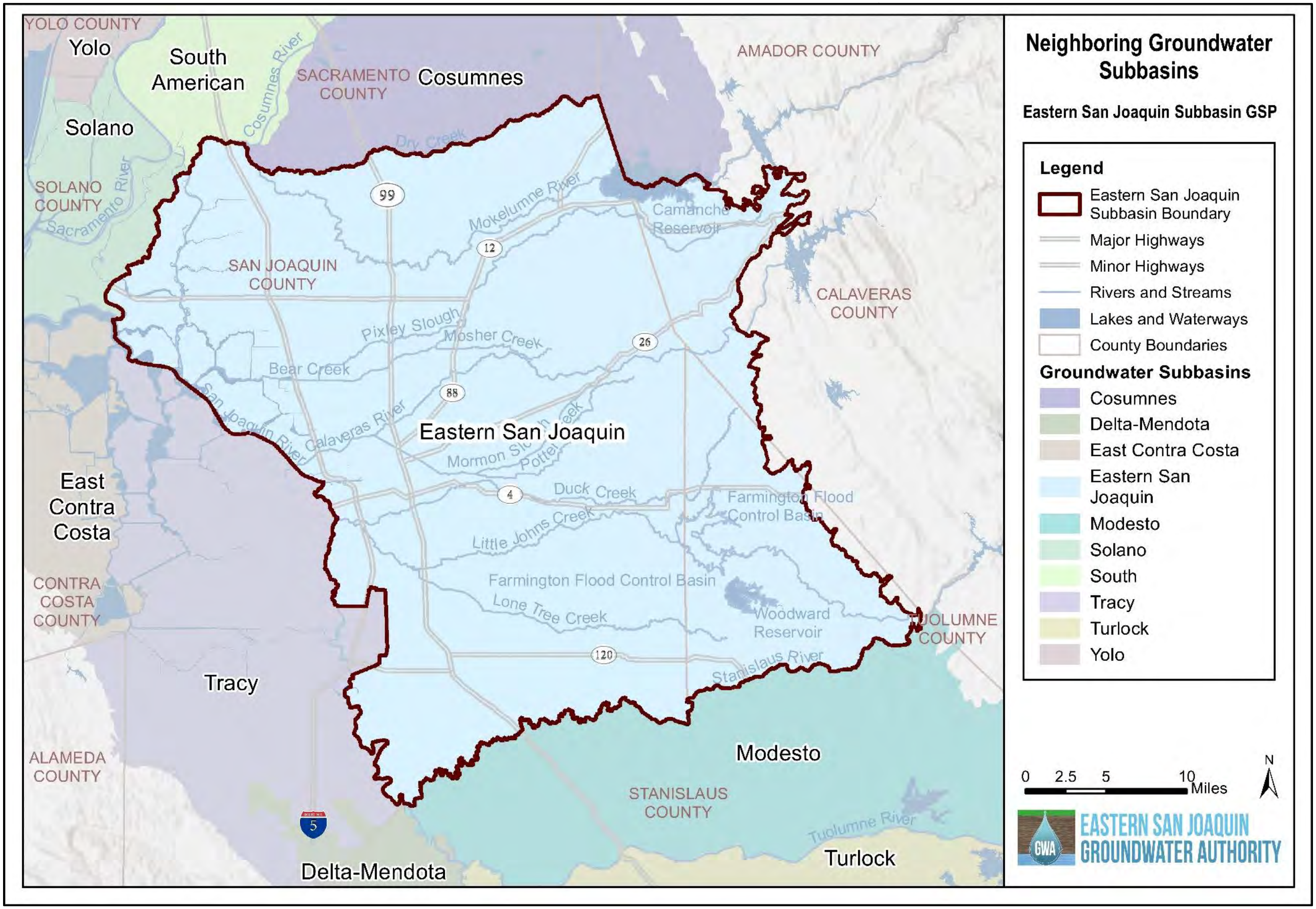


Figure 1-5: Neighboring Groundwater Subbasins



The Eastern San Joaquin Subbasin underlies areas of San Joaquin, Stanislaus, and Calaveras counties. Figure 1-6 shows the location of these three counties within the State of California as well as the three other counties bordering the Eastern San Joaquin Subbasin: Sacramento, Amador, and Contra Costa.

Figure 1-6: Surrounding Counties

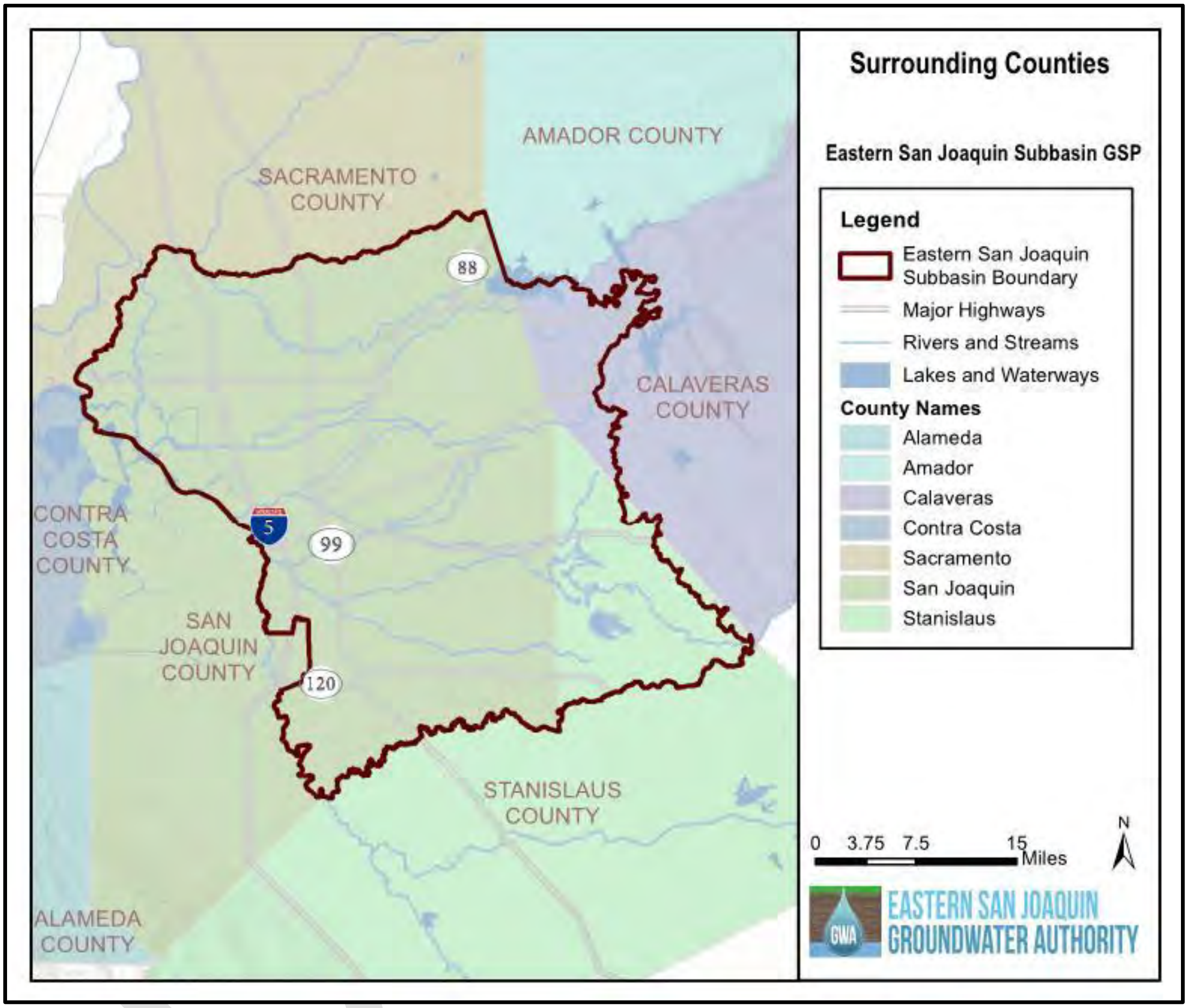


Figure 1-7 shows the Eastern San Joaquin Subbasin and the basin's key geographic features. The Subbasin encompasses an area of about 1,195 square miles. There are eight entities within the region with land use jurisdiction: the County of San Joaquin, the County of Calaveras, the County of Stanislaus, the City of Stockton, the City of Lodi, the City of Manteca, the City of Escalon, and the City of Ripon. The cities of Lodi, Escalon, Manteca, and Ripon are contained entirely within the Subbasin, while eastern portions of San Joaquin County and City of Stockton, and western portions of Calaveras and Stanislaus counties, lie in neighboring subbasins. The Eastern San Joaquin Subbasin encompasses the following unincorporated communities: Burson, Clements, Farmington, French Camp, Glenwood, Linden, Lockeford, Morada, Nobel Acres, Peters, Valley Springs, Victor, Wallace, and Woodbridge.

Figure 1-7: City Boundaries

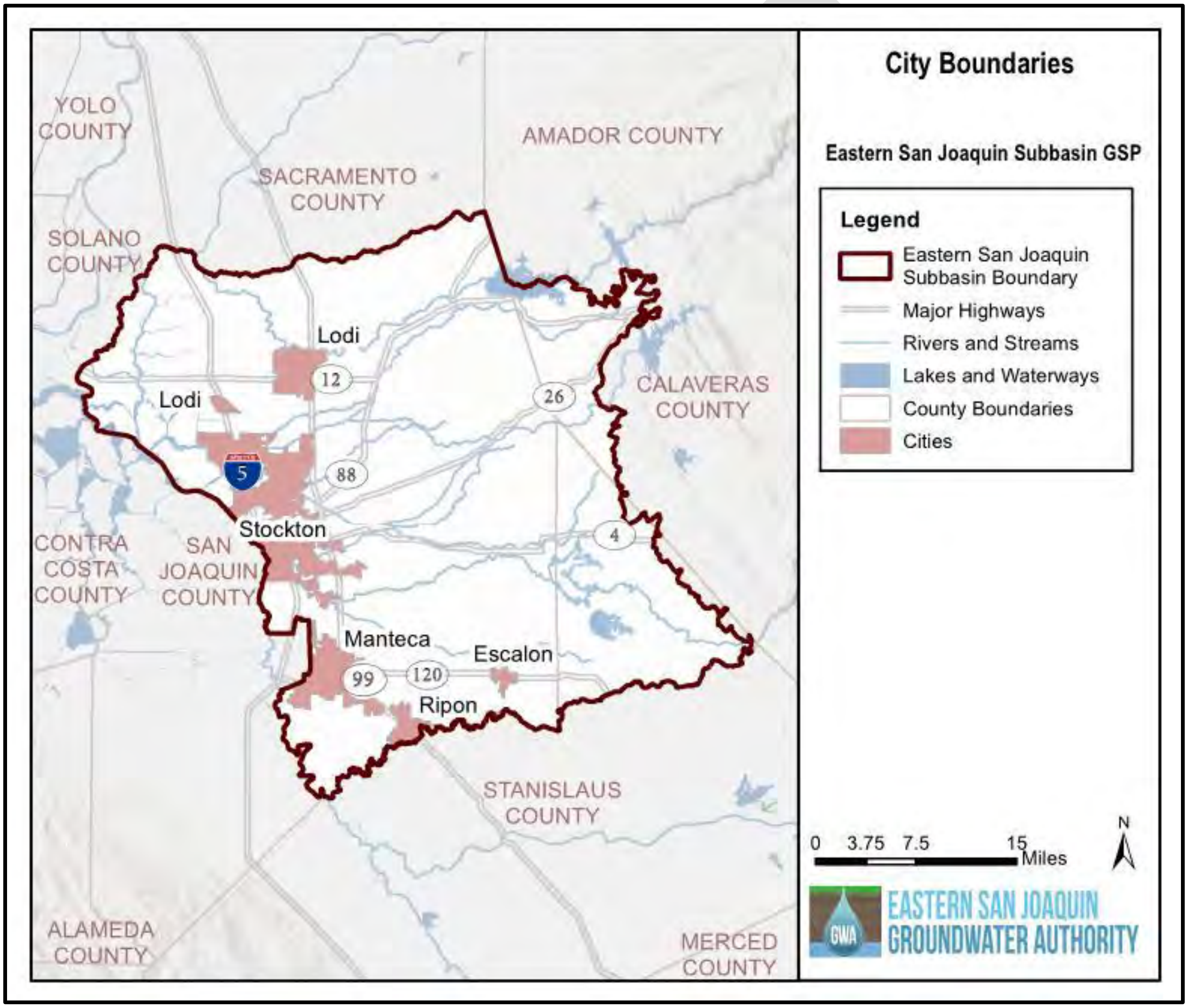


Figure 1-8 shows the spatial extent of Disadvantaged Communities (DACs) and Severely Disadvantaged Communities (SDACs) in the Eastern San Joaquin Subbasin. DWR defines DACs as census geographies (census tracts, census block groups, and census-designated places) with an annual median household income (MHI) that is less than 80 percent of the Statewide annual MHI. SDACs are defined as census geographies with an MHI less than 60 percent of the Statewide annual MHI. DWR uses the most recently available 5-Year American Community Survey (ACS) dataset to identify these areas. For this GSP, the 2012-2016 ACS dataset was used, establishing statewide MHI as $63,783 (CA DWR, Mapping Tools).

Figure 1-8: Disadvantaged Communities (DACs)

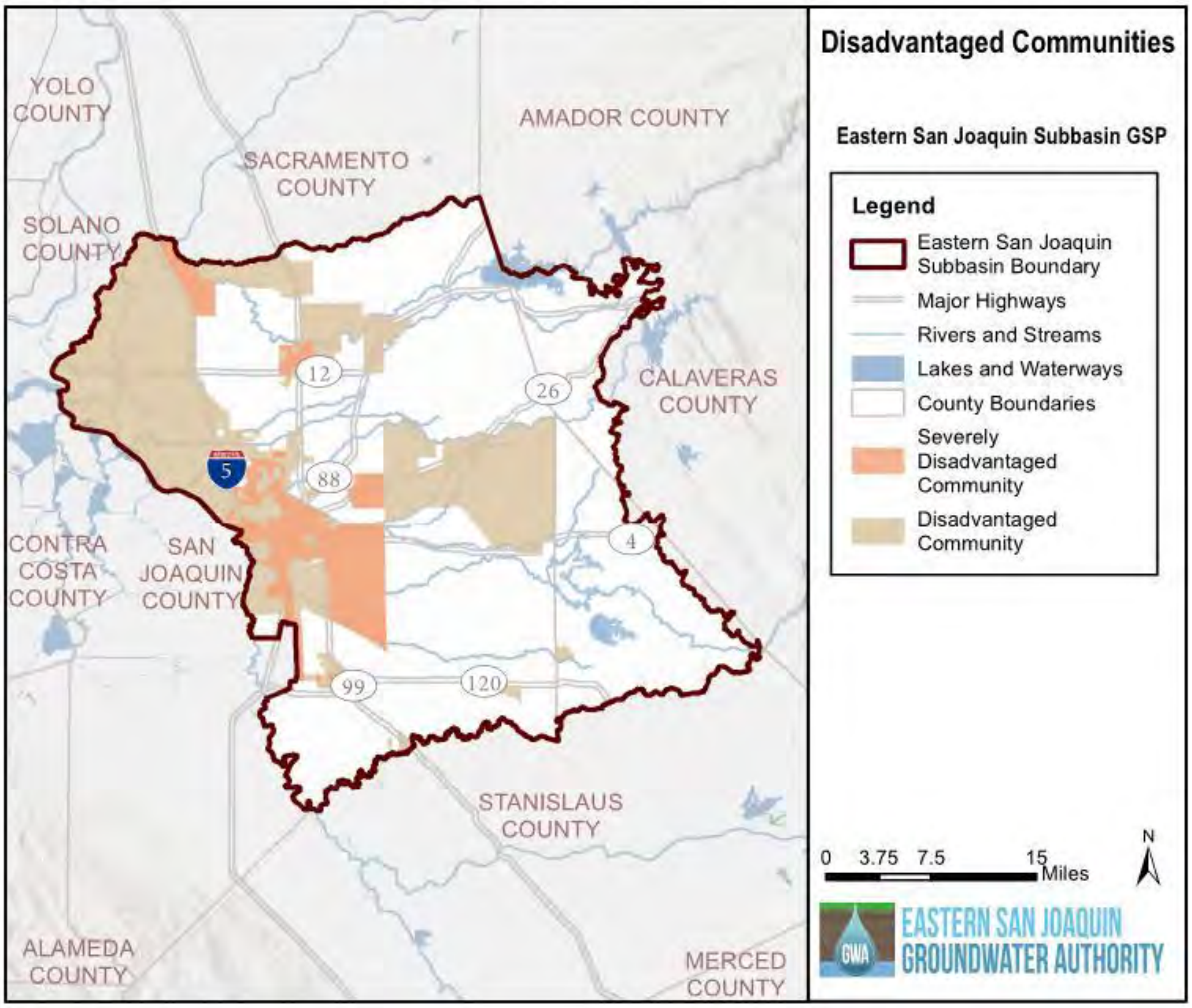
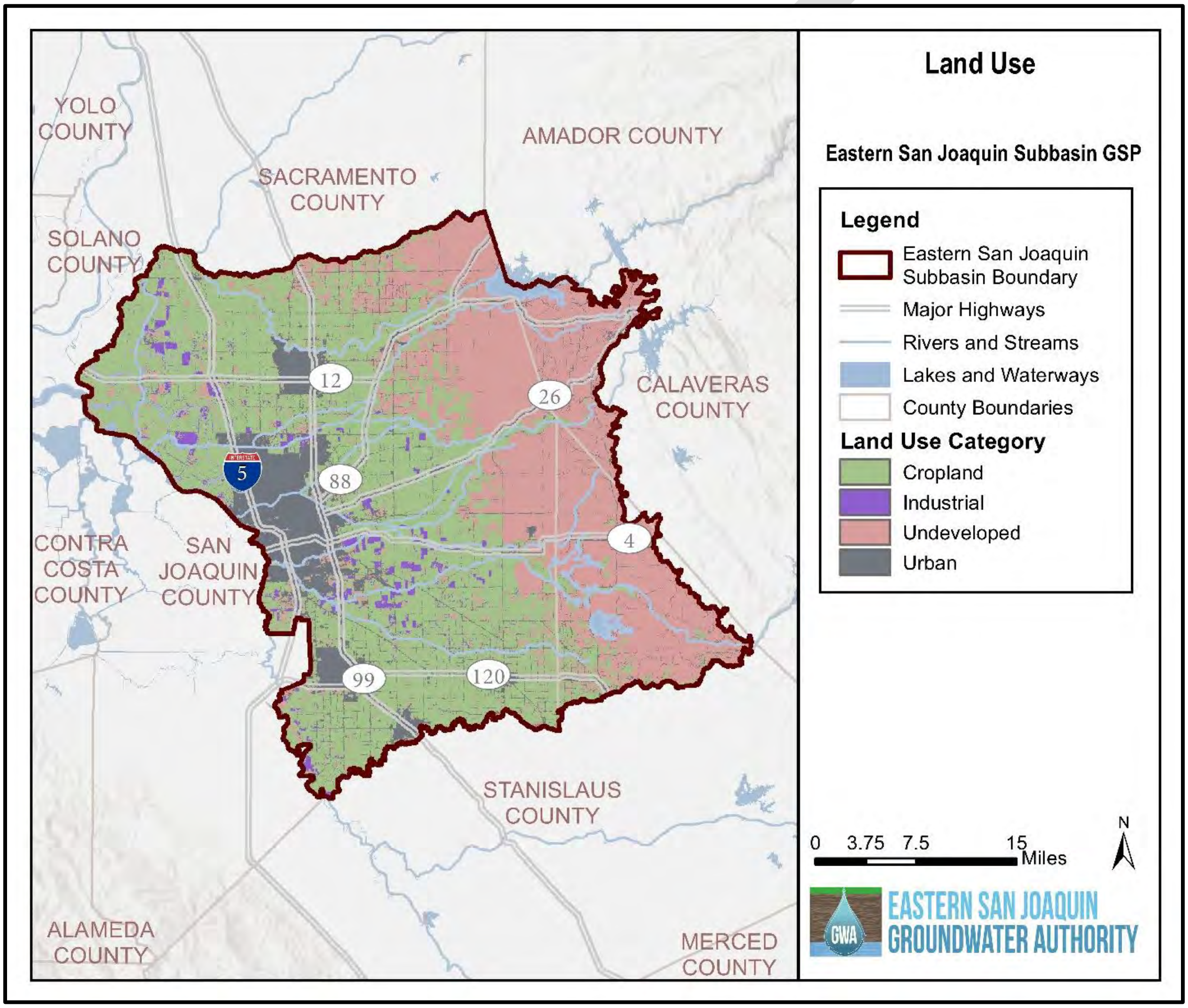


Figure 1-9 shows a map of land use in the Eastern San Joaquin Subbasin across four general categories: cropland, industrial, undeveloped, and urban. These categories were mapped based on categories provided by 2015 land use from the CropScape 2015 dataset.

Land use patterns in the Eastern San Joaquin Subbasin are dominated by agricultural uses, including nut and fruit trees, vineyards, row crops, grazing, and forage. These uses rely heavily on purveyors or districts, private groundwater wells, and surface water sources in some areas. Urban land use relies on a combination of surface water and groundwater. Land use is primarily controlled by local agencies. Land use patterns in the mountainous areas to the east are dominated by native vegetation and unirrigated pasture lands (USDA, 2015).

Figure 1-9: Land Use



Crop type varies by region, with orchards and vine crops comprising the majority of agriculture in the Subbasin. Almond orchards dominate the southern portion of the Subbasin, cherry and walnut orchards dominate the central portion of the Subbasin, and vineyards dominate the northern portion (Figure 1-10). In 2015, fruit and nut trees comprised 37 percent, and vineyards comprised 24 percent, of the irrigated crops in the Subbasin. Alfalfa and irrigated pasture were the next most dominant crop type, comprising 11 percent of irrigated crops in the Subbasin (USDA, 2015).

Figure 1-10: Land Use by Crop Type

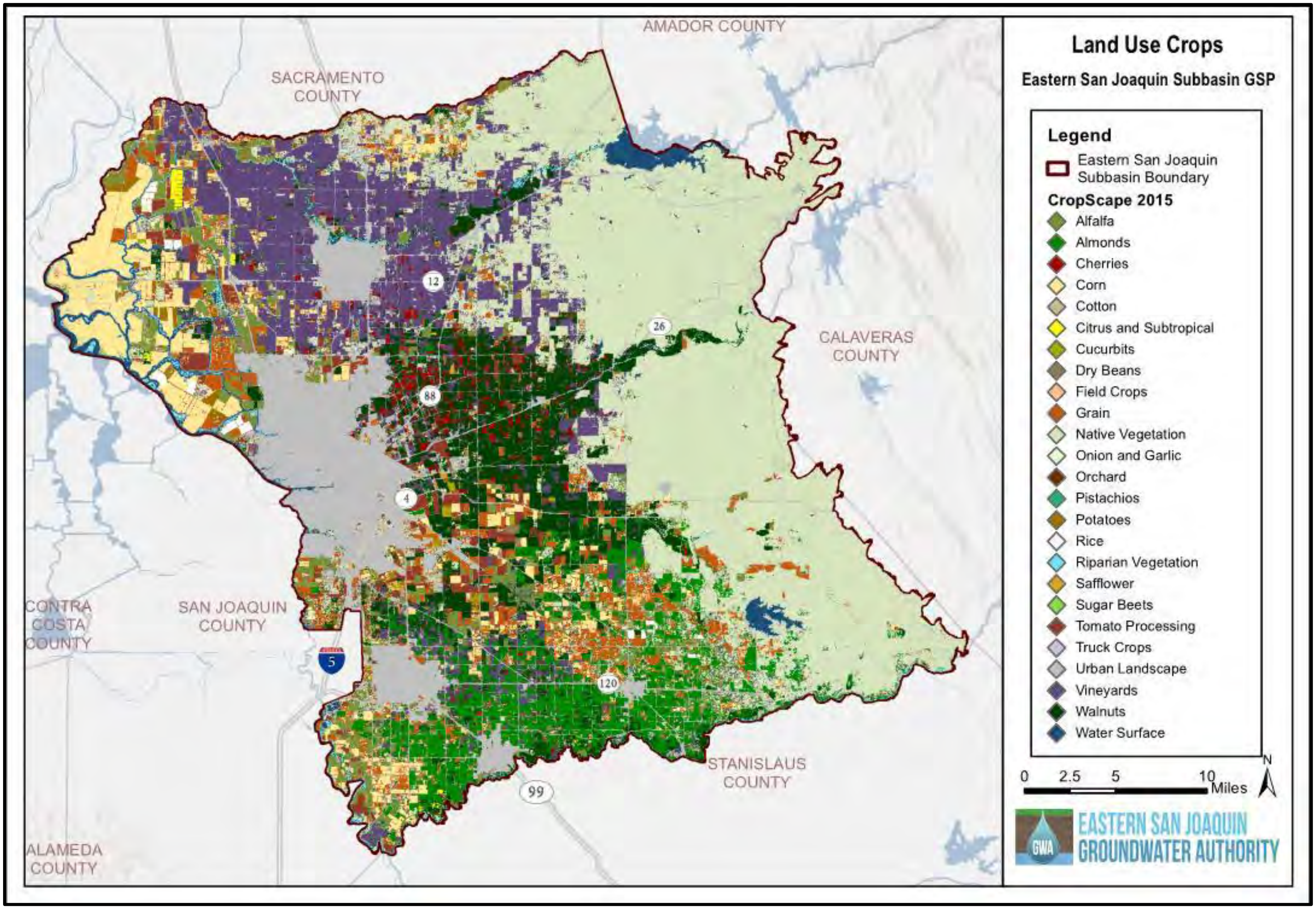


Figure 1-11 shows a map with boundaries of federal and state parks within the Eastern San Joaquin Subbasin. The United States Fish & Wildlife Service (USFW) manages the San Joaquin River National Wildlife Refuge situated in Stanislaus County where the Tuolumne, Stanislaus, and San Joaquin rivers meet. Established in 1987 to provide habitat for migratory birds and endangered species, the Refuge is 7,000 acres and is located just outside the southern boundary of the Subbasin (USFW, 2012).

The California Department of Parks and Recreation (California State Parks) also maintains the Caswell Memorial State Park located along the Stanislaus River near Ripon. The Caswell Memorial State Park protects a riparian oak woodland and is home to the riparian brush rabbit, an endangered species (California State Parks). This is the only State Park within the Eastern San Joaquin Subbasin boundary. The Franks Tract State Recreation Area (SRA) and the Carnegie State Vehicular Recreation Area (SVRA) are also managed by California State Parks; however, both of these areas are located outside of the Subbasin boundary.

Figure 1-11: US Fish & Wildlife Service and CA State Park Boundaries

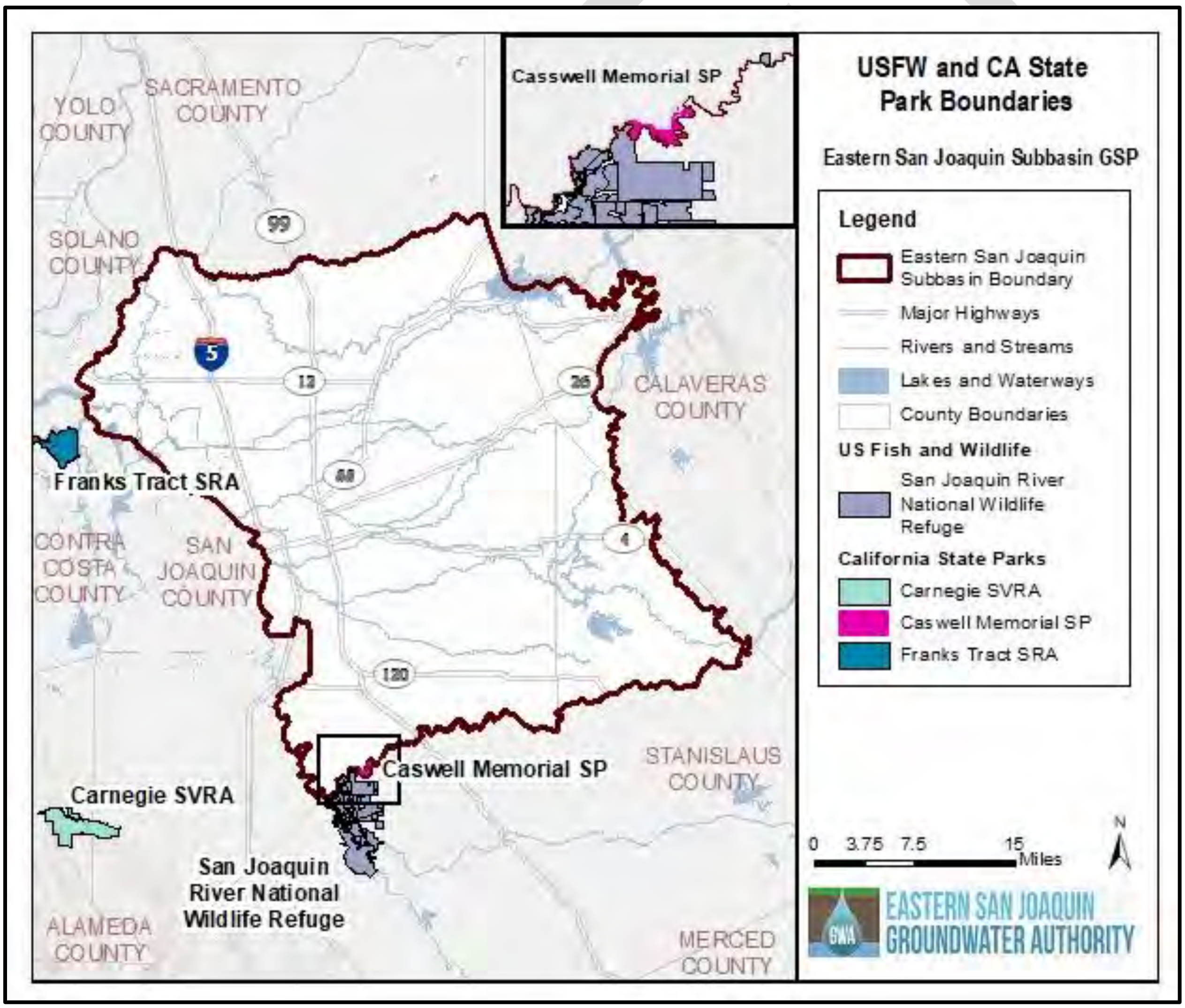


Figure 1-12 to Figure 1-14 shows the density of domestic, public, and production wells per square mile in the Eastern San Joaquin Subbasin, as available from the DWR. This includes approximately 1,000 unique wells collected primarily from DWR's Water Data Library (WDL), but also other state, regional, and local monitoring entities. Though there are overlaps and discrepancies in the designation of wells, domestic wells are largely private residential wells, public wells are municipal-operated wells, and production wells are for irrigation or industrial purposes. (CA DWR, Water Data Library). DWR recommends a suggested well density of 0.2 to 10 monitoring wells per 100 square miles. While the majority of the Eastern San Joaquin Subbasin meets this threshold, data gaps exist, particularly the northwestern corner of the Subbasin and to the east. Wells containing groundwater level data are described further in Section 1.2.2.1.

Figure 1-12: Density of Domestic Wells per Square Mile

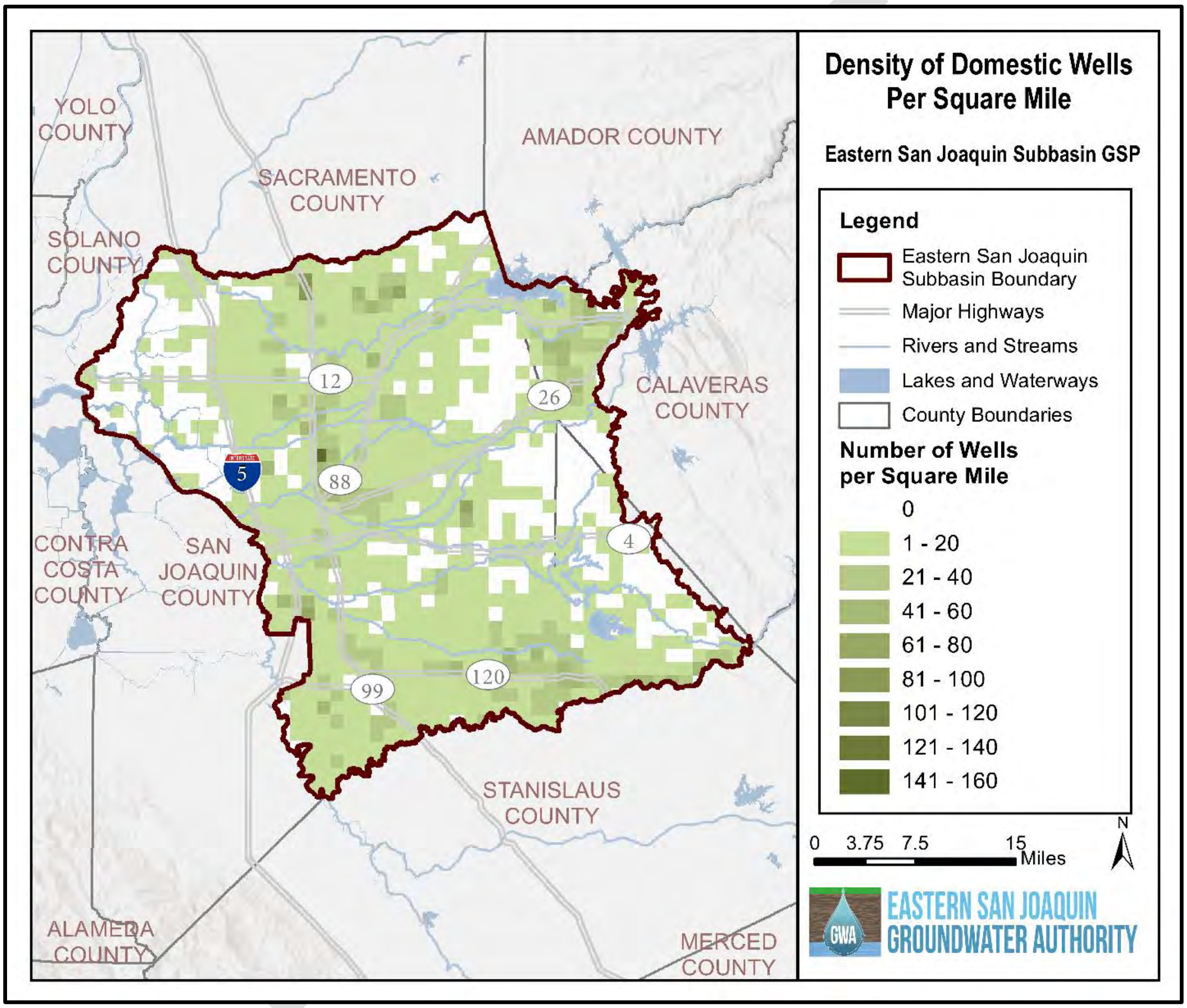


Figure 1-13: Density of Public Wells per Square Mile

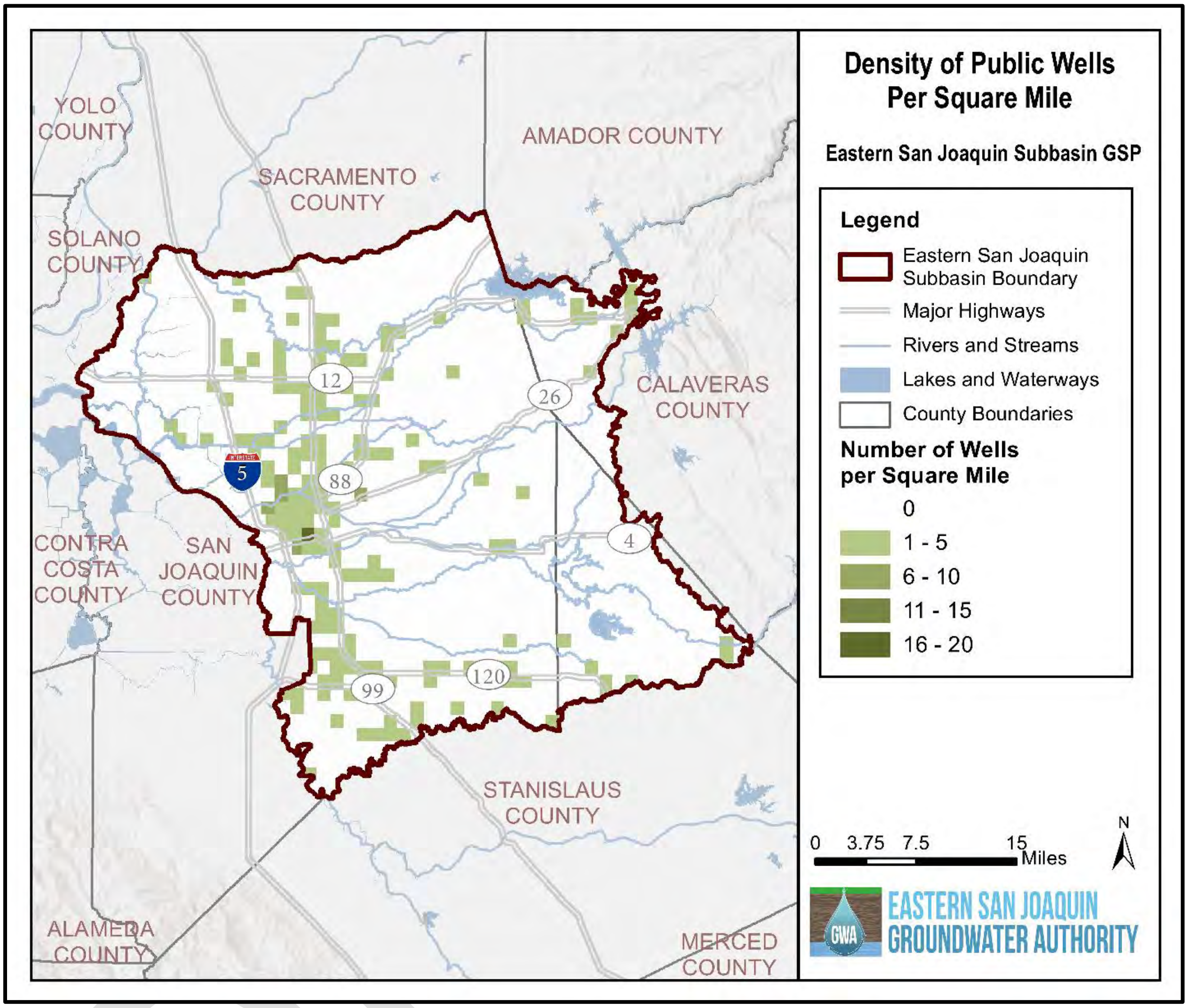
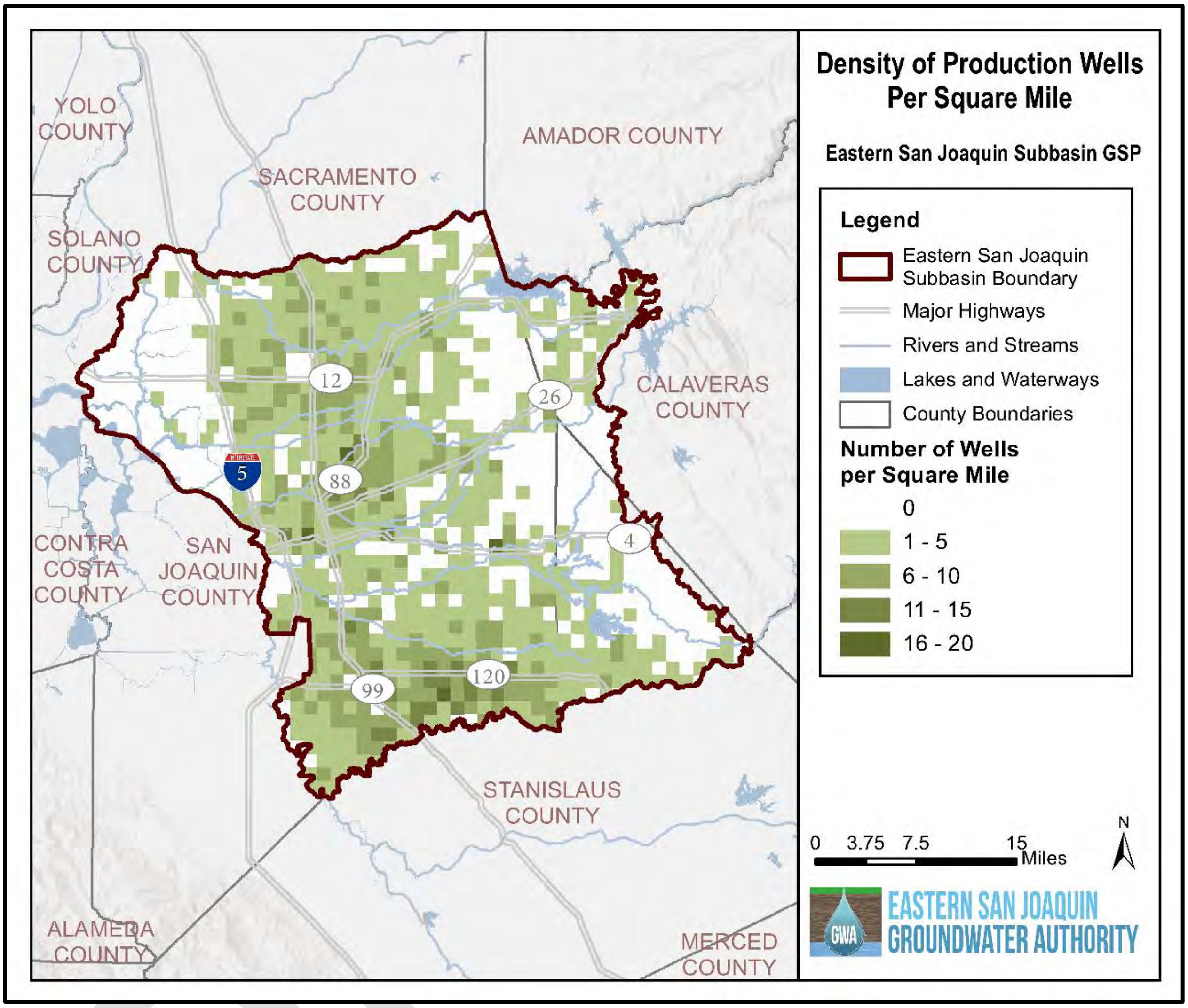


Figure 1-14: Density of Production Wells per Square Mile



1.2.2 Water Resources Monitoring and Management Programs

The existing monitoring and management landscape within the Eastern San Joaquin Subbasin is a patchwork of local, regional, state, and federal programs, each serving its own specific function. This patchwork provides valuable data that has supported past needs and will assist in meeting monitoring needs under SGMA. This patchwork of programs includes redundancies, inconsistent protocols, and inconsistent timing of monitoring that will need to be improved during SGMA implementation.

Existing monitoring within the Eastern San Joaquin Subbasin is extensive, complex, and performed for a variety of purposes by a variety of entities. During a review of existing groundwater monitoring data and programs, data were collected from the following agencies and programs:

Statewide Monitoring Programs (Agencies and Databases):

- California Data Exchange Center (CDEC)
- California Department of Pesticide Regulation (CDPR)
- California Environmental Data Exchange Network (CEDEN)
- California State Water Resources Control Board (SWRCB), Division of Drinking Water (DDW)
- Department of Water Resources:
    - California Statewide Groundwater Elevation Monitoring Groundwater Information Center Interactive Mapping Application (GICIMA)
    - WDL
- GeoTracker
- Groundwater Ambient Monitoring and Assessment Program (GAMA)
- Online System for Well Completion Reports (OSWCR)
- University NAVSTAR Consortium (UNAVCO)
- United States Bureau of Reclamation (USBR)
- United States Geological Survey (USGS)

Regional Monitoring Programs:

- Central Valley Salinity Alternatives for Long-Term Sustainability
    - California Department of Public Health (CDPH)
    - DDW
    - DWR
    - Central Valley Regional Water Quality Control Board (CVRWQCB) Waste Discharge Requirement (WDR) dairy data, Dairy CARES
    - USGS's National Water Information System (NWIS)
- Central Valley Dairy Representative Monitoring Program
- EnviroStor
- Groundwater Quality Trend Monitoring Program through SWRCB Irrigated Lands Regulatory Program (ILRP)
- San Joaquin River Restoration Program

Local Monitoring Agencies

- Cal Water

- Calaveras County Water District
- City of Lodi
- City of Manteca
- City of Stockton
- Linden County Water District
- Lockeford Community Services District
- North San Joaquin Water Conservation District
- Oakdale Irrigation District
- San Joaquin County
- South San Joaquin Irrigation District
- Stockton East Water District

See Chapter 4: Monitoring Networks for a description of the monitoring programs that will be used in GSP implementation.

1.2.2.1 Groundwater Level Monitoring and Data Sources

1.2.2.1.1 CASGEM

DWR maintains several groundwater level monitoring programs, tools, and resources covering California. The California Statewide Groundwater Elevation Monitoring (CASGEM) Program is DWR's primary resource for groundwater level data, and it has been used extensively in the development of this GSP. The CASGEM Program was authorized in 2009 by SB X7-6 to establish collaboration between local monitoring parties and DWR to collect and make public statewide groundwater elevation data. The program provides the framework for local agencies or other organizations to "assume responsibility for monitoring and reporting groundwater elevations in all or part of a basin or subbasin" (CA Water Code Section 10927). Three CASGEM monitoring agencies exist in the Eastern San Joaquin Subbasin: CCWD, San Joaquin County Flood Control and Water Conservation District (SJCFCWCD), and Stanislaus County. These three agencies have completed separate CASGEM Monitoring Plans, which are included in the references section.

- CCWD CASGEM Monitoring Plan: CCWD adopted a CASGEM Monitoring Plan in November 2012, with the following objectives:
  - Collect semi-annual groundwater levels from a selected monitoring well network
  - Upload groundwater levels to the CASGEM website after data quality steps have been completed
  - Maintain and update the monitoring well network plan documents including additions and removals from the monitoring network

  These objectives are helpful to this planning effort, as they include regular monitoring of groundwater levels and data upload to CASGEM. The CCWD plan also includes a description of the CASGEM monitoring network and groundwater level measurements. The monitoring network includes two USGS nested monitoring wells equipped with pressure transducers, which continuously monitor groundwater levels. The monitoring network also includes seven other wells that are not USGS wells. These wells are not equipped with pressure transducers, and manual groundwater elevation measurements are gathered at all wells twice a year. As stated in the CCWD CASGEM plan, the non-USGS wells are owned by private landowners, and additional wells may need to be added in the future if owners opt out of the monitoring network (CCWD, 2012). This monitoring network covers the portion of Calaveras County within the Eastern San Joaquin Subbasin.

- SJCFCWCD CASGEM Monitoring Plan: The SJCFCWCD CASGEM Monitoring Plan provides a description of the CASGEM monitoring network and groundwater conditions in San Joaquin County. This plan covers the portions of the Eastern San Joaquin and Tracy Subbasins within San Joaquin County. The SJCFCWCD has been taking semi-annual water level measurements since 1971 at wells owned by a variety of entities and by private individuals. A large portion of wells in the District's network are privately owned (SJCFCWCD, 2006). The District sent out consent forms to these private well owners to release well information to CASGEM, about forty of these forms were signed and returned, and construction information for these wells was uploaded to CASGEM. This information includes attributes such as well depth, coordinates, reference point elevation, and depth of screened interval.

- Stanislaus County CASGEM Monitoring Plan: The Stanislaus County Department of Environmental Resources (SCDER) established a CASGEM monitoring plan in 2016 to cover the portion of Stanislaus County within the Eastern San Joaquin Subbasin, often referred to as the northern triangle. This plan details the groundwater level monitoring history, protocols, and network for the northern triangle portion of Stanislaus County. This area is largely rural and most of the development exists between the Stanislaus River and near the Woodward Reservoir. Wells selected for the CASGEM program are in the developed areas. 17 wells are included in this CASGEM plan to be measured semi-annually, consisting of one domestic and ten irrigation wells, plus six wells that are of unknown type. Similar to the SJCFCWCD and Calaveras County CASGEM plans, well information such as depth and screened interval was uploaded to CASGEM for these wells. (Stanislaus County DER, 2016).

1.2.2.1.2 San Joaquin County

San Joaquin County publishes semi-annual groundwater reports, covering groundwater conditions in San Joaquin County. These reports include tables, hydrographs, and maps on groundwater levels. Groundwater level results from each semi-annual report are compared with values from the previous period. Groundwater level data collected by the county includes the data mentioned in the CASGEM section, above, and additional data that is not incorporated into CASGEM. The data are maintained by the San Joaquin County Department of Public Works.

1.2.2.1.3 Water Data Library

DWR's WDL contains measurements of groundwater elevations from water supply and monitoring wells monitored by numerous entities, such as DWR and local agencies. Groundwater level measurements available from the WDL are either continuously or periodically measured. Continuous measurements are provided by automatic water level measuring devices that take readings at wells; periodic measurements are manual recordings typically occurring at semi-annual or more frequent time intervals. Measurements displayed through the WDL are taken through other programs, such as CASGEM. The WDL lists the organization responsible for collecting each water level measurement. The WDL water level measurements are available through the California Natural Resources Agency (CNRA) Open Data website as a bulk download, or through the WDL website on a per station basis.

1.2.2.1.4 USGS – National Water Information System

The NWIS is a USGS program comprising several water datasets, including groundwater level measurements. Like the WDL, NWIS contains continuous and periodic water level measurements for recent and historical conditions. Within the Eastern San Joaquin Subbasin, there are only a few active NWIS groundwater sites and a large number of inactive sites with historical records. NWIS includes the monitoring organization for each well.

1.2.2.1.5 Data Received Directly from GSAs

A number of the GSAs collect water level and water quality information within their GSAs of varying frequencies and detail. These data were provided as part of the ESJWRM data collection effort and were compared with and included in groundwater level and water quality datasets analyzed for the preparation of this GSP.

The development of the ESJWRM took place in an open and transparent process. Coordination efforts took place with the Eastern San Joaquin County GBA, the organizational structure for agency coordination that proceeded SGMA regulations and the formation of the GWA. Through this effort, many of the GWA agency members participated in a Technical Review Committee, which acted as a forum to review model input data and assumptions. The Technical Review Committee facilitated major modeling decisions and provided input data, including groundwater pumping records, surface water delivery records, urban demand, and local water levels and quality data.

Local agencies with consistent representation at the Technical Review Committee meetings included San Joaquin County, WID, City of Lodi, NSJWCD, LCSD, CCWD, City of Stockton, Cal Water, SEWD, City of Lathrop, City of Manteca, SSJID, City of Escalon, OID, and Stanislaus County. Other agencies contributed local data to information collection efforts later in the GSP development process.

Online System for Well Completion Reports – The OSWCR is a DWR program used to document and compile boring or well completion records throughout California. There are as many as 2 million domestic, irrigation, and monitoring water wells in California included in this dataset, including approximately 10,000 domestic wells located in the Eastern San Joaquin Subbasin. When a well is constructed, modified, or destroyed, drilling contractors are required to submit a Well Completion Report to DWR for upload to the interactive OSWCR web site. OSWCR is used as a data source for wells identified for monitoring. In this GSP, the OSWCR database was used to evaluate Plan Area and identify sustainable management criteria.

1.2.2.2 Groundwater Quality Monitoring and Data Sources

1.2.2.2.1 Groundwater Ambient Monitoring and Assessment Program

The GAMA Program is an extensive groundwater quality monitoring program that was established by the SWRCB in 2000. The program compiles groundwater quality data from several agencies including the DWR, USGS, Department of Pesticide Regulations (DPR), Lawrence Livermore National Laboratory (LLNL), and others. Agencies submit data from monitoring wells for 258 constituents including total dissolved solids (TDS), nitrates and nitrites, arsenic, and manganese. GAMA data for the Eastern San Joaquin Subbasin contains water quality results collected by the SWRCB-DDW (formerly DHS-DDW), DPR, DWR, LLNL, and USGS from the 1940s to present. Figure 2-3 in the Chapter 2: Basin Setting shows the GAMA monitoring network throughout the Eastern San Joaquin Subbasin, which consists of roughly 6,800 monitoring points.

1.2.2.2.2 Water Data Library

In addition to the groundwater level records described previously, DWR's WDL contains groundwater quality data. This information includes discrete samples collected by DWR of current and historical groundwater quality measurements. These water quality results list the entity responsible for taking the sample but do not specify what program the sample was taken under. The WDL water quality measurements are available through the CNRA Open Data website as a bulk download, or through the WDL website on a per-station basis. In this GSP, WDL water quality measurements are utilized for basin characterization but are acquired from the other programs.

1.2.2.2.3 National Water Information System

The USGS NWIS contains groundwater quality data, in addition to the groundwater level measurements previously discussed. Groundwater quality results in NWIS relate to GAMA records, but there is no direct link between the two databases. Some NWIS sites have a State ID listed, which is a common identifier used for wells. This indicates these wells can be connected to other databases using the State ID information. However, differences in the format of the State ID between NWIS and other databases creates challenges in cross referencing between databases. In this GSP, NWIS water quality measurements are utilized for basin characterization but are acquired from the other programs.

1.2.2.2.4 Division of Drinking Water

The SWRCB DDW monitors public water system wells for Title 22 requirements such as organic and inorganic compounds, metals, microbial, and radiological analytes. Data are available for active and inactive drinking water sources for water systems that serve the public – defined as wells serving 15 or more connections or more than 25 people per day. Data are electronically transferred from certified laboratories to DDW daily. Data generated from this program become part of the Consumer Confidence Reporting (CCR) program and GAMA. DDW data was used in the development of this GSP to identify point-source contamination areas.

1.2.2.2.5 GeoTracker

GeoTracker, operated by the SWRCB, is a subset program of the GAMA program. GeoTracker GAMA does not regularly monitor for general groundwater quality constituents. Instead, GeoTracker contains records for sites that require cleanup, such as leaking underground storage tank sites, Department of Defense sites, and cleanup program sites. GeoTracker also contains records for various unregulated projects as well as permitted facilities including: ILRP, future CV-SALTS, oil and gas production, operating permitted underground storage tanks, and land disposal sites. GeoTracker receives records and data from SWRCB programs and other monitoring agencies.

1.2.2.2.6 Irrigated Land Regulatory Program and CV-SALTS

The IRLP is a program established by the CVRWQCB focused on monitoring and regulating the concentration of pesticides, toxicity, and nutrients (such as TDS and nitrates) in surface and groundwater. General orders under the ILRP require agricultural users in the Central Valley to prevent sediment, fertilizer, pesticides, manure, and other materials used in farming from leaving the field in irrigation or stormwater and entering surface waters or leaching below the root zone to groundwater. Biannually, agricultural users sample and submit data for irrigation and domestic wells. As part of the ILRP, the San Joaquin County and Delta Water Quality Coalition members monitor drinking water wells on enrolled parcels for nitrates, with results submitted to GeoTracker. This requirement began January 1, 2019, based on the February 7, 2018, revision of ILRP WDR (Order) for the Eastern San Joaquin River Watershed by the SWRCB. In addition, there are several representative monitoring sites for the monitoring of dairies. The ILRP program is in the process of developing a comprehensive monitoring network for future use to address the ILRP data objectives. The San Joaquin County and Delta Water Quality Coalition members also monitor domestic wells for nitrate in high vulnerability areas.

The Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) program was launched by the CVRWQCB in 2006 in an effort to develop sustainable salinity and nitrate management plans and solutions to the salinity problem in the Central Valley. CV-SALTS is a coalition of agricultural, business, and industry parties along with local, regional, and state governments which facilitate and fund efficient management systems of salinity, technical studies, and the 2017 Final Salt and Nitrate Management Plan (SNMP). The 2017 SNMP was developed based off a detailed water quality analysis conducted for salinity (represented by TDS) and nitrates using measurements from wells across multiple agencies from 2000-2016. Appendices to the SNMP and supporting documents contain summary information about these constituents by Subbasin, including Eastern San Joaquin. Basin Plan Amendments identify specific actions and recommendations for individual basins in the Central Valley. Efforts are underway to implement a salinity monitoring program, and the CV-SALTS program will likely require monitoring and data submittal to GeoTracker.

1.2.2.3 Interconnection of Databases

Several of the databases discussed above utilize the same water level or water quality data. These records often specify the monitoring entity responsible for the measurement. Although these data overlap between databases, the correlation between databases is not specified. For example, water level data in the WDL is also in CASGEM, but this link is not mentioned in WDL records. This lack of connection poses problems for gathering water level and quality data in the Eastern San Joaquin Subbasin and throughout California. For instance, if certain water level data is gathered through CASGEM but not uploaded to NWIS, users who gather water level measurements through NWIS would miss the CASGEM data. Efforts have been made in the development of this Plan to overcome the issue related to overlap and poor correlation between databases, but the issue remains. It is recommended that agencies work together to utilize a common unique identifier to ease use of multiple datasets.

1.2.2.4 Land Subsidence Monitoring

Subsidence monitoring in San Joaquin County is performed using continuous global positioning system (GPS) stations and has been reported by the University Navigation Satellite Timing and Ranging (NAVSTAR) Consortium Plate Boundary Observatory since 2004. Periodic subsidence reporting within the Eastern San Joaquin Subbasin is not known to occur. However, analyses have been conducted using satellite-based methods over limited time periods, as described below.

United States Geological Survey – Eleven continuously operating GPS (CGPS) stations are used to monitor subsidence in the Central Valley. The monitoring station closest to the Eastern San Joaquin Subbasin is station P781 located west of Modesto in Stanislaus County. This location will be used to assess the impact from subsidence associated with the occurrence of expansive clays below ground (Corcoran Clay) in this area.

The USGS report *Land Subsidence along the Delta-Mendota Canal in the Northern Part of the San Joaquin Valley, California, 2003-10* (Sneed et al., 2013) presents land subsidence data in the southwestern portion of the Eastern San Joaquin Subbasin from 2007 to 2010. Data for about 100 square miles of the Subbasin were recorded using Interferometric Synthetic Aperture Radar (InSAR) processing, a satellite-based remote sensing technique that can detect ground-surface deformation. Two InSAR techniques were used: conventional InSAR and persistent scatterer (PS) InSAR. Both sources of data were collected from the Japanese Aerospace Exploration Agency's Advanced Land Observing Satellite (ALOS). Periodic reporting of InSAR-derived ground displacement maps to a single member agency is not known to occur.

Other - DWR has made two InSAR datasets available for SGMA application: TRE Altamira InSAR point and raster data and NASA JPL raster data. Vertical displacement approximations in both datasets are collected by the European Space Agency's Sentinel-1A satellite. The two different datasets represent two different processing results, one by TRE Altamira Inc. and one by NASA JPL. The TRE Altamira data has coverage between January 2015 and June 2018. Both annual and total raster datasets from TRE Altamira are available and represent interpolations of the vertical displacement point features. The NASA JPL processed dataset spans Spring of 2015 to Summer of 2017 (CA DWR, 2019).

1.2.2.5 Groundwater Storage Monitoring

There are no existing programs that conduct regular monitoring specific to groundwater storage in the Eastern San Joaquin Subbasin. The ESJWRM historical model was used to generate estimates for historical groundwater storage based on a series of inputs including historical groundwater elevation data. The ESJWRM generated estimates for current and projected volumes of groundwater in storage based on assumptions for how future conditions may change relative to historical conditions.

1.2.2.6 Interconnected Surface Water Monitoring

There are no existing programs that conduct regular monitoring specific to the interconnection of surface water to groundwater in the Eastern San Joaquin Subbasin. However, surface water monitoring and groundwater level monitoring will be integrated to characterize spatial and temporal exchanges between surface water and groundwater and to estimate potential depletions of surface water caused by groundwater extractions. Additional information on how the depletions monitoring network was developed, monitoring frequency, and summary protocols is provided in Section 3: Sustainable Management Criteria.

1.2.2.7 Existing Water Management Programs and Plans

The subsections below contain descriptions of existing water management programs and plans, including Integrated Regional Water Management Plans (IRWMPs), Agricultural Water Management Plans (AWMPs), and Urban Water Management Plans (UWMPs) that apply to the Eastern San Joaquin Subbasin.

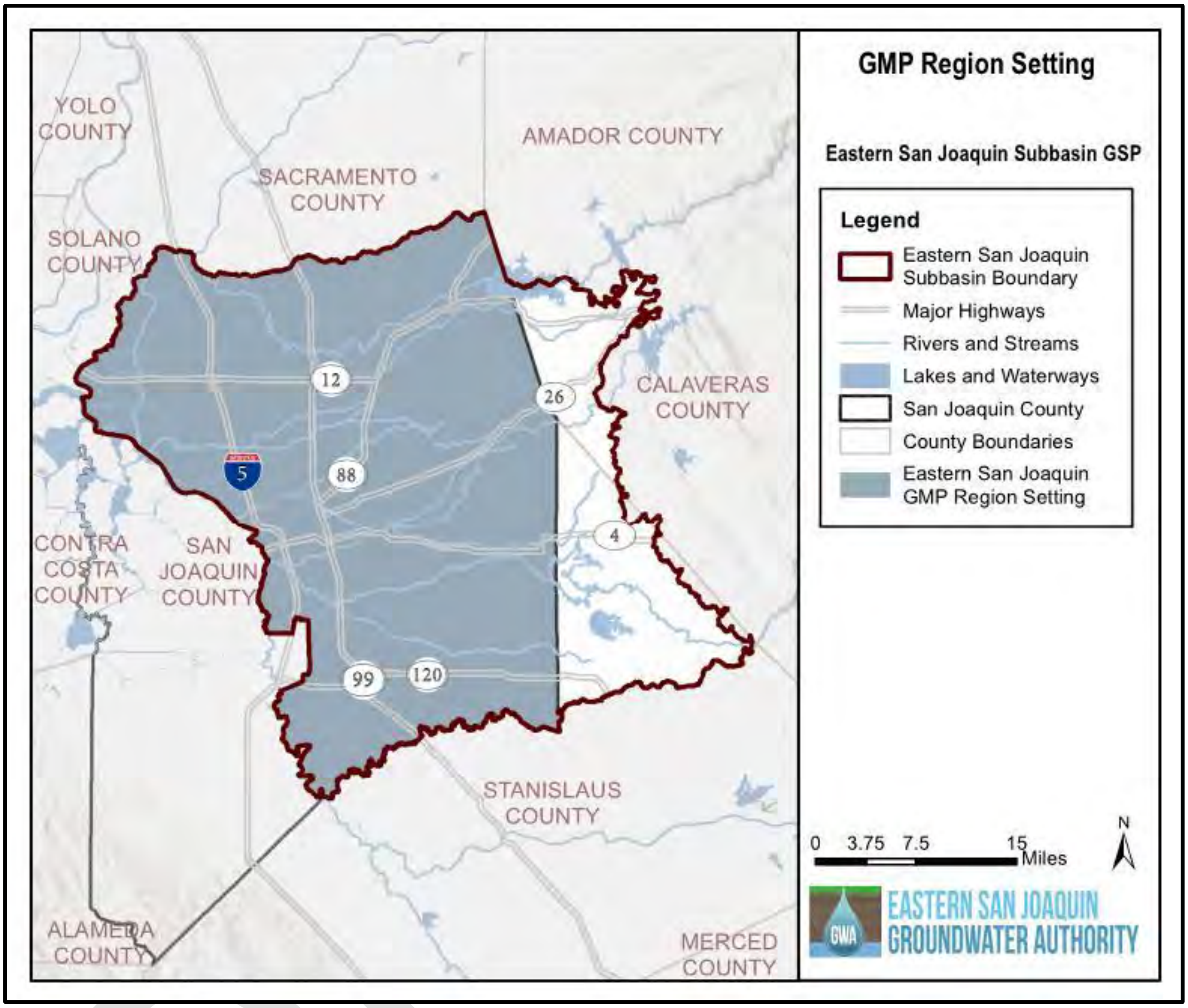
1.2.2.7.1 Groundwater Management Plan

The Eastern San Joaquin Groundwater Basin Groundwater Management Plan (GMP), developed by the Northeastern San Joaquin County Groundwater Banking Authority in September 2004, was a collaborative effort between local water interests with historically diverse viewpoints to reinforce local control and provide direction for the sustainable development of groundwater resources. The GMP covers a geographic region that includes the entirety of the Eastern San Joaquin Subbasin that falls within San Joaquin County but excludes portions within Calaveras and Stanislaus counties to the east. The GMP boundaries are generally defined by the San Joaquin County line to the east, the San Joaquin River to the west, Dry Creek to the north, and the Stanislaus River to the south. See Figure 1-15 for a map of the Eastern San Joaquin GMP Region.

The 2004 GMP provides valuable resources related to potential concepts, projects, and monitoring strategies that are leveraged in this GSP (Northeastern San Joaquin County Groundwater Banking Authority, 2004). The following management objectives would potentially influence implementation of the GSP:

- Maintain or enhance groundwater elevations to meet the long-term needs of groundwater users within the Groundwater Management Area
- Maintain or enhance groundwater quality underlying the Basin to meet the long-term needs of groundwater users within the Groundwater Management Area
- Minimize impacts to surface water quality and flow due to continued Basin overdraft and planned conjunctive use
- Prevent inelastic land subsidence due to continued groundwater overdraft

Figure 1-15: Eastern San Joaquin GMP Region Setting



1.2.2.7.2 Integrated Regional Water Management Plan

The Eastern San Joaquin Integrated Regional Water Management Plan (Eastern San Joaquin IRWMP) is a collaborative regional planning document that was published in June 2014. The IRWMP defines and integrates key water management strategies to establish protocols and courses of action to implement the Eastern San Joaquin Integrated Conjunctive Use Program (ICU Program). The ICU Program was designed to implement a comprehensive, prioritized set of projects and management actions to meet adopted Best Management Objectives, moving the Eastern San Joaquin County Region toward the goal of sustainable and reliable water supplies (Eastern San Joaquin County GBA, 2014).

The following 2014 IRWMP objectives related to groundwater use would potentially influence implementation of the GSP:

- Minimize adverse impacts to agriculture, communities, and the environment
- Maximize efficiency and beneficial use of supplies

- Protect and enhance water rights and supplies

An update to the 2014 Plan is currently underway.

1.2.2.7.3 Mokelumne Interregional Sustainability Program Report

The Mokelumne Watershed Interregional Sustainability Evaluation (MokeWISE) was formed following efforts made by the Mokelumne River Forum over seven years by a diverse set of stakeholders in the Upper and Lower Mokelumne River watersheds, with the objective to develop and evaluate alternatives to optimize water resources management within the Mokelumne-Amador-Calaveras (MAC) and Eastern San Joaquin IRWM planning regions. The plan offers a bi-regional approach by bringing together stakeholders, and it brings together the interregional sections of two IRWM regions identified as the Mokelumne River Forum (San Joaquin GBA, 2015).

The following MokeWISE objectives related to groundwater use would potentially influence implementation of the GSP:

- Groundwater is not considered a viable additional source in Amador and Calaveras counties
- The Eastern San Joaquin Subbasin is considered critically overdrafted
- Groundwater is not considered a viable additional supply source, although conjunctive use and recharge opportunities may be available

1.2.2.7.4 Agricultural Water Management Plans

AWMPs were developed and adopted by OID, SEWD, SSJID, and WID in 2015 in compliance with SB X7-7 of 2009, which requires certain agricultural water suppliers to prepare an AWMP and implement Efficient Water Management Practices (EWMPs). The Critical EWMPs include:

- Measure the volume of water delivered to customers with sufficient accuracy
- Adopt a pricing structure based at least in part on quantity delivered (Volumetric Pricing)

Applicable Conditional EWMPs that have the benefit of less applied water or increasing system efficiency include:

- Facilitate alternative land use for lands with exceptionally high water duties
- Facilitate use of available recycled water
- Facilitate financing of capital improvements for on-farm irrigation systems
- Implement an incentive pricing structure that promotes one or more of the goals identified in the California Water Code (CWC)
- Expand line or distribution systems, construct regulating reservoirs to increase distribution system flexibility and capacity, decrease maintenance, and reduce seepage
- Increase flexibility in water ordering by, and delivery to, water customers within operational limits
- Construct and operate supplier spill and tailwater recovery systems
- Increase planned conjunctive use of surface water and groundwater
- Automate canal control structures
- Facilitate or promote customer pump testing and evaluation

- Designate a water conservation coordinator who will develop and implement the water management plan and prepare progress report
- Provide for the availability of water management services to water users
- Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional changes to allow more flexible water deliveries and storage
- Evaluate and improve the efficiencies of the supplier's pumps

The 2015 AWMPs provide a framework of management practices to help meet water management goals that align with the goals of the Eastern San Joaquin GSP.

1.2.2.7.5 Urban Water Management Plans

UWMPs were developed by Cal Water, CCWD, City of Lodi, City of Manteca, City of Ripon, City of Stockton, SSJID, and SEWD, according to requirements of the CWC.

Agencies acting as GSAs use the following actions to encourage conservation and efficient use of water:

- Water waste prohibition ordinances
- Metered distribution systems
- Tiered water rates and conservation pricing
- Public education and outreach efforts
- Water conservation program coordination and staffing support
- Free residential plumbing retrofit devices
- Washing Machine Rebate program

1.2.2.8 Canal Diversions and Seepage

Canal seepage in the Eastern San Joaquin Subbasin is tracked on a district-by-district basis. All of the major irrigation districts utilize natural watercourses and/or canals to distribute surface water diversions to their customers.

OID diverts water from the Stanislaus River at Goodwin Reservoir through the Joint Main Canal on the north side and the South Main Canal on the south side. Approximately 330 miles of laterals carry water to landowners off of the main canals. While this entire lateral system was historically comprised of open, unlined ditches, 100 miles of the laterals have been converted to pipelines; 105 miles are inconsistent, non-continuous open concrete-lined ditches; and the rest remain unlined. Approximately 40 percent of the OID service area is within the Eastern San Joaquin Subbasin. According to the District-wide water balance developed by OID in 2016 as part of the 2015 Agricultural Water Management Plan, canal seepage is calculated to be 33,746 AF on average in wet years and 37,647 AF in dry years. Drain seepage is estimated to be 5,579 AF and 6,219 AF for wet and dry years, respectively. Deep percolation of applied water contributes about 27,474 AF of recharge on average overall. Within OID, approximately 44 percent of all recharge is due to canal seepage, and an additional 33 percent of all recharge is due to deep percolation of applied water (OID, 2015).

In SSJID, similarly, the primary source of recharge in the groundwater system is conveyance seepage and deep percolation of applied water. SSJID diverts from the Stanislaus River initially and then sends the water through a system of lateral canals to its customers. Like OID, the entire system was open and unlined, but over time it has been slowly concrete lined and replaced with PVC pipelines. By 2015, the District used 312 miles of piped laterals and 38 miles of concrete-lined ditches. The 18 miles of the Main Distribution Canal is the only unlined portion. Recharge from canal seepage and deep percolation are estimated to be 144,000 AF/year, with 34 percent of total recharge from canal seepage and 66 percent from deep percolation (SSJID, 2015a).

SEWD uses two unlined canal systems to deliver water from Stanislaus River: Upper Farmington Canal and Lower Farmington Canal. SEWD also uses natural watercourses to distribute their water, such as rivers, creeks, and sloughs. SEWD's two canals are considered to lose about 5 percent of their flow to seepage, and natural water courses within the district may lose as much as 40 percent of their flow to seepage during the irrigation/delivery season. CSJWCD also uses the Upper Farmington Canal for transport, as well as natural watercourses within its boundaries. SEWD estimates that overall 26,000 AF is recharged through canal and natural watercourse seepage within district boundaries for an average year (SEWD, 2015).

Throughout its history, WID has also made efforts to improve the efficiency of the delivery infrastructure it maintains. Water for WID is diverted from the Mokelumne River and from the Delta at the end of Beaver Slough. In 2015, WID had about 100 miles of lined and unlined canals, and pipelines. Approximately 60,000 AF/year of Mokelumne River water is recharged through deep percolation and in-lieu recharge in the District. To counter these losses, the District has imposed a $2 per acre fee on land benefiting from the use of unlined portions of the canal network (WID, 2016).

Canal seepage, generally considered a loss to Districts in the short term, has played and will continue to play a crucial role in the long-term sustainability of groundwater resources in the Eastern San Joaquin Subbasin.

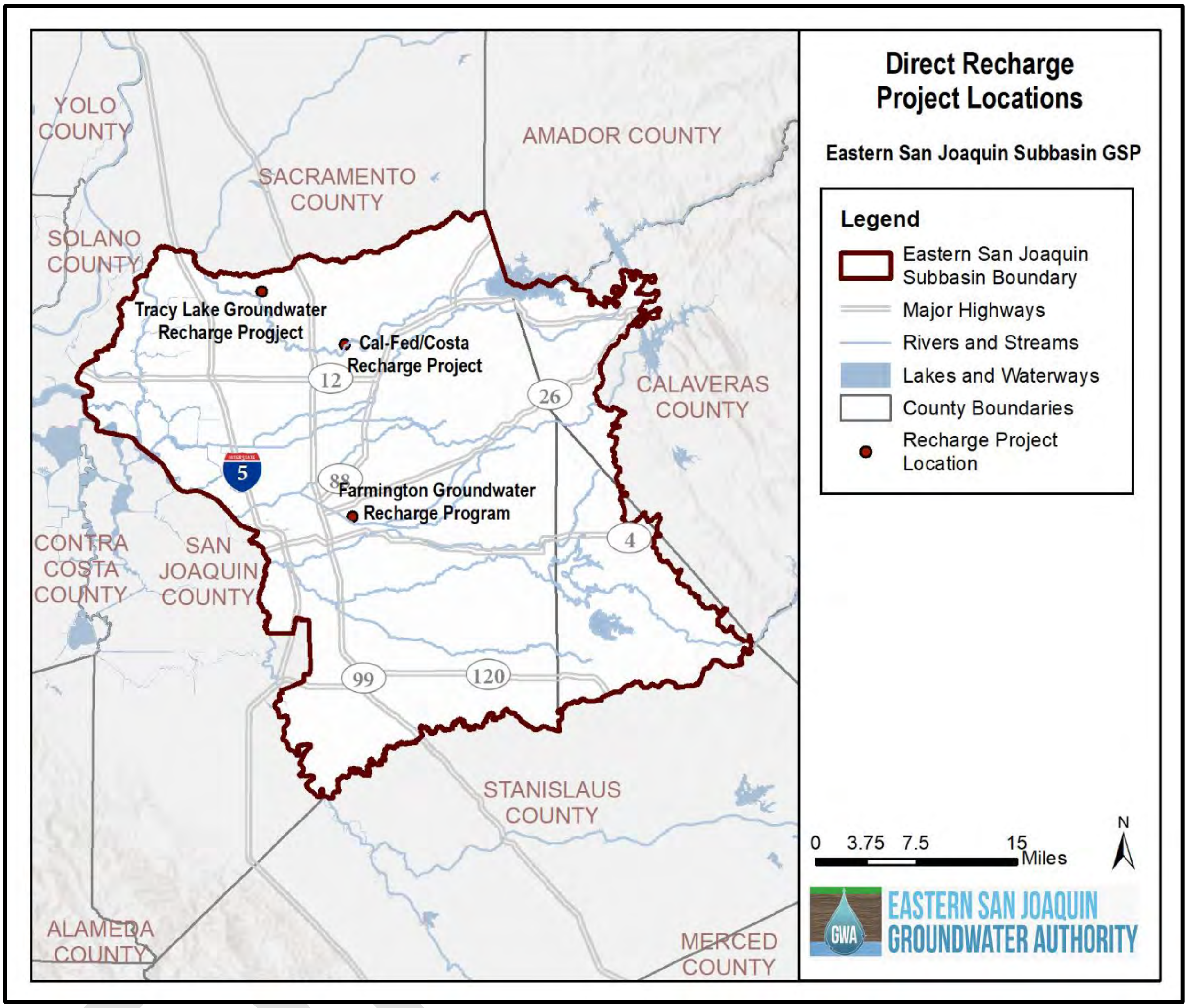
1.2.2.9 Conjunctive Use Programs

Conjunctive use is the use of surface water to allow the basin to recharge and store additional water supply, either through in-lieu use or direct recharge. This section describes conjunctive use programs in the Eastern San Joaquin Subbasin, including both in-lieu recharge and direct recharge projects.

In-lieu recharge occurs for both agricultural and municipal purposes wherever surface water is being delivered to offset the use of groundwater. Agencies conducting in-lieu recharge include CCWD, City of Lodi, City of Manteca, City of Stockton, CSJWCD, OID, SEWD, SSJID, and WID. Riparian users of surface water are also benefitting from in-lieu recharge.

Direct recharge projects exist in NSJWCD and SEWD, as shown below in Figure 1-16: Locations of Existing Groundwater Recharge ProjectsFigure 1-16. NSJWCD's Tracy Lake Groundwater Recharge Project includes direct recharge of 500 to 1,000 AF/year by placing surface water in the bed of South Tracy Lake to allow for percolation. The Cal-Fed/Costa Recharge project includes direct recharge of about 300 AF/year by flooding about 20 acres of vineyards post-harvest. NSJWCD is in the process of looking to expand all of these programs and add additional in-lieu and direct recharge projects in its service area. SEWD's Farmington Groundwater Recharge Program was developed in 2001 with a conceptual plan to recharge surface water via field flooding on about 1,200 acres. Since 2003, SEWD operated a 60-acre recharge site as a result of the Farmington Program with additional 73 acres coming online in 2019. The observed recharge amount ranges from 2,800 AF/year to 5,800 AF/year with an average of 4,400 AF/year for a total recharge volume about 65,000 AF. SEWD also has several wells to pump some of this recharged water for municipal supply during especially dry years.

Figure 1-16: Locations of Existing Groundwater Recharge Projects



1.2.3 Land Use Elements or Topic Categories of Applicable General Plans

1.2.3.1 General Plans in the Plan Area

San Joaquin County has jurisdiction over land use planning for the majority of the surface area of the Subbasin. The incorporated cities of Stockton, Manteca, Lodi, Ripon, and Escalon make up the remaining area. Implementation of the Eastern San Joaquin GSP may be affected by the policies and regulations outlined in the San Joaquin County General Plan, as well as the General Plans for the five cities, given that the long-term land use planning decisions that would affect the Subbasin are under the jurisdiction of the County and respective cities.

This section describes how implementation of the various General Plans may change water demands in the basin, how the General Plans may influence the GSP's ability to achieve sustainable groundwater use, and how the GSP may affect implementation of General Plan land use policies. Policies outlined in the General Plans that will potentially influence implementation of the GSP are discussed below and listed in Appendix 1-E.

1.2.3.1.1 San Joaquin County General Plan

The San Joaquin County General Plan describes the official County "blueprint" on the location of future land use, type of development encouraged, and decisions regarding resource conservation. Stakeholders informed the development of the County's vision and guiding principles, which represent the County's core values and establish benchmarks for the General Plan's goals and policies (SJC, 2016b). The General Plan encourages preservation of the County's groundwater resources and states that future urban and agricultural growth should occur within the sustainable capacity of these resources.

1.2.3.1.2 Calaveras County General Plan

The Calaveras County General Plan has provided a framework for growth and development in Calaveras County. The Calaveras County General Plan was developed in 1996 in collaboration with local stakeholders and policymakers to understand the challenges facing the community and to enact a common vision for the future. The Calaveras County Planning Commission has been working since 2008 to revise the General Plan, which is now more than 20 years old.

The Calaveras County General Plan recognizes that water is a limited and valuable resource and that the region is experiencing localized problems with both water supply and quality. To mitigate these issues, the General Plan delineates policies and goals that promote sustainable water resources management in the region (Calaveras County, 1996).

1.2.3.1.3 Stanislaus County General Plan

The Stanislaus County General Plan provides a comprehensive, long-term plan to guide development within the Stanislaus County boundaries through 2035. The General Plan was updated and adopted in 2016 to reflect the evolving conditions of the region. While Stanislaus County's economic base remains predominantly agricultural, the County's land use and economy continue to diversify in response to increased pressure to convert productive agricultural lands to non-agricultural uses. To address the region's changing water needs, the Stanislaus County General Plan supports goals, policies, and implementation measures that promote sustainable water management and protect the local groundwater sources (Stanislaus County, 2016).

1.2.3.1.4 City of Stockton General Plan

The City of Stockton General Plan establishes the City's 2040 vision and provides supporting goals, policies, and actions needed to achieve it. The General Plan for the 2040 vision was built upon the prior 2035 Stockton General Plan (adopted in 2007) and was a collaborative process that involved a diverse group of stakeholders and interests. The General Plan update incorporated feedback from City Council study sessions, Planning Commission study sessions, community workshops, and numerous other public meetings and outreach events (City of Stockton, 2016).

The City of Stockton's General Plan recognizes that groundwater supplies are vital to Stockton's ability to meet current and future water demands. The City has focused attention on optimizing available surface water supplies and cooperating with agencies in the region to manage the groundwater resources at a sustainable yield and to address regulatory pressures, droughts, and saline intrusion (City of Stockton, 2016).

1.2.3.1.5 City of Lodi General Plan

The City of Lodi General Plan Update, published in 2010, outlines a vision for Lodi's future and provides a set of policies and programs that guide community growth and development. The 2010 General Plan Update replaced the 1991 General Plan and was informed by community members and stakeholders who participated in the planning process through different avenues, including public workshops and meetings, mail surveys, interviews, presentations, and newsletters (City of Lodi, 2010).

As the primary source of water supply for the City of Lodi, the General Plan recognizes that groundwater contamination and overdraft in the Eastern San Joaquin Subbasin can threaten the City's ability to meet current water demands and limit future development (City of Lodi, 2010).

1.2.3.1.6 City of Manteca General Plan

The City of Manteca adopted the current Manteca General Plan in 2003 and is currently working on the Manteca General Plan Update to reflect the current conditions of the City. The Manteca General Plan Update is anticipated to conclude in 2020 and is a collaborative process between community members, City staff, and decision-makers to produce a General Plan that is current, progressive, flexible, and viable. The General Plan Update also reevaluates the existing vision for Manteca through 2040, incorporates new planning strategies, and brings the General Plan into compliance with recent social and environmental justice policies and laws (City of Manteca, 2017).

The Manteca General Plan Update recognizes that groundwater is a large source of potable water supply for the City and that the Eastern San Joaquin Subbasin is in overdraft. To address groundwater overdraft in the City, a significant number of policies in the General Plan promote increased understanding of the Eastern San Joaquin Subbasin.

1.2.3.1.7 City of Escalon General Plan

The Escalon General Plan was developed for the City in 1994 and updated in 2010 to reflect the most current conditions of the City and to provide comprehensive planning for future development. The Escalon General Plan was developed through a cooperative effort involving the City Council and Planning Commission, City staff and their consultants, and stakeholders in the City (City of Escalon, 2010). The Escalon General Plan delineates policies that support the long-term preservation of water supplies and water quality in the Eastern San Joaquin Subbasin (City of Escalon, 2010).

1.2.3.1.8 City of Ripon General Plan

The City of Ripon's General Plan was updated in 2006 to guide the use of private and public lands within the community's boundaries through 2040. The General Plan update provides a framework for promoting growth and reevaluates where growth should be located. The General Plan development process was informed by community members representing a wide variety of interests, city department heads, and staff representatives of public agencies (City of Ripon, 2006).

The General Plan supports the preservation of groundwater quantity and quality as it is an important source of water supply for the City of Ripon. Future development within the planning area is expected to have minimal effects on groundwater supplies, although it is unknown how development will impact groundwater quality. The General Plan predicts that the City of Ripon may have to abandon a large number of wells as sources of potable water due to contamination, and, as a result, additional development may be prohibited until an adequate source of potable water can be identified. Surface water is expected to meet water demands for surrounding agricultural uses (City of Ripon, 2006).

1.2.3.2 Effect of GSP Implementation on Applicable General Plans

The General Plans in the Subbasin provide the regions with a guideline to facilitate anticipated growth within the sustainable capacity of existing resources. Successful land use planning also promotes sustainable water supply and use within the regions. Due to the complementary nature of the General Plans and the GSP, the goals and policies in the General Plans support the ability of the GSAs to achieve sustainability.

Implementation of the GSP, including changes in groundwater management, may influence the type of land use and location of future development, depending on the level of changes set forth by the GSP, such as enacted programs, plans, and policies. While General Plan implementation may result in land use changes and changes in water consumption, minimal change in water demand is expected from GSP implementation. Most of the land within the Eastern San Joaquin Subbasin is currently developed to some use, and conversion from agricultural uses to urban uses is not anticipated to increase water demand. However, conversion from agriculture to urban use may have an effect on water source, depending on the location in the Subbasin, and may shift supply from groundwater to surface water.

1.2.3.3 Land Use Plans Outside the Plan Area

Land use decisions in neighboring areas experiencing overdraft are likely to affect groundwater conditions in the Eastern San Joaquin Subbasin. The portions of the Tracy and the Delta-Mendota Subbasins that are adjacent to the Eastern San Joaquin Subbasin are also located within San Joaquin County. These land use planning areas are covered by the San Joaquin County General Plan described in Section 1.2.3.1.1.

The cities of Tracy, Lathrop, Modesto, Galt, and Elk Grove are the largest urban areas neighboring the Eastern San Joaquin Subbasin. The City of Tracy, located within San Joaquin County, updated its General Plan in 2011. The City of Tracy General Plan identifies the Tracy Subbasin as a source of water supply for the city, though available groundwater supplies are projected to decrease by 2025. The City of Tracy is working towards reducing its reliance on groundwater and reserving its use for emergency situations and droughts (City of Tracy, 2011).

The City of Lathrop, located within San Joaquin County, relies on potable water supplies consisting of a combination of groundwater and treated surface water from the South County Water Supply Program. The General Plan for the City of Lathrop was first adopted in 1991 and last amended in 2004. The General Plan reflects the City’s long-range aspirations by defining goals and policies for current and future development and by providing guidance on proposed projects.

The City of Modesto, located in Stanislaus County, relies on the Modesto and Turlock Subbasins for its groundwater supplies. The City of Modesto General Plan identifies declining groundwater levels as an environmental concern for the City of Modesto as a result of increased urban demands. The General Plan calls for continued protection and conservation of groundwater sources while pursuing additional water supplies (City of Modesto, 2008).

The City of Galt, located in Sacramento County, is on the southern edge of the Cosumnes Subbasin and last updated its General Plan in 2009. Groundwater from the Cosumnes Subbasin is the sole source of water supply for the city. The General Plan outlines policies to ensure groundwater availability and protection (City of Galt, 2009).

The City of Elk Grove, located in Sacramento County, relies heavily on groundwater from the Sacramento Valley subregion of the Central Valley aquifer system. To address years of drought conditions and low precipitation, the City of Elk Grove Draft General Plan outlines several goals and policies to protect groundwater supplies while meeting increased water demands from agricultural production and a growing population (City of Elk Grove, 2018).

1.2.3.4 Well Permitting

1.2.3.4.1 San Joaquin County

San Joaquin County oversees a well permitting program for any new, replacement, back-up, and De Minimis well construction. The purpose of this program is to prevent groundwater contamination and safety hazards by regulation of the location, construction, repair, and destruction of water supply, monitoring, and geophysical wells and borings. Pursuant to CWC, Section 13808, all new wells that do not meet the exemption criteria must submit additional information prior to the issuance of a permit by the Environmental Health Department. The permit program is enforced by Ordinance Code of San Joaquin County Section 9-1115, and Municipal Codes of Stockton, Lodi, Manteca, Tracy, Escalon, and Ripon. Applicants must provide information about groundwater elevation estimates, land elevation estimates, extraction volume estimates, depth of Corcoran Clay, and other basic well characteristics.

San Joaquin County has established water well standards that define property line setbacks (at least 10 feet depending on well type), casing perforations, gravel packing, well seals, backflow prevention, disinfection requirements, sampling taps, and more, as well as the requirement for installing monitoring device(s) for groundwater extraction, elevation, and/or water quality. Other setbacks for potential sources of contamination or pollution require at least 50 feet depending on the contamination source and well type.

The San Joaquin County Well Standards outline well grouting and construction standards to prevent contamination, pollution, and degradation of water wells and of the groundwater by intrusion of poor-quality water. Wells must have a watertight annular seal near the land surface to keep surface water and other potential contamination out of the well. The minimum depth of the annular seal for wells in San Joaquin County is summarized in Table 1-1 (San Joaquin County, 1993).

Table 1-1: Minimum Depth of Seal Below Ground Surface for Wells in San Joaquin County

Well Type	Feet
Public Water Supplies	100
Individual Domestic Well	100
Industrial Wells	100
Agricultural Wells	50

1.2.3.4.2 Calaveras County

The Calaveras County Board of Supervisors adopted a well construction and destruction ordinance in 1998. The ordinance mandates that a permit must be obtained from the Calaveras County Environmental Health Department prior to development or modification of any well within the Calaveras County boundaries. The purpose of the program is to regulate the construction, alteration, abandonment, and destruction of wells such that groundwater will not be contaminated and that groundwater supplies will not jeopardize the health, safety, or welfare of Calaveras County residents.

To prevent polluted or contaminated water from entering the well, the Well Program established a minimum depth at which the annular space should be filled as well as minimum horizontal set back requirements. Horizontal setbacks range from 10 feet from property lines for small parcels to 150 feet for underground storage with nearby wells at least 25 feet away. The annular seal depths for wells in Calaveras County are summarized in Table 1-2 (Calaveras County Board of Supervisors, 2008).

Table 1-2: Minimum Depth of Seal Below Ground Surface for Wells in Calaveras County

Well Type	Feet
Public drinking water well	50
Commercial well	50
Industrial well	50
Individual domestic well	20
Agricultural well	20
Vertical geothermal exchange wells	20
Wells within 25 feet of a water way	20 feet below the bed of the water way

1.2.3.4.3 Stanislaus County

Pursuant to Chapter 9.36 of the Stanislaus County Code, well owners must first receive a valid permit from Stanislaus County to construct, install, repair, or destroy any well or well seal within the County. The Stanislaus County Department of Environmental Resources (DER) is responsible for reviewing the applications and issuing permits. The Stanislaus County Code also states that all wells must have an annular seal, except for agricultural wells that are not used for domestic purposes and are located more than 300 feet from a domestic well. The Stanislaus County Code does not specify the minimum annular seal depths for wells in Stanislaus County (Stanislaus County, 2019a).

In 2014, the DER adopted a Groundwater Ordinance to prohibit unsustainable extraction of groundwater in unincorporated areas of the County. The DER reviews each Well Permit Application and determines whether the well is subject to, or exempt from, the prohibitions in the Groundwater Ordinance. Permit Applications for wells intended to extract 2 AF/year of groundwater or less are exempt from the prohibitions in the Groundwater Ordinance (Stanislaus County, 2019b). The annular seal depths for wells in Calaveras County are summarized in Table 1-3 (Stanislaus County, 2019a).

Table 1-3: Minimum Depth of Seal Below Ground Surface for Wells in Stanislaus County

Well Type	Feet
Community water supply well	50
Industrial well	50
Individual domestic well	20
Agricultural well	20
Air conditioning well	20
All other types	20

1.2.4 Additional GSP Elements

The Additional GSP Elements section of the GSP provides GSAs with the opportunity to discuss "any additional Plan elements included in Water Code Section 10727.4 that the Agency determined to be appropriate". These additional elements include:

- Control of saline water intrusion
- Wellhead protection areas and recharge areas
- Migration of contaminated groundwater
- A well abandonment and well destruction program
- Replenishment of groundwater extractions
- Activities implementing, opportunities for, and removing impediments to, conjunctive use or underground storage
- Well construction policies
- Measures addressing groundwater contamination cleanup, groundwater recharge, in-lieu use, diversions to storage, conservation, water recycling, conveyance, and extraction projects
- Efficient water management practices, as defined in Section 10902, for the delivery of water and water conservation methods to improve the efficiency of water use
- Efforts to develop relationships with state and federal regulatory agencies
- Processes to review land use plans and efforts to coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity

- Impacts on groundwater dependent ecosystems

Each of the Additional Elements listed are relevant and important to the Eastern San Joaquin Subbasin, and are discussed throughout this GSP, as identified below.

Control of saline water intrusion – Section 2.2.3 describes the current status of saline water intrusion in the Subbasin. Section 3.2.4 addresses saline water intrusion as a sustainability indicator and identifies minimum thresholds, measurable objectives, and interim milestones. Actions to identify and monitor for saline water intrusion early is described in Section 3.2.4.4.

Wellhead protection areas and recharge areas – Section 1.2.3.4 addresses wellhead protection programs in San Joaquin County, Calaveras County, and Stanislaus County.

Migration of contaminated groundwater – The migration of contaminated groundwater that may impair water supplies is addressed in Section 3.2.3.

A well abandonment and well destruction program – The well destruction program in San Joaquin County is discussed in Section 1.2.3.4.1. The well destruction and abandonment requirements in Calaveras County are referenced in Section 1.2.3.4.2.

Replenishment of groundwater extractions – Chapter 6: Projects and Management Actions discusses proposed projects and management actions that will facilitate replenishment of groundwater extraction. Areas where potential groundwater replenishment could occur through direct recharge are described in Section 2.1.4.5.

Activities implementing, opportunities for, and removing impediments to, conjunctive use or underground storage – Existing conjunctive use projects are identified in Section 1.2.2.9. Chapter 6: Projects and Management Actions contains the proposed projects and management actions that will address implementing, opportunities for, and removing impediments to, conjunctive use or underground storage projects in the Subbasin.

Well construction policies – Section 1.2.3.4 addresses well construction policies in San Joaquin County, Calaveras County, and Stanislaus County. Annular well seal depth requirements are tabulated in Tables 1-1, 1-2, and 1-3.

Measures addressing groundwater contamination cleanup, groundwater recharge, in-lieu use, diversions to storage, conservation, water recycling, conveyance, and extraction projects – Chapter 6: Projects and Management Actions discusses proposed projects and management actions that address groundwater recharge, in-lieu use, diversions to storage, conservation, and water recycling.

Efficient water management practices, as defined in Section 10902, for the delivery of water and water conservation methods to improve the efficiency of water use – Ongoing efforts to implement efficient water management practices are described in Section 1.2.2.7. Conservation methods and efficiency of water use are also noted in many local or regional general plans, detailed in Section 1.2.3. Projects relevant to this topic are discussed in Chapter 6: Projects and Management Actions.

Efforts to develop relationships with state and federal regulatory agencies – A strong relationship between the GSAs and existing regulatory agencies is valuable to the success of this GSP. Efforts to develop this relationship are described in Chapter 7: Plan Implementation, of this GSP.

Processes to review land use plans and efforts to coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity – Summaries of land use plans both inside the Subbasin and in nearby Subbasins can be found in Section 1.2.3. Efforts are being made at the local level to develop a formal opportunity for GSAs to provide input on the land use and water-related elements of future General Plans and CEQA documentation to promote consistency with the GSP. Current opportunities to participate in plan decision making are outlined in the 2016 San Joaquin County General Plan update, including opportunities to provide input through community workshops, focus group meetings, Board of Supervisors/Planning Commission Study Sessions, and public hearings.

Impacts on groundwater dependent ecosystems – Groundwater dependent ecosystems (GDEs) are defined in this GSP in Section 2.2.7. The methodology for identifying GDEs can be found in Section 2.2.8. A map of identified GDEs in the Subbasin is shown in Section 2.2.9. Adverse impacts to GDEs are described under Depletion of Interconnected Surface Water, Section 3.2.6, as part of the undesirable results discussion.

1.3 NOTICE AND COMMUNICATION

1.3.1 Beneficial Uses and Users in the Basin

The California Regional Water Quality Control Board (RWQCB) Central Valley Region designates all groundwaters in the Sacramento River Basin and San Joaquin River Basin as suitable or potentially suitable, at a minimum, for municipal and domestic water supply, agricultural supply, industrial service supply, and industrial process supply (CA RWQCB Central Valley Region, 2016).

As listed in California Water Code Section 10723.2, beneficial uses and users of groundwater in the region include the following interests:

- Agricultural users and domestic well owners that hold of overlying groundwater rights. There are approximately 1,000 unique domestic, public, and production wells in the Subbasin.
- Public water systems/municipal well operators in the Subbasin. These are listed in Section 1.1.4.3.
- Local agencies that have land use planning jurisdiction. These include counties of San Joaquin, Calaveras, and Stanislaus, and cities of Stockton, Lodi, Manteca, Escalon, and Ripon.
- Environmental users of groundwater, including species and habitat reliant on instream flows, as well as wetlands and GDEs. Identified GDEs are mapped in Figure 2-69 in Section 2.2.9. Freshwater species in the Eastern San Joaquin Subbasin are listed in Appendix 1-F.
- Irrigation districts in the Subbasin that divert surface water to deliver to their customers.
- Lands managed by the federal government. The San Joaquin River National Wildlife Refuge lies just outside of the Subbasin boundary. Also just outside of the Subbasin are three California State Parks, including: Carnegie SVRA, Caswell Memorial SP, and Franks Tract SRA.
- DACs and SDACs. DACs and SDACs are mapped in Figure 1-8: Disadvantaged Communities (DACs)Figure 1-8 and are primarily in the western portions of the Subbasin. Approximately 33 percent of the Subbasin area is considered Disadvantaged and 7 percent is considered severely disadvantaged. Disadvantaged communities include the following census designated places (CDPs)[1]: Stockton City CDP, Collierville CDP, Lockeford CDP, Terminous CDP, and Valley Home CDP. Severely disadvantaged communities include: Kennedy CDP, August CDP, French Camp CDP, Taft Mosswood CDP, and Thornton CDP.
- Entities that monitor and report groundwater elevations. Monitoring in the Subbasin is extensive. A list of monitoring agencies can be found in Section 1.2.2.

[1] A census designated place is a concentration of population identified by the United States Census Bureau for statistical purposes. CDPs are delineated for each decennial census as the statistical counterparts of incorporated places, such as cities, towns, and villages.

Of the potential beneficial uses and users of groundwater in the Subbasin listed in CWC Section 10723.2, those not included are the following:

- California Native American tribes

1.3.2 List of Public Meetings Where the GSP was Discussed

During the development of this GSP, meetings of the GWA Board, Advisory Committee, and Workgroup were open to the public, with meeting information noticed, as appropriate, and posted to the GWA website (discussed below in Section 1.3.4.1). In addition, informational open house events were held throughout GSP development (see Section 1.3.4.5).

Below is a list of the public meetings where the GSP was discussed. The following includes the public meetings held from June 2017 through July 2019.

1.3.2.1 GWA Board Meetings

In 2017, GWA Board meetings were held on June 14, July 12, August 9, September 13, October 11, and November 8.

In 2018, GWA Board meetings were held on February 14, March 14, April 11, May 9, June 13, July 11, August 8, September 12, October 10, and November 14.

In 2019, GWA Board meetings were held on February 13, March 13, April 10, May 8, June 12, and July 10.

1.3.2.2 GWA Advisory Committee Meetings

In 2018, Advisory Committee meetings were held on May 9, June 13, July 11, August 8, September 12, October 10, and November 14.

In 2019, Advisory Committee meetings were held on January 9, February 13, March 13, April 10, April 24, May 8, June 12, and July 10.

1.3.2.3 Groundwater Sustainability Workgroup Meetings

In 2018, Workgroup meetings were held on June 12, July 10, August 15, September 11, October 9, and November 13.

In 2019, Workgroup meetings were held on January 9, February 13, March 13, April 10, May 8, and June 12.

1.3.2.4 Informational Open House Events

In 2018, informational open house events were held on August 29 and November 7.

In 2019, informational open house events were held on February 12 and July 18.

1.3.3 Decision-Making Process

The GWA Board is tasked with the vote and approval of policy decisions for the development and implementation of this GSP. As described in Section 1.1.4.2, the GWA Board receives input from an Advisory Committee, the Workgroup, and the public.

The governing bodies of each of the individual GSAs take action and provide direction to their Board member representatives and must individually approve the final GSP. A description of the agencies that comprise the GSAs can be found in Section 1.1.4.3.

1.3.4 Opportunities for Public Engagement and How Public Input was Used

Throughout the process of GSP development, the GWA has engaged stakeholders and the public in the development of the GSP, including the actions listed below. This effort has been greatly aided by the facilitation support provided through DWR.

1.3.4.1 GWA Website

The GWA website has been online since 2018 and continues to be maintained on a regular basis at www.esjgroundwater.org. It contains an introduction of the SGMA background, Member agencies, and GWA Board updates with meeting information and materials posted regularly. There are detailed sections for project descriptions, education materials, and meeting notices with the accompanying presentation materials and minutes. As a major purpose in creating accessible information online, there is a section devoted to press releases, newsletters, public notices, and other major events and accomplishments. As distribution of information to the public and interested parties is important, there is also an area to access the complete project reports relative to the GWA and its member agencies. Contact information is readily available for interested parties to communicate with GWA members and staff.

1.3.4.2 Groundwater Sustainability Workgroup

The GWA developed a Workgroup in order to promote stakeholder input and was relied upon when developing the GSP. The Workgroup began with an application process to ensure a diverse cross section of populations were represented to serve on the Workgroup. Workgroup members participated and provided valuable input throughout the GSP development process.

Applications were distributed to organizations within every GSA to establish a Workgroup that represented the region's broad interests, perspectives, and geography. The Workgroup included members from a variety of organizations, and who represent one or more of the interested parties' groups. Table 1-4 lists the organizations and interests represented on the Workgroup.

Table 1-4: Groundwater Sustainability Workgroup Interests

Eastern San Joaquin Groundwater Authority Groundwater Sustainability Workgroup – Interests Represented										
AG CM ENV FM GU	Agricultural Community Neighborhood Environmental Flood Management Groundwater User	BUS DAC INST NA	Business Disadvantaged Communities Institutional Native American							
Role/Organization	AG	BUS	CM	DAC	ENV	FM	GU	INST	NA	Application Notes
2Q Farming	✓		✓			✓				2Q Farming is interested in making a difference for agriculture and communities, and in preserving water rights for future generations so they will have the ability to irrigate and access the water necessary for life.
Agricultural Business – Farmer Representative	✓	✓	✓	✓	✓	✓	✓			As a representative of agricultural business, this member sees SGMA as an opportunity to manage the Subbasin while keeping jurisdiction, implementation, monitoring, and oversight at the local level.
Calaveras County Resource Conservation District	✓		✓	✓	✓	✓	✓	✓		Calaveras RCD hopes to partner with groundwater users in the Western part of Calaveras County to address sustainability and recharge.
California Sportfishing Protection Alliance	✓				✓	✓	✓	✓		California Sportfishing Protection Alliance, longtime Mokelumne River stakeholder, is interested in reducing groundwater overdraft, managing surface water responsibly, and resolving longstanding conflicts. Representative is interested in the technical aspects of groundwater management and gaining a better understanding of recharge.

Eastern San Joaquin Groundwater Authority Groundwater Sustainability Workgroup – Interests Represented										
AG CM ENV FM GU	Agricultural Community Neighborhood Environmental Flood Management Groundwater User	BUS DAC INST NA	Business Disadvantaged Communities Institutional Native American							
Role/Organization	AG	BUS	CM	DAC	ENV	FM	GU	INST	NA	Application Notes
Catholic Charities of the Diocese of Stockton			✓	✓	✓	✓	✓			The Environmental Justice Program of the Catholic Charities of the Diocese of Stockton works with disadvantaged communities. Some of these communities have concerns regarding drinking water quality and toxic contamination of groundwater supplies.
Environmental Justice Coalition for Water			✓	✓		✓	✓			The Environmental Justice Coalition for Water is interested in ensuring that environmental justice interests are present, informed, and meaningfully engaged in a process that bears considerable importance for health, wealth, and growth.
J.R. Simplot Co.	✓	✓			✓					As a local industry representative with a stake in groundwater quality, this representative sees benefit in being part of the stakeholder process.
Lima Ranch	✓	✓			✓	✓	✓			Lima Ranch views water as a precious commodity that must be conserved and used sustainably. Representative values preserving water rights and using water efficiently.
Machado Family Farms	✓		✓				✓			Representative manages a family farm and brings agricultural experience and experience with the California Public Utilities Commission to provide a balanced perspective.
Manufacturers Council of the Central Valley	✓	✓			✓	✓	✓			Through their involvement as a stakeholder, Manufacturer's Council of the Central Valley provides resources to manufacturers impacted by the implementation of GSPs and to GSAs looking to work with the sector.

Eastern San Joaquin Groundwater Authority
Groundwater Sustainability Workgroup – Interests Represented

AG	Agricultural	BUS	Business
CM	Community Neighborhood	DAC	Disadvantaged Communities
ENV	Environmental	INST	Institutional
FM	Flood Management	NA	Native American
GU	Groundwater User		

Role/Organization	AG	BUS	CM	DAC	ENV	FM	GU	INST	NA	Application Notes
Restore the Delta			✓	✓	✓	✓	✓			Representative is interested in the link between surface water flows for the San Joaquin Delta and groundwater management. Additionally, this member brings connections for broad environmental justice outreach.
San Joaquin Audubon					✓					San Joaquin Audubon is interested in overall water use and environmental issues.
San Joaquin County Environmental Health Department			✓		✓		✓			The San Joaquin County Environmental Health Department plays a role in protecting the area's groundwater resource, drinking water, and public health.
San Joaquin Farm Bureau	✓	✓	✓			✓	✓			The San Joaquin Farm Bureau is interested in helping manage and utilize the groundwater reservoir to better supply all needs for the short and long term.
Sequoia ForestKeeper					✓					Sequoia ForestKeeper has been submitting comments on water-related issues to the SWRCB since 2015.
Sierra Club - Delta-Sierra Group	✓		✓	✓	✓	✓	✓			Sierra Club cares about the future of the Eastern San Joaquin Subbasin and sustainability. They believe that representation of individuals is lacking and there is insufficient outreach.
Spring Creek Golf & Country Club		✓	✓		✓	✓	✓			Representative is golf course Superintendent at Spring Creek Golf & Country Club, is interested in groundwater rights and contributing to the stakeholder Workgroup.

Eastern San Joaquin Groundwater Authority Groundwater Sustainability Workgroup – Interests Represented										
AG CM ENV FM GU	Agricultural Community Neighborhood Environmental Flood Management Groundwater User	BUS DAC INST NA	Business Disadvantaged Communities Institutional Native American							
Role/Organization	AG	BUS	CM	DAC	ENV	FM	GU	INST	NA	Application Notes
The Hartmann Law Firm	✓	✓	✓			✓	✓			Representative is Advisory Water Commissioner, District Counsel for multiple reclamation districts.
The Wine Group	✓	✓			✓		✓			The Wine Group has technical knowledge and provides a unique viewpoint that supports the successful development of a GSP for the Eastern San Joaquin Subbasin.
Trinchero Family Estates and Sutter Home Winery	✓	✓	✓		✓		✓			Trinchero Family Estates and Sutter Home Winery is interested in helping develop a balanced approach for communities and businesses.
University of the Pacific		✓	✓			✓				Representative is an Emeritus Professor of Operations/Engineering Management at the University of the Pacific and is engaged in research on stream flow diversion for groundwater recharge.

The Groundwater Sustainability Workgroup meetings were held approximately monthly, typically on the second Tuesday or Wednesday of each month. The meetings were open to the public and provided opportunities for attendees to learn more about the process and provide input.

1.3.4.3 Stakeholder Outreach and Engagement Plan

With the support of the Workgroup, the GWA developed an initial Stakeholder Outreach and Engagement Plan (see Appendix 1-G) for the San Joaquin Subbasin detailing stakeholder engagement strategy has been developed to achieve the following goals:

- Keep interested list of stakeholders informed and aware of opportunities for involvement through email communications and/or their preferred communications
- Engage DWR for facilitated support to aid in the development of the GSP
- Open GWA planning efforts to the public with agendas and meeting minutes published on the GWA website
- Inform and obtain comments from the general public through public meetings held on an approximately quarterly basis
- Facilitate productive dialogue among participants at Advisory Committee, Workgroup, and public meetings through the use of qualified facilitators to obtain, consider, and integrate feedback accordingly throughout the planning process
- Seek the input of interest groups during the implementation of the GSP and any future planning efforts
- Obtain input from the Workgroup about preferred locations to conduct public informational meetings to reach diverse audiences and disadvantaged communities
- Provide timely and accurate public reporting of planning milestones through the distribution of outreach materials and posting of materials on the GWA website for the GSP
- Secure quality media coverage that is accurate, complete, and fair
- Maintain an active communications tracking tool to capture stakeholder engagement and public outreach activities and to demonstrate the reporting of GSP outreach activities

1.3.4.4 Stakeholder Database

The GWA developed a database of stakeholders who represent the region's interests, perspectives, and geography. The database was developed by leveraging existing stakeholder lists and databases from prior GWA engagement efforts, conducting new research, and obtaining referrals from key stakeholders and stakeholder groups.

During the initial development of the stakeholder database, the GWA worked with those responsible for implementing the GSP to obtain contact lists of interested parties within the basin as well as other diverse contact lists they maintain.

This robust stakeholder list of interested parties includes, but is not limited to, the following:

- Community water systems
- Agricultural well owners
- Domestic well owners

- Municipal well operators
- Groundwater users (including agricultural)
- Local land use planning agencies
- Government agencies
- Nonprofit organizations
- Environmental organizations
- Higher education institutions
- Community based organizations
- Neighborhood organizations
- California Native American Tribes
- Disadvantaged communities
- Private citizens

The Stakeholder Database was regularly updated by adding additional parties who expressed interest as including public meetings and through website signups. As needed, contacts were updated or removed. It served as the foundation for targeted outreach and communication throughout the project. Additionally, the database was used to:

- Provide a single repository to collect, store, and organize information on basin stakeholders
- Allow individuals to self-identify their SGMA interests when they sign up as an interested stakeholder
- Identify the interests and concerns of organization contacts and individual stakeholders
- Plan meetings and send notices to stakeholders based upon their identified interests and role
- Document all stakeholders invited to GSP development meetings and their primary input at the meetings
- Post meeting agendas and minutes
- Produce communication and engagement summary reports

Table 1-5 provides a summary breakdown of the number of parties and interests represented in the Stakeholder Database.

Table 1-5: Stakeholder Database Summary

Eastern San Joaquin Groundwater Authority Stakeholder Database	
Interest Represented	Number of Stakeholders
Agricultural	31
Government Agency	19
Groundwater	152
Business	33
Nonprofit	5
Higher Education	1
Community Based Organization/Neighborhood Association	14
Disadvantaged Communities	21
Environmental	30
Flood Control	6
Community Water Systems	433
Native American Tribe	4
Private Citizen	17
Total	766

1.3.4.5 Stakeholder Education and Outreach

Recognizing that an inclusive outreach and education process supports the success of a well-prepared GSP, the GWA has prioritized Stakeholder involvement and outreach in plan development and implementation, dedicating staff and financial resources for this high-priority effort.

- The GWA held four informational open house events devoted to SGMA outreach and providing information to the public on the GSP development process. The purpose was to provide participants with information on GSP development, seek feedback from stakeholders and the public, provide a forum for the public to interact with their GSA representatives, and address questions in a transparent manner. These events were held on an approximately quarterly basis in different locations throughout the Subbasin, as listed below.
  - August 2018 – Robert J. Cabral Agricultural Center, Stockton, CA (51 attendees)
  - November 2018 – Manteca Transit Center, Manteca, CA (25 attendees)
  - February 2019 – Lockeford Community Center, Lockeford, CA (61 attendees)
  - July 2019 – Robert J. Cabral Agricultural Center, Stockton, CA (XX attendees)
- Targeted outreach presentations were given at community meetings to the following groups:
  - Delta-Sierra Group
  - Manteca Kiwanis Sunrise Club
  - Manufacturer's Council of the Central Valley
  - North San Joaquin Water Conservation District Board of Directors
  - San Joaquin County Hispanic Chamber of Commerce
  - San Joaquin Farm Bureau

- Individually, member GSAs provide targeted outreach materials to their constituencies through the distribution of outreach and informational materials.
- SGMA outreach materials were distributed at various programs and events to reach growers. Outreach flyers containing information on SGMA and GSA contact information were distributed at the San Joaquin County Pesticide Applicator Permitting meetings in November 2018.
- Factsheets and e-blasts were used to raise awareness about topics and events relevant to the GSP development process. Outreach included providing overviews of participation opportunities for GSP planning processes.
- Social media channels, such Facebook, were used to distribute targeted information relevant to the GSP planning process and ways to get involved. A GWA Facebook page was developed, and social media templates were distributed to members of the GSA Board, Advisory Committee, and Workgroup for use on their agency social media accounts.
- Comment cards, provided in postcard format at every public informational open house, allowed the public and stakeholders to contribute written comments, solicit additional information, make suggestions, and submit other feedback as appropriate.
- News releases were distributed to regional media agencies, including local newspapers and radio stations, to draw attention to important GWA events such as workgroup and public meetings.

1.3.4.6 Situation Assessment

The GWA applied for and received DWR facilitation to conduct a Situation Assessment, the purpose of which was to facilitate the stakeholder engagement process. The facilitation services supported third-party interviews conducted with the members of the Workgroup as part of a Situation Assessment. The Situation Assessment was conducted in Q4 2018 with the goal of facilitating stakeholder input into the GSP development process. All Workgroup members were invited to participate in the Situation Assessment, and 17 were interviewed during a series of in-person and phone interview sessions. Assessment summary and highlights are available on the GWA website.

Situation Assessment questions covered topics including:

- Outreach and engagement approach
- Meeting presentations
- Meeting discussions
- Strengthening the Workgroup process
- Decision making and input
- GSP development and plan content
- Resource and management conditions data
- Implementation considerations

Situation Assessment findings were presented to the Workgroup, the Advisory Committee, and the GWA Board. Changes, including those to the Workgroup process, meeting presentations and discussions, and draft GSP development and review schedule were made based on feedback from the Workgroup members.

1.3.4.7 Incorporation of Stakeholder Feedback

The development of this GSP was informed and supported by stakeholder feedback, which was documented, addressed, and incorporated at numerous points throughout the development process. The public was invited to provide input at each Advisory Committee and GWA Board meeting, including the Projects and Management Actions Workshop, which featured a public feedback survey. Information provided for GSP development was refined based on input from public meetings. Stakeholder involvement was additionally supported through monthly meetings of the Workgroup, a 23-member multidisciplinary stakeholder group that was formed for the specific purpose of soliciting input on GSP development from a wide range of beneficial users of groundwater in the Subbasin. Questions raised by participants at these meeting were addressed, with follow-up content presented and discussed at subsequent meetings.

Ideas generated at the Workgroup meetings were directed to decision makers at the GWA Board meetings. Input was captured in monthly meeting summaries, which were reviewed by Workgroup members prior to being presented to the GWA Board in meeting agenda packets and posted to the GWA website. In addition, summaries of prior month Workgroup meetings, as well as highlights and key takeaways from those meetings, were presented regularly as a standing agenda item at GWA Board meetings.

In addition to influencing GSP development and decisions related to groundwater management, feedback from stakeholders played a key role in enhancing education and outreach efforts, and the stakeholder involvement process more broadly. Changes were made to the Open House format following stakeholder comment, and outreach events with community groups (as referenced in Section 1.3.4.5 above) were added based on feedback to further spread the word about SGMA and local GSP development efforts. Additionally, changes to the Workgroup meeting structure and process were made based on findings of the Situation Assessment.

1.3.5 Inter-basin Coordination

As part of the SGMA process, stakeholder outreach often includes inter-basin coordination efforts. To date, there has been at least one meeting between representatives of the GWA and neighboring basins of Cosumnes Subbasin and Tracy Subbasin to initiate this process. The purpose of these meetings was to share and discuss elements included in the Eastern San Joaquin Draft GSP, including water budget estimates, boundary flow assumptions, and minimum thresholds. Participants discussed next steps for data sharing and ongoing coordination. There are plans to increase the level of inter-basin coordination as the Eastern San Joaquin GSP is implemented.

Below is a summary of initial inter-basin coordination meetings with neighboring subbasins:

- Cosumnes Subbasin – April 15, 2019
- Tracy Subbasin – June 20, 2019
- Modesto Subbasin – July 10, 2019
- South American, Solano, and East Contra Costa Subbasins – anticipated summer 2019

2. BASIN SETTING

This Basin Setting chapter contains three main sections as follows:

- Hydrogeologic Conceptual Model (HCM) – The HCM section (Section 2.1) provides the geologic information needed to understand the framework under which water moves through the Subbasin. It focuses on geologic formations, aquifers, structural features, and topography.
- Current and Historical Groundwater Conditions – The Current and Historical Groundwater Conditions section (Section 2.2) describes and presents groundwater trends, levels, hydrographs and level contour maps, estimates changes in groundwater storage, identifies groundwater quality issues, addresses land subsidence, and addresses surface water interconnection.
- Water Budget – The Water Budget Section (Section 2.3) describes the data used to develop the water budget. Additionally, this section discusses how the budget was calculated, and provides water budget estimates for historical conditions, current conditions, and projected conditions.

2.1 HYDROGEOLOGIC CONCEPTUAL MODEL

2.1.1 Data Compilation

This section describes the HCM for the Eastern San Joaquin Subbasin. The regulatory framework is based on the California Code of Regulations, Title 23, Division 2 Department of Water Resources (DWR) § 354.14. The HCM presents the physical characteristics used to define water movement throughout the Eastern San Joaquin Subbasin.

Data supporting development of the Eastern San Joaquin Subbasin HCM is available to the public from a variety of local, State, and federal agencies, as well as from non-governmental entities. The data presented herein was compiled from numerous studies conducted in the eastern portion of the San Joaquin Valley (SJV). Information from several online databases that support ongoing monitoring and development of the groundwater resources within the Eastern San Joaquin Subbasin and across California were amassed, digitized, evaluated, and reconfigured in support of the HCM. To accomplish the data compilation task, software programs such as Microsoft Excel, ArcGIS, QGIS and CrossView provided platforms for entering, storing, displaying, and evaluating the volume of data available. The following subsections describe the online programmatic databases from which much of the data was sourced and provides insight on the unique obstacles within each.

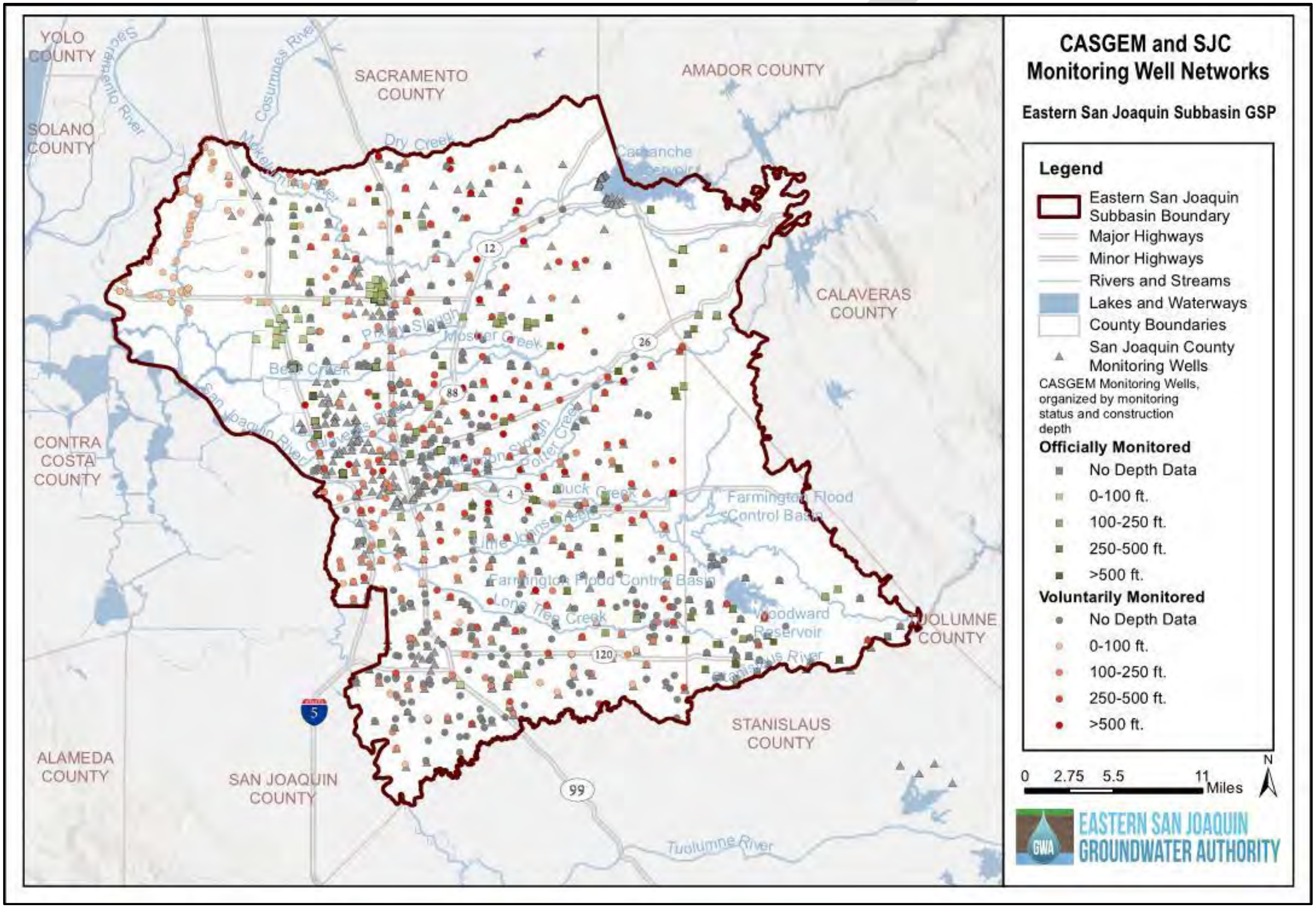
2.1.1.1 Groundwater Level Data

The California Statewide Groundwater Elevation Monitoring (CASGEM) and San Joaquin County (SJC) monitoring well networks provide the basis for determining groundwater levels across the Eastern San Joaquin Subbasin. CASGEM maintains a website that allows users to download site locations and water level information. SJC's monitoring well data comes from the SJC Public Works Division and was gathered as part of the data compilation efforts.

The two monitoring networks have substantial overlap, thus combining the databases was a necessary step in the data compilation effort. Because CASGEM uses the local, State, and CASGEM ID, whereas the SJC network uses the local and State ID, correlating or joining these two databases required manipulating or changing the State ID to a consistent format during the data compilation effort. Additionally, the databases cannot be merged based on well location because wells are often clustered together in close proximity and location information for the same well can vary between datasets.

Together, the CASGEM and SJC monitoring well networks include approximately 1,000 unique wells across the Eastern San Joaquin Subbasin. Despite the large number of wells, data gaps still exist, both horizontally and vertically. As depicted on Figure 2-1, large areas of the subbasin contain very few wells, particularly in the northwest and southeast portions of the Subbasin.

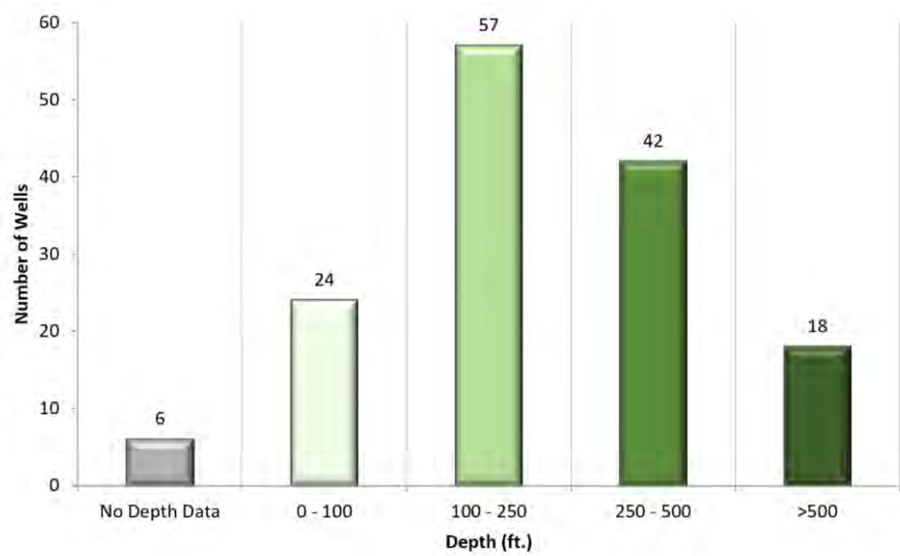
Figure 2-1: CASGEM and San Joaquin County Monitoring Well Networks



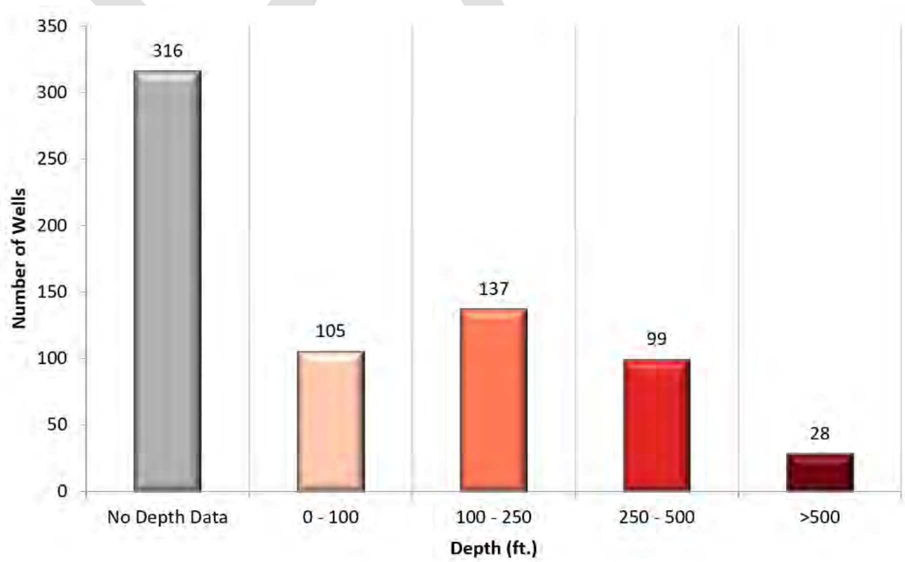
Vertical data gaps are even more pronounced, as lack of construction data is an obstacle. Figure 2-2 shows the distribution of well depths of officially and voluntarily monitored CASGEM wells, a large number of which do not have construction depth or screen interval information. This makes determining groundwater levels for depth-discrete aquifer intervals impossible. Groundwater elevation contour maps were prepared of each principal aquifer, consistent with CCR § 354.16 Groundwater Conditions requirements. Despite uncertainties due to limited construction information, this Groundwater Sustainability Plan (GSP) presents maps that provide a useful description of groundwater conditions.

Figure 2-2: Depth Distribution of Wells in the CASGEM Network

Officially Monitored CASGEM Wells



Voluntarily Monitored CASGEM Wells



2.1.1.2 Groundwater Quality Data

This GSP relies on groundwater quality data from the groundwater ambient monitoring and assessment (GAMA) Program (GAMA Data Download). GAMA includes water quality data from numerous sources, such as United States Geological Survey (USGS) and DWR. The GAMA database contains approximately 6,800 well sites throughout the Eastern San Joaquin Subbasin with over 1.6 million water quality measurements (Figure 2-3).

Although GAMA provides data on a large number of groundwater parameters and wells throughout the Eastern San Joaquin Subbasin, significant data gaps remain. For instance, there are inconsistencies in the parameters measured, as well as in the sampling periods. Some wells are sampled at regular intervals (i.e., quarterly or annually), while others are sampled irregularly. Such assorted schedules make analysis over a given period of time difficult. Data gaps are also apparent when looking at parameters over a longer timeframe. For example, chloride, an important and commonly measured groundwater quality parameter, is reported in only a small fraction of the total number of GAMA wells. As shown in Figure 2-4, out of the over 6,800 wells listed in GAMA for the Eastern San Joaquin Subbasin, no more than 700 chloride measurements were taken during any year since 2005.

Figure 2-3: GAMA Monitoring Well Network

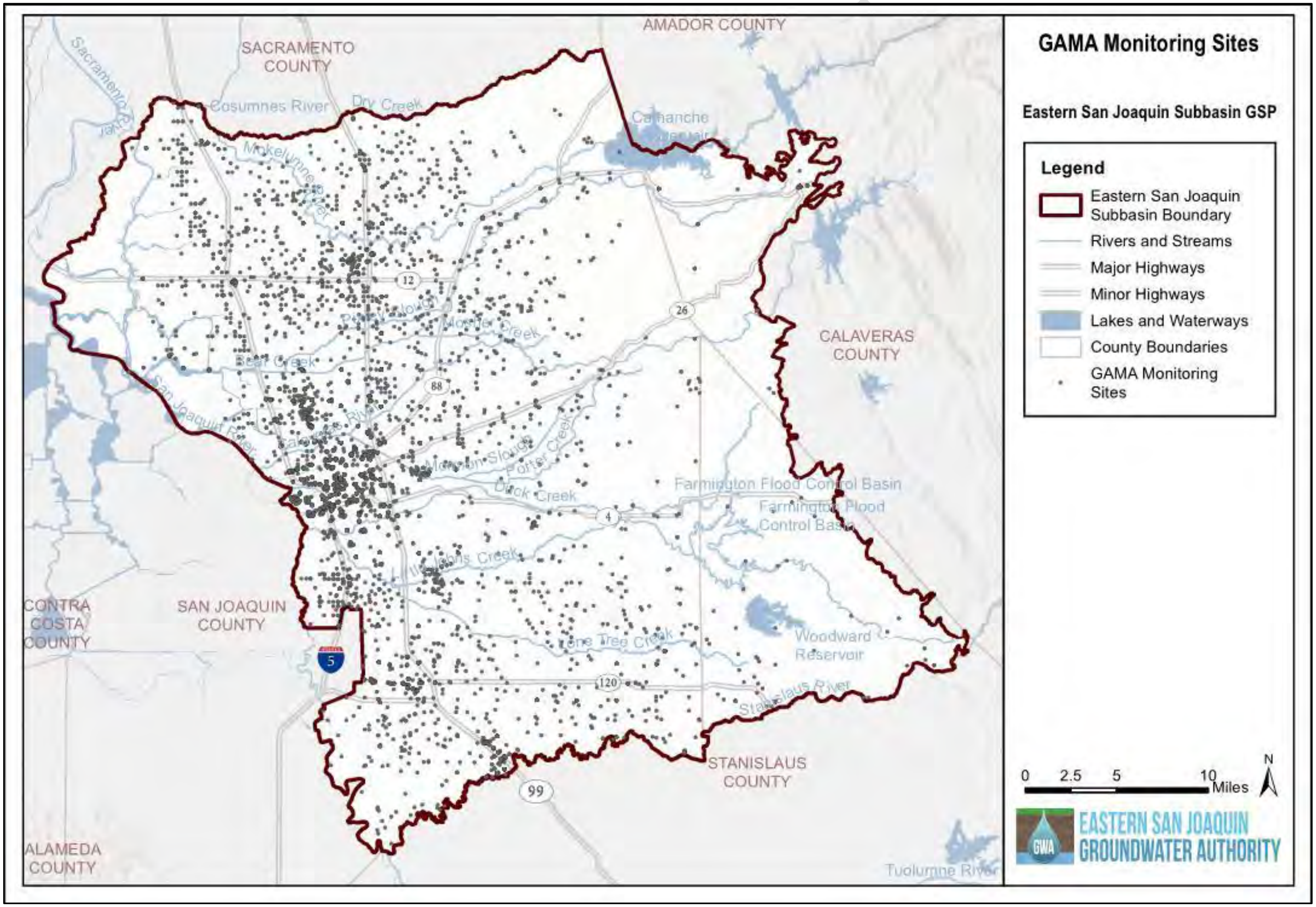
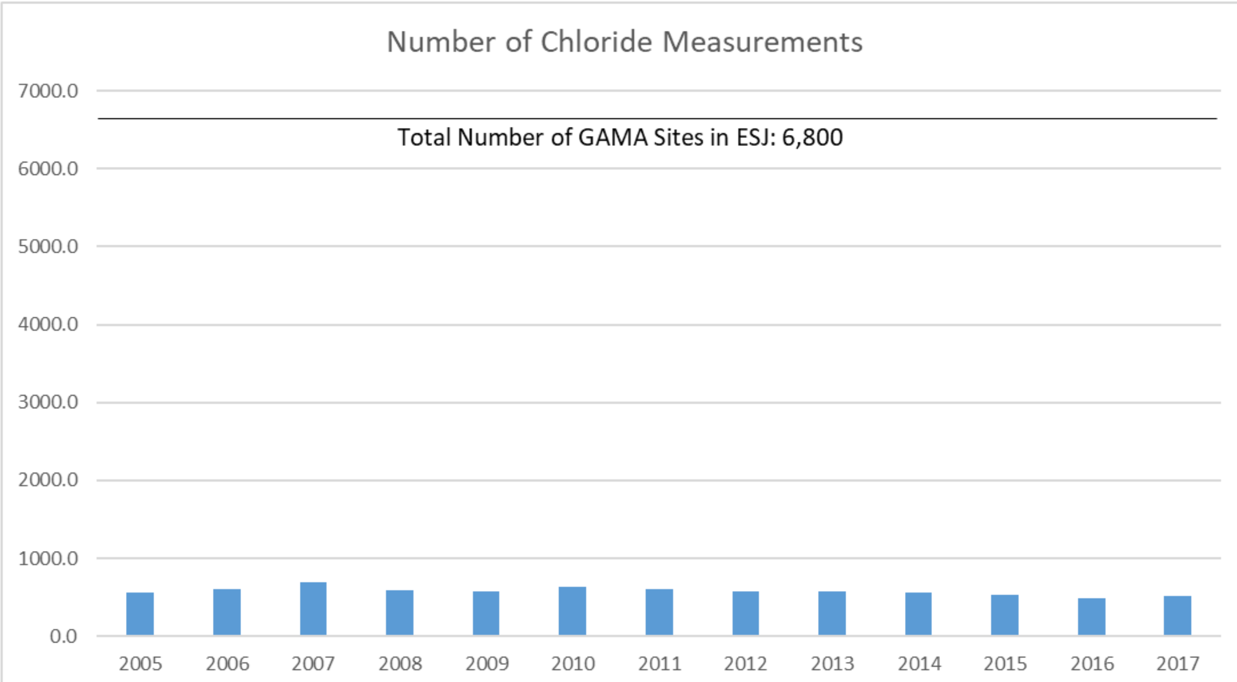


Figure 2-4: Number of Chloride Measurements Taken at GAMA Monitoring Sites (2005-2017)



Below is a list of attributes for each well in GAMA:

- Well ID
- Results
- Chemical
- Units
- Qualifier
- RL (Reporting Limit)
- Approximate Latitude
- Approximate Longitude
- Well Type
- Well Depth
- Top of Screen
- Screen Length
- Source
- Source Name
- Other Names

The attributes of each well in the GAMA database are not always complete or accurate. Well depths and screen interval data, where available, promotes vertical analysis of groundwater quality data because these data can be correlated to depth-discrete aquifer zones. Additional depth-specific water quality monitoring is a focus of the monitoring network for this GSP, as discussed in the monitoring network section of this GSP.

2.1.1.3 Stratigraphic Data

The Online System for Well Completion Reports (OSWCR) provided a majority of the groundwater well logs used in developing the HCM. This online database, developed and maintained by DWR, is a compilation of well completion reports accessible to the public for viewing and downloading. Tables of water well records are also available which contain attributes such as construction depth and well type (e.g., domestic or agricultural). However, not every well record is complete within the tables or only a few attributes may be listed. None of the stratigraphic or geologic data are provided in the tables. Stratigraphic or geologic data must be obtained from the individual well completion reports, which are only available as scanned images downloadable in portable document format (pdf). Once the well completion reports are retrieved from the database, the geologic information can then be manually digitized into MS Excel or other database software.

Critical information needed from the well completion reports are construction depth, screen interval, and borehole stratigraphy. The quality and completeness of the reports are, however, highly variable. Very few well logs contain all of the critical data; many more list only a few of the key attributes or none at all. Descriptions of the borehole stratigraphy also vary widely, from comprehensive geologic descriptions to single-word captions (e.g., sand, sandstone, or clay). Given the volume of wells in the Eastern San Joaquin Subbasin and the critical importance of the data being retrieved, great attention was paid to this aspect of the data compilation effort.

Once compiled, the well construction and stratigraphic data from OSWCR was correlated with well data available from the CASGEM and SJC monitoring well databases. To accomplish this task, individual well logs from OSWCR were assigned a unique location and then matched to a specific well within the CASGEM and SJC datasets (DWR, 2000).

Although the State ID format does not allow for matching between OSWCR, CASGEM, and SJC databases, well completion reports from OSWCR were correlated to wells in the other databases. This connection was made by plotting CASGEM/SJC well locations in Geographic Information System (GIS) software and correlating well completion reports to nearby wells with similar attributes. For instance, the State ID of the CASGEM/SJC wells and the modified State ID of the OSWCR were used to locate the features within the same Township/Range/Section. Well completion reports were matched to wells by attributes such as screen interval and seal depth or based on written location descriptions or hand drawn sketches of the location.

To further support spatial analysis, well completion reports from OSWCR with no corresponding well in any database were added to the data set. Well completion reports for wells from other sources, including USGS nested wells and municipality wells, were also added. Well completion reports from OSWCR that did not correspond to wells in a different database were plotted using latitude and longitude coordinates listed in OSWCR. These coordinates are often approximations of the actual location; many latitude and longitude values are the centroid of the section containing each well. All totaled, the borehole stratigraphy from approximately 330 groundwater wells was digitized to provide horizontal spatial coverage.

While groundwater wells provide valuable data in the shallower portion of the basin that is most accessed for groundwater use, the hydrostratigraphic units within the Eastern San Joaquin Subbasin are much deeper, reaching a maximum depth of approximately 1,000 feet. The Division of Oil, Gas, and Geothermal Resources (DOGGR) wells were used to assess the geologic strata at the depths important to the HCM, as these wells are typically much deeper than groundwater wells.

Interpretation of geologic formations from the well completion reports and DOGGR well logs was undertaken after digitizing stratigraphic data from the various sources. This process relied heavily on the distinguishing features of each formation (Section 2.1.5), surficial geologic maps (Section 2.1.5), location and depth of borehole (Section 2.1.7), and professional judgement.

2.1.1.4 GIS Data

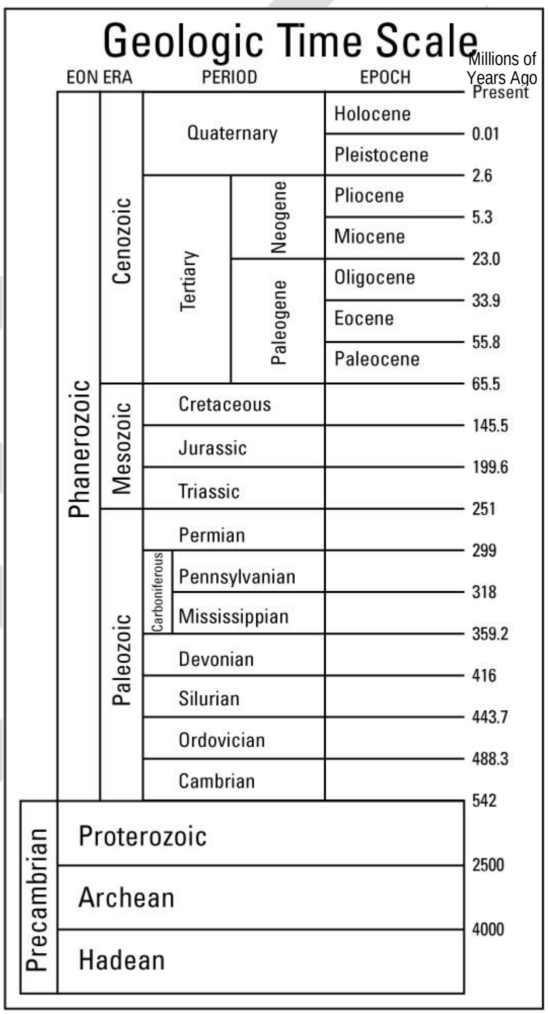
In accordance with CCR § 354.14, maps of various basin attributes are required as part of the HCM. To produce these maps, GIS software was used to store, manage, and analyze spatial and tabular data. GIS software was also used to extrapolate data through complex processes in cases where information or guidance was limited. For example, in accordance with CCR § 354.16, groundwater elevation contour maps are required based on the best available information. This requirement does not specify methods to use for producing the data, but the DWR Best Management Practice (BMP) for HCM suggests techniques used in Tonkin, M. and Larson, S. (2002), which uses geostatistical methods in conjunction with logical interpretations of groundwater level data to provide an adequate level of detail and accuracy.

Certain GIS software programs, including QGIS and ArcGIS, were relied on heavily. QGIS is a powerful open-source program, whereas ArcGIS is the industry standard. Both are capable of completing the required elements for the GSP. QGIS provided the graphical capabilities for final map production. ArcGIS was specifically utilized because of a third-party extension, CrossView, which is capable of generating hydrogeologic cross-sections that are presented in Section 2.1.7. The Universal Transverse Mercator (UTM) coordinate system and North American Datum of 1983 (NAD 83) were utilized along with the North American Vertical Datum of 1988 (NAVD 88) for all spatial data.

2.1.2 Regional Geologic and Structural Setting

The Eastern San Joaquin Subbasin lies within the San Joaquin Valley, which is part of the Central Valley of California. The Central Valley is a 400-mile-long, 50-mile-wide, northwestward trending asymmetrical structural trough filled with geologic units deposited over a long period of time. See Table 2-2 (Section 2.1.5) for the generalized stratigraphic column and Figure 2-5 below for the geologic time scale. The Sierra Nevada Mountain Range, east of the Central Valley, is comprised of pre-Tertiary continental rocks. The Coast Ranges, to the west, is comprised of pre-Tertiary and Tertiary semi-consolidated to consolidated marine sedimentary and continental rocks. The material source for the Central Valley continental deposits are the Coastal Ranges and Sierra Nevada, which are composed primarily of granite, related plutonic rocks, and metasedimentary and metavolcanic rocks from Late Jurassic to Ordovician age (Bertoldi et al., 1991).

Figure 2-5: Geologic Time Scale



2.1.3 Geologic History

The origin of geologic formations within the Eastern San Joaquin Subbasin vary in geologic time ranging from recent to Pre-Cretaceous bedrock or basement. Six to 10 miles of sediment have been deposited within the Central Valley and include both marine and continental deposits consisting of gravels, sands, silts, and clays. During the middle Cretaceous (~100 million years ago), parts of the Central Valley were inundated by the Pacific Ocean resulting in deposition of marine deposits. Marine conditions persisted through the middle to late Tertiary period (~3-30 million years ago) after which time sedimentation changed from marine to continental deposits due to the retreat of the sea and the regional rising of land mass previously inundated by the ocean. Intermittent volcanism dominated with the deposition of rhyolites and andesites (DWR, 1967).

2.1.4 Near-Surface Conditions

2.1.4.1 Topography

Ground surface elevations vary extensively across the Eastern San Joaquin Subbasin from almost 1,000 feet above mean sea level (MSL) in the upland areas in the east and around sea level in the flat lying valley floor to the west. The Eastern San Joaquin Subbasin topographic map is provided as Figure 2-6.

The modern-day physiographic features are a direct result of the geologic history of the region. Surficial features on the valley floor in the Eastern San Joaquin Subbasin can be divided into physiographic units as described by CA DWR (1967) and Burow and others (2004): river flood plains, channels, and overflow lands; low alluvial plains and fluvial fans; and dissected uplands. The dissected uplands lie along the flanks of the valley between the Sierra Nevada to the east and the alluvial plains and fluvial fans to the west. Local relief ranges in excess of 100 feet in the form of dissected hills and gently rolling lands. The most extreme slopes are observed in Calaveras County, which are steeper than 25 percent. West of the dissected uplands is a belt of coalescing fluvial fans of low relief (less than 10 feet) that forms the low alluvial plains and fans that range in width from about 14 to 20 miles. These fans lie between the dissected uplands and the nearly flat surface of the valley trough. River floodplains and channels occur as narrow, disconnected strips along the channels of the major rivers. Overflow lands of the valley trough tributary to the San Joaquin River define the area inundated by rivers when floods are highest under natural conditions.

2.1.4.2 Major Hydraulic Features

The major hydrologic features within the Eastern San Joaquin Subbasin are shown in Figure 2-7. The Subbasin is bounded on all sides except to the east by streams. Adjacent groundwater subbasins also share an interest in the impacts of the Sustainable Groundwater Management Act (SGMA) on these boundary streams.

In the Eastern San Joaquin Subbasin, the major rivers running east-west have headwaters high in the Sierra Nevada and flow west toward the axis of the valley (Figure 2-7). Little deposition is taking place currently, and the rivers are cutting downward on the upper reaches of the fans where the river floodplains are commonly entrenched to depths of 50 to 80 feet. However, toward the lower ends of the fans where river gradients are low, many small streams and tributaries of the major rivers are actively aggrading their beds.

Figure 2-6: Topography

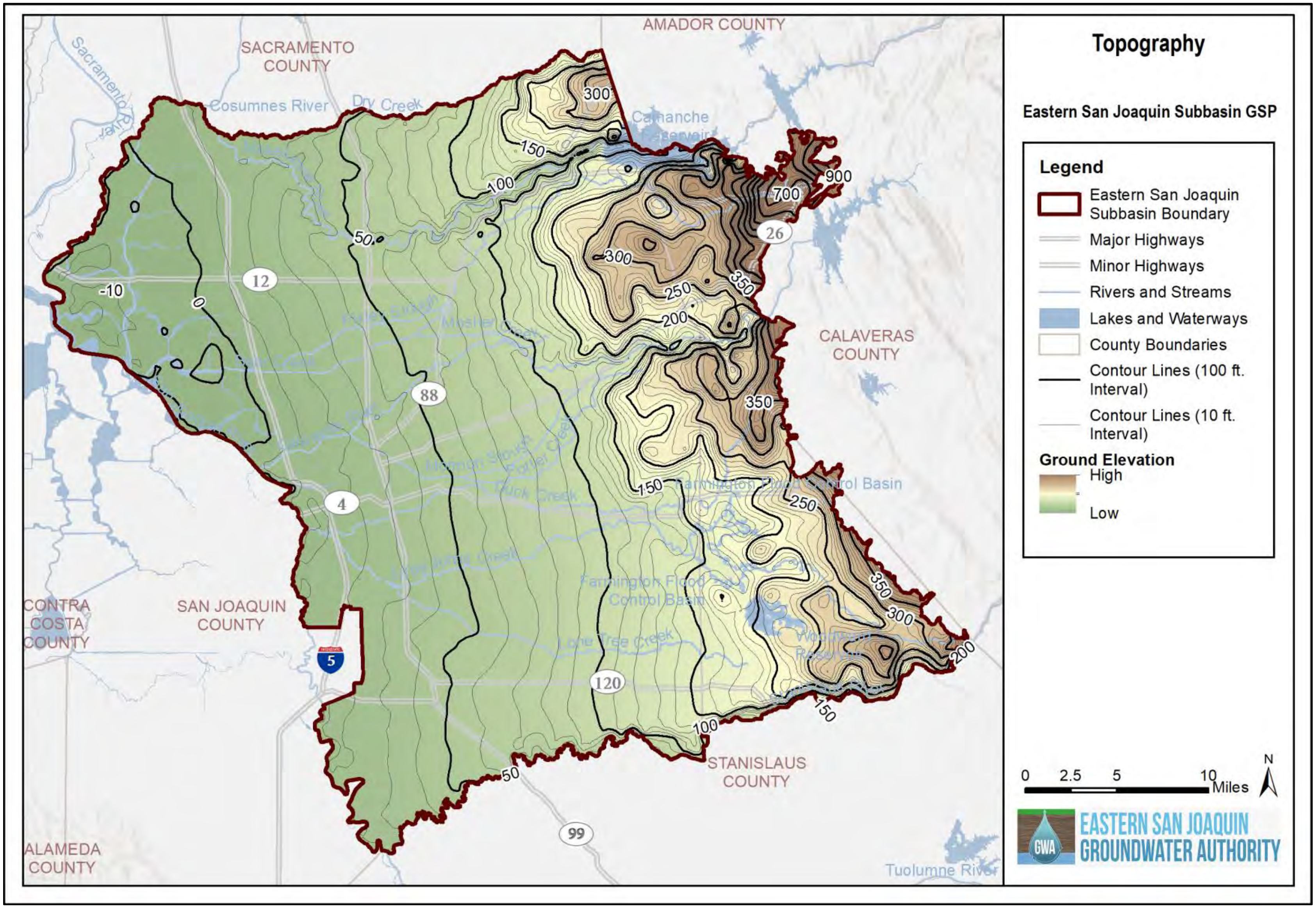
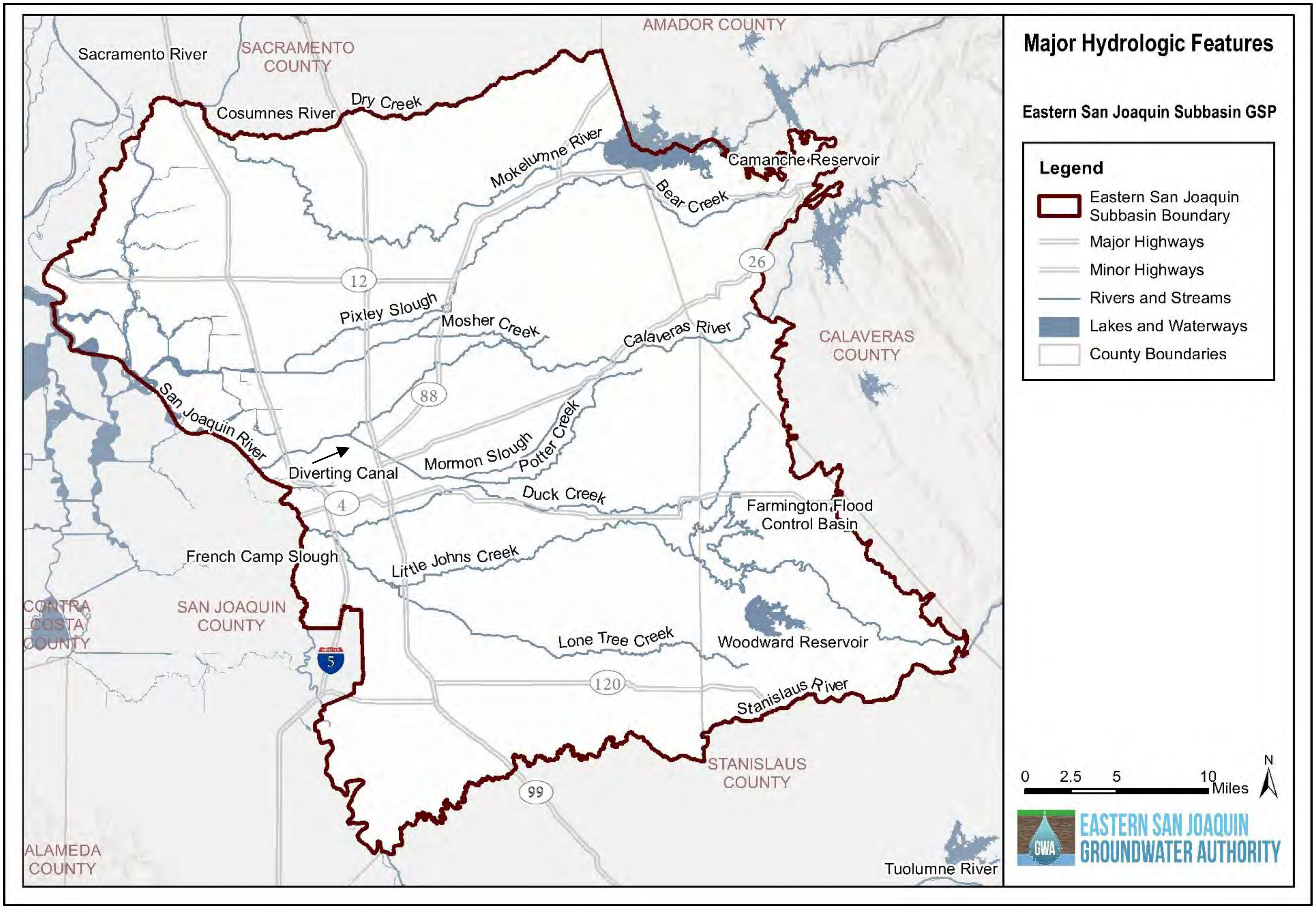


Figure 2-7: Major Hydrologic Features



The San Joaquin River is the principal drainage outlet of the northern San Joaquin Valley, flowing northward on the west margin of the Eastern San Joaquin Subbasin to its confluence with the Sacramento River in the San Joaquin-Sacramento Delta (Burow et al., 2004). Two major westerly flowing tributaries to the San Joaquin River within the Eastern San Joaquin Subbasin are: (1) Stanislaus River (Subbasin south boundary) and (2) Mokelumne River (north portion of Subbasin). The Stanislaus River drains a watershed of about 1,040 mi^2 (Burow et al., 2004) and flows through the dissected uplands between Knights Ferry and Oakdale, along the low alluvial plains and fans near the City of Riverbank to the confluence with the San Joaquin River near Vernalis. Most of the watershed area falls within Modesto Subbasin. The flow in the Stanislaus River varies seasonally from less than 134 acre-feet per day (AF/day) during the dry season in early fall to over 16,400 AF/day during wet season in winter. These volumes correlate to discharges from 68 to over 8270 cubic feet per second (cfs) recorded at the Orange Blossom Bridge gauging station approximately 1 mile east of Oakdale (CA DWR, 2019).

The Mokelumne River drains a watershed of about 5,550 km^2 (2,140 mi^2) and flows through the dissected uplands between Jackson and San Andreas into Pardee Reservoir where it is released to flow downstream into Camanche Reservoir and out along the alluvial plains and fans toward its confluence with the San Joaquin River near Isleton. On the north boundary of the Eastern San Joaquin Subbasin is Dry Creek and the Lower Dry Creek Watershed, the majority of which is within Cosumnes Subbasin. Dry Creek is mapped as an ephemeral drainage and is tributary to the Mokelumne River with its confluence near Thornton. Flow in the Mokelumne River below the Camanche Reservoir varies seasonally and is dependent on discharges from the on-stream reservoir, from 733 AF/day during the dry season to 57,100 AF/day during the wet season. These volumes correlate to discharges from 370 to over 28,800 cfs collected by the USGS below the Camanche Dam. Major watersheds of the river are the Upper Mokelumne River (most of which is outside of the Subbasin to the east with a small portion overlapping with Cosumnes Subbasin) and the Lower Mokelumne River (mostly contained in the Subbasin with a small portion intersecting the South American and Solano Subbasins).

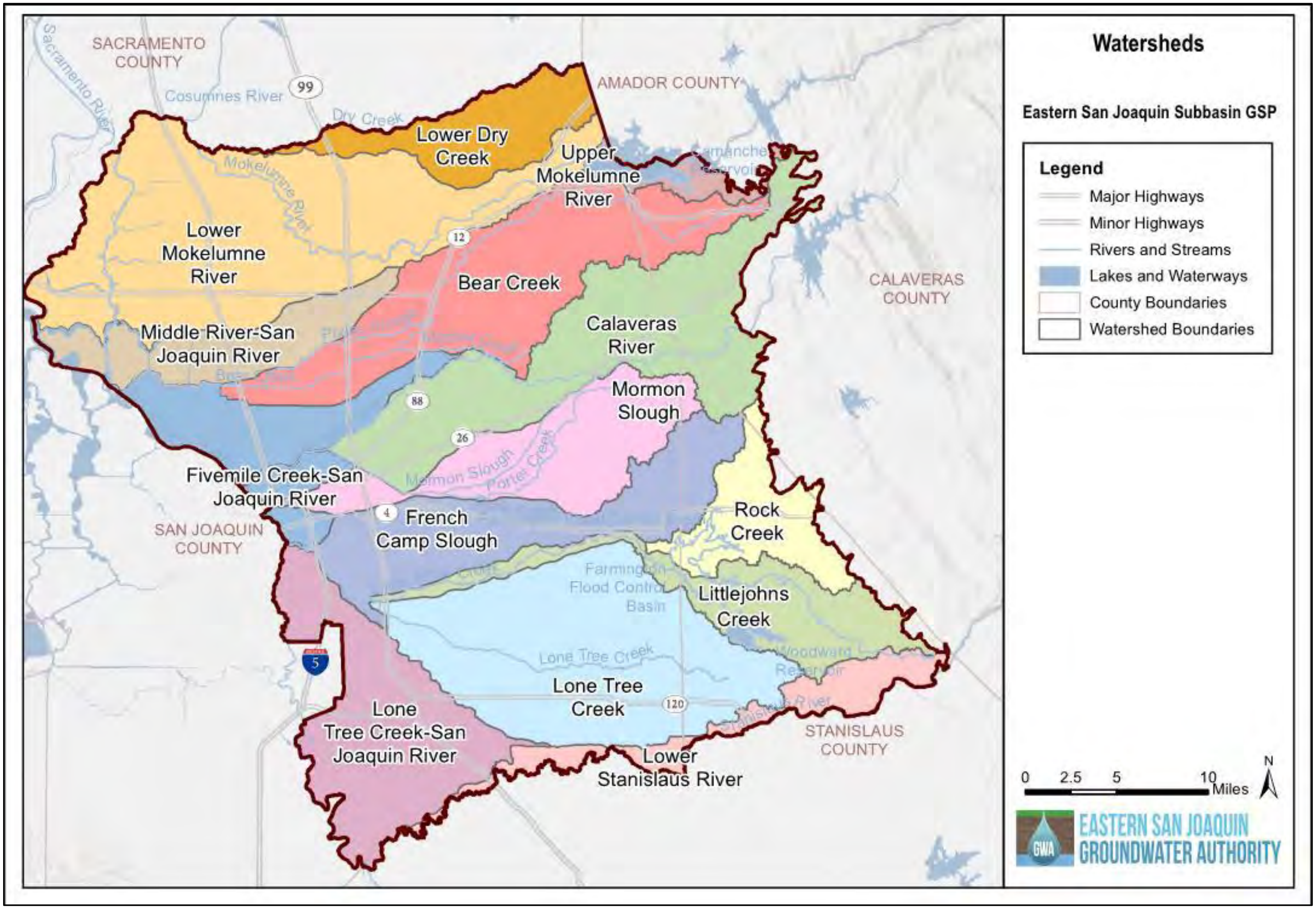
The Calaveras River, also with headwaters in the Sierra Nevada, drains a watershed of about 1,370 km^2 (530 mi^2) and flows into and across the Subbasin to its confluence with the San Joaquin River on the northwest side of Stockton. Flow in the Calaveras River below the New Hogan Reservoir varies seasonally and is dependent on discharges from the on-stream reservoir, from 608 AF/day to 19,800 AF/day. These volumes correlate to discharges from 223 to over 10,000 cfs collected by the USGS below the New Hogan Reservoir.

In addition to the Stanislaus, Mokelumne, and Calaveras Rivers, the 10 watersheds extend into and across the Eastern San Joaquin Subbasin. Three of these watersheds extend beyond the western boundary of the Eastern San Joaquin Subbasin into the East Contra Costa or Tracy Subbasins: Middle River-San Joaquin, Five Mile Creek-San Joaquin, and Lone Tree Creek-San Joaquin. The Lone Tree Creek-San Joaquin watershed has its headwaters in the Coast Range foothills. Figure 2-8 depicts the Eastern San Joaquin Subbasin and the watersheds that overlie the Subbasin. Table 2-1 is a list of watersheds that overlie the Subbasin.

Table 2-1: Eastern San Joaquin Subbasin Watershed Details

Watershed Name	Total Area (square miles)	Area Within Subbasin (square miles)	Percentage of Watershed within Subbasin
Lower Mokelumne River	223	202	91
Lower Dry Creek	88	47	53
French Camp Slough	88	88	100
Upper Mokelumne River	93	15	16
Lone Tree Creek	158	158	100
Little Johns Creek	122	63	52
Rock Creek	107	44	41
Calaveras River	224	133	60
Middle River-San Joaquin River	213	49	23
Mormon Slough	75	75	100
Lower Stanislaus River	218	37	17
Lone Tree Creek-San Joaquin River	169	110	65
Five Mile Creek-San Joaquin River	154	62	40
Bear Creek	127	127	100

Figure 2-8: Eastern San Joaquin Subbasin Watersheds



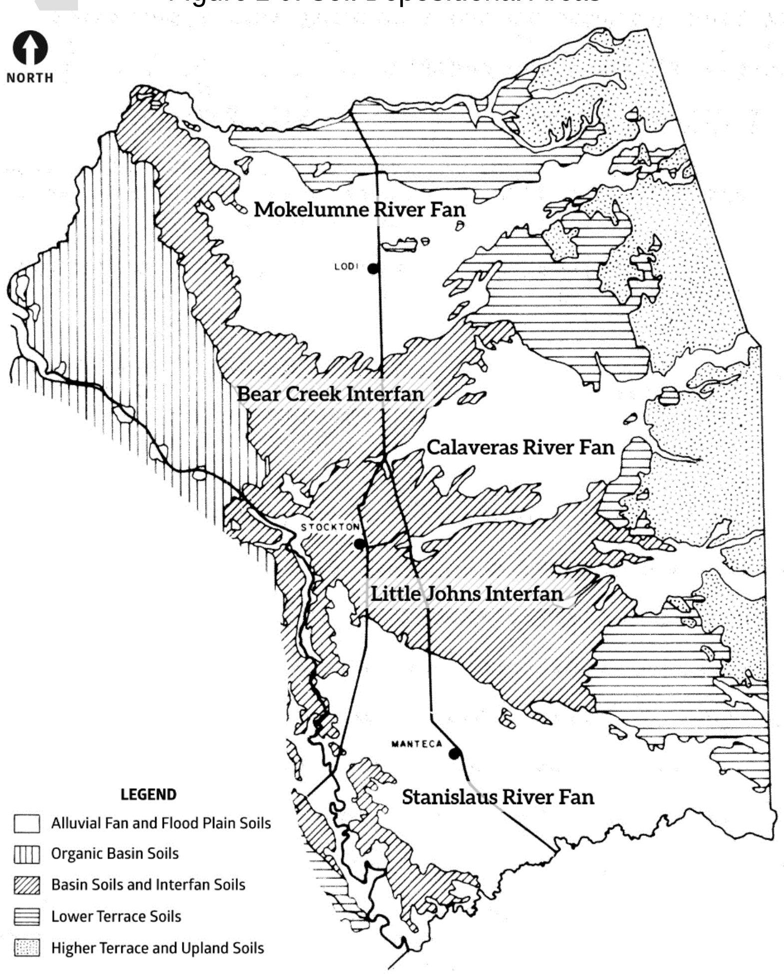
2.1.4.3 Surface Soils

Soils in the Eastern San Joaquin Subbasin are one of the primary controlling factors on surface water percolation rates through the vadose zone down to the groundwater table. As described in CA DWR (1967), soils in the region of the Eastern San Joaquin Subbasin can be grouped into five main categories:

1. Alluvial fan and flood plain soils
2. Organic basin soils
3. Basin soils
4. Lower terrace soils; and
5. Higher terrace and upland soils

These groupings, in part, coincide with the geologic formations in that the oldest soils are found on the nearly level high terraces and old fluvial fans in the eastern part of the area. The oldest soils typically have claypan or hardpan layers at depths of 2 feet or less. The youngest soils are forming on the recently deposited alluvium along stream bottoms and on recently exposed surfaces. These soils are generally deep and rich in nutrients. The soils at intermediate stages of development are on the low terraces. Figure 2-9 shows the areal distribution of the five soil types in SJC (CA DWR 1967).

Figure 2-9: Soil Depositional Areas



Alluvial fan and floodplain deposits are present in three areas of the Eastern San Joaquin Subbasin bounding major east-west rivers: Mokelumne, Calaveras, and Stanislaus Rivers. Figure 3-9 depicts soil depositional areas within the Subbasin. These areas have the best infiltration rates, exclusive of the peat locales in the Delta (northwest portion adjacent to the Mokelumne River). Soils of the Mokelumne and Stanislaus River fans have young soil profiles of sandy loam to loam. Infiltration rates of the soils are predominantly between 0.6 to 2 inches per hour. Areas of silt loam are also common especially in the floodplain and have a lower infiltration rate of less than 0.6 inches per hour. Soils in the alluvial fans tend to coarsen toward the apex of the fan. The soil types show little compaction and slight accumulation of lime or clay. Hardpan development, which would preclude infiltration, is minimal.

The soils of the Calaveras fan have deeper profiles of loam and clay loam with an infiltration rate of less than

0.6 inches per hour. These soils tend to be darker and heavier than the Stanislaus and Mokelumne River fan soils likely due to the source area being restricted to metamorphic or pre-Tertiary sedimentary material and that, whereas the Mokelumne and Stanislaus Rivers received large contributions from a granitic source (CA DWR 1967).

The organic basin soils are restricted to the lower Delta portion of the Eastern San Joaquin Subbasin. Peat, muck, and clay loam are terms commonly applied to soils in this group. The organic basin soils have variable infiltration capacity. Where peat is the dominant soil constituent, infiltration is high (greater than 2 inches per hour); where clay loam or muck occurs, infiltration is low (less than 0.6 inches per hour) (CA DWR, 1967).

The interfan and basin soils lie between the Mokelumne, Calaveras, and Stanislaus River fans in a northwesterly trending belt and around the periphery of the organic basin soils. These soils generally have well-developed profiles, medium-to-heavy textures, and fairly well compacted subsoils. Locally, hardpan overlies silty to silty clay loams. Consequently, these soils have low infiltration rates (less than 0.6 inches per hour).

The terrace and upland soils have profiles containing moderately dense accumulation of clay and claypan, relatively near the surface. These layers are impervious barriers to the local downward movement of water, except where root holes and other breaks permit infiltration.

The Natural Resource Conservation Service (NRCS) categorizes soils by hydrologic soil groups. The hydrologic soil group is an estimation of the infiltration rate of the first 5 feet of soil based on depositional characteristics (mostly grain size and sorting) and secondary characteristics (compaction, lithification, and weathering). Hydrologic Soil Groups and their relative infiltration rates are listed below:

- A (high)
- B (medium)
- C (slow)
- D (very slow)

Figure 2-10 shows the distribution of soils mapped by hydrologic soil group across the Eastern San Joaquin Subbasin. The broad geologic features of the Eastern San Joaquin Subbasin reflecting the river drainage elevations, areas, and percent above snowline are also apparent in the map of soils distribution. The Stanislaus and Mokelumne River alluvial fans have the overall highest infiltration rate followed by the Calaveras River fan. The smaller foothill watersheds have the lowest average infiltration rates. The relatively high permeability of windblown sands on the Mokelumne and Stanislaus River fans and the recent alluvium of the current Mokelumne and Calaveras River floodplains are also recognizable (Figure 2-10).

Hardpan is a strongly cemented weathering profile that limits infiltration unless it is modified by ripping or excavating. Some hardpan is discontinuous and relatively shallow (located at a depth of 5 feet or less) and often is ripped with a bulldozer for agricultural purposes. However, in other areas, particularly in the older pre-Modesto formations, the hardpan is more continuous and extends to depths that cannot be reached by ripping methods.

The Farmington Groundwater Recharge/Seasonal Habitat Study Final Report, prepared by Montgomery Watson Harza (MWH), dated August 2001 (MWD, 2001), overlaid the NRCS's interpretation of where hardpan soils would be found under natural conditions. The extent of the thickest hardpan is shown in Figure 2-11 in dark blue cross hatching.

Figure 2-10: Hydrologic Soil Groups

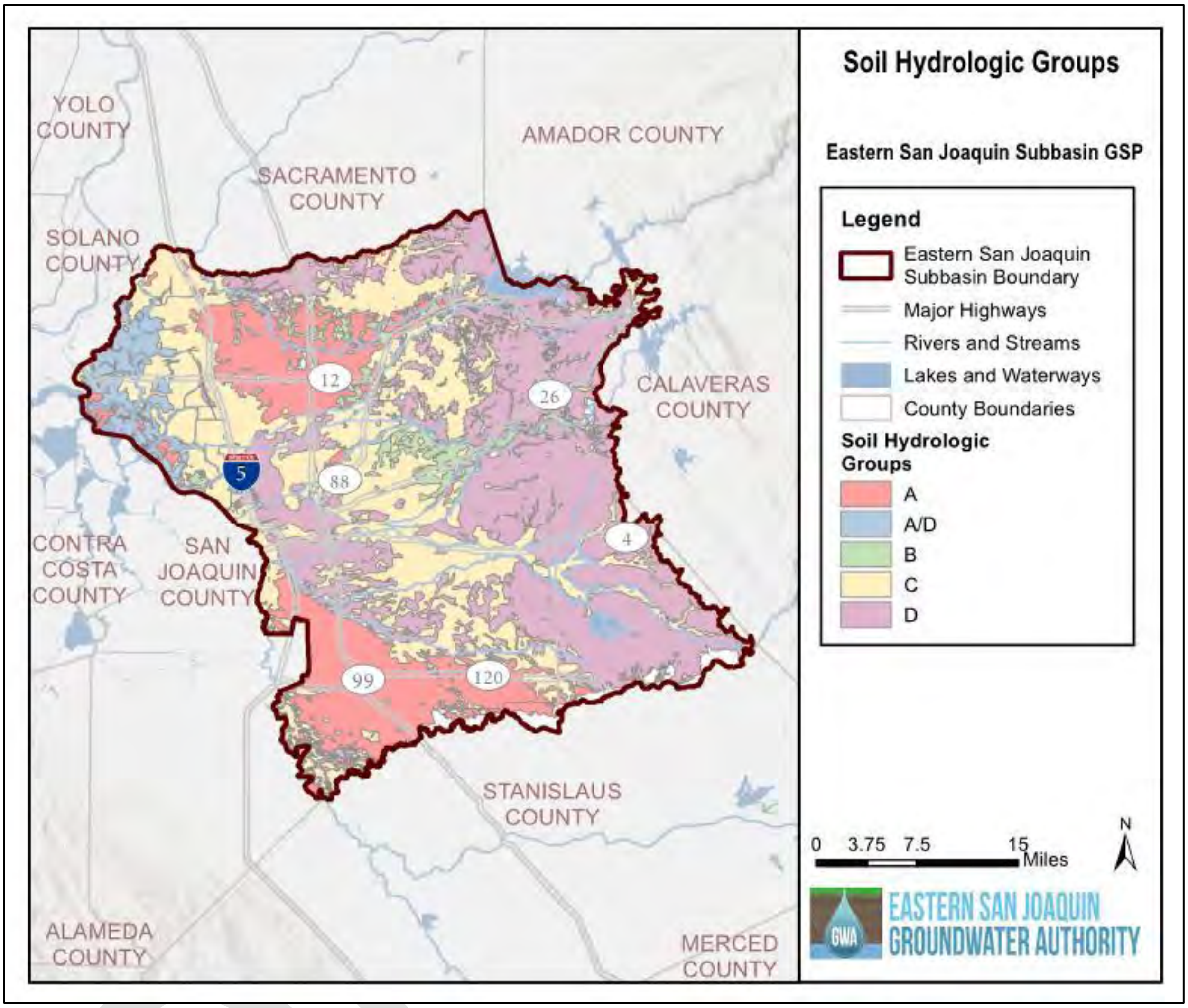
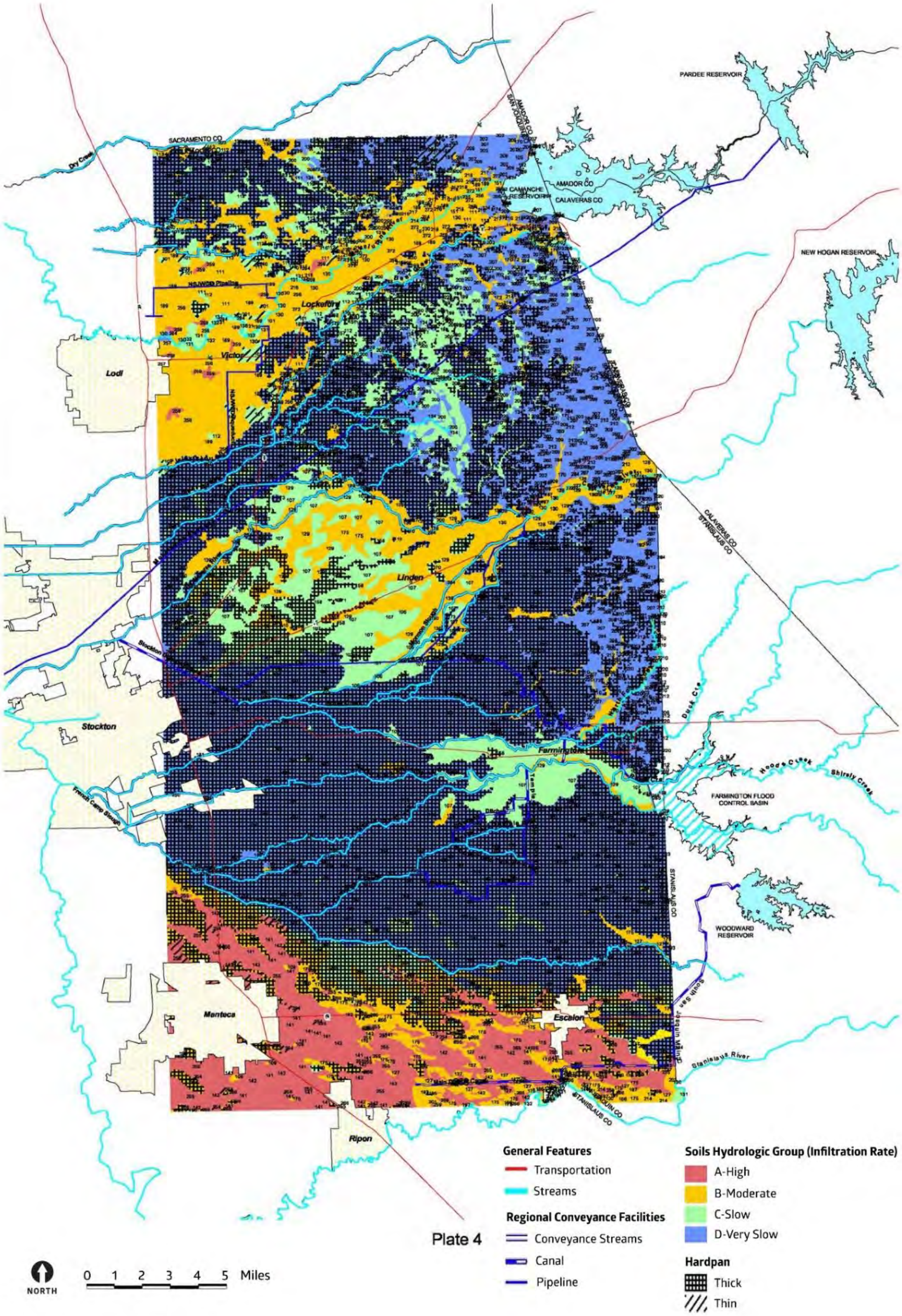


Figure 2-11: Occurrence of Hardpan within the Eastern San Joaquin Subbasin



2.1.4.4 Imported Water

The Eastern San Joaquin Subbasin does not rely on imported water supplies. All surface water used within the Subbasin originates from sources either within or directly tributary to the Subbasin. Several districts receive surface water from Stanislaus River with a point of diversion approximately four miles upstream of the eastern boundary of the Subbasin (located in the Sierra Nevada foothills and not part of a Bulletin 118 groundwater basin). While this diversion point occurs outside of the Subbasin boundary, this water naturally enters the Subbasin by diversion or by surface-groundwater interaction.

2.1.4.5 Groundwater Recharge and Discharge Areas

Groundwater recharge and discharge is driven by both natural and anthropogenic (human-influenced) factors. Areas of recharge and discharge within the Eastern San Joaquin Subbasin are discussed below. Quantitative information about all natural and anthropogenic recharge and discharge is provided in the Water Budget section of the Basin Setting chapter.

2.1.4.5.1 Description of Recharge Areas

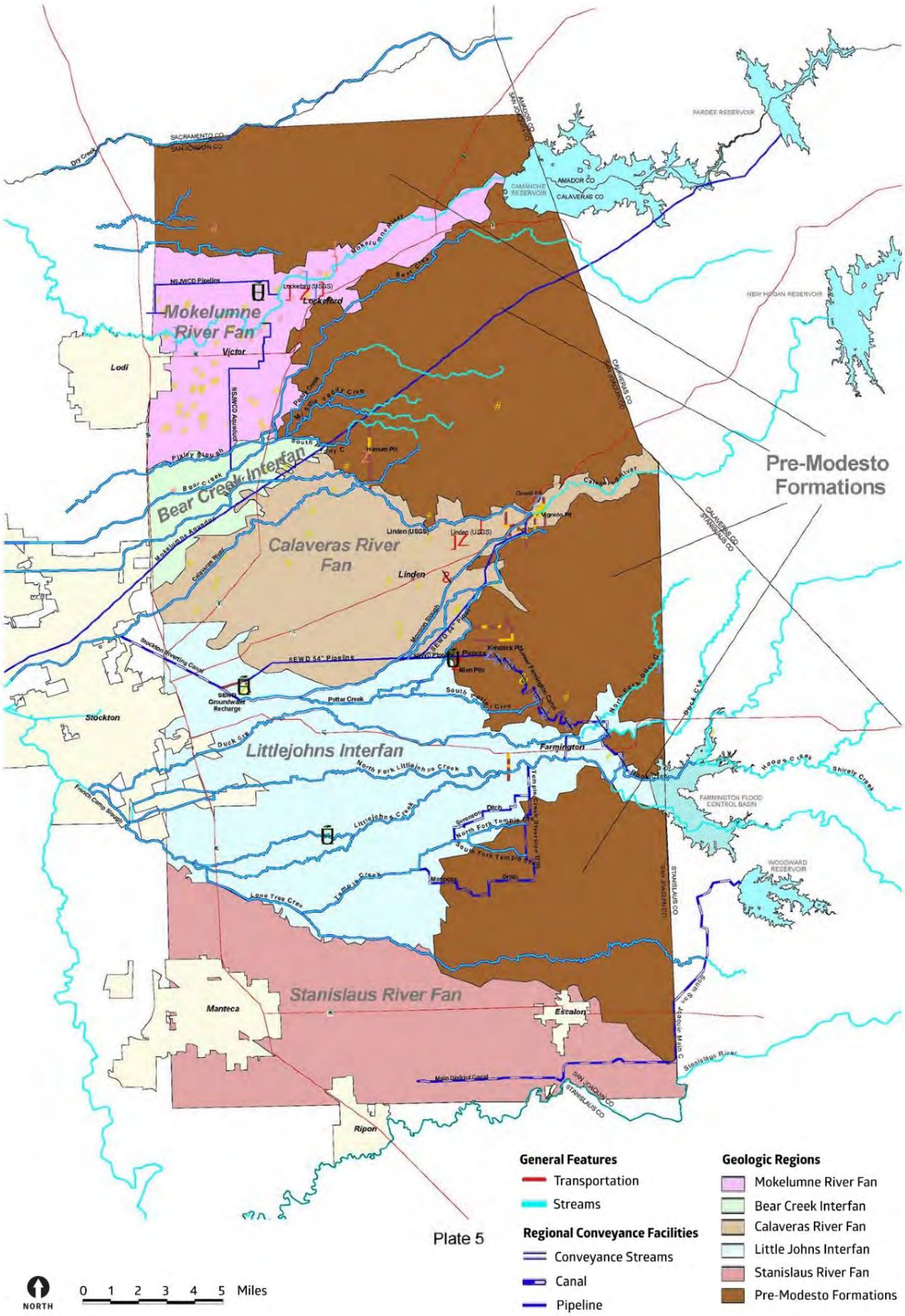
The recharge potential of soils encountered in the Eastern San Joaquin Subbasin varies considerably and is dependent on primary and secondary geologic effects. Primary geologic patterns that influence permeability relate to grain size and sorting, which is a result of depositional characteristics. Secondary geologic effects that influence soil recharge characteristics are associated with post-depositional events such as consolidation, lithification, and weathering, including the development of hardpan soils (MWH, 2001).

The primary (original) geologic permeability of the pre-Modesto formations is variable depending on grain size, but in general is low due to secondary (post-depositional) effects including the development of hardpan soils. However, the units are heterogeneous (variable), and permeable channels are common beneath the hardpan. The primary permeability of the Modesto Formation varies both east-west and north-south due to grain size differences in the original depositional environments. On any given drainage, the alluvium is generally coarsest (and most permeable) in the east where the gradient is steepest, and the relatively high energy stream carries and deposits a high proportion of coarse bedload sand and gravel (the proximal fan). Suspended sediment (clay and silt) is generally not deposited until it is carried farther west to a lower energy environment (the distal fan). As a result, the average permeability, and thus the average recharge rates, of the alluvial fan decreases overall from east to west (MWH, 2001).

The grain size distribution produced from each watershed depends on several characteristics, including the type of geologic materials in the source area, the watershed's gradient and total area, and the portions of the watershed subject to rainfall and snowmelt runoff.

During the Pleistocene Epoch when the Modesto and Riverbank formations were deposited (approximately 1 million to 10,000 years ago), a colder, wetter climate produced a lower snowline than at present, and coarse glacial outwash dominated the major streams originating in the interior of the Sierra Nevada (Mokelumne and Stanislaus River fans). Alluvium of the smaller foothill watersheds consists primarily of fine-grained material in interfan areas (Bear Creek and Little Johns/Rock Creek drainages). The Calaveras River drainage is intermediate between the two, forming a moderately coarse alluvial fan between the Calaveras River and Mormon Slough (MWH, 2001). Figure 2-12 depicts the aerial extents of the alluvial fans, interfan areas, and pre-Modesto formations.

Figure 2-12: Areal Extents of Alluvial Fans, Interfans and Pre-Modesto Formations



Within this overall framework, the alluvial fans of each drainage contain coarse-grained channel and levee deposits of relatively high permeability within finer-grained overbank and floodbasin deposits of low permeability. In this depositional environment, stream channels migrate and abruptly jump to new locations over time, creating deposits that are heterogeneous both laterally and vertically. As a result of this depositional environment, localized silt and clay lenses are common even in the alluvial fan areas. However, no regional clay layer is expected to exist that would severely reduce or inhibit vertical migration of water. The recent (Holocene) alluvium in the current incised river floodplains (Mokelumne and Calaveras Rivers) and windblown (eolian) sand deposits are of limited extent but relatively permeable (MWH, 2001). These present and historic alluvial depositional factors are useful in understanding rainfall percolation rates when the soil moisture deficit is zero and groundwater recharge occurs; groundwater system preferential vertical movement pathways through the Principal Aquifer and Aquitards; and future groundwater management alternatives.

The Eastern San Joaquin Water Resources Model (ESJWRM) estimates the recharge that occurs in different areas of the Eastern San Joaquin Subbasin, largely due to the percolation of rainfall and applied irrigation water.

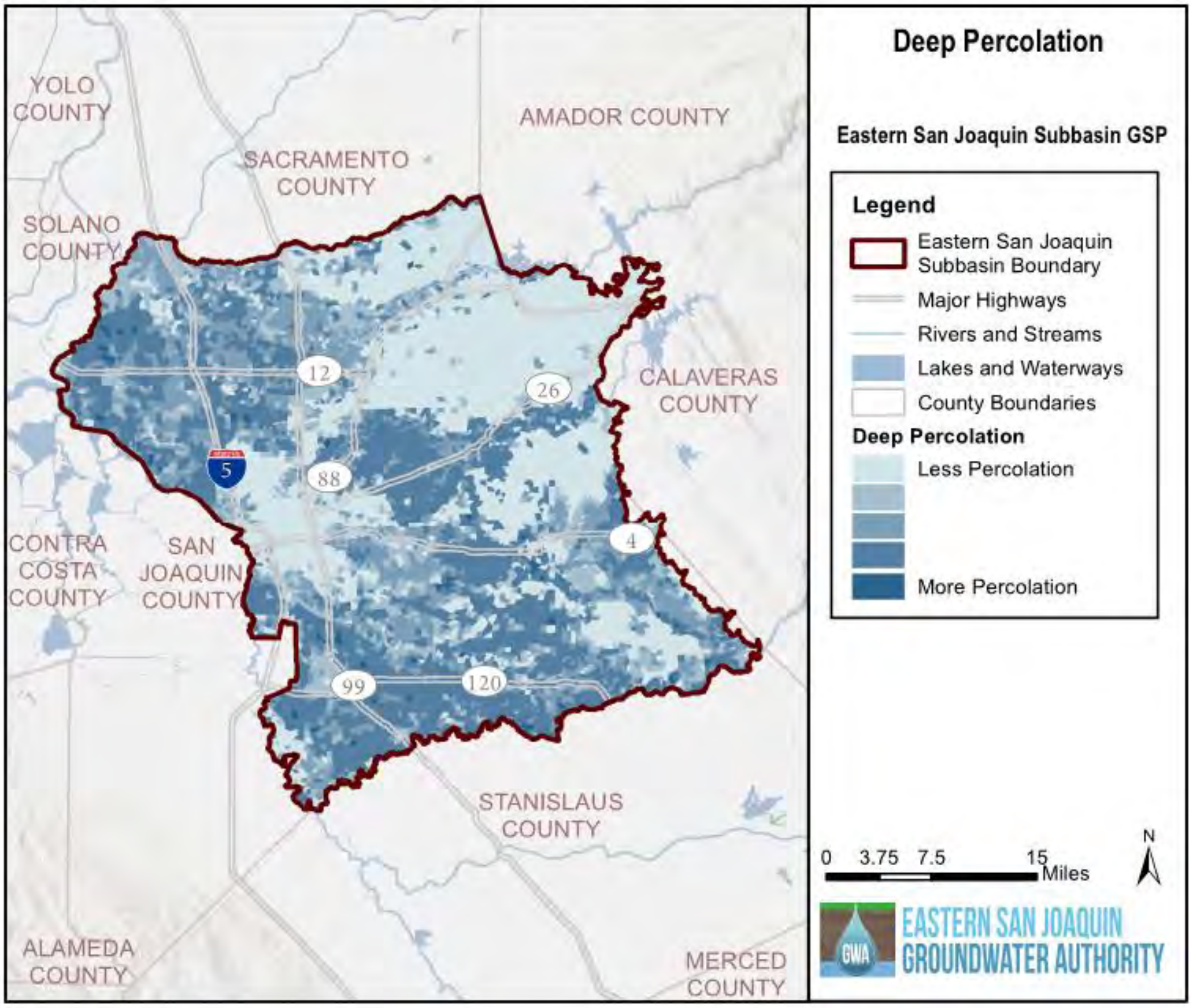
Figure 2-13 shows the spatial distribution of percolation in the Subbasin, with generally less percolation occurring in finer soil areas (e.g., Hydrologic Soil Group D) and areas without extensive irrigation (i.e., native landscape).

2.1.4.5.2 Description of Discharge Areas

Groundwater discharge primarily occurs through groundwater production wells. Groundwater production in ESJ Subbasin is discussed further in the Basin Setting Chapter under the presentation of the Water Budgets (Section 2.3). Groundwater also discharges to rivers and streams where groundwater elevations are higher than river stage. This is described more in Section 2.2.6 of the Basin Setting Chapter. Figure 2-65 indicates where stream nodes indicate gaining conditions (groundwater contributing to streamflow) and where they indicate losing conditions (surface water recharging groundwater). This analysis was based on modeling results from the ESJWRM for approximately 900 stream nodes (locations along simulated streams where calculations are made related to stream flows and interaction with groundwater) in the Eastern San Joaquin Subbasin. The stream nodes within the ESJWRM contain information on the quantity of stream gains and losses on a monthly basis. Using the historical simulation (see Section 2.3), the median value of monthly stream gains and losses was calculated over the 1996 to 2015 time period.

Other sources of groundwater discharge are evapotranspiration from riparian areas, phreatophyte woodlands, and other GDE communities, along with areas of high groundwater levels.

Figure 2-13: Areas of Groundwater Recharge

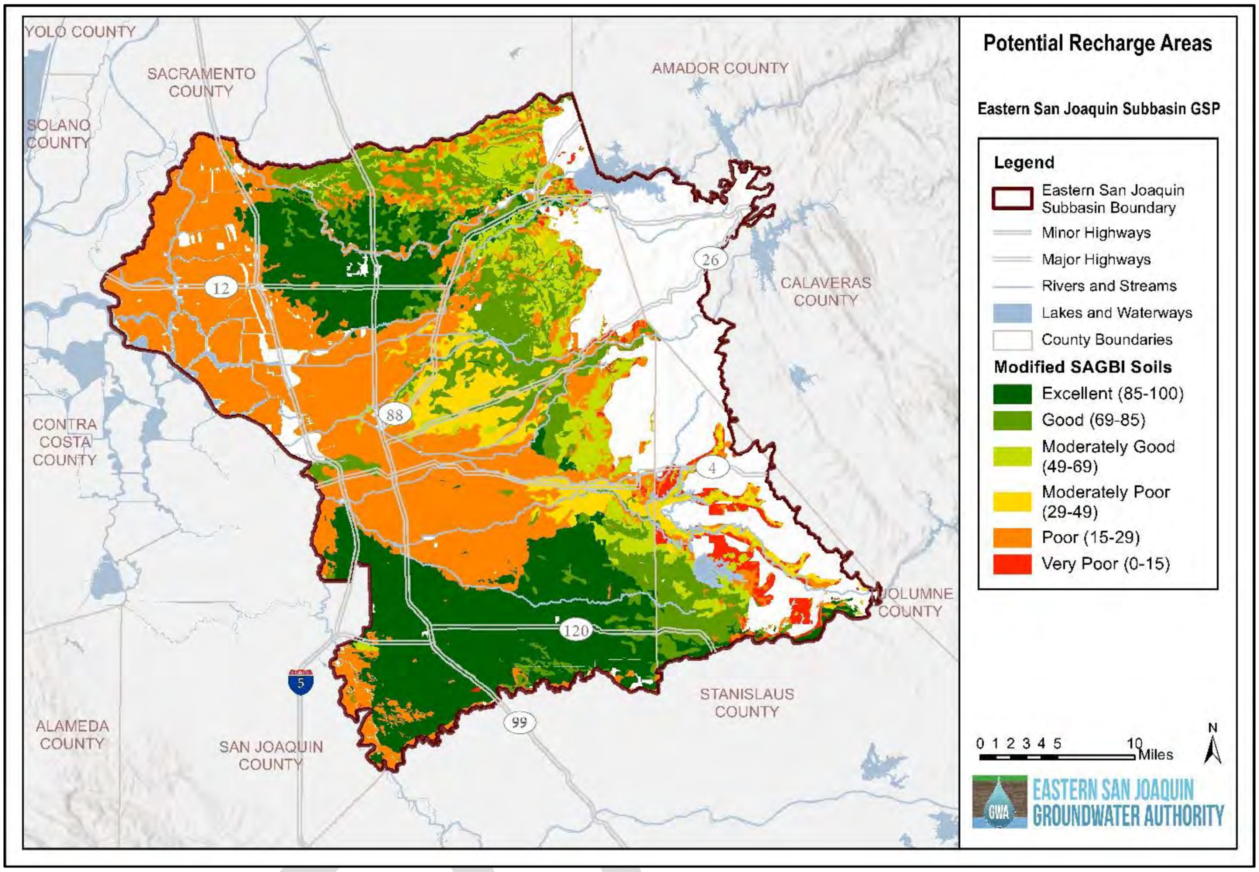


2.1.4.5.3 Description of Potential Recharge Areas

Figure 2-14 shows areas with their potential for groundwater recharge, as identified by the Soil Agricultural Groundwater Banking Index (SAGBI). SAGBI provides an index for the groundwater recharge for agricultural lands by considering deep percolation, root zone residence time, topography, chemical limitations, and soil surface condition.

SAGBI data is derived from “modified” SAGBI data. “Modified” SAGBI data show higher potential for recharge than unmodified SAGBI data because the modified data assume that the soils have been or will be ripped to a depth of 6 feet, which can break up fine grained materials at the surface to improve percolation. Modified SAGBI data categorizes 310,098 acres out of 610,890 acres (51 percent) of agricultural and grazing land within the Subbasin as moderately good, good, or excellent for groundwater recharge (University of California, Davis, 2018).

Figure 2-14 Potential Recharge Areas



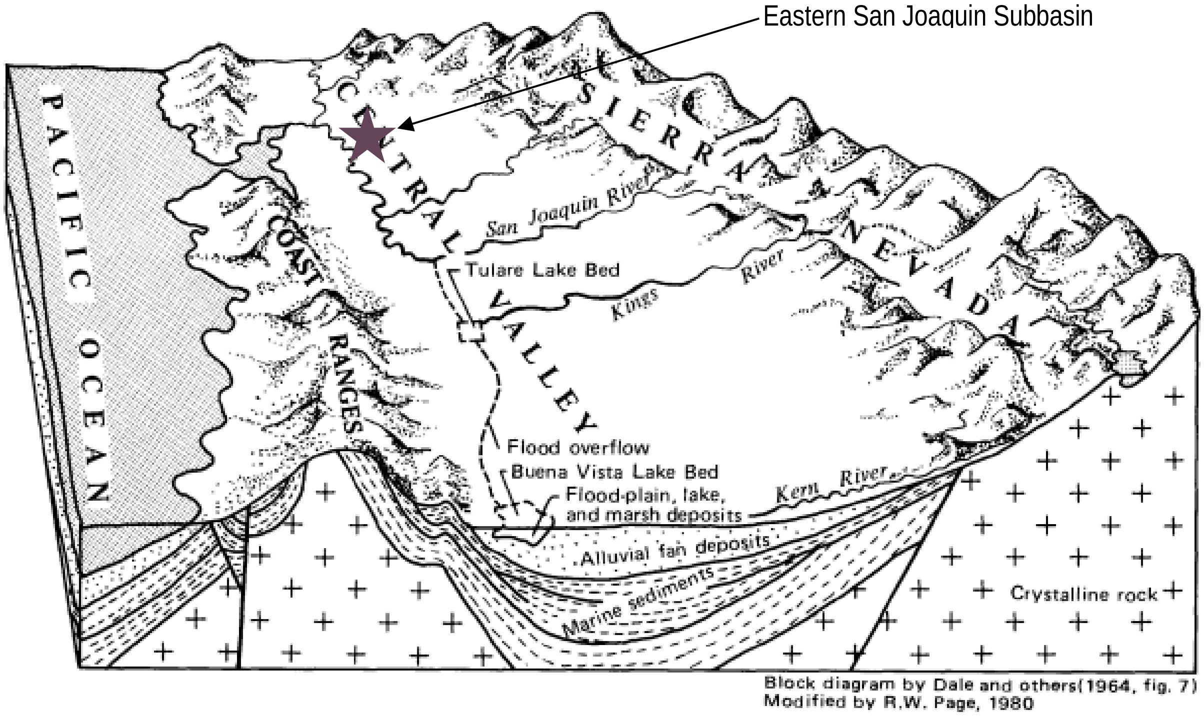
2.1.5 Geologic Formations and Stratigraphy

Geologic formations within the Central Valley and Eastern San Joaquin Subbasin are generally grouped as either eastside or westside formations based on their location relative to the San Joaquin River and the source of the sedimentary material of which they are composed. Generally, eastside formation material originates from continental deposits from the Sierra Nevada and westside formation material originates from the continental Coastal Ranges. Rising land masses contributed to the erosion and deposition of alluvial sands and fan deposits. Glaciation in the Pleistocene also contributed to the steepening of streams during melt water periods (CA DWR, 1967).

The block diagram of the Central Valley (Figure 2-15), provides a generalized geologic cross-sectional view of the geologic setting. The Eastern San Joaquin Subbasin is located in the foothills margin between the roughly horizontal alluvial sediments of the Central Valley geomorphic province and the granitic Sierra Nevada geomorphic province.

Sediment deposits can be subdivided into consolidated and unconsolidated deposits, with the consolidated sediments underlying the unconsolidated sediments. The most important fresh water-bearing formations in the Eastern San Joaquin Subbasin are the sands within the consolidated Mehrten and Laguna Formations and the unconsolidated younger alluvial deposits consisting of the Riverbank and Modesto Formations.

Figure 2-15: Generalized Geologic Section and Eastern San Joaquin Subbasin Setting



With depth, the stratigraphy of unconsolidated sediments consists initially of Recent to Pleistocene Age alluvial deposits of the Post-Modesto deposits and the Modesto and Riverbank Formations. The sediments of these units are typically unconsolidated sands and gravels interbedded with considerable silts and clays. These clays separate the upper sediments over the lower Late Plio-Pleistocene Age Laguna Formation and the older Eocene to Pliocene Age Mehrten Formation. The Laguna and Mehrten are poorly consolidated sediments and are differentiated based on color and sand type. The Laguna Formation is typically light brown and the differentiating characteristic of the Mehrten is black sands derived from volcanic detritus. The Valley Springs and Ione Formations are encountered below the Mehrten Formation. The formations have a distinct geologic dip and thickness to the west.

The geologic map shown in Figure 2-16 illustrates the surface deposits of the Pleistocene-aged Modesto Formation and Turlock Lake Formation largely within the valley floor (Wagner et al., 1981; Wagner et al., 1991). The knolls and ridges to the east represent outcrops of the Tertiary-aged Laguna, Mehrten, Valley Springs, and Ione Formations. The geologic stratigraphic column is provided on Table 2-2.

Figure 2-16: Geologic Map

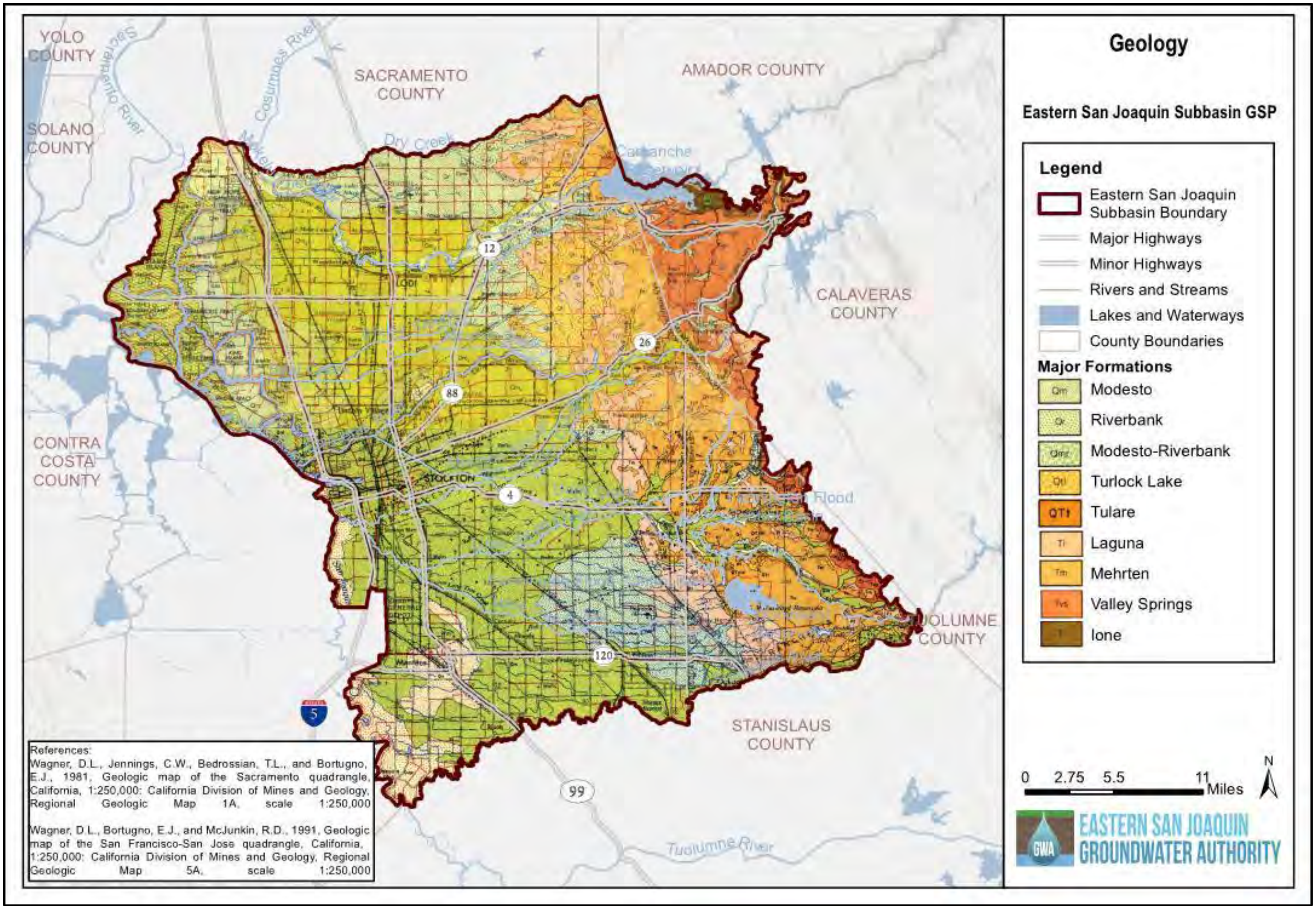


Table 2-2: Generalized Stratigraphic Column, Formation Descriptions, and Water-Bearing Properties

	System	Series *	Formation & Map Symbol	Thickness Maximum (feet)	Rock Characteristics and Environment	Water-Bearing Properties
CENOZOIC	*Quaternary*	Holocene	Stream Channel Deposits (Qsc)	50±	Continental unconsolidated gravel and coarse to medium sand deposited along present stream channels.	High permeability, significant avenue for percolation to underlying formations. Generally, not saturated except by the San Joaquin River
		Late Pliocene	Modesto	65-130±	Continental fan and interfan material, locally some basin types, lenticular gravel, sand, silt, clay.	Moderate permeabilities. Unconfined aquifer.
		Pliocene	Riverbank	150 to 250	Continental fan and interfan material, locally some basin types, lenticular gravel, sand, silt, clay. Reddish clay-rich duripan caps the unit.	Moderate permeabilities. Unconfined aquifer.
		Recent to Plio-Pleistocene	Flood Basin Deposits (Qb) Turlock Lake Formation	0-1,000±	Continental basinal equivalent of Laguna, Tulare & younger formations. Clay, silt & sand, organic in part.	Generally low permeabilities, saturated environment, unconfined to confined.
		Plio-Pleistocene	Laguna (QTl)	0-1000±	Continental, semi-to unconsolidated silt, sand & gravel, poorly sorted, includes Arroyo Seco Gravel pediment of Mokelumne R. area.	Moderate permeability, Unconfined to locally semi-confined. Restricted perched bodies in some areas.
	Tertiary	Mio-Pliocene	Mehrten (Tm)	0-600±	Continental andesitic derivatives of silt, sand and gravel & their indurated equivalents; tuff; breccia; agglomerate.	Moderate permeability to high where "Black Sands" occur. Confined to unconfined.
		Miocene	Valley Springs (Tvs)	0-500±	Continental rhyolitic ash, clay, sand & gravel and their indurated equivalent.	Low permeability. Not considered as significant in groundwater studies.

	System	Series *	Formation & Map Symbol	Thickness Maximum (feet)	Rock Characteristics and Environment	Water-Bearing Properties
		Eocene	Ione (TI)	0-500±	Light colored clay and sand. Marine shale, siltstone and sandstone	Contains saline waters except where flushed in outcrop areas. Unimportant to fresh water basin except as possible contaminant source.
MESOZOIC	*Creta-ceous*	Cretaceous Jurassic	Undifferentiated Bedrock		Igneous, metamorphics and ultramafics.	Contains saline waters. Unimportant to fresh water basin except as possible contaminant source.
	Pre-Cretace-ous					

Notes: DWR, 1967; Burow et al, 2004
* Figure 2-5 contains time scales corresponding to formations

2.1.5.1 Geologic Formation Descriptions

The Tertiary-age units that overlie the basement rocks and generally outcrop within the Eastern San Joaquin Subbasin are discussed in the following sections, from oldest to youngest.

2.1.5.1.1 Pre-Ione Eocene Rocks

The pre-Ione Eocene rocks, as described by Chapman and Bishop (1975), were deposited in a pre-Ione bedrock paleochannel system. Their composition includes sedimentary rocks of marine origin with biotite, chlorite, and muscovite. Feldspar is a significant component of this unit (Creely & Force, 2007). The thickness of this unit is highly variable in the foothill area as it is controlled by basement complex topography. The unit “wedges out” to the east and assumes a more uniform regional thickness to the west in the Central Valley Mesozoic-Cenozoic sediment pile (Creely & Force, 2007). Depictions and full geologic formation detail are provided in Table 2-2. The Tertiary volcanic and sedimentary rocks and terrace deposits are separated from the Jurassic volcanic/metamorphic basement by an angular unconformity from small-scale faulting. The Franciscan Group, Cretaceous, and Eocene Undifferentiated deposits have been impacted by the east-west Stockton Fault (CA DWR, 1967)

2.1.5.1.2 Ione Formation

The Eocene Age Ione Formation has been mapped along the eastern margin of the Eastern San Joaquin Subbasin, and, as described by Loyd (1983), contains interbedded kaolinitic clay, quartz sand, sandy clay, and lignite. The Ione Formation is characteristically light in color, with color influenced by iron oxide, lignite, and carbonaceous mud rocks and shale (Creely & Force, 2007). Pask and Turner (1952) subdivided the Ione Formation into upper and lower members based on mineralogy. The upper and lower members contain kaolinite (anauxite) clays. Deposits can include coarse-grained sand (up to 2 mm diameter). This kaolinite sand is commonly called Ione sand.

Ione sand is one of the most important sources of commercial clay and silica sand in the Ione Formation (Creely & Force, 2007). Ione sand has a white color with a pearly luster and appears massive; however, closer examination usually reveals cross stratification, heavy mineral laminae, and burrows (Creely & Force, 2007). Quartz is abundant with varying feldspar content in both members.

The lower member contains 8 to 10 percent feldspar with the upper member containing 20 to 25 percent feldspar. The minerals biotite and chlorite are rare in the lower member and common in the upper member. Heavy mineral deposits vary. The lower member contains mature minerals like zircon and ilmenite. The upper member contains hornblende and epidote. Chromite is also commonly found in the Ione Formation. The upper member is largely absent north of Jackson Valley due to erosion and deposition during the development of the overlying Valley Springs Formation. The Ione Formation is deposited in both marine and fluvial continental environments (Creely & Force, 2007).

2.1.5.1.3 Valley Springs Formation

The Oligocene-Age Valley Springs Formation is described by Loyd (1983) as stream channel and alluvial deposits derived mainly from rhyolitic volcanic rocks including some white, welded tuffs, and ash flows. The basal contact of the Valley Springs Formation is characterized, locally, by the presence of rhyolitic conglomerate. These tuffs may display alteration to clays, and, in extreme cases, only a claystone bed with relict tuffaceous texture remains. Pure deposits of rhyolitic ash exist in areas, while many sand and ash beds are present. In general, the clay beds of the Valley Springs Formation are greenish in color, may contain silt, sand, and large pumice fragments. The sandstones range in grain-size from fine to coarse and are typically well cemented. Predominantly composed of quartz and pre-Cretaceous material, the relatively sparse conglomerate lenses within the tuff, clay, and sandstone may also contain pumice fragments. In general, the Valley Springs Formation is predominantly fine-grained, containing less coarse-grained deposits. In the Central Valley, the Valley Springs Formation is considered to be largely non-water-bearing. This is likely due to the great depths beneath the valley floor and the proximity to the base of freshwater (Sections 2.1.7 and 2.1.8.2).

2.1.5.1.4 Mehrten Formation

Overlying the Valley Springs Formation is the Miocene Age Mehrten Formation, described as being stream channel, alluvial, and mudflow deposits derived mainly from andesitic volcanic rocks. The Mehrten Formation is considered the oldest significant fresh water-bearing formation within the Eastern San Joaquin Subbasin.

Bartow (1992) generally describes the Mehrten in the east-central portion of the Central Valley as being sandstone composed of amphiboles, pyroxenes, and pebbles (mostly volcanic) with lenticular bedding and gray to blue color. Bartow discusses a major change in regional volcanism as the rhyolitic pyroclastic deposits of the Late Oligocene and earliest Miocene were replaced near the end of the Early Miocene by reestablished andesitic arc volcanism in the northern Sierra Nevada. This andesitic volcanism provided the source materials for the Mehrten Formation.

Ferriz (2001) discusses how the Mehrten Formation outcrops discontinuously along the eastern flank of the Valley and was laid down in the Mokelumne area by streams carrying andesitic debris from the Sierra Nevada. The Mehrten thickens in the northeastern part of the San Joaquin Valley; generally, it can be more than 700 to 1,200 feet thick at depths ranging from more than 300 feet below ground on the east side of the valley to depths exceeding 1,400 feet along the central portion of the valley. The contact between the Mehrten Formation and underlying Valley Springs Formation is a non-distinct unconformity.

The formation is subdivided into upper and lower units. The upper unit contains finer grained deposits (black sands interbedded with brown-to-blue clay) and the lower unit consists of dense tuff breccia. Deep wells in the Stockton area indicate the upper portion of the Mehrten Formation contains a high percentage of clay, suggesting that the upper portion of the unit may be finer grained than the middle or lower portions, with resulting semi-confined conditions (CA DWR, 1967).

The black sands of the Mehrten Formation (black andesite detrital grains) generally have moderate to high permeability and yield large quantities of fresh water to wells, which makes them a preferred exploration target for groundwater supply in the eastern half of the Central Valley (Davis & Hall, 1959; CA DWR, 1967). East of Jack Tone Road, a large number of wells produce from the relatively permeable "black sands" commonly described as hard sandstones (CA DWR, 1967).

2.1.5.1.5 Laguna Formation

The Pliocene to Pleistocene Laguna Formation is composed of discontinuous lenses of unconsolidated to semi-consolidated alluvial sands, gravels, and silts and is typically light brown. These poorly exposed stream-laid alluvial deposits form high terraces and are associated with the last major uplift in the Sierra Nevada.

The Laguna Formation outcrops in the northeastern part of the County and dips at 90 feet per mile and reaches a maximum thickness of 1,000 feet, with the thickest areas (400 to 1000 feet) observed near the Mokelumne River in the Stockton Area (CA DWR, 1967). The Laguna Formation is moderately permeable with some reportedly highly permeable coarse-grained fresh water-bearing zones.

Some studies suggest that an extensive aquitard, namely the Corcoran Clay member of the Tulare Formation, extends into the Laguna Formation or separates the Laguna and Mehrten Formations. Corcoran Clay is further discussed in the following section.

2.1.5.1.6 Turlock Lake Formation

The Turlock Lake Formation as consisting primarily of arkosic alluvium, mostly fine sand, silt, and in places clay, at the base grading upward into coarse sand and occasional coarse pebbly sand or gravel (Marchand & Allwardt, 1981). The age of the Turlock Lake Formation is about 600,000 to greater than 730,000 years old, but younger than about 1 million years. The Turlock Lake commonly stands topographically above the younger fans and terraces throughout the northeastern San Joaquin Valley in a broad band between the Merhten, Laguna, and the younger Riverbank and Modesto alluvial fans to the west. A buried soil separates the Turlock Lake Formation into two units (Upper and Lower) in the northeastern San Joaquin Valley. The thickness of the Turlock Lake is variable and appears to increase toward the valley. Estimates of thickness in the subbasins to the south range from 295 to 850 feet for eastern Stanislaus County, 1,000 feet for northern Merced County, and 160 to 720 feet in the Chowchilla area.

The Turlock Lake Formation is differentiated from the west to east by its Corcoran Clay member that is present in the southwest corner of the Subbasin near Manteca and dominates the area west of Highway 99 south of the Eastern San Joaquin Subbasin. The Corcoran Clay becomes interbedded with the sands and silt of the upper Tulare and is not found in the central and northern portions of the Subbasin. This member is found ranging in thickness from a feather edge to 160 feet beneath the present bed of Tulare Lake. The Turlock Lake Formation is dominant within the basins to the south.

2.1.5.1.7 Riverbank Formation

The Riverbank Formation consists primarily of arkosic sediment derived mainly from the interior Sierra Nevada, which forms at least three sets of terraces and coalescing alluvial fans along the eastern San Joaquin Valley (Marchand & Allwardt, 1981). The Riverbank Formation is about 130,000 to 450,000 years old. The Riverbank, as exposed in the northeastern San Joaquin Valley, is primarily sand, containing some scattered pebbles, gravel lenses, and some interbedded fine sand and silt. The Riverbank unconformably overlies the Laguna Formation, and its terraces and fans truncate or are cut into Turlock Lake alluvium or fill post-Turlock Lake gullies and ravines, which, in turn, are cut and filled near the foothills by terraces of the lower member of the Modesto Formation. The Riverbank Formation is informally subdivided into three units (lower, middle, and upper) which appear to coarsen upward, like those of the older Turlock Lake Formation. The Riverbank Formation also shows a variable thickness that tends to increase toward the major river channels; 150 to 200 feet is reported in northern Merced and eastern Stanislaus Counties, 260 feet along the Merced River, and about 65 feet along the Chowchilla River.

2.1.5.1.8 Modesto Formation

The Modesto Formation is composed of mainstream arkosic sediments and associated deposits of local derivation laid down during the last major series of aggradation events in the eastern San Joaquin Valley (Marchand & Allwardt, 1981). Gravel, sand, and silt were deposited as a series of coalescing alluvial fans extending continuously from the

Kern River drainage on the south to the Sacramento River tributaries in the north. They occur in a wide band immediately east of the San Joaquin Valley axis and to the west of the Riverbank and older fan remnants. Radiocarbon dating estimates the age of the Modesto to be older than 9,000 years before present (B.P.) to 42,000 years B.P. Most of the prime agricultural land and many of the major cities are located in the young alluvial soils associated with the undissected Modesto terrace and fan surfaces. Modesto deposits overlie late Riverbank alluvium and older units and are locally incised or covered along modern channels by post-Modesto deposits.

The materials of the Modesto Formation are virtually identical to those of the Laguna, Turlock Lake, and Riverbank Formations, but their association with low terraces and young fans and their moderate to slight degree of erosional modification and soil profile development clearly differentiate them from older alluvium. The total thickness of the Modesto deposits is reported to be 50 to 100 feet in eastern Stanislaus County, 130 feet along the Merced River, and about 65 feet along the Chowchilla River fan. The Modesto Formation also thickens toward each river channel and toward the south; there is significant evidence of local facies changes laterally. Exposed sections toward the basin differ substantially from exposures near the foothills and from exposures along the westward draining rivers.

2.1.5.1.9 Post-Modesto Deposits – Recent Alluvium and Basin Deposits

In general, these younger units are less consolidated and sedimentary in nature, representing a sequence of young alluvial fills including alluvial fans, channel, point bar, levee, crevasse splay, interdistributary, and floodbasin alluvium. The alluvial fan deposits are much smaller than the late Modesto fans. The age of these deposits ranges from 9,000 years B.P to modern time. Lacustrine, swamp, and marsh deposits are presently accumulating in poorly drained areas on the alluvial fan toes. In oxbow lakes on river flood plains, near the edge of the Delta where Holocene sea level rise caused alluviation of the lower Mokelumne and Cosumnes Rivers, lakes and swamps have formed where tributary gullies have been blocked by mainstream aggradation (Marchand and Allwardt, 1981).

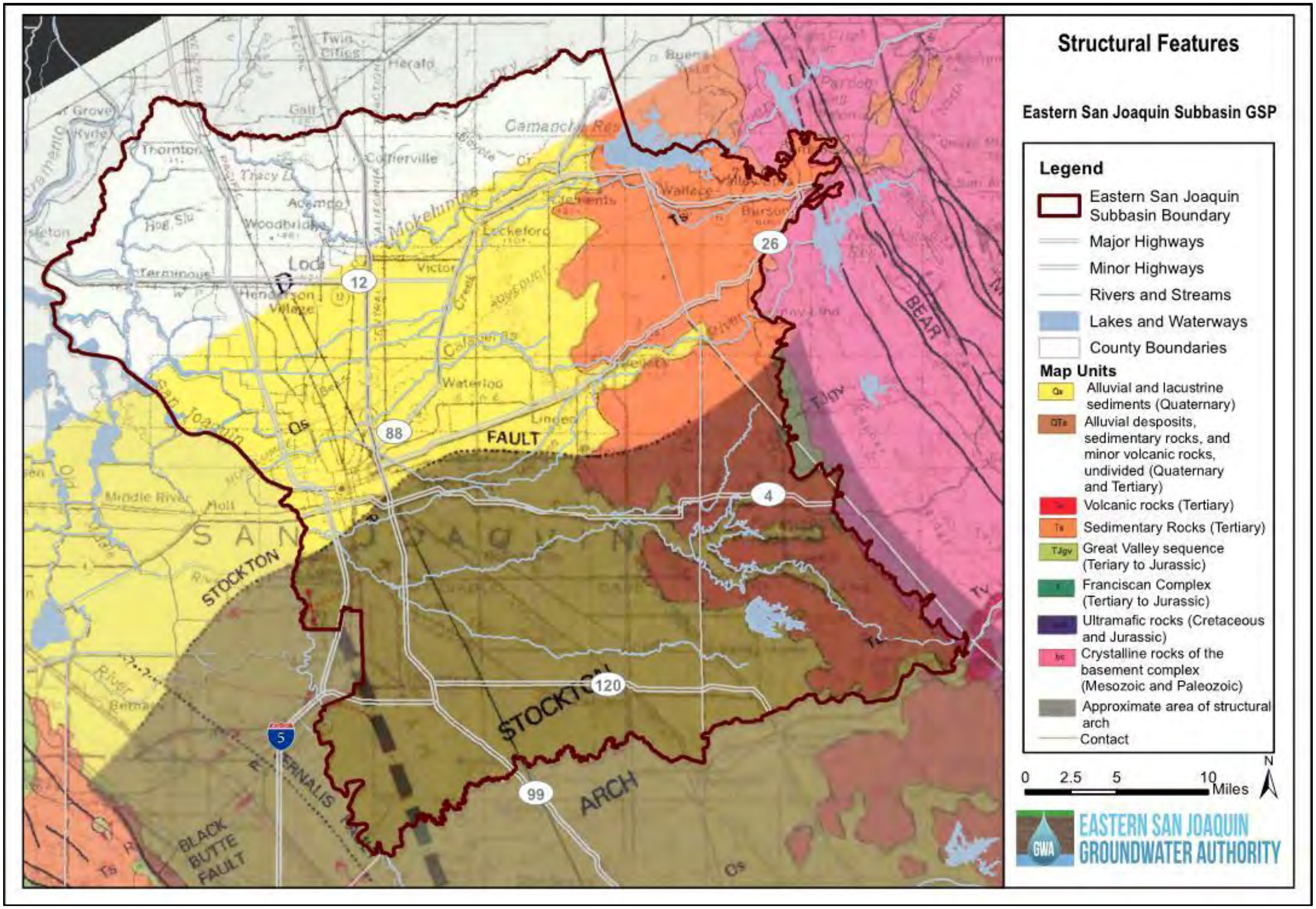
2.1.6 Faults and Structural Features

The Stockton Fault – The Stockton Fault is the largest fault in the Eastern San Joaquin Subbasin, shown in Figure 2-17. It is a large reverse fault with displacements of up to 3,600 feet (1,100 m) that trends transverse to the regional structure and bounds the Stockton Arch on the north. Bartow (1985) shows relative movement along the fault as north side down. The timing of the vertical movement is predominantly post-Eocene (Hoffman, 1964), and the latest movements appear to have been subsequent to deposition of the basal part of the Valley Springs Formation probably during Miocene time. See the geologic time scale (Figure 2-5) for the relative ages (in millions of years ago [Ma]) of the referenced chronostratigraphic units (e.g., Tertiary age spans from 65.5 to 2.6 Ma).

The Vernalis Fault – The Vernalis Fault is a major reverse fault with northwest-southeast trend that bounds the Tracy-Vernalis anticlinal trend that is mapped outside of the west boundary of the Eastern San Joaquin Subbasin. East-side-down movement of as much as 1,500 feet (460 m) probably took place at the same time as the major movements on the Stockton Fault (Bartow, 1985). The relative thickness of sediments can be inferred from the elevations of the base of the freshwater aquifer system shown in Figure 2-5. The freshwater aquifer system on the north side of the Stockton fault extends approximately 600 feet deeper than the aquifer system south of the fault. Relative movement along the fault is north-side-down, thus allowing for greater accumulation of the continental Tertiary sediments and deepening of the aquifer materials in this area.

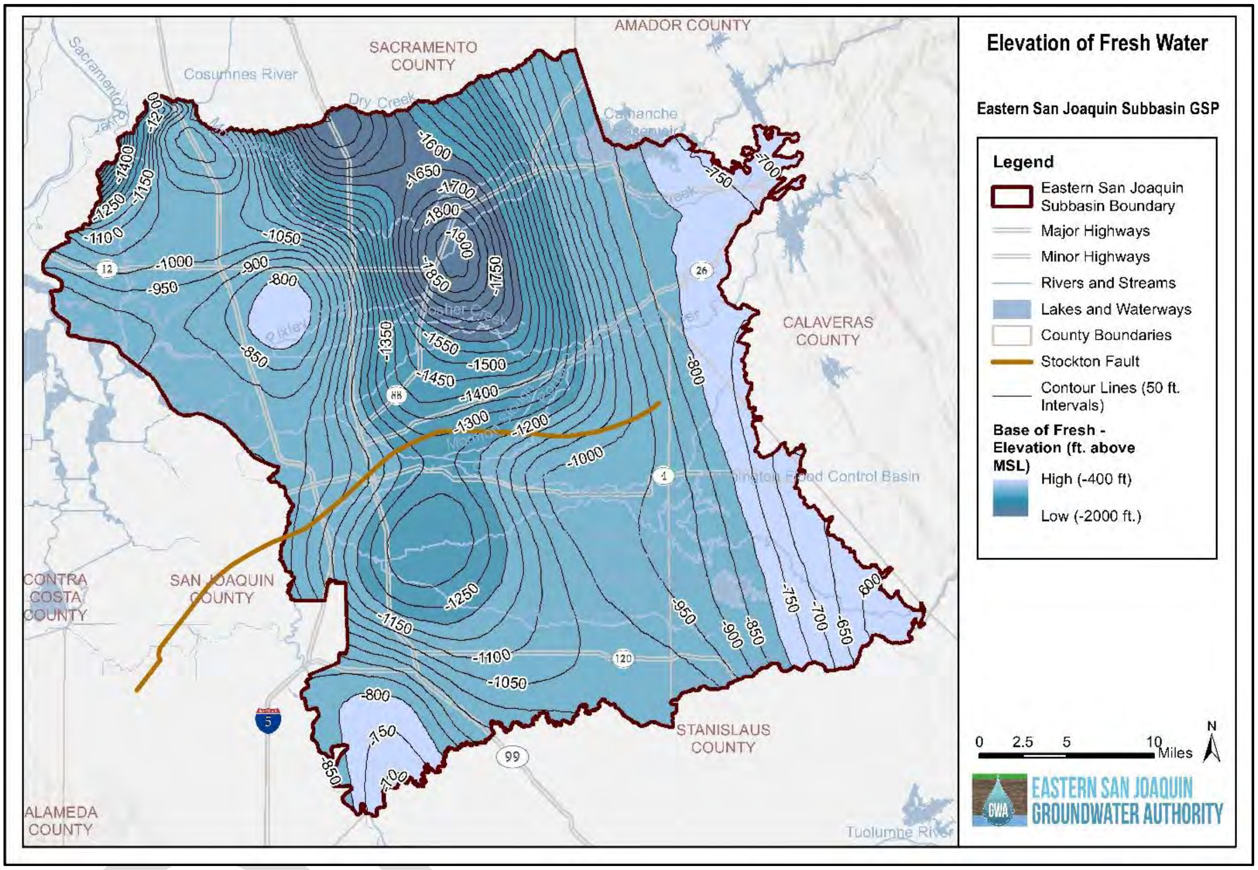
Stockton Arch – The Stockton Arch is a broad transverse structure that underlies the southern half of the Eastern San Joaquin Subbasin. The arch is bounded on the north by the Stockton Fault, and the southern limit is the line of truncation of Paleogene strata south of Modesto (Bartow, 1985). Indications of northward-shallowing marine facies in the lower Paleogene sequence suggests that the arch was present by Paleocene time. Erosion during the Oligocene time apparently reduced whatever physiographic expression the arch may have had and left a nearly flat plain prior to deposition of the later Tertiary units.

Figure 2-17: Faults and Structural Features



As a result of the north-side-down movement along the Stockton Fault, the Tertiary sediments are thicker north of the fault and thinner south of the fault. This feature also influences the location, depth, and thickness of the "base of the fresh water", as shown below in Figure 2-18.

Figure 2-18: Base of Fresh Elevation Contours and Stockton Fault



There are a series of angular unconformities formed during the Cenozoic related to uplift of the Sierra Nevada to the east (Bartow, 1985). The Cenozoic history of the Sierra Nevada is one of progressive westward tilting, perhaps episodic, with an increasing rate in the late Cenozoic. The subtle angular unconformities that separate the Tertiary units are evidence of this progressive tilting. The Tertiary units rarely have dips of more than 2 degrees; the difference in dip between the Ione and the Valley Springs Formations, for example, may be less than 1 degree. The discordances are most apparent in terms of gradients of depositional surfaces measured in distances of several miles. The largest discordances are between the Ione Formation (about 1,500 ft/mile) and the Valley Springs Formation (94 - 120 ft/mile), between the Mehrten Formation (99 - 131 ft/mile) and the Laguna Formation (52 - 79 ft/mile), and between the Laguna Formation and the Quaternary deposits (less than 18 ft/mile). The Ione-Valley Springs unconformity represents the Oligocene regression that affected most of central and southern California, and the Mehrten-Laguna unconformity probably marks the accelerated uplift of the Sierra Nevada beginning 3 to 5 Ma (Huber, 1981) in the central part of the range. The Sierra Nevada was relatively stable through the Miocene with only a minor discordance between the Valley Springs and Mehrten Formations; their lithological difference reflects primarily a change from rhyolitic to andesitic volcanism in the source area. Uplift of the Sierra Nevada continued through the Quaternary, but the record is complicated by Quaternary climatic events (e.g., glaciation) which were the principal controlling factor in Quaternary sedimentation for the east side of the Great Valley.

2.1.7 Geologic Cross-Sections

Five Geologic cross-sections (A-A', B-B', C-C', D-D', and E-E') were developed for the Eastern San Joaquin Subbasin based on the stratigraphic information amassed as part of the data compilation efforts. A geologic cross-section is an interpretive diagram of the lateral and vertical subsurface relationships of geologic formations. A cross-section location map with locations of groundwater and oil and gas wells reviewed in the development process is provided as Figure 2-19. Three of the cross-sections (A-A' through C-C') are along east-west transects in the north, central, and southern portion of the Subbasin, respectively; two of the cross-sections (D-D' and E-E') are generally along north-south transects. Cross-section D-D' generally transects the cities of Lodi, Stockton, and Manteca in the west portion of the Subbasin, and cross-section E-E' transects the Eastern San Joaquin Subbasin along the alignment of Jack Tone Road from the northeast to the southwest portion of the Subbasin. Each of the five geologic cross-sections are provided in Figure 2-20, Figure 2-21, and Figure 2-22.

Figure 2-19: Cross-Section Location Map

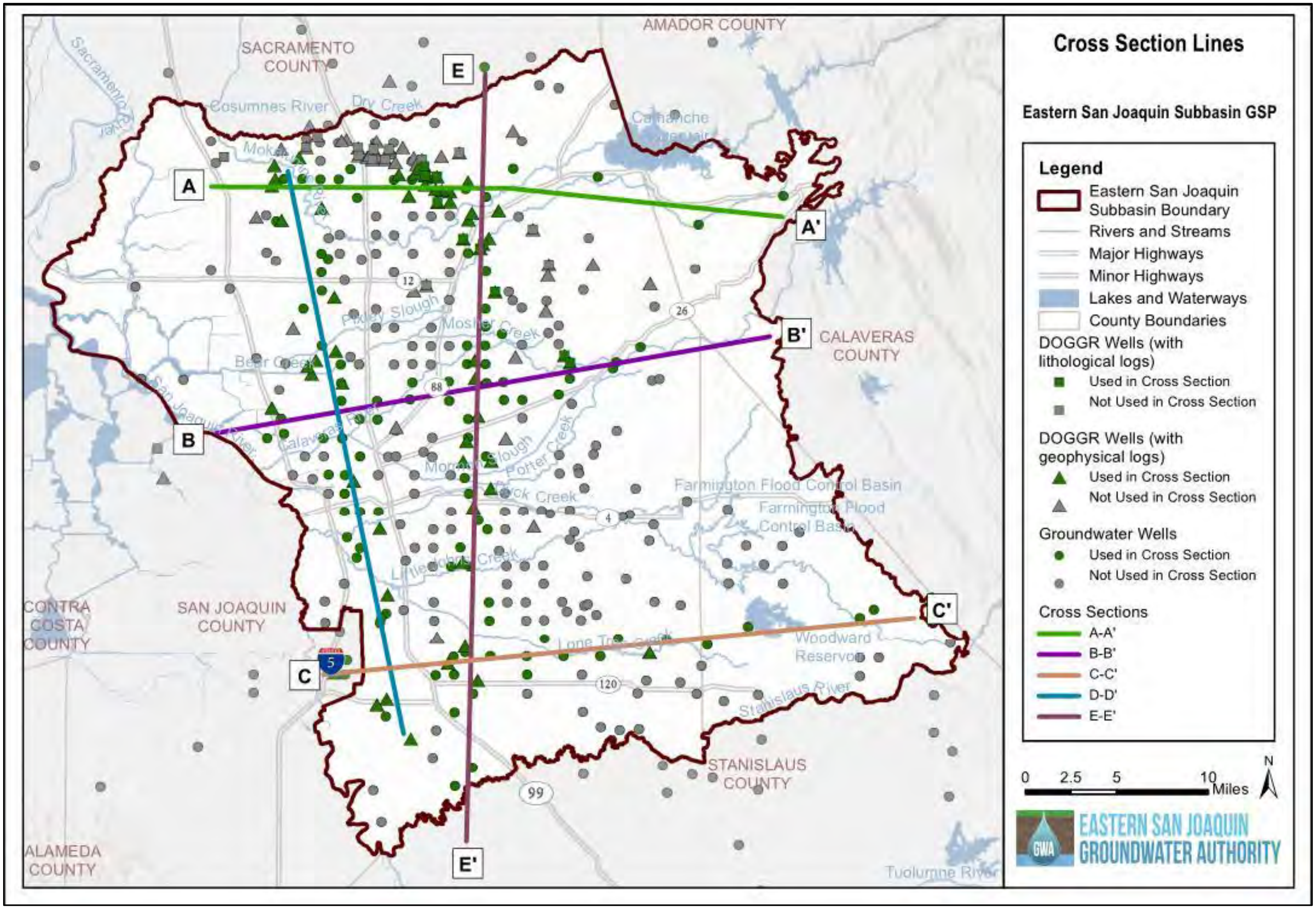


Figure 2-20: Hydrogeologic Cross-sections A-**A' and B-B'**

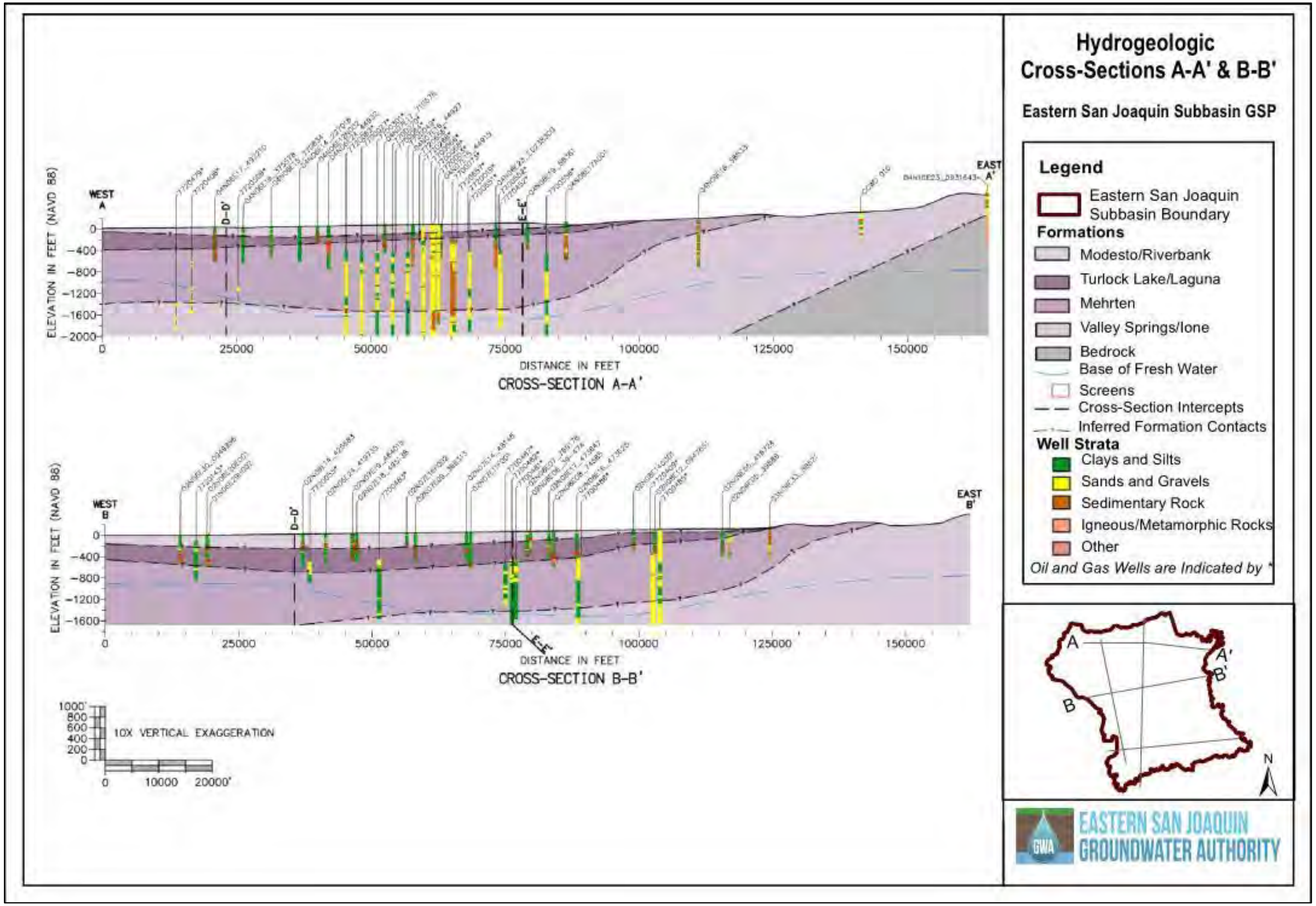


Figure 2-21: Hydrogeologic Cross-sections C-**C' and D-D'**

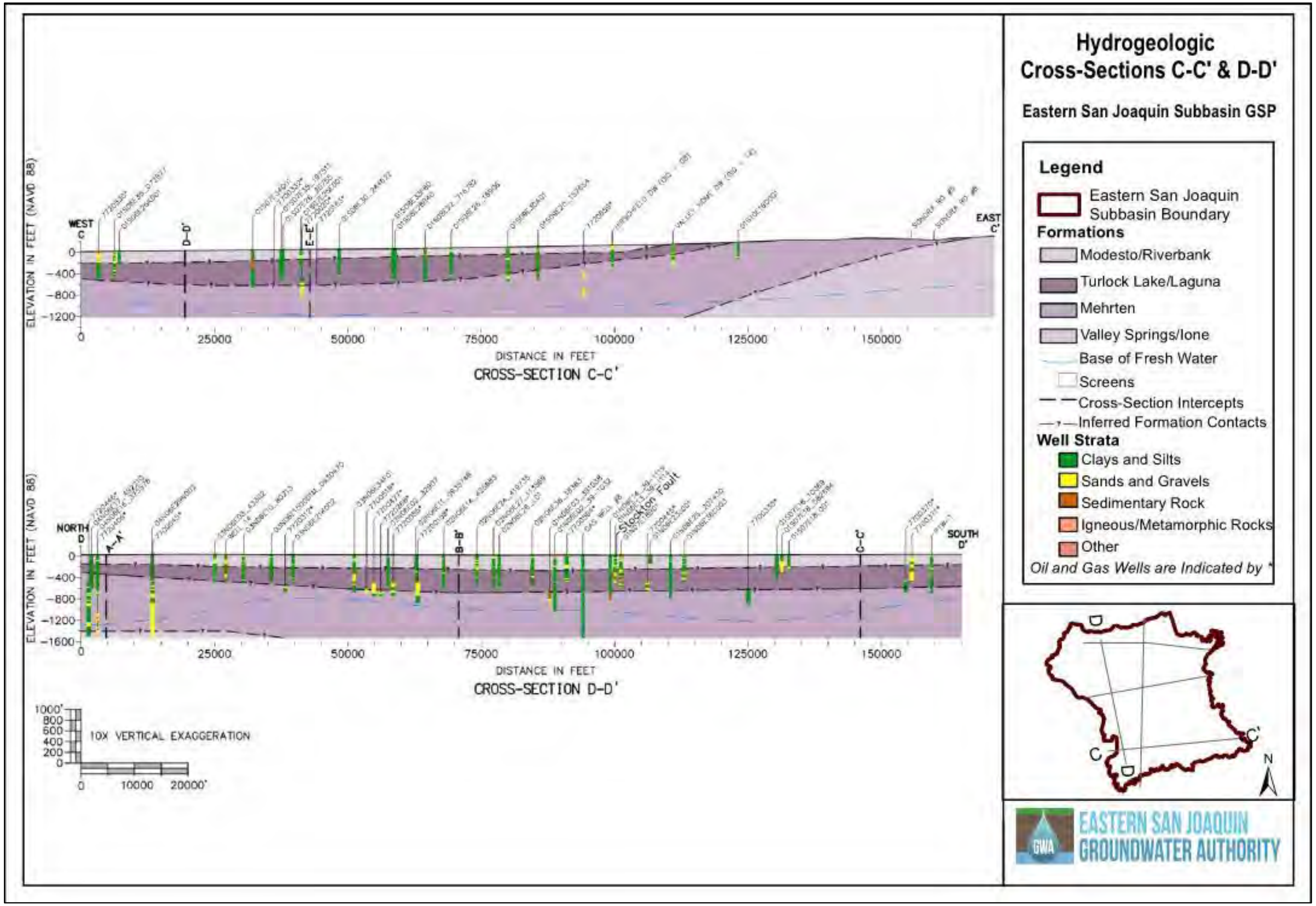
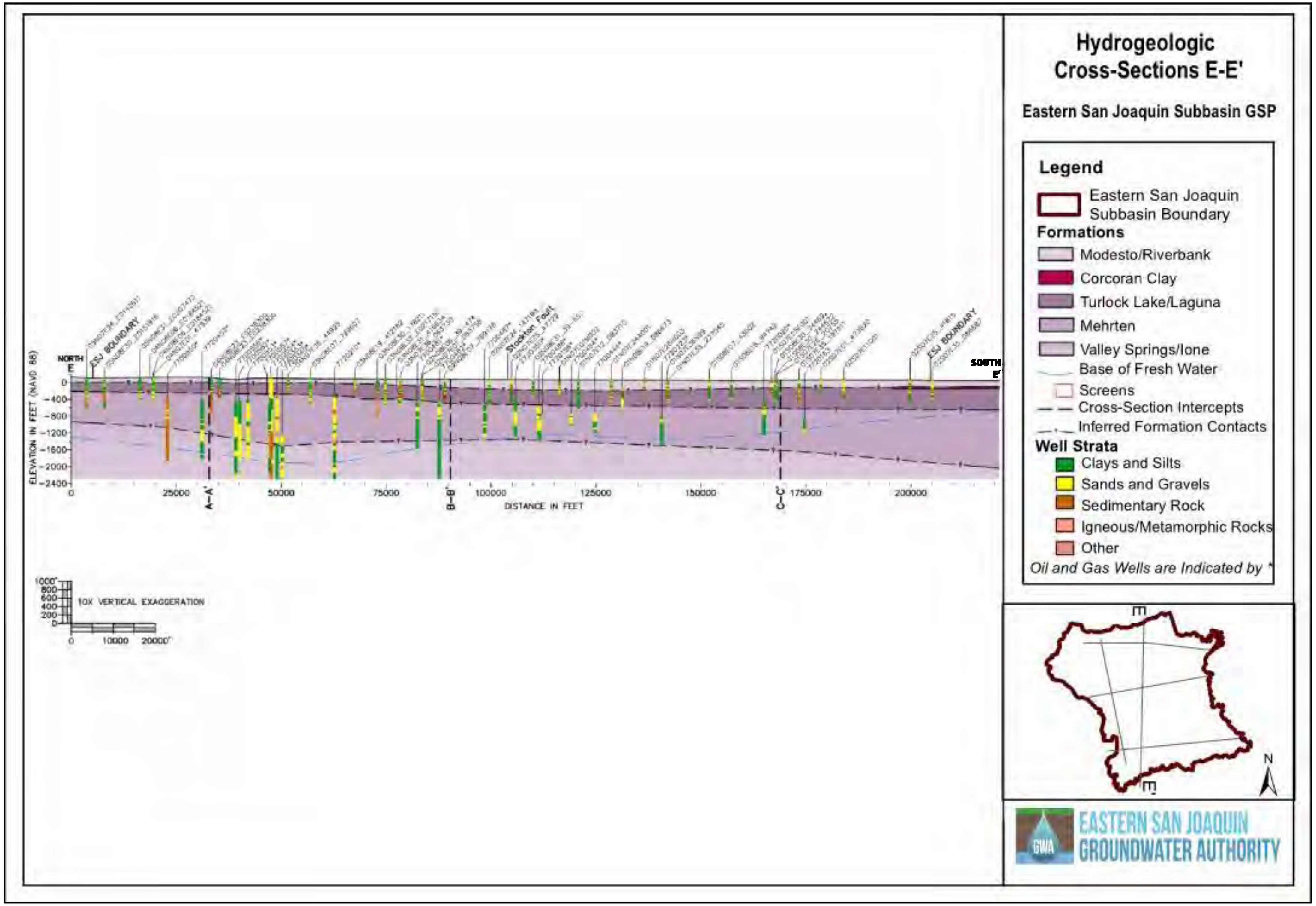


Figure 2-22: Hydrogeologic Cross- section E-**E'**



The analysis for this GSP used stratigraphic data from well completion reports of hundreds of water wells and oil and gas wells (indicated by an asterisk on the cross-sections) to develop the geologic cross-sections. Stratigraphy (i.e., clays and silts, sands and gravels, sedimentary rock, metamorphic and igneous rock, and others) is presented directly on the cross-sections along with the well screen interval (shown in red). The deeper oil and gas wells are shown extending to the bottom depth of the cross-sections, but many extend several hundred to thousands of feet beyond the depictions provided.

The analysis interpreted geologic formations from the borehole data after digitizing stratigraphic data from the various well log sources. This process relied heavily on the distinguishing features of each formation. Particularly, the black sands prevalent in the Mehrten Formation and evidence of shells noted in the descriptions that likely indicated a change to marine sediments of the Ione Formation were often mentioned in well logs. The analysis used superficial geology, location, and depth of the borehole to determine geologic formations. The analysis inferred formation contracts in places where this data was limited, including areas on the east and west limbs of the cross-sections, as well as vertically throughout.

As evident on the east-west geologic cross-section transects, the oldest formations are present on the east side of the Eastern San Joaquin Subbasin, shown overlapping the older sedimentary and/or basement rocks of the Sierra Nevada (A-A'), with progressively younger formations present to the west and vertically occupying shallower depth intervals. The east-west depictions also show the contacts of the formations steeply dipping in the east and nearly flat lying or at low gradients to the west. The northwest-southeast trending cross-section D-D' shows the formations in their relatively flat-lying positions, with oldest formations on the bottom and progressively younger formations above. This cross-section transect is essentially normal to the dip of the beds. In slight contrast to D-D', the transect of cross-section E-E' is somewhat oblique to the dip of the beds, thus there is an apparent down-dip toward the south. This effect is seen because the transect is moving into younger materials from the south toward the north.

The base of fresh water, as represented in Figure 2-18, is superimposed on the cross-sections as supported by works from Page (1974) and Williamson (1989). The base of the fresh water represents the vertical extent of fresh non-saline groundwater within the Eastern San Joaquin Subbasin Principal Aquifer. As shown on cross-sections A-A' and B-B', the sands of the Mehrten Formation are thickest in the northeast portion of the basin and there is a corresponding deepening of the freshwater aquifer on the north side of the Stockton Fault. The depth of the base of fresh water is shallower south of the Stockton Fault in the southern portion of the Eastern San Joaquin Subbasin. Further discussion of the Principal Aquifer is provided in Section 2.1.9.

Well depths generally decrease in termination depth from north to south across the Subbasin and locally within proximity of the major surface water drainages. In general, coarser sands are found at shallower depths within the lower unit of the Laguna Formation and upper Mehrten Formation (C-C') in the area of the Stanislaus River Drainage. Similarly, shallow well completions evident on cross-section D-D' and the southern portion of E-E' are indicative of the sandier nature of the recent alluvial deposits, the Turlock Lake, and Laguna Formations near the San Joaquin River.

2.1.8 Basin Boundaries

2.1.8.1 Lateral Boundaries and Boundaries with Neighboring Subbasins

The Eastern San Joaquin Subbasin is within the larger San Joaquin Valley, which comprises the southernmost portion of the Great Valley Geomorphic Province of California. Groundwater subbasins bounding the Eastern San Joaquin Subbasin are shown in Figure 1-6 and include:

- Cosumnes Subbasin to the north of Dry Creek
- Modesto Subbasin to the south of Stanislaus River
- South American Subbasin to the northwest of Mokelumne River

- Solano Subbasin to the northwest of Mokelumne River
- East Contra Costa Subbasin to the west of San Joaquin River
- Tracy Subbasin to the west of the San Joaquin River

Foothill and bedrock highs are to the east within Calaveras and Amador Counties.

2.1.8.2 Definable Bottom of the Basin

The base of the fresh water defines the bottom of the basin, the maximum vertical extent of fresh non-saline groundwater within the Eastern San Joaquin Subbasin. While water-bearing materials exist below this depth, the saline nature of the groundwater, in addition to the depth itself, generally makes accessing deeper groundwater not economically viable.

Because of the extreme depths to the base of fresh water, efforts by the USGS have been used to define the "base of fresh water" through the interpretation of the California DOGGR well logs and deep oil well geophysical logs as depicted on maps and cross-sections above. Base of fresh water (encountered saline) has been observed as shallow as 650 feet below ground surface (bgs) in the eastern part of the basin to over 2,000 feet bgs in the northern part of the basin as depicted on the surface contour map and supported by work completed by Williamson (1989).

2.1.9 Principal Aquifer

The Eastern San Joaquin Subbasin HCM has one Principal Aquifer that provides water for domestic, irrigation, and municipal water supply and that is composed of three water production zones. The zones have favorable aquifer characteristics that deliver a reliable water resource because of their basin location and sand thickness.

The zones are:

- Shallow Zone that is comprised of the alluvial sands and gravels of the Modesto, Riverbank, and Upper Turlock Lake Formations
- Intermediate Zone that is comprised of the Lower Turlock Lake and Laguna Formations
- Deep Zone that consists of the consolidated sands and gravels of the Mehrten Formation

Details on the formations are provided in Section 2.1.5.

2.1.9.1 Zones within Principal Aquifer

As discussed in Section 2.1.1 Data Compilation, the GSP is based on the compilation of five hydrogeologic cross-sections (refer to Figure 2-22). From the review of over 330 well logs in the Eastern San Joaquin Subbasin and DWR Bulletin 118, the depth of municipal and irrigation wells ranges from 75 to over 800 feet bgs, with an average of 350 feet bgs. The GSP closely documents the following items specific to the number of well logs and depth of each boring:

- Groundwater saturation
- Thickness and type of saturated fine to coarse grained sand and gravel layers
- Depth discrete layers of the sands with horizontal and vertical connectivity across the basin
- Depth discrete clay or silt layers that locally confine groundwater
- Stratigraphy of the Deep Zone aquifer materials (e.g., sands and gravels) down to the base of fresh water and deeper, where available

Analysis identified significant permeable zones with high production rates and good water quality at relatively shallow depths (less than 700 feet bgs) due to the following conditions:

- The relatively shallow depths of production wells had high specific capacity that met the water supply demand and reduced the cost associated with drilling deeper
- The base of fresh groundwater is deep; ranging from depths of 700 to 1,900 feet bgs
- Deeper water is saline and not considered suitable for potable or agricultural use

Figure 2-23 and Figure 2-24 depict the number of wells, log information, horizontal and vertical distribution, and cross-sectional information used during this hydrogeologic characterization effort. Information compiled was used to detail the three permeable water-bearing zones described from surface downward in the following sections.

Figure 2-23: Bottom Elevation of Water-Bearing Zones (Shallow)

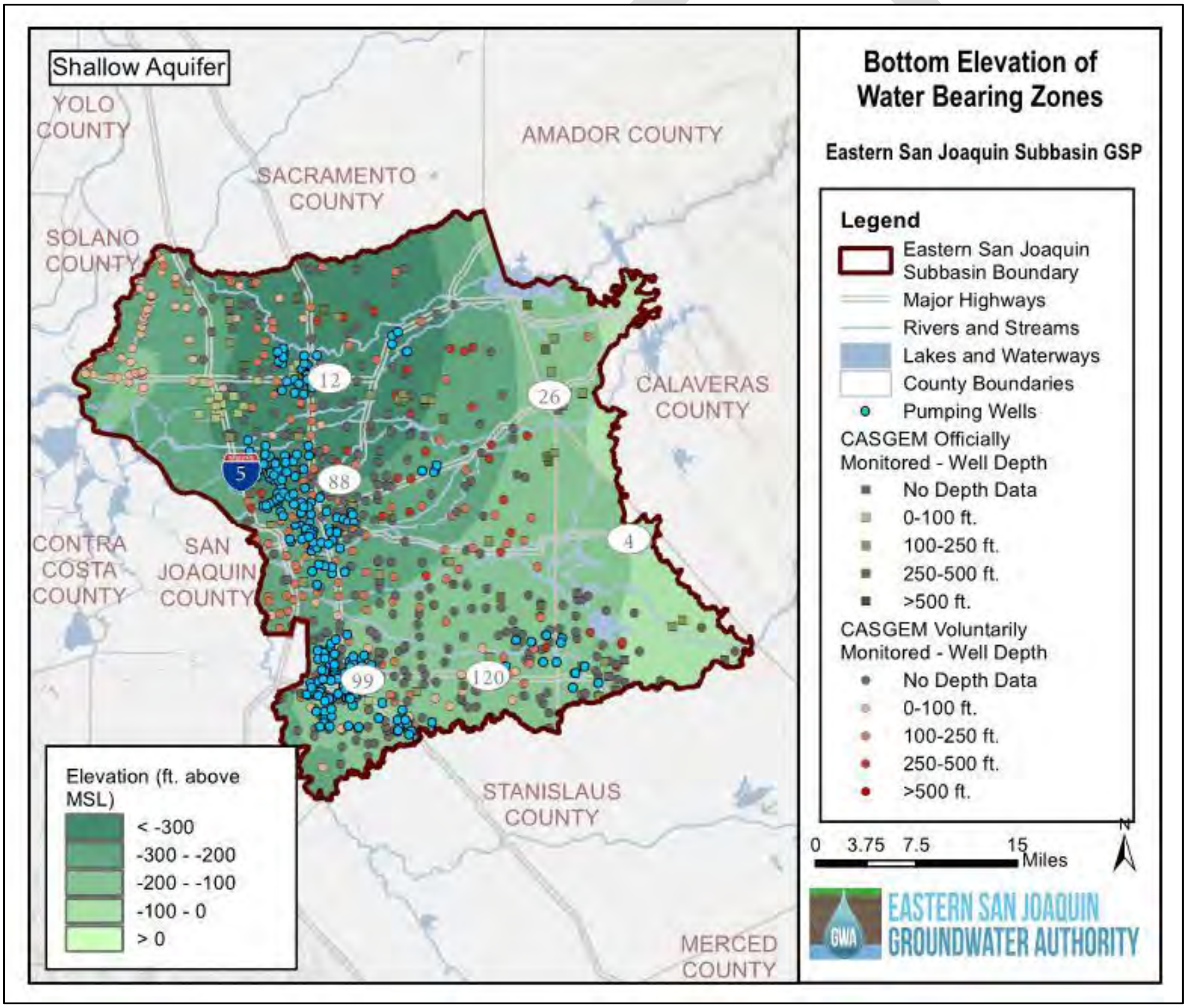
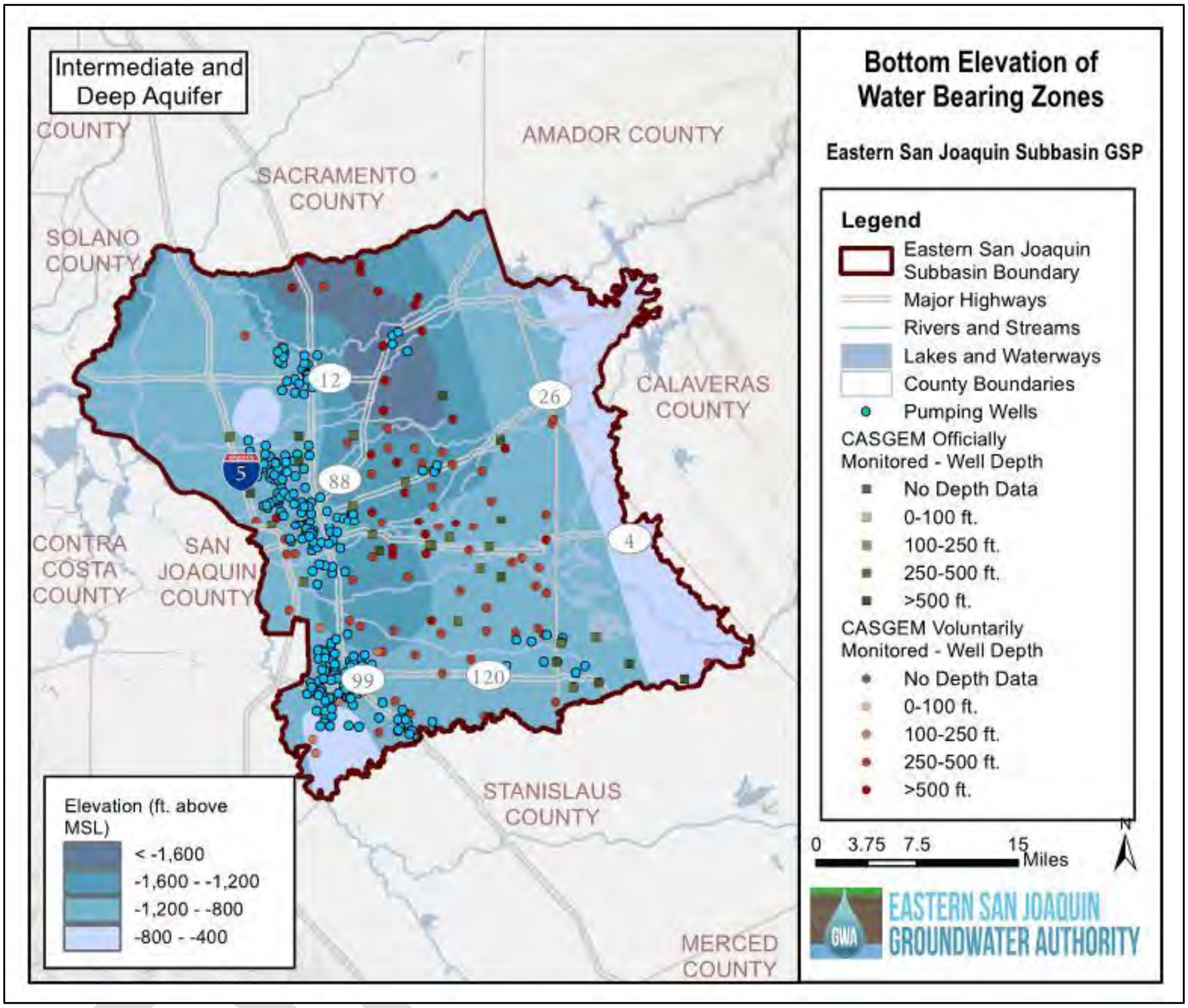


Figure 2-24: Bottom Elevation of Water-Bearing Zones (Deep and Intermediate)



2.1.9.1.1 Shallow Zone

The shallow water-bearing zone is composed of permeable sediments from recent alluvium, Modesto/Riverbank Formations, and the upper unit of the Turlock Lake Formation that are present west of the older geologic formations extend across the majority of the Eastern San Joaquin Subbasin. This zone is generally unconfined above the aquitards (clays/silts, including Corcoran clay, and old soil horizons/hardpan layers).

The depositional structure on the eastern side of the valley trough is depicted on the hydrogeologic cross-sections A-A' through E-E' (refer to Figure 2-20, Figure 2-21, and Figure 2-22). This structure results in the groundwater flow that follows both the dip of the beds and hydraulic head differentials. Erosional and depositional features dominate aquifer characteristics. The cross-sections also depict the aquifer thickness from 30 feet to greater than 300 feet.

The Shallow Zone characteristics are supported by the sand thickness information detailed below along with review of basin aquifer parameters. This zone has high yielding wells. Area groundwater numerical models support the CA DWR (1967) and Burow and others (2004) aquifer characteristic (characteristics described in Section 2.1.9.2.1) values range as follows:

- Transmissivities up to 90,000 gpd/ft
- Storage coefficients up to 17 percent
- Vertical permeability estimates up to 0.1 ft/day

2.1.9.1.2 Intermediate Zone

As depicted on the hydrogeologic cross-sections A-A' through E-E' (refer to Figure 2-20, Figure 2-21, and Figure 2-22), sands, typically from 10 to over 60 feet thick, are found below the low permeable clay layers or aquitards. The sands and gravels are developed with one relatively continuous sand unit at 350 feet bgs, within the top of the lower unit of the Turlock Lake Formation and Laguna Formation, thinning out at topographic highs to the east. Eastern basin depositional structure shows a pinching, wedging, and combination water-bearing zones with the surficial alluvium.

The aquifer characteristics are supported by the sand thickness information detailed herein for the Principal Aquifer. The eastern distribution of this water-bearing zone near surface suggests unconfined groundwater conditions. Typically, this zone is found semi-confined with high yielding wells and is considered the current primary production zone. Area groundwater numerical models support the CA DWR (1967) and Burow and others (2004) aquifer characteristic values range as follows:

- Transmissivities up to 59,500 gpd/ft
- Storage coefficients typically 0.00001 (unitless)
- Vertical permeability estimates up to of 0.07 ft/day

2.1.9.1.3 Deep Zone

The water-bearing "black sands" of the semi-consolidated Mehrten Formation are considered a significant source of water for Eastern San Joaquin Subbasin production wells. The formation is thick in the west with a limited number of deep wells that penetrate the entire depth of this unit as depicted on the hydrogeologic cross-sections A-A' through E-E' (refer to Figure 2-20, Figure 2-21, and Figure 2-22). This water-bearing zone is confined due to the thick overlying clay units, consolidation, and basin location. Semi-confined conditions are more likely to the east because of the dipping of beds and stratigraphic layer thinning and erosion of clay/silt beds. The dipping beds of the Mehrten Formation dip are at a steeper slope of 90 to 180 feet per mile westward. Consolidated sediments of the Mehrten and Valley Springs Formations are at valley bottom depth and exposed on the eastern foothills. Recharge to these aquifer formations occurs because of the high topographic setting with increased rainfall and exposure of weathered surface and runoff from the adjacent fractured Sierran bedrock.

As depicted on the hydrogeologic cross-sections A-A' through E-E' (refer to Figure 2-20, Figure 2-21, and Figure 2-22), boring logs indicate a significant 30-foot thick gravel encountered at a depth from 140 to 170 feet. Thickly bedded sands were found to exceed 250 feet. At the eastern margins of the basin, consolidated portions of the Mehrten, Valley Spring, and Ione Formations are important for low-yielding bedrock wells and are considered aquifer recharge sources for the Eastern San Joaquin Subbasin. The relatively low permeable and consolidated nature of the Valley Springs and Ione Formations act as the bottom of the Deep Zone (Burow et al., 2004).

The aquifer characteristics are supported by the sand thickness information. The well yields are high in this zone, over 1,000 gallons per minute (gpm). Area groundwater numerical models support the CA DWR (1967) and Burow and others (2004) aquifer characteristic values range as follows:

- Transmissivities up to 250,000 gpd/ft
- Storage coefficients that are typically 0.0001

- Vertical permeability estimates up to of 0.05 ft/day

2.1.9.1.4 Limited Aquitards

The Corcoran Clay member of the Turlock Lake Formation and other interbedded clay/silts are aquitards that inhibit groundwater flow. The Corcoran Clay (found at the base of the upper unit of the Turlock Formation) is present at a depth of about 200 feet bgs. Corcoran Clay has a limited distribution in the extreme southwestern extent of the Subbasin, southwest of the City of Manteca. The clay is typically 20 to over 100 feet thick and is locally eroded and interfingered with coarser materials at its margin, as depicted on Figure 2-22. Groundwater below the Corcoran Clay is confined. The Corcoran Clay is found more significantly in the greater San Joaquin Basin south of the Stanislaus River where it is a significant vertical barrier to flow.

Thick clay and silt layers are found within the Laguna and Mehrten Formations. These two formations each have two documented upward coarsening alluvial sequences (Burow et al., 2004). Significant clay and paleosols divide the water-bearing zones at the base of each sequence. The cross-sections (Figure 2-20, Figure 2-21, and Figure 2-22) show both the clay and silt horizons range in thickness from less than 10 feet to over 150 feet. The vertical permeability estimates range from 0.01 to 0.007 feet per day (Burow et al., 2004).

Discontinuous clay horizons have been eroded significantly by the movement of the ancestral rivers. As depicted on the cross-sections, thickest sequences of uppermost permeable units and overbank fines below these layers has been observed. The general thickness and depth are supported by a southeast to northwest movement of river channels to the existing channel location.

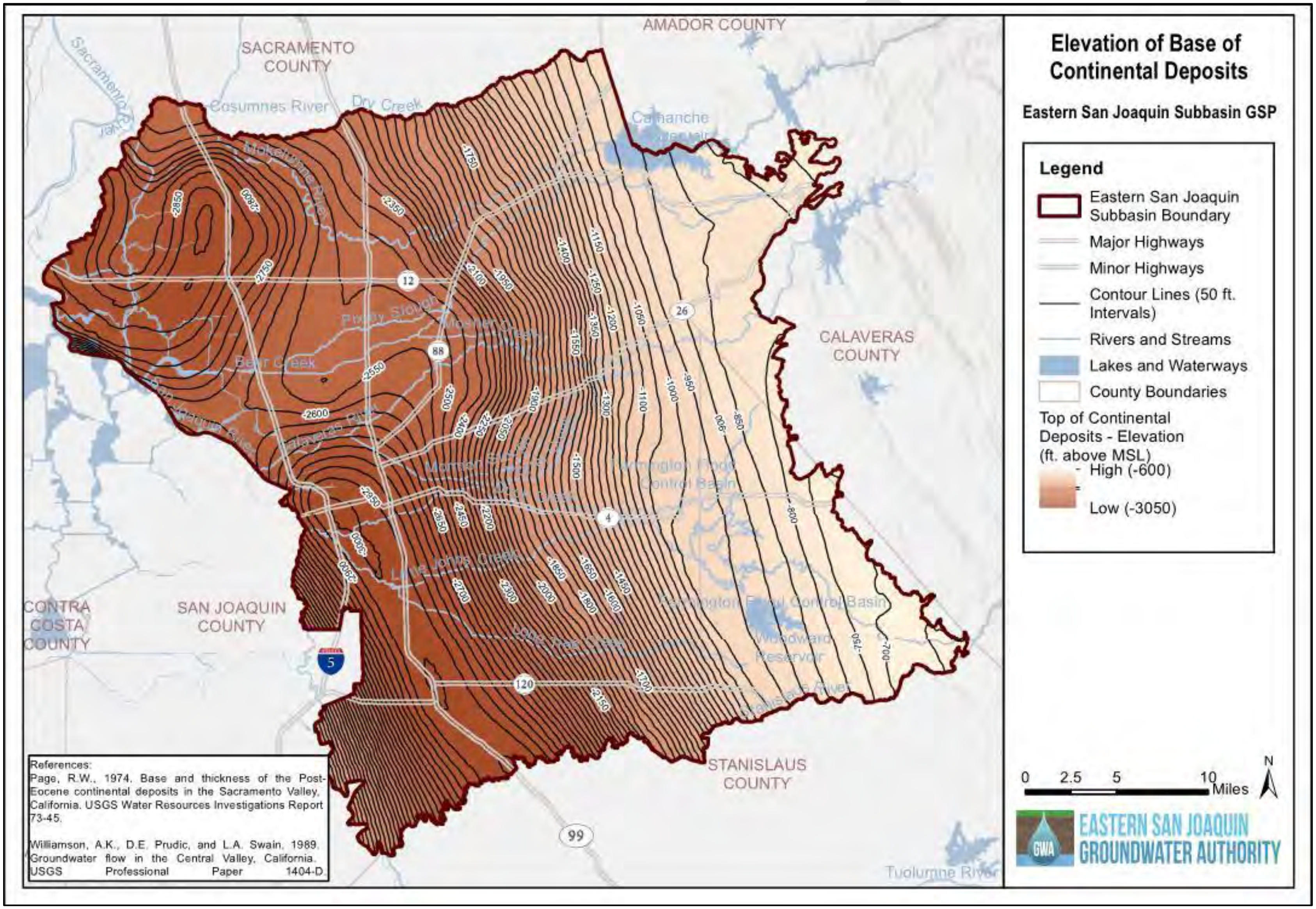
Hydraulic connection for the entire depth of the Principal Aquifer is supported by cross-section depictions that indicate the laterally extensive interbeds of high and low permeable layered deposits. The historical erosional and depositional history supports the referenced hydraulic interconnection. This observation is consistent with the possible thinning and wedging out of the regional clay units due to reworking or ancestral erosion (Davis et al., 1959).

In addition to the natural connectivity, the number of water wells drilled through these zones also indicates additional hydraulic connection because of the construction of long well gravel packs that connect the water-bearing zones.

2.1.9.1.5 Deep Saline Groundwater

Connate or saline water occurs from the base of fresh water (shown in Figure 2-18 or Figure 2-24) to the base of continental deposits (shown in Figure 2-25), forming a saline layer that ranges in thickness from 50 to 2,250 feet from the east to the west across the Subbasin. The deep saline layer is not currently a water production zone for consumption or land application. Information used in developing the thickness of the saline water above continental deposits is from Page's 1974 *Base and Thickness of the Post Eocene Continental Deposits in the Sacramento Valley* and the thickness of the aquifer developed by Williamson and others (1989).

Figure 2-25: Elevation of Base of Continental Deposits



2.1.9.2 Aquifer Characteristics and Groundwater Quality

Because of the horizontal and vertical distribution of sediments and hydraulic connection between the water-bearing zones, one Principal Aquifer is defined.

An important step in aquifer characterization includes the completion of sand and gravel thickness (isopach) maps. An isopach map illustrates thickness variations within a tabular layer or stratum. Isopachs are contour lines of equal thickness over an area. The combined isopach map for the Principal Aquifer is depicted on Figure 2-26. The isopach map details are as follows:

- Over 313 water supply well logs with depths to 1,000 feet were used, with an average depth of 540 feet bgs
- Average sand and gravel thickness is 140 feet
- The thickest sand and gravel sequences ranged from 500 to 700 feet in the foothills located near Dry Creek, south of Camanche Reservoir and Northeast of Oakdale
- Thicknesses from 200 to 400 feet were observed west of Morada along Bear Creek and toward the Delta
- The 200 to 500 feet thickness contours were observed near Stockton along the Duck Creek historic drainage
- Recognition of the sand and gravel thickness and the relative hydraulic conductivity of these permeable units, a more comprehensive understanding of the aquifer transmissivity can be made detail in Section 2.1.9.2.1

As discussed in Section 2.1.4.3, soils facilitate rainfall infiltration which is a significant recharge source for the Shallow Zone. Other recharge takes place through infiltration and percolation of surface water bodies and via groundwater flow from upgradient areas to the zones within the entire Principal Aquifer and, potentially, from flow between subbasins from the north, south, and west. The Intermediate and Deep Zones are recharged via infiltration near sand and gravel layers that are typically thicker near historical river beds. Vertical movement of water through sand deposits is more rapid compared to the confining clay deposits. In the high topographic areas along the east margin of the Subbasin, water-bearing zone sediments are exposed at the surface and considered significant to recharge.

2.1.9.2.1 Aquifer Parameters and Production Zone Well Capacities

The GSP uses several sources to summarize the field-tested aquifer characteristics and production zone well capacity information for the Principal Aquifer.

For depiction purposes, Table 2-3 includes four investigation areas comprised of the entire basin: Calaveras County, Farmington, Manteca, and near the Stanislaus Triangle Area (Riverbank). For these examples, the maximum well yields range from greater than 100 to 2,800 gpm. The range in specific capacity is 27 to 90 gpm/ft of drawdown. These numbers relate to the testing of individual well capacities and the anticipated pumping water level related to the pumping rate. Transmissivity and storage values relate to the aquifer character anticipated at a distance away from a pumping well. Specific yield (SY) is defined as a unit volume of water released from an aquifer per unit decline in water table. Specific storage (SS) of a saturated aquifer is defined as the amount of water released from storage per unit decline in hydraulic head (Freeze and Cherry, 1979).

Figure 2-26: Sand and Gravel Isopach Map

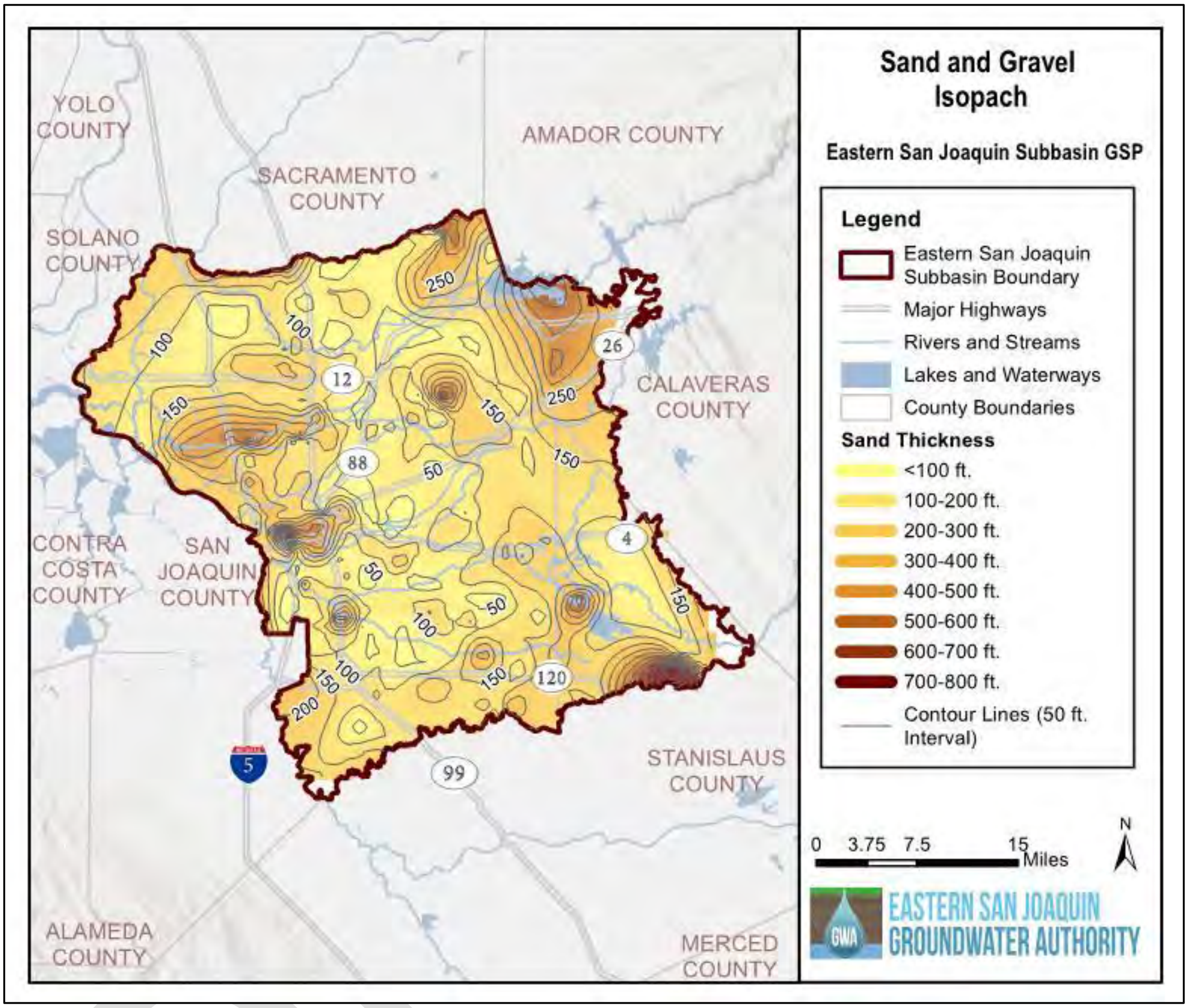


Table 2-3: Combined Aquifer Field Production Zone Capacities

Sources/Well Information	Maximum Well Yield (gpm)	Maximum Well Specific Capacity (gpm/ft drawdown)	Maximum Transmissivity (gpd/ft)	Maximum Specific Yield Unconfined % Specific Storage Confined Unitless	Sand and Gravel Thickness/ Encountered Mehrten Depth, feet
Entire Eastern San Joaquin Subbasin (CA DWR, 2006)	1,500	n/a	n/a	7.3	>150 400-600
Calaveras County (WRIME, 2003)	>100	>10	>35,000	>6	>120 At Surface
Farmington (DE, 2012)	800	27	19,600	>5 0.001	>110 230
Manteca (NV5, 2017)	2,500	90	61,000	>10 0.0001	>130 350
Stanislaus Triangle (Bookman-Edmonston, 2005)	>2,800	>40 (DE, 2007)	35,000	17 0.001	>150 Dip to the West

Using the basic physical properties of groundwater flow, a confined aquifer transmissivity is defined by:

$$T = Kb$$

Where: T is transmissivity
K is the hydraulic conductivity (rate of flow under a unit hydraulic gradient through a unit cross-sectional area)
b is the aquifer thickness.

Using a typical clean sand hydraulic conductivity value of 500 gpd/ft^2 and a thickness of 120 feet, the aquifer transmissivity averages approximately 60,000 gpd/ft which is similar to the documented values reported above (Freeze and Cherry, 1979).

For additional comparison, the basin data for the four layers of the ESJWRM are provided in the ESJWRM Model Report (see Appendix 2-A)

The distribution of production wells and monitoring networks are provided on Figure 2-23 and Figure 2-24. Table 2-4 provides descriptors for the three water-bearing zones:

- Number of wells for each zone
- Well depths
- Wells used on the cross-sections
- Wells used for monitoring and future model calibration

Additional aquifer parameter confirmation is provided by the ESJWRM as follows (Woodard & Curran, 2018):

- Horizontal Hydraulic Conductivity – The horizontal hydraulic conductivity varies across the non-saline model layers ranging from 1.1 ft/day to 72.7 ft/day or 0.148 to 10 gal/day/ft^2; these values are considered to be low.

- Specific Storage and Yield – SS and SY are used to represent the available storage at nodes in confined and unconfined aquifers. SS values range from 4.18 x 10^{-6} to 2.05 x 10^{-4}. SY values range from 4 to 10 percent.

Table 2-4: Wells within Water-Bearing Zones

CASGEM Wells				
Water-Bearing Zone	Well Type	Number of Wells	Average Construction Depth (ft. bgs)	Average Construction Bottom Elevation (ft. MSL)
Shallow	CASGEM	124	174	-64
	Voluntary	328	155	-100
Intermediate and Deep	CASGEM	79	538	-397
	Voluntary	122	540	-424

Pumping Wells			
Water-Bearing Zone	Number of Wells	Average Bottom of Screen Depth	Average Bottom of Screen Elevation
Shallow	148	270	-238
Intermediate and Deep	113	369	-300

Groundwater Wells Used in Cross-Sections			
Water-Bearing Zone	Number of Wells	Average Bottom of Borehole Depth	Average Bottom of Borehole Elevation
Shallow	39	234	-144
Intermediate and Deep	273	672	-566

2.1.9.2.2 Regional Historic Groundwater Flow and Surface Water Interaction

The horizontal groundwater flow direction for the Eastern San Joaquin Subbasin is typically from east to west. In general, the flow mirrors topography and is the same over time. The flow direction follows the overall east dipping gradient of the geologic formations. Higher groundwater elevations are in the foothills on the east side of the Subbasin, and the elevations decrease following the topography. In the western portion of the Subbasin, groundwater flows east toward areas with relatively lower groundwater elevation. Horizontal groundwater flow is further discussed in the Current and Historical Groundwater Conditions section (Section 2.2).

The GSP evaluates vertical groundwater gradients using the USGS nested wells in the Eastern San Joaquin Subbasin. Clark and others (2012) drilled and assessed several nested wells or multiple well sites in the Eastern San Joaquin Subbasin. These nested well sites include three to five monitoring wells per borehole, with screen intervals at depths of approximately 100 to 900 feet (Clark et al., 2012). Groundwater elevation in these monitoring wells, measured from 2006 to 2008, usually indicate the same trend. Groundwater elevation is typically lower in monitoring wells with deeper screen placement. The difference in groundwater elevations from the shallowest to deepest monitoring wells, within each borehole, is typically between 5 and 20 feet (Clark et al., 2012). Additional discussion regarding differences and distribution across the basin is provided in Current and Historical Groundwater Conditions section (Section 2.2).

2.1.9.2.3 General Groundwater Quality

2.1.9.2.3.1 Geologic Formation Water Quality

The USGS and other government agencies completed several major studies concerning water quality in the Central Valley of California, which encompass the Eastern San Joaquin Subbasin. Repeatedly mentioned in these studies is the natural geochemical effects on groundwater quality that is specific to geologic formations (Creely & Force, 2007; Faunt, 2009; CA DWR, 1967). This natural effect is of great interest for the GSP implementation because groundwater level fluctuations from overdraft and recharge may result in water quality changes that are specific to geologic formations.

Natural geochemical reactions can be highly variable, even from well to well, as reactions depend on a number of factors, including the amount of: 1) reactive surface area of the formation sediments; 2) available oxygen in the formation as affected by fluctuations in groundwater elevation, depth to groundwater, and oxygenated near-surface recharge; and 3) potentially inorganic-oxidizing bacteria. The natural geochemical effects on water quality results to mobilize the elemental makeup of sediments (i.e., metals and other ions).

For the Eastern San Joaquin Subbasin, igneous and metamorphic rocks of the Sierra Nevada Mountains underlie the upstream drainages. These rocks predominately contain oxygen, silicon, aluminum, iron, calcium, sodium, potassium, and magnesium (Creely & Force, 2007). Rivers draining areas of granitic rocks also have better water quality than metamorphic or volcanic rocks (CA DWR, 1967). For example, the Mokelumne River drains areas of granitic origin and has a lower salt content than the Calaveras River, which drains an area of primarily metamorphic rocks (CA DWR, 1967). Streams originating from either igneous or metamorphic rocks have relatively low amounts of dissolved solids, compared to marine sedimentary rocks that make up the Coast Ranges west of the Subbasin (Faunt, 2009). However, marine formations also underlie continental deposits in the Eastern San Joaquin Subbasin and have considerable amounts of chlorine, sulfur, bromine, and boron from connate water (Creely & Force, 2007). Connate water originates from fluids that are trapped in the pores of the sedimentary rocks as they are deposited and can contain many mineral components as ions in solution. Above these marine formations are continental deposits described in Section 2.1.5.

Groundwater quality of wells in Calaveras County is characterized by Metzger and others (2012) study, *Test Drilling and Data Collection in the Calaveras County Portion of the Eastern San Joaquin Groundwater Subbasin, California, December 2009 – June 2011*. These wells are in the Eastern San Joaquin Subbasin, in an area underlain by the Ione and Valley Springs Formations. This study assessed groundwater samples and identified three water types present: calcium-magnesium-bicarbonate, sodium-bicarbonate, and mixed cation-mixed anion water. The mixed cation-mixed anion group consisted mostly of sodium and chloride. These groundwater samples also showed high levels of arsenic, which were attributed to pH level variation or redox potential (Metzger et al., 2012). The Ione formation, for instance, is known to have high sulfate levels in groundwater related to the pH influence on pyrite-sulfide rich coal deposits.

Arsenic is of particular concern because it is naturally occurring in the Eastern San Joaquin Subbasin and hazardous to human health. Izbicki and other's (2008) study, *Source, Distribution, and Management of Arsenic in Water from Wells, Eastern San Joaquin Groundwater Subbasin, California*, assesses the concentration and sources of arsenic in various wells. Arsenic was detected mostly in SJC, and the largest concentrations were in the western portion of the subbasin (Izbicki et al., 2008). The surficial geology in this area consists of the Modesto and Riverbank Formations, which are underlain by the Turlock Lake and Laguna Formations (see Figure 2-16, Figure 2-20, Figure 2-21, and Figure 2-22). Sources of arsenic include weathering of minerals containing arsenic, desorption of arsenic under certain pH values, and release of arsenic in redox conditions (Izbicki et al., 2008).

Another element of great importance is nitrogen, as it is included in many compounds that are by-products of agriculture, which heavily dominates the landscape of the Eastern San Joaquin Subbasin. Nitrogen, most commonly occurring as Nitrate, is well understood as a result of fertilizer application and artificial influence on the natural environment. Naturally occurring nitrogen must also be discussed to have a complete understanding of the natural conditions in the Eastern San Joaquin Subbasin. Extensive work by Holloway and others (1998) showed the Mokelumne River watershed contained significant quantities of nitrogen from bedrock lithology. The upper part of the watershed, outside the Eastern San Joaquin Subbasin, is underlain by igneous and metamorphic rock, but the metasedimentary and metavolcanic rocks contained the highest levels of nitrogen (Holloway et al., 1998).

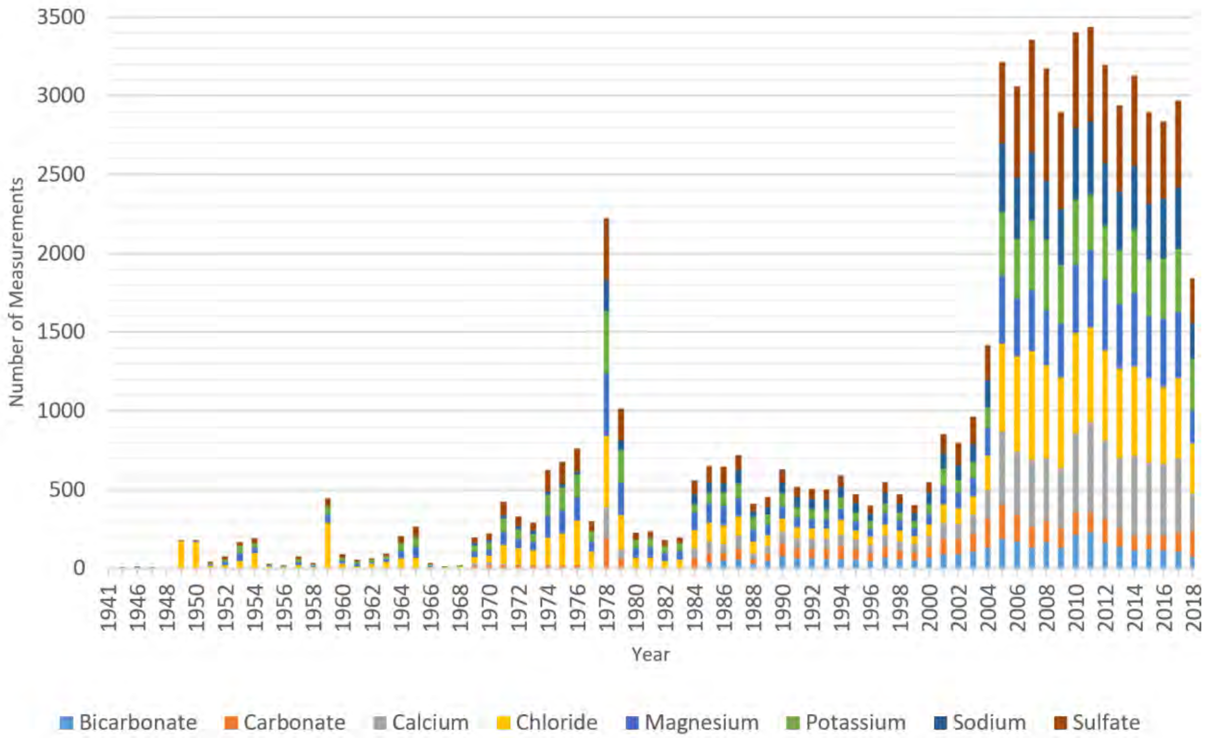
Per 23 CCR § 354.14, general water quality of principal aquifers shall be summarized. General water quality can be determined by assessing commonly measured inorganic parameters as indicators of change. Evaluating these inorganic parameters involves looking at historical trends and comparing results to certain thresholds, as well as determining water types. These parameters include major cations and anions, listed below:

Anions	Cations
Bicarbonate	Calcium
Carbonate	Magnesium
Chloride	Potassium
Sulfate	Sodium

2.1.9.2.3.2 Ion Composition

Evaluating the historical trends of these parameters is not straightforward. GAMA records include groundwater quality results going back to the 1940s in the Eastern San Joaquin Subbasin. However, a thorough analysis can only be performed as far back as a sufficient amount of groundwater quality data exists. This sufficient amount of data means a large number of measurements of all the major cations and anions mentioned above. From 2005 to 2017, a relatively large amount of the major cation and anion measurements occurred (see Figure 2-27). Data from 2018 are excluded because at the time of this writing the data were incomplete.

Figure 2-27: Total Number of Cation/Anion Measurements in the Eastern San Joaquin Subbasin



General water quality of the Subbasin can be determined by assessing water type over specific years within the time frame of 2005 to 2017. Evaluating the years 2005, 2011, and 2017 provides an even spread over the selected time frame and gives a better idea of possible water type trends. Trilinear diagrams for each of these years show relative concentrations of the major cations and anions (see Figure 2-28).

Due to the difference in sampling locations, the years 2005 and 2011 show carbonate and bicarbonate-rich waters, and 2017 displays increased chloride and sulfate concentrations in some wells. These dates correlate to both data size increases and heavier rainfall periods. Chloride concentrations in 2017 are generally less than 150 mg/L, with some higher measurements reaching 2,000 mg/L. Sulfate concentrations in 2017 are mostly under 300 mg/L, but a few extremely high levels up to 100,000 mg/L exist near City of Manteca.

The increased chloride concentrations apparent in 2017 may not be indicative of a long-term trend. Chloride concentrations are higher in more wells in 2017 when compared to 2005 and 2011, but there is little fluctuation in the range of values for each year (Figure 2-29). Sulfate concentrations are also increased in 2017 compared to 2005 and 2011. Similar to chloride, the range of sulfate results for each year between 2005 and 2017 does not show any obvious trends (Figure 2-30).

Higher chloride and sulfate concentrations during 2017 are apparent near the cities of Manteca and Stockton (Figure 2-31 and Figure 2-32). A further discussion and assessment of chloride measurements in the Eastern San Joaquin Subbasin is included in the Current and Historical Groundwater Conditions section (Section 0).

Figure 2-28: Trilinear Diagrams

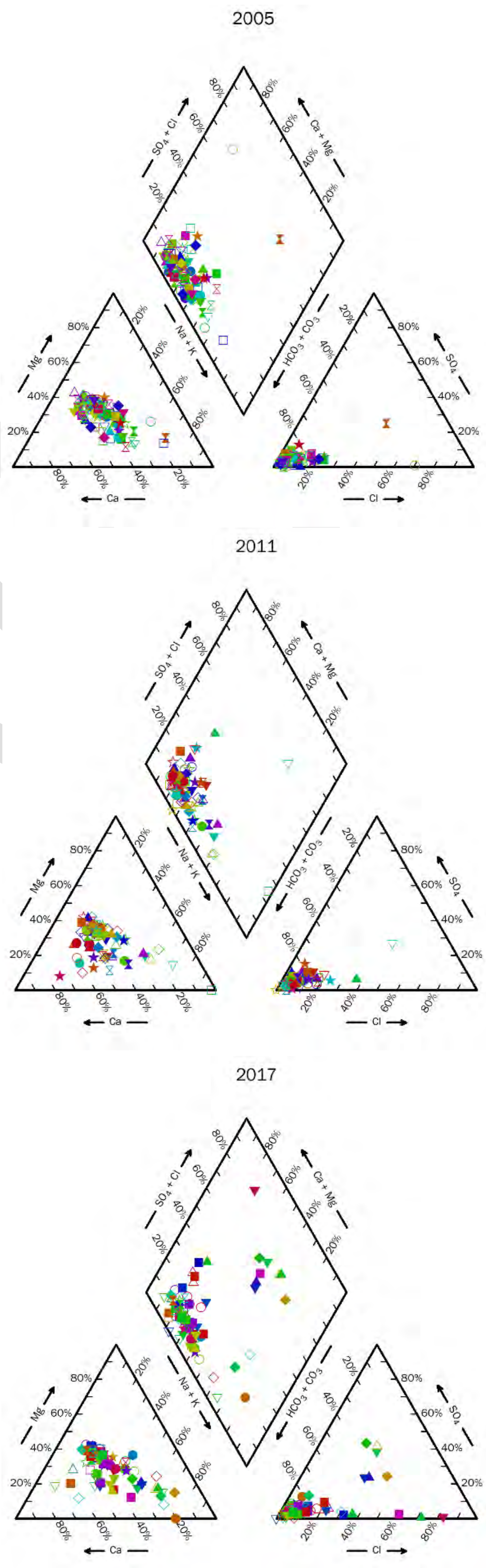


Figure 2-29: Chloride Annual Variation

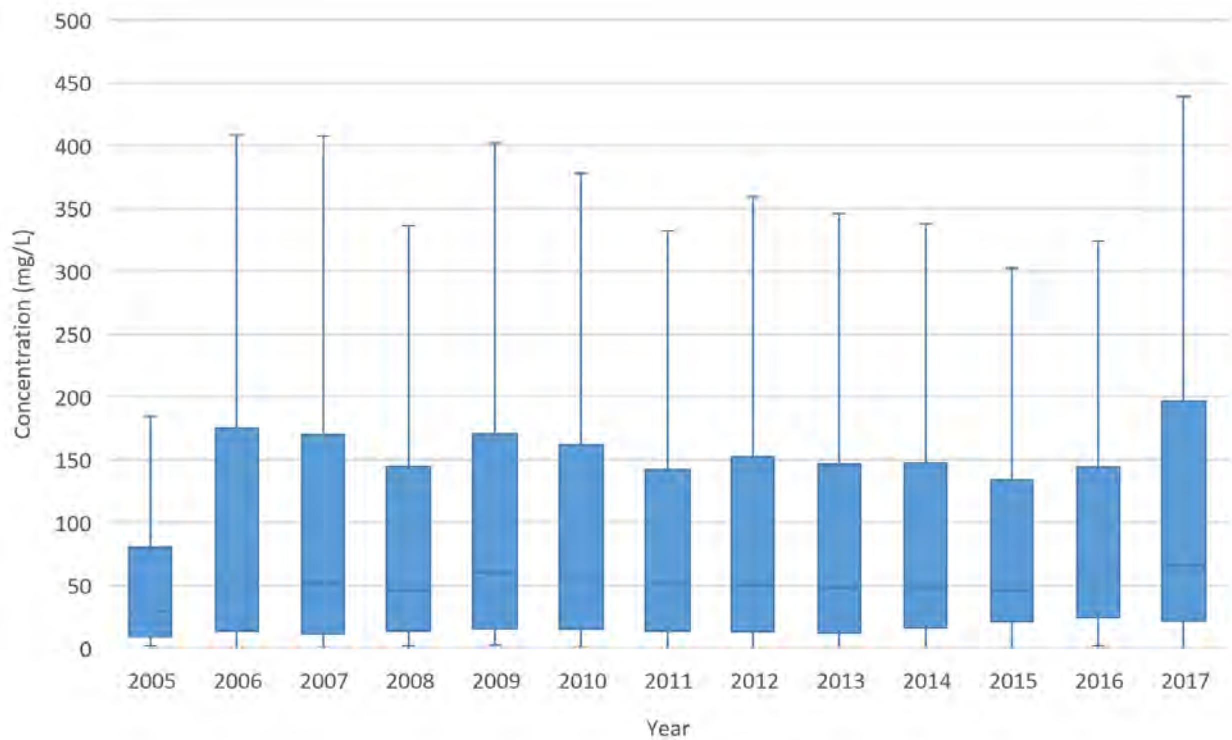


Figure 2-30: Sulfate Annual Variation

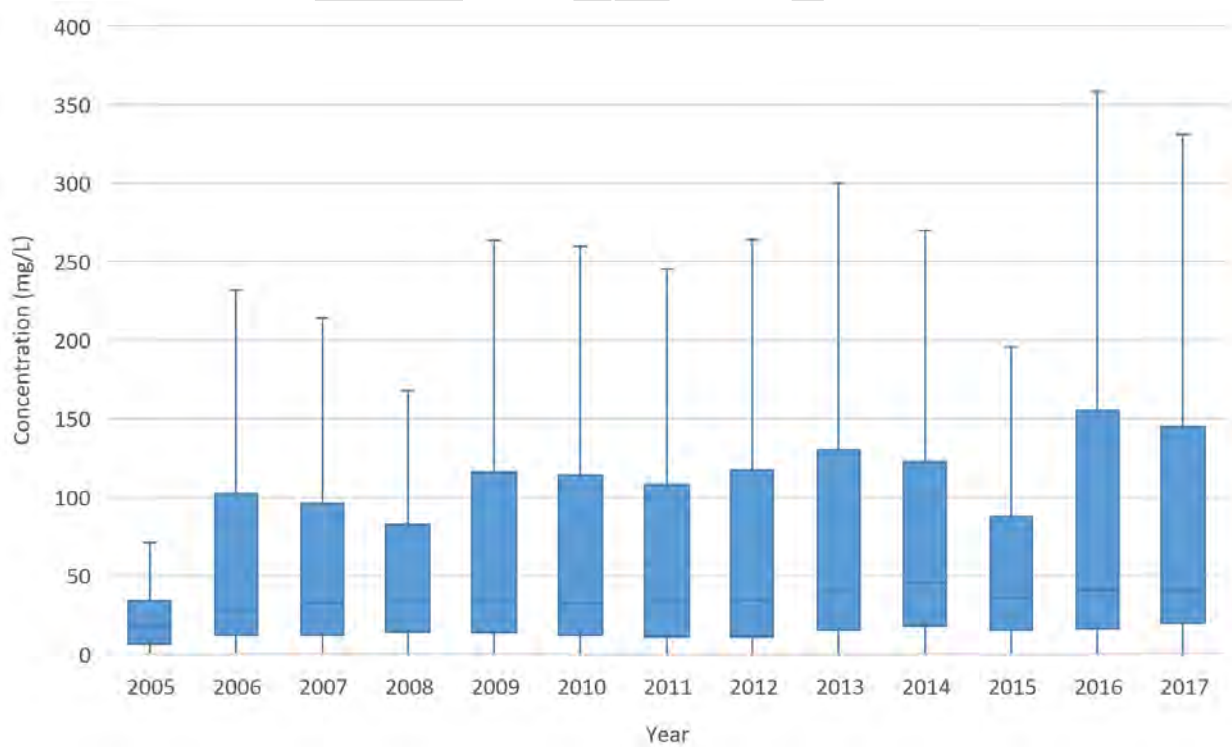


Figure 2-31: Chloride Concentrations in 2017

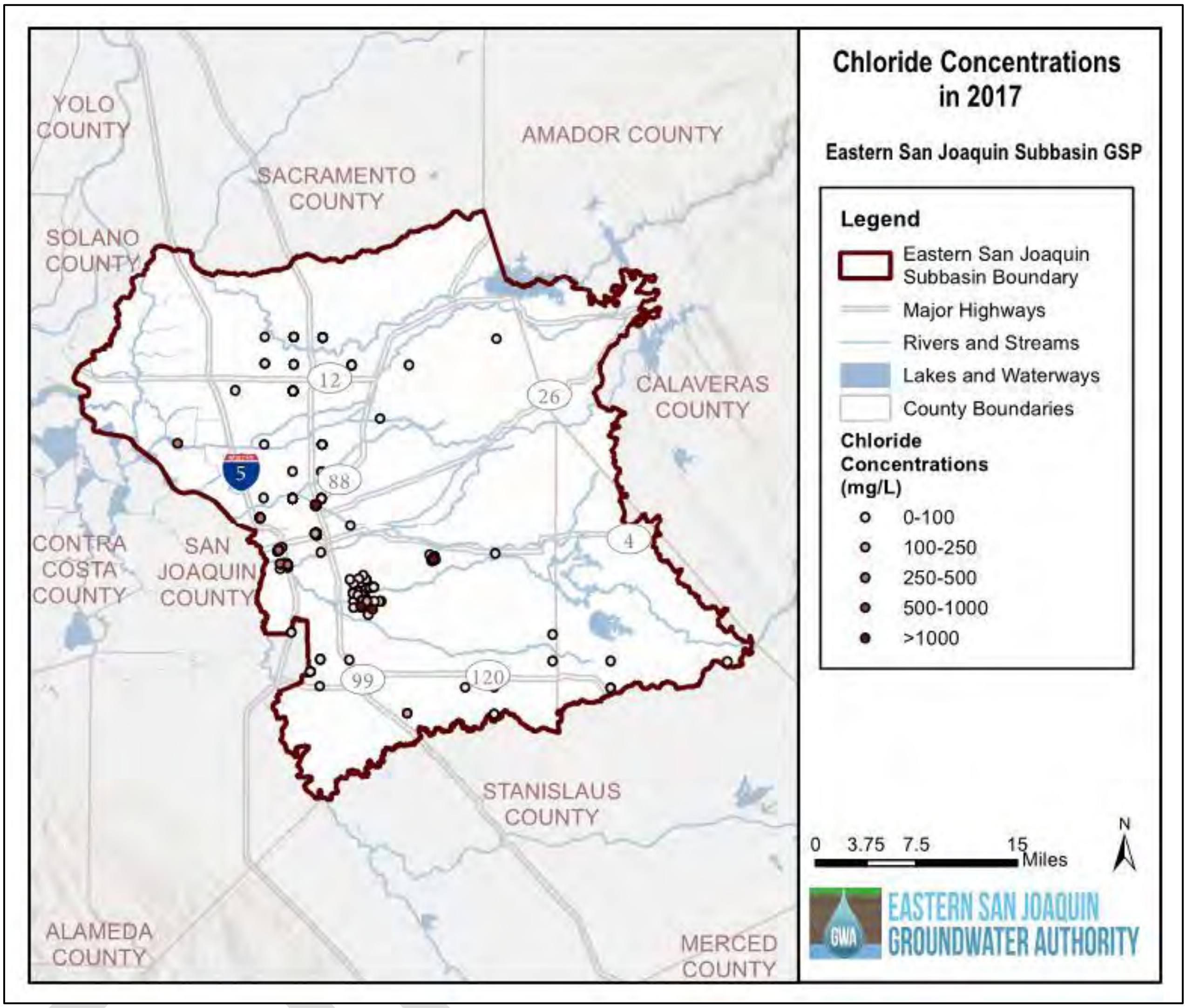
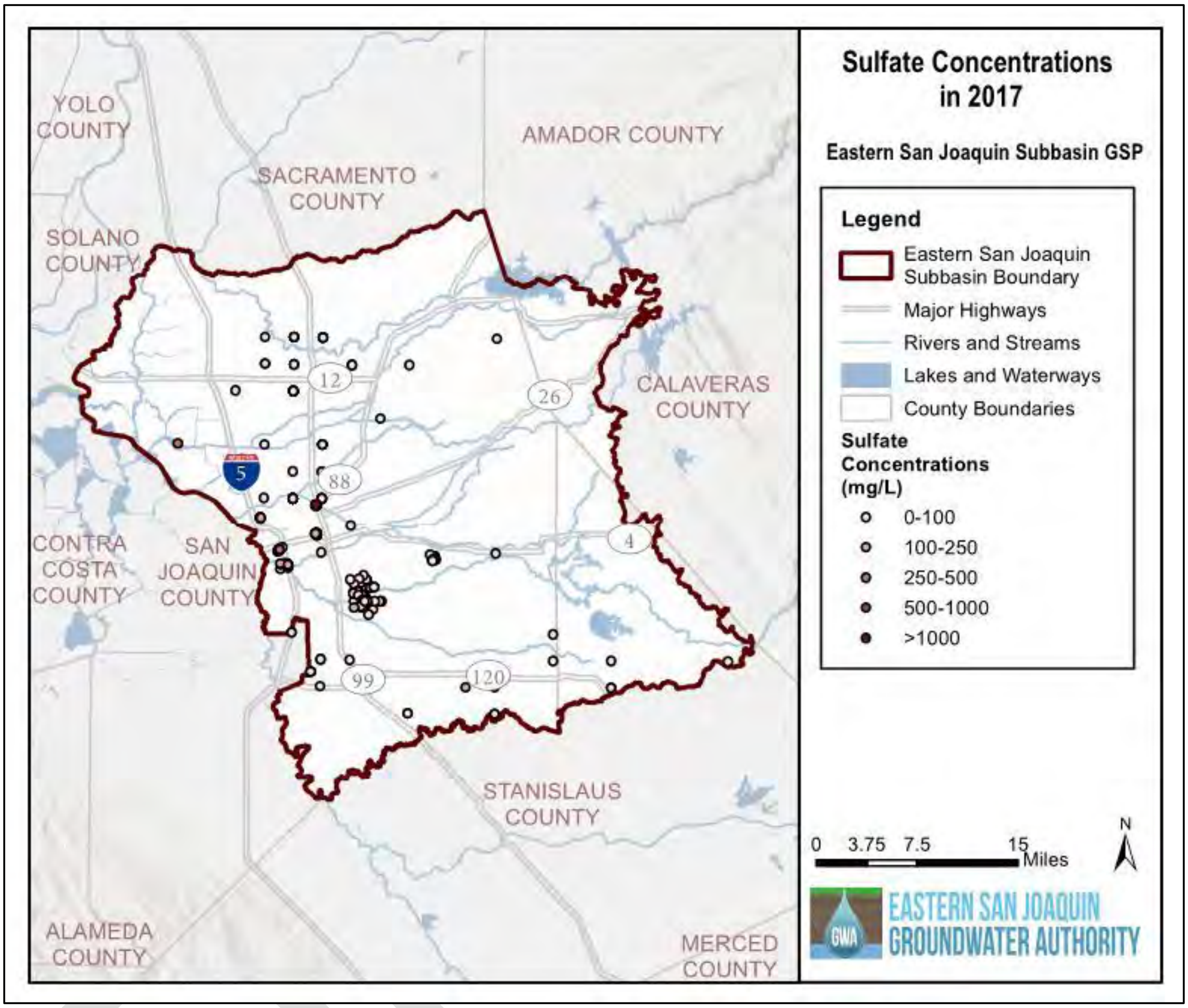


Figure 2-32: Sulfate Concentrations in 2017

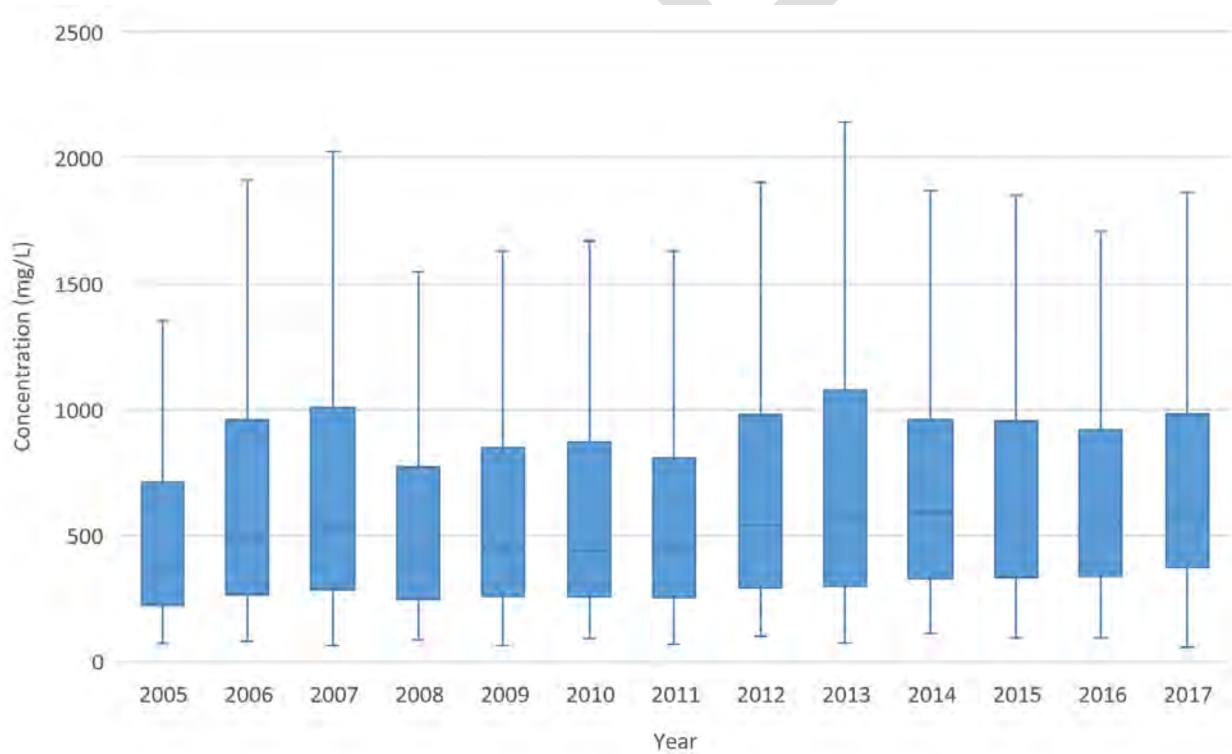


Bennet and others (2006) assessed GAMA groundwater quality data in the Northern San Joaquin Basin. Groundwater samples were compared to thresholds such as the U.S. Environmental Protection Agency (EPA) secondary maximum contaminant levels (SMCL). None of major cations and anions measured in the Eastern San Joaquin Subbasin resulted in exceedances of the SMCL (Bennet et al., 2006). These measurements took place in December 2004 to February 2005. Additional parameters were sampled in this study and are discussed further in the Current and Historical Groundwater Conditions section.

2.1.9.2.3.3 Total Dissolved Solids

A wide range of TDS values exist in the Eastern San Joaquin Subbasin. Based on data in the GAMA database from 2005 to 2017, TDS values generally varied from 100 to 2,000 milligrams per liter (mg/L) (Figure 2-33), with a median value of 520 mg/L. Over the 13-year period shown in Figure 2-33, the median value has steadily increased from approximately 400 mg/L in 2005 to approximately 600 mg/L in 2017. Sources of TDS in the Subbasin include San Joaquin Delta sediments, deep deposits, and irrigation return water, as discussed in Section 2.2.4.1. Additional details on TDS concentrations is provided in the Current and Historical Groundwater Conditions section (Section 2.2).

Figure 2-33: TDS Annual Variation



2.1.10 HCM Data Gaps

All hydrogeologic conceptual models contain a certain amount of uncertainty and can be improved with additional data and analysis. The Eastern San Joaquin Subbasin HCM data gaps are present in the understanding of the HCM presented in this GSP. These data gaps are listed below and will be updated with future monitoring, modeling, and data refinement efforts.

- Water quality of principal aquifers

  - Additional depth-specific water quality data will inform minimum thresholds for the degraded water quality sustainability indicator and help monitor and identify potential undesirable results.
  - Additional monitoring at various depths for different constituents will help inform the understanding of water quality. This can be achieved through installation of new monitoring wells or through determination of screened intervals of existing monitoring wells.

- Aquifer characteristics
  - Aquifer characteristics (such as hydraulic conductivity) have a significant impact on how projects and management action in one part of the basin may influence sustainability in other parts of the basin.
  - Aquifer characteristics should be confirmed through additional aquifer testing or additional monitoring wells.

HCM data gaps have been identified to improve the GSP and future monitoring tasks. Considerations are listed below based on the development of the HCM. The following data gap elements require additional information, and are discussed further in Section 4.3:

Groundwater Level Data

- Depth- or zone-specific water levels to assess vertical interconnection, including zones within the Principal Aquifer
- Additional shallow groundwater data near surface waters and natural communities commonly associated with groundwater (NCCAGs)
- Additional groundwater level data in the east and northwest areas of the Subbasin
- Additional groundwater level data near major rivers such as the Mokelumne River to improve quantification and understanding of subsurface flows

Groundwater Quality Data

- Groundwater quality database compilation improvements to improve the linkage between the GAMA and CASGEM databases
- Aquifer zone-specific groundwater quality data

Subsurface Conditions

- Stockton Fault extent and impact on the base of fresh water
- Improved characterization of near-surface soil conditions as they relate to recharge
- Further definition of aquifer characteristics (e.g., hydraulic conductivity, transmissivity, and storage parameters) within and near Subbasin boundary areas to the east, southeast, and northwest, including aquifer tests

2.2 CURRENT AND HISTORICAL GROUNDWATER CONDITIONS

This section describes the current and historical groundwater conditions in the Eastern San Joaquin Subbasin. As required by the GSP regulations, the groundwater conditions section includes:

- Definition of current groundwater conditions in the Subbasin
- Description of historical groundwater conditions in the Subbasin
- Description of the distribution, availability (storage), and quality of groundwater
- Identification of interactions between groundwater, surface water, groundwater dependent ecosystems, and subsidence

The groundwater conditions described in this section present the historical availability, quality, and distribution of groundwater which are the basis of this Plan's sustainable management criteria and monitoring network.

In the Eastern San Joaquin Subbasin, the two aspects of greatest focus historically have been groundwater elevation and, in some areas of the Subbasin, groundwater quality conditions. As discussed herein, a groundwater depression exists in the central portion of the Subbasin, while high groundwater levels characterize the west portion of the Subbasin. Additionally, there are elevated levels of salinity and nitrate in some areas, along with naturally occurring constituents commonly seen throughout Central Valley soil conditions. Detailed descriptions of these conditions are provided in the following sections as part of a discussion of the historical and current conditions for each of the six sustainability indicators:

- Groundwater Elevation (Section 2.2.1)
- Groundwater Storage (Section 2.2.2)
- Seawater Intrusion (Section 2.2.3)
- Groundwater Quality (Section 2.2.4)
- Land Subsidence (Section 2.2.5)
- Interconnected Surface Water (Section 2.2.6)

2.2.1 Groundwater Elevation

2.2.1.1 Historical Groundwater Elevations

Data sources for groundwater elevation are abundant in the Eastern San Joaquin Subbasin. As discussed in Section 2.1, the CASGEM and SJC databases constitute the groundwater level data used for this analysis. These sources provide a robust dataset of water levels going back to 1940.

To visually show long-term trends in groundwater elevations in the Eastern San Joaquin Subbasin, 10 wells with periods of record greater than 40 years and that are relatively evenly distributed across the Subbasin were selected from available data (see Figure 2-34). Long-term hydrographs prepared for these wells show that, throughout most of the Eastern San Joaquin Subbasin, groundwater elevations have declined over time.

Average groundwater level decline was quantified for 1996-2015. In Section 2.3 - Water Budgets, the Historical Water Budget uses 1996-2015 as a representative hydrologic period which includes an average annual precipitation of 14.7 inches, very close to the long-term average of 15.4 inches. The 1996-2015 period also includes the recent 2012-2015 drought, the wet years of 2010-2011, and periods of normal precipitation. Based on data from the

10 selected wells in Figure 2-34, the average groundwater level decline was -0.5 ft/year from 1996-2015. Hydrographs for wells numbered #2, #5, and #6 show the largest decrease in groundwater elevation. These wells are located to the east of the City of Stockton. Hydrograph #9, which corresponds to a well located on the north edge of the Subbasin, shows the least decrease in groundwater elevation from 1996-2015. Hydrograph #4 corresponds with a well located in the western side of the Subbasin and is the only well to show an increasing trend in groundwater elevations. The northeast corner of the Subbasin is an area without a nearby representative hydrograph and was identified as a data gap in the HCM Section.

Figure 2-34: Hydrographs of Selected Wells

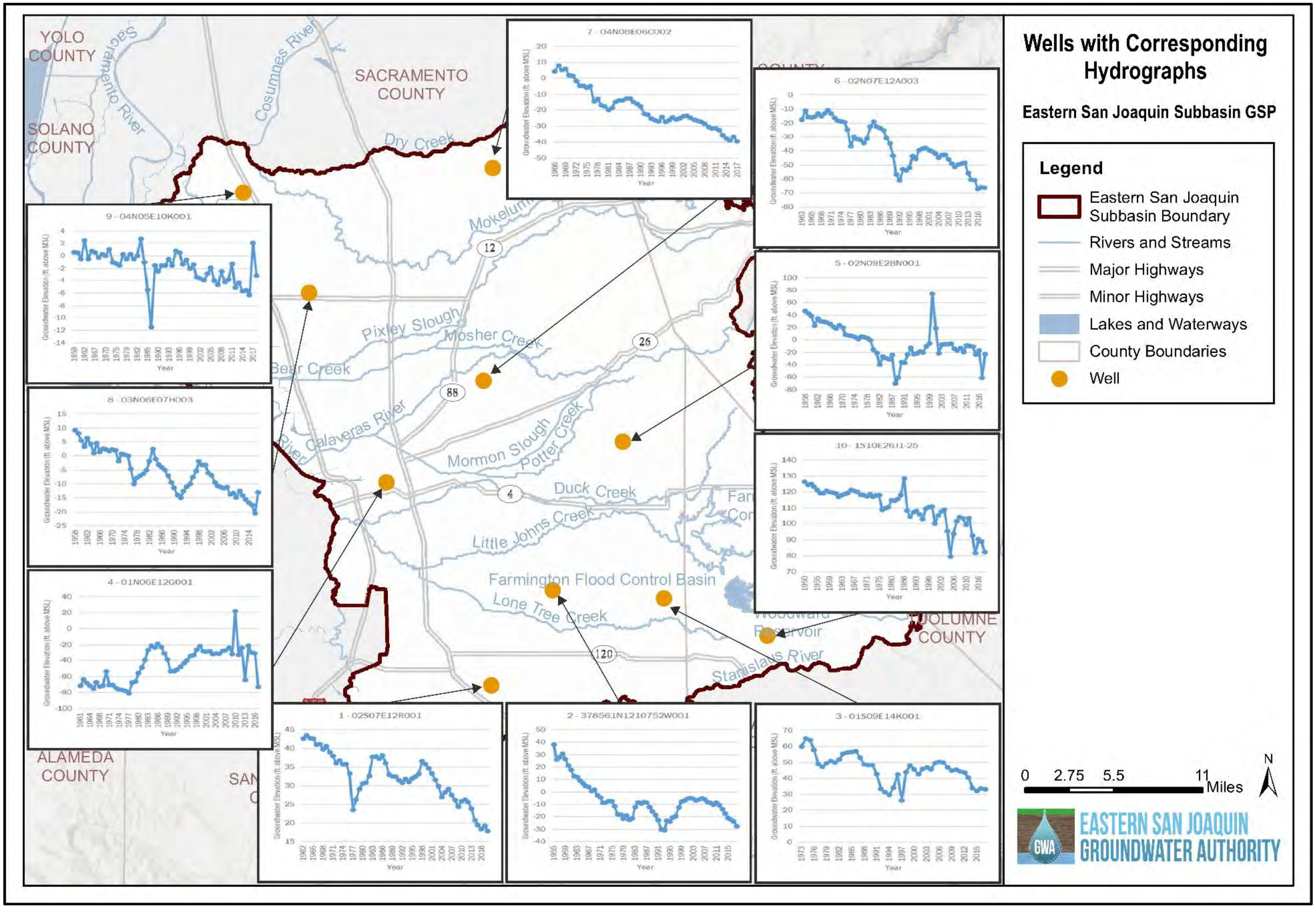
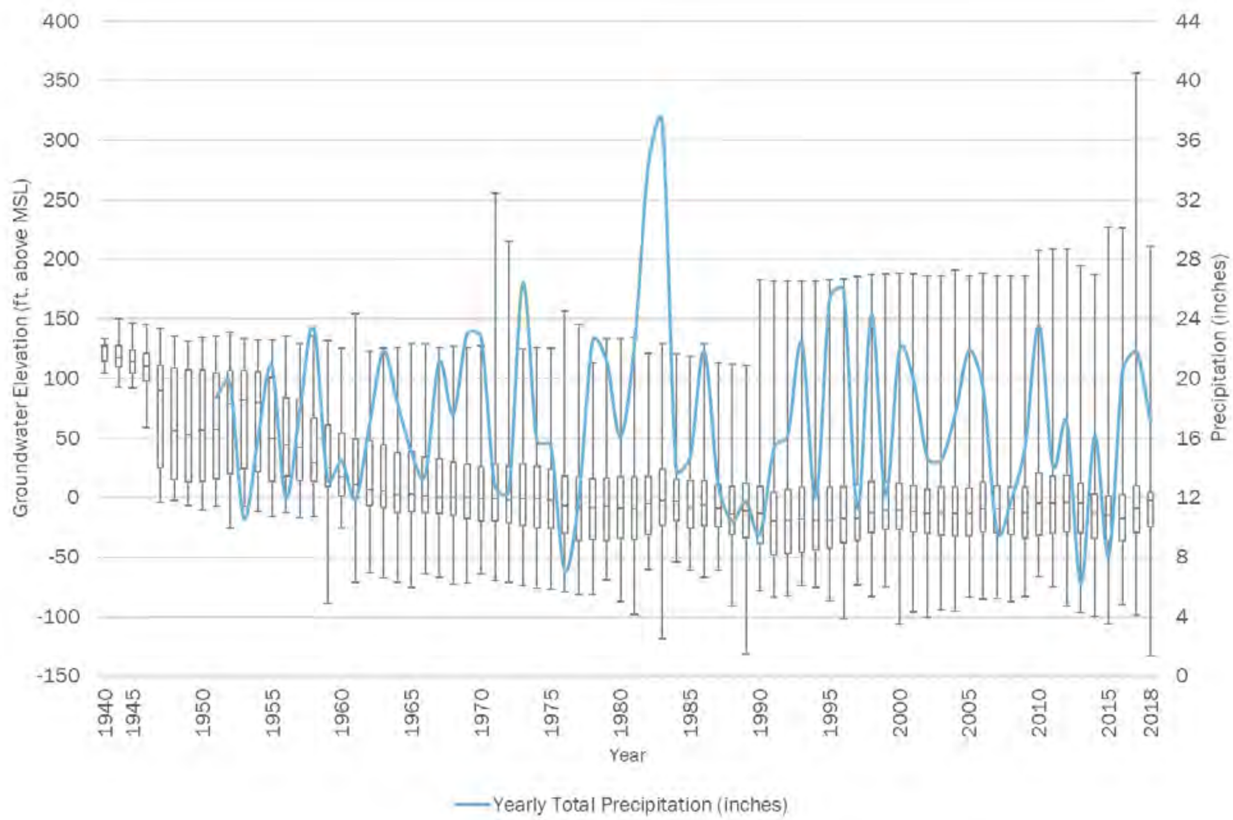


Figure 2-35 shows the distribution of the groundwater elevations from the CASGEM and SJC databases against average precipitation from several stations in the Subbasin, including one station located at Camp Pardee in Calaveras County, east of the Subbasin boundary. Figure 2-35 shows an overall decreasing trend in groundwater elevation levels with larger variability over time. The increasing variability comes partly due to a larger number of wells being sampled through time, but also reflects the growing difference between areas of groundwater depression and areas that show higher groundwater levels, such as the west portion of the Subbasin.

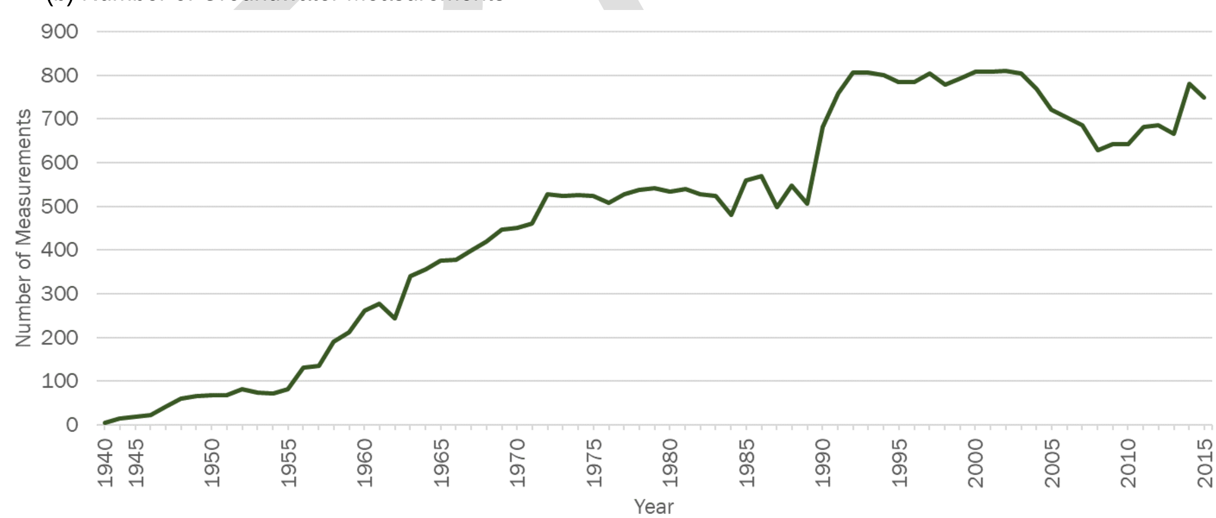
Periods of increases in groundwater elevation moderately correspond to the amount of precipitation in the Eastern San Joaquin Subbasin. A correlating trend can be seen with groundwater elevation increases in several hydrographs in the early 1980s and late 1990s, associated with periods of high precipitation.

Figure 2-35: Groundwater Elevation 1940-2018

(a) Box-and-Whisker Plot with Precipitation

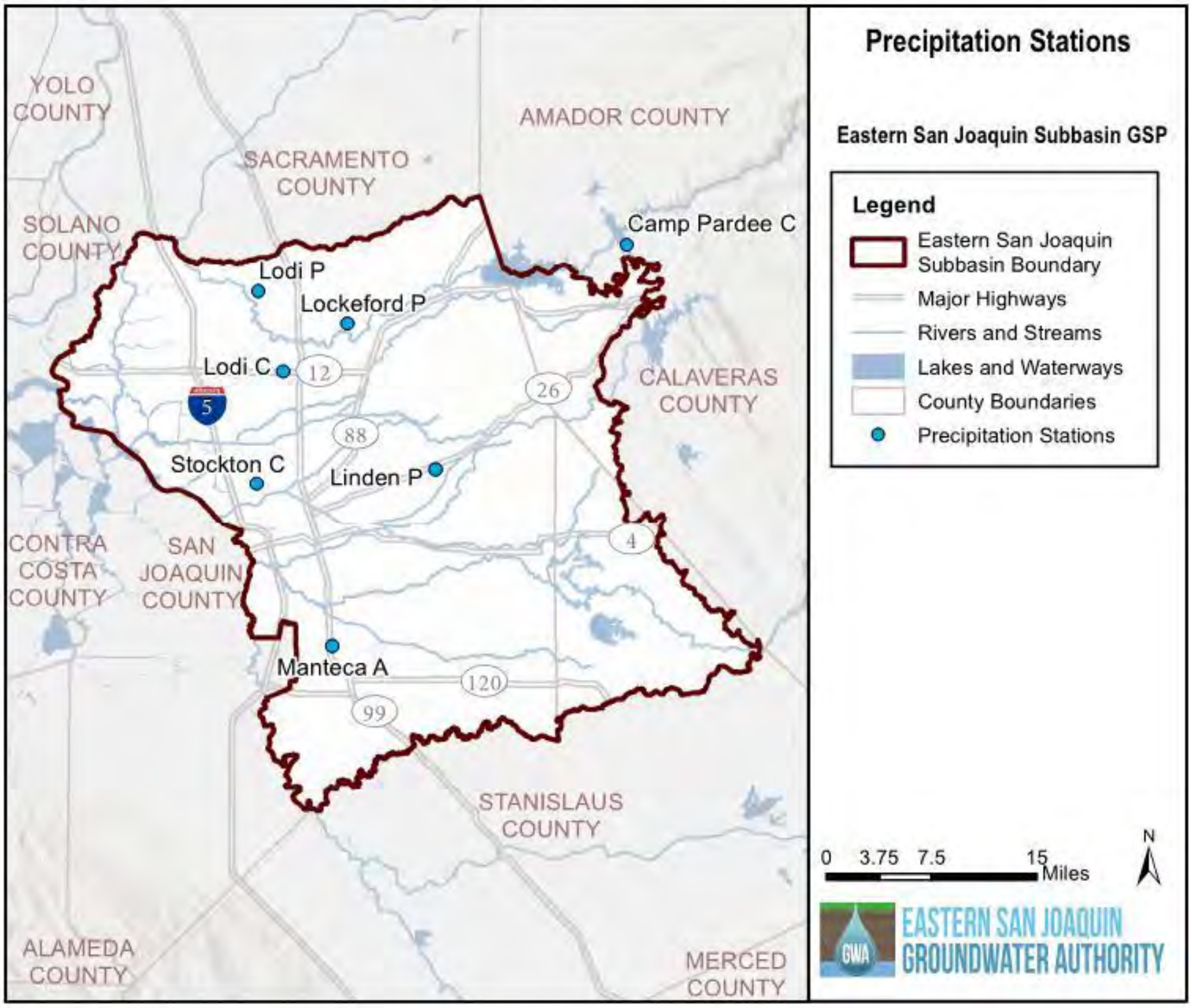


(b) Number of Groundwater Measurements



1. Each vertical bar in Figure 2-35 (a) represents the full range of groundwater level measurements recorded in a given year. The central gray box represents the middle 50% of measurements (ranging from the 25th percentile to the 75th percentile), with the horizontal line showing the median. The capped lines below and above the central box represent the minimum and maximum, respectively.
2. Precipitation monitoring depicted in Figure 2-35 (a) began in 1951.
3. The average annual precipitation line, presented in Figure 2-35 (b) is based on an average of data collected at 7 stations which are mapped in Figure 2-36.

Figure 2-36: Precipitation Stations



1. These stations are from California Irrigation Management Information System (CIMIS), National Oceanic and Atmospheric Administration (NOAA), or PestCast (University of California Statewide Integrated Pest Management Program [UC IPM] and Department of Pesticide Regulation [DPR]).

Additionally, extensive reports and research examining the groundwater conditions of the Central Valley are available from a variety of sources, including the USGS and DWR. These documents supplement the water level data provided by the CASGEM and SJC databases and were used to assess current and historical groundwater elevations.

USGS Water Supply Paper 780 – One of the earliest discussions of measured groundwater levels in the Eastern San Joaquin Subbasin is the USGS Water Supply Paper 780. The report details river stage of the Mokelumne River and the surrounding groundwater table from roughly 1900 to 1930. Groundwater levels in wells around the Mokelumne River varied, but mostly declined due to an increase in groundwater pumping. Even between years of minimal groundwater pumping, from 1927 to 1933, the water table decreased in elevation, most drastically in areas northeast and southeast of the City of Lodi (Piper et al., 1939).

DWR Bulletin 146 – DWR's Bulletin 146 (1967) discusses water levels and flow directions in the 1960s and earlier, which provides added historical context to current groundwater conditions. Figures 4 and 5 of Bulletin 146 show groundwater elevation in most of the Eastern San Joaquin Subbasin in Fall of 1950 and 1964, respectively. Both maps show groundwater levels at the lowest elevation underneath the City of Stockton, which is attributed to heavy groundwater pumping. This depression is attributed as causing groundwater from the Delta to flow toward the City of Stockton and is described as having relatively worse water quality. Barriers between the poorer quality water from the Delta, and higher quality water from the Sierra Nevada Mountains noted in previous studies around the City of Stockton are not apparent (DWR, 1967).

Williamson 1989 – Groundwater conditions provided in the groundwater model report by Williamson (1989) included horizontal and vertical flows. As depicted on Figure 14 of that report, a westerly groundwater flow direction that roughly parallels the ground surface in the Eastern San Joaquin Subbasin was confirmed. Estimates of groundwater elevations for before human development were provided. Vertical flow characteristics before considerable human development were characterized and mapped; artesian flow existed throughout the valley and in the western portion of the Eastern San Joaquin Subbasin. This is in contrast to current conditions, where artesian wells have not been currently observed in the Subbasin. At present, USGS nested monitoring wells confirm downward vertical flows (Williamson, 1989).

2.2.1.2 Current Groundwater Elevations

Current groundwater elevation conditions, for the purposes of this Plan, have been characterized as First Quarter 2017 (most recent seasonal high) and Fourth Quarter 2017 (most recent seasonal low) groundwater elevation measurements. At the time of this report, these records constitute the most complete dataset. Groundwater elevations are mapped using the CASGEM dataset (including voluntarily monitored wells) and the SJC dataset.

Figure 2-37 and Figure 2-38 show the groundwater elevations for these periods. A pumping depression at the center of the Subbasin, east of the City of Stockton, exists during both of these periods. Groundwater generally flows from the outer edges of the Subbasin towards the depression in the middle of the Subbasin. Along the eastern side of the Subbasin, the lateral gradient ranges from approximately 21 ft/mi during the seasonal high and 16 ft/mi during the seasonal low. Along the western side of the Subbasin, the lateral gradient ranges from approximately 7 ft/mi during the seasonal high and 6 ft/mi during the seasonal low.

Figure 2-37: First Quarter 2017 Groundwater Elevation

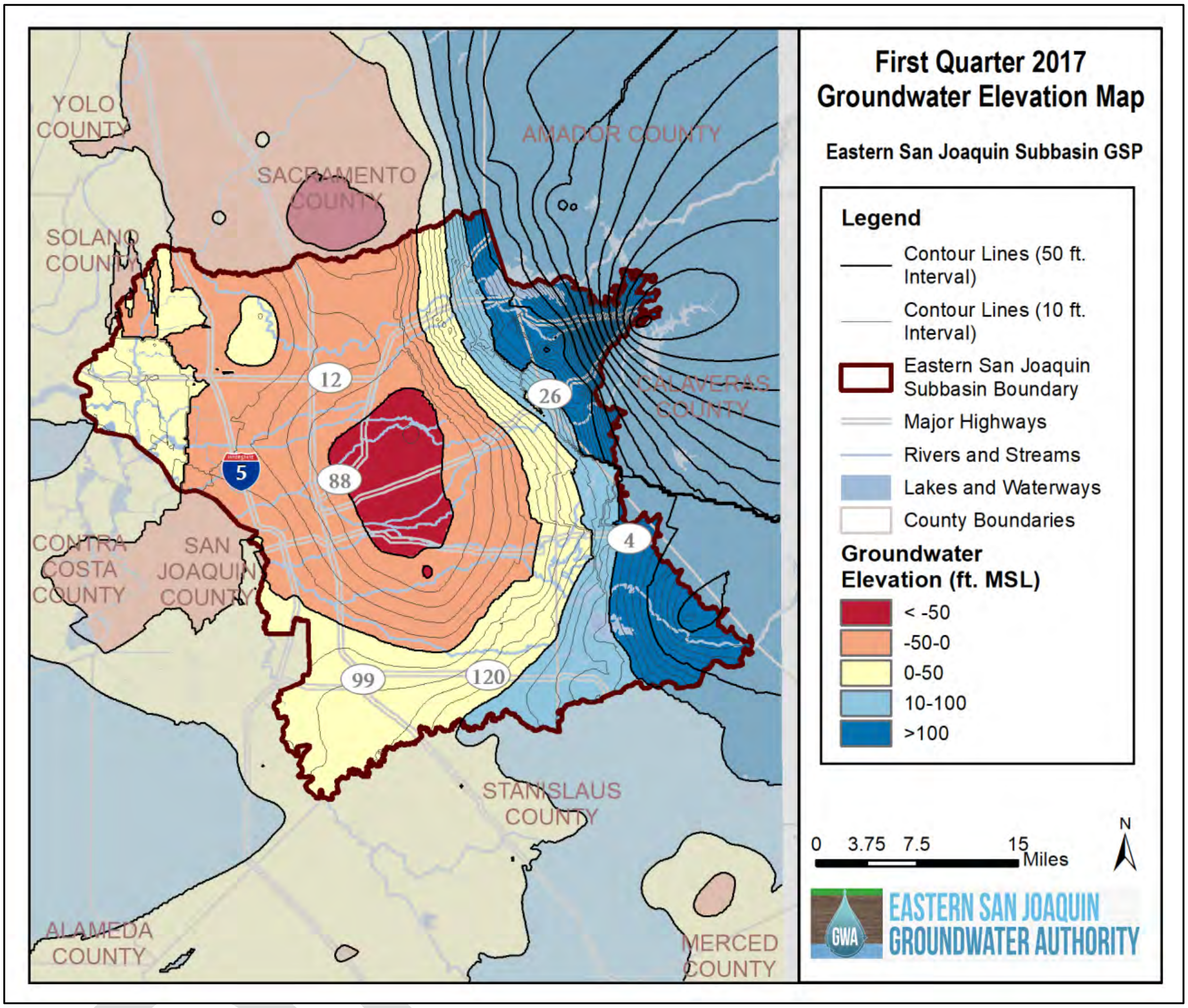
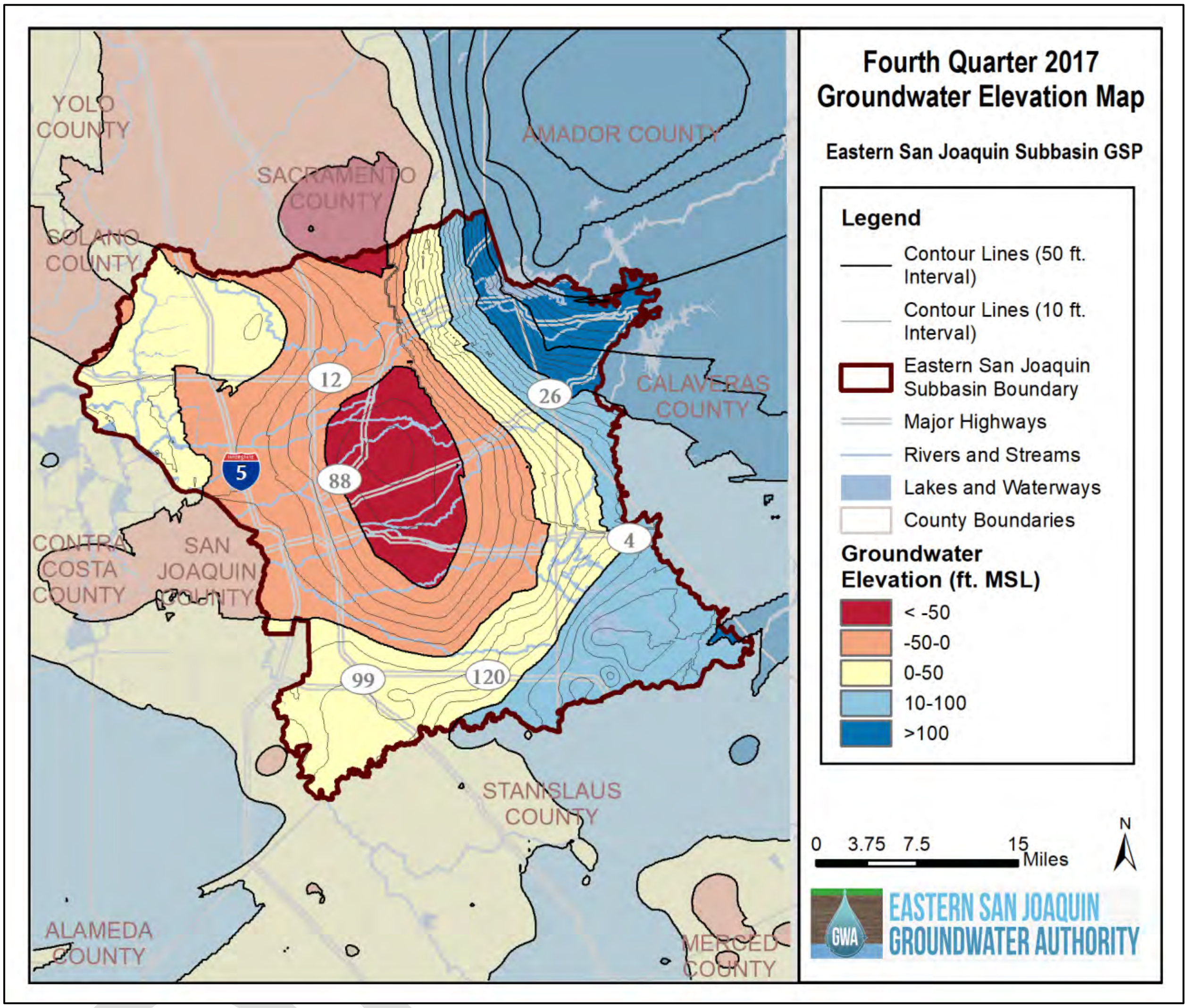


Figure 2-38: Fourth Quarter 2017 Groundwater Elevation



2.2.1.2.1 Vertical Gradients

A vertical gradient drives the movement of groundwater perpendicular to the ground surface and is typically measured by comparing the elevations of groundwater in clustered or nested wells, wells with multiple completions at different depths. If groundwater elevations in the shallower completions are higher than in the deeper completions, the gradient is identified as a downward gradient. A downward gradient is one where groundwater is moving downward through the subsurface. If groundwater elevations in the shallower completions are lower than in the deeper completions, the gradient is identified as an upward gradient. An upward gradient is one where groundwater is moving upward through the subsurface. If groundwater elevations are the same throughout the completions, there is no vertical gradient. Knowledge about vertical gradients is required by regulation and is useful for understanding how groundwater moves in the Subbasin.

Vertical flow characteristics before considerable human development are characterized and mapped by Williamson (1989), showing that artesian flow existed in the western portion of the Eastern San Joaquin Subbasin. This contrasts with current conditions, where artesian wells have not been currently observed in the Subbasin. At present, USGS nested monitoring wells confirm downward vertical flows (Williamson, 1989).

There are 16 multiple completion wells located in the Eastern San Joaquin Subbasin. The locations of the multiple completion wells are shown in Figure 2-39. The majority of these wells are located in the northwest portion of the Subbasin near cities of Stockton and Lodi. Hydrographs with groundwater elevations for each respective set of completion wells are shown in Figure 2-40 through Figure 2-49. 10 out of 16 sets of wells consistently show elevations in shallower completions that are higher than in the deeper completions which confirms the downward gradient. The remaining six sets of multiple completion wells are located in the City of Lodi and hydrographs are still being prepared.

Figure 2-39: Map of Multiple Completion Wells

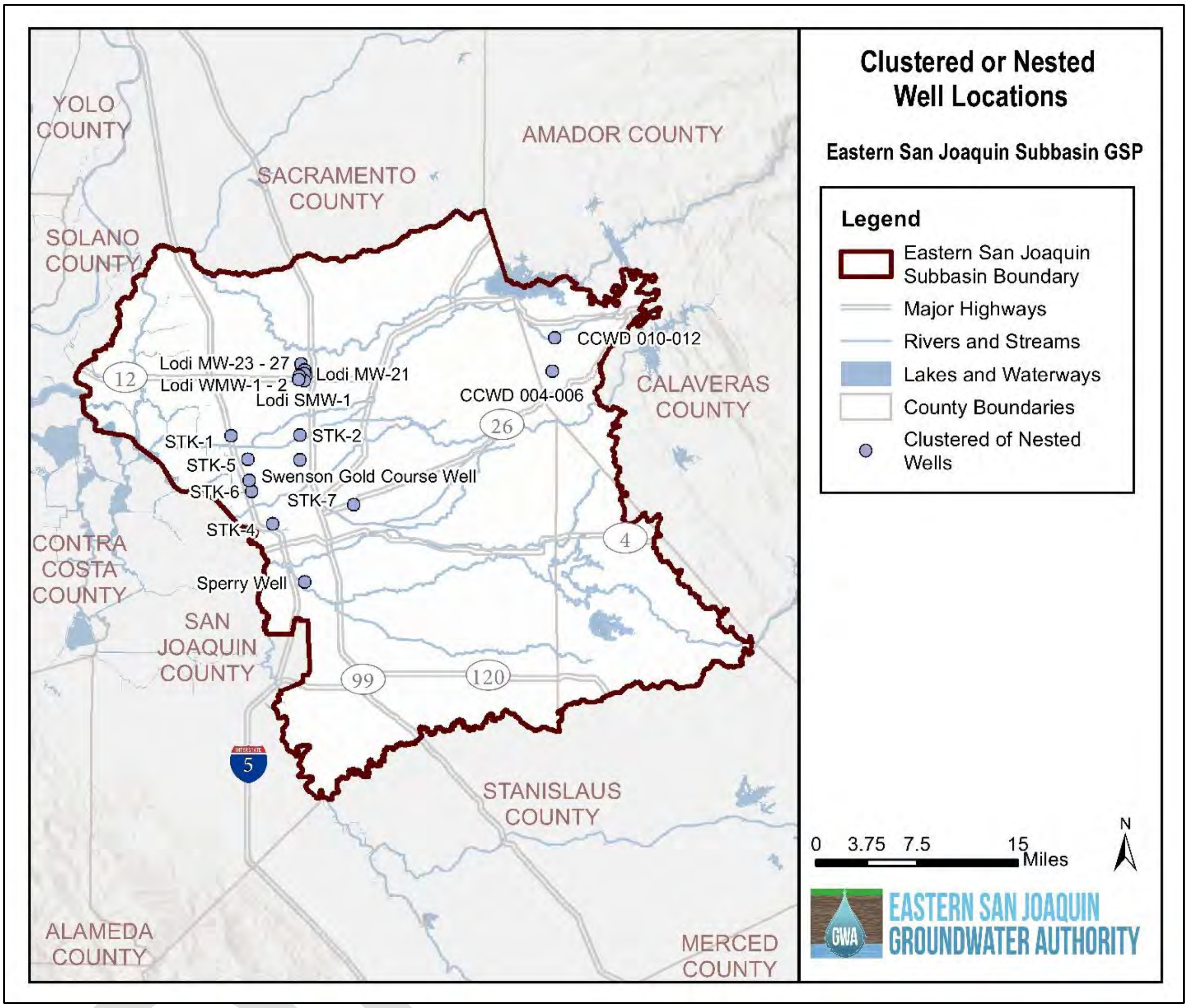


Figure 2-40: Nested Well Hydrographs: CCWD 004-006

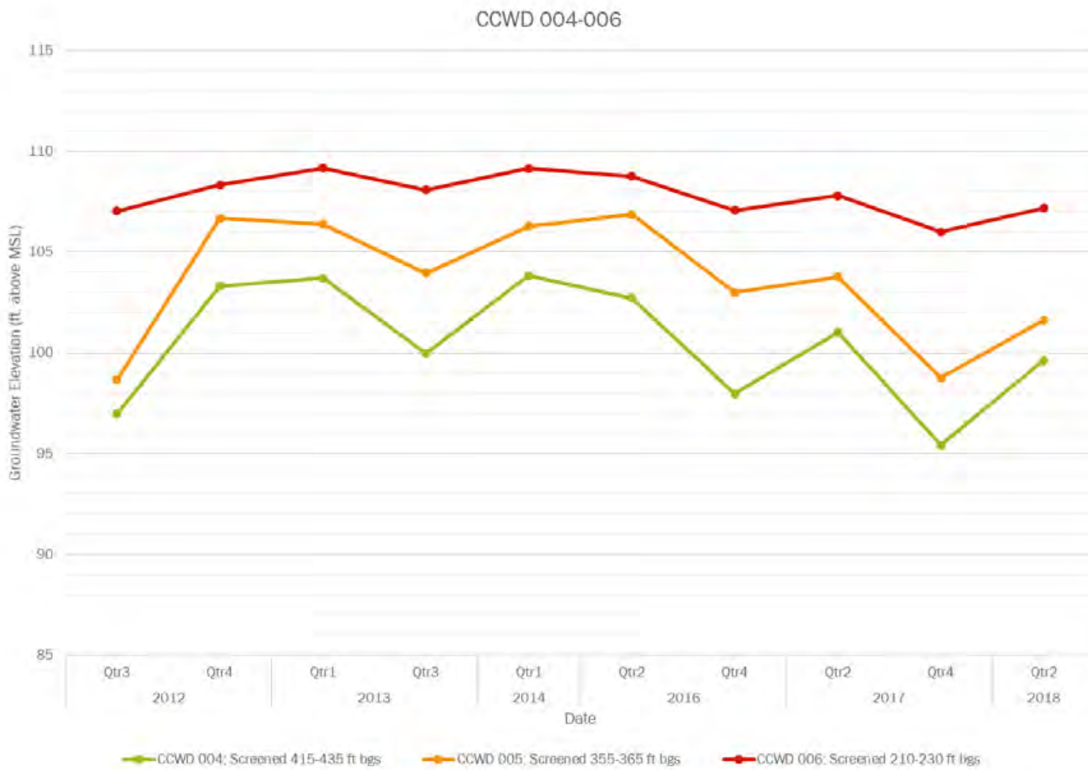


Figure 2-41: Nested Well Hydrographs: CCWD 010-012

Figure 2-42: Nested Well Hydrographs: Sperry Well

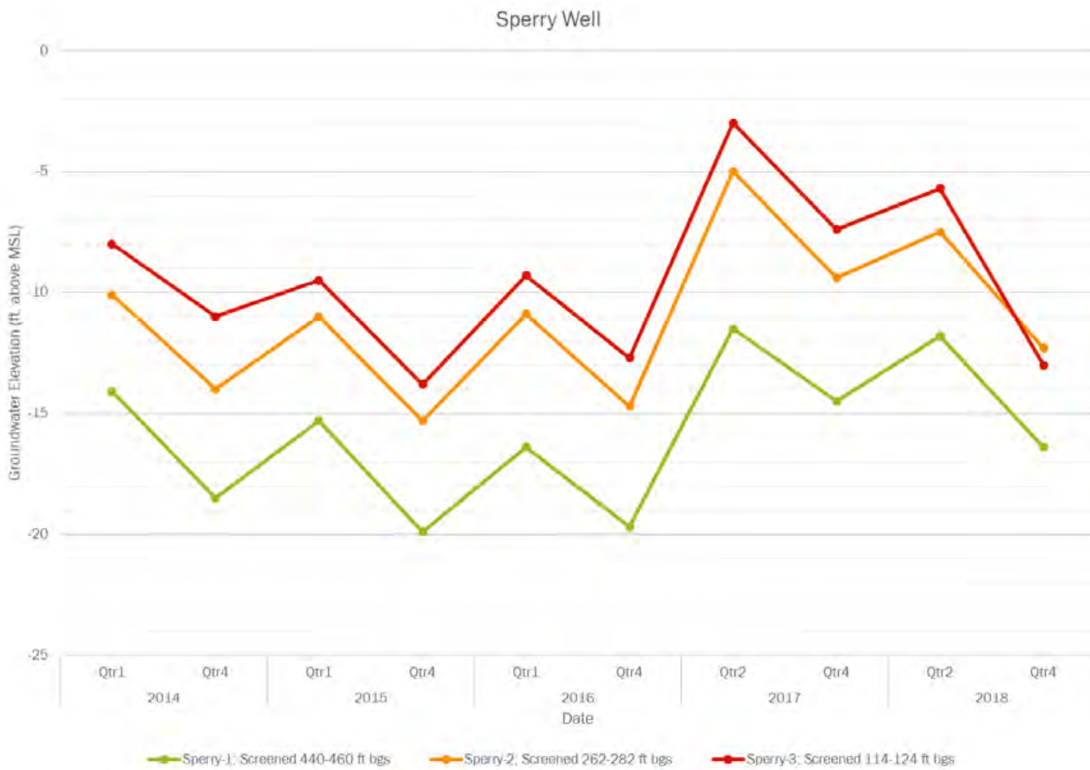


Figure 2-43: Nested Well Hydrographs: Swenson Golf Course

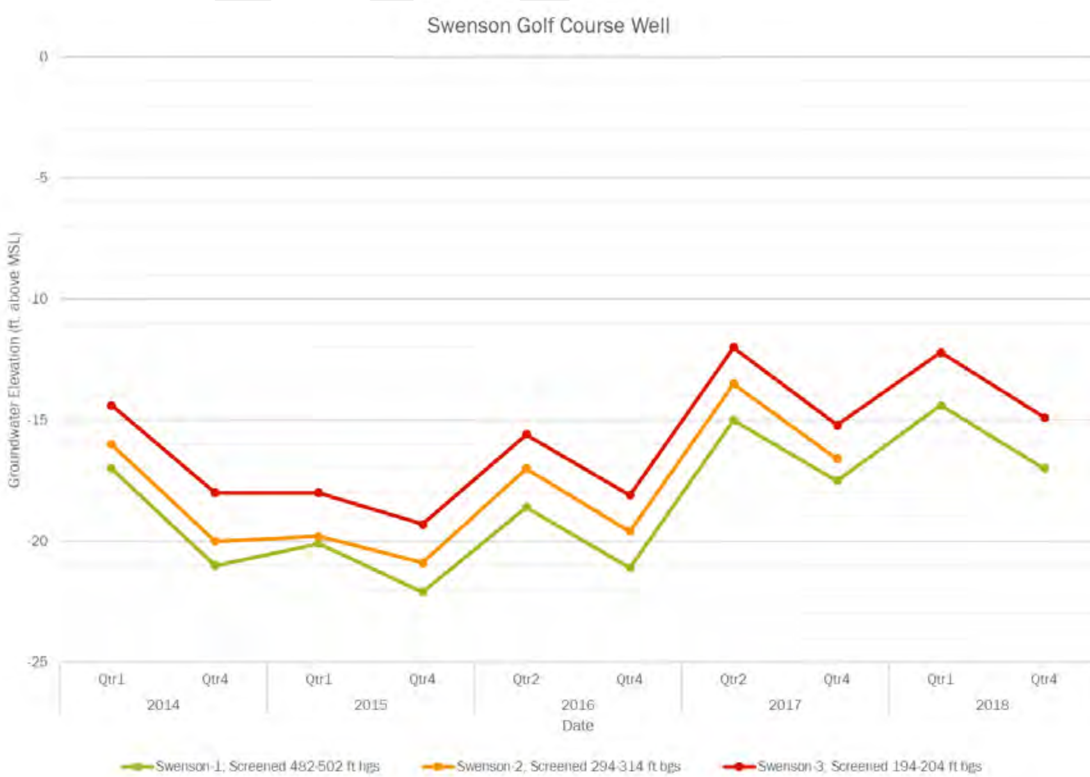


Figure 2-44: Nested Well Hydrographs: STK-1

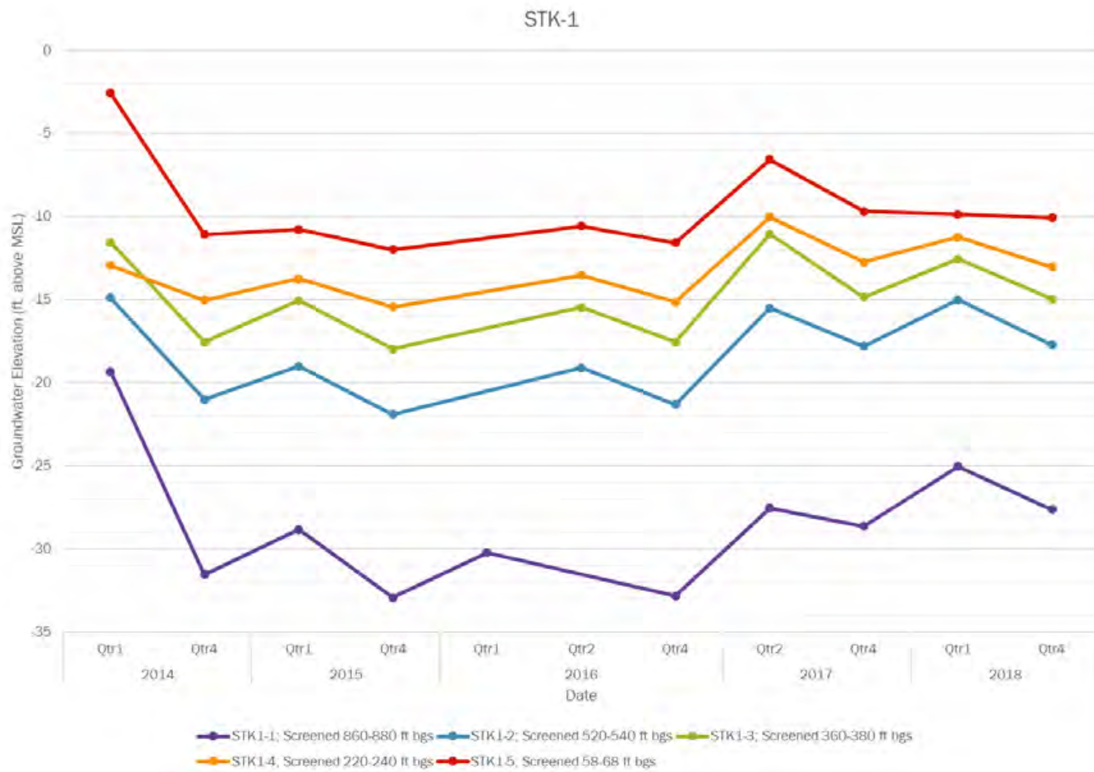


Figure 2-45: Nested Well Hydrographs: STK-2

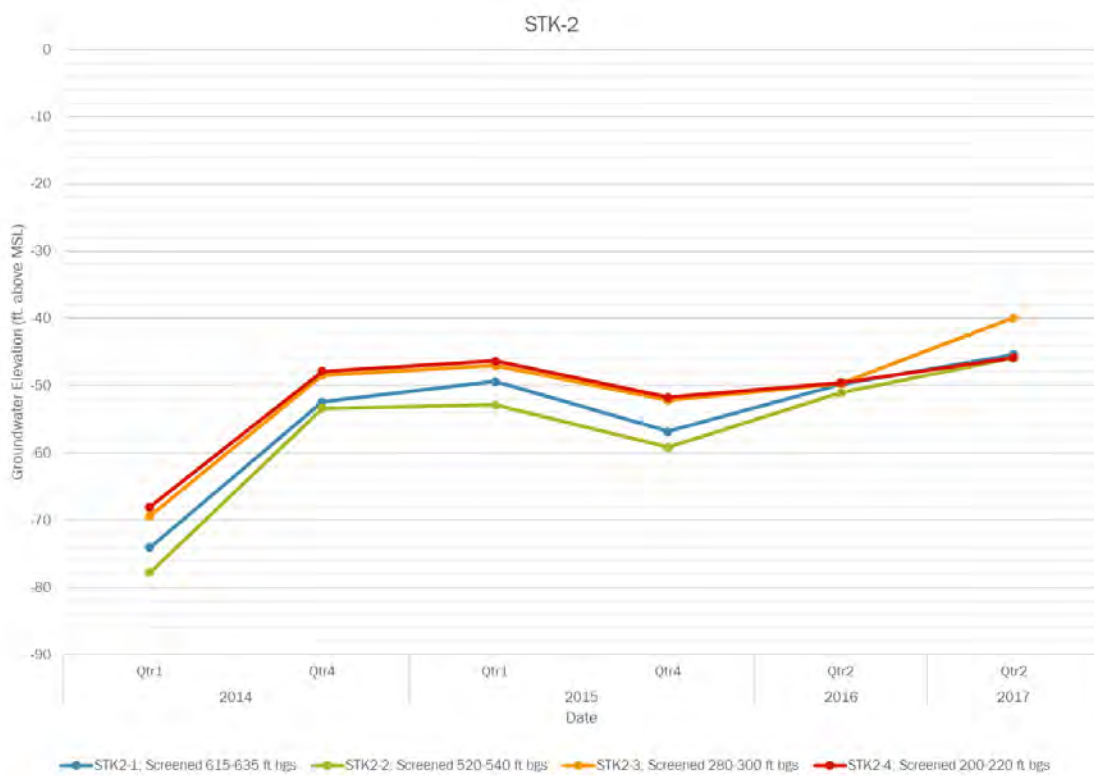


Figure 2-46: Nested Well Hydrographs: STK-4

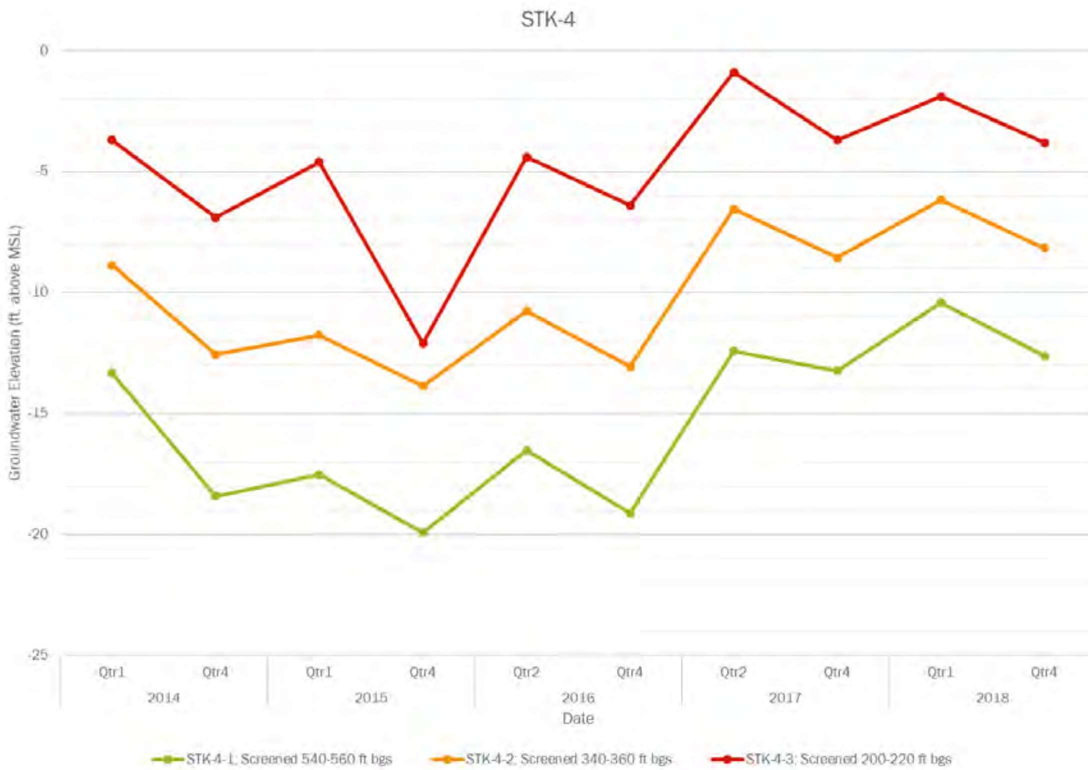


Figure 2-47: Nested Well Hydrographs: STK-5

Figure 2-48: Nested Well Hydrographs: STK-6

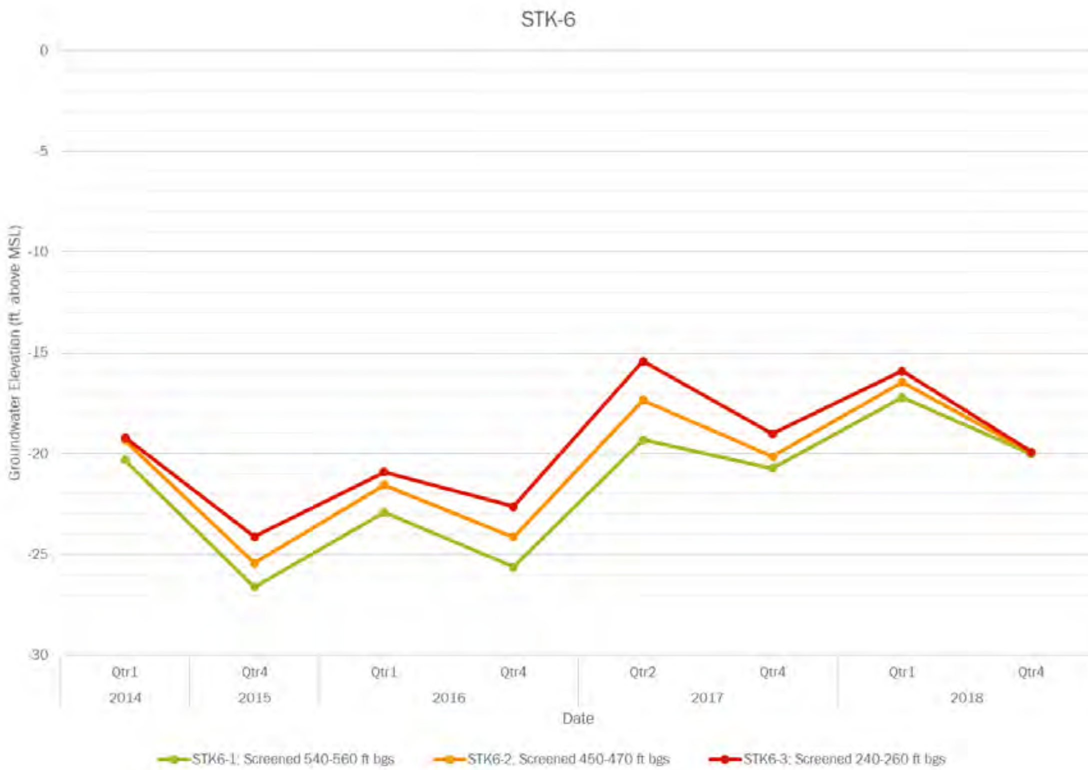
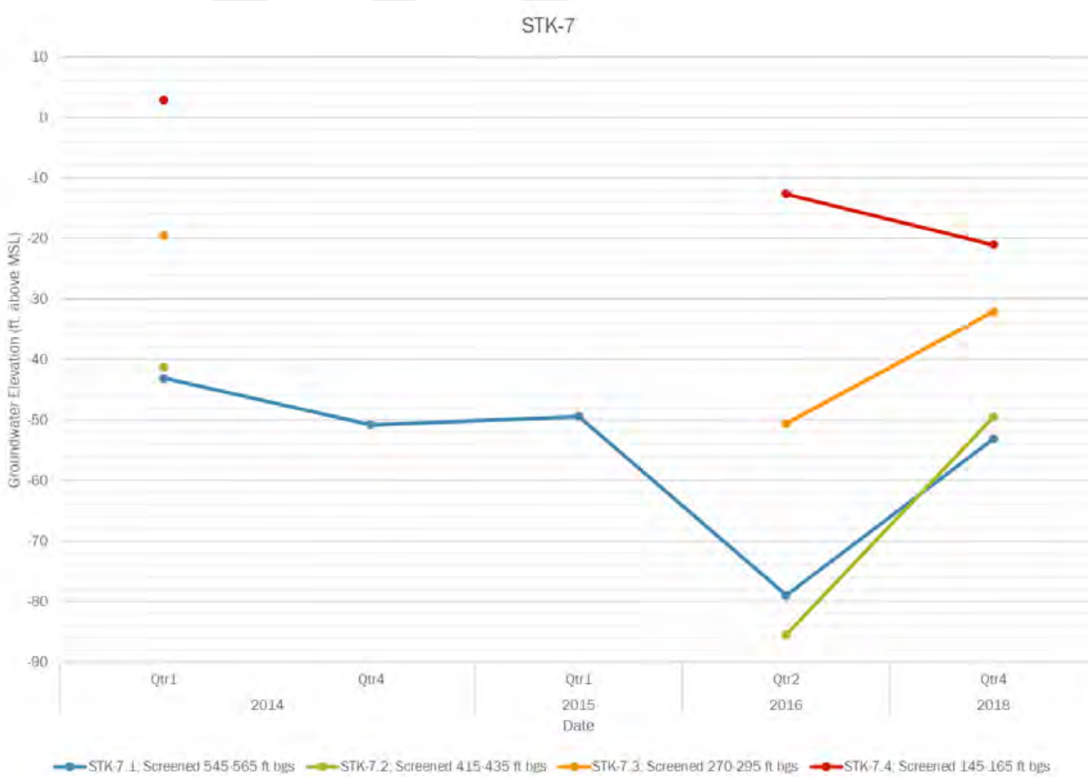


Figure 2-49: Nested Well Hydrographs: STK-7



2.2.2 Groundwater Storage

The ESJWRM was used to estimate historical change in storage of the Eastern San Joaquin Subbasin from 1995-2015.

Figure 2-50 shows annual total storage for the combined ESJWRM fresh groundwater layers (not including the deep saline layer). Figure 2-51 shows the cumulative change in storage against annual storage change and water year type. In 2015, the total fresh groundwater storage was estimated as 53.0 MAF and the cumulative change in storage over 1995-2015 was estimated as -0.91 MAF (-0.09%), or -0.05 MAF/year. An additional 75.0 MAF in Layer 4 of the model (not pictured) is saline water. More information about the layers of the ESJWRM and calculation of storage changes can be found in model documentation in Appendix 2-A.

Figure 2-50: Historical Modeled Change in Storage

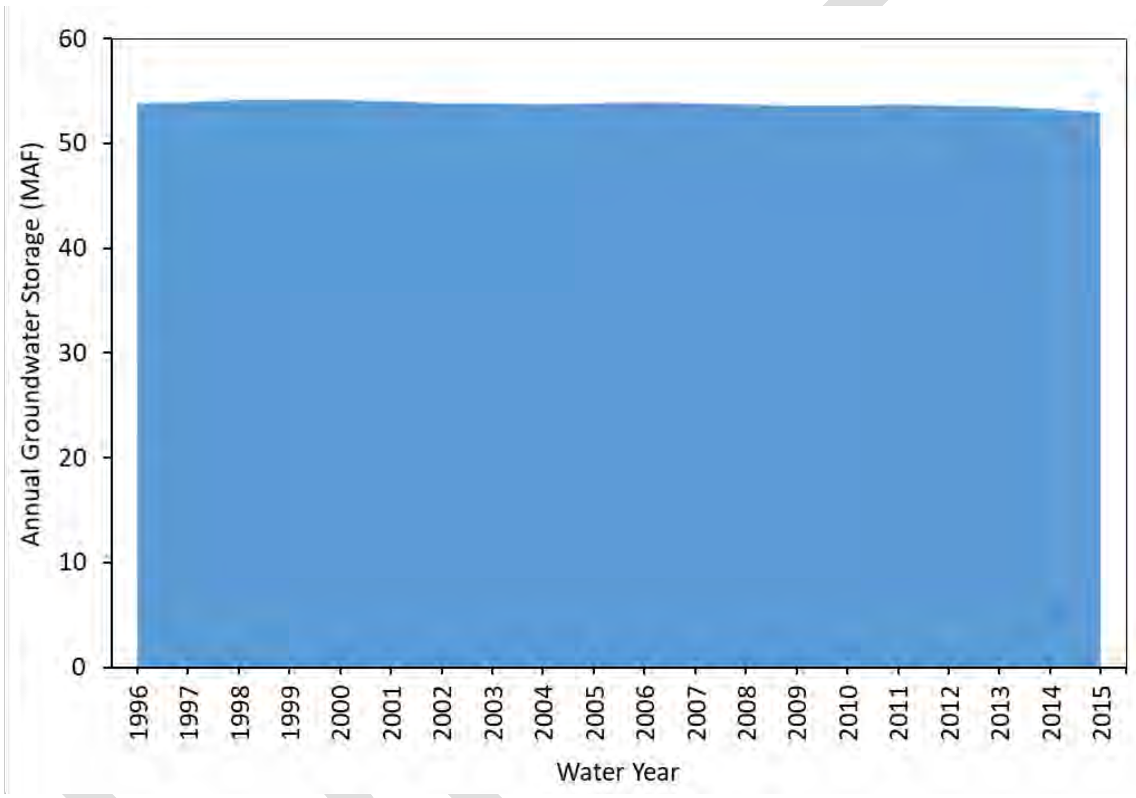
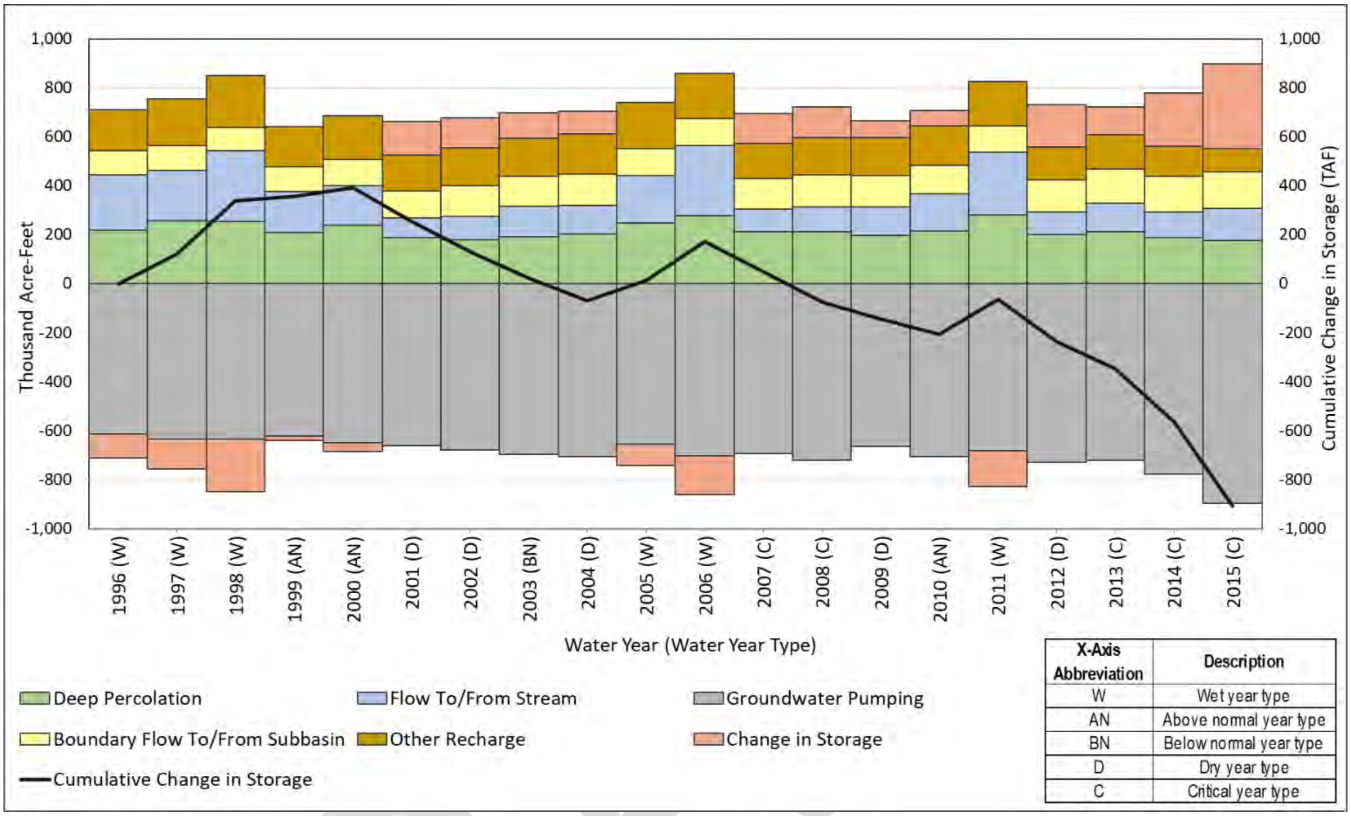


Figure 2-51: Historical Modeled Change in Annual Storage with Water Use and Year Type



Notes:

1. Water Year Types based on San Joaquin Valley Water Year Index (DWR, 2018)
2. “Other Recharge” includes managed aquifer recharge, recharge from unlined canals and/or reservoirs, and recharge from ungauged watersheds.
3. “Change in Storage” is placed to balance the water budget. For instance, if annual outflows (-) are greater than inflows (+), there is a decrease in storage, but this would be shown on the positive side of the bar chart to balance out the increased outflows on the negative side of the bar chart.

2.2.3 Seawater Intrusion

The Eastern San Joaquin Subbasin is not in a coastal area and seawater intrusion is not present. While the Delta ecosystem evolved with a natural salinity cycle that brought brackish tidal water in from the San Francisco Bay, barriers are now in place between the Bay and the Delta to prevent the inland movement of seawater through the Delta. Current management practices maintain freshwater surface flows through a combination of hydraulic and physical barriers, and alternations to existing channels (Water Education Foundation). Portions of the Subbasin do, however, experience water quality issues related to salinity, which are addressed under the water quality section (Section 2.2.4.1). As described in Section 2.2.4.1, the sources of salinity in the Subbasin are due to other factors and are not the result of seawater intrusion.

2.2.4 Groundwater Quality

While groundwater quality in the Eastern San Joaquin Subbasin is generally sufficient to meet beneficial uses, a number of constituents of concern are either currently impacting groundwater use or have the potential to impact it in the future. Depending on the water quality constituent, the source may be anthropogenic in origin or naturally occurring, and the issue may be widespread or localized.

The primary naturally occurring water quality constituents of concern are salinity and arsenic, while primary water quality constituents related to human activity include nitrates, salinity, and various point-source contaminants.

The sections herein provide information on the historical and current groundwater quality conditions for constituents including:

- Salinity (Section 2.2.4.1)
- Nitrate (Section 2.2.4.2)
- Arsenic (Section 2.2.4.3)
- Point-source contamination (Section 2.2.4.4), which includes petroleum hydrocarbons, solvents, and emerging contaminants

The EPA implements national primary drinking water regulations, which are a starting point for evaluating groundwater quality in a regulated toxicological context and for assessing impact to beneficial use. The EPA defines a Primary maximum contaminant level (MCL) or SMCL, for a variety of parameters. For the purposes of this GSP, comparing parameter concentrations to their MCL or SMCL is used as the basis for describing groundwater quality concerns in the Eastern San Joaquin Subbasin. Comparisons to the MCL or SMCL must be considered in context as the measured concentrations represent raw water, which may be treated or blended prior to delivery to meet the standard or may not be used for potable uses. Water quality is not known to have adversely affected beneficial uses of groundwater in the Eastern San Joaquin Subbasin, generally.

2.2.4.1 Salinity

As identified in prior planning efforts, and as referenced in Section 2.2 of this Plan, localized salinity issues are a concern for some areas of the Eastern San Joaquin Subbasin. Pumping in excess of recharge has resulted in declining aquifer water levels that have contributed to an increase of salinity in groundwater wells since the 1950s. As identified through isotopic typing, elevated salinity concentrations in the Subbasin are the result of natural processes and overlying land use activities (O'Leary et al., 2015). Within the Subbasin, there are three primary sources of salinity:

1. San Joaquin Delta Sediments – Naturally occurring soluble salts are emplaced in the San Joaquin Delta sediments from the evaporation of groundwater in discharge areas.

2. Deep Deposits – Saline groundwater in the Subbasin is principally the result of the migration of a naturally occurring deep saline water body which originates in regionally deposited marine sedimentary rocks that underlie the San Joaquin Valley. This results in a saline aquifer underlying the freshwater aquifer and well pumping can result in upwelling saline brines into the freshwater aquifer.

3. Irrigation Return Water – Irrigation return water is excess surface and subsurface water that flows from an irrigated field following the application of irrigation water. Return water may include contaminants typical of agricultural practices (e.g., pesticides, herbicides), including those commonly high in salinity, and may act as a conduit delivering these contaminants to the surrounding watershed. Areas in the Subbasin with salinity resulting from irrigation return water do not commonly exceed chloride concentrations of 100 mg/L (O'Leary et al., 2015).

Salinity is a measure of the amount of dissolved particles and ions in water. Salinity can include several different ions, but the most common are chloride, sodium, nitrate, calcium, magnesium, bicarbonate, and sulfate. Chloride and TDS are two common ways to measure and analyze salinity. Each is described separately in the sections below.

2.2.4.1.1 Chloride

Chloride is one way to measure salinity and is reported as a concentration of the Cl^- ion that originates from the dissociation of salts in water. EPA's SMCL of 250 mg/L for chloride is a common approach to identifying water quality concerns for this constituent. The SMCL is a Secondary Drinking Water Standard that is established for aesthetic reasons such as taste, odor, and color and is not based on public health concerns. The 250 mg/L value is "recommended" by SWRCB as a threshold below which chloride concentrations are desirable for a higher degree of consumer acceptance of drinking water. An "upper" limit of 500 mg/L is used to define a range above the "recommended" value where chloride concentration is acceptable if it is neither reasonable nor feasible to provide more suitable waters (SWRCB, 2006). Comparisons to the SMCL must be considered in context as the measured concentrations represent raw water, which may be treated or blended prior to delivery to meet the standard or may not be used for potable uses.

As shown in Figure 2-52, the majority of observed chloride concentrations above 250 mg/L occur on the western side of the Subbasin, with additional measurements above 250 mg/L scattered throughout SJC. As shown in Figure 2-53, the number of measurements with observed concentrations above 250 mg/L have decreased since the 1970s.

Figure 2-52: Chloride Concentration Greater Than 250 mg/L (1940s-2010s)

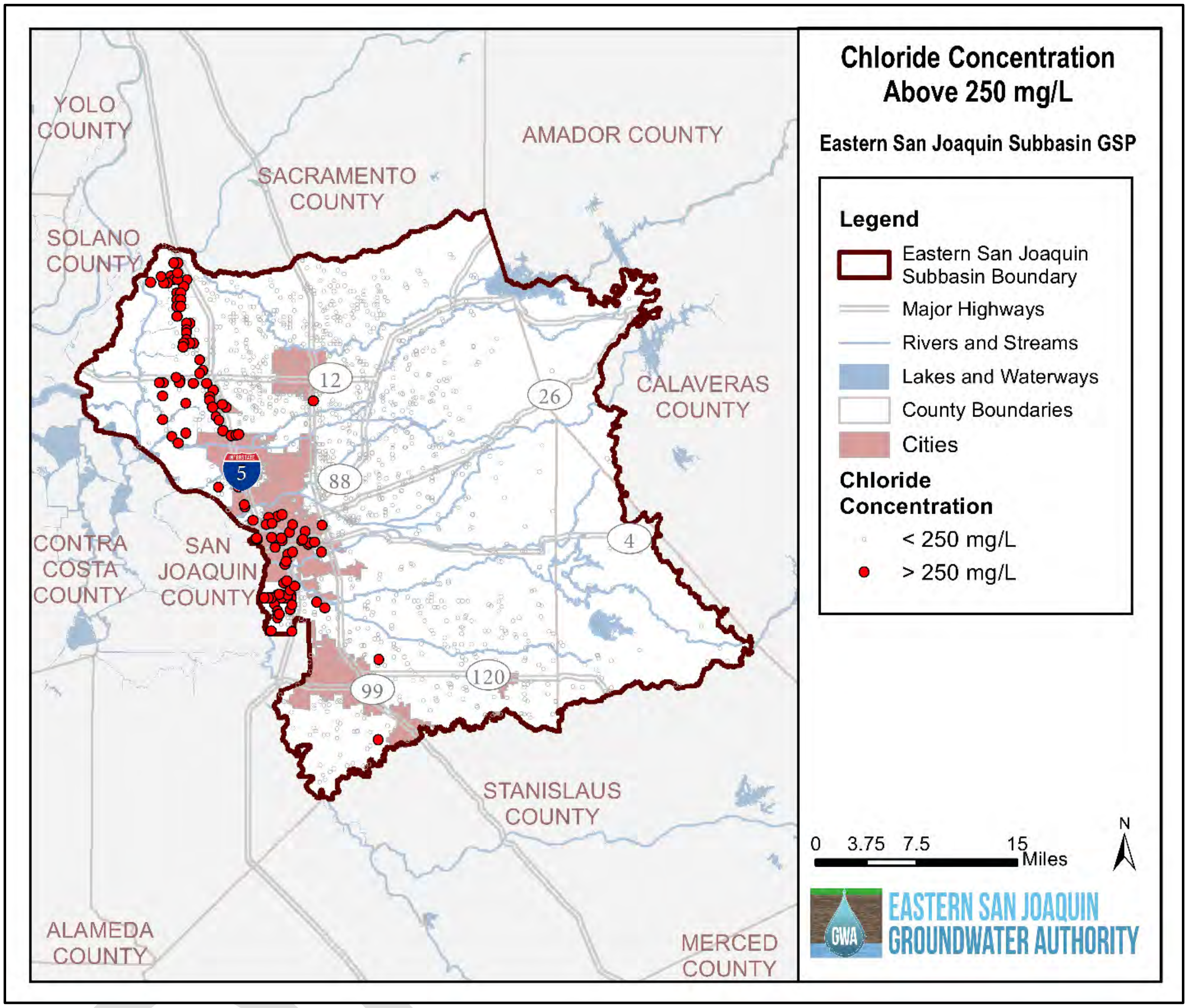


Figure 2-53: Chloride Concentration Above 250 mg/L by Decade

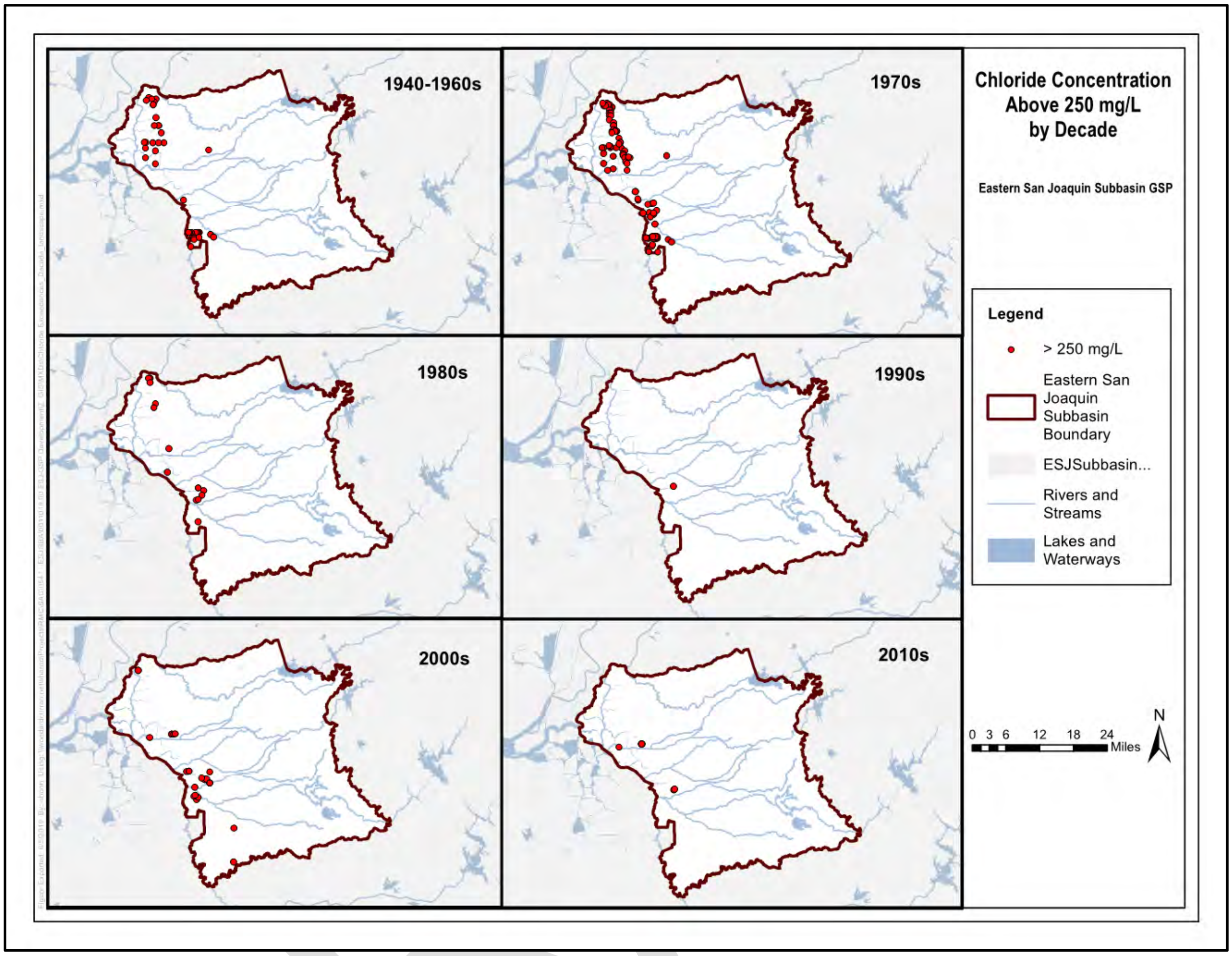


Table 2-5 shows occurrence of chloride measurements greater than 250 mg/L by decade. Chloride records have been observed above 250 mg/L both historically and recently. Sampling frequencies increased in the 1970s and 2000s.

Table 2-5: Summary of Chloride Data by Decade

Decade	Measurement Above 250 mg/L?		Range of Values (mg/L)				Total Number of Samples
	No	Yes	Minimum	Average	Median	Maximum	
1940	98%	2%	7.0	45.2	20.0	975	180
1950	93%	7%	2.3	89.4	25.0	3,750	699
1960	90%	10%	0.0	115.0	17.0	1,960	312
1970	90%	10%	1.8	85.9	19.0	3,310	1,780
1980	97%	3%	0.0	45.4	20.5	630	858
1990	99%	1%	0.0	31.2	19.0	533	663
2000	95%	5%	0.0	59.6	35.0	2,050	1,453
2010	97.5%	2.5%	0.0	34.8	39.0	2,050	986

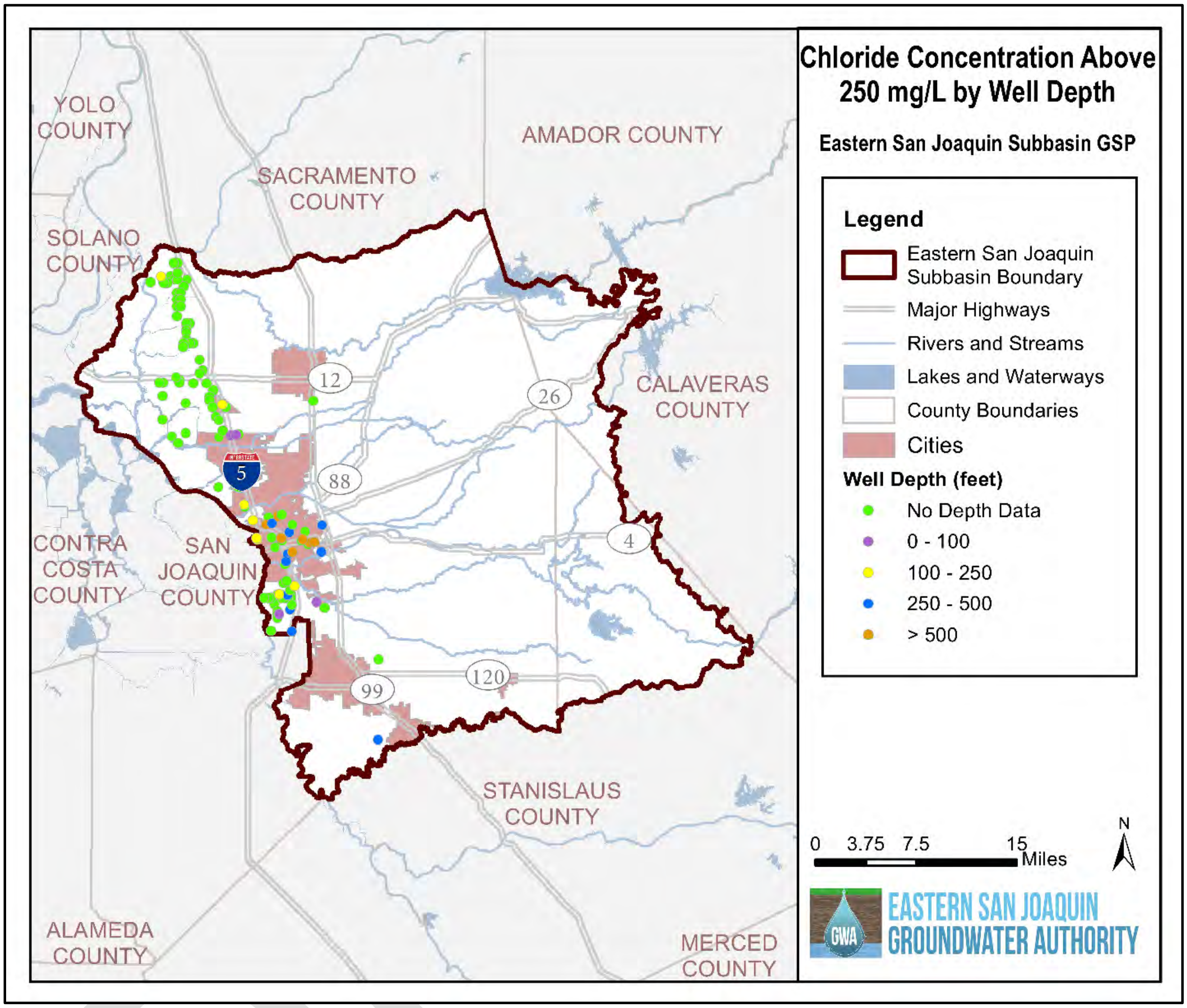
Table 2-6 shows chloride occurrences of concentrations greater than 250 mg/L by well depth. The highest proportion of readings above 250 mg/L occur in the shallowest wells, less than 100 feet deep (8 percent). The highest maximum value also occurred at this depth range (up to 2,050 mg/L).

Figure 2-54 shows the spatial distribution of chloride occurrences greater than 250 mg/L by well depth within the Subbasin.

Table 2-6: Summary of Chloride Data by Depth (1940s-2010s)

Depth (feet)	Measurement Above 250 mg/L?		Range of Values (mg/L)				Total Number of Samples
	No	Yes	Minimum	Average	Median	Maximum	
No Depth Data	92%	8%	0.0	82.5	20.0	3,750	3,566
0 - 100	92%	8%	0.8	73.5	60.0	2,050	239
100 - 250	97%	3%	1.0	44.2	36.0	1,400	1,215
250 - 500	98%	2%	0.0	32.4	16.0	1,100	1,487
> 500	95%	5%	2.7	62.1	15.6	1,940	424

Figure 2-54: Chloride Concentration Above 250 mg/L by Well Depth (1940s-2010s)



A lack of depth information presents a challenge to analyzing the vertical distribution of chloride measurements which would inform identification of chloride sources. Examples of depth information include total well construction depth or screened interval depths, which vary between wells. Some wells have construction depth but not screened interval depth, or vice versa. For this analysis, screened interval depth was used first, and if this information was not available, total depth was used. Approximately 4,600 of the almost 13,000 chloride measurements in the Eastern San Joaquin Subbasin are from wells lacking any construction or screen depth information. Roughly half of the measurements above 250 mg/L occur in the wells lacking depth data, which also show the highest range in values occurring above 250 mg/L. Identifying the source of high-chloride water in wells of various depths over time requires further analysis of geochemical data; depth-specific water quality was identified as a data gap in the HCM.

2.2.4.1.2 Total Dissolved Solids (TDS)

TDS, which is a measure of all inorganic and organic substances present in a liquid in molecular, ionized, or colloidal suspended form, is commonly used to measure salinity. Recent TDS measurements show trends that match closely with the overall historical trends for chloride and highlight areas with elevated salinity concentrations in more recent years. Between 2015 and 2018, TDS concentrations in the Eastern San Joaquin Subbasin ranged from 35 to 2,500 mg/L. Spatially, the highest concentrations of TDS are found along the western margin of the Subbasin and the San Joaquin River and decrease significantly to the east, to typically less than 500 mg/L. TDS measurements, like chloride levels, are elevated near cities of Stockton and Manteca, and in the Lodi GSA near the White Slough Water Pollution Control Facility.

Figure 2-55 shows the maximum and Figure 2-56 shows the average TDS concentrations from 2015 to 2018 as compared to the SMCL lower limit of 500 mg/L and upper limit of 1,000 mg/L. The SMCL is established by the USEPA then adopted by the SWRCB. The SMCL is a Secondary Drinking Water Standard that is established for aesthetic reasons such as taste, odor, and color and is not based on public health concerns. The 500 mg/L value is “recommended” by SWRCB as a threshold below which TDS concentrations are desirable for a higher degree of consumer acceptance of drinking water. The “upper” limit is used to define a range above the “recommended” value where TDS concentration is acceptable if it is neither reasonable nor feasible to provide more suitable waters (SWRCB, 2006). Comparisons to the SMCL must be considered in context as the measured concentrations represent raw water, which may be treated or blended prior to delivery to meet the standard or may not be used for potable uses.

Figure 2-55: Maximum TDS Concentrations 2015-2018

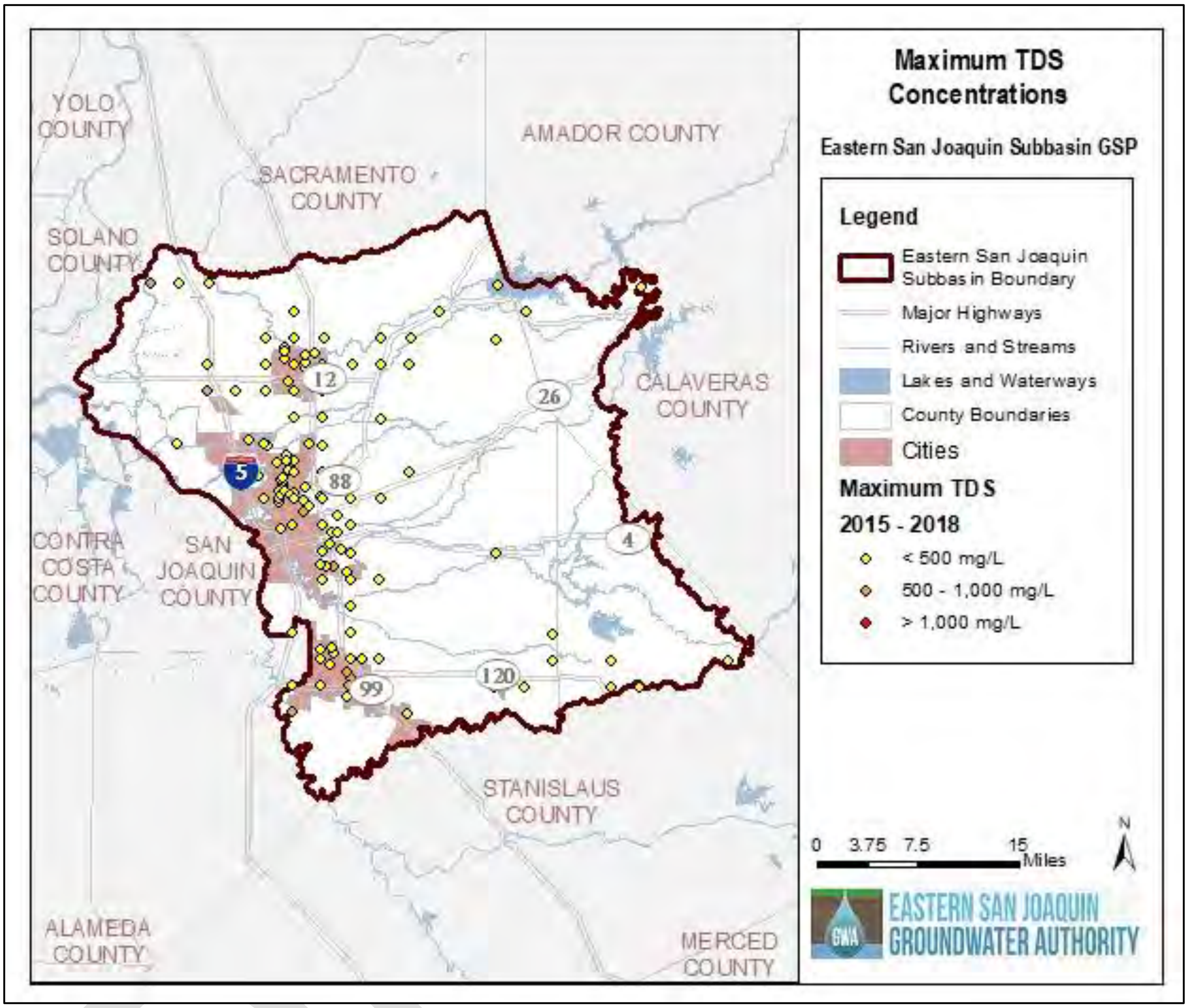
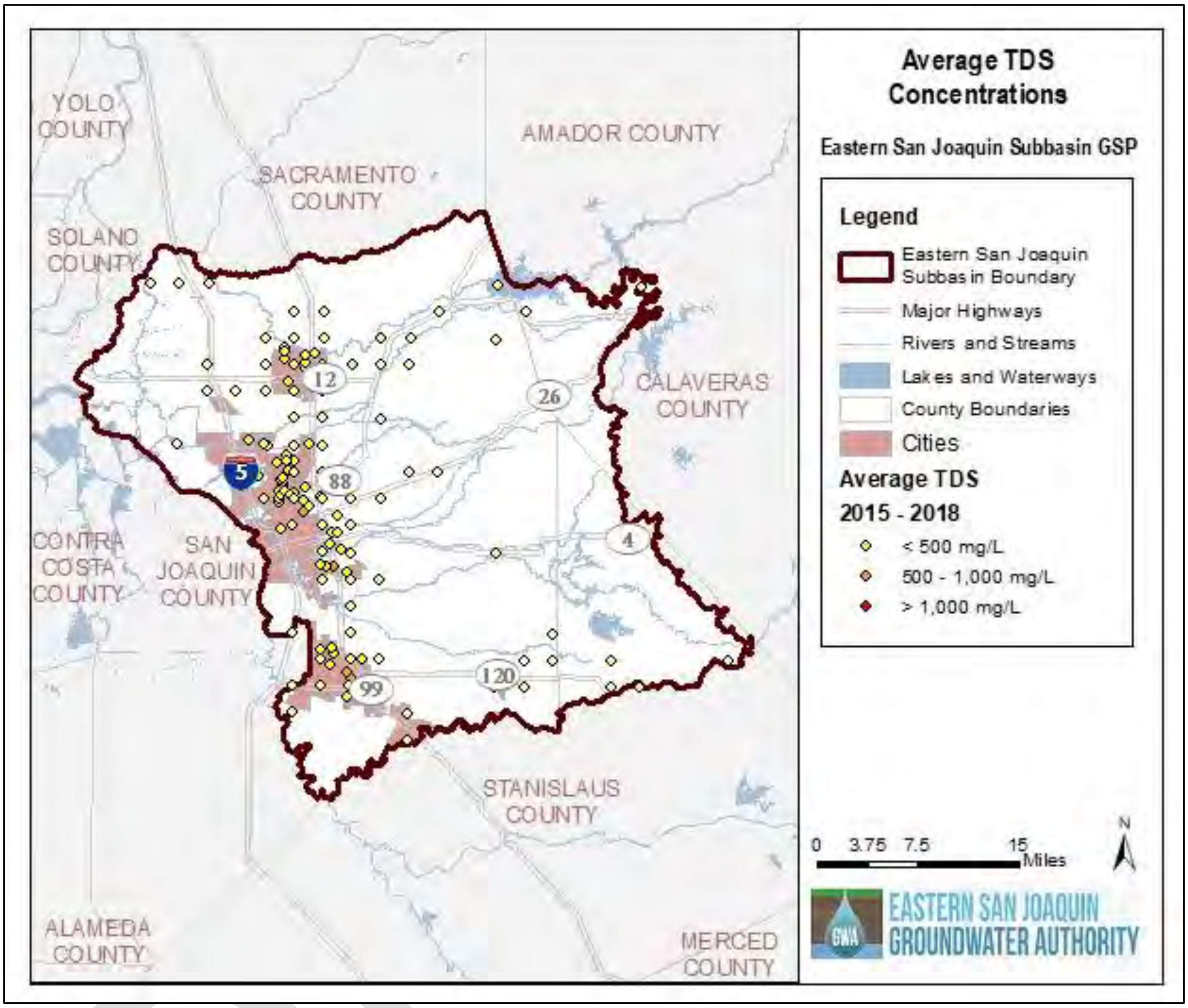


Figure 2-56: Average TDS Concentrations 2015-2018



Elevated TDS concentrations are apparent in very shallow groundwater in close proximity to the San Joaquin River, while deep wells (depths greater than 200 feet) typically have TDS concentrations below 500 mg/L. TDS trends by depth are summarized in Table 2-7.

Figure 2-57 shows the maximum TDS concentrations for shallow wells in the Eastern San Joaquin Subbasin from years 2015 to 2018, and Figure 2-58 shows the maximum TDS concentrations for deep wells in the same timeframe. As with chloride measurements, depth-dependent TDS data is not widely available. It was identified as a data gap in the HCM and will be a focus of the monitoring network for water quality, as described in the Chapter 4: Monitoring Network.

Table 2-7: Summary of TDS Data by Depth (2015-2018)

Depth (feet)	% Measurements in Range			Range of Values (mg/L)				Total Number of Samples
	< 500 mg/L	500 – 1000 mg/L	> 1,000 mg/L	Minimum	Average	Median	Maximum	
No Depth Data	90%	8%	2%	94	339	310	1,180	451
0 - 100	N/A							0
100 - 250	54%	46%	0%	280	438	480	540	13
250 - 500	93%	7%	0%	120	344	340	560	75
> 500	N/A							0

Figure 2-57: Maximum TDS Concentrations in Shallow Wells 2015-2018

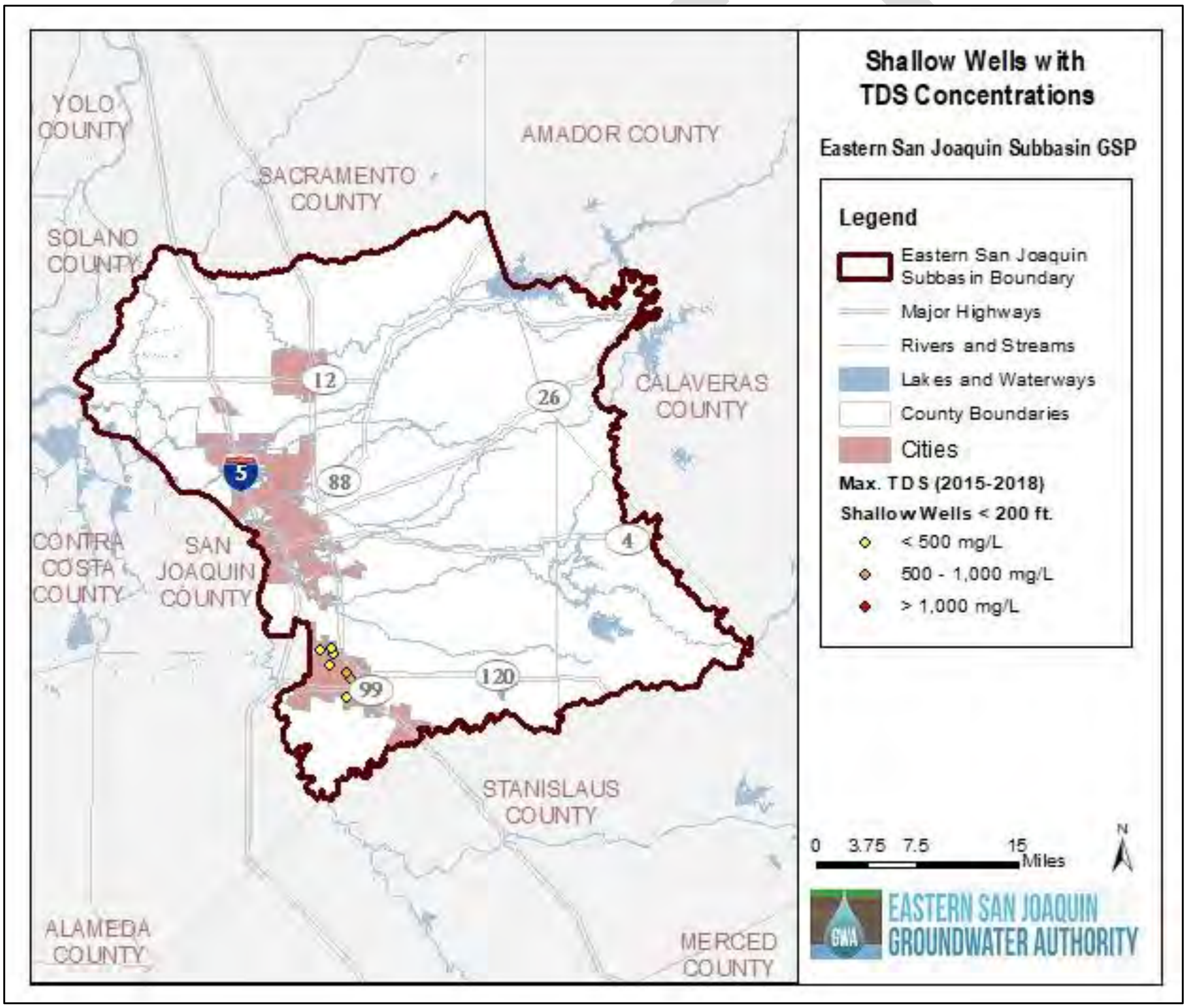
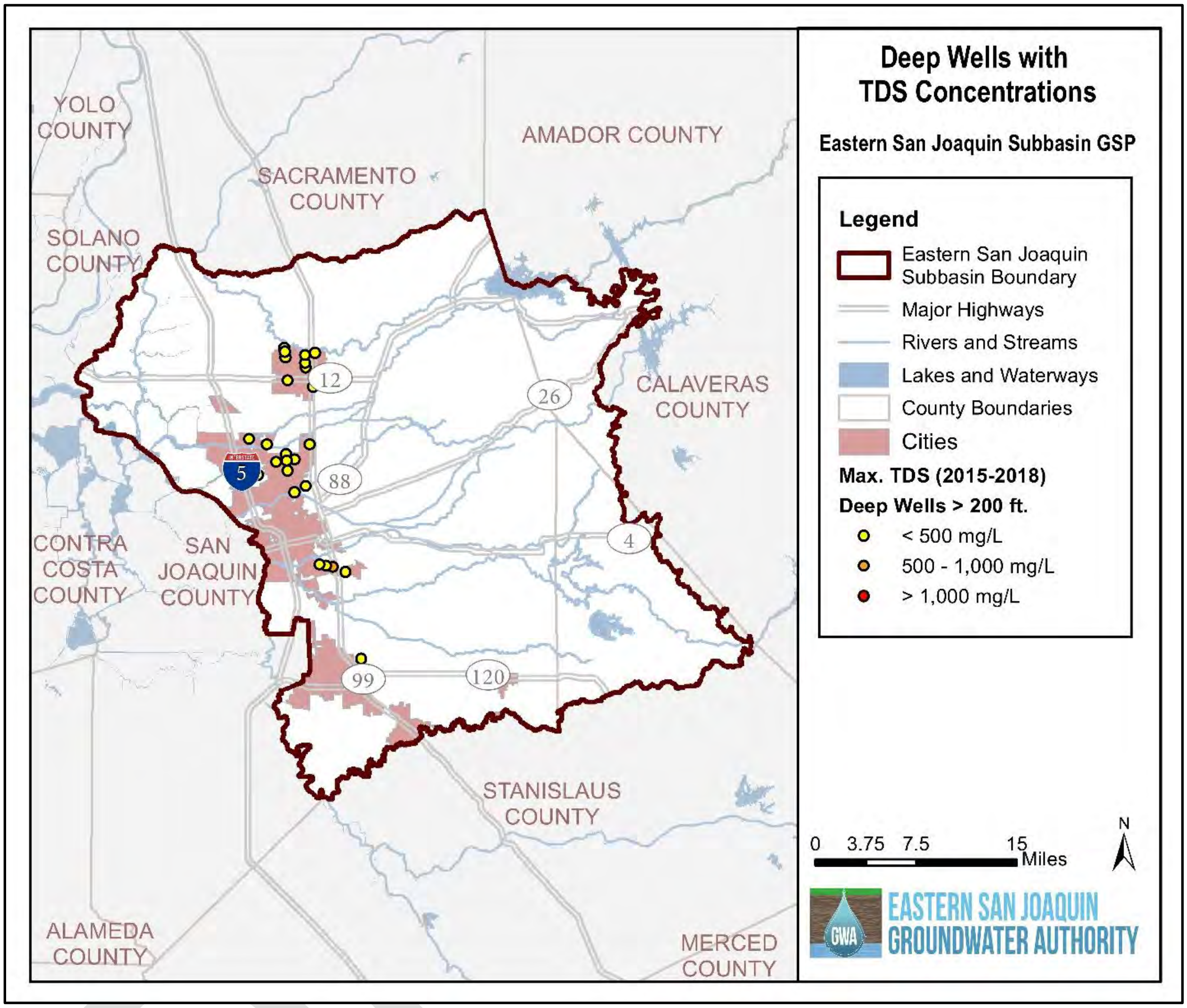


Figure 2-58: Maximum TDS Concentrations in Deep Wells 2015-2018



2.2.4.2 Nitrate

Nitrate is both naturally occurring and can be contributed a result of human activity. Nitrate can cause adverse human health effects. Anthropogenic sources of nitrate include fertilizers, septic systems, and animal feedlots. The EPA's MCL of 10 mg/L for Nitrate as N delimits high levels of nitrate for drinking water use. Many measured concentrations are above this value, both historically and recently. Comparisons to the MCL must be considered in context as the measured concentrations represent raw water, which may be treated or blended prior to delivery to meet the standard or may not be used for potable uses.

Table 2-8 provides the total number of nitrate values by decade and the percentage of those values greater than 10 mg/L. Although the total number of nitrate measurements has grown since 2000, the occurrence of concentrations greater than 10 mg/L has increased greater than what is proportional for this increase in sampling.

Table 2-8: Nitrate as N Concentrations by Decade

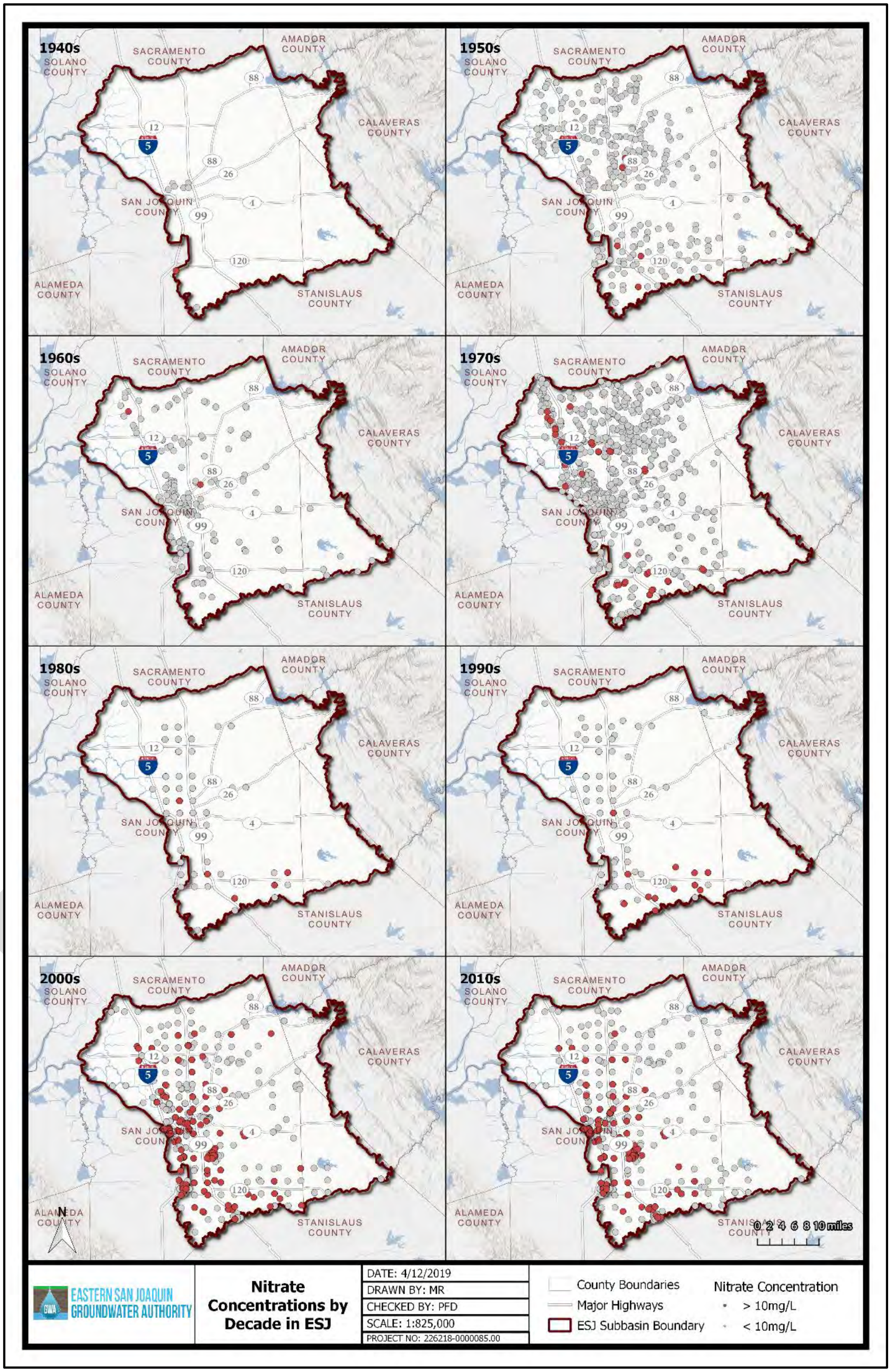
Decade	% of Measurements		Number of Nitrate Measurements
	<10 mg/L	>10 mg/L	
1940	88%	13%	8
1950	99%	1%	362
1960	99%	1%	240
1970	96%	4%	1,500
1980	95%	5%	420
1990	98%	2%	1,716
2000	87%	13%	9,679
2010	83%	17%	11,060

Figure 2-59 shows the historical spatial distribution of nitrate samples and detections by decade. During the 1940s, the earliest decade with nitrate measurements, very few records exist and no significant conclusions can be made from this timeframe. The 1950s and 1960s have larger datasets, but measurements above 10 mg/L during these decades are sporadic and localized. Nitrate concentrations during the 1970s show a significant number of measurements above 10 mg/L in the northwest portion of the Eastern San Joaquin Subbasin, adjacent to Interstate 5. The 1980s and 1990s show similar patterns of fewer records than the 1970s, primarily around the cities of Stockton, Lodi, and Manteca. Nitrate measurements above 10 mg/L are also located near the southern edge of the Eastern San Joaquin Subbasin, close to Highway 120. Although a much greater number of records exists for the 1990s than the 1980s, these decades have approximately the same spatial distribution. One possible explanation is similar wells were sampled during the 1980s and 1990s, but much more frequently in the 1990s. The 2000s and 2010s had both the greatest number of nitrate measurements and the largest number of measurements above 10 mg/L. Measurements above 10 mg/L during these decades follow previous trends: they are primarily between Highway 99 and Interstate 5, from Ripon to near Lodi.

Recent nitrate measurements above the MCL correspond to the overall historical trends and highlight areas with elevated Nitrate concentrations in more recent years. These areas include cities of Stockton and Ripon, areas of the Lodi GSA near the White Slough Pollution Control Facility, the N.A. Chaderjian Youth Correctional Facility, Republic Services Landfill on South Austin Road, and the Kruger and Sons, Inc. site off Highway 4 outside Farmington. Increased nitrate concentrations have not been found to be related to groundwater management activities in the Subbasin.

Section 3.2.3.1.1 of this Plan discusses Irrigated Lands Regulatory Program (ILRP) and Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS), two existing regulatory programs for the monitoring and regulation of nitrate. Under the ILRP, the SJC and Delta Water Quality Coalition is required to test and potentially mitigate for nitrate in domestic wells. Additionally, the 2017 Salt and Nitrate Management Plan developed by CV-SALTS through the CVRWQCB identifies long-term nitrate management practices (CVRWQCB, 2016).

Figure 2-59: Nitrate as N Concentrations by Decade



2.2.4.3 Arsenic

Arsenic is ubiquitous in nature and is commonly found in drinking water sources in California. Determining the source of arsenic in groundwater is difficult because arsenic is both naturally occurring and used in human activities such as agriculture. Public health concerns about arsenic in drinking water related to its potential to cause adverse health effects are addressed through EPA's MCL, established at 10 micrograms per liter (μg/L).

Figure 2-60 shows the spatial distribution of arsenic concentrations contained in the GAMA database. From the 1970s to present, the total number and percentage of arsenic values above 10 μg/L has increased (see Table 2-9). The spatial distribution of measurements above 10 μg/L is similar to nitrate, largely between Interstate 5 and Highway 99, from Manteca to Lodi. The increased arsenic concentrations near urban areas are not necessarily indicative of contamination from these areas and may partially be due to the fact that arsenic measurements are more abundant in these urban areas; GAMA water quality records are rarely evenly distributed throughout the Subbasin for any constituent. Recent arsenic samples show measurements above 10 μg/L similar to the overall trends (see Figure 2-61). Measurements above 10 μg/L in years 2015, 2016, 2017, and 2018 are primarily located in cities of Stockton and Manteca, with fewer occurring around City of Lodi. Increased arsenic concentrations have not been found to be related to groundwater management activities in the Subbasin.

Figure 2-60: Arsenic Concentrations by Decade

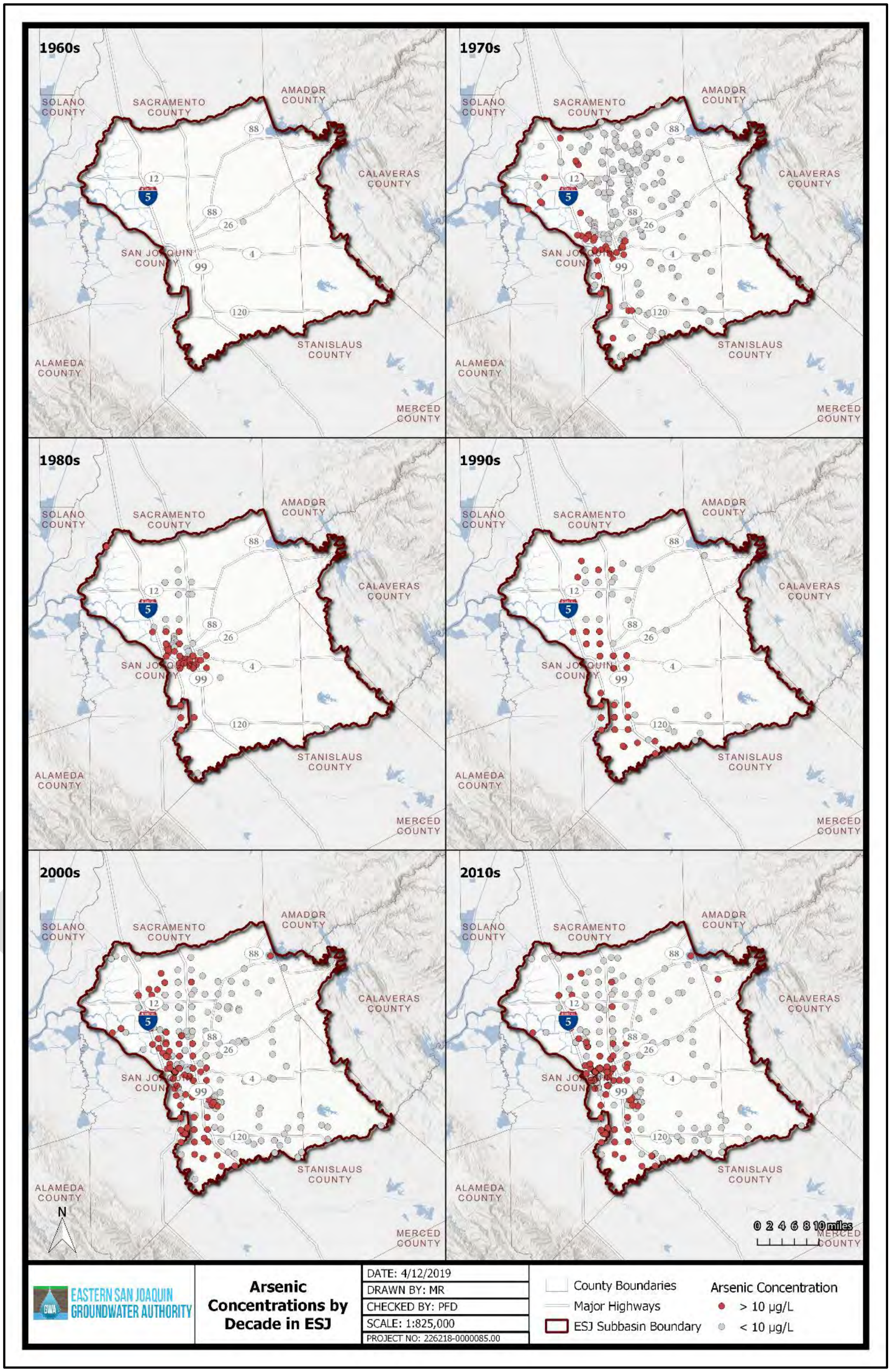
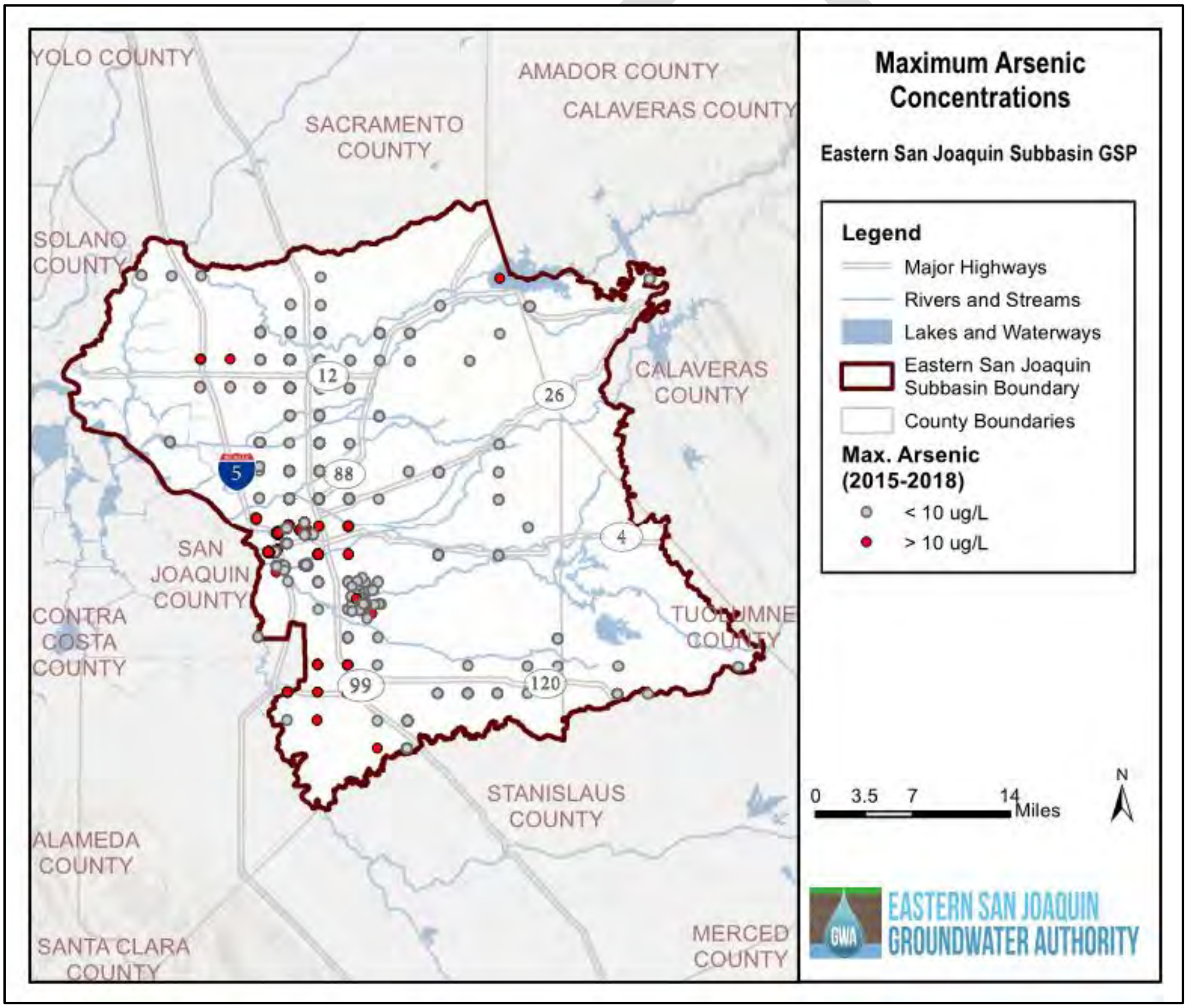


Table 2-9: Arsenic Values by Decade

Decade	% of Measurements		Number of Arsenic Measurements
	<10 µg/L	>10 µg/L	
1960	100%	0%	1
1970	86%	14%	339
1980	72%	28%	363
1990	72%	28%	645
2000	56%	44%	4,051
2010	48%	52%	5,109

Figure 2-61: Maximum Arsenic Concentrations 2015-2018



2.2.4.4 Point Sources

Point sources are discrete or discernable sources of pollutants which may introduce undesirable constituents into groundwater and may negatively impact water quality. In the Eastern San Joaquin Subbasin, point sources include leaking underground storage tanks, landfills, historical dry cleaners, and others. These sites are actively investigated and monitored within the Eastern San Joaquin Subbasin in response to these known or potential sources of groundwater contamination. The Regional Water Quality Control Board (RWQCB), the Department of Toxic Substances Control (DTSC), and the USEPA provide oversight of point source pollution through existing regulatory programs, including management of remedial action for point source contamination sites. Figure 2-62 shows the results of a query from both the RWQCB's GeoTracker database and the DTSC's EnviroStor database. GeoTracker documents contaminant concerns that the RWQCB is or has been working with site owners to remediate while EnviroStor is the DTSC's data management system to track known contamination sites undergoing cleanup, permitting, enforcement, and investigation efforts. As shown in Figure 2-62, there are 258 active sites within the Eastern San Joaquin Subbasin which are color-coded based on the site's constituent(s) of concern: fuels (gas and/or diesel); synthetic organics (pesticides, herbicides, insecticides, etc.); or a mix of constituents (multiple constituents such as heavy metals and pesticides). Most sites within the Eastern San Joaquin Subbasin are fuel sites (e.g., gas or diesel) that are under active investigation or remediation. Sites with the potential to cause plumes are mapped in Figure 2-63, which were identified by filtering for sites containing soluble and mobile constituents such as volatile organic compounds (VOCs); benzene, toluene, ethylbenzene, and xylenes (BTEX); and/or petroleum hydrocarbons (gas or diesel). Point source contamination has not been found to be related to groundwater management activities in the Subbasin.

Specific point source sites and contaminants are discussed in the sections below.

Figure 2-62: Active Investigation and Remediation Sites

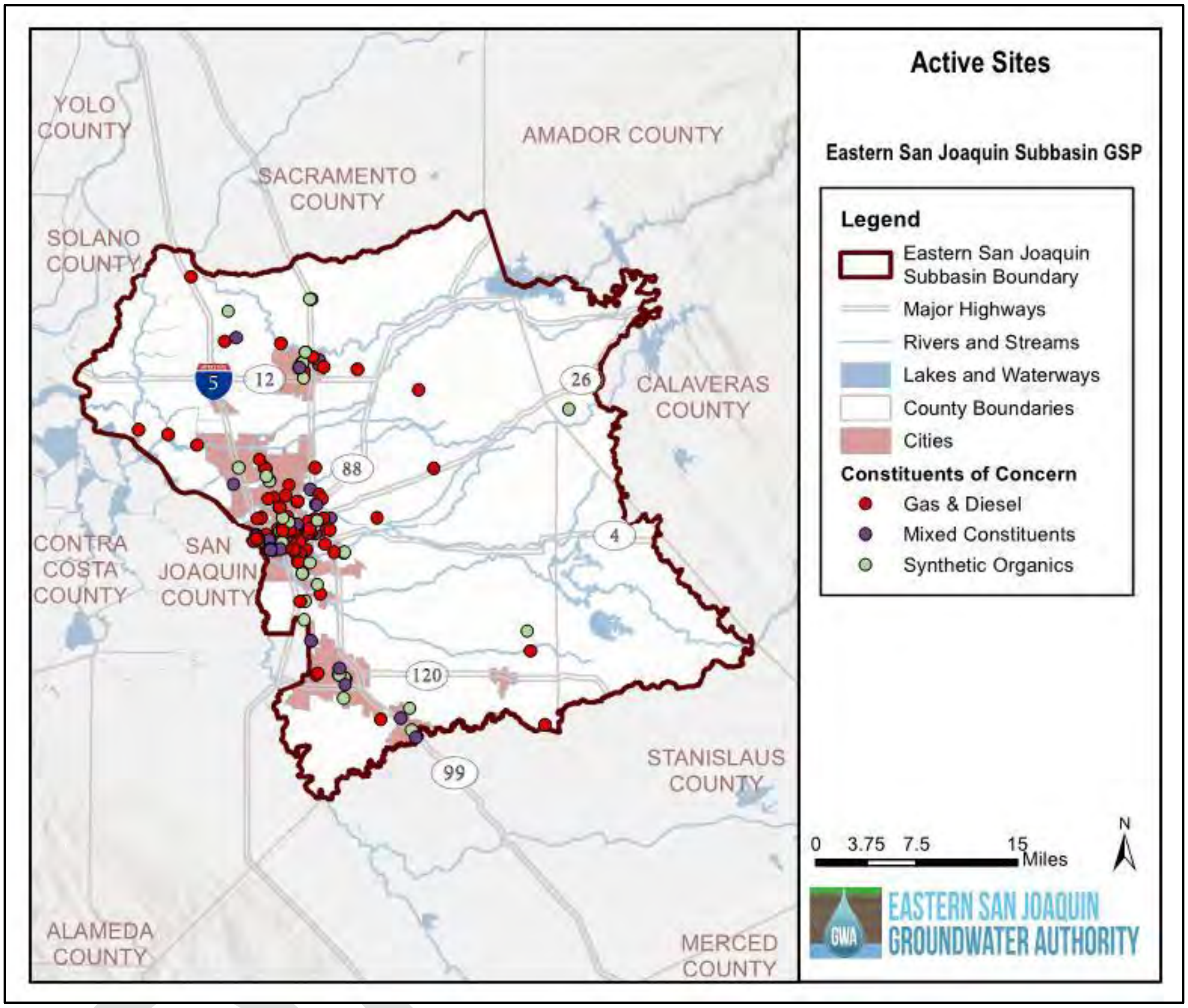
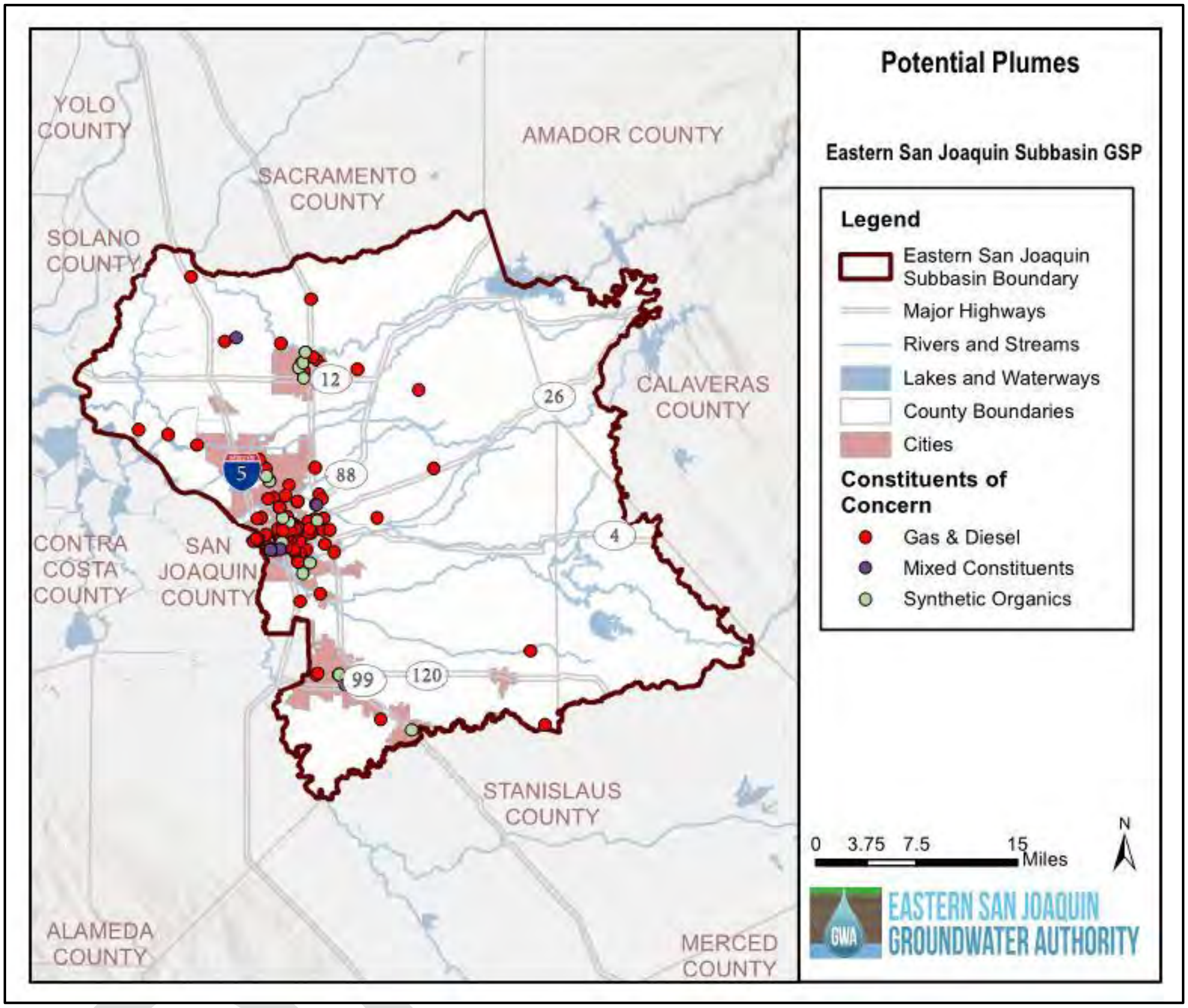


Figure 2-63: Active Sites with the Potential to Cause Plumes



2.2.4.4.1 Publicized Plumes in and near the Subbasin

As indicated above, the Eastern San Joaquin Subbasin has numerous open cleanup sites, including areas contaminated by chlorinated solvents, methyl tertiary-butyl ether (MtBE), pesticides and herbicides, and leaking underground storage tanks. Plume sites are often clustered around urban centers but are also found near sites where historical industrial or agricultural practices have released contaminants of concern. While other plumes exist in and around the Subbasin, three specific plumes have been highly publicized: the Lodi Plumes, the Sharpe Army Depot Plume, and the Occidental Chemical Corporation Plume

In the late 1980s, the City of Lodi discovered the chlorinated solvents perchloroethylene (PCE) and trichloroethene (TCE) in drinking water supplies and pursued a groundwater investigation that revealed a series of five separate plume areas located in the northeastern portion of the City: the Northern, Western, Central, Southern, and Busy Bee plumes. The Busy Bee plume, named after a dry cleaner business that previously operated on the site, now has regulatory closure and with cleanup moving toward completion under CVRWQCB oversite (Water Resources Control Board, 2011).

Groundwater contamination plumes in the City of Lathrop, located just outside the Subbasin boundary, include the Sharpe Army Depot and Occidental Chemical Corporation sites. Contamination of groundwater at the Sharpe Army Depot consists primarily of trichloroethene, tetrachloroethene, and cis-1,2-dichloroethene from historical industrial activities related to military activities. Due to concerns of potential contamination, the City abandoned City wells in the area. Three groundwater extraction and treatment systems are located at Sharpe Army Dept and are used to treat existing groundwater (EKI Environment & Water, 2015).

The Occidental Chemical Corporation Plume was discovered in the late 1970s and is the result of former leaking wastewater holding ponds containing pesticides and chemicals used for equipment cleaning by the Occidental Chemical Corporation. Contaminants of concern include the pesticides DBCP and EDB, 2,3,4,5-tetrahydrothiopene-1, 1-dioxide, sulfate, nitrate, chloride, lindane, and BHC (RWQCB, 2012). Since the discovery of these plumes in the 1980s, groundwater has been monitored and evaluated at these point source locations and has resulted in the removal of contaminant sources and the implementation of remedial activities such as the installation of groundwater extraction and remedial systems, implementation of a Salinity Reduction Plan, and mandated WDRs (RWQCB, 2012).

2.2.4.4.2 Petroleum Hydrocarbons

Approximately 134 sites in the Eastern San Joaquin Subbasin are identified as actively investigating or remediating an unauthorized release of petroleum hydrocarbons, according to the GeoTracker and EnviroStor databases. Of these sites, petroleum hydrocarbon constituents are most commonly fuels (diesel, gasoline, motor oil, or aviation fuel) and VOCs commonly added to fuels, including MTBE and BTEX constituents. Concentrations of petroleum hydrocarbons have not been modeled across the Subbasin; concentrations are local and site specific. A summary description of the aforementioned constituents is provided in Table 2-10 below:

Table 2-10: MCLs for Common Petroleum Hydrocarbons and MTBE

Constituent	Source	Primary MCL[1]
MTBE	Oxygenate commonly added to gasoline	13 µg/L
BTEX		
Benzene	Industrial solvent added to crude oil paint, varnish, and lacquer thinner	1 µg/L
Toluene	Aromatic hydrocarbon used in industrial feedstock, as a solvent, and to produce benzene and added to gasoline	15 µg/L
Ethylbenzene	Used as a solvent and added to fuel, asphalt, and naphthalene	300 µg/L
Xylenes	Naturally occurring in petroleum, coal and wood tar	1.750 mg/L

Notes:
[1] Source: (SWRCB, 2018)

2.2.4.4.3 Synthetic Organics

Approximately 47 sites in the Eastern San Joaquin Subbasin are identified as actively investigating or remediating an unauthorized release of synthetic organics, according to the GeoTracker and EnviroStor databases. Of these sites, pesticides, herbicides, fertilizer, and pesticides are the most common constituents. Other constituents include VOCs such as PCE and TCE. Concentrations of synthetic organics have not been modeled across the Subbasin; concentrations are local and site specific. For context, a brief description of the aforementioned VOCs is provided in Table 2-11.

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Table 2-11: MCLs for Common Synthetic Organic Constituents

Constituent	Source	Primary MCL[1]
TCE	Used as a solvent in manufacturing facilities and dry cleaners	5 µg/L
PCE	Used as a solvent in manufacturing facilities, printing shops, and auto repair facilities	5 µg/L

Notes:
[1] Source: (SWRCB, 2018)

2.2.4.4.4 Mixed Constituents

Approximately 28 sites in the Eastern San Joaquin Subbasin are identified as actively investigating or remediating an unauthorized release of mixed constituents, according to the GeoTracker and EnviroStor databases. Sites with mixed constituents are those that include a release of more than one type of contaminant, such as a mix of heavy metals, diesel, inorganics, and/or organics. Of these sites, the most common constituents include a mixture of heavy metals (chromium, arsenic, and lead), inorganics, and solvents. The sources and primary MCL for many contaminants found in the 'mixed constituents' classification have been discussed throughout Section 2.2.4.

2.2.4.4.5 Emerging Contaminants

Many chemical and microbial constituents that have not historically been considered as contaminants are occasionally, and in some cases with increasing frequency, detected in groundwater. These newly recognized (or emerging) contaminants are commonly derived from municipal, agricultural, industrial wastewater, and domestic wastewater sources and pathways. These newly recognized contaminants are dispersed to the environment from domestic, commercial, and industrial uses of common household products and include caffeine, artificial sweeteners, pharmaceuticals, cleaning products, and other personal care products. Residual waste products of genetically modified organisms are also of potential concern. Several studies, such as by Watanabe et al. in 2010, have recently been published or are underway regarding the potential link between dairies and the occurrence of pharmaceuticals in shallow groundwater in the San Joaquin Valley.

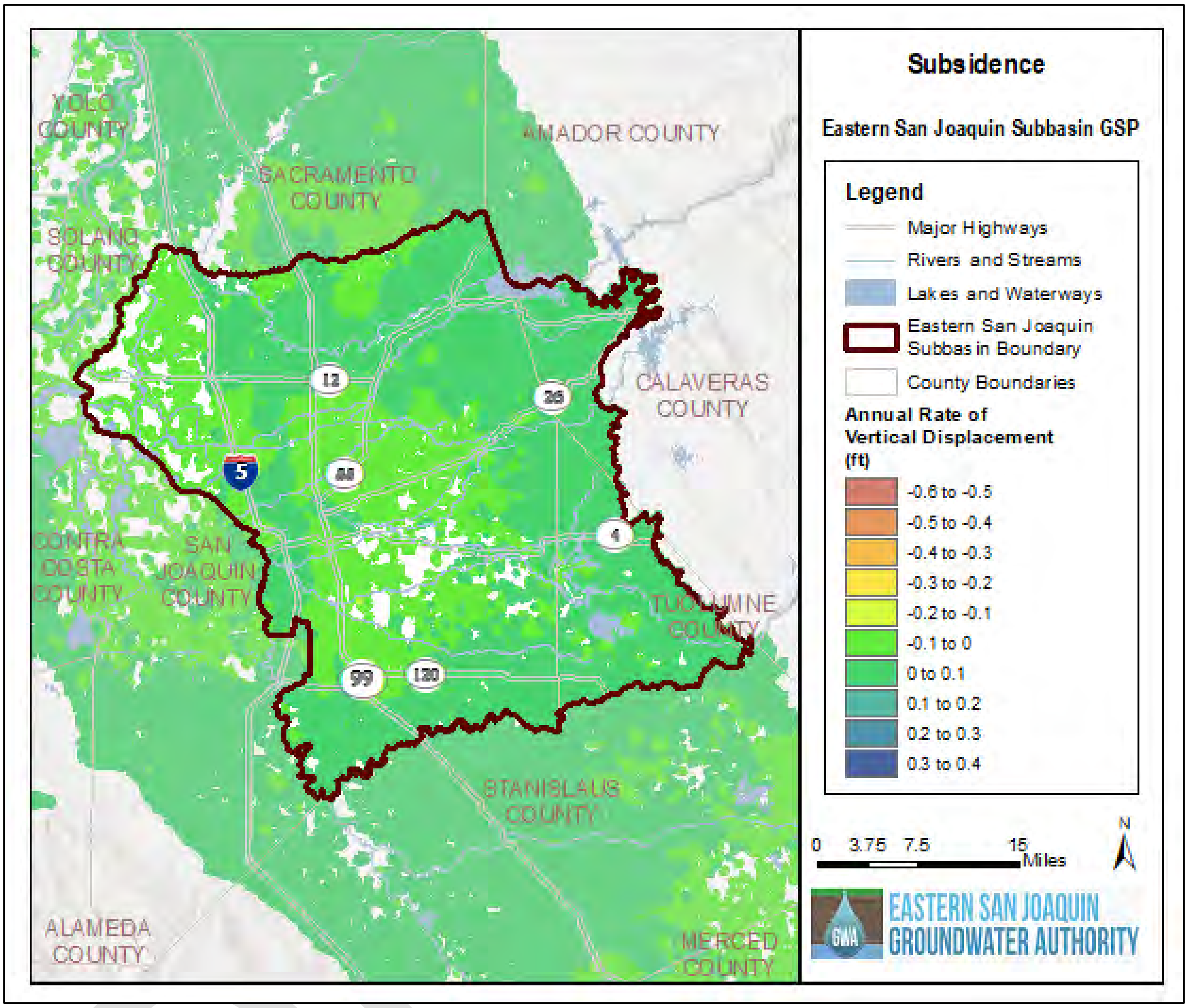
Perfluorooctanesulfonic acid (PFOS) and perfluorooctantoic acid (PFOA) are organic chemicals synthesized for water and lipid resistance, used in a wide variety of consumer products as well as fire-retarding foam and various industrial processes. These chemicals tend to accumulate in groundwater, though typically in a localized area in association with a specific facility, such as a factory or airfield (California Water Boards, 2018). There are currently no MCLs for PFOS or PFOA; however, the USEPA is moving forward with the MCL process for (USEPA, 2019). The USEPA has recommended municipalities notify customers at levels at or greater than 70 PPT in water supplies, and California's DDW has established notification levels at 13 PPT for PFROS and 14 PPT for PFOA (SWRCB, 2019). The MCL for 1,2,3-Trichloropropane (1,2,3-TCP) is 0.005 µg/L and is regulated as of January 1, 2018. The solvent is typically found in industrial or hazardous waste sites (SWRCB, 2019).

Currently, data on PFOS, PFOA, and 1,2,3-TCP is limited in the Eastern San Joaquin Subbasin since these are emerging contaminants.

2.2.5 Land Subsidence

Subsidence has not historically been an area of concern in the Eastern San Joaquin Subbasin as there are no records of significant and unreasonable impacts from subsidence. Figure 2-64 shows regional subsidence produced from Interferometric Synthetic Aperture Radar (InSAR) data. InSAR is a satellite-based method for showing ground-surface displacement over time. This figure illustrates that subsidence has historically been minimal in the Subbasin and surrounding areas (ranging from -0.1 to 0.1 feet of vertical displacement annually). See section 2.1.5 for a discussion of the soils and clays within the Subbasin, including the extent of Corcoran Clay.

Figure 2-64: Subsidence (Annual Rate of Vertical Displacement)



2.2.6 Interconnected Surface Water Systems

Interconnected surface waters are surface water features that are hydraulically connected by a saturated zone to the groundwater system. In these systems, water table and surface water features intersect at the same elevations and locations. Interconnected surface waters may be either gaining or losing, wherein the surface water feature itself is either gaining water from the aquifer system or losing water to the aquifer system.

In the Eastern San Joaquin Subbasin, groundwater discharge from the aquifer is primarily through groundwater pumping. However, groundwater also discharges to streams where groundwater elevations are higher than the streambed. Figure 2-65 shows gaining streams in blue where groundwater discharges to rivers, losing streams in red where streams lose water to the groundwater system, and mixed streams (gaining or losing less than 75 percent of the time) in orange. This analysis was based on modeling results from the historical calibration of the ESJWRM for approximately 900 stream nodes in the Eastern San Joaquin Subbasin.

Stream connectivity was analyzed by comparing monthly groundwater elevations from the historical calibration of the ESJWRM to streambed elevations along the streams represented in ESJWRM. Shown in Figure 2-66 are locations where streams are interconnected at least 75 percent of the time (shown in blue) or disconnected (shown in green).

Figure 2-65: Losing and Gaining Streams

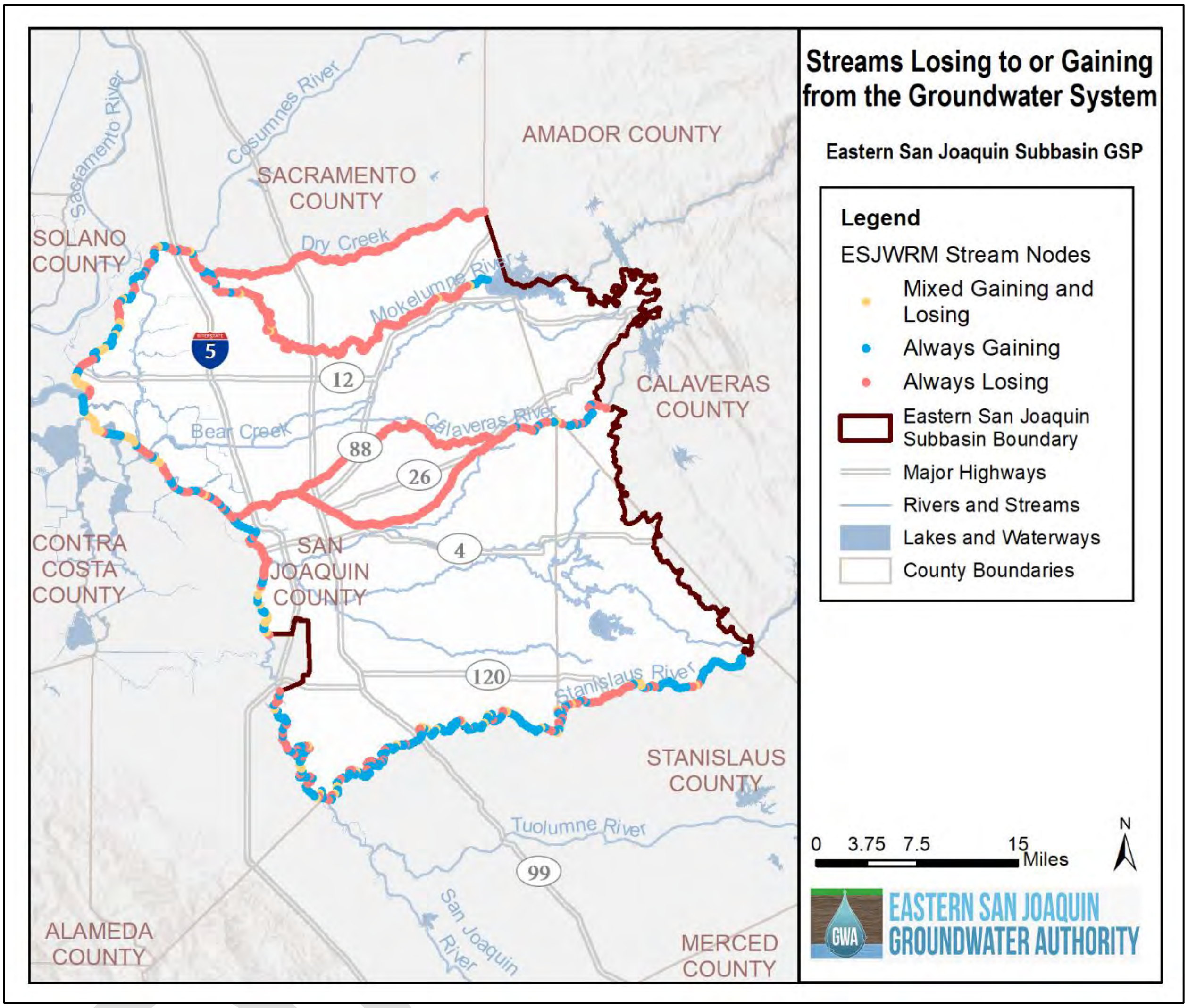
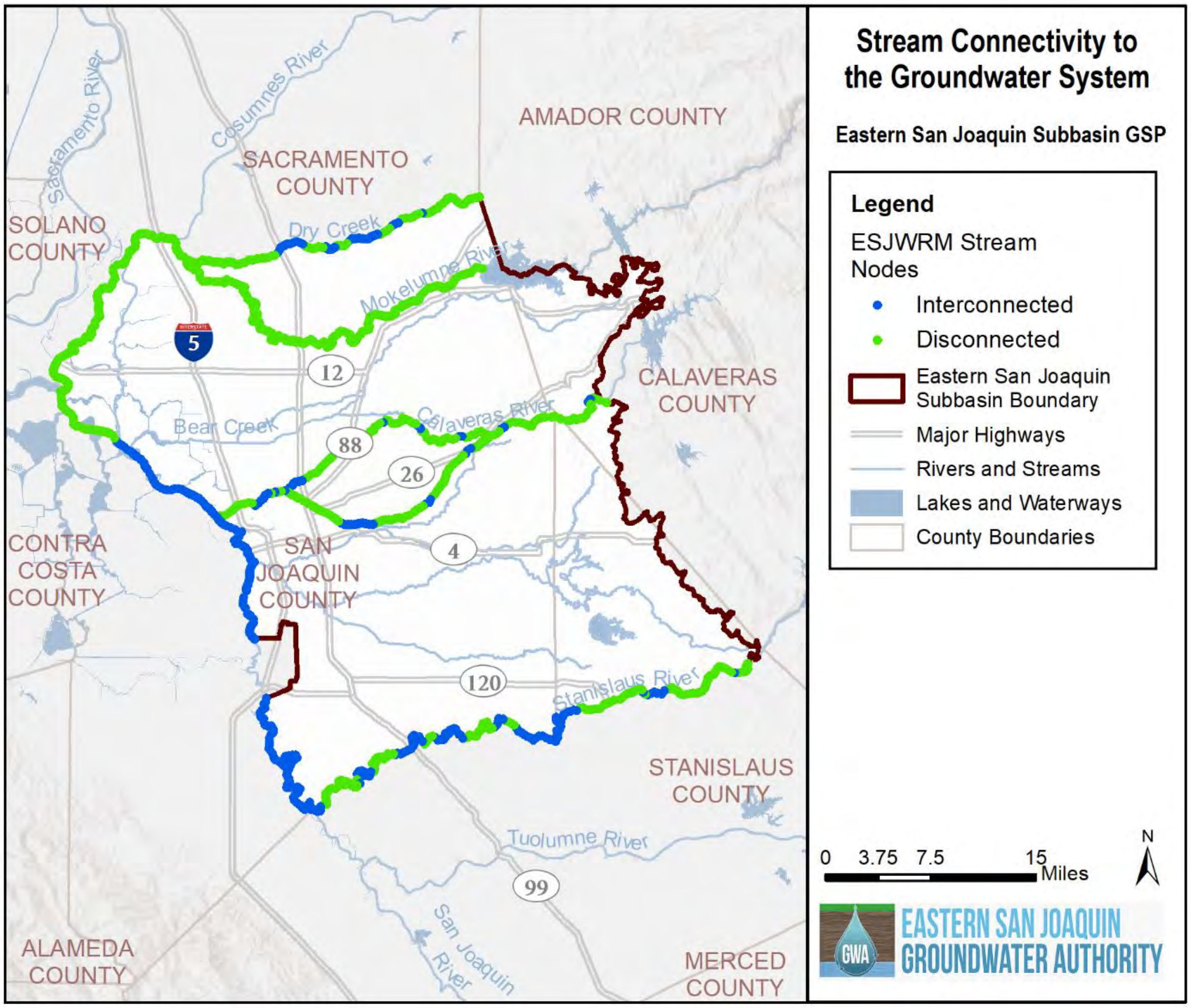


Figure 2-66: Interconnected and Disconnected Streams



2.2.7 Groundwater-Dependent Ecosystems

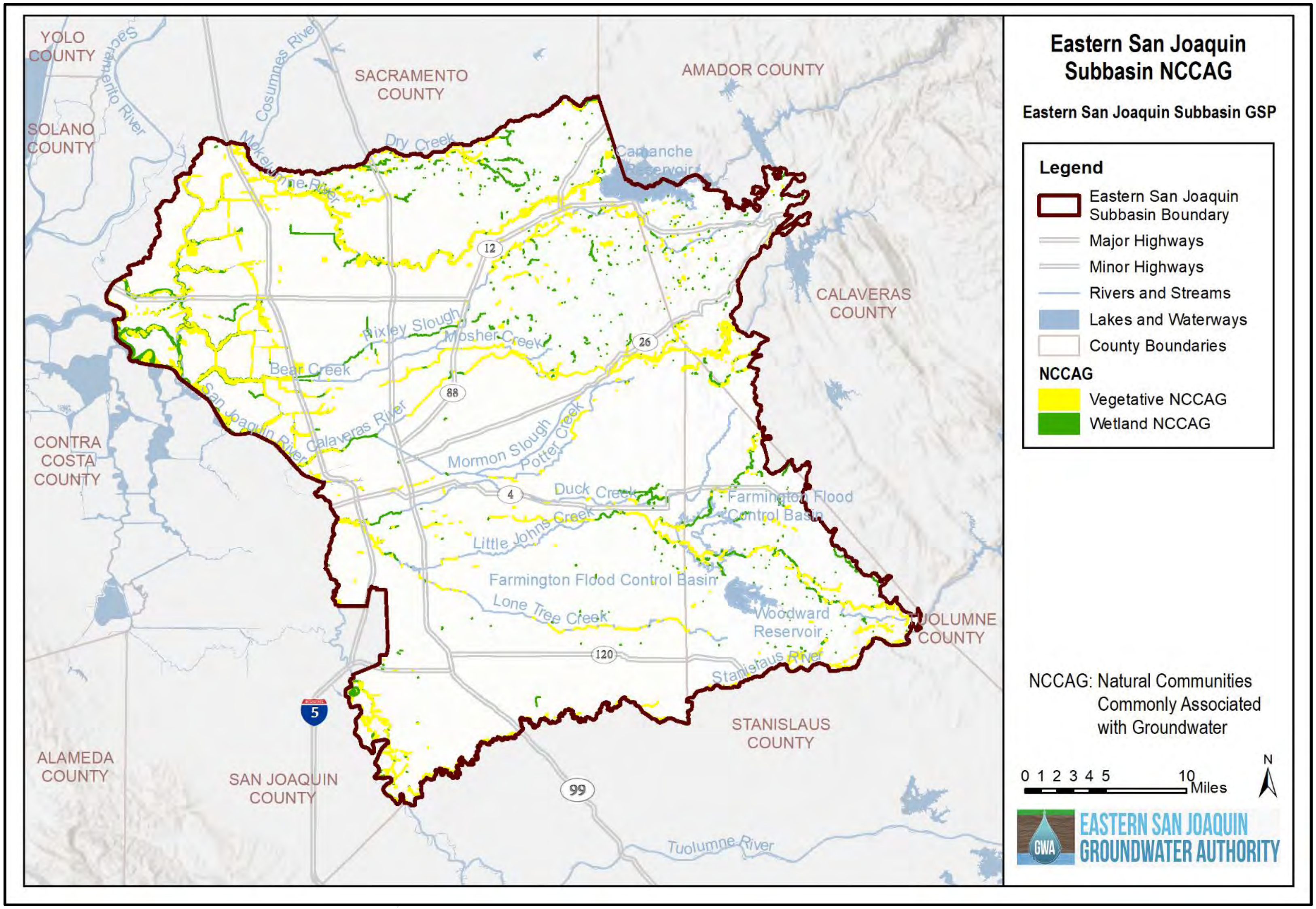
Groundwater-dependent ecosystems (GDEs) are defined in the GSP regulations as “ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface.” SGMA requires the identification of GDEs but does not require that sustainable management criteria be established to manage these areas.

GDEs exist where vegetation accesses shallow groundwater for survival; without the access to shallow groundwater, these plants would die. Thus, this Plan identifies GDEs within the Eastern San Joaquin Subbasin based on determining the areas where vegetation is dependent on groundwater.

2.2.8 Methodology for GDE Identification

The Natural Communities Commonly Associated with Groundwater (NCCAG) database was used as a starting point to identify natural communities within the Subbasin. The NCCAG database was developed from a working group comprised of DWR, California Department of Fish and Wildlife (CDFW), and The Nature Conservancy (TNC) by reviewing publicly available state and federal agency datasets that mapped California vegetation, wetlands, springs, and seeps and by conducting a screening process to retain types and locations commonly known to be associated with groundwater. The results were compiled into the NCCAG database with two habitat classes defined. The first class includes wetland features commonly associated with the surface expression of groundwater under natural, unmodified conditions. The second class includes vegetation types commonly associated with the sub-surface presence of groundwater (phreatophytes). Figure 2-67 shows these two classes of NCCAG areas within the Eastern San Joaquin Subbasin.

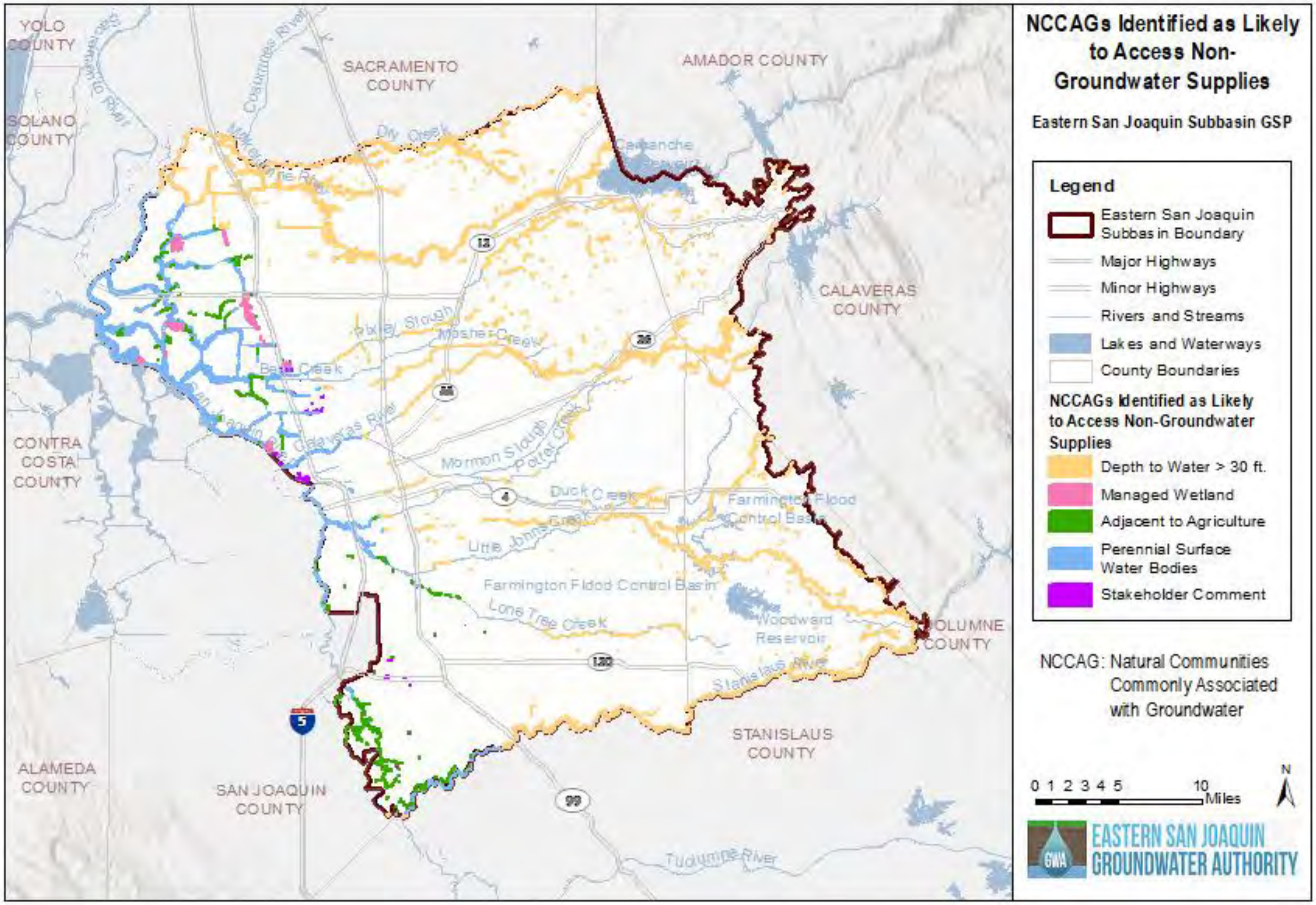
Figure 2-67: Natural Communities Commonly Associated with Groundwater (NCCAG)



This Plan identifies GDEs as NCCAG communities that are dependent on groundwater. The NCCAG database was refined to identify only communities without alternate water supplies. This was done by confirming sufficiently shallow groundwater levels and examining distance from alternative water supplies. This GSP does not consider communities without access to shallow groundwater and in close proximity to alternative water supplies to be groundwater dependent. Figure 2-68 shows the locations of NCCAGs that were excluded through this process. This includes areas with a depth to groundwater greater than 30 feet, areas close to managed wetlands, areas adjacent to agriculture, areas near perennial surface water bodies, and areas removed based on stakeholder comment. Several of these criteria are described in more detail in the following pages. Areas identified as GDEs were ground-truthed with Workgroup members and GSA staff. Through this process, areas identified as irrigated parcels were removed from the list of identified GDEs.

The distinction between GDEs and other NCCAG areas is important from a management perspective, as no land use protections are conveyed through SGMA. Management of NCCAGs may require greater focus on land use or irrigation activities, whereas GDEs are expected to be more responsive to changes in groundwater management. The rigorous analysis to identify GDEs was developed to focus groundwater management activities on the most appropriate areas.

Figure 2-68: NCCAGs Identified as Likely to Access Non-groundwater Water Supplies



This Plan identifies GDEs as NCCAG-identified areas the meet all of the below criteria.

- Areas with a depth to groundwater less than 30 feet – Oak trees are considered the deepest-rooted plant in the region with a root zone of roughly 25 feet. Communities with zones where the depth to water in 2015 was less than 30 feet are classified as GDEs in this Plan because they are likely to be supported by groundwater. Even the 25-foot value is considered conservative, as this depth is unlikely to support recruitment of new oak seedlings. Communities in areas with groundwater deeper than 30 feet are assumed to be reliant on other water supplies and not dependent on groundwater. These communities are not considered GDEs and are labeled as “Depth to Water”.

- Areas without alternate water supplies – In addition to having access to shallow groundwater, to be dependent on groundwater there must not be other available water supplies. Areas that are without supplemental water were considered for classification as GDEs. This was defined as areas that are:

  - At least 50 feet from irrigated agricultural lands – Irrigated agricultural lands are dependent on reliable water supplies to ensure a successful harvest, and surface water or deeper groundwater is used to irrigate crops in the Eastern San Joaquin Subbasin. Such irrigation benefits not only the crops, but also surrounding vegetation, regardless of the condition of the underlying aquifer. Areas farther than 50 feet from irrigated lands were assumed to be supported by groundwater, or water supplies other than agricultural irrigation water, and were considered for classification as GDEs. Areas likely dependent on water from irrigated fields are represented as NCCAG areas with access to non-groundwater water supplies. 50 feet was used to reflect non-ponded conditions in the fields.

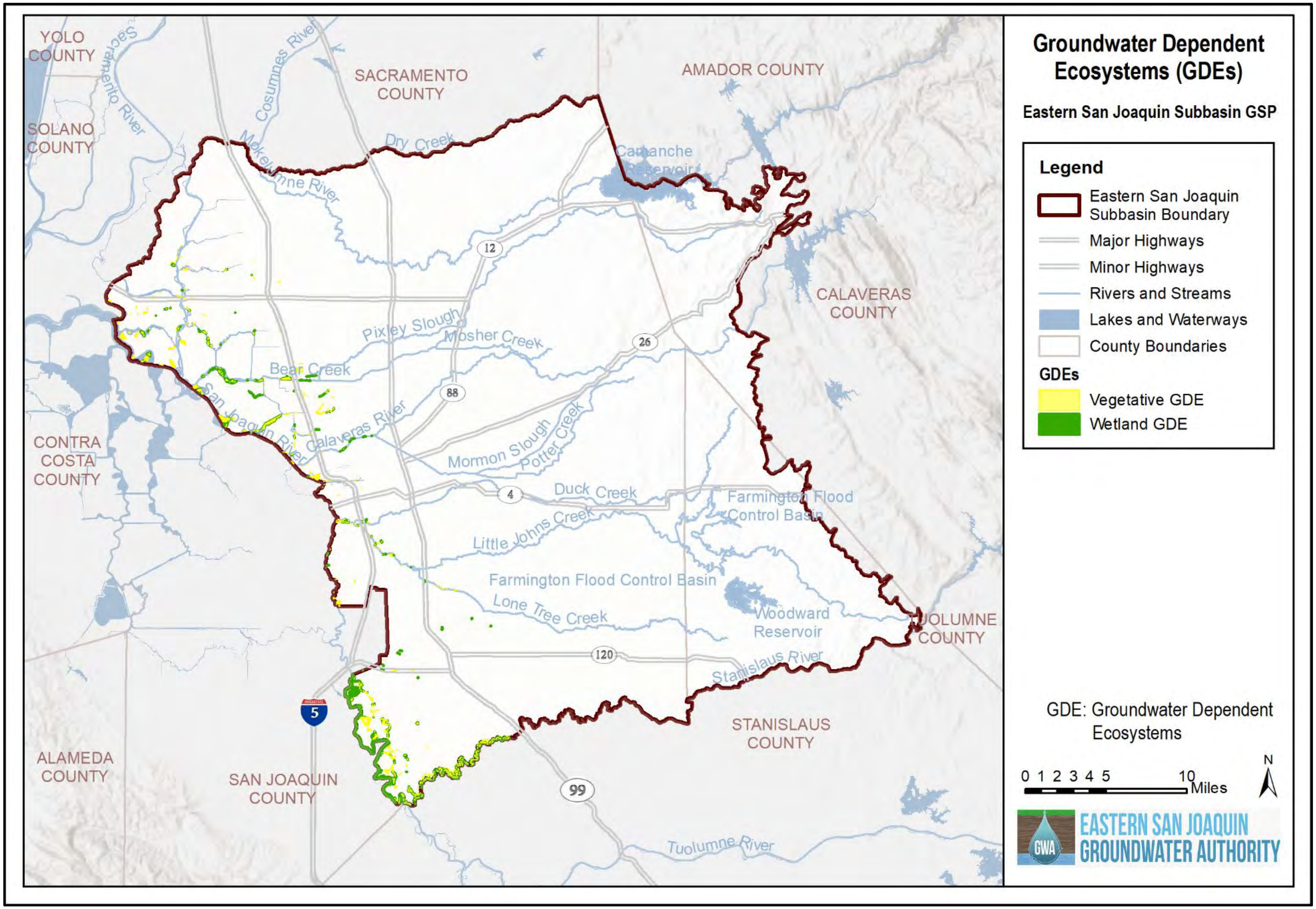
  - At least 150 feet from managed wetlands that receive supplemental water – Managed wetlands receive supplemental water to support wildlife habitat. The wetlands were identified and reviewed with local water managers to verify supplemental water deliveries. Areas at least 150 feet from the managed wetlands are assumed to be unable to access the supplemental water and dependent on groundwater and were considered for classification as GDEs. Managed wetlands and areas within 150 feet of managed wetlands are not assumed to be dependent on groundwater, as they can access delivered water supplies regardless of the condition of the underlying aquifer. This Plan does not consider these areas as GDEs and are labeled as NCCAG areas with access to non-groundwater water supplies. 150 feet was used to reflect ponded conditions at the wetlands.

  - At least 150 feet from perennial surface water bodies – Perennial surface water bodies provide year-round water supplies that can be accessed by adjacent vegetation. These water bodies include much of the Delta; large, managed rivers; and smaller water bodies that flow throughout the summer due to agricultural deliveries or tailwater. Areas at least 150 feet from the perennial surface water bodies are assumed to be unable to access the water from the perennial surface water bodies and dependent on groundwater and were considered for classification as GDEs. Areas within 150 feet of these surface water bodies are not assumed to be dependent on groundwater, as they can access water from the river regardless of the condition of the underlying aquifer. These are labeled as NCCAG areas with access to non-groundwater water supplies. 150 feet was used to reflect open water conditions in the surface water bodies.

2.2.9 Areas Identified as GDEs

Following the methodology presented above, this Plan identifies several GDEs, primarily located along the western boundary of the Subbasin, in the Delta areas where groundwater is typically shallow. These areas are divided into two categories: vegetative GDEs and wetland GDEs, as shown in Figure 2-69.

Figure 2-69: Areas Identified as GDEs



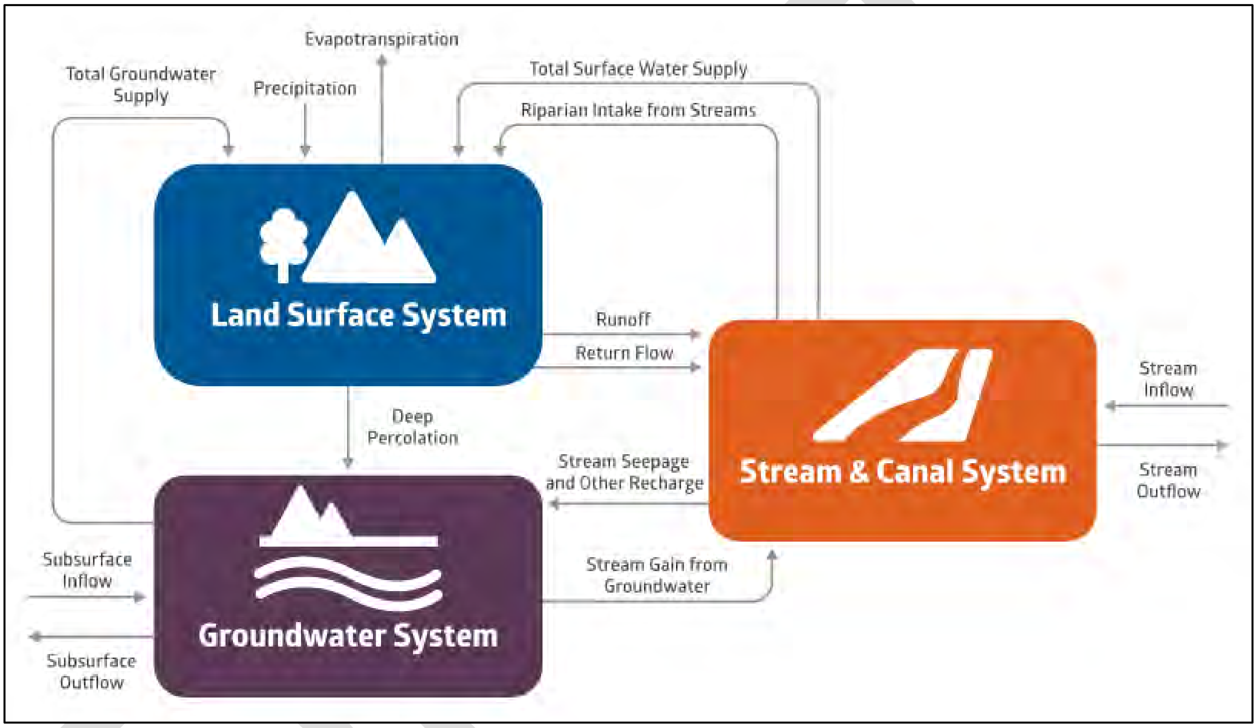
The current and historical conditions discussed above are further expanded upon in Chapter 3: Sustainable Management Criteria, and used to define measurable objectives, identify interim milestones, and establish undesirable results. Groundwater elevations and quality are targeted based on existing conditions, and existing programs lay the framework for monitoring associated with thresholds set for the GSP.

2.3 WATER BUDGETS

2.3.1 Water Budget Background Information

Water budgets are developed to provide a quantitative account of water entering and leaving the Eastern San Joaquin Subbasin. Water entering and leaving the Subbasin includes flows at the surface and in the subsurface environment. Water enters and leaves due to natural conditions, such as precipitation and streamflow, and/or through human activities, such as groundwater pumping or recharge from applied water. Additionally, interconnection between the groundwater system and rivers/streams accounts for other components of the water budget. Figure 2-70 depicts the major components of a water budget and their interconnection as presented in the context of stream, land surface, and groundwater systems.

Figure 2-70: Generalized Water Budget Diagram



Quantities presented for the water budget components of the Eastern San Joaquin Subbasin provide information on historical, current, and projected conditions as they relate to hydrology, water demand, water supply, land use, population, climate variability, groundwater and surface water interaction, and groundwater flow. This information can assist in the management of the Subbasin by identifying the relationship between different components affecting the water budget in the Subbasin, which provides context in the development and implementation of strategies and policies to achieve Subbasin groundwater sustainability conditions. Water budget quantities presented are based on the simulation results from the ESJWRM.

The ESJWRM was developed to be the main analysis tool supporting the development of the GSP for the Subbasin. The ESJWRM is a quasi-three-dimensional finite element model developed using the Integrated Water Flow Model (IWFM) simulation code (Dogrul et al., 2017). Using data from Federal, State, and local resources, the ESJWRM was calibrated for the 20-year hydrologic period of October 1995 to September 2015 (water years 1996 through 2015) by comparing simulated groundwater levels and streamflow records with historical observed records. Development of the model involved the study and analysis of hydrogeologic conditions, agricultural and urban water demands, agricultural and urban water supplies, and an evaluation of regional water quality conditions. ESJWRM development is documented in a report, "Eastern San Joaquin Water Resources Model (ESJWRM) Final Report," published in August 2018 and available in Appendix 2-A.

Consistent with §354.18 of the Regulations (California Code of Regulations), the water budgets presented in this document encompass the combined surface and groundwater system of the Eastern San Joaquin Subbasin. The Subbasin water budget focuses on the full water year (12 months spanning October 1 of the previous year to September 30 of the year in question), with some consideration of monthly variability.

The Regulations require that the annual water budget quantify three different conditions: historical, current, and projected. Budgets are developed to capture typical conditions during these time periods. Typical conditions are developed through selecting historical hydrologic periods that incorporate droughts, wet periods, and normal periods. By incorporating these varied conditions within the budgets, the Subbasin is analyzed under certain hydrologic conditions, such as drought or very wet events, along with long-term averages. This Plan relies on historical hydrology to identify time periods for water budget analysis and uses the ESJWRM and associated data to develop the water budget and resulting budget estimates. The water budget components developed for the Eastern San Joaquin Subbasin are based upon estimates developed from historical and projected data as well as modeling assumptions. Because this process is new, and has been developed under time constraints, the water budget assumptions will be refined in the future, the water budget may change, and the conclusions and recommendations derived from the water budget may also change.

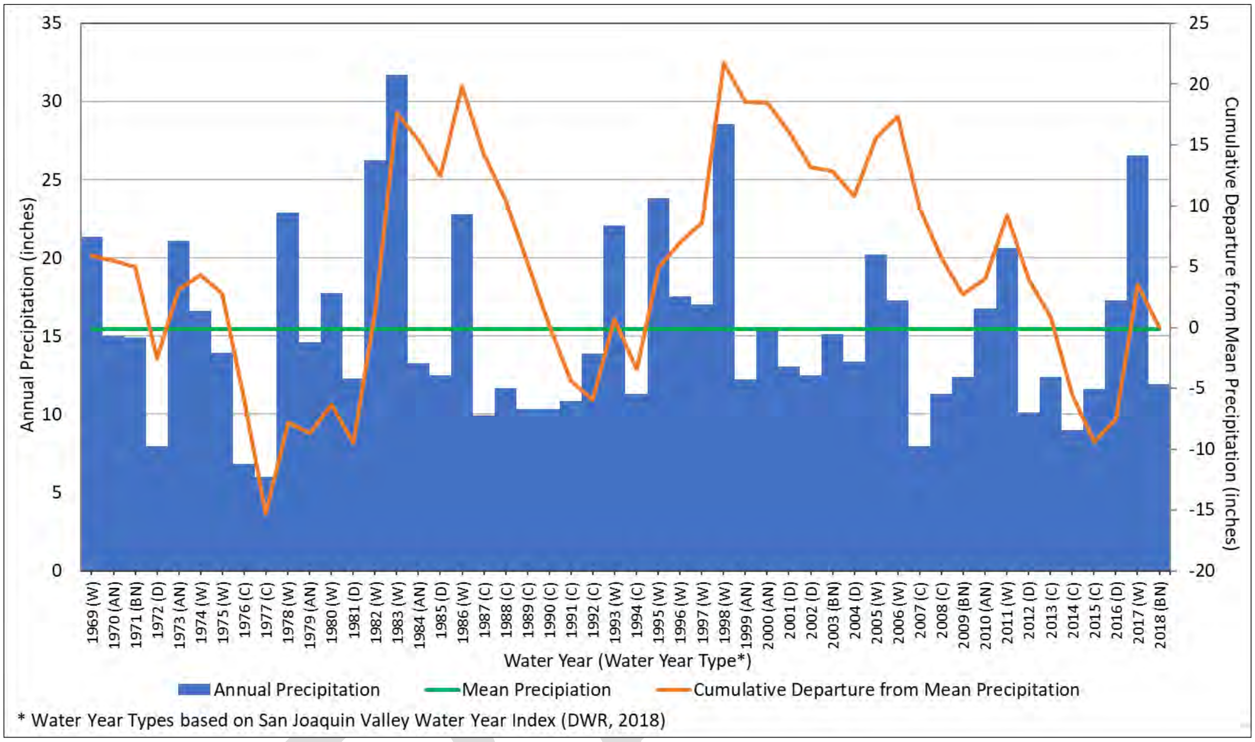
2.3.2 Identification of Hydrologic Periods

The historical hydrologic periods used in this Plan were selected to meet the requirements of developing historical, current, and projected water budgets. The Regulations require that the projected water budget reflect a 50-year hydrologic period in order to project how the Subbasin's land and groundwater systems may react under long-term average hydrologic conditions. Consistent with the Regulations, the 50-year historical record characterizes future conditions with respect to precipitation, evapotranspiration, and streamflow. Historical precipitation or rainfall in the Eastern San Joaquin Subbasin was used to identify a hydrologic period that would provide a representation of wet and dry periods and long-term average conditions needed for water budget analyses. Rainfall data for the Subbasin is derived from the PRISM (Precipitation-Elevation Regressions on Independent Slopes Model) dataset of the DWR's California Simulation of Evapotranspiration of Applied Water (CALSIMETAW) model. Precipitation-Elevation Regressions on Independent Slopes Model (PRISM) is a spatial estimation of rainfall data developed using monitoring network point data and interpolated using a variety of factors (Oregon State University, 2019).

Wet and dry hydrologic periods were identified by evaluating the cumulative departure from mean precipitation. Under this method, the long-term average precipitation is subtracted from annual precipitation within each water year to develop the departure from mean precipitation for each water year. Wet years have a positive departure and dry years have a negative departure; a year with exactly average precipitation would have zero departure. Starting at the first year analyzed, the departures are added cumulatively for each year. So, if the departure for Year 1 is 5 inches and the departure for Year 2 is -2 inches, the cumulative departure would be 5 inches for Year 1 and 3 inches (5 plus -2) for Year 2. Figure 2-71 graphically illustrates the cumulative departure of the spatially averaged rainfall within the Eastern San Joaquin Subbasin. The figure includes bars displaying annual precipitation for each water year from 1969 through 2018 and a horizontal line representing the mean precipitation of 15.4 inches. The cumulative departure from mean precipitation is based on these data sets and is displayed as a line that highlights wet periods with upward slopes (positive departure) and dry periods with downward slopes (negative departure). More severe events are shown by steeper slopes and greater changes. For example, the period from 1975 to 1977 illustrates a short period with dramatically dry conditions (6-inch decline per year in cumulative departure).

The PRISM estimates for rainfall in the Subbasin were confirmed by comparing the cumulative departure from mean precipitation results to the water year types in the San Joaquin Valley Water Year Hydrologic Classification (DWR, 2018), which classifies water years 1901 through 2018 as wet, above normal, below normal, dry, and critical based on inflows to major reservoirs or lakes. Wet (W) or Above Normal (AN) years show upward sloping cumulative departures, while Below Normal (BN), Dry (D), or Critical (C) water year types show downward trending cumulative departures (Figure 2-71).

Figure 2-71: 50-Year Historical Precipitation and Cumulative Departure from Mean Precipitation



2.3.3 Use of the ESJWRM and Associated Data in Water Budget Development

This Plan developed water budgets utilizing the ESJWRM, a fully integrated surface and groundwater flow model covering the Eastern San Joaquin Subbasin, as well as the Cosumnes Subbasin to the north and the Modesto Subbasin to the south. The adjacent subbasins were included in the ESJWRM boundaries to be consistent with past local modeling efforts and to better simulate boundary flows to/from the north and south of the Subbasin. This Plan provides a water budget for the Eastern San Joaquin Subbasin portion of the ESJWRM.

With the ESJWRM as the underlying framework, three model scenarios were developed representing historical, current, and projected conditions in the Eastern San Joaquin Subbasin, as discussed below:

- Historical water budget represents the historical model calibration period, which covers water years 1996 through 2015 (20 years).
- Current water budget represents estimated long-term average conditions of the Subbasin assuming that the current level of development and agricultural demand persists over a long-term period of hydrologic conditions (the 50-year period represented by water years 1969 through 2018).
- Projected water budget represents estimated long-term conditions of the Subbasin under the foreseeable future level of development over a long-term period of hydrologic conditions (the 50-year period represented by water years 1969 through 2018).

2.3.4 Water Budget Definitions and Assumptions

Definitions and assumptions for the historical, current, and projected water budgets are provided in the sections below and summarized in Table 2-12.

Table 2-12: Summary of Water Budget Assumptions (Historical, Current, and Projected Periods)

Water Budget Type	Historical	Current	Projected
Tool	ESJWRM	ESJWRM	ESJWRM
Scenario	Historical Calibration	Current Conditions	Projected Conditions
Hydrologic Years	Water Years 1996-2015	Water Years 1969-2018	Water Years 1969-2018
Level of Development[1]	Historical[5]	Current	General Plan or Sphere of Influence Buildout
Agricultural Demand[2]	Historical[5]	Current (2014)	Current (2014), less urban expansion
Urban Demand[3]	Historical[5]	Current (pre-drought)	Projected based on UWMP data
Water Supplies[4]	Historical[5]	Current	Projected based on local information

Notes:

1 The level of development describes the footprint of the urban areas. Historical is the footprint in the historical model period (water years 1996-2015), current is the footprint at the end of the historical model period (water year 2015), and projected reflects the footprint after general plan or sphere of influence urban buildout (approximately water year 2040).

2 Agricultural demand is based on historical cropping patterns and evapotranspiration rates. Current and projected agricultural cropping patterns are assumed to be consistent with DWR's statewide crop mapping of 2014, less any urban buildout in the projected conditions. Future evapotranspiration rates are assumed to remain the same as historical.

3 Historical urban demand includes actual demand and population from UWMPs or other planning efforts. Current demand is assumed to represent demands at a pre-drought level (assumed water year 2013) and water year 2015 population. Projected demand uses projected demand and population from UWMPs or other planning efforts and uses numbers for a buildout level of development (approximately water year 2040).

4 Historical water supplies rely on local district information and records. Projected water supplies were assumed for approximately water year 2040 and may include projects or expansions of supplies currently begun or with funding secured. Current water supplies represent water supplies averaging approximately water years 2012-2015 in the historical records.

5 For more information on historical assumptions, see the published model report (Appendix 2-A) Error! Reference source not found..

2.3.4.1 Assumptions Used in the Historical Water Budget

The historical water budget is intended to evaluate availability and reliability of past surface water supply deliveries, aquifer response to water supply, and demand trends relative to water year type. The historical calibration of the ESJWRM reflects the historical conditions in the Eastern San Joaquin Subbasin over water years 1996-2015. The hydrologic period has an average annual precipitation of approximately 14.7 inches and includes the recent 2012-2015 drought, the wetter years of 1996-2000, and periods of normal precipitation. Regulations require the use of a minimum of 10 years to develop the historical water budget. The entire historical calibration period of the ESJWRM was used to be inclusive of all the data used in developing the ESJWRM and to average over a broader range of different hydrologic conditions. The historical water budget applied an evolving level of development and agricultural demand throughout a 20-year historical hydrology.

Additional details of the data used in the development of the historical calibration can be found in the published model report (Appendix 2-A).

The historical calibration includes the following:

- Hydrologic period: Water Years 1996-2015 (20-year hydrology)
- Stream Flows for Water Years 1996-2015:
    - Dry Creek: No streamflow gaging stations available for Dry Creek; as such, flow estimates from the DWR's California Central Valley surface and groundwater Model (C2VSim) was used (C2VSim-Fg Beta Release, DWR, May 2018)
    - Mokelumne River: Historical records from USGS (Mokelumne River below Camanche Dam, CA)
    - Calaveras River: New Hogan Dam releases
    - Stanislaus River: Historical records from USGS (Stanislaus River below Goodwin Dam near Knights Ferry, CA)
    - San Joaquin River: Historical records from USGS (San Joaquin River near Vernalis, CA)
- Reservoir Operations: Upstream reservoirs regulating streamflows into the Subbasin include Pardee and Camanche on the Mokelumne River; New Hogan on the Calaveras River; and New Melones, Tulloch, and Goodwin on the Stanislaus River. Streamflows entering the Subbasin are regulated releases from respective reservoirs. As such, no changes to the historical operations of the reservoirs are assumed. In addition, two other local reservoirs are included in the model: Woodward and Farmington. The model estimates seepage contributions from these reservoirs to the groundwater system. Water supply deliveries from these reservoirs are based on records provided by the agencies responsible for operation of these reservoirs.
- Land use and cropping patterns are based on the DWR land use surveys (assumed to represent water year 1995), USDA's remote sensing data from the CropScape library for 2007-2015, and the recent, comprehensive, and Subbasin-wide land use survey from DWR as prepared by Land IQ (2014). Local data and information were also utilized to refine and update the cropping patterns, as needed. To fill the gap between 1995 and 2007, all land use and crop categories were interpolated at the spatial resolution level of the model elements to simulate the geographic distribution of various crops.
- Urban water demand is calculated for all the urban areas in the model. Urban centers in Eastern San Joaquin Subbasin are City of Escalon, Linden, Lockeford, City of Lodi, City of Manteca, City of Ripon, and City of Stockton. Demands for other domestic areas are estimated based on rural population. Urban water demand is based on:
    - Urban water use from 2015 Urban Water Management Plans (Cal Water; Calaveras County Water District [CCWD], Cities of Lodi, Manteca, Ripon, and Stockton; Stockton East Water District [SEWD]; and South San Joaquin Irrigation District [SSJID]) or municipal pumping records, used to calculate the per capita water use for each urban center.
    - Urban center population from Urban Water Management Plans (UWMPs), United States Census Bureau, or the California Department of Finance.
- Surface Water Deliveries:
    - Deliveries to agricultural areas: Obtained from agricultural entities in the Subbasin, including Central San Joaquin Water Conservation District [CSJWCD], North San Joaquin Water Conservation District [NSJWCD], Oakdale Irrigation District [OID], SEWD, SSJID, and Woodbridge Irrigation District [WID]

- Deliveries to urban areas: Cities of Lodi, Manteca, and Stockton (including Cal Water and City of Stockton service areas, and unincorporated SJC areas)
- Recharge projects: SEWD's Farmington Groundwater Recharge Program
- Riparian diversions: CCWD, Delta areas, and data from the California Central Valley Surface and Groundwater Model (C2VSim) for riparian diversions off major streams (Dry Creek, Mokelumne River, Calaveras River and related streams, Stanislaus River, San Joaquin River) (C2VSim-Fg Beta Release, DWR, May 2018)

- Groundwater Pumping:
  - District pumping for agricultural/landscape uses: City of Manteca, OID, City of Ripon, and SSJID
  - District pumping for urban uses: Cal Water, City of Escalon, Linden County WD, Lockeford CSD, City of Lodi, City of Manteca, City of Ripon, SEWD, and City of Stockton
  - Data on private pumping was not available, so private pumping was estimated as that which would be required to meet agricultural and rural residential water needs as calculated by the ESJWRM model based on consumptive use methodology (Refer to the ESJWRM documentation for details).

2.3.4.2 Assumptions Used in the Current Water Budget

To analyze the long-term effects of the current level of development on groundwater and surface water conditions and to most appropriately estimate current inflows and outflows for the Subbasin, a current conditions scenario using the ESJWRM was developed for use in estimating the current water budget. The current conditions scenario applies the recent level of development and agricultural demand to a 50-year historical hydrology. As discussed below, current conditions are not necessarily indicative of one year and are instead a compilation of data assumed representative of average recent conditions.

The current conditions scenario includes the following assumptions:

- Hydrologic Period: Water Years 1969-2018 (50-year hydrology)
- Stream Flows for Water Years 1969-2018:
  - Dry Creek: No streamflow gaging stations available for Dry Creek, as such, flow estimates from the DWR's C2VSim was used (C2VSim-Fg Beta Release, DWR, May 2018)
  - Mokelumne River: Historical records from USGS (Mokelumne River below Camanche Dam, CA)
  - Calaveras River: Historical records from USGS (Calaveras River below New Hogan Dam near Valley Springs, CA) and New Hogan Dam releases
  - Stanislaus River: Historical records from USGS (Stanislaus River below Goodwin Dam near Knights Ferry, CA)
  - San Joaquin River: Historical records from USGS (San Joaquin River near Vernalis, CA)
- Reservoir Operations: Upstream reservoirs regulating streamflows into the Subbasin include Pardee and Camanche on the Mokelumne River; New Hogan on the Calaveras River; and New Melones, Tulloch, and Goodwin on the Stanislaus River. Current condition scenario assumes that the historical operations of the reservoirs over the 50-year hydrologic records were in place and no changes are made.

- Land use and cropping patterns are based on the most recent, comprehensive, and Subbasin-wide land use survey from DWR as prepared by LandIQ (CA DWR, 2014), with adjustments based on local information and input.
- Urban water demands are calculated for all the urban areas in the model. Urban centers in Eastern San Joaquin Subbasin are City of Escalon, Linden, Lockeford, City of Lodi, City of Manteca, City of Ripon, and City of Stockton. Demands for other domestic areas are estimated based on rural population. Urban water demand is based on:
    - Urban water use for 2013 from 2015 Urban Water Management Plans (Cal Water; CCWD, Cities of Lodi, Manteca, Ripon, and Stockton; SEWD; and SSJID) or municipal pumping records, used to calculate the per capita water use for each urban center under normal (pre-drought) water use conditions.
    - Urban center population from the 2015 Urban Water Management Plans, United States Census Bureau, or the California Department of Finance for 2015. No growth assumed during scenario.
- Surface water delivery data for the 50-year hydrologic period was estimated based on average values for similar water year types from the historical calibration, taking into consideration any changes to delivery volumes that occurred within the historical model. Diversion points and delivery areas were assumed to remain the same as the historical calibration. Surface water deliveries include:
    - <u>Deliveries to agricultural areas</u>: CSJWCD, NSJWCD, OID, SEWD, SSJID, and WID
    - <u>Deliveries to urban areas</u>: Cities of Lodi, Manteca, and Stockton (including Cal Water and City of Stockton service areas, and unincorporated SJC areas)
    - <u>Recycling or recharge projects</u>: Recycled water for Cities of Lodi and Manteca; SEWD's Farmington Groundwater Recharge Program; and NSJWCD's Tracy Lakes Recharge Project
    - <u>Riparian</u>: CCWD, Delta areas, and data from C2VSim for riparian diversions off major streams (Dry Creek, Mokelumne River, Calaveras River, Stanislaus River, and San Joaquin River)
- As private groundwater pumping was estimated by ESJWRM in the historical calibration, there is no local estimate of current private groundwater pumping. Therefore, groundwater pumping to meet agricultural and rural residential needs is calculated by the model based on meeting remaining demands after appropriate surface water delivery is made to respective areas. Demand in areas with no access to surface water is completely met by groundwater pumping.

2.3.4.3 Assumptions Used in the Projected Water Budget

The projected water budget is intended to assess the conditions of the Subbasin under future conditions of water supply and agricultural and urban demand, including quantification of uncertainties in the components. The projected conditions scenario applies future land and water use conditions and uses the 50-year hydrologic period of water years 1969-2018. Projections are assumed to represent a buildout level of development (approximately year 2040) and are represented using projected population, land use, and water demand and supply projections. Results of the projected conditions scenario under potential climate change conditions (changes to precipitation, stream flows, and evapotranspiration) are presented in Section 2.3.7.4.

The projected conditions scenario includes the following conditions:

- Hydrologic Period: Water Years 1969-2018 (50-year hydrology)
- Stream Flows for Water Years 1969-2018:
  - Dry Creek: No streamflow gaging stations available for Dry Creek, as such, flow estimates from the DWR's C2VSim was used (C2VSim-Fg Beta Release, DWR, May 2018)
  - Mokelumne River: Historical records from USGS (Mokelumne River below Camanche Dam, CA)
  - Calaveras River: Historical records from USGS (Calaveras River below New Hogan Dam near Valley Springs, CA) and New Hogan Dam releases
  - Stanislaus River: Historical records from USGS (Stanislaus River below Goodwin Dam near Knights Ferry, CA)
  - San Joaquin River: Historical records from USGS (San Joaquin River near Vernalis, CA)
- Reservoir Operations: Upstream reservoirs regulating streamflows into the Subbasin include Pardee and Camanche on the Mokelumne River; New Hogan on the Calaveras River; and New Melones, Tulloch, and Goodwin on the Stanislaus River. Projected condition scenario assumes that the historical operations of the reservoirs over the 50-year hydrologic records were in place and no changes are made.
- Land use and cropping patterns are based on the most recent, comprehensive, and Subbasin-wide land use survey from DWR as prepared by LandIQ (CA DWR, 2014), with adjustments based on local information and input. Urban areas expand to either the sphere of influence or general plan boundaries and are held constant during the simulation. Cropping acreage is reduced only where urban expansion occurs.
- Urban water demands are calculated for all the urban areas in the model. Urban centers in Eastern San Joaquin Subbasin are City of Escalon, Linden, Lockeford, City of Lodi, City of Manteca, City of Ripon, and City of Stockton. Demands for other domestic areas are estimated based on rural population. Urban water demand is based on:
  - Urban water use estimated from projections in the 2015 Urban Water Management Plans (Cal Water; CCWD, Cities of Lodi, Manteca, Ripon, and Stockton; SEWD; and SSJID) or municipal pumping records, used to calculate the per capita water use for each urban center in the future (approximately 2040).
  - Urban center population projections from the San Joaquin Council of Governments.
- Surface water delivery projections for the 50-year period was estimated based on the historical records of diversions by water year type, surface water rights or agreements, and potential planned changes/upgrades to the surface water diversion facilities. Surface water diversion estimates reflecting projected conditions using current available information and knowledge were provided to each GSA for review and comment and appropriate adjustments were made to the estimated record to reflect the surface water diversion projections for each entity. Surface water deliveries include:
  - Deliveries to agricultural areas: CSJWCD, NSJWCD, OID, SEWD, SSJID, and WID
  - Deliveries to urban areas: Cities of Lodi, Manteca, and Stockton (including Cal Water and City of Stockton service areas, and unincorporated SJC areas)

- <u>Recycling or recharge projects</u>: Recycled water for Cities of Lodi and Manteca; SEWD's Farmington Groundwater Recharge Program; NSJWCD's Tracy Lakes Recharge Project; and NSJWCD's CALFED groundwater recharge project
- <u>Riparian</u>: CCWD, Delta areas, and data from C2VSim for riparian diversions off major streams (Dry Creek, Mokelumne River, Calaveras River, Stanislaus River, and San Joaquin River)

- As private groundwater pumping was estimated by ESJWRM in the historical calibration, there is no local estimate of current private groundwater pumping. Therefore, groundwater pumping to meet agricultural and rural residential needs is calculated by the model based on meeting remaining demands after appropriate surface water delivery is made to respective areas. Demand in areas with no access to surface water is completely met by groundwater pumping.

2.3.5 Water Budget Estimates

The ESJWRM simulates the major hydrologic processes that affect the land surface, stream, and groundwater systems in the Eastern San Joaquin Subbasin. The major hydrologic processes can be represented by separate water budgets which detail inflows and outflows occurring at the stream level (budget on surface water flows occurring in the Subbasin), land surface level (budget balancing how demands on urban, agricultural, and native lands are met by rainfall, surface water deliveries, or groundwater pumping), and groundwater (budget detailing flows occurring within the groundwater aquifers of the Subbasin).

The primary components of the stream system are:

- <u>Inflows</u>:
  - Stream inflows
  - Stream gain from the groundwater system
  - Surface runoff to the stream system from precipitation
  - Return flow to stream system from irrigation water
- <u>Outflows</u>:
  - Stream outflows
  - Stream losses to groundwater
  - Surface water diversions
  - Riparian intake from streams

The primary components of the land surface system are:

- <u>Inflows</u>:
  - Precipitation
  - Surface water supplies to meet agricultural and urban uses
  - Groundwater pumping (groundwater supplies to meet agricultural and urban uses)
  - Riparian intake from streams

- Outflows:
  - Evapotranspiration
  - Surface runoff to the stream system
  - Return flow to the stream system
  - Deep percolation from precipitation, applied water (surface water and groundwater) for agricultural lands, and applied water (surface water and groundwater) for outdoor use in the urban areas

The primary components of the groundwater system are:

- Inflows:
  - Deep percolation from precipitation, applied water (surface water and groundwater) for agricultural lands, and applied water (surface water and groundwater) for outdoor use in the urban areas
  - Stream seepage (stream losses to groundwater)
  - Other recharge (including unlined canals/reservoir seepage, local tributaries seepage, and Managed Aquifer Recharge [MAR] projects)
  - Subsurface inflow
- Outflows:
  - Stream gain from the groundwater system
  - Groundwater pumping
  - Subsurface outflow
- Change in Groundwater Storage: This reflects average annual change in groundwater storage

The estimated water budgets for the historical, current conditions, and projected conditions scenarios are provided herein, with results summarized below in Table 2-13 through Table 2-15.

Table 2-13: Average Annual Water Budget – Stream System (AF/year)

Component	Historical Calibration (AF/year)	Current Conditions (AF/year)	Projected Conditions (AF/year)
Hydrologic Period	Water Years 1996- 2015	50-Year Period	50-Year Period
Inflows			
Stream Inflows[1]	4,066,000	3,949,000	3,952,000
Stream Gain from Groundwater[2]	202,000	209,000	212,000
Eastern San Joaquin Subbasin	107,000	109,000	114,000
Dry Creek	-	1,000	1,000
Mokelumne River	14,000	22,000	24,000
Calaveras River	14,000	15,000	16,000
Stanislaus River	41,000	31,000	29,000
San Joaquin River	29,000	30,000	30,000
Local Tributaries[3]	8,000	11,000	14,000
Other Subbasins[4]	95,000	100,000	98,000
Dry Creek	28,000	39,000	40,000
Mokelumne River	1,000	1,000	1,000
Stanislaus River	49,000	42,000	40,000
San Joaquin River	17,000	18,000	17,000
Runoff to the Stream System[5]	471,000	533,000	542,000
Return Flow to Stream System[6]	74,000	75,000	127,000
Total Inflow	*4,812,000*	*4,766,000*	*4,833,000*
Outflows			
Stream Outflows[7]	4,168,000	4,037,000	4,050,000
Stream Seepage[2]	303,000	375,000	381,000
Eastern San Joaquin Subbasin	262,000	317,000	318,000
Dry Creek	12,000	14,000	14,000
Mokelumne River	114,000	124,000	122,000
Calaveras River	91,000	105,000	102,000
Stanislaus River	13,000	35,000	39,000
San Joaquin River	28,000	36,000	36,000
Local Tributaries[3]	3,000	3,000	3,000
Other Subbasins[4]	41,000	58,000	63,000
Dry Creek	14,000	15,000	16,000
Mokelumne River	2,000	2,000	2,000
Stanislaus River	18,000	32,000	36,000
San Joaquin River	8,000	9,000	9,000
Surface Water Diversions[8]	301,000	323,000	370,000
Riparian Intake from Streams[9]	40,000	31,000	32,000
Total Outflow	*4,812,000*	*4,766,000*	*4,833,000*

Notes:

1 Stream inflows into Eastern San Joaquin Subbasin include flows from Dry Creek, Mokelumne River, Calaveras River, Stanislaus River, San Joaquin River, and estimated tributary flows. Differences between historical and current/projected flows are due to differing hydrologic periods. Differences between current and projected flows are due to differences in flows simulated at Subbasin boundaries (such as from Dry Creek) and estimated tributary flows.

2 Stream gain from groundwater and stream seepage represent the interaction of surface water and groundwater. Differences between the scenarios are related to differences in streamflows and long-term average groundwater elevations.

3 Local tributaries include Bear Creek and related streams, Little Johns Creek, Duck Creek, and Lone Tree Creek.

4 Other subbasins include the Cosumnes, Modesto, South American, Solano, East Contra Costa, and Tracy Subbasins. Stream-aquifer interaction with the other subbasins was included for streams on the boundaries of the Eastern San Joaquin Subbasin.

[5] Runoff to the stream system is due to precipitation. As urban areas are assumed to have greater runoff (e.g., more paved areas), the changes in runoff between the runs are due to differences in the urban areas in the scenarios, as well as the amount of precipitation occurring. The historical calibration, with both less precipitation and smaller urban areas, has a corresponding smaller runoff. The current condition uses urban areas at the end of the historical calibration, while the projected scenario includes urban buildout to sphere of influence or general plan boundaries and therefore has more runoff.

[6] Return flow to the stream system is due to applied water, either surface water or groundwater used for agricultural or municipal purposes. Differences between the scenarios is primarily related to the urban growth in the projected conditions scenario causing higher urban demand and therefore correspondingly higher applied water to meet that demand resulting in greater urban return flows (i.e., discharge of treated wastewater).

[7] Stream outflows occur at the edge of Eastern San Joaquin Subbasin at the confluence of the San Joaquin and Mokelumne Rivers.

[8] Surface water diversions shown in this table are the volumes of water taken directly off the river prior to any losses due to evaporation or canal seepage. These numbers do not include surface water directly diverted from simulated stream nodes (i.e., water taken off Stanislaus River occurs just upstream in the Subbasin). Differences between scenarios are due to differences in current and planned surface water diversions.

[9] Riparian intake from streams is the portion of the riparian vegetation evapotranspiration met by streamflows. Differences between scenarios may be due to availability of streamflows or extent of riparian vegetation, which may be affected by growth in urban areas.

Table 2-14: Average Annual Water Budget – Land Surface System (AF/year)

Component	Historical Calibration (AF/year)	Current Conditions (AF/year)	Projected Conditions (AF/year)
Hydrologic Period	Water Years 1996- 2015	50-Year Period	50-Year Period
Inflows			
Precipitation[1] (Precipitation, inches)	938,000 (14.7)	984,000 (15.4)	984,000 (15.4)
Total Surface Water Supply[2]	502,000	493,000	529,000
Agricultural	451,000	426,000	426,000
Urban and Industrial	51,000	67,000	103,000
Total Groundwater Supply[3]	692,000	851,000	801,000
Agricultural	624,000	788,000	680,000
Urban and Industrial	68,000	63,000	121,000
Riparian Intake from Streams[4]	28,000	23,000	24,000
Total Inflow	*2,161,000*	*2,352,000*	*2,338,000*
Outflows			
Evapotranspiration[5]	1,351,000	1,449,000	1,394,000
Agricultural	969,000	1,077,000	976,000
Municipal and Domestic	66,000	73,000	123,000
Refuge, Native, and Riparian	316,000	300,000	296,000
Runoff to the Stream System[6]	471,000	533,000	542,000
Return Flow to the Stream System[7]	74,000	75,000	127,000
Agricultural	2,000	2,000	2,000
Municipal and Domestic	72,000	73,000	125,000
Deep Percolation[8]	218,000	272,000	266,000
Precipitation	61,000	68,000	66,000
Applied Surface Water – Agricultural	59,000	65,000	64,000
Applied Surface Water – Urban and Industrial	7,000	10,000	15,000
Applied Groundwater – Agricultural	82,000	119,000	102,000
Applied Groundwater – Urban and Industrial	9,000	10,000	18,000
Other Flows[9]	47,000	23,000	8,000
Total Outflow	*2,161,000*	*2,352,000*	*2,338,000*

Notes:

1 Precipitation is discussed in the identification of the hydrologic periods in 2.3.2. The current and projected conditions scenarios utilize the same 50 years of hydrology (water years 1969-2018) and have the same overall Subbasin precipitation, whereas the historical calibration has a shorter hydrologic period (20 years from 1996-2015) with less precipitation on average.

2 Total surface water supply shown in this table is the volume of surface water diverted or transported to meet agricultural and urban demands minus estimated losses due to evaporation or canal seepage. Differences between scenarios are due to differences in current and planned surface water deliveries.

3 Total groundwater supply in the scenarios is calculated based on meeting remaining demands after surface water deliveries occur. Differences in demand largely drive the amount of groundwater pumped.

4 Riparian intake from streams is the portion of the riparian vegetation evapotranspiration met by streamflows. Differences between scenarios may be due to availability of streamflows or extent of riparian vegetation, which may be affected by growth in urban areas.

5 Evapotranspiration is the demand required by agricultural land (i.e., crops); municipal and domestic areas (i.e., industrial and urban demands); and refuge, native and riparian areas. Differences in evapotranspiration are largely related to differences in urban areas between the scenarios and the loss of agricultural or native/riparian land as urban growth occurs.

6 Runoff to the stream system is due to precipitation. As urban areas are assumed to have greater runoff (e.g., more paved areas), the changes in runoff between the runs are due to differences in the urban areas in the scenarios, as well as the amount of

precipitation occurring. The historical calibration, with both less precipitation and smaller urban areas, has a corresponding smaller runoff. The current condition uses urban areas at the end of the historical calibration, while the projected scenario includes urban buildout to sphere of influence or general plan boundaries and therefore has more runoff.

[7] Return flow to the stream system is due to applied water, either surface water or groundwater used for agricultural or municipal purposes. Differences between the scenarios is primarily related to the urban growth in the projected conditions scenario causing higher urban demand and therefore correspondingly higher applied water to meet that demand.

[8] Deep percolation is the amount of infiltrated water ultimately reaching the groundwater aquifer. The source of the water may be from precipitation or either applied surface water or groundwater used for agricultural or urban and industrial purposes. Differences between scenarios are related to differences between these sources of water and differences in the infiltration parameters related to land use.

[9] Other Flows captures the gains and losses due to land expansion and temporary storage in the root-zone and unsaturated (vadose) zones.

Table 2-15: Average Annual Water Budget – Groundwater System (AF/year)

Component	Historical Calibration (AF/year)	Current Conditions (AF/year)	Projected Conditions (AF/year)
Hydrologic Period	Water Years 1996- 2015	50-Year Period	50-Year Period
Inflows			
Deep Percolation[1]	218,000	272,000	266,000
Precipitation	61,000	68,000	66,000
Applied Surface Water – Agricultural	59,000	65,000	64,000
Applied Surface Water – Urban and Industrial	7,000	10,000	15,000
Applied Groundwater – Agricultural	82,000	119,000	102,000
Applied Groundwater – Urban and Industrial	9,000	10,000	18,000
Stream Seepage[2]	262,000	317,000	317,000
Dry Creek	12,000	14,000	14,000
Mokelumne River	114,000	124,000	122,000
Calaveras River	91,000	105,000	102,000
Stanislaus River	13,000	35,000	39,000
San Joaquin River	28,000	36,000	36,000
Local Tributaries[3]	3,000	3,000	2,000
Other Recharge[4]	160,000	158,000	164,000
Subsurface Inflow[5]	171,000	212,000	192,000
Cosumnes Subbasin	32,000	38,000	37,000
Sierra Nevada Mountains	55,000	58,000	59,000
Modesto Subbasin	25,000	41,000	33,000
South American Subbasin	4,000	4,000	3,000
Solano Subbasin	15,000	15,000	13,000
East Contra Costa Subbasin	6,000	7,000	7,000
Tracy Subbasin	35,000	48,000	41,000
Total Inflow	*811,000*	*959,000*	*939,000*
Outflows			
Groundwater Outflow to Streams[2]	107,000	109,000	114,000
Dry Creek	-	1,000	1,000
Mokelumne River	14,000	22,000	24,000
Calaveras River	14,000	15,000	16,000
Stanislaus River	41,000	31,000	29,000
San Joaquin River	29,000	30,000	30,000
Local Tributaries[3]	8,000	11,000	14,000
Groundwater Pumping[6]	692,000	851,000	801,000
Agricultural	624,000	788,000	680,000
Urban and Industrial	68,000	63,000	121,000
Subsurface Outflow[5]	53,000	47,000	58,000
Cosumnes Subbasin	18,000	15,000	18,000
Modesto Subbasin	19,000	18,000	25,000
South American Subbasin	-	-	-
Solano Subbasin	4,000	4,000	4,000
East Contra Costa Subbasin	2,000	2,000	2,000
Tracy Subbasin	9,000	8,000	8,000
Total Outflow	*852,000*	*1,007,000*	*973,000*
Change in Groundwater Storage	*(41,000)*	*(48,000)*	*(34,000)*

Notes:

[1] Deep percolation is the amount of infiltrated water ultimately reaching the groundwater aquifer. The source of the water may be from precipitation or either applied surface water or groundwater used for agricultural or urban and industrial purposes. Differences between scenarios are related to differences between these sources of water and differences in the infiltration parameters related to land use.

[2] Stream gain from groundwater and stream seepage represent the interaction of surface water and groundwater. Differences between the scenarios are related to differences in streamflows and long-term average groundwater elevations.

[3] Local Tributaries include Bear Creek and related streams, Little Johns Creek, Duck Creek, and Lone Tree Creek.

[4] Other Recharge includes unlined canals/reservoir seepage, local tributaries seepage, and MAR projects.

[5] The goal of projecting interbasin flows is to maintain a reasonable balance between the neighboring groundwater subbasins. The resulting projected conditions scenario flows are within 10-15% of historical calibration flows, considered a reasonable range given the availability of projected land use, population, surface water delivery, and groundwater production data from areas outside of the Eastern San Joaquin Subbasin.

[6] Groundwater pumping is estimated by the ESJWRM based on the need for additional water to meet remaining demands after surface water deliveries occur. Differences in demand largely drive the amount of groundwater pumped.

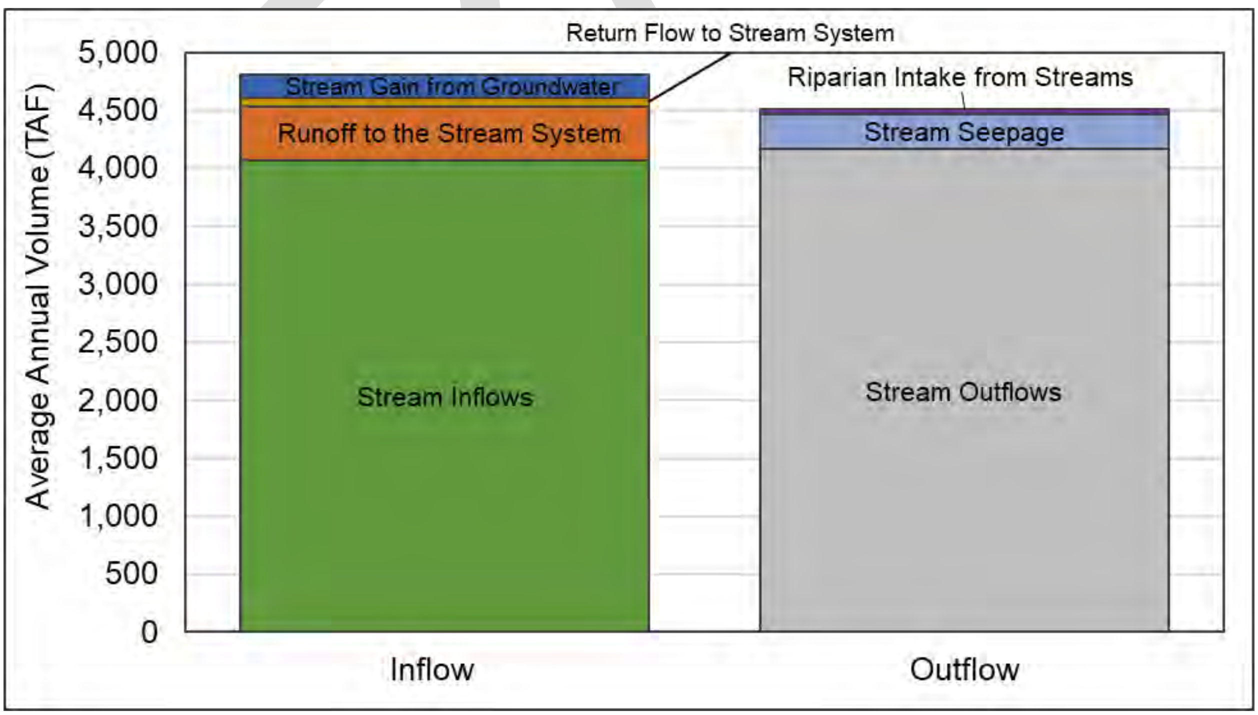
2.3.5.1 Historical Water Budget Estimates

The historical water budget is a quantitative tabulation of the historical surface and groundwater supply represented in the historical calibration of the ESJWRM covering the 20-year period of water years 1996-2015. The Joint Powers Agreement (JPA) selected this period as the representative hydrologic period to calibrate and reduce the uncertainty of the ESJWRM. Proper analysis and calibration of water budgets using the ESJWRM assures the hydrologic characteristics of the groundwater basin are well simulated. The historical calibration is discussed in detail in the historical model documentation (Appendix 2-A). Per §354.18 of the Regulations, the water budget includes estimates for supply and demand, while summarizing flows within the Subbasin, including the movement of all primary sources of water such as rainfall, irrigation, streamflow, and subsurface flows.

The existing stream network supplies water to multiple agricultural water users and municipalities in the Eastern San Joaquin Subbasin. When analyzing the water budget for the stream system, it is important to note potentially significant effects resulting from the natural interactions and managed operations of adjacent groundwater subbasins for streams coinciding with the boundaries of the Subbasin (i.e., Dry Creek, portions of the Mokelumne River, San Joaquin River, and Stanislaus River). Because of these circumstances, the water budget presented in Table 2-12 and Figure 2-72 below not only quantifies surface water systems within the Subbasin, but also estimates of contributions from adjoining areas.

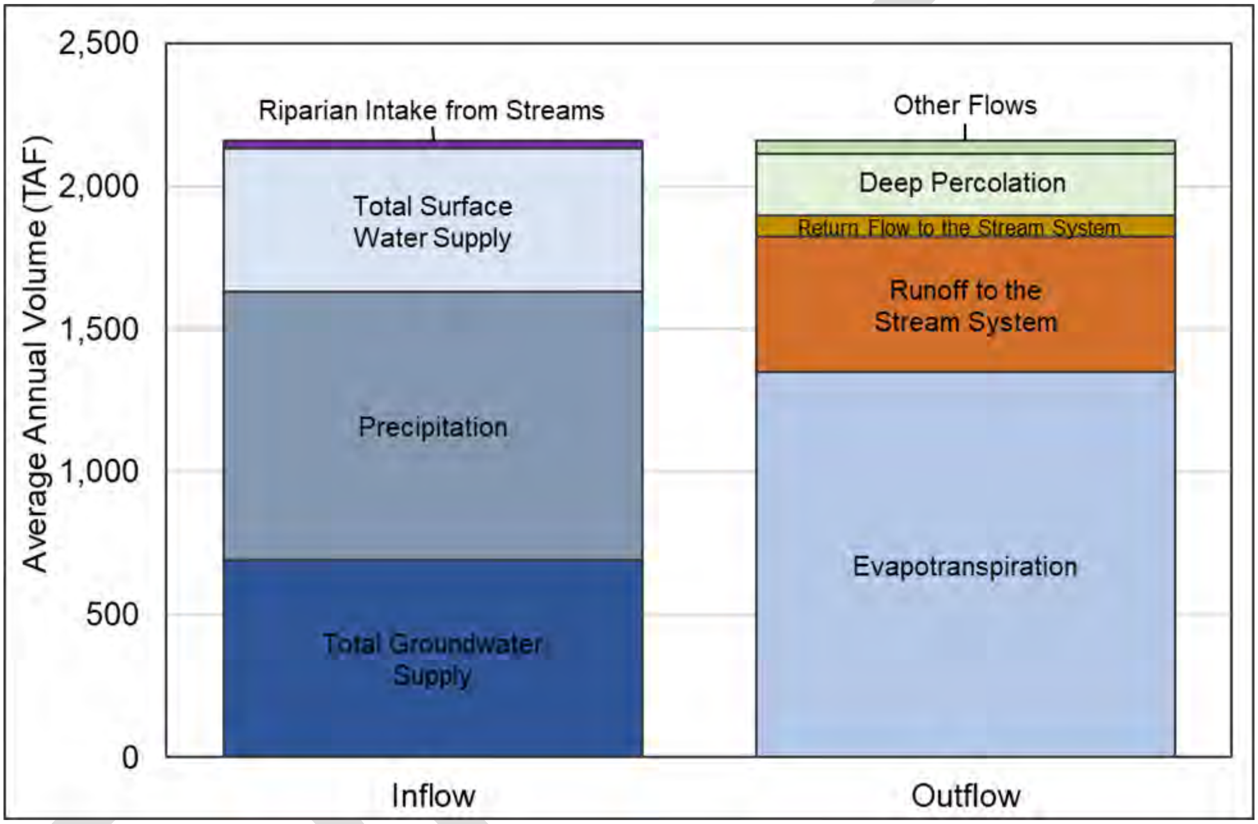
The stream system inflows through or along the Subbasin boundary simulated in the historical condition average 4.8 million acre-feet per year (MAF/year). The majority of these flows, almost 4.1 MAF/year, enter the Subbasin through upstream reservoir releases into major streams in the Subbasin. Three other surface water inflows are estimated stream gains from the groundwater system (202,000 AF/year), runoff of precipitation (471,000 AF/year), and return flow of applied water (74,000 AF/year). Outflows of the Eastern San Joaquin Subbasin stream system total 4.8 MAF/year and include downstream outflows leaving the Subbasin (almost 4.2 MAF/year), stream seepage to the groundwater system (303,000 AF/year), surface water diversions (301,000 AF/year), and riparian vegetation intake (40,000 AF/year).

Figure 2-72: Historical Average Annual Water Budget – Stream System



The land surface system water budget in the historical calibration of the Eastern San Joaquin Subbasin, shown below in Figure 2-73, estimates almost 2.2 MAF/year of inflows, a combination of precipitation (938,000 AF/year), surface water supply (502,000 AF/year), groundwater supply (692,000 AF/year), and riparian intake from streams (28,000 AF/year). The outflow from the land surface system in the historical calibration estimates evapotranspiration (close to 1.4 MAF/year), surface runoff of precipitation (471,000 AF/year), return flow of applied water (74,000 AF/year), deep percolation of precipitation or applied water (218,000 AF/year), and a small component representing other flows (47,000 AF/year), which includes uncertainties in other components due to land expansion and temporary storage in the root-zone and unsaturated (vadose) zones.

Figure 2-73: Historical Average Annual Water Budget – Land Surface System



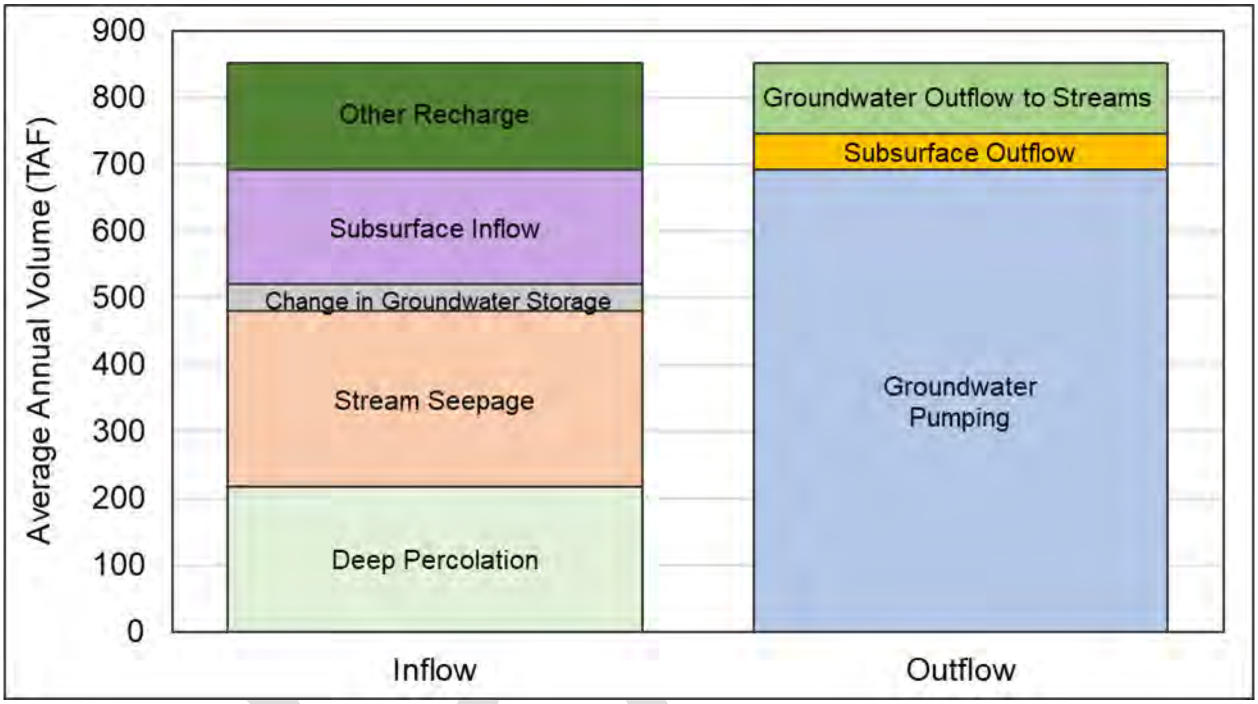
The groundwater system of the Eastern San Joaquin Subbasin includes 811,000 AF/year of inflows in the historical calibration (not including change in storage), of which 218,000 AF/year is deep percolation. There is also stream seepage (262,000 AF/year), other recharge (160,000 AF/year), and subsurface inflows (171,000 AF/year) from the Sierra Nevada Mountains and the neighboring groundwater subbasins of Cosumnes, Modesto, South American, Solano, East Contra Costa, and Tracy. On average, the inflows do not meet the entire groundwater demand. The primary outflow of the groundwater system is pumping (692,000 AF/year), followed by groundwater outflow to streams (107,000 AF/year), and subsurface outflow to the neighboring groundwater subbasins (53,000 AF/year).

The Eastern San Joaquin Subbasin average historical groundwater budget has greater outflows than inflows, leading to an estimated average annual decrease in groundwater storage of approximately 41,000 AF/year. Figure 2-74 summarizes the average historical calibration groundwater inflows and outflows of the Eastern San Joaquin Subbasin.

A groundwater overdraft estimate of 41,000 AF/year represents a refinement over previous efforts which have formerly estimated levels of overdraft for the Subbasin to be between 70,000 AF and 150,000 AF annually. Such previous efforts include the DWR's 2003 Bulletin 118 study (DWR, 2003) and modeling conducting as part of the SJCFCWCD's 2001 Water Management Plan (SJCFCWCD, 2001) and presented in the 2004 Eastern San Joaquin Groundwater Basin

Groundwater Management Plan (NSJCGBA, 2004). The analysis presented in this Plan represents the best available information to date. These estimates, which are the result of several years of collaboration between agencies prior to Plan development, utilize new data and modeling capabilities not captured in prior modeling efforts. Additionally, a portion of the reduction seen in the overdraft estimate may be due to a shift to surface water supplies that has occurred since the development of previous estimates. For additional discussion of refinements that occurred in the development of the ESJWRM (Woodard & Curran, 2018), see Appendix 2-A.

Figure 2-74: Historical Average Annual Water Budget Estimates – Groundwater System



Historical inflows and outflows change by water year type as defined by the San Joaquin Valley Water Year Hydrologic Classification (DWR, 2018a). In wet years, precipitation meets more of the water demand and greater availability of surface water reduces the need for groundwater pumping. However, in dry years, more groundwater is pumped to meet the demand not met by surface water or precipitation. This may lead to an increase in groundwater storage in wet years and a decrease in dry years. Table 2-16 breaks down the average historical water supply and demand by water year type.

During the historical calibration, the focus is on representing changing conditions and operations, such as new agricultural land or crop types, new surface water diversions, and population growth. When these changes occurred was oftentimes independent of the hydrologic conditions of the year in question; therefore, looking at supplies and demands averaged by water year type does not necessarily present clear results. Furthermore, the 20 years represented in the historical calibration do not include an equal number of each water year type, making averages less reliable to gather historical trends. As the projected conditions scenario considered the water year type in some of the model inputs and the 50-year hydrologic period allows for greater repetition of the water year types, the results presented in Table 2-17 are more consistent with the trends expected when averaging by water year type.

Table 2-16: Average Annual Values for Key Components of Historical Water Budget by Year Type

Component	Water Year Type (San Joaquin River Index)					
	Wet	Above Normal	Below Normal[1]	Dry	Critical	20-Year
Number of Years[2]	6	3	1	5	5	20
Precipitation, AF/year (Precipitation, inches)	1,287,000 (20.2)	944,000 (14.8)	963,000 (15.1)	784,000 (12.3)	666,000 (10.5)	938,000 (14.7)
Water Demand (AF/year)						
Ag Demand[3]	1,030,000	1,060,000	1,054,000	1,072,000	1,142,000	1,074,000
Urban Demand[4]	115,000	118,000	123,000	126,000	124,000	120,000
Total Demand	*1,145,000*	*1,178,000*	*1,177,000*	*1,198,000*	*1,266,000*	*1,194,000*
Water Supply (AF/year)						
Total Surface Water Supply[5]	491,000	518,000	479,000	510,000	504,000	502,000
Agricultural	446,000	466,000	435,000	458,000	445,000	451,000
Urban and Industrial	46,000	51,000	44,000	52,000	59,000	51,000
Total Groundwater Supply[6]	654,000	660,000	698,000	688,000	762,000	692,000
Agricultural	585,000	595,000	620,000	615,000	698,000	624,000
Urban and Industrial	68,000	65,000	78,000	73,000	64,000	68,000
Total Supply (AF/year)	*1,145,000*	*1,178,000*	*1,177,000*	*1,198,000*	*1,266,000*	*1,194,000*
Change in Groundwater Storage (AF/year)	*137,000*	*-3,000*	*-106,000*	*-120,000*	*-184,000*	*-41,000*

Notes:

1 There was only one below normal water year in the historical calibration (water year 2003), so averages are just based on model results for that single water year. Since there weren't any more below normal years to use in the average, results for the below normal water year type do not follow expected trends.

2 List of historical water budget water years by water year type:
Wet: 1996, 1997, 1998, 2005, 2006, 2011
Above Normal: 1999, 2000, 2010
Below Normal: 2003
Dry: 2001, 2002, 2004, 2009, 2012
Critical: 2007, 2008, 2013, 2014, 2015

3 Agricultural demand is based on evapotranspiration by crop and the acreages by crop. As land use continually evolves over the historical calibration, averaging of the resulting agricultural demand is less a function of water year type and rather dependent more on when in the simulation that year type fell.

4 Urban demand evolves in the historical calibration based on changes in population and water consumption. Due to these changes over the historical calibration period, averaging of the urban demand is less a function of water year type and rather dependent more on when in the simulation that year type fell.

5 Total surface water supply is based on information received from local entities and varied historically based on when surface water rights or agreements occurred. As some entities received new surface water sources during the historical calibration period, averaging by water year type depends more on when the water year types occurred in the simulation.

6 Total groundwater supply as estimated by the ESJWRM is a function of demand, precipitation, and surface water. Differences between water year types for groundwater pumping is more related to differences in these components.

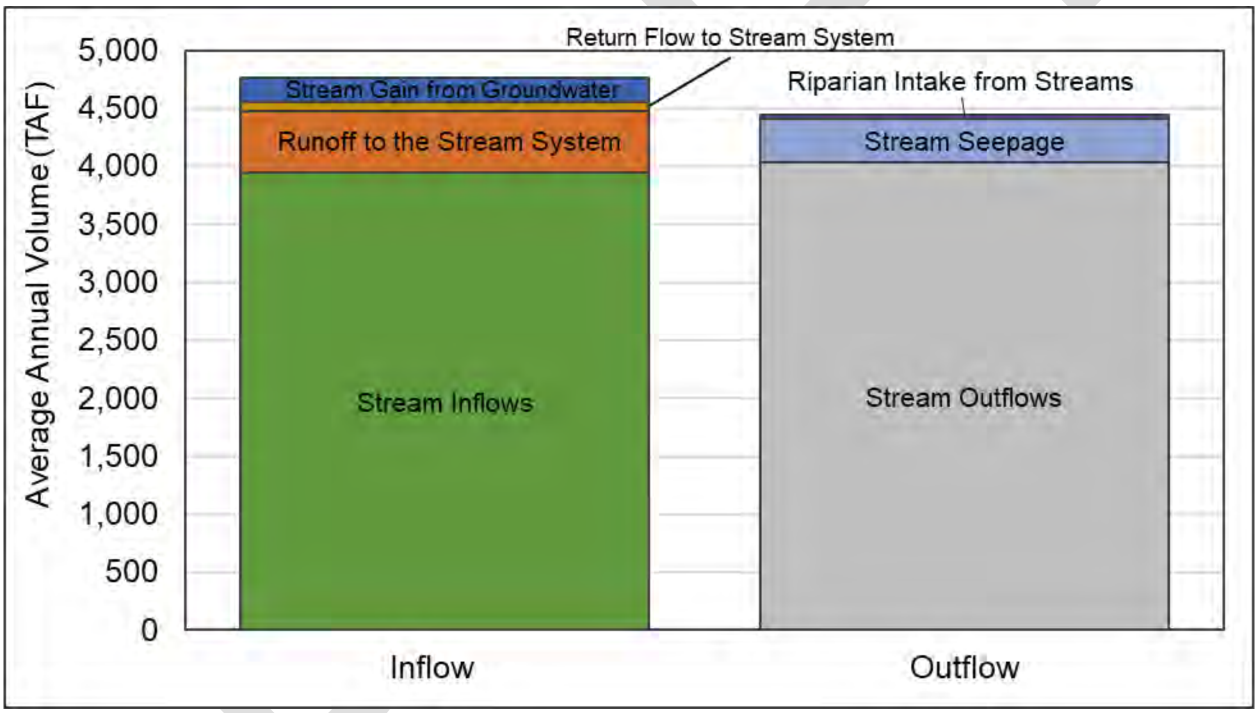
2.3.5.2 Current Water Budget Estimates

The current water budget quantifies inflows to and outflows from the basin using the most recent 50 years of hydrology, water supply, water demand, and land use information. By using a baseline approach with the ESJWRM, long-term hydrology is applied to the most recent water supply, water demand, and land use information to provide a robust estimate of the current water budget. These conditions are incorporated in the current conditions scenario of the ESJWRM.

The stream system in the current conditions scenario estimates 323,000 AF/year of surface water diversions occurring in the Subbasin from simulated streams. In addition, on average, over 4.0 MAF/year leaves the Subbasin's surface water system as downstream flow in the San Joaquin River and Mokelumne River, 375,000 AF/year is lost as stream seepage to the groundwater system, and 31,000 AF/year is used by riparian vegetation.

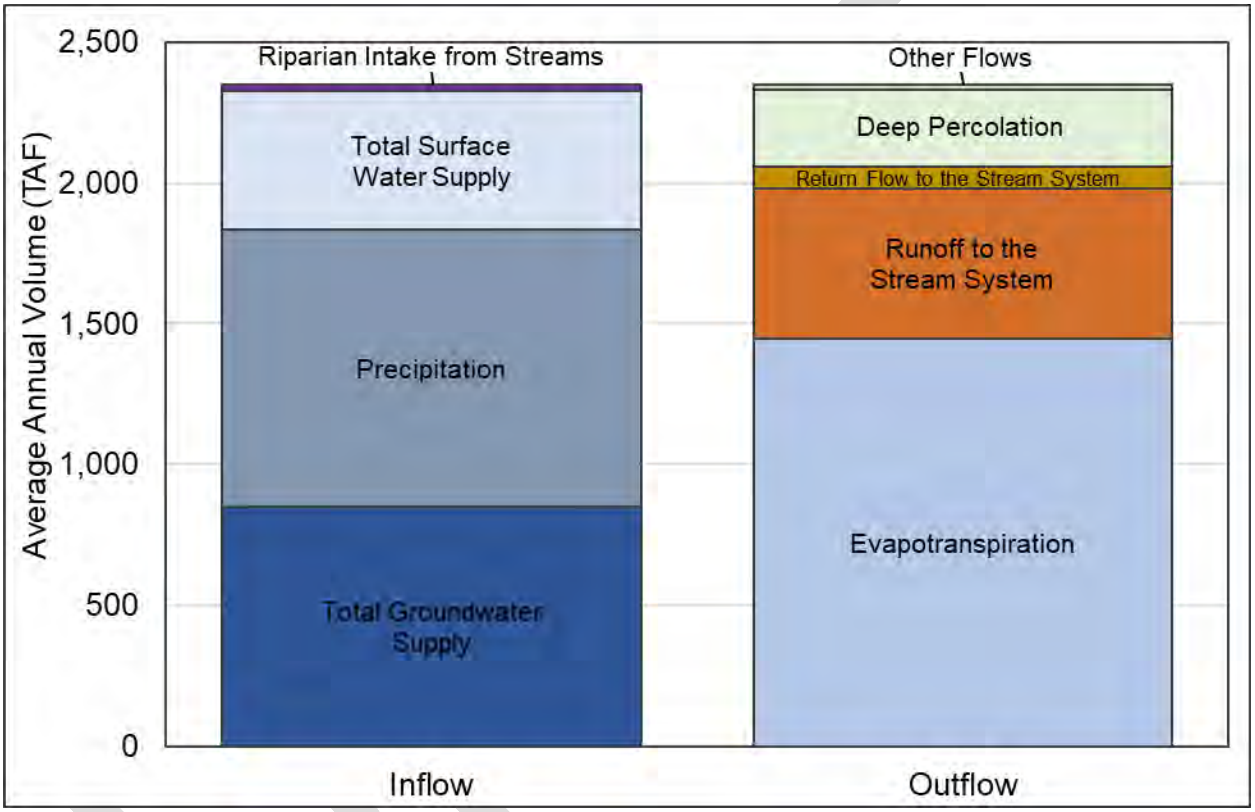
These demands are met by an estimated 3.9 MAF/year of local stream inflows, 533,000 AF/year of surface runoff of precipitation, 75,000 AF/year of return flow of applied water, and 209,000 AF/year of stream gain from groundwater. Figure 2-75 summarizes the average annual inflows and outflow of the current condition scenario in the Eastern San Joaquin Subbasin surface water network.

Figure 2-75: Current Average Annual Water Budget Estimates – Stream System



Based on 2014 cropping patterns and urban demands calculated using 2015 population and pre-drought (assumed 2013) per capita water use, over the 50-year hydrologic period, the current conditions land surface water budget simulates annual inflows of almost 2.4 MAF/year, including 984,000 AF/year of precipitation, 1.3 MAF/year of applied water (493,000 AF/year of surface water and 851,000 AF/year of groundwater), and 23,000 AF/year of riparian intake from the stream system. The almost 2.4 MAF/year of outflows include evapotranspiration (1.4 MAF/year), surface runoff to the stream system of precipitation (533,000 AF/year), return flow to the stream system of applied water (75,000 AF/year), deep percolation (272,000 AF/year), and other flows due to land expansion and temporary storage in the root-zone and vadose zones (23,000 AF/year). Figure 2-76 summarizes the average annual current condition inflows and outflows in the land surface budget for the Eastern San Joaquin Subbasin.

Figure 2-76: Current Average Annual Water Budget Estimates – Land Surface System

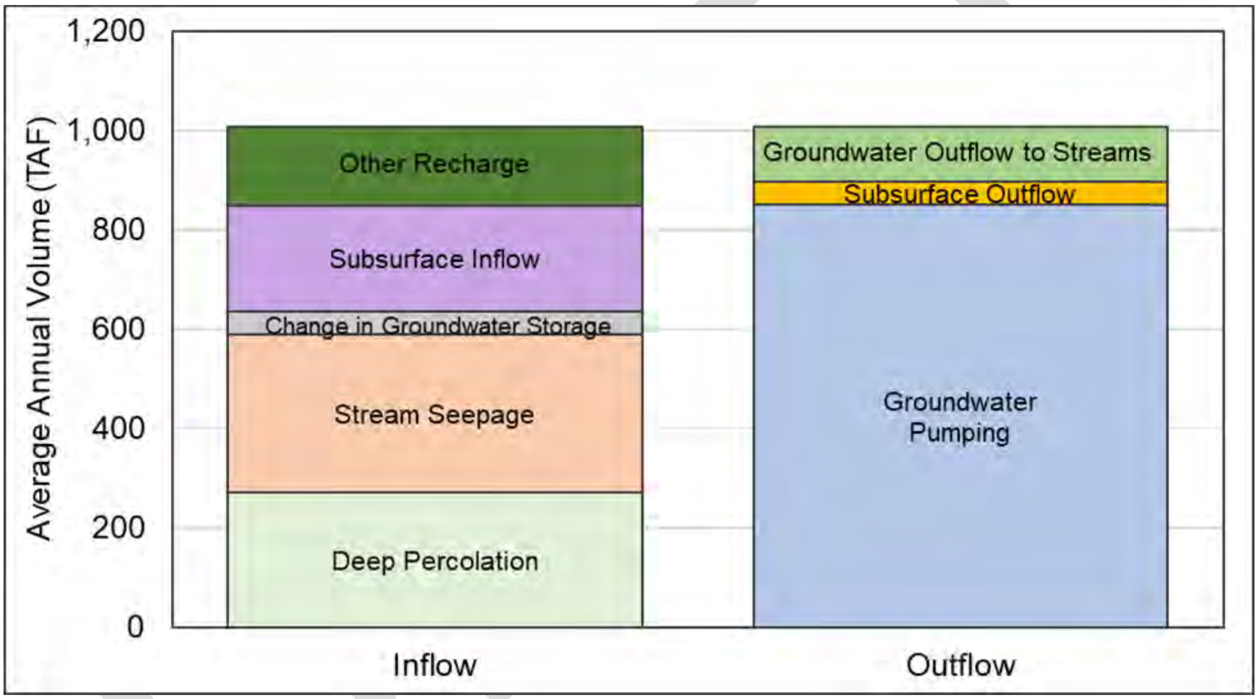


The current conditions scenario simulates 50 years of hydrology with initial conditions reflective of the start of the 2016 water year. Over the simulation, the current conditions groundwater system water budget simulates annual inflows of 959,000 AF/year, including 272,000 AF/year of deep percolation, 317,000 AF/year of stream seepage, 158,000 AF/year of other recharge (including canal and reservoir seepage and MAR projects), and subsurface inflows from surrounding subbasins and the Sierra Nevada Mountains totaling 212,000 AF/year.

Similar to the historical water budget, average aquifer outflows exceed the inflows under current conditions. Groundwater production (851,000 AF/year) remains the largest portion of aquifer discharge, with subsurface outflows to surrounding Subbasins (47,000 AF/year) and losses to the stream system (109,000 AF/year) bringing the total system outflows to over 1 MAF/year.

The Eastern San Joaquin Subbasin current conditions groundwater budget has greater outflows than inflows, resulting in an average annual deficit in groundwater storage of 48,000 AF/year. Figure 2-77 summarizes the average current conditions groundwater inflows and outflows in the Eastern San Joaquin Subbasin.

Figure 2-77: Current Average Annual Water Budget Estimates – Groundwater System



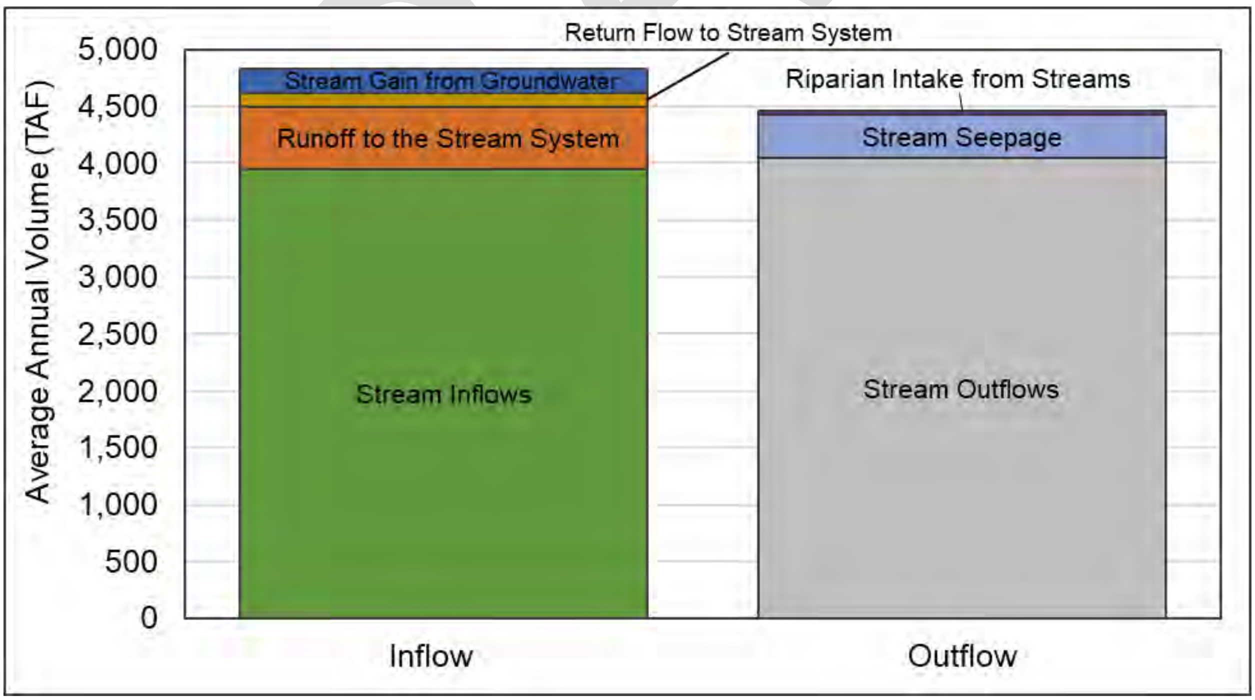
2.3.5.4 Projected Water Budget Estimates

The projected water budget is used to estimate future baseline conditions of supply, demand, and aquifer response to Plan implementation. The projected conditions scenario of the ESJWRM is used to evaluate the projected conditions water budget assuming a 2040 level of development and using hydrology from water years1969-2018. Results of the projected conditions scenario under potential climate change conditions (changes to precipitation, stream flows, and evapotranspiration) are presented in Section 2.3.7.4.

Development of the projected water demand is based on population growth trends reported by the San Joaquin Council of Governments, urban per capita water use consistent with projections in 2015 UWMPs, and urban area expansion from general plans or sphere of influence boundaries. Due to the expansion of urban area in all the major municipalities, agricultural acreage is reduced by less than 40,000 acres. There is agricultural growth anticipated in the eastern areas of the Subbasin and potential conversion of existing agricultural land to permanent irrigated crops, but no reliable projections were available to include in the simulation; therefore, no additional agricultural land growth was added to the projected conditions scenario. An analysis of county agricultural reports can be performed to assess agricultural trends in future scenarios of the ESJWRM.

Average annual surface water inflows to the Eastern San Joaquin Subbasin's stream system total an average of over 4.8 MAF/year in the projected conditions scenario. Under projected conditions, stream inflows of almost 4.0 MAF/year are augmented by stream gains from groundwater of 212,000 AF/year and runoff of precipitation (542,000 AF/year) and return flow of applied water (127,000 AF/year) to the stream system. Of these volumes, it is anticipated that 370,000 AF/year will be distributed to local growers to meet agricultural demand as surface water diversions and the remaining amount will leave the system in the form of San Joaquin River and Mokelumne River outflows (over 4.0 MAF/year), stream seepage (380,000 AF/year), and riparian intake (32,000 AF/year). Figure 2-78 summarizes the average projected inflows and outflows in the Eastern San Joaquin Subbasin surface water network.

Figure 2-78: Projected Average Annual Water Budget Estimates – Stream System



The land surface water budget for the projected conditions scenario has annual average inflows and outflows of 2,338,000 AF/year. Inflows are comprised of precipitation (984,000 AF/year), surface water (529,000 AF/year), groundwater (801,000 AF/year), and riparian intake from streams (24,000 AF/year). The balance of this is the summation of average annual evapotranspiration (1,394,000 AF/year), surface runoff of precipitation (542,000 AF/year), return flow of applied water (127,000 AF/year), and deep percolation (266,000 AF/year). A summary of these flows can be seen below in Figure 2-79.

Figure 2-79: Projected Average Annual Water Budget Estimates – Land Surface System

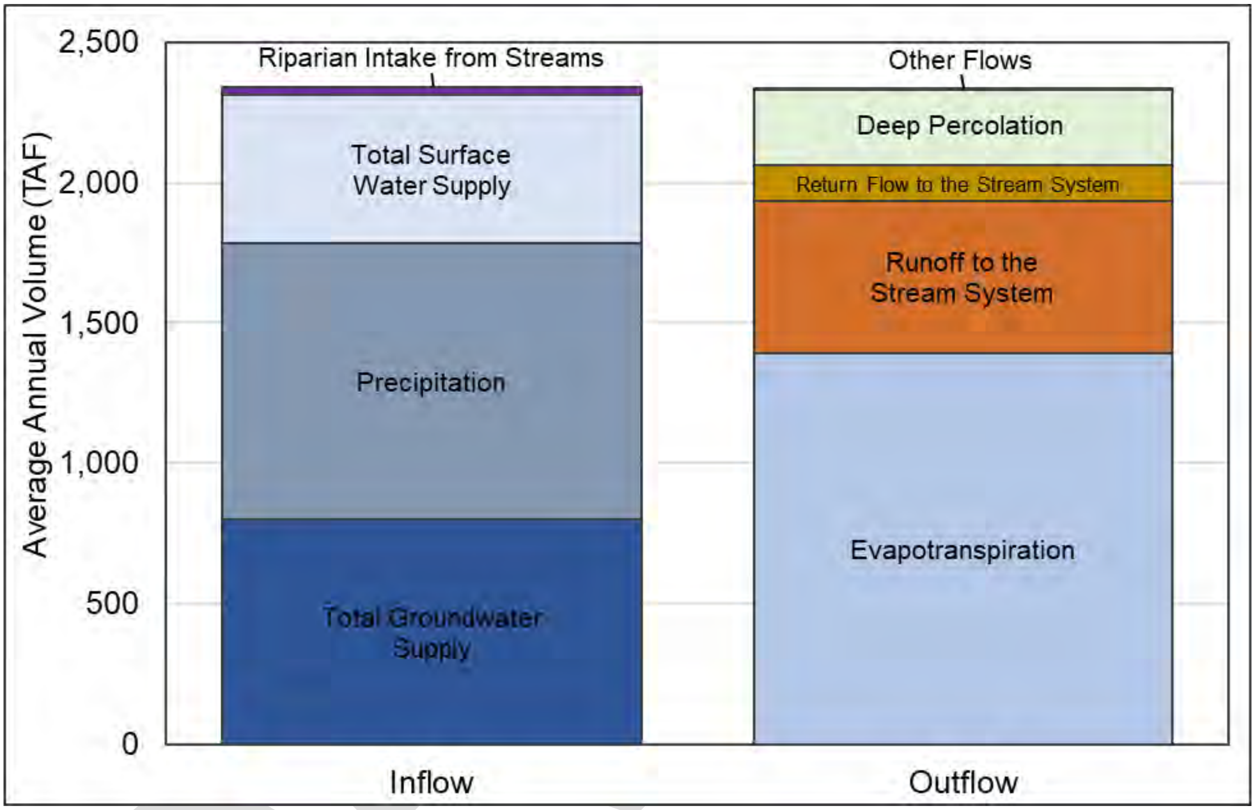
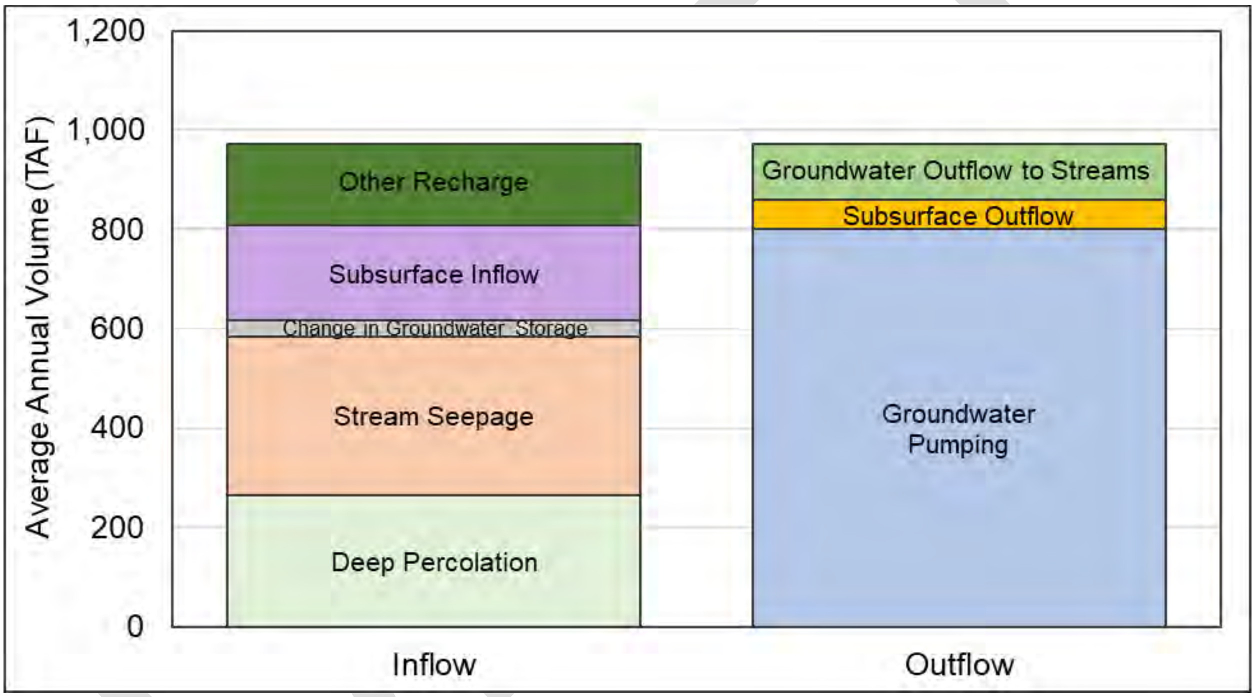


Figure 2-80 below shows how anticipated expansion in surface water supplies is reflected by decreases to groundwater production (801,000 AF/year) relative to current conditions estimates. Subsurface outflow to neighboring subbasins (58,000 AF/year) and stream gain from groundwater (114,000 AF/year) bring the total Subbasin discharges to 973,000 AF/year.

Under projected conditions, the groundwater system of the Eastern San Joaquin Subbasin experiences an average of 939,000 AF/year of inflows each year, of which 266,000 AF/year is deep percolation. There is also seepage from streams (317,000 AF/year), as well as other recharge which includes recharge from canals, reservoirs, and MAR projects (164,00 AF/year), and subsurface inflows (192,000 AF/year) from the Sierra Nevada Mountains and the neighboring subbasins of Cosumnes, Modesto, South American, Solano, East Contra Costa, and Tracy.

The projected water budget has greater outflows than inflows, resulting in an average annual deficit in groundwater storage of 34,000 AF/year. Figure 2-80 summarizes the average projected groundwater inflows and outflows in the Eastern San Joaquin Subbasin.

Figure 2-80: Projected Average Annual Water Budget Estimates – Groundwater System



As seen previously in Table 2-16 for the historical calibration, Table 2-17 shows the projected conditions water demands, supplies, and change in groundwater storage averaged based on the San Joaquin Valley Water Year Hydrologic Classification or water year type. As expected, in wet years there is more precipitation and surface water to meets more of the water demand, reducing the need for groundwater pumping and increasing groundwater storage. However, in dry years, more groundwater is pumped to meet the demand not met by surface water or precipitation, which leads to a decrease of groundwater storage. Unlike the historical calibration, the 50-year period allows for enough of each water year type to calculate meaningful averages and the supplies and demands are largely unchanging except for differences based on water year type.

Table 2-17: Average Annual Values for Key Components of Projected Water Budget by Year Type

Component	Water Year Type (San Joaquin River Index)					
	Wet	Above Normal	Below Normal	Dry	Critical	50-Year
Number of Years[1]	17	7	4	8	14	50
Precipitation, AF/year (Precipitation, inches)	1,376,000 (21.6)	987,000 (15.5)	866,000 (13.6)	790,000 (12.4)	652,000 (10.2)	984,000 (15.4)
Water Demand (AF/year)						
Ag Demand	1,088,000	1,107,000	1,108,000	1,112,000	1,117,000	1,104,000
Urban Demand	230,000	228,000	225,000	225,000	222,000	226,000
Total Demand	*1,318,000*	*1,335,000*	*1,333,000*	*1,337,000*	*1,339,000*	*1,330,000*
Water Supply (AF/year)						
Total Surface Water Supply	565,000	559,000	518,000	507,000	488,000	529,000
Agricultural	450,000	446,000	416,000	408,000	395,000	426,000
Urban and Industrial	114,000	113,000	102,000	98,000	93,000	103,000
Total Groundwater Supply	753,000	776,000	815,000	830,000	851,000	801,000
Agricultural	639,000	662,000	693,000	705,000	725,000	681,000
Urban and Industrial	115,000	116,000	124,000	126,000	128,000	121,000
Total Supply (AF/year)	*1,318,000*	*1,335,000*	*1,333,000*	*1,337,000*	*1,339,000*	*1,330,000*
Change in Groundwater Storage (AF/year)	*185,000*	*20,000*	*-113,000*	*-164,000*	*-223,000*	*-34,000*

Notes:
1 List of projected water budget water years by water year type:
Wet: 1969, 1974, 1975, 1978, 1980, 1982, 1983, 1986, 1993, 1995, 1996, 1997, 1998, 2005, 2006, 2011, 2017
Above Normal: 1970, 1973, 1979, 1984, 1999, 2000, 2010
Below Normal: 1971, 2003, 2009, 2018
Dry: 1972, 1981, 1985, 2001, 2002, 2004, 2012, 2016
Critical: 1976, 1977, 1987, 1988, 1989, 1990, 1991, 1992, 1994, 2007, 2008, 2013, 2014, 2015

2.3.6 Sustainable Yield Estimate

Sustainable yield is defined for SGMA purposes as "the maximum quantity of water, calculated over a base period representative of long-term conditions in the basin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result." (CWC §10721(w)). Sustainable yield for the Eastern San Joaquin Subbasin was calculated through development of an ESJWRM sustainable conditions scenario (model run) in which the goal was to generate a long-term (50-year) change in Subbasin groundwater storage of zero, a conservative approach, as a change in storage of greater than zero could occur without causing undesirable results. In order to account for the challenges of implementing the GSP, this Plan assumes future operations would remain consistent for a 25-year period and groundwater levels would continue to decline until 2040. From 2040, the 50 years of long-term hydrology was applied and various scenarios were run to see what level of groundwater production resulted in a long-term change in storage of, or very close to, zero. The sustainable conditions scenario is based on the projected conditions scenario (see Section 2.3.4.3, Table 2-15, and Figure 2-80) modified by lowering groundwater production across the model domain. The sustainable conditions scenario estimates future conditions of supply, demand, and the resulting aquifer response to implementation of sustainable conditions in the Subbasin. Under sustainable conditions, groundwater pumping activities in the Subbasin are not anticipated to create changes in groundwater inflow that could impact GSP implementation in neighboring basins.

There are uncertainties associated with projections in the ESJWRM scenarios due to the sequence of the hydrologic period, population projections, future cropping patterns, and irrigation practices and technologies, as well as uncertainties inherent in the representation of the physical groundwater and surface water system by the model. Therefore, to account for these uncertainties, a range of assumptions (from use of high-end estimates to low-end estimates) are used in running model scenarios to estimate the sustainable yield and a rough estimate of the adjustment that would be required to achieve the sustainable yield over the 50-year planning period. These assumptions will be honed over time in updates to this Plan.

The sustainable conditions scenario results in groundwater outflows almost equal to groundwater inflows, bringing the long-term (50-year) average change in groundwater storage to close to zero. Based on this analysis, the sustainable yield of the basin is 715,000 AF/year ± 10 percent.

In order to achieve a net-zero change in groundwater storage over a 50-year planning period, approximately 78,000 AF/year of direct or in lieu groundwater recharge and/or reduction in agricultural and urban groundwater pumping would need to be implemented in the Eastern San Joaquin Subbasin. This number is larger than the estimated annual overdraft of the projected conditions scenario due to the integrated nature of the groundwater subbasin. As efforts are made to reach sustainability in the Subbasin, flows to and from neighboring basins and flows to and from streams may be impacted, creating the need for additional recharge or pumping reduction greater than the overdrafted amount.

2.3.7 Climate Change Analysis

2.3.7.1 Regulatory Background

SGMA requires taking into consideration uncertainties associated with climate change in the development of GSPs.

Consistent with Section 354.18(d)(3) and Section 354.18(e) of the GSP Regulations, analyses for the Eastern San Joaquin Subbasin GSP evaluated the projected water budget with and without climate change conditions.

Section 354.18(d)(3) of the GSP Regulations states:

"(d) The Agency shall utilize the following information provided, as available, by the Department pursuant to Section 353.2, or other data of comparable quality, to develop the water budget:
- *(1) Historical water budget information for mean annual temperature, mean annual precipitation, water year type, and land use.*
- *(2) Current water budget information for temperature, water year type, evapotranspiration, and land use.*
- *(3) Projected water budget information for population, population growth,* climate change *[emphasis added], and sea level rise."*

Section 354.18(e) states:

"(e) Each Plan shall rely on the best available information and best available science to quantify the water budget for the basin in order to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change *[emphasis added], sea level rise, groundwater and surface water interaction, and subsurface groundwater flow. If a numerical groundwater and surface water model is not used to quantify and evaluate the projected water budget conditions and the potential impacts to beneficial uses and users of groundwater, the Plan shall identify and describe an equally effective method, tool, or analytical model to evaluate projected water budget conditions."*

2.3.7.2 DWR Guidance

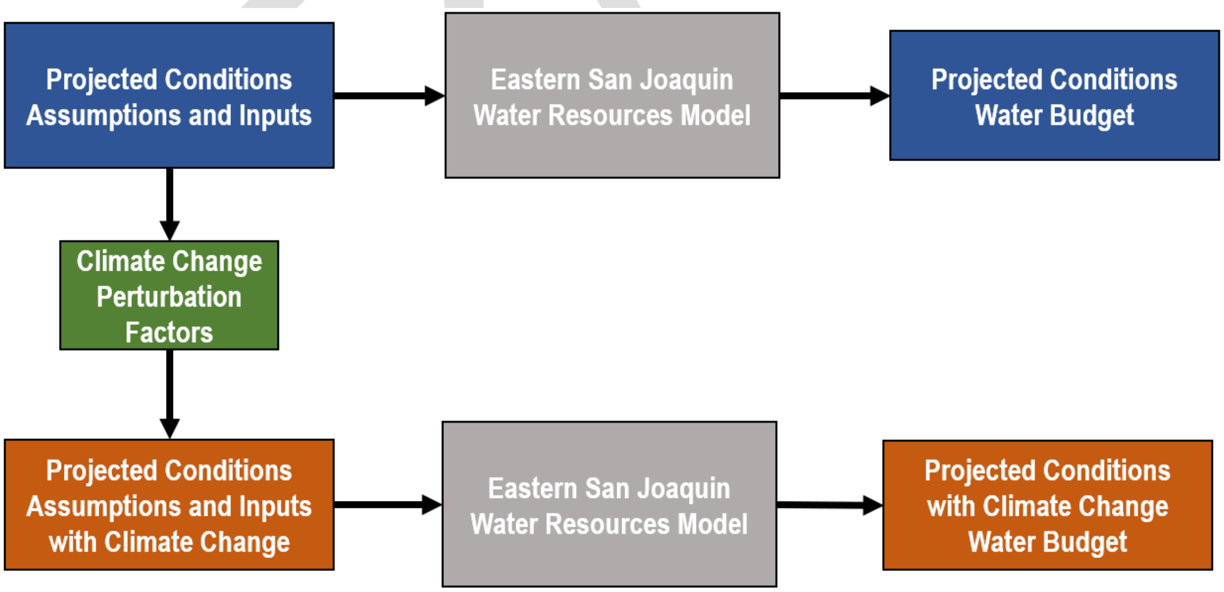
Climate change analysis is an area of continued evolution in terms of methods, tools, forecasted datasets, and the predictions of greenhouse gas concentrations in the atmosphere. The approach developed for this GSP is based on the methodology in DWR's guidance document (CA DWR, 2018b). The "best available information" related to climate change in the Eastern San Joaquin Subbasin was deemed to be the information provided by DWR combined with basin-specific modeling tools. The following resources from DWR were used in the climate change analysis:

- SGMA Data Viewer
- Guidance for Climate Change Data Use During Sustainability Plan Development and Appendices (Guidance Document)
- Water Budget BMP
- Climate Change Desktop IWFM Tools

The SGMA Data Viewer is where the climate change forecast datasets are available for download (CA DWR, 2018c). The guidance document details the approach, development, applications, and limitations of the datasets available from the SGMA Data Viewer (CA DWR, 2018c). The Water Budget BMP describes in greater detail how DWR recommends projected water budgets be computed (CA DWR, 2016). The Desktop IWFM Tools are available to calculate the projected precipitation and evapotranspiration inputs under climate change conditions (CA DWR, 2018b).

The methods suggested by DWR in the above resources were used, with modifications where needed, to ensure the resolution would be reasonable for the Eastern San Joaquin Subbasin and align with the assumptions of the ESJWRM. Figure 2-81 shows the overall process developed for the Subbasin consistent with the Climate Change Resource Guide (CA DWR, 2018b) and describes workflow beginning with projected conditions inputs and assumptions to perturbed 2070 conditions for the projected conditions.

Figure 2-81: Eastern San Joaquin Climate Change Analysis Process



The process described in Figure 2-81 of developing a projected water budget with and without climate change was discussed with DWR staff and is consistent with the regulations. Further, it enables the analysis to account for variability in demand and supply separate from the uncertainty associated with climate change forecasts.

Table 2-18 summarizes the forecasted variable datasets provided by DWR that were used to carry out the climate change analysis (CA DWR, 2018b). The Variable Infiltration Capacity (VIC) model referred to in Table 2-18 is the fully mechanistic hydrologic model used by DWR to derive hydrographs under standard and climate change conditions. Section 1.2.2 includes further description of the model and other tools and datasets.

Table 2-18: DWR-Provided Datasets

Input Variable	DWR-Provided Dataset
Unimpaired Streamflow	Combined VIC model runoff and baseflow to generate change factors, provided by HUC 8 watershed geometry
Impaired Streamflow (Ongoing Operations)	CalSim II time series outputs
Precipitation	VIC model-generated GIS grid with associated change factor time series for each cell
Reference ET	VIC model-generated GIS grid with associated change factor time series for each cell

2.3.7.3 Climate Change Methodology

Accepted methods for estimating climate change impacts on groundwater are based on the assessment of impacts on the individual water resource system elements that directly link to groundwater. These elements include precipitation, streamflow, evapotranspiration and, for coastal aquifers, sea level rise as a boundary condition. For the Eastern San Joaquin Subbasin, sea level rise was not included.

The method for perturbing the streamflow, precipitation, and evapotranspiration input files is described in the following sections. A future scenario of 2070 climate forecasts was evaluated in this analysis, consistent with DWR guidance (CA DWR, 2018b). DWR combined 10 global climate models (GCMs) for two different representative climate pathways (RCPs) to generate the central tendency scenarios in the datasets used in this analysis. The "local analogs" method (LOCA) was used to downscale these 20 different climate projections to a scale usable for California (CA DWR, 2018b). The 2070 central tendency among these projections serves to assess impacts of climate change over the long-term planning and implementation period.

2.3.7.3.1 Streamflow under Climate Change

Hydrologic forecasts for streamflow under various climate change scenarios are available from DWR as either a flow-based timeseries or a series of perturbation factors applicable to local data. DWR simulates volumetric flow in most regional surface water bodies by utilizing the Water Resource Integrated Modeling System (WRIMS, formally named CalSim II). While river flows and surface water diversions in the Calaveras, San Joaquin, and Stanislaus Rivers are simulated in CalSim II, there are significant variations when compared to local historical data. Due to the uncertainty in reservoir operations, flows from CalSim II provided by the state are not used directly. Instead, relative perturbation factors were used to derive surface water inflows and diversions for use in ESJWRM.

Local tributaries and smaller streams within Eastern San Joaquin Subbasin are not simulated in CalSim II and must be simulated using adjustment factors developed by DWR for unregulated stream systems. Dry Creek flows were perturbed using this method. The resolution of these perturbation factors is at the HUC 8 watershed scale. CalSim II model runs are not available for the Mokelumne River, according to Appendix B, Table B-2 of DWR's Climate Change Document (CA DWR, 2018b). Therefore, to keep as consistent as possible, Mokelumne River flows are considered "unimpaired" flow and the perturbation factor method was employed. The remaining streams simulated in the ESJWRM utilize the IWFM small watershed package, whose climate change impacts are calculated internally dependent on both precipitation and evapotranspiration refinement. Table 2-19 presents the impaired and unimpaired streams in the ESJWRM model for the Eastern San Joaquin Subbasin.

Table 2-19: Eastern San Joaquin Stream Inflows

Stream	Impaired	Unimpaired
Dry Creek		X
Mokelumne River		X
Calaveras River	X	
San Joaquin River	X	
Stanislaus River	X	

2.3.7.3.1.1 Unimpaired Flows

Change factors for unimpaired streams (Dry Creek and Mokelumne River) were downloaded from SGMA Data Viewer and multiplied by the projected conditions input streamflow data to calculated perturbed flows. DWR change factors are available through 2011; however, the model hydrologic period runs from WY 1969-2018. Flows for the remaining model years beyond 2011 were synthesized using the change factor from the most recent matching water year type in the available dataset. Water Year types are designated for each year based on the San Joaquin Valley Runoff WY year type index (CA DWR, 2018a). DWR uses five designations ranging from driest to wettest conditions: Critical, Dry, Below Normal, Above Normal, and Wet. Table 2-20 below shows the year type designations used to synthesize the remaining years (2011-2018).

Table 2-20: San Joaquin Valley Water Year Type Designations

Water Year	Year Type
2003	Below Normal
2004	Dry
2005	Wet
2006	Wet
2007	Critical
2008	Critical
2009	Below Normal
2010	Above Normal
2011	Wet
2012	Dry
2013	Critical
2014	Critical
2015	Critical
2016	Dry
2017	Wet
2018	Below Normal

Figure 2-82 shows the perturbed time series against the projected condition scenario time series for Dry Creek and Figure 2-83 presents the exceedance probability curve. Figure 2-84 and Figure 2-85 show perturbed time series and exceedance curves for Mokelumne River. The exceedance curves are provided because they more clearly show the differences between the projected condition scenario and the with climate change scenario. Generally, flows under the climate change scenario are slightly higher.

Figure 2-82: Dry Creek Hydrograph

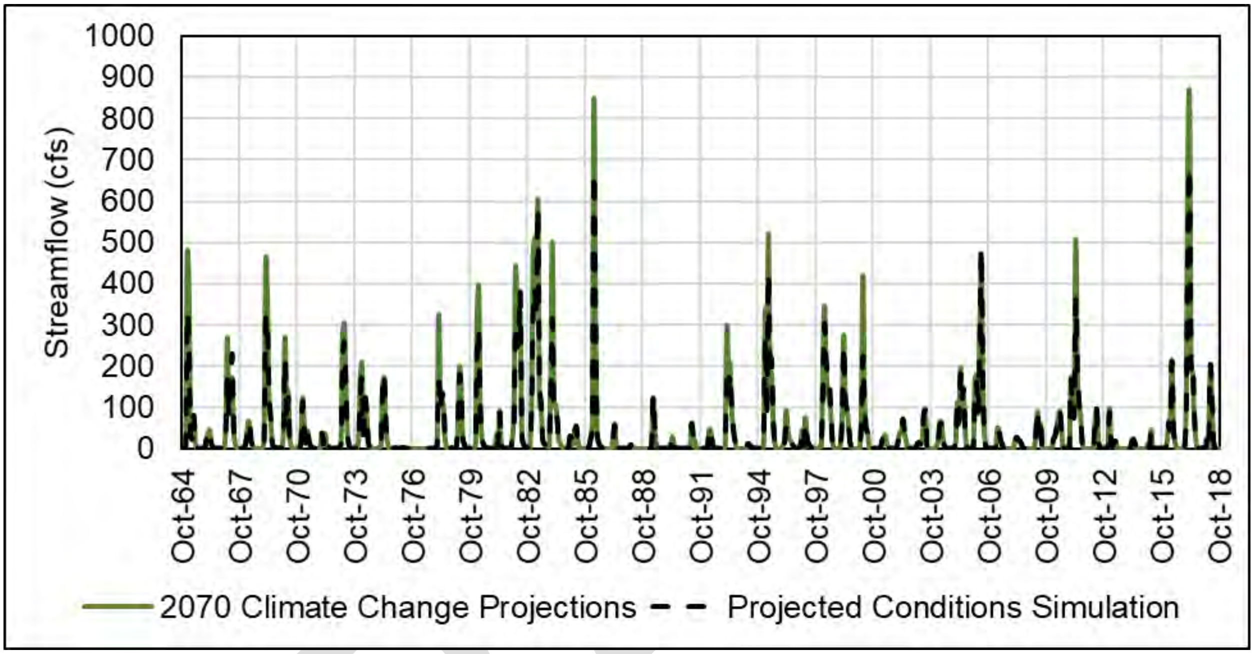


Figure 2-83: Dry Creek Exceedance Curve

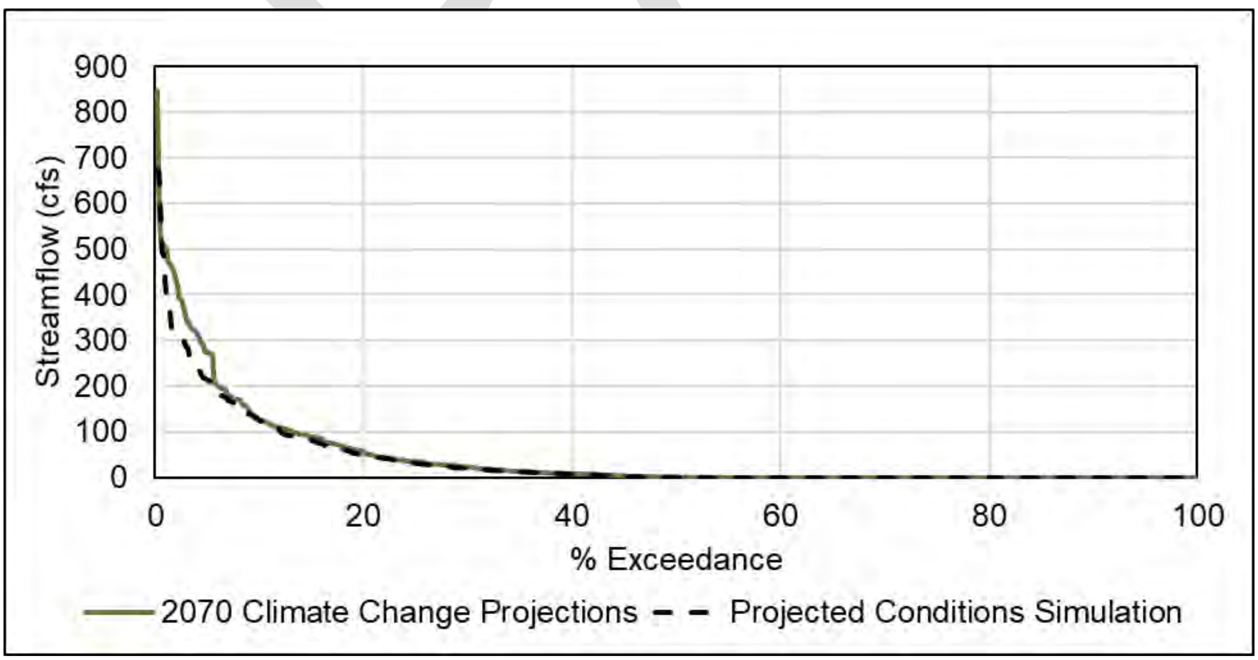


Figure 2-84: Mokelumne River Hydrograph

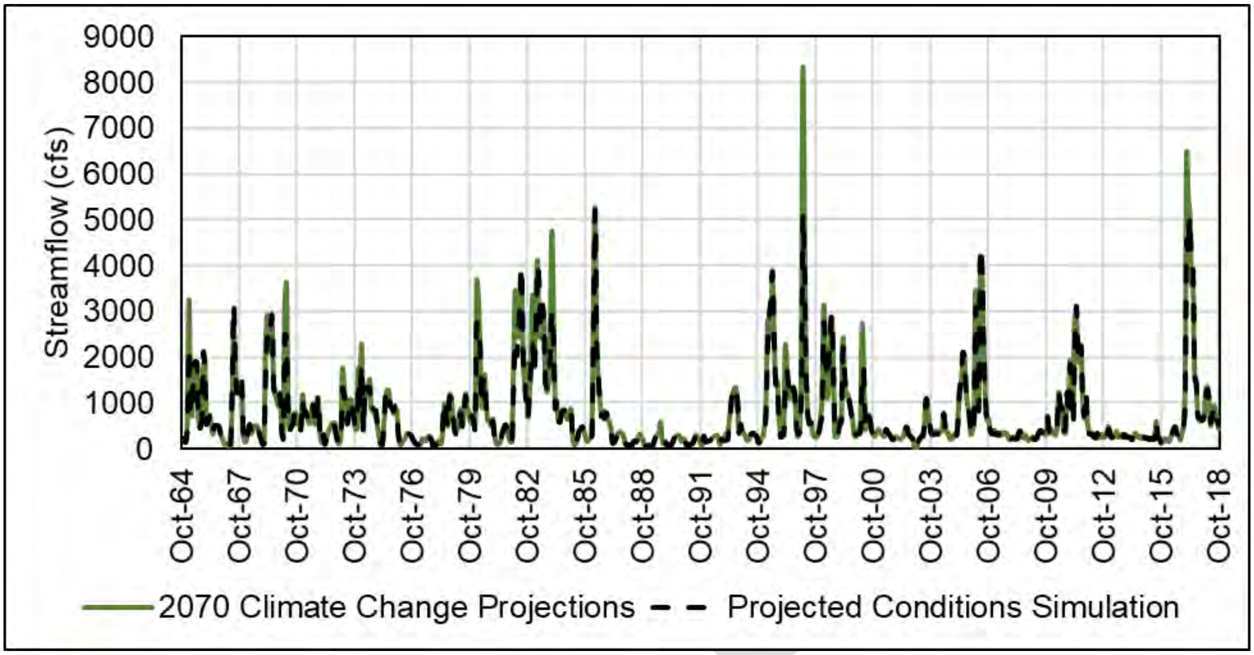
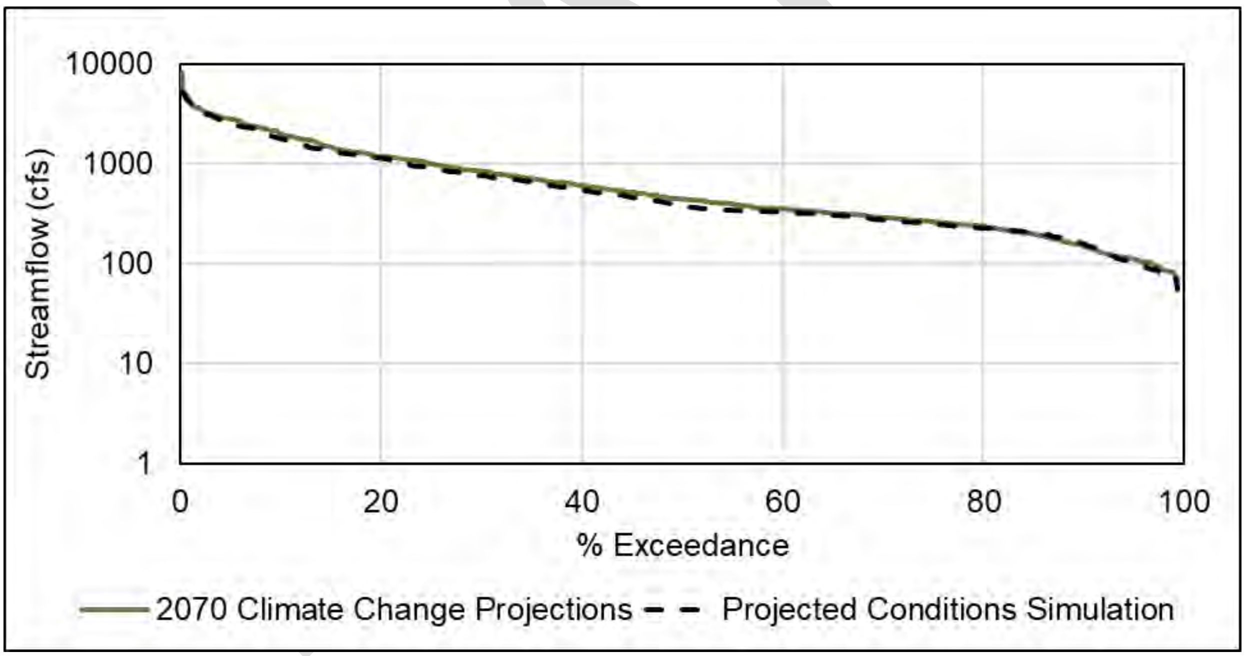


Figure 2-85: Mokelumne River Exceedance Curve



2.3.7.3.1.2 Impaired Flows

CalSim II-estimated flows for point locations on the Calaveras River, San Joaquin River, and Stanislaus River were downloaded from DWR. These points obtained from CalSim II include:

- Calaveras River: New Hogan Reservoir Outflow
- San Joaquin River: San Joaquin River at Vernalis
- Stanislaus River: New Melones Reservoir Outflow

These flows represent projected hydrology based on reservoir outflow, operational constraints, and diversions and deliveries of water for the State Water Project and the Central Valley Project. CalSim II data from WY 1969-2003 was available. For the years 2003-2018, streamflow was synthesized based on flows from WY 1969-2003 and the DWR year type index shown in Table 3 (CA DWR, 2018a). For example, the total monthly streamflow for October 2003 was calculated as the average of the monthly streamflows from October 1966 and October 1971 because they are the same water year type.

CalSim II simulated flows were compared with flows generated using the DWR-provided unimpaired perturbation factors. Streamflow simulated in CalSim II and those derived using the unimpaired adjustment factors did not present similar trends, particularly in dry years, due to CalSim II's simulation of reservoir operations. DWR-provided unimpaired change factors do not account for variations in the operation of the reservoirs that would result from climate change conditions. Therefore, CalSim II outputs were considered a more appropriate starting dataset for regulated streams given that downstream flow is driven by surface water demand rather than natural flow.

The team explored a hybrid approach to improve upon the discrepancy between flows produced using CalSim II and perturbation factors, while accounting for some change in reservoir operations. In this approach, change factors are generated from the difference between the simulated future climate change CalSim II scenario for 2070 climate conditions and a "without climate change" CalSim II run. This "without climate change" run is the CalSim II 1995 Historical Detrended simulation run. The generated change factors from these two runs were then used to perturb the regulated river inflows simulated in the ESJWRM projected conditions scenario. For the purposes of simplicity, this method is referred to throughout the rest of the document as CalSim II Generated Perturbation Factors (CGPF). The CGPF method presents limitations given that the resulting flows are not directly obtained from an operations model. The actual mass balance on the reservoirs is not tracked in the estimates of the flows and, instead, the method relies on CalSim II tracking storage and managing the reservoir based on the appropriate rule curves.

Figure 2-86 through Figure 2-91 provide a comparison of project baseline condition and the results of the CGPF method described above. Exceedance curves are included for each of the CGPF flows against the project baseline flows.

Figure 2-86: Calaveras River Perturbed Hydrograph

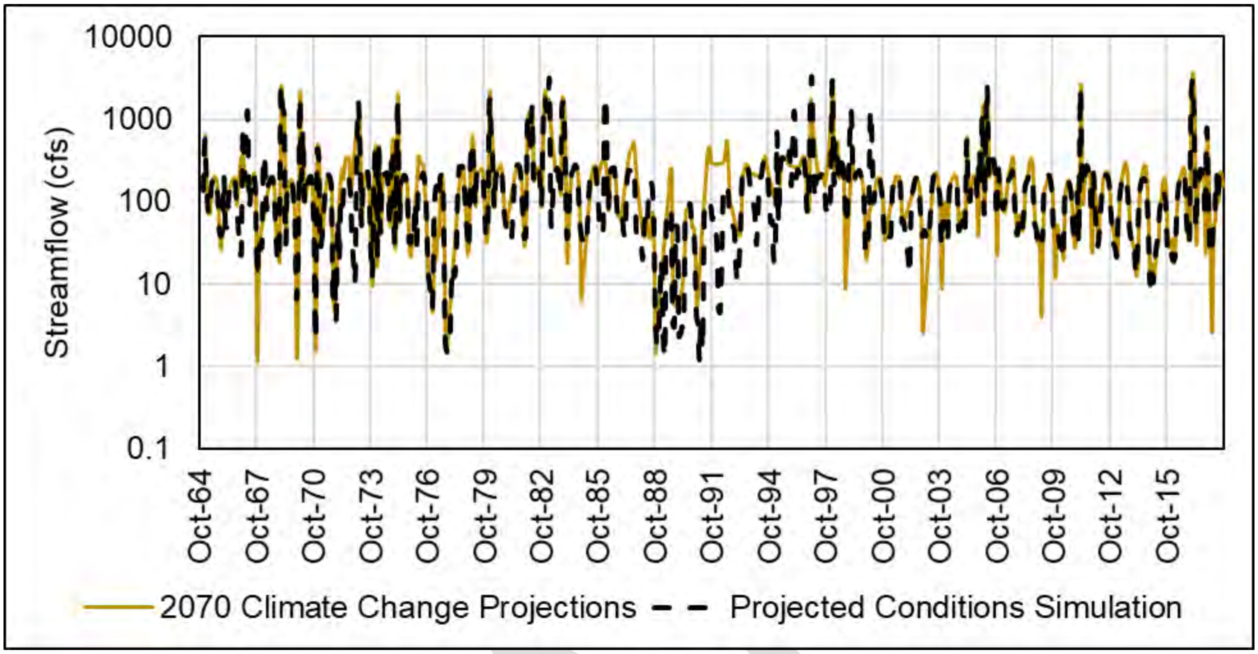


Figure 2-87: Calaveras River Exceedance Curve

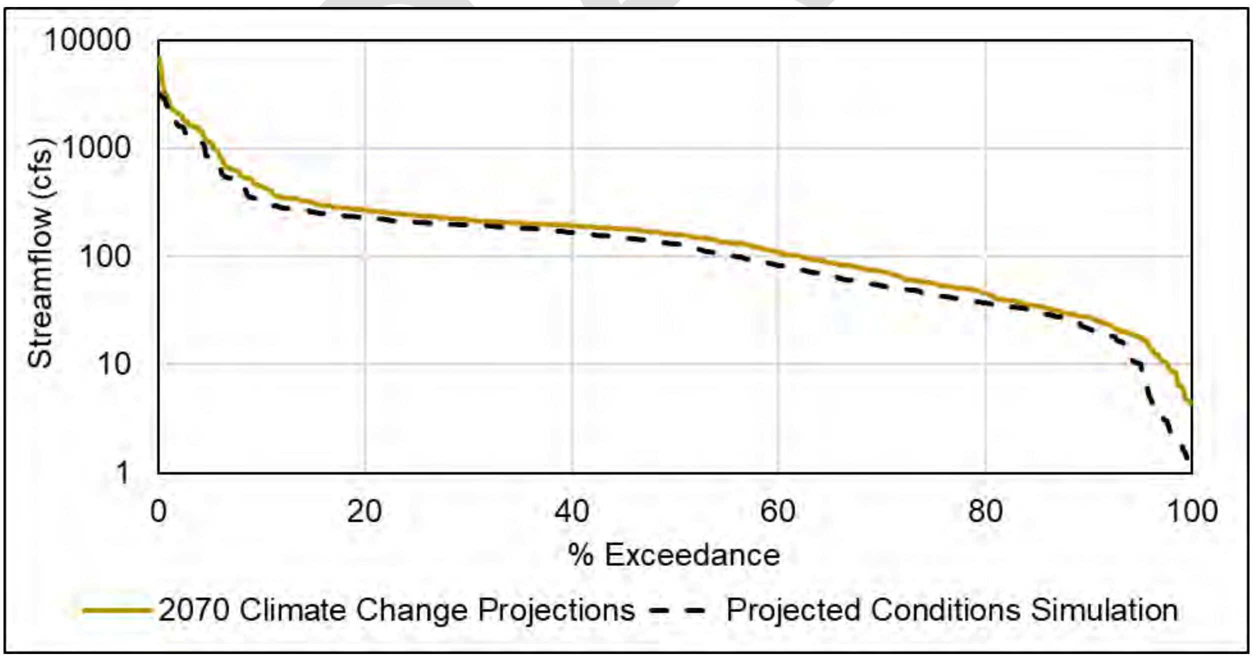


Figure 2-88: Stanislaus River Hydrograph

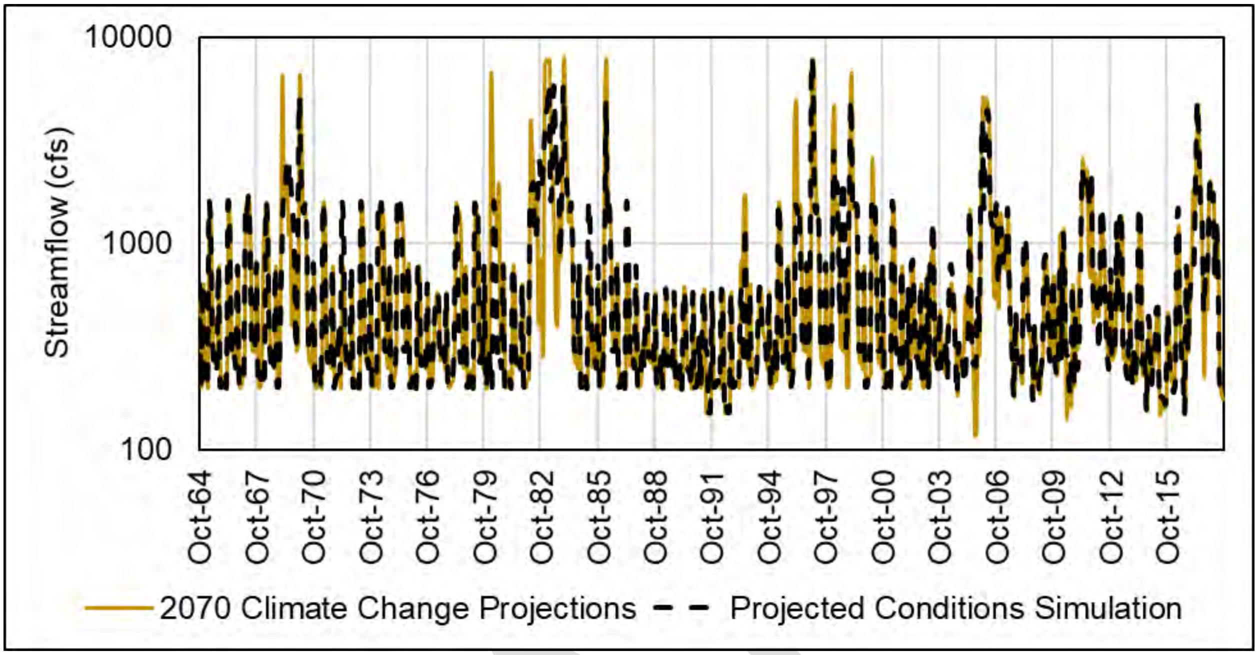


Figure 2-89: Stanislaus River Exceedance Curve

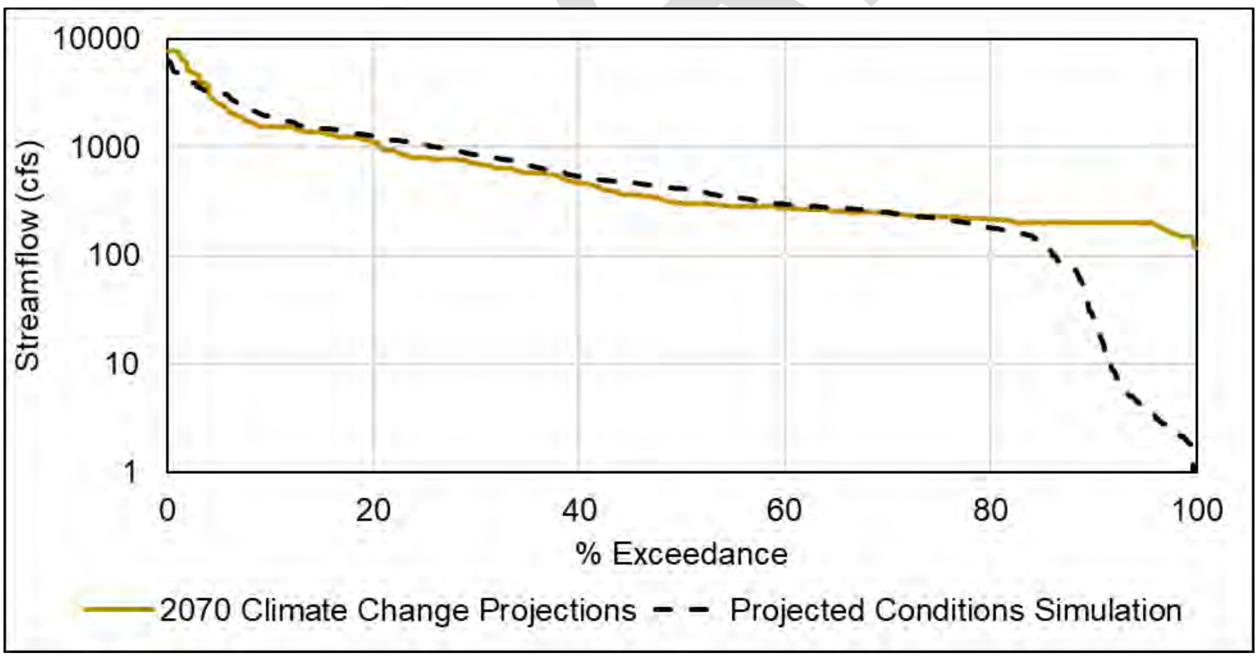


Figure 2-90: San Joaquin River Hydrograph

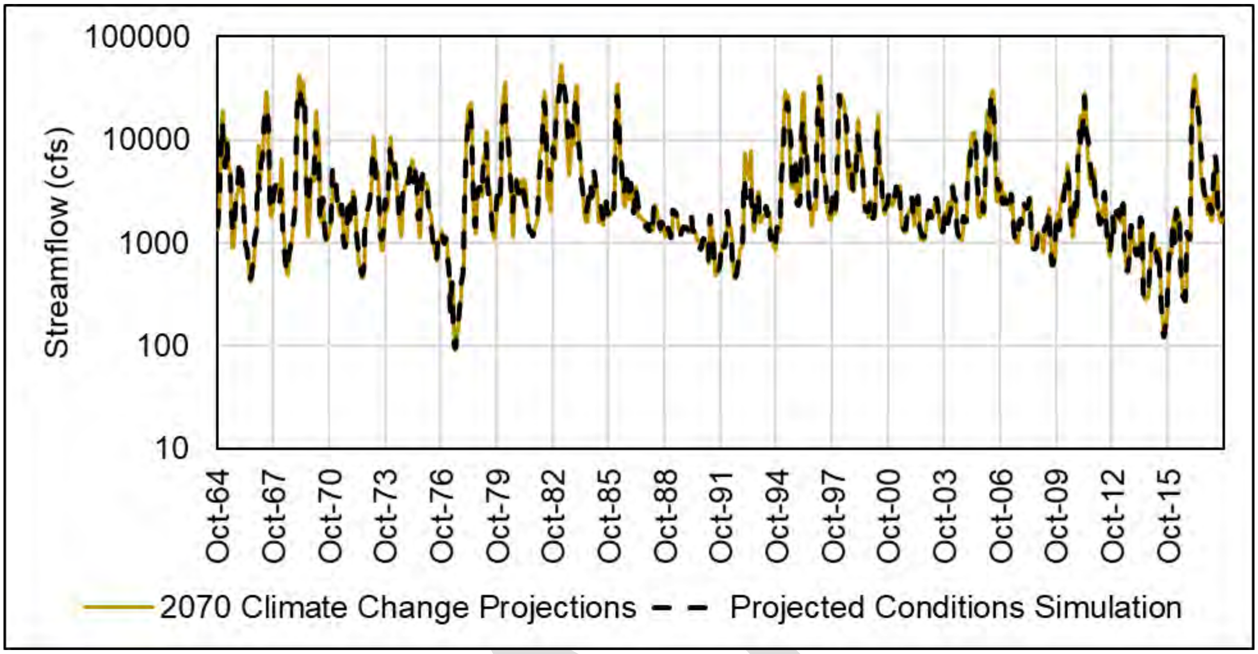
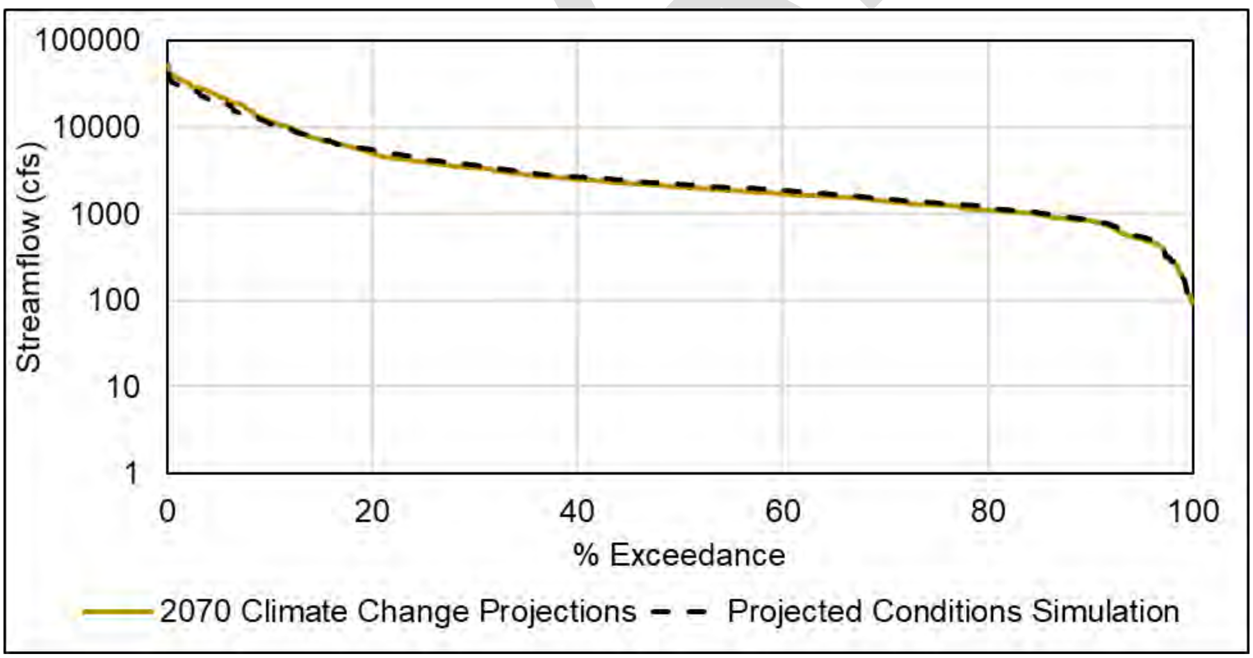


Figure 2-91: San Joaquin River Exceedance Curve



2.3.7.3.2 Precipitation and Evapotranspiration under Climate Change

Projected precipitation and evapotranspiration (ETo) change factors were calculated using a climate period analysis based on historical precipitation and ETo from January 1915 to December 2011 (DWR, 2018b). DWR used a macroscale hydrologic model that solves the water balance of a watershed, called the VIC Model. Change factors provided by DWR were calculated as a ratio of the value of a variable under a "future scenario" divided by a baseline. That baseline data is the 1995 Historical Temperature Detrended scenario downscaled from GCM climate data. The "future scenario" corresponds to VIC outputs of the simulation of future conditions using GCM forecasted hydroclimatic variables as inputs. These change factors are thus a simple perturbation factor that corresponds to the ratio of a future with climate change divided by the past without it. Change factors are available on a monthly time step and spatially defined by the VIC model grid. Supplemental tables with the time series of perturbation factors are available from DWR for each grid cell. DWR has made accessible a Desktop GIS tool for both IWFM and MODFLOW to process these change factors (DWR, 2018c).

2.3.7.3.2.1 Applying Change Factors to Precipitation

DWR change factors were multiplied by historical precipitation to generate projected precipitation under the 2070 central tendency future scenario using the Desktop IWFM GIS tool (DWR, 2018c). The tool calculates an area weighted precipitation change factor for each model grid geometry. This model grid geometry was based on polygons generated around the PRISM nodes within the model region used to specify rainfall depths.

However, the DWR tool only includes change factors through 2011. The remaining 6 years of the time series were synthesized according to historically comparable water years. The perturbation factor from the corresponding month of the comparable year was applied to the baseline of the missing years (2012-2018) to generate projected values. Months with no precipitation in the baseline were assumed a monthly precipitation of 1mm under climate change to account for increased precipitation that cannot be calculated from a baseline of 0 mm for these synthesized years. The comparable years that were used can be found in Table 2-21. These comparable years were determined by comparing total San Joaquin Valley runoff, DWR year type index, and total annual Subbasin precipitation.

Table 2-21: Comparable Water Years (Precipitation)

Water Year Not Available in DWR Tool	Comparable Water Year
2012	2001
2013	1991
2014	1987
2015	1977
2016	2002
2017	1983
2018	1983

The resulting perturbed precipitation values and the baseline precipitation values for the representative historical period can be found in Figure 2-92. The exceedance plot for these two times series can be found in Figure 2-93.

Figure 2-92: Perturbed Precipitation Under Climate Change

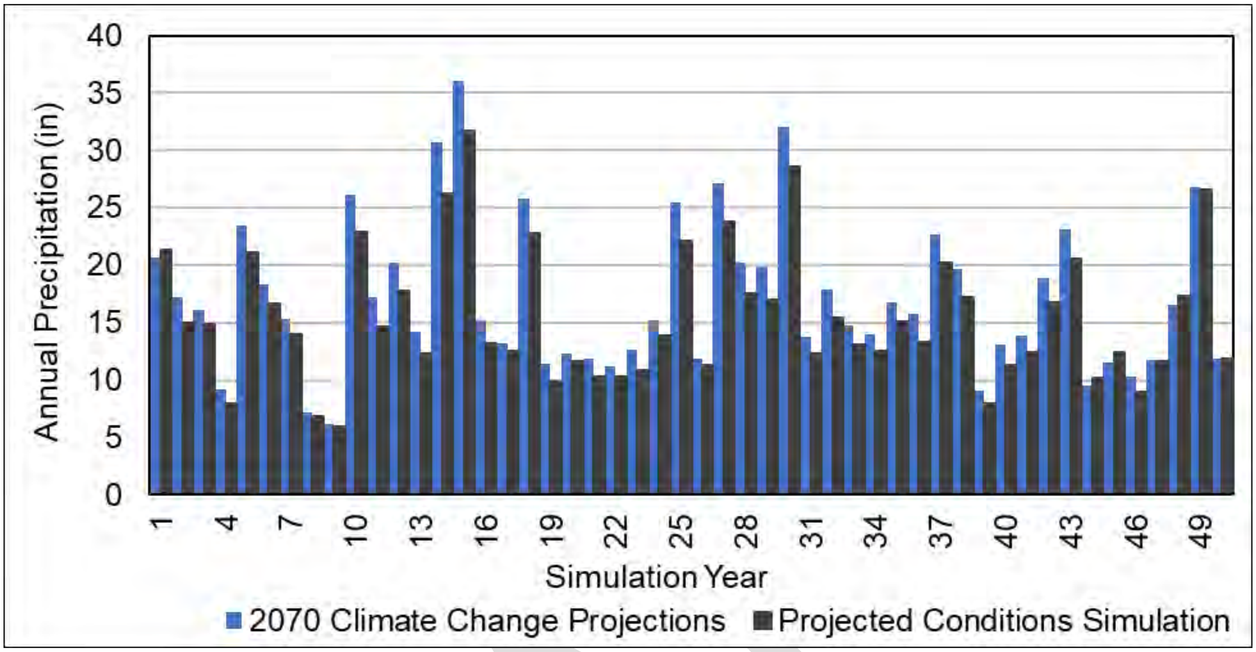
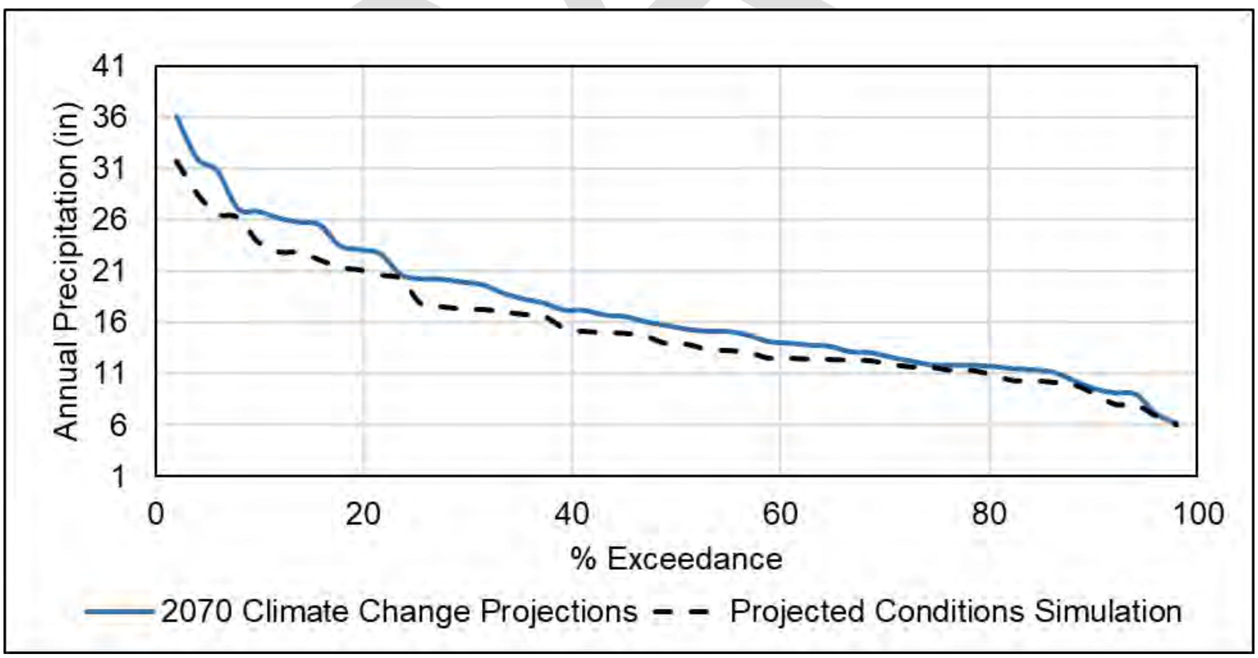


Figure 2-93: Perturbed Precipitation Exceedance Curve



2.3.7.3.2.2 Applying Change Factors to Evapotranspiration

Potential ETo in the basin varies geographically and by land use. DWR provides change factors for ETo that vary spatially based on the VIC model grid as described above. ETo in southern portions of the basin is generally higher than in northern portions for certain land use types, as reflected in the historical calibration of the ESJWRM. For the purposes of this analysis, a localized change factor of 1.084 was used for almonds, walnuts, cherries, pistachios, pasture crops, corn, and rice in the southern areas of the model and a regional ETo change factor of 1.082 was used for the remaining crops in the south and all crops in the northern portion. In this way, the level of discretization of ETo variation between the change factors and the modeled ETo is matched.

The tool provided by DWR to process ETo was not used because of the minimal spatial variation in ETo in the Subbasin. Change factors provided by DWR for November 1, 1964 through December 1, 2011 were averaged. This average ETo change factor was then applied to the historical ETo time series for each crop type. Because there is no interannual variability in ETo in ESJWRM, the same perturbed time series was applied across all simulation years. Refinement to the simulated evapotranspiration of almonds, walnuts, and cherries under 2070 climate conditions are shown in Figure 2-94 through Figure 2-97.

Figure 2-94: Monthly Evapotranspiration Variability for Almonds

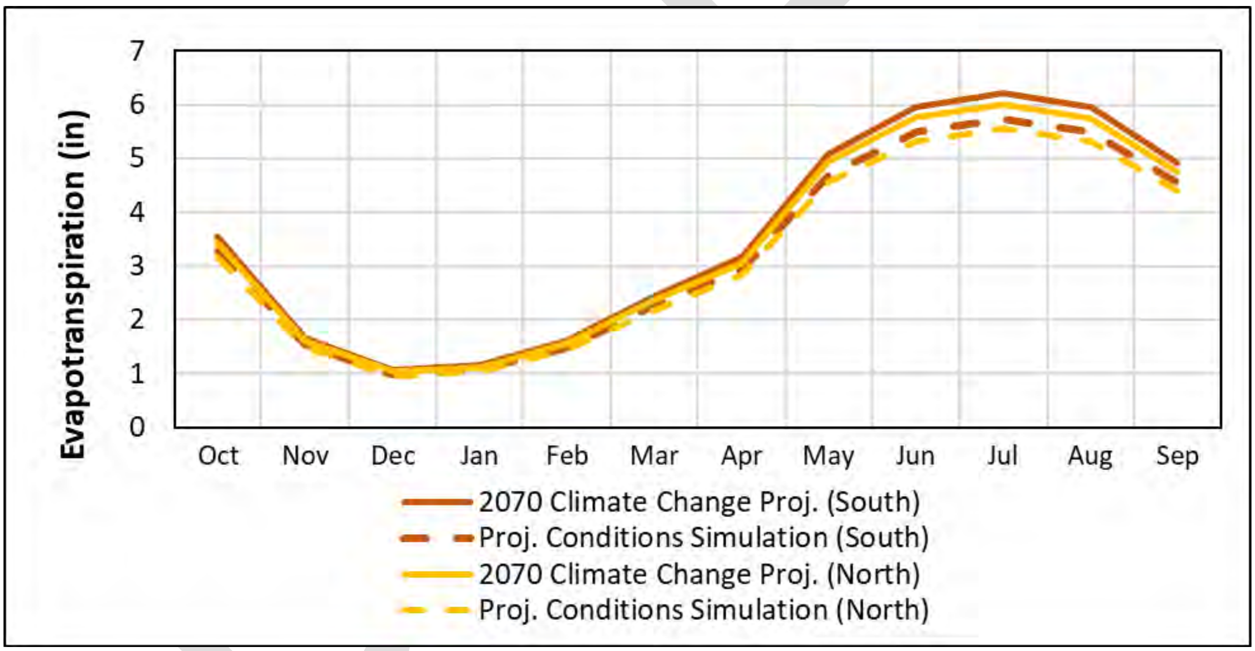


Figure 2-95: Monthly Evapotranspiration Variability for Walnuts

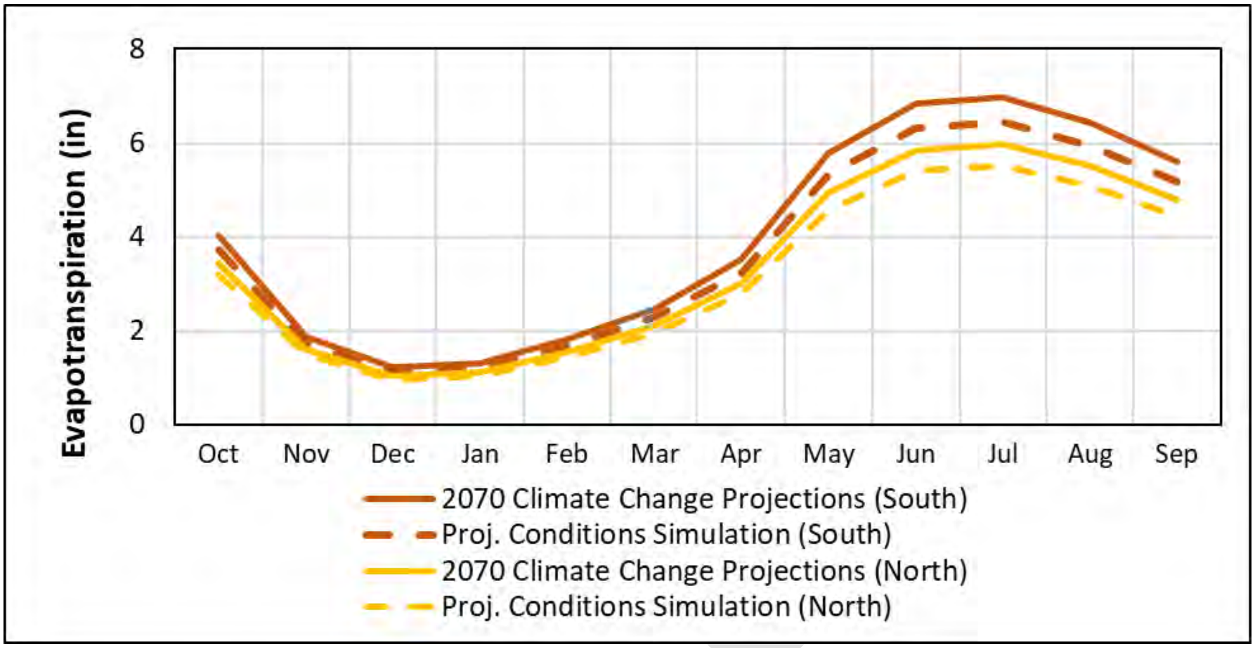


Figure 2-96: Monthly Evapotranspiration Variability for Cherries

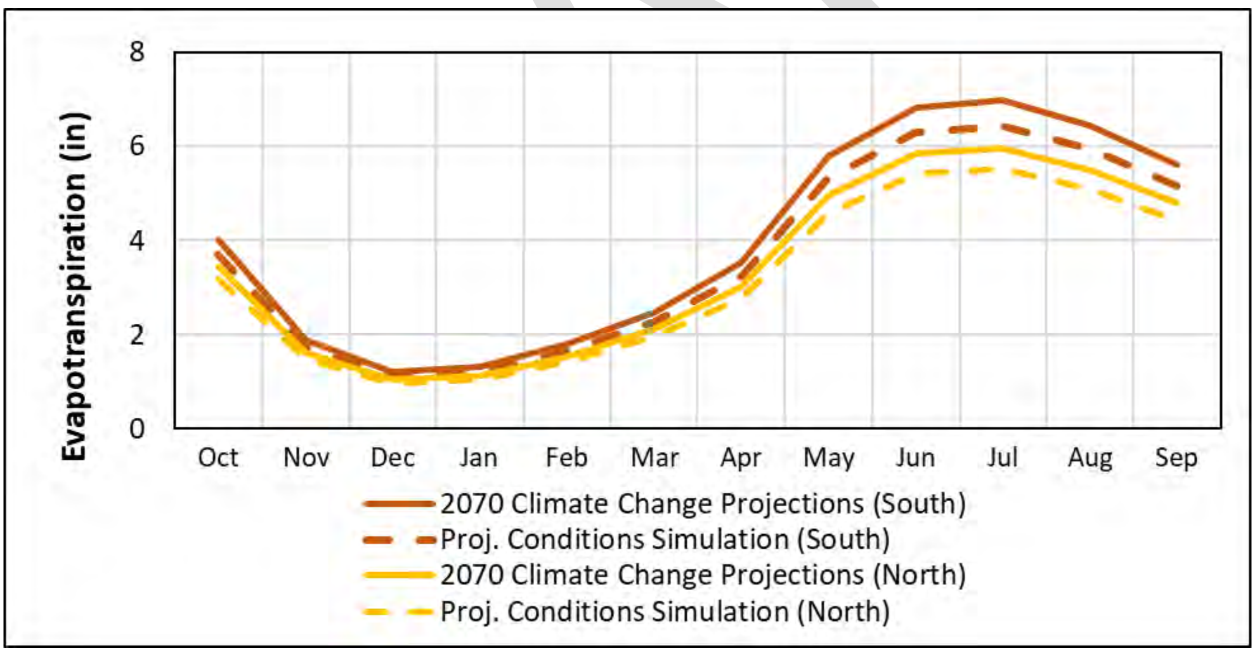
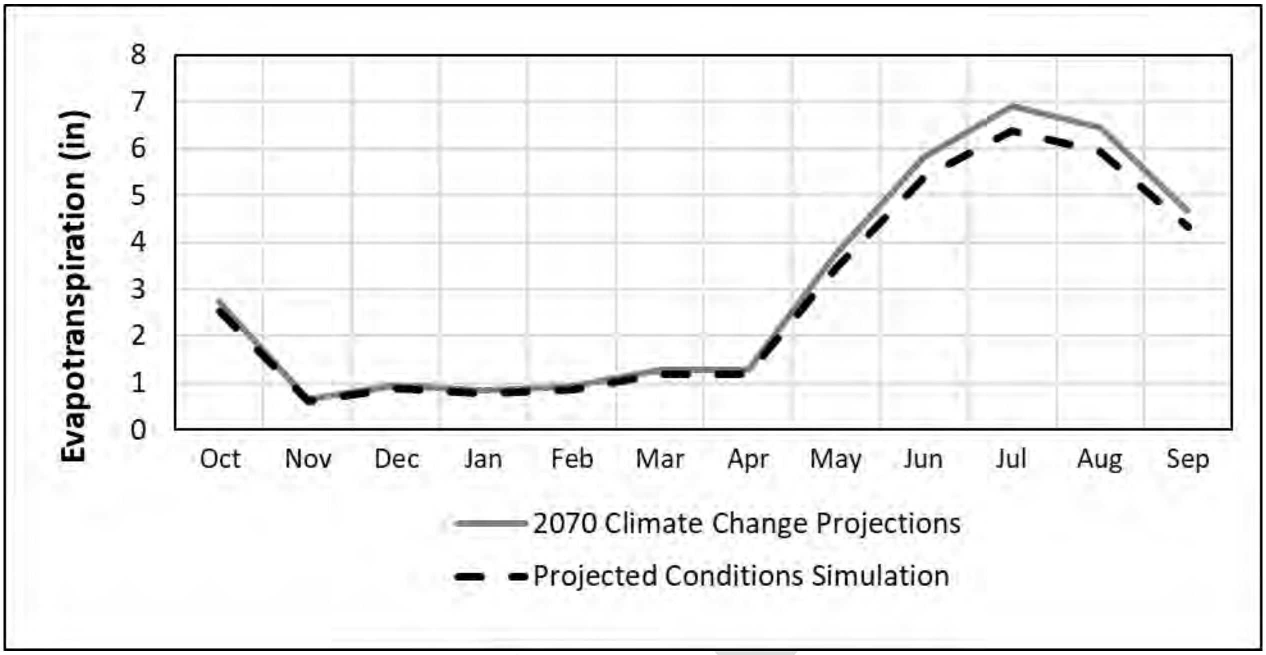


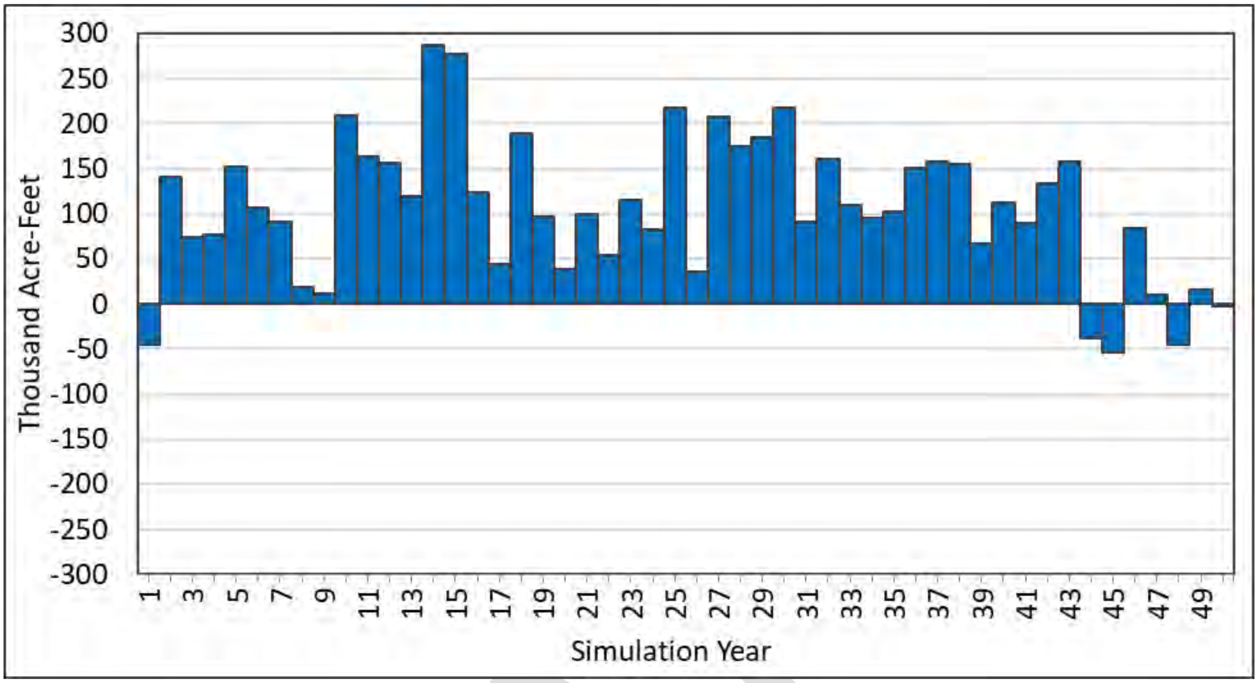
Figure 2-97: Monthly Evapotranspiration Variability for Vineyards



2.3.7.4 Eastern San Joaquin Water Budget Under Climate Change

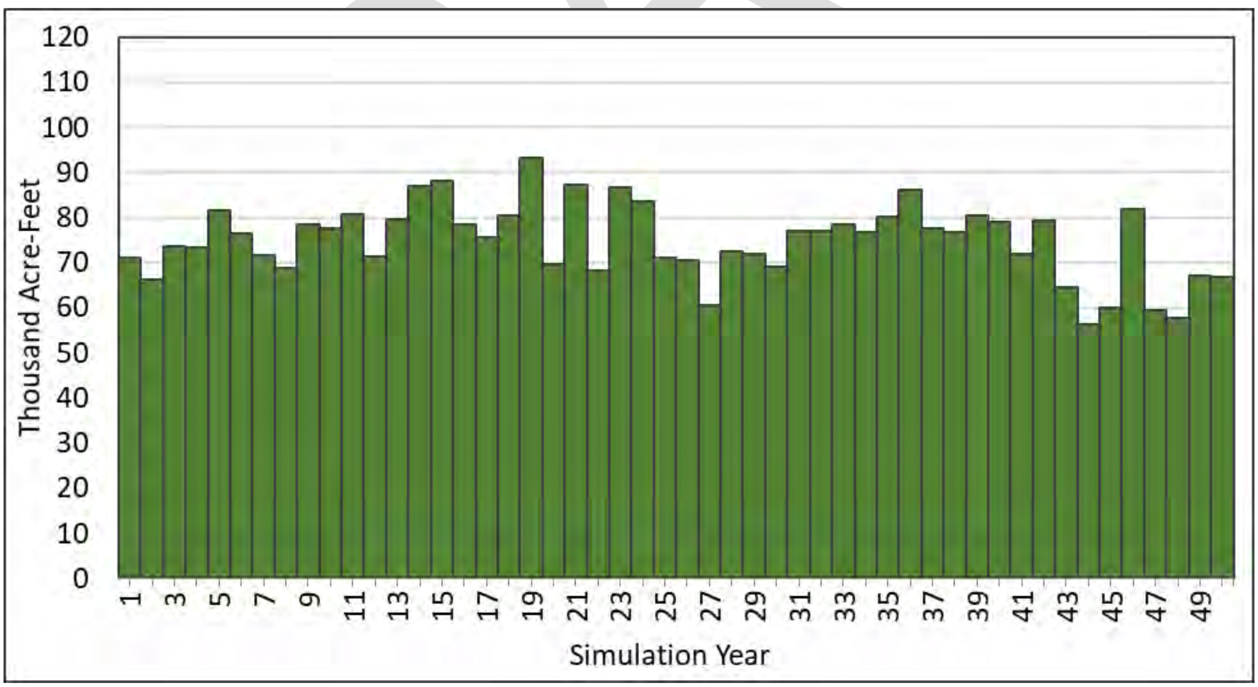
A climate change scenario was developed for the ESJWRM to evaluate the hydrological impacts under these climate change conditions. The analysis was based on the projected conditions scenario with climate change perturbed inputs for streamflow, precipitation, and ETo. Under the climate change scenario, the average annual precipitation is 11 percent higher than the projected conditions scenario, increasing from 984,000 AF/year to 1,090,000 AF/year. Similarly, the average annual volume of evapotranspiration is 6 percent higher than the projected conditions scenario, increasing to 1,476,000 AF/year from 1,394,000 AF/year. Despite there being higher flows in streams, the monthly timing of the flows meant that surface water diversions were not expected to change due to both availability of water in the stream and water rights agreements limiting diversion months. With a similar surface water supply and increased water demands under the climate change scenario, private groundwater production is simulated to increase approximately 11 percent, from 801,000 AF/year to 887,000 AF/year. Under climate change conditions, the depletion in aquifer storage is expected to increase by about 68 percent to an average annual storage change of 57,000 AF/year, from 34,000 AF/year in the projected conditions scenario. A graphical representation of simulated changes to precipitation, evapotranspiration, and groundwater pumping are presented in Figure 2-98 though Figure 2-100, and complete water budgets for the climate change scenario are shown in Figure 2-101 and Figure 2-102.

Figure 2-98: Simulated Changes in Precipitation due to Climate Change



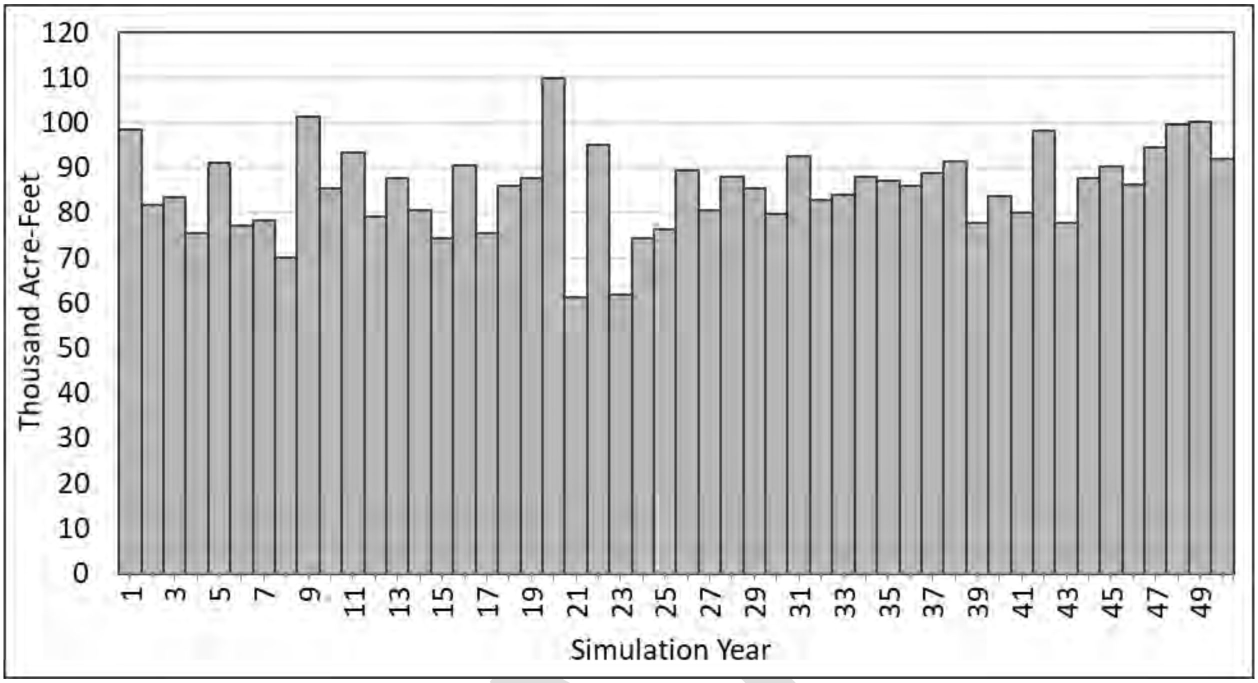
Note: Negative indicates projected conditions scenario value was larger and positive indicates climate change scenario was larger. As expected based on the analysis, the climate change scenario largely has more precipitation.

Figure 2-99: Simulated Changes in Evapotranspiration due to Climate Change



Note: Climate change scenario evapotranspiration is always larger than the projected conditions scenario for all simulated years.

Figure 2-100: Simulated Changes in Groundwater Production due to Climate Change



Note: Climate change scenario groundwater pumping or production is always larger than the projected conditions scenario for all simulated years.

Figure 2-101: Land and Water Use Budget – Climate Change Scenario

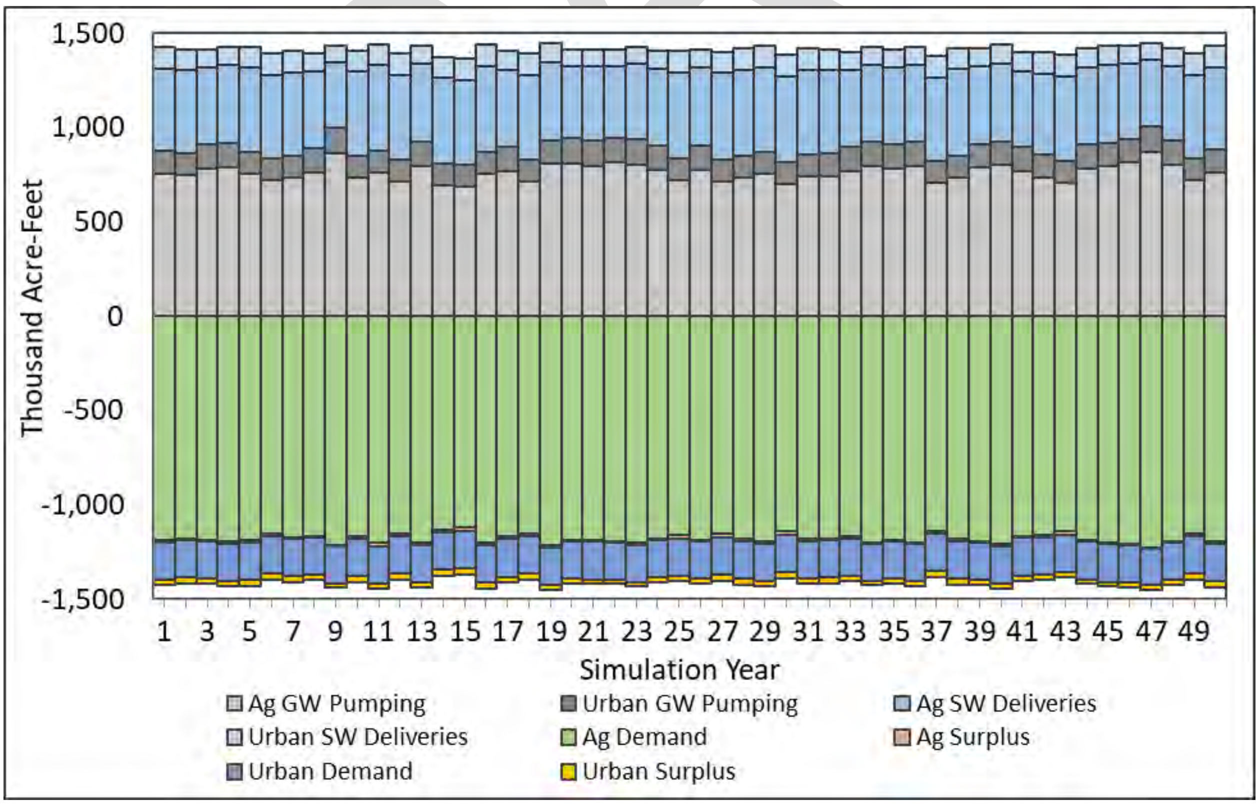
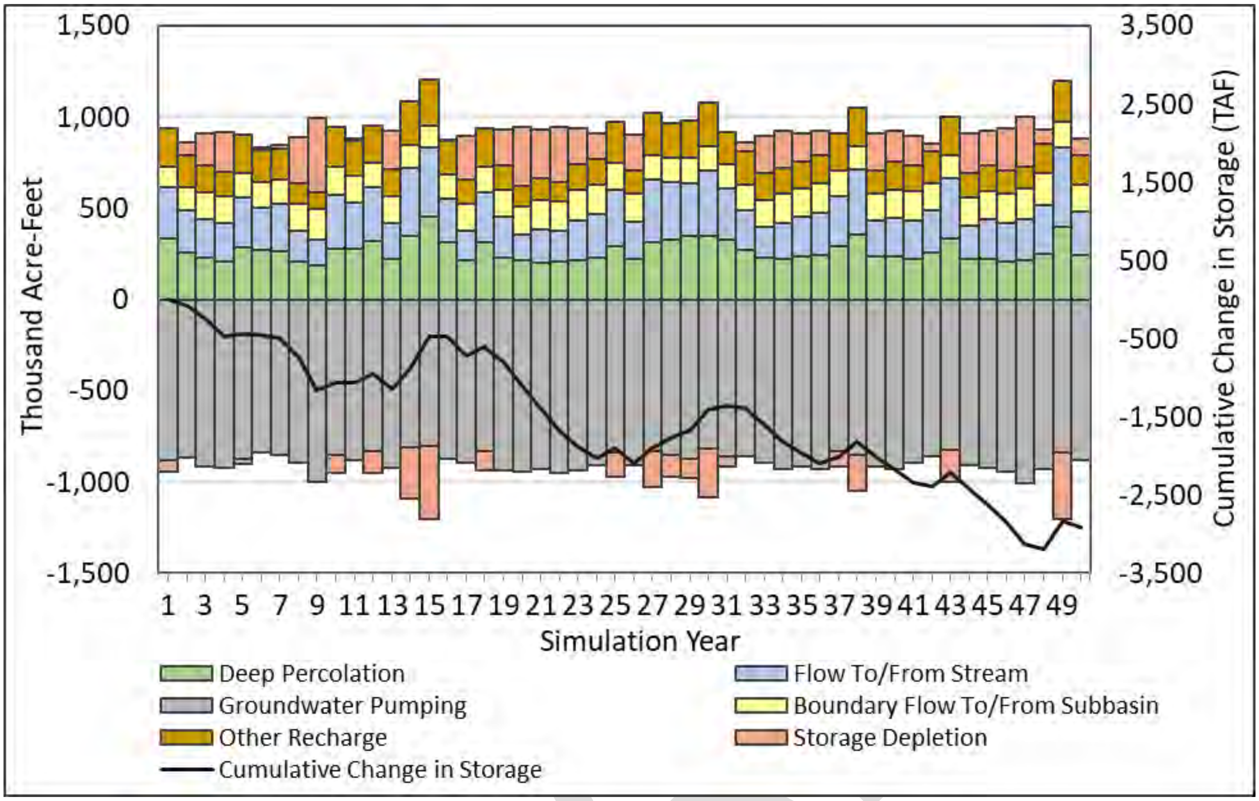


Figure 2-102: Groundwater Budget – Climate Change Scenario



2.3.7.5 Opportunities for Future Refinement

The approach developed for this GSP is based on the methodology in DWR's guidance document (DWR, 2018b) and uses "best available information" related to climate change in the Eastern San Joaquin Subbasin. There are limitations and uncertainties associated with the analysis. One important limitation is that CalSim II does not fully simulate local surface water operations. Thus, the analysis conducted for this GSP may not fully reflect how surface and groundwater basin operations would respond to the changes in water demand and availability caused by climate change. Despite the influence of operations from Pardee and Camanche Dams, Mokelumne flows are simulated under climate change as unimpaired flows in this analysis. This presents an opportunity in future efforts to improve the analysis to better project streamflow. However, for this GSP, use of a local model and the perturbation factor approach were deemed appropriate given the uncertainties in the climate change analysis.

3. SUSTAINABLE MANAGEMENT CRITERIA

Several requirements of Groundwater Sustainability Plans (GSPs) fall under the heading of "Sustainable Management Criteria". These criteria include:

- Sustainability Goal
- Undesirable Results
- Minimum Thresholds
- Measurable Objectives

The Eastern San Joaquin GSP developed these criteria based on information about the basin developed in the hydrogeologic conceptual model (Section 2.1), the descriptions of current and historical groundwater conditions (Section 2.2), the water budget (Section 2.3), and input from stakeholders during the GSP development process. The sustainable management criteria were developed by working with the Advisory Committee, Groundwater Authority Board of Directors (GWA Board), and Workgroup meetings over several months in 2018 and into 2019.

This GSP considers the six sustainability indicators defined by SGMA in the development of sustainable management criteria. SGMA allows several pathways to meet the distinct local needs of each groundwater basin, including development of sustainable management criteria, usage of other sustainability indicators as a proxy, and identification of indicators as not being applicable to the basin. This GSP relies on groundwater levels as a proxy for minimum thresholds and measurable objectives for reduction in groundwater storage, land subsidence, and depletion of interconnected surface water.

3.1 SUSTAINABILITY GOAL

The California Water Code (CWC) defines sustainable groundwater management as "the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results" (CA Water Code Section 10721). The sustainability goal reflects this requirement and succinctly states the GSAs' objectives and desired conditions of the Subbasin:

The sustainability goal description for the Eastern San Joaquin Subbasin is *to maintain an economically-viable groundwater resource for the beneficial use of the people of the Eastern San Joaquin Subbasin by operating the basin within its sustainable yield or by modification of existing management to address future conditions. This goal will be achieved through the implementation of a mix of supply and demand type projects consistent with the GSP implementation plan* (see Chapter 6).

Groundwater levels in the Subbasin may continue to decline during the implementation period. However, as projects are implemented and basin operations are modified, sustainable groundwater management will be achieved and elevations will stabilize on a long-term average basis. Throughout the implementation period, despite the possible decline of groundwater elevations, the Subbasin will be managed to prevent undesirable results. This sustainability goal is supported by locally-defined minimum thresholds that will avoid undesirable results. Demonstration of stable groundwater levels on a long-term average basis combined with the absence of undesirable results will ensure the basin is operating within its sustainable yield and the sustainability goal will be achieved.

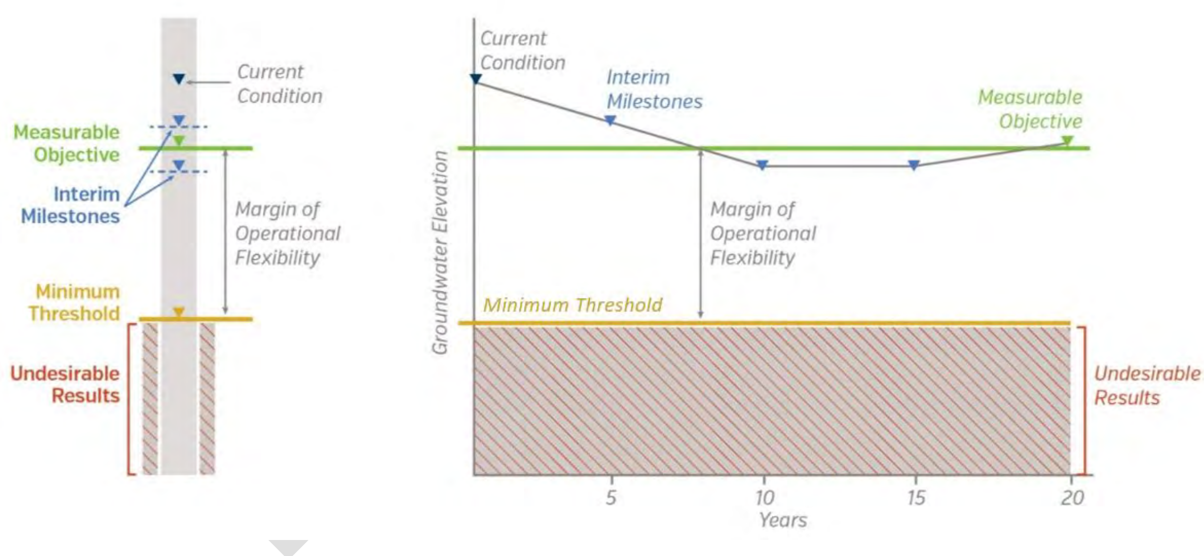
An explanation of how the goal will be achieved is included in Chapter 6: Projects and Management Actions.

Sustainable Management Criteria Definitions

- Undesirable Results – Significant and unreasonable negative impacts associated with each sustainability indicator, avoidance of which is used to guide development of GSP components
- Minimum Threshold – Quantitative threshold for each sustainability indicator used to define the point at which undesirable results may begin to occur
- Measurable Objective – Quantitative target that establishes a point above the minimum threshold that allows for a range of active management in order to prevent undesirable results
- Interim Milestones – Targets set in increments of 5 years over the implementation period of the GSP to put the basin on a path to sustainability
- Margin of Operational Flexibility – The range of active management between the measurable objective and the minimum threshold

See Figure 3-1 for a graphic that demonstrates the relationship between the Sustainable Management Criteria terms.

Figure 3-1: Sustainable Management Criteria Definitions Graphic (Groundwater Levels Example)



3.2 SUSTAINABILITY INDICATORS

3.2.1 Chronic Lowering of Groundwater Levels

3.2.1.1 Undesirable Results

3.2.1.1.1 Description of Undesirable Results

SGMA defines undesirable results related to chronic lowering of groundwater as:

> *Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued over the planning and implementation horizon. Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods.*

An undesirable result for chronic lowering of groundwater levels in the Eastern San Joaquin Subbasin is experienced if sustained groundwater levels are too low to satisfy beneficial uses within the Subbasin over the planning and implementation horizon of this GSP. Potential impacts and the extent to which they are considered significant and unreasonable are determined by the GWA Board and with input by the Advisory Committee, Workgroup, and members of the public. During development of the GSP, potential undesirable results identified by stakeholders included a significant and unreasonable:

- Number of wells going dry
- Reduction of in the pumping capacity of existing wells
- Increase in pumping costs due to greater lift
- Need for deeper well installations or lowering of pumps

3.2.1.1.2 Identification of Undesirable Results

An undesirable result is considered to occur during GSP implementation when at least 25 percent of representative monitoring wells used to monitor groundwater levels (5 of 20 wells in the Subbasin) fall below their minimum level thresholds for two consecutive years that are categorized as non-dry years (below-normal, above-normal, or wet), according to the San Joaquin Valley Water Year Hydrologic Classification. The lowering of groundwater levels during consecutive dry or critically-dry years is not considered to be unreasonable, and would therefore not be considered an undesirable result, unless the levels do not rebound to above the thresholds following those consecutive non-dry years.

3.2.1.1.3 Potential Causes of Undesirable Results

The Eastern San Joaquin Subbasin is currently designated as an overdrafted basin by the Department of Water Resources (DWR). Potential causes of future undesirable results for the chronic lowering of groundwater levels sustainability indicator could result from insufficient pumping offset/reduction in the basin that results in localized or basin-wide groundwater level lowering, or delays in implementation of GSP programs or projects due to increased demand or regulatory, permitting, or funding obstacles.

3.2.1.1.4 Potential Effects of Undesirable Results

If groundwater levels were to cause undesirable results, effects could include de-watering of a subset of the existing groundwater infrastructure, starting with the shallowest wells, which are generally domestic wells; and adverse effects on groundwater-dependent ecosystems, to the extent connected with the production aquifer. Lowering levels to this degree could necessitate changes in irrigation practices and crops grown and could cause adverse effects to property values and the regional economy. Additionally, undesirable results due to declining groundwater levels could adversely affect current and projected municipal uses translating into increased costs for potable water supplies. Furthermore, reduced groundwater levels could drive increased surface water depletions that may impact the beneficial uses of the surface water within the Subbasin.

3.2.1.2 Minimum Thresholds

The minimum thresholds for chronic lowering of groundwater levels are the shallower of 1992 and 2015-2016 historical groundwater levels with a buffer of 100 percent of historical range applied, *or* the 10th percentile domestic well total depth of wells within a 3-mile radius of the monitoring well,[1] whichever is shallower at each representative monitoring well site.

To develop these thresholds, members of the GWA Board, Advisory Committee, and Workgroup evaluated the potential for undesirable results based on past, present, and future conditions. In addition to anecdotal on-the-ground data, data from DWR and GSAs, as well as information from reports and planning documents, were used to identify how a given area falls into any one of three general conditions: 1) Areas with significant and unreasonable existing issues, 2) Areas that previously had issues, and 3) Areas that have never had issues. Each of the three conditions scenarios correspond to a different pathway to setting minimum thresholds. Areas were considered without undesirable results if no significant and unreasonable issues were identified based on input from GSAs and stakeholders and review of prior planning documents.

- Areas with significant and unreasonable existing issues: these areas are considered to have undesirable results, and minimum thresholds are set to 2015 in accordance with SGMA legislation. No areas were identified by the GWA Board or other stakeholders under this condition scenario within the Subbasin.

- Areas that previously had issues: for areas with historical but not current significant and unreasonable results (as identified by GSAs, stakeholders, and prior planning documents), historical levels were considered in the development of minimum thresholds in addition to existing basin management criteria.

- Areas that have never had issues: in areas that have never had issues, discussions on values drove identification of potential thresholds, and minimum thresholds were developed based on the preservation of future beneficial uses.

The GSP authors reviewed prior groundwater-related planning documents in the Subbasin – including Integrated Regional Water Management Plans (IRWMPs), the 2004 Groundwater Management Plan (GMP), Agricultural Water Management Plans (AWMPs), and the Mokelumne Watershed Interregional Sustainability Evaluation (MokeWISE) Water Program – and relied upon these documents as a starting point for setting minimum thresholds under SGMA. The 2014 IRWMP indicates Fall 1992 groundwater elevation levels as a historical low benchmark for the Subbasin, stating "The Eastern San Joaquin Groundwater Basin contour measured in 1992 is proposed as the basin management framework baseline. Groundwater fell to its lowest recorded elevation in 1992 following a significant drought period and it is considered undesirable to drop below this level." (Eastern San Joaquin County GBA, 2014). This language, although not developed within the Sustainable Groundwater Management Act (SGMA) framework, describes what could potentially be considered as a starting point for developing minimum thresholds under SGMA.

Fall 1992 groundwater levels were examined and compared to levels following the recent drought (Fall 2015-2016) using groundwater elevation data from officially monitored California Statewide Groundwater Elevation Monitoring (CASGEM) wells, voluntarily monitored CASGEM wells, clustered and nested wells, and San Joaquin County database wells. This examination evidenced that groundwater elevation levels in some areas of the Subbasin have recovered since 1992, with much of the central portion of the Subbasin showing an increase of greater than 10 feet. However,

[1] A radius of 2 miles was used in for well 03N07E21L003 to reflect domestic well depths in close proximity to the Mokelumne River.

groundwater elevation levels in other portions of the Subbasin have further decreased below 1992 levels without undesirable effects, such as a significant and unreasonable number of wells going dry or impact to GDEs, being observed by GSAs and other stakeholders. In many cases, areas that experienced undesirable effects in 1992 put mitigation measures in place, often deepening wells, meaning that 1992 groundwater levels would no longer trigger undesirable effects.

To develop a greater understanding of potential impacts to beneficial uses experienced under historical low groundwater elevations, the deepest conditions between fourth quarter 1992 and 2015-2016 groundwater levels were examined. These years were chosen based on the threshold language in the IRWMP and also to capture the end of the two most recent droughts. Fourth quarter 2014 data was used in the northwest corner of the Subbasin, where data is limited.

Individual GSAs confirmed understanding of the historical lows based on their experience and data, provided feedback on groundwater conditions for their GSAs, and indicated if undesirable results could occur if the minimum threshold was set deeper than the lower of 1992 and 2015-2016 based on their understanding. From there, GSAs identified potential wells to be included in the representative monitoring network for the groundwater level sustainability indicator based on the adequate spatial coverage, availability of historical data, and reliability of monitoring well. For the majority of the Subbasin, no undesirable effects were identified based on stakeholder input, even at historical low groundwater elevations. As a starting point, a potential minimum threshold was considered for each representative monitoring well based on the lower of 1992 or 2015-2016 values unless otherwise indicated. A buffer was subtracted from the minimum 1992 or 2015 groundwater elevation. The buffer was calculated by finding the difference between the minimum and maximum groundwater level over the historical record for each representative monitoring well. The subtraction of the buffer provides a range in which groundwater levels may continue to decline during implementation of projects and management actions until sustainable yield is reached. The buffer allows for flexibility but would avoid significant and unreasonable impacts to groundwater levels.

The GWA Board determined that dewatering of domestic wells may be a potential undesirable result that could potentially be used to confirm the adequacy of the minimum threshold methodology. Domestic wells are generally shallower than agricultural and municipal wells and thus more sensitive to undesirable effects such as wells going dry. Additionally, the loss of a domestic well usually results in a loss of water for consumption, cooking, and sanitary purposes, which can often have substantial impacts on the users of the water and can be financially difficult for the well owner to replace. The 10th percentile domestic well depth (i.e., the depth of the top 10th percent most shallow well) was examined within a radius around the monitoring well representative of local conditions. A radius of 3 miles around the representative monitoring well was used in all cases except for well 03N07E21L003, where a 2-mile radius was used due to variations in local well depth due to proximity to the Mokelumne River. An average of 400 domestic wells were captured within a 3-mile radius of each representative monitoring well, covering approximately 76 percent of the domestic wells in the Subbasin. In cases where the 10th percentile domestic well depth was shallower than the historical drought low with the buffer, that value was developed as the threshold to prevent undesirable results associated with dewatering wells in the Subbasin. Domestic well data was retrieved from Online System for Well Completion Reports (OSCWR), and information on casing, screening, and age of well is not available in most locations. The 10th percentile well depth was developed due to the uncertainty in the database and to account for domestic wells may have been drilled to a very shallow depth and/or have reached the end of their useful lives. Using this threshold, impact to the deepest 90 percent of domestic wells is considered a significant and unreasonable impact.

Figure 3-2 shows the location of groundwater level representative monitoring wells throughout the Eastern San Joaquin Subbasin. Table 3-1 lists the corresponding numeric minimum thresholds at each representative monitoring well as well as the basis criteria applied.

Additional data on the monitoring wells and minimum thresholds, including hydrographs of historical observed data and domestic well analysis is provided in Appendix 3-A and 3-B.

Figure 3-2: Location of Representative Monitoring Wells for Groundwater Levels

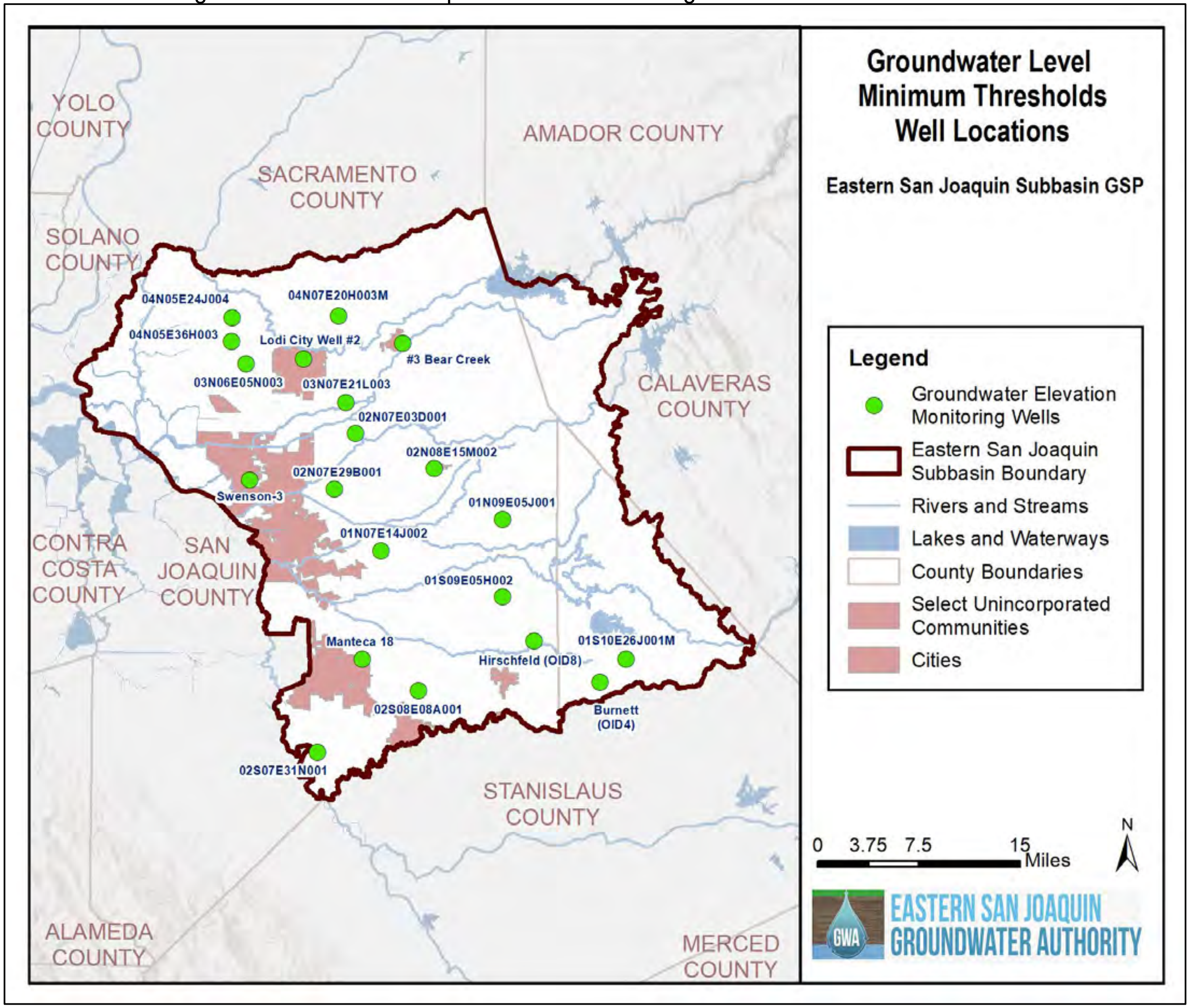


Table 3-1: Minimum Thresholds for Chronic Lowering of Groundwater Levels

Narrative Description		
The minimum threshold is set at the shallower of 1992 and 2015-2016 groundwater levels with a buffer of 100 percent of historical range applied, *or* the 10th percentile domestic well depth, whichever is shallower.		
Numeric Minimum Thresholds		
Well ID	Minimum Threshold (feet mean sea level [MSL])	Basis for Threshold
01S09E05H002	-49.8	10th percentile domestic well depth
01N07E14J002	-114.4	1992 groundwater level with a buffer of 100 percent of historical range
Swenson-3	-26.6	2015 groundwater level with a buffer of 100 percent of historical range
02N08E15M002	-124.1	10th percentile domestic well depth
#3 Bear Creek	-72.3	2016 groundwater level with a buffer of 100 percent of historical range
Lodi City Well #2	-38.5	1992 groundwater level with a buffer of 100 percent of historical range
Manteca 18	-16.0	2016 groundwater level with a buffer of 100 percent of historical range
04N07E20H003M	-81.7	2016 groundwater level with a buffer of 100 percent of historical range
03N07E21L003	-100.0	1992 groundwater level with a buffer of 100 percent of historical range*
Hirschfeld (OID-8)	8.0	2015 groundwater level with a buffer of 100 percent of historical range
Burnett (OID-4)	60.7	2015 groundwater level with a buffer of 100 percent of historical range
02S07E31N001	1.5	1992 groundwater level with a buffer of 100 percent of historical range
02S08E08A001	0.6	2016 groundwater level with a buffer of 100 percent of historical range
02N07E03D001	-122.8	10th percentile domestic well depth
01N09E05J001	-86.8	10th percentile domestic well depth
02N07E29B001	-130.1	10th percentile domestic well depth
04N05E36H003	-31.1	2015 groundwater level with a buffer of 100 percent of historical range
03N06E05N003	-35.1	2015 groundwater level with a buffer of 100 percent of historical range
04N05E24J004	-31.2	2015 groundwater level with a buffer of 100 percent of historical range
01S10E26J001M	43.7	2015 groundwater level with a buffer of 100 percent of historical range

* Minimum threshold is evaluated against the10th percentile domestic well depth, calculated using a 2-mile radius around selected monitoring well

3.2.1.3 Measurable Objectives and Interim Milestones

Measurable objectives are quantitative goals that reflect the desired Subbasin condition and allow the Subbasin to achieve its sustainability goal. The measurable objective is set to allow a reasonable margin of operational flexibility (Margin) between minimum thresholds to allow for active management of the basin during dry periods without reaching the minimum threshold. The Margin is intended to accommodate droughts, climate change, conjunctive use operations, or other groundwater management activities. The Margin is defined as the difference between the minimum threshold and measurable objective.

The measurable objective for chronic lowering of groundwater levels is defined as the lower of 1992 or 2015-2016 groundwater level values.

Table 3-2 lists the measurable objectives for each representative monitoring well. The Margin is defined at each well as the difference between the minimum and maximum groundwater level over the historical record for that well.

Table 3-2: Measurable Objective for Chronic Lowering of Groundwater Levels

Narrative Description	
The measurable objective is set at the deeper of 1992 and 2015-2016 groundwater levels.	
Numeric Measurable Objectives	
Well ID	Measurable Objective (feet MSL)
01S09E05H002	-19.6
01N07E14J002	-70.4
Swenson-3	-19.3
02N08E15M002	-69.7
#3 Bear Creek	-50.3
Lodi City Well #2	-3.5
Manteca 18	5.8
04N07E20H003M	-36.7
03N07E21L003	-57.5
Hirschfeld (OID-8)	31.5
Burnett (OID-4)	79.7
02S07E31N001	13.0
02S08E08A001	24.0
02N07E03D001	-79.7
01N09E05J001	-51.1
02N07E29B001	-80.4
04N05E36H003	-5.1
03N06E05N003	-14.1
04N05E24J004	-6.2
01S10E26J001M	81.7

To assist the Subbasin in reaching the measurable objective for groundwater levels, interim milestones for 2025, 2030, and 2035 are developed to keep implementation on track. Interim milestones are based on achieving the sustainability goal within the 20-year time period provided by SGMA.

Table 3-3 shows the 5-year milestones, which follow a stepwise trend between the current condition and the measurable objective.

Table 3-3: Interim Milestones for Chronic Lowering of Groundwater Levels

Narrative Description					
5-year milestones are assumed to remain similar to current for the first 10 years and then follow along a linear trend between the current condition and the measurable objective.					
Numeric Interim Milestones					
Well ID	Current Condition* (feet MSL)	Measurable Objective (feet MSL)	Interim Milestones		
			2025	2030	2035
01S09E05H002	-8.7	-19.6	-8.7	-8.7	-14.2
01N07E14J002	-49.9	-70.4	-49.9	-49.9	-60.2
Swenson-3	-19.3	-19.3	-19.3	-19.3	-19.3
02N08E15M002	-63.2	-69.7	-63.2	-63.2	-66.5
#3 Bear Creek	-49.3	-50.3	-49.3	-49.3	-49.8
Lodi City Well #2	0.6**	-3.5	0.6	0.6	-1.5
Manteca 18	9.1	5.8	9.1	9.1	7.5
04N07E20H003M	-35.5	-36.7	-35.5	-35.5	-36.1
03N07E21L003	-51.5	-57.5	-51.5	-51.5	-54.5
Hirschfeld (OID-8)	31.5	31.5	31.5	31.5	31.5
Burnett (OID-4)	79.7	79.7	79.7	79.7	79.7
02S07E31N001	13.8**	13	13.8	13.8	13.4
02S08E08A001	22.2**	24	22.2	22.2	23.1
02N07E03D001	-61.7	-79.7	-61.7	-61.7	-70.7
01N09E05J001	-20.2	-51.1	-20.2	-20.2	-35.7
02N07E29B001	-49.8**	-80.4	-49.8	-49.8	-65.1
04N05E36H003	-5.1	-5.1	-5.1	-5.1	-5.1
03N06E05N003	-14.1	-14.1	-14.1	-14.1	-14.1
04N05E24J004	-6.2	-6.2	-6.2	-6.2	-6.2
01S10E26J001M	81.7	81.7	81.7	81.7	81.7

* Current Condition is the fall 2015 groundwater level
** Current Condition is the average of fall groundwater levels for 2013-2016

3.2.2 Reduction in Groundwater Storage

3.2.2.1 Undesirable Results

3.2.2.1.1 Description of Undesirable Results

The undesirable result related to reduction in groundwater storage is defined in SGMA as:

> *Significant and unreasonable reduction in groundwater storage.*

An undesirable result for reduction in groundwater storage in the Eastern San Joaquin Subbasin is experienced if sustained groundwater storage volumes are too low to satisfy beneficial uses within the Subbasin over the planning and implementation horizon of this GSP.

Undesirable results related to groundwater storage in the Subbasin have not occurred historically, are not currently occurring, and are not likely to occur in the future. As discussed in the current and historical groundwater conditions section of this GSP (Section 2.2), there is a large volume (approximately 53 million acre-feet [MAF]) of freshwater in storage. Previous analysis of groundwater storage using the Eastern San Joaquin Water Resources Model (ESJWRM) showed a range of fluctuation from 1996 to 2015 of approximately 0.001 percent per year. See Section 2.2.2 for additional quantification of groundwater storage. A discussion of the geology of the Subbasin can be found in Section 2.1.

3.2.2.1.2 Identification of Undesirable Results

An undesirable result occurs when storage is insufficient to satisfy beneficial uses within the Subbasin. It is roughly estimated that groundwater demand for beneficial use occurs within the top 23 MAF of the Subbasin. Therefore, undesirable results would occur if groundwater storage were reduced to less than 30 MAF.

3.2.2.1.3 Potential Causes of Undesirable Results

Although the Subbasin has enough fresh groundwater in storage to sustain groundwater pumping in conditions of overdraft for centuries, dramatic increases in reliance on groundwater, severe drought, or other major changes in groundwater management over time could cause the volume of freshwater in groundwater storage to decline to a significant and unreasonable level.

3.2.2.1.4 Potential Effects of Undesirable Results

If groundwater levels were to reach levels causing significant and unreasonable undesirable results, effects could include running out of fresh groundwater to access in drought years. Increased cost of access, reduction in beneficial uses, such as domestic supply and changes to agriculture.

3.2.2.2 Minimum Thresholds

This GSP uses groundwater level minimum thresholds as a proxy for the reduction in groundwater storage sustainability indicator.

GSP regulations allow GSAs to use groundwater levels as a proxy metric for any sustainability indicator, provided the GSP demonstrates that there is a significant correlation between groundwater levels and the other metrics. In order to rely on groundwater levels as a proxy, one approach suggested by DWR is to:

> *Demonstrate that the minimum thresholds and measurable objectives for chronic declines of groundwater levels are sufficiently protective to ensure significant and unreasonable occurrences of other sustainability indicators will be prevented. In other words, demonstrate that setting a groundwater level minimum threshold*

> *satisfies the minimum threshold requirements for not only chronic lowering of groundwater levels but other sustainability indicators at a given site* (CA DWR, 2017).

Minimum thresholds for groundwater levels will effectively avoid undesirable results for reduction of groundwater storage. As noted above, the amount of groundwater in storage in the Subbasin is approximately 53 MAF and the undesirable result of reducing beneficial uses would not occur until storage reached 30 MAF. The minimum threshold for groundwater levels would create a reduction of approximately 1.2 MAF of storage.[2] Minimum thresholds and measurable objectives for groundwater levels can therefore be used as a proxy for reduction in groundwater storage because groundwater levels are sufficiently protective against occurrences of significant and unreasonable reduction in groundwater storage.

3.2.2.3 Measurable Objectives and Interim Milestones

As chronic lowering of groundwater levels is used as a proxy for reduction in groundwater storage, the measurable objectives and interim milestones for the reduction in groundwater storage sustainability indicator are the same measurable objectives and interim milestones for the chronic lowering of groundwater levels sustainability indicator as set forth in Section 3.2.5.3.

3.2.3 Degraded Water Quality

3.2.3.1 Undesirable Results: Degraded Water Quality

3.2.3.1.1 Description of Undesirable Results

The undesirable result related to degraded water quality is defined in SGMA as:

> *Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.*

An undesirable result for degraded water quality in the Eastern San Joaquin Subbasin is experienced if groundwater management activities cause significant and unreasonable impacts to the long-term viability of domestic, agricultural, municipal, environmental, or other beneficial uses over the planning and implementation horizon of this GSP.

Salinity is the only water quality constituent for which minimum thresholds are established in the Eastern San Joaquin Subbasin. Although other constituents, including arsenic, nitrogen, and sulfate, are evaluated in the Current and Historical Groundwater Conditions section of this GSP (Section 2.2), these constituents are managed through existing management and regulatory programs within the Subbasin. Additionally, SGMA does not give GSAs land use authority, so a nexus must be present between groundwater conditions and groundwater pumping activities. Programs such as the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) and Irrigated Lands Regulatory Program (ILRP) focus on improving water quality by managing septic and agricultural sources of salinity and nutrients. Additionally, point-source contaminants are managed and regulated through a variety of programs by Regional Water Quality Control Board (RWQCB), Department of Toxic Substances Control (DTSC), and the U.S. Environmental Protection Agency (EPA). Through monitoring, the GSP will document these constituents and identify opportunities for coordination with existing programs. A description of existing regulations and requirements for these constituents is provided in Section 2.2.4. Through coordination with existing agencies and through monitoring, the GWA will know if such regulations are being met.

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2 Volumes based on ESJWRM estimates calculated assuming all representative monitoring wells for groundwater levels reached their minimum thresholds across the Subbasin for a conservative estimate of Subbasin storage reduction.

TDS was selected for the evaluation of sustainable management criteria for salinity under this sustainability indicator, as historical data for TDS are more widely available in the Eastern San Joaquin Subbasin than other constituents used to measure salinity, such as electrical conductivity (EC) or chloride. This decision was made by the GWA Board based on the greater availability of TDS data in the Subbasin. TDS data are available through existing monitoring programs such as the CV-SALTS program and groundwater ambient monitoring and assessment (GAMA) program or through monitoring or regulatory agencies such as United States Geological Survey (USGS), DWR, State Water Resources Control Board (SWRCB), and the Central Valley Regional Water Quality Control Board (CVRWQCB) Waste Discharge Requirement (WDR) Dairy program. GSA members and their affiliates including Cal Water and the cities of Stockton, Lodi, Manteca, and Lathrop, provided total dissolved solids (TDS) data from existing monitoring wells.

3.2.3.1.2 Identification of Undesirable Results

Undesirable results occur during GSP implementation when more than 25 percent of representative monitoring wells (3 of 10 sites) exceed the minimum thresholds for water quality for two consecutive years and where these concentrations are the result of groundwater management activities.

3.2.3.1.3 Potential Causes of Undesirable Results

Elevated TDS concentrations in the Subbasin are the result of natural processes and overlying land use activities (O’Leary, Izbicki, and Metzger; 2015). Pumping in excess of recharge has resulted in declining aquifer water levels and led to an increase of salinity in groundwater wells since the 1950s (O’Leary, Izbicki, and Metzger; 2015). Within the Subbasin, there are three primary sources of salinity, as discussed in Section 2.2.4 of this GSP.

3.2.3.1.4 Potential Effects of Undesirable Results

If groundwater quality were degraded resulting in undesirable results, the effect would potentially include: reduction in usable supply of groundwater, domestic wells being dewatered, increased treatment costs, and required access to alternate supplies can be unaffordable for small users. Some water quality issues could potentially cause more impact to agricultural uses than municipal or domestic uses, depending on the impact of the contaminant to these water use sectors. Water quality degradation may cause potential changes in irrigation practices, crops grown, adverse effects to property values, and other economic effects. Additionally, reaching undesirable result levels for groundwater quality could adversely affect current and projected municipal uses, and users could have to install treatment systems or seek alternate supplies.

3.2.3.2 Minimum Thresholds

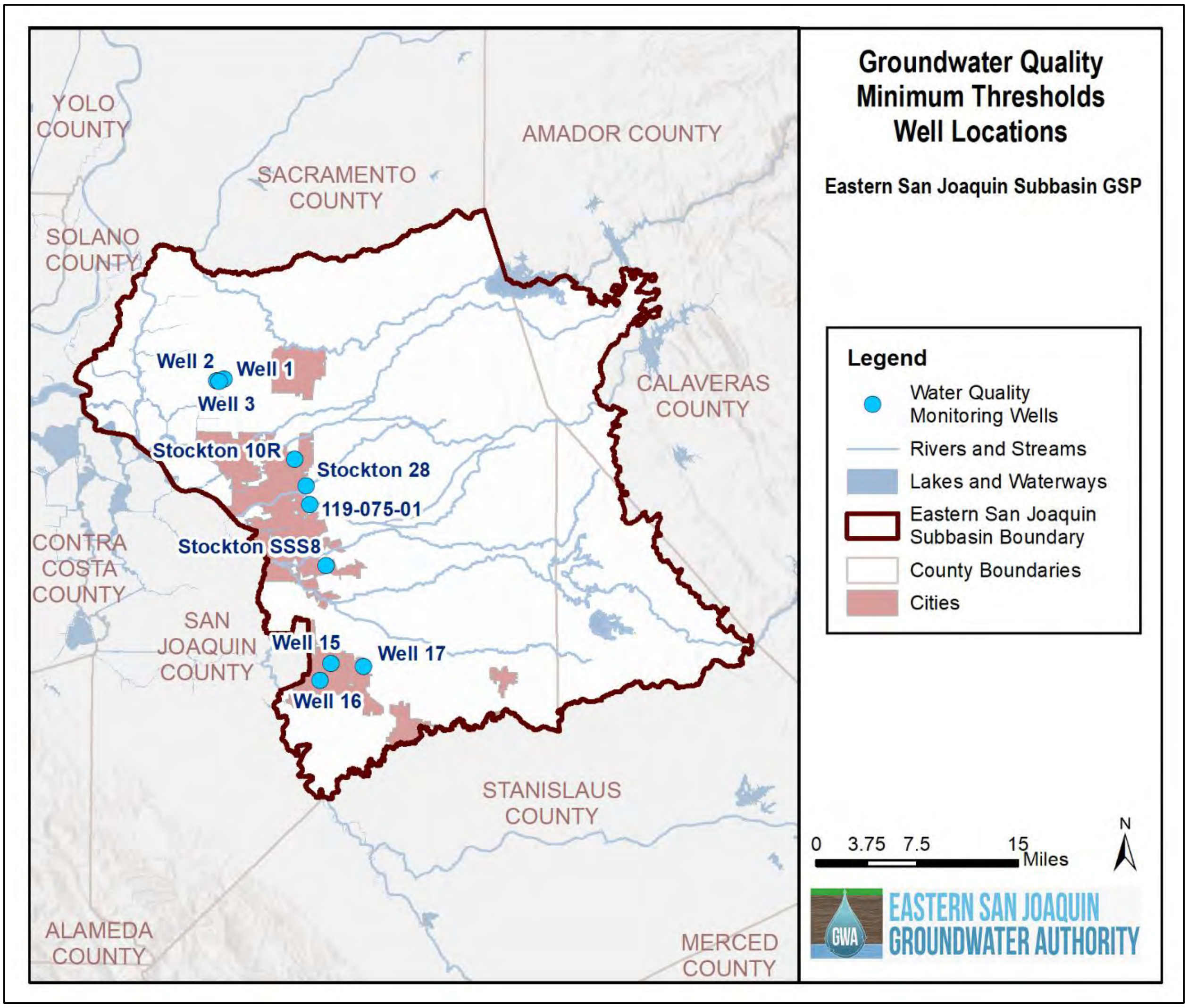
The minimum threshold for degraded water quality is 1,000 milligrams per liter (mg/L) TDS at all representative monitoring well locations, shown in Figure 3-3.

Minimum thresholds for this sustainability indicator are focused on addressing the major groundwater quality issue of salinity by monitoring TDS as a representative constituent of salinity and preventing future water quality degradation due to pumping.

The minimum threshold of 1,000 mg/L was defined by considering two primary beneficial uses as risk of undesirable results related to salinity: drinking water quality and agriculture uses. The minimum threshold was defined by the GWA Board and reflects input from agricultural and municipal stakeholders, including local drinking water purveyors and the local agricultural community. A meeting was held in Fall 2018 with GSA representatives in areas impacted by high salinity. Representatives from San Joaquin County, City of Lodi, City of Manteca, City of Stockton, and Cal Water were in attendance. Additionally, members of the Workgroup who represent the interests of local growers provided input on the salinity levels at which crops begin to become impacted by salinity.

In the development of minimum thresholds, beneficial uses of groundwater as a drinking water supply and as an agricultural supply were considered. For drinking water, the TDS secondary maximum contaminant level (SMCL) was considered. As noted in the Current and Historical Conditions section of this GSP (Section 2.2), the SWRCB Division of Drinking Water (DDW) has established SMCLs for TDS in drinking water supplies. SMCLs are established for aesthetic reasons such as taste, odor, and color and are not based on public health concerns. For TDS, the SMCL is 500 mg/L (recommended) and the upper SMCL is 1,000 mg/L (SWRCB, 2017). The SWRCB has set a short-term standard of 1,500 mg/L, which is a temporary concentration generally allowed only under rare circumstances (SWRCB, 2017). For agricultural uses, crop tolerances in the Subbasin were considered which ranged by crop type from 900 mg/L TDS for almonds up to 4,000 mg/L TDS for wheat (Texas A&M AgriLife Extension, 2003). Crop tolerances are more focused on fruit and nut trees and vineyards, as these crops cover more than half of the acreage of the Subbasin. These crop types have lower crop tolerances of TDS, in the range of 900 to 1,000 mg/L; any standard in this range is considered protective of these crop types and therefore the majority of Subbasin crops.

Figure 3-3: Location of Representative Monitoring Wells for Water Quality



3.2.3.3 Measurable Objectives and Interim Milestones

The measurable objective for degraded water quality is 600 mg/L TDS at all representative monitoring well locations.

600 mg/L was developed based on the TDS recommended SMCL for drinking water of 500 mg/L and adding a 100 mg/L buffer to meet the needs of wells used for both drinking water and agricultural wells. In addition to agricultural uses, the crop tolerance for turf is 750 mg/L; the minimum threshold is more stringent than this and will protect landscape uses are against impacts of high salinity groundwater (Texas A&M AgriLife Extension, 2003).

To ensure the Subbasin meets the measurable objective for groundwater quality, interim milestones for 2025, 2030, and 2035 are developed to keep implementation on track. Table 3-4 shows the 5-year milestones, which follow along a linear trend between the current condition and the measurable objective. Interim milestones are based on the measurable objective and will be coordinated with projects and management actions.

Table 3-4: Interim Milestones for Degraded Water Quality

Narrative Description					
5-year milestones follow along a linear trend between the current condition and the measurable objective.					
Numeric Interim Milestones					
Well ID	Current Condition* (mg/L TDS)	Measurable Objective (mg/L TDS)	Interim Milestones		
			2025	2030	2035
Well 1	500	600	525	550	575
Well 2	510	600	532.5	555	577.5
Well 3	510	600	532.5	555	577.5
Stockton 10R	322	600	391.5	461	530.5
Stockton 26	350	600	412.5	475	537.5
Stockton SSS8	370	600	427.5	485	542.5
Well 15	300	600	375	450	525
Well 16	280**	600	360	440	520
Well 17	300**	600	375	450	525
119=075-01	300	600	375	450	525

* Current Condition is the average TDS for 2015-2018 except where indicated
** Current Condition is the average TDS for 2012-2018

3.2.4 Seawater Intrusion

3.2.4.1 Undesirable Results

3.2.4.1.1 Description of Undesirable Results

The undesirable result related to seawater intrusion is defined in SGMA as:

Significant and unreasonable seawater intrusion

An undesirable result for seawater intrusion in the Eastern San Joaquin Subbasin is experienced if sustained groundwater salinity levels caused by seawater intrusion and due to groundwater management practices are too high to satisfy beneficial uses within the basin over the planning and implementation horizon of this GSP.

The Eastern San Joaquin Subbasin is not in a coastal area and seawater intrusion is not currently present. Undesirable results related to seawater intrusion are not currently occurring and are not reasonably expected to occur (see Section 2.2.3).

There is the possibility of future seawater intrusion due to potential future changes in the San Joaquin Delta that could be caused by sea level rise. This GSP develops minimum thresholds and measurable objectives that include monitoring for chloride and an analysis of isotopic ratios to identify the source of high salinity (see Section 2.2.4.1).

3.2.4.1.2 Identification of Undesirable Results

Undesirable results are considered to occur during GSP implementation when 2,000 mg/L chloride reaches an established isocontour line and where these concentrations are caused by intrusion of a seawater source as a result of groundwater management activity.

3.2.4.1.3 Potential Causes of Undesirable Results

If seawater intrusion does become an issue in the future, the cause of undesirable results would be seawater coming from surface waters in the San Joaquin Delta either due to climate change and associated sea level rise or significant changes in Delta management practices.

3.2.4.1.4 Potential Effects of Undesirable Results

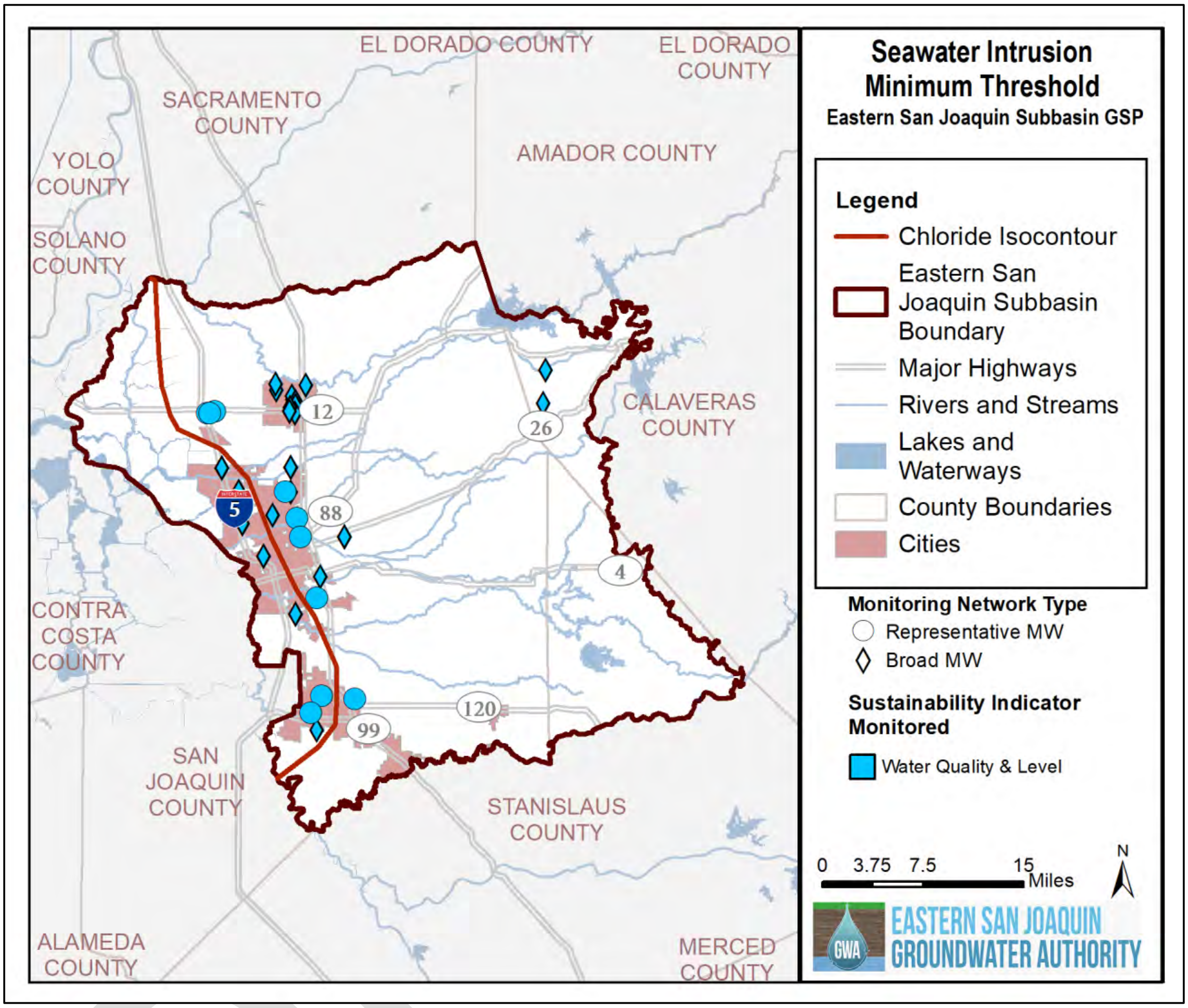
Similar to the effects of undesirable results for degraded water quality, increased salinity due to seawater intrusion could potentially cause a reduction in usable supply to groundwater users, with domestic wells being most vulnerable as treatment costs or access to alternate supplies can be high for small users. Water quality degradation due to seawater intrusion could cause potential changes in irrigation practices, crops grown, adverse effects to property values, and other economic effects. It could also adversely affect current and projected municipal uses, and users could have to install treatment systems or seek alternate supplies.

3.2.4.2 Minimum Thresholds

The minimum threshold for seawater intrusion is a 2,000 mg/L chloride isocontour line. 2,000 mg/L chloride is approximately 10 percent of seawater chloride concentrations (19,500 mg/L) and was developed as a minimum threshold based on consideration of existing management practices in other areas of the state including Monterey County and Fox Canyon. This threshold incorporates input for stakeholders for multiple meetings and was reviewed by the GWA Advisory Committee and Board.

The minimum threshold contour line for seawater intrusion is shown in Figure 3-4. The contour would be between the most westernmost monitoring points and the next most-westerly points monitored for water quality in the Subbasin monitoring network (see Section 4.4), to serve as a sentinel.

Figure 3-4: Seawater Intrusion Minimum Threshold Chloride Isocontour Line



3.2.4.3 Measurable Objectives and Interim Milestones

The measurable objective for seawater intrusion is the current condition, using 2015-2018 average chloride concentrations.

The 5-year interim milestones follow along a linear trend between the current condition, using 2015-2018 average chloride concentrations, and the measurable objective. Interim milestones are based on the measurable objective and will be coordinated with projects and management actions.

3.2.4.4 Trigger and Actions

An action plan is in place as part of this GSP to trigger additional monitoring and analysis at detections of 1,000 mg/L chloride in the monitoring network to confirm seawater source. Assessing high-chloride water sources to determine origin involves determining water type from major-ions, and evaluating stable isotope concentrations (O'Leary et al., 2015). The ratio of chloride to iodide is also used to differentiate high-chloride water sources besides seawater (O'Leary et al., 2015). These assessment tools would be used to provide the GSAs adequate time to develop groundwater management strategies to address any seawater intrusion before the 2,000 mg/L chloride minimum threshold is reached.

3.2.5 Land Subsidence

3.2.5.1 Undesirable Results

3.2.5.1.1 Description of Undesirable Results

The undesirable result related to land subsidence is defined in SGMA as:

Significant and unreasonable land subsidence that substantially interferes with surface land uses.

An undesirable result for land subsidence in the Eastern San Joaquin Subbasin is experienced if the occurrence of land subsidence substantially interferes with beneficial uses of groundwater and infrastructure within the basin over the planning and implementation horizon of this GSP.

3.2.5.1.2 Identification of Undesirable Results

An undesirable result occurs when subsidence substantially interferes with beneficial uses of groundwater and surface land uses. Subsidence occurs as a result of compaction of subsurface materials due to the dewatering of subsurface materials. Undesirable results would occur when substantial interference with land use occurs, including significant damage to canals, pipes, or other water conveyance facilities.

3.2.5.1.3 Potential Causes of Undesirable Results

Potential causes of future undesirable results for land subsidence would include significant increases in groundwater production beyond what is currently projected, resulting in dewatering of compressible clays in the subsurface, which are not known to be common in the Eastern San Joaquin Subbasin, as indicated by historical absence of subsidence. Corcoran Clay is one type of subsurface material that is predisposed to compression. See Chapter 2: Basin Setting, Section 2.1.5 for a description of Corcoran Clay extent in the Subbasin.

3.2.5.1.4 Potential Effects of Undesirable Results

If land subsidence conditions were to reach undesirable results levels, the adverse effects could potentially cause an unrecoverable loss of groundwater storage and damage to infrastructure, including water conveyance facilities and flood control facilities. This could impact the ability to deliver surface water, resulting in increased groundwater use, or could impact the ability to store and convey flood water. These could have adverse effects to property values or public safety.

3.2.5.2 Minimum Thresholds

This GSP uses groundwater level minimum thresholds as a proxy for the land subsidence sustainability indicator. As such, the minimum thresholds for the land subsidence sustainability indicator are the same as the minimum thresholds for the chronic lowering of groundwater levels sustainability indicator.

GSP regulations allow GSAs to use groundwater levels as a proxy metric for any sustainability indicator, provided the GSP demonstrates that there is a significant correlation between groundwater levels and the other metrics. DWR requires the GSP (CA DWR, 2017):

> *Demonstrate that the minimum thresholds and measurable objectives for chronic declines of groundwater levels are sufficiently protective to ensure significant and unreasonable occurrences of other sustainability indicators will be prevented. In other words, demonstrate that setting a groundwater level minimum threshold satisfies the minimum threshold requirements for not only chronic lowering of groundwater levels but other sustainability indicators at a given site.*

This GSP uses groundwater levels as a proxy metric for the land subsidence sustainability indicator. There is significant correlation between groundwater levels and land subsidence, with land subsidence being driven by a lowering of groundwater levels in the aquifer. Further, the use of groundwater levels as a proxy is necessary, given the lack of direct monitoring for land subsidence in the Subbasin.

Land subsidence can only occur if two conditions are met: (1) subsurface materials are dewatered and (2) those dewatered subsurface materials are compressible. Historical declines in groundwater levels have not resulted in subsidence (see Section 2.2.5), suggesting that subsurface materials in the geologic units historically affected by groundwater elevation fluctuations are not compressible. If the basin were to operate within the margin of operational flexibility for groundwater levels, future dewatering would continue to occur in the same geologic units historically affected by groundwater elevation fluctuations (see Section 2.1.7 for the 5 geologic cross sections of the Subbasin). It is anticipated that additional declines in groundwater levels would affect dewatered materials at a depth no deeper than 205 feet[3], at which depth materials are consistent with historical dewatering, which resulted in no known subsidence. As a result, projected elevation declines are not expected to result in subsidence, and groundwater level minimum thresholds are protective.

3.2.5.3 Measurable Objectives and Interim Milestones

As chronic lowering of groundwater levels is used as a proxy for land subsidence, the measurable objectives and interim milestones for the land subsidence sustainability indicator are the same measurable objectives and interim milestones as the chronic lowering of groundwater levels sustainability indicator found in Section 2.2.

3.2.6 Depletion of Interconnected Surface Water

Depletion of interconnected surface water is a reduction in flow or levels of surface water caused by groundwater extraction. This reduction in surface water flow or levels, at certain magnitudes or timing, may have adverse impacts on beneficial uses of surface water and may lead to undesirable results. Quantification of depletions is relatively challenging and requires significant data on both groundwater levels near streams and stage information supported by groundwater modeling.

3.2.6.1 Undesirable Results

3.2.6.1.1 Description of Undesirable Results

The undesirable result related to *depletions of interconnected surface water* is defined in SGMA as:

> *Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.*

The undesirable result for depletions of interconnected surface water in the Eastern San Joaquin Subbasin is depletions that result in reductions in flow or levels of major rivers and streams that are hydrologically connected to the basin such that the reduced surface water flow or levels have a significant and unreasonable adverse impact on beneficial uses of the surface water within the Subbasin over the planning and implementation horizon of this GSP.

Major rivers and streams that potentially have a hydraulic connection to the groundwater system in certain reaches are the Calaveras River, Dry Creek, Mokelumne River, San Joaquin River, and Stanislaus River. Many of the smaller creeks and streams are solely used for the conveyance of irrigation water and these systems have not been considered in the analysis of depletions.

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[3] Based on deepest groundwater level threshold depth to water at well 02N08E15M002.

3.2.6.1.2 Identification of Undesirable Results

Undesirable results would occur if groundwater extractions depleted interconnected streams and there was not sufficient surface water to supply domestic, agricultural, or fish and wildlife demands. An undesirable result would occur if depletions resulted in the release of stored surface water to meet fish and wildlife requirements, in the decrease of acreage or yield of agriculture crops that have a more senior water right than the groundwater extractor, the reduction in availability of surface water for domestic supplies, or potentially the elimination of groundwater dependent ecosystems.

3.2.6.1.3 Potential Causes of Undesirable Results

Potential causes of undesirable results would include increased groundwater extractions near groundwater dependent ecosystems, reduced recharge due to drought, and increased groundwater demand along interconnected corridors.

3.2.6.1.4 Potential Effects of Undesirable Results

If depletions of interconnected surface water were to reach levels causing undesirable results, effects could include reduced flow and stage within rivers and streams in the Subbasin to the extent that insufficient surface water would be available to support diversions for agricultural uses, diversions for urban uses, or to support regulatory environmental requirements. This could result in increased groundwater production, changes in irrigation practices and crops grown, and could cause adverse effects to property values and the regional economy. Reduced flows and stage, along with potential associated changes in water temperature, could also negatively impact aquatic species in the rivers and streams. Such impacts are tied to the inability to meet minimum flow requirements, which are defined for the Mokelumne, Stanislaus, and San Joaquin Rivers, which, in turn, are managed through operations at Camanche Dam, Woodbridge Dam, New Melones, and other reservoirs.

3.2.6.2 Minimum Thresholds

This GSP uses groundwater level minimum thresholds as a proxy for the depletion of interconnected surface water sustainability indicator. As such, the minimum thresholds for the interconnected surface water sustainability indicator are the same as the minimum thresholds for the chronic lowering of groundwater levels sustainability indicator.

GSP regulations allow GSAs to use groundwater levels as a proxy metric for any sustainability indicator, provided the GSP demonstrates that there is a significant correlation between groundwater levels and the other metrics. The following approach from DWR is used to justify the proxy metric (CA DWR, 2017):

> *Demonstrate that the minimum thresholds and measurable objectives for chronic declines of groundwater levels are sufficiently protective to ensure significant and unreasonable occurrences of other sustainability indicators will be prevented. In other words, demonstrate that setting a groundwater level minimum threshold satisfies the minimum threshold requirements for not only chronic lowering of groundwater levels but other sustainability indicators at a given site.*

To use the minimum thresholds for chronic lowering of groundwater levels as a proxy for interconnected surface water, the stream depletions which would occur when undesirable results for groundwater levels are reached must not be significant and unreasonable.

Current or historical issues associated with the depletion of interconnected surface water were not indicated to be significant and unreasonable based on discussions at GWA Board, Advisory Committee, and Workgroup meetings and through input from GSA staff. Based on this input, it was assumed that historical conditions are protective of beneficial uses related to interconnected surface water. Therefore, the historical depletions simulated by ESJWRM's historical calibration (documentation in Appendix 3-A) are assumed to have no associated undesirable results. If groundwater levels were to fall lower than historical levels, there is an associated level of additional depletions that would occur, quantified below.

The ESJWRM was used to estimate the volume of depletions associated with groundwater levels that would be classified as undesirable results (non-dry year pairings where 25 percent or more wells fall below their minimum thresholds). The sustainable conditions scenario (see Section 2.3.6) does not result in groundwater level undesirable results, but the projected conditions scenario (see Section 2.3.4.3) does result in groundwater level undesirable results. The additional stream losses that occurred in the projected conditions scenario compared to the historical calibration are estimates of depletions as they can be linked directly to simulated increases in groundwater pumping. The additional depletions in the projected conditions scenario are 50,000 acre-feet per year (AF/year), which is approximately 1 percent of total stream outflows from the Eastern San Joaquin Subbasin. As the reduction in total stream flows is small, no impact is expected to the beneficial users of interconnected surface water in the Subbasin. Depletions greater than an increase of 50,000 AF/year would not occur because at this point the sustainability indicators for groundwater elevations would be triggered and would be protective of any further depletions. Therefore, groundwater level thresholds are protective of the depletion of interconnected surface water.

3.2.6.3 Measurable Objectives and Interim Milestones

As chronic lowering of groundwater levels is used as a proxy for depletions of interconnected surface water, the measurable objectives and interim milestones for the depletion of interconnected surface water sustainability indicator are the same as the measurable objectives and interim milestones for the chronic lowering of groundwater levels sustainability indicator.

4. MONITORING NETWORKS

Monitoring networks in the Eastern San Joaquin Subbasin are dedicated to monitoring short-term, seasonal, and long-term trends in sustainability indicators. There are four networks: a broad network for water levels, a representative network for water levels, a broad network for water quality, and a representative network for water quality. These monitoring networks are tools for the Groundwater Authority (GWA) and will allow the GWA to compile data on key sustainability indicators and monitor groundwater trends on a variety of temporal and spatial scales. The objective of these monitoring networks is to detect undesirable results in the basin as described in Chapter 3: Sustainable Management Criteria of this GSP. The data and trends will allow the GWA to detect changes in basin conditions, meet sustainability goal, avoid minimum thresholds, and evaluate the effectiveness of projects and management actions implemented. Ultimately, the monitoring network and associated data will guide decisions to prevent undesirable results occurring within the GSP implementation timeframe. Other objectives of the monitoring networks, as defined by the Department of Water Resources (DWR), include:

- Demonstrate progress toward achieving measurable objectives described in the Plan
- Monitor impacts to the beneficial uses or users of groundwater
- Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds
- Quantify annual changes in water budget components

The monitoring networks are intended to monitor for chronic lowering of groundwater levels, degraded water quality, and seawater intrusion. As discussed in Chapter 3: Sustainable Management Criteria, the following sustainability indicators will be evaluated using groundwater levels as a proxy: reduction in groundwater storage, land subsidence, and depletion of interconnected surface water.

The schedule and costs associated with monitoring and implementation will be discussed in Chapter 7: Plan Implementation of the GSP.

4.1 MONITORING NETWORK FOR CHRONIC LOWERING OF GROUNDWATER LEVELS

This section provides information on how the groundwater level monitoring networks were developed, criteria for selecting dedicated monitoring wells, monitoring frequency, spatial density, and summary protocols. The two networks that collect data for groundwater levels include:

- Representative Monitoring Network – These wells will be used to monitor sustainability in the Subbasin. These wells are used to determine compliance with minimum thresholds and measurable objectives for the groundwater level sustainability indicator.
- Broad Monitoring Network – Additional wells are included as part of the broad monitoring network to collect additional information and to maintain a robust network for evaluation. Wells part of the broad monitoring network are not used to determine compliance with minimum thresholds or measurable objectives.

4.1.1 Representative Monitoring Network for Groundwater Levels

Representative monitoring wells represent overall conditions in production zone in the basin and are located in areas that indicate the long term, regional changes in its vicinity. Table 4-1 identifies and summarizes the 20 representative monitoring wells for groundwater levels. Well locations were shown previously in Chapter 3: Sustainable Management Criteria.

Table 4-1: Representative Monitoring Wells for Groundwater Levels

Local Well ID	CASGEM Site Code	Monitoring Agency	Well Depth (ft.)	Screen Interval in ft. bgs (ft. MSL)	Measurement Period (years)	Measurement Count
Swenson-3	380067N1213458W003	San Joaquin County (SJC)	204	194–204 (-190 to -200)	2014–2018	10
01S09E05H002	378824N1210000W001	SJC	256	148–256 (-41 to -149)	1991–2018	47
Burnett (OID4)	377909N1208675W001	Stanislaus County	501	168–249 (21 to -60)	2005–2019	26
02N07E03D001	380578N1212017W001	SJC	484	130–484 (-74 to -428)	1990–2018	49
04N07E20H003M	381843N1212261W001	SJC	180	164–180 (-87to -103)	1972–2019	103
02S07E31N001	377136N1212508W001	SJC	Unknown*	Unknown*	1991–2018	45
02S08E08A001	377810N1211142W001	SJC	180	50–180 (22 to -108)	1991–2018	47
01N07E14J002	379316N1211665W001	SJC	556	168–556 (-116 to -504)	1991–2018	47
01N09E05J001	379661N1210011W001	SJC	750	100–750 (56 to -594)	2011–2018	12
02N07E29B001	379976N1212308W001	SJC	202	130–202 (-88 to -160)	1989–2018	41
02N08E15M002	380206N1210943W001	SJC	Unknown*	Unknown*	2011–2013	5
03N07E21L003	380909N1212153W001	SJC	Unknown*	Unknown*	1991–2013	39
03N06E05N003	381317N1213524W001	SJC	292	252–292 (-225 to -265)	1991–2018	44
04N05E36H003	381559N1213727W001	SJC	112	50–112 (-27 to -89)	1971–2018	88
04N05E24J004	381816N1213723W001	SJC	190	150–190 (-128 to -168)	1991–2018	47
#3 Bear Creek	n/a	LCSD	780	0–780 (96 to -684)	2011–2018	23
Lodi City Well #2	n/a	City of Lodi	315	109–310 (-57 to -258)	1927–2015	89
Hirschfeld (OID8)	n/a	Stanislaus County	408	88–179 (44 to -47)	2005–2016	23
Well 18	n/a	City of Manteca	350	109–349 (-65 to -305)	1997–2018	65
01S10E26J001M	378163N1208321W001	CASGEM	Unknown*	Unknown*	1950–2019	104

* Indicates wells are voluntarily monitored as part of the California Statewide Groundwater Elevation Monitoring (CASGEM) program and monitoring agency is not required to provide well depth or screen interval information

Note: Wells with CASGEM Site Codes listed as n/a for "not applicable" are not available in the CASGEM database.

Representative groundwater level sites were selected by several different criteria. These include:

1. Adequate Spatial Distribution – Representative monitoring does not require the use of all wells that are spatially "clumped" together within a portion of the Basin. Adequately spaced wells will provide greater Basin coverage with fewer monitoring sites.
2. Robust and Extensive Historical Data – Representative monitoring sites with longer and more robust historical data provide insight into long-term trends that can provide information about groundwater conditions through varying climatic periods such as droughts and wet periods. Historical data may also show changes in groundwater conditions through anthropogenic effects as well. While some sites chosen may not have extensive historical data, they may still be selected because there are no wells nearby with longer records.
3. Increased Density in Heavily Pumped Areas – Selection of additional wells in heavily pumped areas such as in the central portion of the Basin and other agriculturally intensive areas will provide additional data where the most groundwater change occurs.
4. Increased Density near Areas of Geologic, Hydrologic, or Topologic Uncertainty – Having a greater density of representative wells in areas of uncertainty, such as around faults or large elevation gradients, may provide insightful information about groundwater dynamics to improve management practices and strategies.
5. Wells with Multiple Depths – The utilization of wells with different screen intervals is important to collect data on the groundwater conditions at different elevations within the aquifer. This can be achieved by using wells with different screen depths that are close to one another, or by using multi-completion wells.
6. Consistency with BMPs – Using published Best Management Practices (BMPs) provided by DWR will promote consistency across all basins and promote compliance with established regulations.
7. Adequate Well Construction Information – Well information such as perforation depths, construction date, and well depth should be considered and encouraged when considering wells to be included.
8. Professional Judgement – Professional judgement is used to make the final decision about each well, particularly when more than one suitable well exists in an area of interest.
9. Maximum Coverage – Any monitoring network well that was suitable for use in the representative network was used to maximize spatial and vertical density of monitoring.

4.1.2 Broad Monitoring Network for Groundwater Levels

The broad monitoring network includes 107 wells which will monitor groundwater levels as part of the broad monitoring network (see Figure 4-1). These wells are not used to determine compliance with the measurable objectives and minimum thresholds. Wells that are part of the broad monitoring network will collect groundwater level data for informational purposes and will help maintain a robust groundwater level monitoring network. Data from this network will be available through the Data Management System (see Chapter 5) and will be reported in Annual Reports to DWR.

The 76 wells included in the broad monitoring network are primarily wells used in CASGEM, a monitoring program that has tracked seasonal long-term groundwater elevation trends in the Subbasin since 2009. CASGEM wells were selected to be included in the broad monitoring network for groundwater level monitoring based on three key qualifications:

1. Existing data source with a historical data record;
2. Provides reliable, consistent data with repeatable data collection methods; and

3. Many wells are new, having been constructed within the past 10 years when the CASGEM program was enacted.

The broad monitoring network also includes 16 nested and/or clustered wells monitored as part of the CASGEM program and/or by the USGS. These 16 wells were selected to be included in the broad monitoring network for groundwater levels for the following reasons:

1. Existing data source with a historical data record;
2. Many wells are new, having been constructed within the past 10 years when the CASGEM program was enacted;
3. Construction details, including total depth, hole depth, and screen intervals, for these wells are widely available;
4. Wells are screened at multiple depths and can provide data for many depths; and
5. Nested and/or clustered wells can be used for collected of vertical gradients, which will be valuable in characterizing the groundwater conditions

The broad monitoring network also includes 15 identified local water quality wells that are included as part of the groundwater water quality monitoring network (located near cities of Stockton, Lodi, and Manteca, and San Joaquin County's Flag City wells) will be monitored for groundwater levels as part of the broad monitoring network for groundwater levels. See Appendix 4-A for additional information on the wells in the broad monitoring network for groundwater levels.

Figure 4-1: Broad Monitoring Network for Groundwater Levels

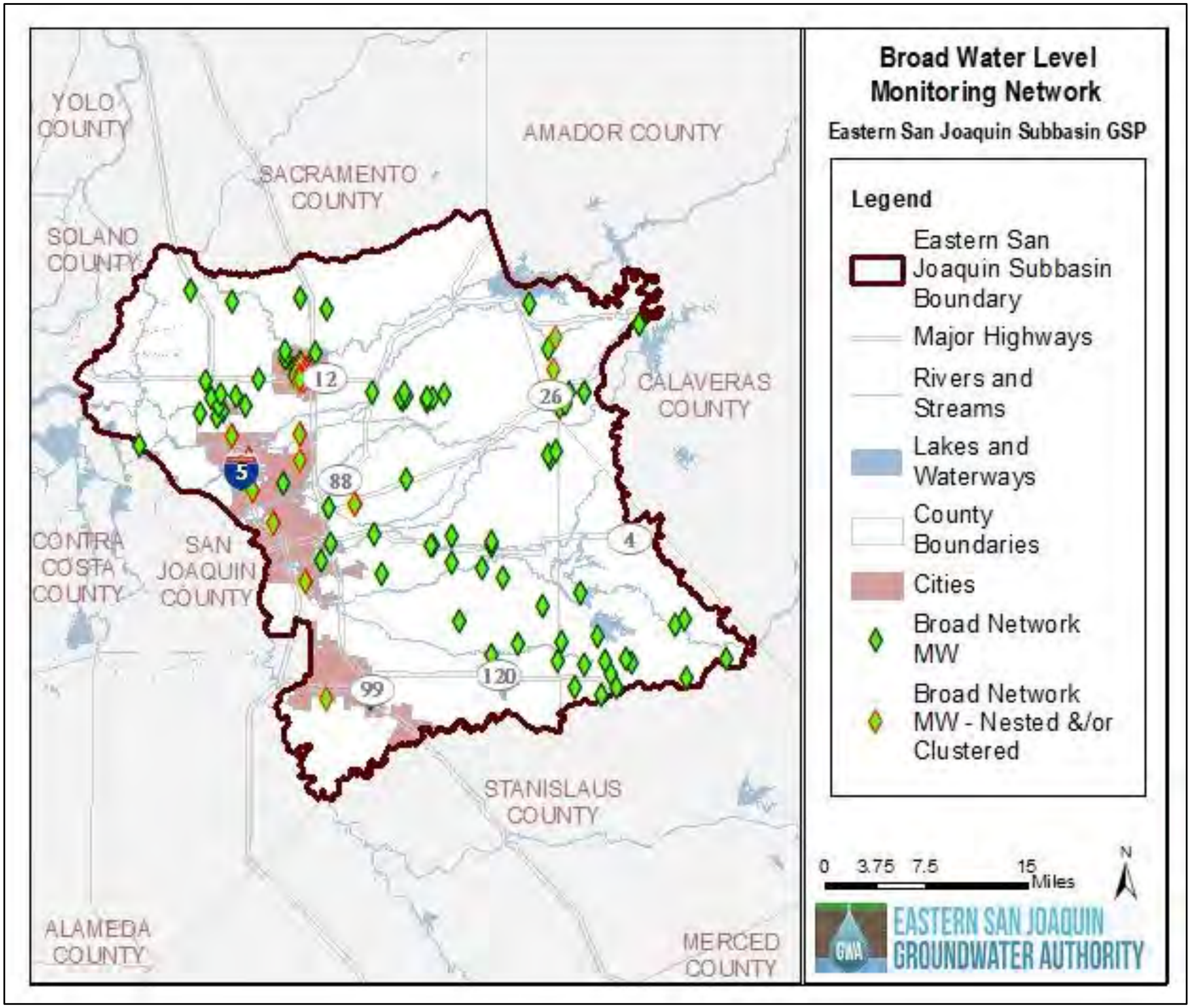


Table 4-2 provides the breakdown on type of wells included in the broad monitoring network for groundwater levels.

Table 4-2: Groundwater Level Monitoring Wells in the Broad Monitoring Well Network

Well Type	Number of Wells Selected for Broad Monitoring Network
CASGEM	76
Existing Clustered and/or Nested Wells	16
Identified Local Water Quality Wells	15
Total	107

4.1.3 Monitoring Protocols for Groundwater Level Data Collection and Monitoring

Groundwater monitoring protocols are essential to producing quality data measurements and protecting the water quality of monitoring wells. Existing protocol resources include DWR's *Groundwater Elevation Monitoring Guidelines* (CA DWR, 2010a) and USGS's *National Field Manual for the Collection of Water Quality Data* (USGS, 2015). Protocols are established to improve consistency in data and ensure comparable methodologies.

Typical groundwater level measurement equipment used by agencies include electric sounders, data loggers, steel tapes, and air gauges. Regardless of the instrumentation used in the field, each groundwater level data measurement must include: well identification number, measurement date, reference point and land surface elevation, depth to water, method of measuring water depth, measurement quality codes, any observations on well conditions (i.e., condition of surface seal, accessibility issues, obstructions within the wells, etc.), and measurement to the base of the well (total well depth).

DWR released a BMP for monitoring protocols, in the *Best Management Practices for the Sustainable Management of Groundwater Monitoring Protocols, Standards, and Sites* (CA DWR, 2016a). The monitoring protocols described in DWR's BMP recommend that groundwater level measurements are taken in a manner to ensure data are:

- Taken from the correct location, well ID, and screen interval depth
- Accurate and reproducible
- Representative of conditions that inform appropriate basin management data quality objectives
- Recorded with all salient information to correct, if necessary, and compare data
- Handled in a way that ensures data integrity.
- Taken using a CASGEM-approved water-level measurement methods to ensure consistency across measurements. Methods include:
    - Establishing a reference point
    - Using one of four approved methods (steel tape, electric sounding tape, sonic water-level meter, or pressure transducer) to measure groundwater levels

Existing wells, monitored under the CASGEM program, already use these procedures in the collection of groundwater level data. These protocols and existing resources will be used when possible in data monitoring and collection in support of this GSP.

4.1.4 Frequency and Timing of Groundwater Level Monitoring

Representative monitoring network wells for groundwater levels will be monitored quarterly, and those in the broad monitoring network will be monitored semi-annually in March and October to capture the seasonal high and low groundwater levels and to avoid interference from pumping wells during irrigation season.

Frequency of groundwater level monitoring is cited in the *Draft Monitoring Networks and Identification of Data Gaps Best Management Practice* (CA DWR, 2016b) which presents guidance on monitoring frequency based on the type of monitoring, aquifer type, confinement, recharge rate, hydraulic conductivity, and withdrawal rate. While semi-annual monitoring is required for groundwater levels, DWR guidance recommends monthly sampling of groundwater levels for the Eastern San Joaquin Subbasin based on aquifer type, volume of long-term aquifer withdrawals, and recharge potential. Sampling frequencies were developed based on this guidance in combination with a consideration of sampling costs.

A quarterly monitoring frequency for representative monitoring wells, and a semi-annual monitoring frequency for the broad monitoring network, will generate data that is useful for monitoring for the long term, regional trends in groundwater level conditions. These measurements are also valuable for local groundwater management and for investigating local pumping's effects on nearby wells. This frequency meets the goal of a successful monitoring schedule which provides enough data to adequately interpret changes in groundwater levels and fluctuations over short- and long-term periods as these fluctuations could be the result of storm events, droughts, or other climatic variations, seasons, and anthropogenic activities.

4.1.5 Spatial Density of Groundwater Level Monitoring Network

The goal of the groundwater level monitoring network is to provide adequate spatial coverage within the Subbasin. This includes the ability to monitor and identify groundwater changes across the basin through time. The spatial location of monitoring wells in the networks were based on proximity to other monitoring wells and ensuring adequate coverage near other prominent features such as faults or production wells. Monitoring wells in close proximity to active pumping wells could be influenced by groundwater withdrawals, thus skewing static level monitoring.

To achieve a suitable monitoring network density, DWR recommends selecting existing, dedicated groundwater monitoring wells with known construction information over production wells to incorporate into the network. When deciding on the number of groundwater wells to be monitored in a basin to adequately represent static water levels (and corresponding elevations), the following factors should be considered:

- Known hydrogeology of the basin
- Slope of the groundwater table or potentiometric surface
- Existence of high-volume production wells and the frequency of their use
- Availability of easily accessible monitoring wells

In 2010, DWR released *Groundwater Elevation Monitoring Guidelines*, which discusses the selection and requirements for new wells to be incorporated into groundwater level monitoring networks (CA DWR, 2010a). The recommended network density ranges from 0.2 to 10 groundwater monitoring wells per 100 square miles depending on local pumping rates. The Subbasin is approximately 1,195 square miles. Based on the recommendations by DWR, the number of monitoring wells for the Eastern San Joaquin Subbasin should range from 2.4 to 119.5 wells per 100 square miles, as summarized in Table 4-3.

Table 4-3: DWR Monitoring Well Density Recommendations

Reference	Monitoring Well Density (wells per 100 sq. miles)	Recommended No. of Monitoring Wells in the Subbasin
Heath (1976)	0.2 – 10	2.4 – 119.5
Sophocleous (1983)	6.3	75.9
Hopkins (1994)		
Basins pumping more than 10,000 AF/year per 100 miles	4.0	47.8

Spatial density of the groundwater level monitoring network was calculated for both the representative monitoring network and the broad monitoring network, as summarized in Table 4-4. The density of the representative monitoring network is 1.7 wells per 100 square miles, a total of 20 monitoring wells, which falls into the lower to mid range of DWR's recommendations. However, in combination with the broad monitoring network, a total of 127 wells are monitored for groundwater levels (approximately 11 wells per 100 square miles), which exceeds DWR's recommendations.

Table 4-4: Groundwater Level Monitoring Network Density

Monitoring Network	No. of Wells	Well Density (Wells per 100 sq. miles)
Representative Monitoring Network	20	1.7
Broad Monitoring Network	107	9.0
Combined Representative Monitoring Network and Broad Monitoring Network	127	10.6

4.2 MONITORING NETWORK FOR REDUCTION IN GROUNDWATER STORAGE

As described in Chapter 3: Sustainable Management Criteria, groundwater levels will be used as a proxy for the reduction in groundwater storage sustainability indicator. As such, sustainable management criteria for groundwater storage will be monitored through the groundwater levels monitoring networks, described in Section 4.1.

4.3 MONITORING NETWORKS FOR DEGRADED WATER QUALITY

Groundwater quality monitoring is conducted through both representative and broad groundwater well monitoring networks. This section will provide information on how the monitoring networks were developed, criteria for selecting dedicated monitoring wells, monitoring frequency, spatial density, and summary protocols.

The representative monitoring network are used to determine compliance with minimum thresholds and measurable objectives developed for the degraded water quality sustainability indicator. The broad monitoring network includes additional wells to maintain a robust network for evaluation and information collection. Wells that are part of the broad monitoring network are not used to determine compliance with minimum thresholds or measurable objectives.

Monitoring networks monitoring for water quality will test for total dissolved solids (TDS), cations and anions, arsenic, and field parameters including pH, electrical conductivity (EC), and temperature. Arsenic will be monitored for informational purposes and to track trends in arsenic concentrations. The Groundwater Sustainability Plan (GSP) does not include sustainability goals, measurable objectives, or minimum thresholds for arsenic.

4.3.1 Representative Monitoring Network for Groundwater Quality

Ten representative monitoring wells were selected for monitoring groundwater quality. These wells are currently monitored and managed by City of Manteca, Cal Water, City of Stockton, and San Joaquin County. Table 4-5 identifies and summarizes the agencies with the 10 representative monitoring wells selected for the groundwater quality monitoring network, which was shown previously in Figure 3-3 (Chapter 3: Sustainable Management Criteria).

Table 4-5: Representative Monitoring Network Wells for Water Quality

Well ID	Monitoring Agency	Well Depth (ft.)	Screen Interval (ft.)	Current Condition Average TDS (2015 – 2018) (mg/L)	Measurement Period (years)	Measurement Count
Well 1	San Joaquin County (Flag City)	170	120 – 170	500	2008 - 2018	8
Well 2	San Joaquin County (Flag City)	180	130 – 180	510	2008 – 2016	7
Well 3	San Joaquin County (Flag City)	Unknown	Unknown	510	2013 - 2016	3
Stockton 10R	City of Stockton	Unknown	177 – 277	322	1998 - 2018	6
Stockton 28	City of Stockton	Unknown	178 – 278	350	1998 - 2018	6
Stockton SSS8	City of Stockton	Unknown	177 - 277	370	1998 - 2018	4
Well 15	City of Manteca	Unknown	81 – 181	300	1998 - 2018	7
Well 16	City of Manteca	Unknown	80 – 180	-	1998 - 2018	6
Well 17	City of Manteca	Unknown	97 - 197	-	1998 - 2018	6
119-075-01	Cal Water	580	176 – 276	300	1979 - 2018	15

Representative monitoring wells were selected based on their ability to represent conditions in the basin and indicate long-term, regional changes in groundwater quality conditions. Groundwater Sustainability Agencies (GSAs) in areas affected by high TDS levels identified wells to be used as representative monitoring wells that met the following criteria:

1. Adequate Spatial Distribution – Historically, high TDS concentrations have occurred in the western portion of the Subbasin, near the San Joaquin River and urban areas; as such, the majority of representative monitoring wells are located in the western half of the Subbasin. Monitoring wells are located both within areas of high TDS concentrations, to observe and monitor TDS trends, and adjacent to high TDS areas, to observe potential TDS movement.

2. Extensive Historical Data – Wells with longer records of TDS monitoring were preferentially selected over wells with short or sporadic records. Monitoring wells with historical TDS records provide insight on long-term trends and the groundwater condition responses to varying climatic periods such as droughts and wet periods and/or anthropogenic effects.

3. A Range of TDS Concentrations – Wells with historically “low” TDS concentrations near areas with high salinity were looked at to alert a change in groundwater quality conditions and a possible migration of salinity.

4. Known Well Construction Information – Wells with known construction data, including total depth, screen intervals, and construction date, were preferred. Knowledge of the depth at which water quality measurements are taken would better describe the representative conditions of specific portions of the aquifer.

5. Current TDS Monitoring Program – Wells currently monitored for TDS were preferred over wells not currently monitored for water quality constituents. These wells are already equipped with monitoring equipment and have protocols underway to ensure accurate and consistent measurements and represent a current asset for the Subbasin that can be further utilized.

6. Consistency with BMPs – DWR's published BMPs were used as guidance documents to ensure consistency across all basins and ensure compliance with established regulations.

7. Professional Judgement – Professional judgement was used to make the final decision about each well, particularly when more than one suitable well exists in an area of interest.

4.3.2 Broad Monitoring Network for Groundwater Quality

In addition to the representative monitoring network wells, 21 additional wells will monitor groundwater quality as part of the broad monitoring network (see Figure 4-2). The purpose of including these wells in the broad monitoring network is to better monitor for potential spread of salinity and to maintain a robust network for evaluation as part of 5-year GSP updates. These wells are not used to determine compliance with the measurable objectives or minimum thresholds. These 21 wells overlap with the broad monitoring network for groundwater levels. Data from this network will be available through the Data Management System (see Chapter 5) and will be reported in Annual Reports to DWR.

The broad monitoring network for water quality includes 5 identified local water quality wells and 16 clustered/nested wells that are also monitored for groundwater levels in the broad monitoring network for groundwater levels (Section 4.1.2). Table 4-6 identifies the wells included in the broad monitoring network for water quality.

Figure 4-2: Broad Monitoring Network for Groundwater Quality

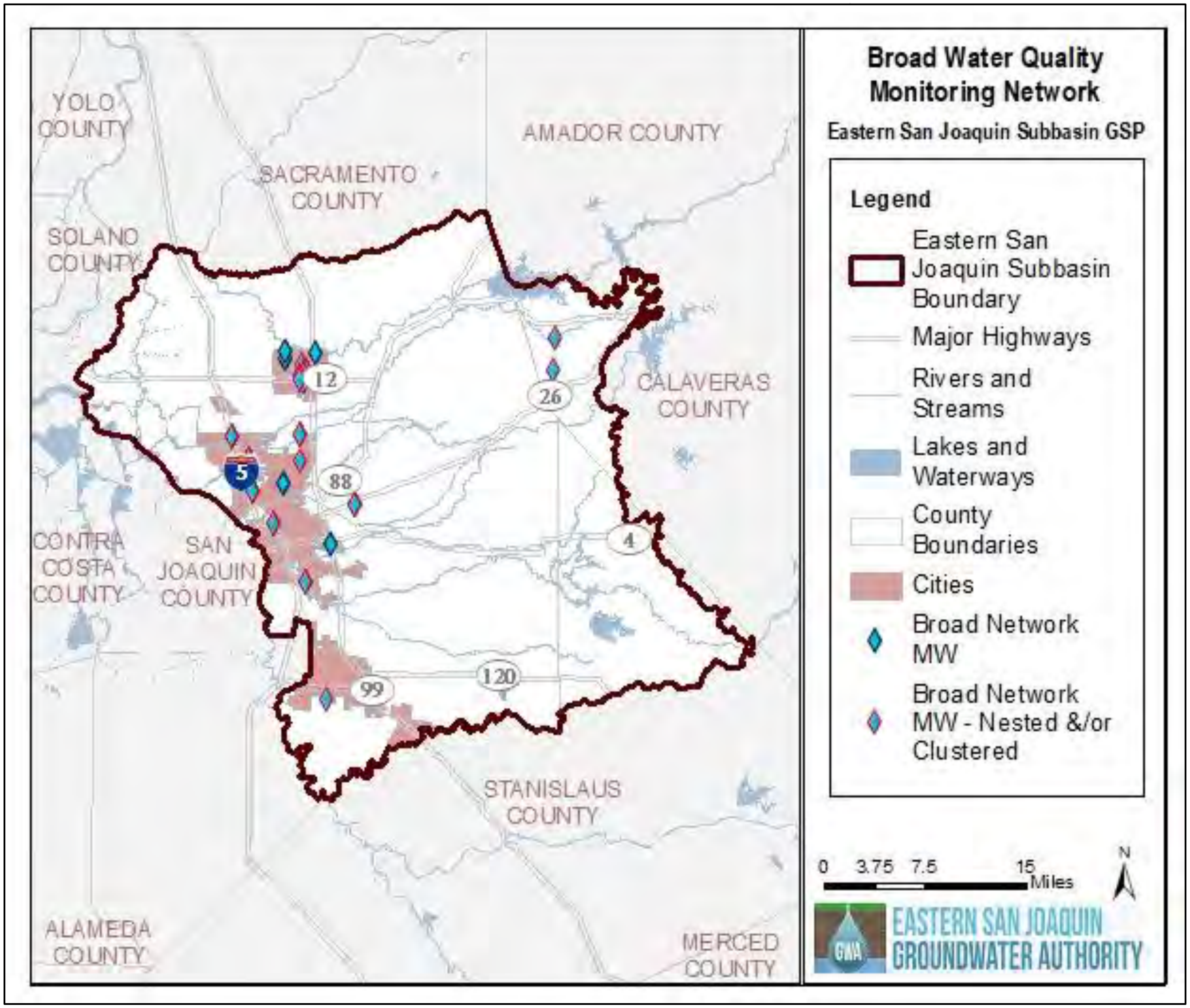


Table 4-6: Wells in the Broad Monitoring Network for Groundwater Quality

Identified Local Water Quality Monitoring Wells			Clustered and/or Nested Wells		
Well ID	Monitoring Entity	Well Depth (ft.)	Well ID	Monitoring Entity	Screen Interval (ft.)
119-059-01	Cal Water	520	Lodi MW - 21	City of Lodi	(66–76) (92–102) (118–128)
119-069-01	Cal Water	530	Lodi MW – 24	City of Lodi	(95.5–105.5) (60–70) (114–124)
Lodi Well #5	City of Lodi	230	Lodi MW – 25	City of Lodi	(86–96) (148–158)
Lodi Well #7	City of Lodi	422	Lodi SMW – 1	City of Lodi	(105–115) (200–210)
Lodi Well #11R	City of Lodi	465	Lodi WMW – 1	City of Lodi	(195–205) (140–150) (232–242)
			Lodi WMW – 2	City of Lodi	(179–189) (204–214) (231–241) (283–293)
			CCWD 04-06	CCWD	Unknown
			CCWD 010-012	CCWD	Unknown
			Sperry Well	SJCFCWCD	(114–124) (262–282) (440–460)
			STK – 1	SJCFCWCD	(58–68) (220–240) (360–380) (520–540) (860–880)
			STK – 2	SJCFCWCD	(200–220) (280–300) (520–540) (615–635)
			STK – 4	SJCFCWCD	(200–220) (340–360) (540–560)
			STK – 5	SJCFCWCD	(210–230) (410–430) (560–580)
			STK – 6	SJCFCWCD	(240–260) (450–470) (540–560)
			STK – 7	SJCFCWCD	(145–165) (270–295) (415–435) (545–565)
			Swenson Gold Course	SJCFCWCD	(482–502) (294–314) (194–204)

4.3.3 Monitoring Protocols for Groundwater Quality Data Collection and Monitoring

Groundwater quality data sampling protocols are based on DWR's *Best Management Practices for the Sustainable Management of Groundwater Monitoring Protocols, Standards, and Sites* (CA DWR, 2016a), which cites the USGS's 1995 publication *Ground-Water Data-Collection Protocols and Procedures for the National Water-Quality Assessment Program: Collection and Documentation of Water-Quality Samples and Related Data* (USGS, 1995). The BMP recommends groundwater quality monitoring protocols and also recommends using the USGS *National Field Manual for the Collection of Water Quality Data* (USGS, 2015) for additional protocols. These publications include protocols for equipment selection, setup, use, field evaluation, sample collection techniques, sample handling, and sample testing.

Groundwater quality sampling protocols recommended in the BMP include ensuring that:

- Groundwater quality data are taken from the correct location
- Groundwater quality data are accurate and reproducible
- Data represents conditions that inform appropriate basin management and are consistent with the data quality objectives
- Data are handled in a way that ensures data integrity
- All salient information is recorded to normalize, if necessary, and compare data

As a quality assurance measure, an operating standard will be developed to ensure data integrity. See Chapter 7: Plan Implementation for additional information on monitoring plan implementation.

4.3.4 Frequency and Timing of Groundwater Quality Monitoring

Groundwater quality measurements will be collected semi-annually for both the representative monitoring network wells and the broad monitoring network wells.

Although DWR does not provide specific recommendations on the frequency of monitoring for TDS, concentrations of groundwater quality, especially salinity, do not fluctuate significantly throughout a year to require multiple samples per year. No existing monitoring wells were found to be monitored continuously for groundwater quality (such monitoring is typically performed only for EC and temperature), nor were there agencies that reported ongoing, non-regulatory, regularly scheduled groundwater quality monitoring programs.

Table 4-7 identifies the historical frequency of groundwater quality monitoring conducted for local water quality wells by each monitoring agency.

Table 4-7: Historical Groundwater Quality Monitoring at Identified Local Water Quality Wells

Agency	Data Record	Historical Monitoring Frequency (Approx.)
Cal Water	1979 - 2018	Approx. every 3 years
City of Lodi	2008 - 2018	Approx. every 3 years[1]
City of Manteca	1975 - 2017	Monthly
City of Stockton	1989 - 2016	Quarterly
San Joaquin County – Flag City	2009 - 2017	Annually

1 TDS has not been regularly monitored at sites around the White Slough Water Pollution Control Facility.

4.3.5 Spatial Density of Groundwater Quality Monitoring Wells

DWR's *Monitoring Networks and Identification of Data Gaps BMP* states "The spatial distribution must be adequate to map or supplement mapping of known contaminants" (CA DWR, 2010b). The goal of the groundwater quality monitoring network is to adequately cover the Subbasin to accurately characterize salinity concentrations and trends. This includes both spatial coverage and temporal coverage in order to identify changes in groundwater quality over time.

DWR's *Monitoring Networks and Identification of Data Gaps BMP* identifies different sources and calculations for establishing monitoring network densities on a Subbasin-specific case (CA DWR, 2010b). These density calculations and guidance are summarized in Table 4-3. The spatial density of the groundwater quality monitoring network was calculated for both the representative monitoring network and the broad monitoring network, as summarized in Table 4-8. A total of 10 monitoring wells comprise the representative monitoring network; a density of 0.8 wells per 100 square miles. The density of the broad monitoring network, a total of 21 monitoring wells, is 1.2 wells per 100 square miles. The total number of wells and monitoring network densities meet DWR's recommendations, identified in Table 4-3.

Table 4-8: Groundwater Quality Monitoring Network Density

Monitoring Network	No. of Wells	Well Density (Wells per 100 sq. miles)
Representative Monitoring Network	10	0.8
Broad Monitoring Network	21	1.2
Combined Representative Monitoring Network and Broad Monitoring Network	31	2.6

4.4 MONITORING NETWORK FOR SEAWATER INTRUSION

The seawater intrusion monitoring network uses the same monitoring wells and monitoring strategies as the groundwater quality representative monitoring network. Chloride concentrations will be monitored at the degraded water quality representative monitoring networks wells to develop a chloride isocontour line (see Section 3.2.4.2 in Chapter 3: Sustainable Management Criteria).

4.5 MONITORING NETWORK FOR LAND SUBSIDENCE

As described in Chapter 3: Sustainable Management Criteria, groundwater levels will be used as a proxy for the land subsidence sustainability indicator. As such, sustainable management criteria for land subsidence will be monitored through the groundwater levels monitoring network, described in Section 4.1.

4.6 MONITORING NETWORK FOR DEPLETION OF INTERCONNECTED SURFACE WATERS

As described in Chapter 3: Sustainable Management Criteria, groundwater levels will be used as a proxy for the depletion of interconnected surface water sustainability indicator. As such, sustainable management criteria for interconnected surface water will be monitored through the groundwater levels monitoring network, described in Section 4.1.

4.7 DATA GAPS

Groundwater level monitoring data gaps exist in areas where data is limited. Specifically, areas of high data needs include monitoring near streams, Subbasin boundaries, and the central area of groundwater depression. Additionally, areas without multiple completion wells present limitation to information collection. Additional sampling taken within these identified areas will provide more information about groundwater levels and trends in the indicated locations.

Groundwater quality monitoring data gaps have three components:

1. Spatial Distribution: Monitoring wells are mainly focused in the western portion of the Subbasin, as this area has historically had the highest concentrations of TDS. Additional sampling performed within these identified areas will provide more information about salinity in the indicated locations.

2. Well construction data: The majority of groundwater quality monitoring wells are screened in intervals between 100 to 300 feet bgs. Only one well is screened below this interval, to a depth of 467 feet bgs. Both deeper and shallower groundwater quality monitoring wells are needed to better understand the spatial distribution of salinity concentrations in the Subbasin.

3. Monitoring Frequency: Temporally, groundwater quality monitoring occurs at different frequencies across the Subbasin, dependent on the monitoring agency responsible (summarized in Table 4-7). The groundwater quality monitoring network under the GSP will utilize a standardized, quarterly monitoring schedule to ensure all wells are sampled regularly.

4.7.1 Plan to Fill Data Gaps

Data gaps will be filled by leveraging existing wells and by constructing new wells through Technical Support Services (TSS) funding, future grant funding, and GSA funding. In total, there are 12 proposed new monitoring well sites (shown in Figure 4-3 in orange); these wells will also be measured for groundwater levels and groundwater quality. Two of these wells will be built using funding awarded to the Subbasin by DWR's TSS program. The TSS program provides support to GSAs during GSP development. The two new wells drilled using DWR's TSS funding will improve the density and sampling frequency for groundwater quality monitoring within data gap areas. The remaining ten wells will be funded by the GWA. The new wells are distributed throughout the Subbasin and increase coverage near streams, Subbasin boundaries, and in the central area of groundwater depression. Two recommended monitoring locations are adjacent to Dry Creek, to provide data relevant to potential surface water depletions and subsurface flows across the Subbasin boundary to the Cosumnes Subbasin to the north. Relevant data from these and other wells will be shared with Cosumnes Subbasin GSAs and parallel efforts will be coordinated.

The DWR's USGS *National Field Manual for the Collection of Water Quality Data* (CA DWR, 2010c) will be used as a guide for collection of wells, well locations, and collection of reliable data, as recommended by DWR's BMP. Requirements are summarized in Table 4-9. The DWR's *California Well Standards, Bulletin 74-81 and 74-90* will be used as references for guidance for construction of new monitoring well installation, per DWR's *Best Management Practices for the Sustainable Management of Groundwater Monitoring Protocols, Standards, and Sites* (CA DWR, 2016a).

Figure 4-3: Proposed New Monitoring Well Locations (Shown in Orange)

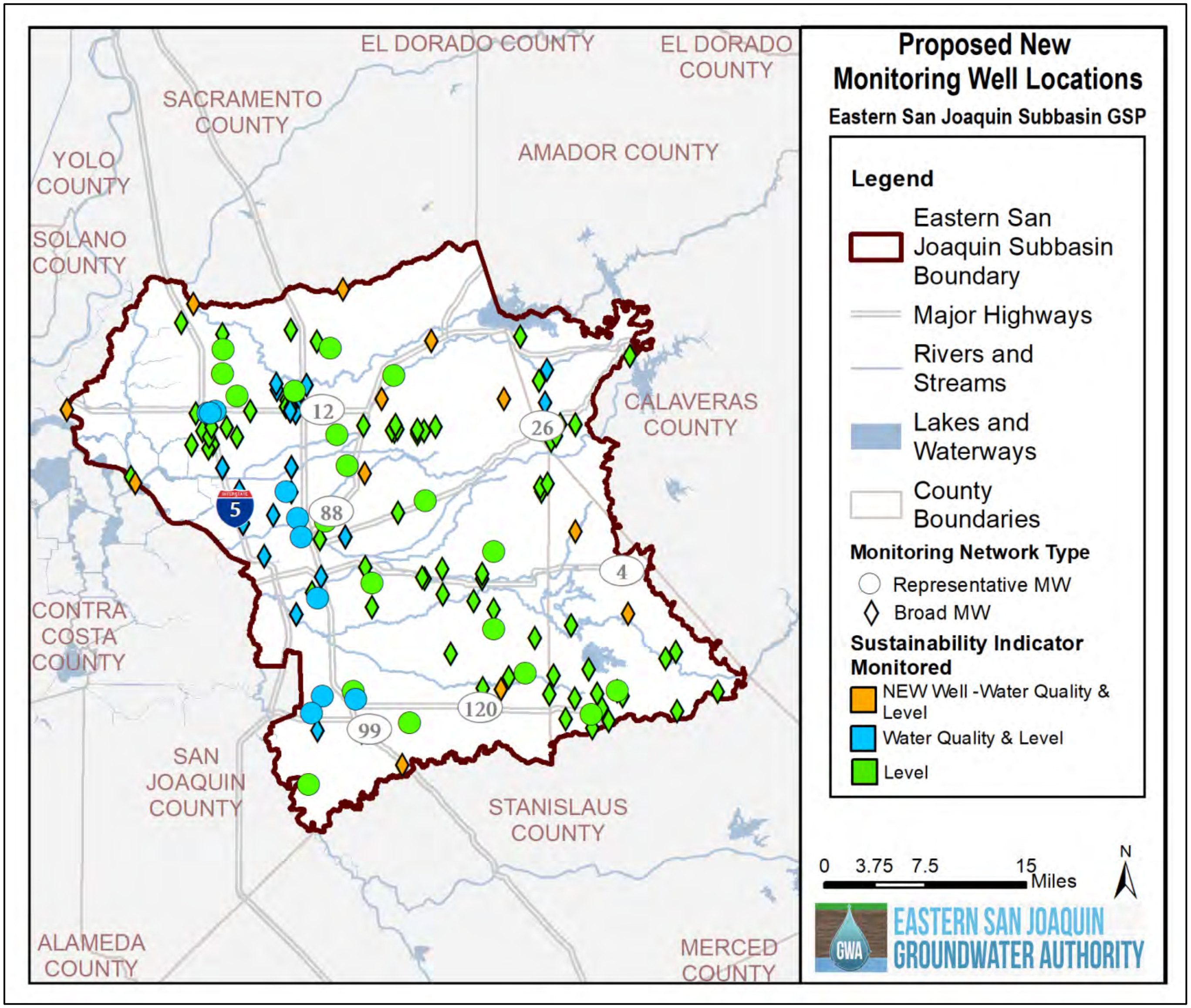


Table 4-9: Considerations for Well Selection and Well Installation

Well Location
• Location conforms to the study's network design for areal and depth distribution. • Land-use/land-cover characteristics, if relevant, are consistent with study objectives. • Site is accessible for equipment needed for well installation and sample collection.
Hydrogeologic Unit(s)
• Hydrogeologic unit(s) that contribute water to the well can be identified. • Depth and thickness of targeted hydrogeologic unit(s) are known or can be determined. • Yield of water is adequate for sampling (typically, a minimum of 1 gallon (3.785 liters) per minute).
Well Records, Description, Design, Materials, and Structure
• Available records (for example, logs of well drilling, completion, and development) have sufficient information to meet the criteria established by the study. • Borehole or casing/screen diameter is adequate for equipment. • Depth to top and bottom of sample-collection (open or screened) interval is known (to determine area contributing water to well). • Length of well screen is proportional to the vertical and areal scale of investigation. • Well has only one screened or open interval in one aquifer, if possible. (Packers can be used to isolate the interval of interest, but packers might not completely isolate zones in unconsolidated or highly fractured aquifers. If packers are used, materials of construction must be compatible with analytes to be studied.) • Top of well screen is several feet below mean annual low-water table to reduce chances of well going dry and to avoid sampling from unsaturated intervals. • Filter pack is of a reasonable length (a long interval compared with length of screened or open interval usually results in uncertainty as to location of the source of water to well). • Well-construction materials do not leach or sorb substances that could alter ambient target-analyte concentrations. • Well-structure integrity and communication with the aquifer are sound. (Checks include annual depth-to-bottom measurements, borehole caliper and downhole-camera video logs, and aquifer tests.)
Pump Type, Materials, Performance, and Location of Sampler Intake
• Supply wells have water-lubricated turbine pumps rather than oil-lubricated turbine pumps. (Avoid suction-lift, jet, or gas-contact pumps, especially for analytes affected by pressure changes, exposure to oxygen, or that partition to a gas phase.) • Pump and riser-pipe materials do not affect target-analyte concentrations. • Effects of pumping rate on measurements and analyses have been or will be evaluated. • Samples intake is ahead of where water enters treatment systems, pressure tanks, or holding tanks.

Source: *National Field Manual for the Collection of Water-Quality Data* (USGS, 2015)

5. DATA MANAGEMENT SYSTEM

This chapter includes the Data Management System Section that satisfies § 352.6 of the Sustainable Groundwater Management Act Regulations. This section contains three main subsections:

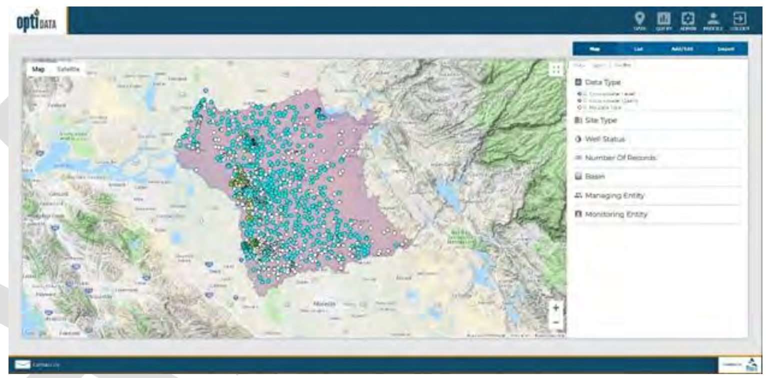
- Overview of the Eastern San Joaquin Subbasin Data Management System
- Functionality of the Data Management System
- Data Included in the Data Management System

5.1 OVERVIEW OF THE EASTERN SAN JOAQUIN SUBBASIN DATA MANAGEMENT SYSTEM

The Eastern San Joaquin Subbasin Data Management System (DMS) is implemented using the Opti platform. The DMS serves as a data sharing portal to enable utilization of the same data and tools for visualization and analysis to support sustainable groundwater management and transparent reporting of data and results.

The DMS is web-based and publicly accessible using common web browsers including Google Chrome, Firefox, and Microsoft Edge. It is a flexible and open software platform that utilizes familiar Google maps and charting tools for analysis and visualization. The site may be accessed here: https://opti.woodardcurran.com/esj

Figure 5-1: Opti DMS Screenshot



5.2 FUNCTIONALITY OF THE DATA MANAGEMENT SYSTEM

The DMS is a modular system that includes numerous tools to support Groundwater Sustainability Plan (GSP) development and ongoing implementation, including:

- User and Data Access Permissions
- Data Entry and Validation
- Visualization and Analysis
- Query and Reporting

The DMS can be configured for additional tools and functionality as the needs of the Groundwater Authority (GWA) change over time. The following sections briefly describe the currently configured tools. For more detailed instructions on the usage of the DMS, please refer to the Opti Public User Guide (the Opti Public User Guide can be accessed online at https://opti.woodardcurran.com/esj/upload/OptiPublicDMS_Guide.pdf.

5.2.1 User and Data Access Permissions

User access permissions are controlled through several user types that have different roles in the DMS as summarized in Table 5-1 below. These user types are broken into three high-level categories:

- System Administrator users manage information at a system-wide level, with access to all user accounts and entity information. System Administrators can set and modify user access permissions when an entity is unable to do so.
- Managing Entity (Administrator, Power User, User) users are responsible for managing their entity's site/monitoring data and can independently control access to this data. Entity users can view and edit their entity's data and view (not edit) shared or published data of other entities. An entity's site information (wells, gages, etc.) and associated data may only be edited by Administrators and Power Users associated with the entity.
- Public users may view data that is published but may not edit any information. These users may access the DMS using the Guest Login feature on the login screen.

Monitoring sites and their associated datasets are added to the DMS by Managing Entity Administrators or Power Users. In addition to the user permissions, access to the monitoring datasets is controlled through three options:

- Private data is monitoring data that is only available for viewing, depending on user type, by the entity's associated users in the DMS.
- Shared data is monitoring data that is available for viewing by all users in the DMS (excludes Public Users).
- Public data is monitoring data that is available publicly and can be viewed by all user types in the DMS and may be published to other sites or DMSs as needed.

The Managing Entity Administrators have the ability to set and maintain the data access options for each dataset associated with their entity.

Table 5-1: Data Management System User Types

Modules/Submodules	System Administrators	Entity			Public
		Admin	Power User	User	
Data: Map	●	●	●	●	○
Data: List	●	●	●	●	○
Data: Add/Edit	●	●	●		
Data: Import	●	●	●		
Query	●	●	●	●	○
Admin	●				
Profile	●	●	○	○	○

● Indicates access to all functionality, ○ Indicates access to partial functionality (see explanations in following sections)

5.2.2 Data Entry and Validation

To encourage agency and user participation in the DMS, data entry and import tools are easy to use, accessible over the web, and help maintain data consistency and standardization. The DMS allows Entity Administrators and Power Users to enter data either manually via easy-to-use interfaces, or through an import tool utilizing Excel templates, ensuring data may be entered into the DMS as soon as possible after collection. The data is validated by Managing Entity's Administrators or Power Users using a number of quality control checks prior to inclusion in the DMS.

5.2.2.1 Data Collection Sites

Site information is input for groundwater wells, stream gages, and precipitation meters manually either through the Data Entry tool or when prompted in the Import tool. In the Data Entry tool, new sites may be added by clicking on New Site. Existing sites may be updated using the Edit Site tool. During data import, the sites associated with imported data are checked by the system against the existing site list in the DMS. If the site is not in the existing site list, the user is prompted to enter the information via the New Site tool before the data import can proceed.

The information that is collected for sites is shown in Table 5-2. Required fields are indicated with an asterisk.

Table 5-2: Data Collection Site Information

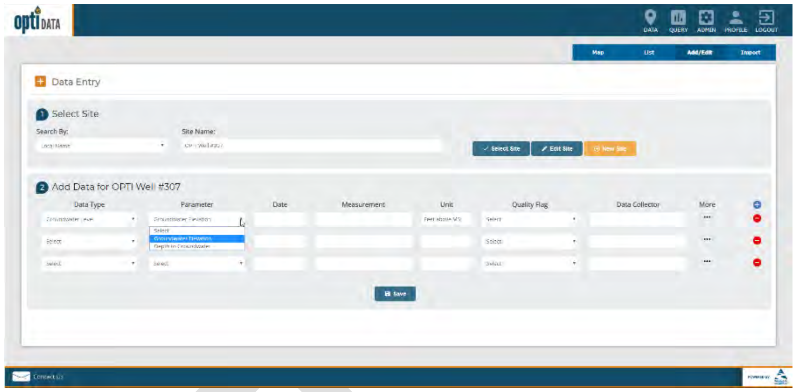
Basic Info	Well Info	Construction Info
Site Type*	State Well ID	Total Well Depth
Local Site Name*	CASGEM ID	Borehole Depth
Local Site ID	Ground Surface Elevation	Casing Perforations
Latitude/Longitude*	Reference Point	Casing Diameter
Description	Reference Point Elevation	Casing Modifications
County	Reference Point Location	Well Capacity
Managing Entity*	Reference Point Description	Well Completion Report Number
Monitoring Entity*	Well Use	Comments
Type of Monitoring	Well Status	
Type of Measurement	Well Type	
Monitoring Frequency	Aquifers Monitored	
	Groundwater Basin Name/Code	
	Comments	
	Upload File	

* Required fields; all other fields are optional

5.2.2.2 Monitoring Data Entry

Monitoring data, including but not limited to groundwater elevation, groundwater quality, streamflow, and precipitation, may be input either manually through the Data Entry tool or using templates in the Import tool. The Data Entry tool allows users to select a site and add data for the site using a web-based tool (see Figure 5-2). The following information is collected:

Figure 5-2: DMS Data Entry Tool



- Data Type (e.g., groundwater elevation, groundwater quality, streamflow, or precipitation)
- Parameter for selected Data Type, units populate based on selection
- Date of Measurement
- Measurement Value
- Quality Flag (e.g., quality assurance description for the measurement such as “Pumping”, “Can’t get tape in casing”, etc., as documented by the Data Collector)
- Data Collector
- Supplemental Information based on Data Type (e.g., Reference Point Elevation, Ground Surface Elevation, etc.)

Data import templates include the same data entry fields and are available for download from the DMS. The Excel-based templates contain drop-down options and field validation similar to the data entry interface.

5.2.2.3 Data Validation

Quality control helps ensure the integrity of the data added to the DMS. The entities that maintain the monitoring data that were loaded into the DMS may have performed previous validation of that data; no effort was made to check or correct that previous validation and it was assumed that all data provided was valid. While it is nearly impossible to determine complete accuracy of the data added to the DMS since the DMS cannot detect incorrect measurements due to human error or mechanical failure, it is possible to verify that the data input into the DMS meets some data quality standards. This helps promote user confidence in the data stored and published for visualization and analysis.

Upon saving the data in the data entry interface or importing the data using the Excel templates, the following data validation checks are performed by the DMS:

- Duplicate measurements: The database checks for duplicate entries based on the unique combination of site, data type, date, and measurement value.
- Inaccurate measurements: The database compares data measurements against historical data for the site and flags entries that are outside the historical minimum and maximum values.
- Incorrect data entry: Data field entries are checked for correct data type (e.g., number fields do not include text, date fields contain dates, etc.)

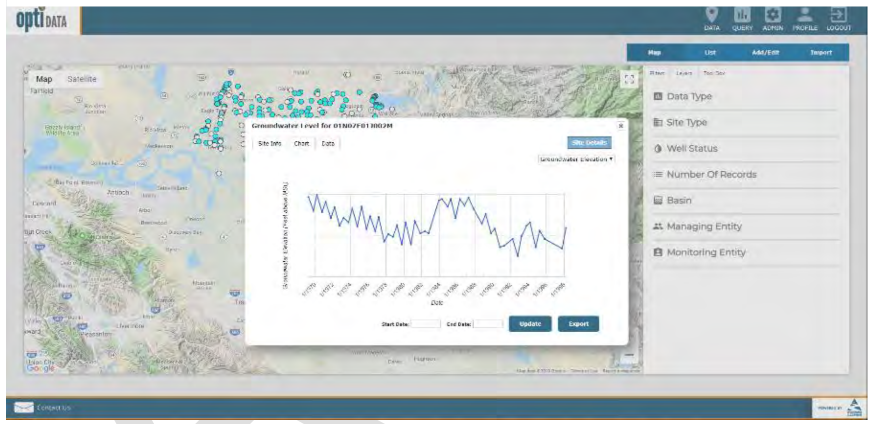
Users are alerted to any validation issues and may either update the data entries or accept the values and continue with the entry/import. Users may access partially completed import validation through the import logs that are saved for each data import. The partially imported data are identified in the Import Log with an incomplete icon under the Status field. This allows a second person to also access the imported data and review prior to inclusion in the DMS.

5.2.3 Visualization and Analysis

Transparent visualization and analysis tools enable utilization of the same data and methodologies, allowing stakeholders and neighboring Groundwater Sustainability Agencies (GSAs) to use the same data and methods for tracking and analysis. In the Eastern San Joaquin Subbasin DMS, data visualization and analysis are performed in both Map and List views.

5.2.3.1 Map View

Figure 5-3: Typical DMS Data Display



The Map view displays all sites (groundwater wells, stream gages, precipitation meters, etc.) in a map-based interface (see Figure 5-3). The sites are color coded based on associated data type and may be filtered by different criteria such as number of records or monitoring entity. Users may click on a site to view the site detail information and associated data. The monitoring data is displayed in both chart and table formats. In these views, the user may select to view different parameters for the data type. The chart and table may be updated to display selected date ranges, and the data may be exported to Excel.

5.2.3.2 List View

The List view displays all sites (groundwater wells, stream gages, precipitation meters, etc.) in a tabular interface. The sites are listed according to site names and associated entities. The list can be sorted and filtered by different criteria such as number of records or monitoring entity. Similar to the Map view, users may click on a site to view the site detail information and associated data. The monitoring data is displayed in both chart and table formats. In these views, the user may select to view different parameters for the data type. The chart and table may be updated to display selected date ranges, and the data may be exported to Excel.

5.2.3.3 Analysis Tools

The Toolbox is available in the Map view and offers Administrative and Entity users access to the Well Tiering tool to support monitoring plan development. The flexibility of the DMS platform allows for future analysis tools, including contouring, total water budget visualization, and management area tracking.

5.2.4 Query and Reporting

The DMS has the ability to format and export data and analysis at different levels of aggregation, and in different formats, to support local decision making and for submission to various statewide and local programs (i.e., the Sustainable Groundwater Management Act [SGMA], California Statewide Groundwater Elevation Monitoring [CASGEM], groundwater ambient monitoring and assessment [GAMA], etc.).

5.2.4.1 Ad-hoc Query

The data in the DMS can be queried and reported using the Query Tool. The Query Tool includes the ability to build ad-hoc queries using simple options. The data can be queried by:

- Monitoring or Managing Entity
- Site Name
- Data Type

Once the type of option is selected, the specific criteria may be selected (e.g., groundwater elevation greater than 100 ft.). Additionally, users may include time periods as part of the query. The query options can build upon each other to create reports that meet specific needs. Queries may be saved and will display in the saved query drop-down menu of the user who created the query for future use.

The query results are displayed in a map format and a list format. In both the Map and List views, the user may click on a well to view the associated data. The resulting data of the query may be exported to Excel.

5.2.4.2 Standard Reports

The DMS can be configured to support wide-ranging reporting needs through the Reports tool. Standard report formats may be generated based on a predetermined format and may be created at the click of a button. These report formats may be configured to match state agency requirements for submittals, including annual reporting of monitoring data that must be submitted electronically on forms provided by the Department of Water Resources (DWR).

5.3 DATA INCLUDED IN THE DATA MANAGEMENT SYSTEM

Many monitoring programs exist at both the local and state/federal levels. A cross-sectional analysis was conducted within the Subbasin to document and assess the availability of data within the Subbasin, as well as statewide or federal databases that provide data relevant to the Subbasin.

The DMS is configured to include a wide variety of monitoring data types and associated parameters. Based on the analysis of existing datasets within the Subbasin and the GSP needs, the data types shown in Table 5-3 below were identified and are currently used in the DMS.

Table 5-3: Data Types and Their Associated Parameters Configured in the DMS

Data Type	Parameter	Units	Currently Has Data in DMS
Groundwater Level	Depth to Groundwater	feet	Yes
	Groundwater Elevation	feet	Yes
Groundwater Quality	Chloride	milligrams per liter	Yes
	Electrical Conductivity	millimho	Yes
	Total Dissolved Solids	milligrams per liter	Yes
	Various Parameters (See Appendix 5-A)	Various	
Surface Water Quality	Various Parameters (See Appendix 5-A)	Various	
Streamflow	Streamflow	cubic feet per second	
Precipitation	Precipitation	inches	
	Reference Evapotranspiration (ETo)	Inches per month	
	Average Air Temperature	ºF	

Additional data types and parameters can be added and modified as the DMS grows over time.

The data were collected from a variety of sources, as shown in Table 5-4 below. Each dataset was reviewed for overall quality and consistency prior to consolidation and inclusion in the database.

The groundwater wells shown in the DMS are those that are included datasets provided by the monitoring data sources shown below for groundwater elevation and quality. These do not include all wells currently used for production and may include wells historically used for monitoring that do not currently exist. Care was taken to minimize duplicative wells in the DMS. As datasets were consolidated, sites were evaluated based on different criteria (e.g., naming conventions, location, etc.) to determine if the well was included in a different dataset. Datasets for the wells were then associated with the same well, where necessary.

After the data was consolidated and reviewed for consistency, it was loaded into the DMS. Using the DMS data viewing capabilities, the data was reviewed for completeness and consistency to ensure the imports were successful.

Table 5-4: Sources of Data Included in the Data Management System

Data Source	Datasets Collected	Date Collected	Activities Performed
CVSALTS	Well Location Well Type (Limited) Well Depth (Limited) Groundwater Quality	8/13/2018	• Removed duplicate records • Matched existing records with other data sources (GAMA, DWR)
DWR CASGEM	Groundwater Elevation Well Type (Limited) Well Depth (Limited) Well Location	4/18/2018	• Removed duplicate records
EnviroStor	Groundwater Quality	7/23/2018	• Removed duplicate records
GeoTracker	Groundwater Quality	7/23/2018	• Removed duplicate records
GAMA	Well Type Well Depth (Limited) Well Location Groundwater Quality	8/2/2018	• Removed duplicate records
Local Data	Groundwater Elevation (Limited) Well Type (Limited) Well Depth Well Location Groundwater Quality	2/2017-10/2018	• Removed duplicate records
San Joaquin County	Groundwater Elevation Well Type (Limited) Well Depth (Limited) Well Location	9/19/2017	• Removed duplicate records

6. PROJECTS AND MANAGEMENT ACTIONS

This chapter includes relevant projects and management actions information to satisfy Sections 354.42 and 354.44 of the Sustainable Groundwater Management Act (SGMA) regulations. The projects and management actions described in this chapter will help achieve the Eastern San Joaquin Subbasin's sustainability goal.

6.1 PROJECTS, MANAGEMENT ACTIONS, AND ADAPTIVE MANAGEMENT STRATEGIES

Achieving sustainability in the Subbasin requires implementation of projects and management actions. The Eastern San Joaquin Subbasin will achieve sustainability by implementing water supply projects that either replace (offset) or supplement (recharge) groundwater to achieve the estimated pumping offest and/or recharge need of 78,000 acre-free per year (AF/year). In addition, three projects have been identified that support demand conservation activities, including water use efficiency upgrades. Currently, no pumping restrictions have been proposed for the Subbasin; however, GSAs maintain the flexibility to implement such demand-side management actions in the future if need is determined.

6.2 PROJECTS

6.2.1 Project Identification

Projects were identified by the Eastern San Joaquin Groundwater Sustainability Agencies (GSAs) through a several month process involving the Groundwater Authority Board of Directors (GWA Board), Advisory Committee, Workgroup, and the general public. This process included a public polling and feedback solicitation process at the Projects and Management Actions Workshop, held at the October 2018 GWA Board meeting. This activity allowed GWA Board members, GSA staff, and members of the public to participate in a real-time online polling activity through their smart phone devices. Hard copy paper surveys were provided for those without online access. Additionally, a template for project feedback and suggestion was created, posted online for the public, and hard copies distributed at Informational Open House events.

Project information was provided by GSAs and compiled into a draft list. This list was discussed and presented during the October and November 2018 GWA Board meetings, the October and November 2018 and January 2019 Advisory Committee meetings, and the November 2018 and January 2019 Workgroup meetings. Priorities identified included:

- Project is implementable with respect to technical complexity, regulatory complexity, institutional consideration, and public acceptance
- Project benefit is located in area of greatest overdraft
- Project is affordable and cose-effective (highest unit cost per volume water savings)
- Project provides an environmental benefit (or reduces environmental impact)
- Project addresses Disadvantaged Communities (DACs) and/or Severely Disadvantaged Communities (SDACs)
- Project is located in an area where water quality is suitable for use

Projects with the potential to contribute to the migration of a potential contaminant plume were eliminated from consideration and removed from the GSP list of projects.

6.2.2 Project Implementation

Projects will be administered by the GSA project proponents. GSAs may elect to implement projects individually or jointly with one or more GSAs or with the GWA.

6.2.3 List of Projects

Several projects to increase water supply availability in the Subbasin have been identified. The initial set of projects were reviewed with the GWA Board, Advisory Committee, and Workgroup. A final list of 23 possible projects are included in the Draft GSP, representing a variety of project types including direct and in-lieu recharge, intra-basin water transfers, demand conservation, water recycling, and stormwater reuse. Projects are classified into three categories based on project status: Planned, Potential, and Longer-term or Conceptual, as defined below.

- Planned Projects – Projects in this category are planned to be completed and online prior to 2040 and the projected supply is considered as offsetting the projected 2040 supply imbalance.
- Potential Projects – Projects in this category are currently in the planning stages and may move forward if funding becomes available. Potential Projects represent a "menu of options" for the Subbasin to achieve long-term sustainability and offset the remaining imbalance above and beyond implementation of the Planned Projects.
- Longer-term or Conceptual Projects – Projects in this category are in the early conceptual planning stages and would require significant additional work to move forward. Longer-term/Conceptual Projects represent potential future projects that could conceptually provide a benefit to the Subbasin in the future, but that would need to be further developed.

This subsection of the GSP satisfies the requirements of California Water Code Section 354.44, reiterated in the Department of Water Resources (DWR) Preparation Checklist for GSP Submittal Guidance. Consistent with SGMA requirements, the project descriptions for projects contain information regarding:

- the measurable objective that is expected to benefit
- permitting and regulatory processes
- time-table for initiation and completion
- expected benefits
- how the project will be accomplished
- legal authority
- estimated costs and plans to meet costs
- circumstances for implementation
- public noticing

Table 6-1 provides a summary of the 23 projects. Full descriptions are included below.

Table 6-1: List of SGMA Projects

Project Name	Project Type	Project Proponent	Measurable Objective Expected to Benefit	Current Status	Time-table (initiation and completion)	Estimated Costs		Required Permitting and Regulatory Process[1]	Expected Groundwater Demand Reduction (AF/year)
						Capital	Annual O&M		
Planned Projects: Projects in this category are planned to be completed and online prior to 2040. The projected supply of projects in this category will be considered as offsetting the projected 2040 supply imbalance.									
Project 1: Lake Grupe In-lieu Recharge	In-lieu Recharge	SEWD	Groundwater levels	Can be implemented immediately	2020-2022	$2.3 M	$330,000	Installation for new intake and pipeline requires permits from DFW, CVFPB, RWQCB, and USACE	10,000
Project 2: SEWD Surface Water Implementation Expansion	In-lieu Recharge	SEWD	Groundwater levels	Design phase	2019-2020	$750,000	$100,000	Permit approvals from DFW, RWQCB, CVFPB, and USACE by private landowners	19,000
Project 3: City of Manteca Advanced Metering Infrastructure Project	Conservation	City of Manteca	Groundwater levels	Currently underway	2019-2021	$650,000	$300,000	None	272
Project 4: City of Lodi Surface Water Facility Expansion & Delivery Pipeline	In-lieu Recharge	City of Lodi	Groundwater levels	Planning phase	2030-2033	$4 M	$2,340,000	SWRCB permitting and CEQA required	4,750
Project 5: White Slough Water Pollution Control Facility Expansion	Recycling/ In-lieu Recharge	City of Lodi	Groundwater levels	Construction complete	2019-2020	$6 M	$4,664	None (permitting complete)	115
Project 6: CSJWCD Capital Improvement Program	In-lieu Recharge	CSJWCD	Groundwater levels	Can be implemented immediately	2020-2027, on-going with 7-year completion cycles	$50,000	$50,000	Individual applications need CSJWCD Board approval and possible streambed alteration permits	5,000

Project Name	Project Type	Project Proponent	Measurable Objective Expected to Benefit	Current Status	Time-table (initiation and completion)	Estimated Costs		Required Permitting and Regulatory Process[1]	Expected Groundwater Demand Reduction (AF/year)
						Capital	Annual O&M		
Project 7: NSJWCD South System Modernization	In-lieu Recharge	NSJWCD	Groundwater levels	Environmental review is complete, funding has been sought and a landowner improvement district formed	2018-2023	$9 M	$250,000	Permits for pump station work have been completed; minor grading and road encroachment permits may be needed	4,500
Project 8: Long-term Water Transfer to SEWD and CSJWCD	Transfers/ In-lieu Recharge	SSJ GSA	Groundwater levels	Infrastructure is in place. Environmental Review may need to be implemented	2019-2021	N/A	$9 M	Project must comply with CEQA	45,000
								Total Planned	*88,637*
Potential Projects: Projects in this category represent a "menu of options" for the Subbasin to achieve long-term sustainability and offset the remaining imbalance above and beyond implementation of the "planned" projects.									
Project 9: BNSF Railway Company Intermodal Facility Recharge Pond	Direct Recharge	CSJWCD	Groundwater levels	Planning phase	2020-2023	$150,000	$50,000	Streambed alteration permit	1,000
Project 10: Stockton Advanced Metering Infrastructure	Conservation	City of Stockton	Groundwater levels	Initial study completed in 2011	2020/25-2025/28	$11 M	$550,000	Not determined	2,000
Project 11: South System Groundwater Banking with EBMUD	In-lieu Recharge	NSJWCD	Groundwater levels	Agreement is in place; partied need to finalize design. Environmental review and permitting needed	2020-2025	$5 M	$400,000	SWCRB change petition for Permit 10478 and San Joaquin County groundwater export permit, and regulatory permits as needed	4,000

Project Name	Project Type	Project Proponent	Measurable Objective Expected to Benefit	Current Status	Time-table (initiation and completion)	Estimated Costs		Required Permitting and Regulatory Process[1]	Expected Groundwater Demand Reduction (AF/year)
						Capital	Annual O&M		
Project 12: NSJWCD North System Modernization/ Lasko Recharge	In-Lieu Recharge/ Direct Recharge	NSJWCD	Groundwater levels	Planning phase	2021-2026	$7 M	$150,000	Regulatory permits as needed	2,600
Project 13: Manserro Recharge Project	Direct Recharge	NSJWCD	Groundwater levels	Planning phase	2019-2022*	$300,000	$400,000	CEQA review, possible grading permit, possible water right change petition	8,000
Project 14: Tecklenburg Recharge Project	Direct Recharge	NSJWCD	Groundwater levels	Planning phase	2020-2023**	$1 M	$400,000	CEQA review and possible grading permit	8,000
Project 15: City of Escalon Wastewater Reuse	Recycling/ In-lieu Recharge/ Transfers	SSJ GSA	Groundwater levels	Planning phase	2020-2028	$18 M	$400,000	CEQA review, RWQCB permits, and road encroachment permits	672
Project 16: City of Ripon Surface Water Supply	In-lieu Recharge	SSJ GSA	Groundwater levels	Design complete; environmental permitting underway	2020-2024	$8.6 M	N/A	NEPA Categorical Exclusion, CEQA Mitigated Negative Declaration, and road encroachment permits	6,000
Project 17: City of Escalon Connection to Nick DeGroot Water Treatment Plant	In-lieu Recharge	SSJ GSA	Groundwater levels	Conceptual design phase; environmental review complete	2020-2023	$8,789,000	$250,000	Road encroachment permits	2,015
								Total Potential	*32,287*

Project Name	Project Type	Project Proponent	Measurable Objective Expected to Benefit	Current Status	Time-table (initiation and completion)	Estimated Costs		Required Permitting and Regulatory Process[1]	Expected Groundwater Demand Reduction (AF/year)
						Capital	Annual O&M		
Longer-term or Conceptual Projects: Projects in this category represent potential future projects that could conceptually provide a benefit to the Subbasin in the future, but that would need to be further developed.									
Project 18: Farmington Dam Repurpose Project	Direct Recharge	SEWD	Groundwater levels	Preplanning phase with reconnaissance study complete	2030-2050	$175 M	$2 M	Permits and approvals form SWRCB, USBR, DFW, RWQCB, CVFPB, and USACE	30,000
Project 19: Recycled Water Transfer to Agriculture	Recycling/Transfers/ In-lieu Recharge	City of Manteca	Groundwater levels	Planning phase with evaluation completed in Draft Reclaimed Water Facilities Master Plan	Not determined	$37,645,000	$679,000	NPDES Permit amendment, CEQA review, and SWRCB approval	5,193
Project 20: Mobilizing Recharge Opportunities	Direct Recharge	San Joaquin County	Groundwater levels	Early conceptual planning phase	Not determined	Not determined	Not determined	Not determined	Not determined
Project 21: NSJWCD Winery Recycled Water	Recycling/ In-Lieu Recharge/ Direct Recharge	NSJWCD	Groundwater levels	Conceptual planning and discussion	2025-2027	$1.5 M	$100,000	WDR permitting through the RWCQB and minor permits for pipeline construction	750
Project 22: Pressurization of SSJID Facilities	Conservation	SSJ GSA	Groundwater levels	Feasibility study complete	2019-2030	$328 M	$8.5 M	CEQA review and road encroachment permits	30,000
Project 23: SSJID Storm Water Reuse	Storm Water/ In-lieu Recharge/ Direct Recharge	SSJ GSA	Groundwater levels	Planning phase	2027-2030	$30 M	$30,000	CEQA review and road encroachment permits	1,100
Total Longer-term or Conceptual									*67,043*

Project Name	Project Type	Project Proponent	Measurable Objective Expected to Benefit	Current Status	Time-table (initiation and completion)	Estimated Costs		Required Permitting and Regulatory Process[1]	Expected Groundwater Demand Reduction (AF/year)
						Capital	Annual O&M		

[1] Acronyms defined: California Department of Fish and Wildlife (DFW), Central Valley Flood Protection Board (CVFPB), Regional Water Quality Control Board (RWQCB), and U.S. Army Corps of Engineers (USACE), State Water Resources Control Board (SWRCB), California Environmental Quality Act (CEQA), U.S. Bureau of Reclamation (USBR), National Pollutant Discharge Elimination System (NPDES), Waste Discharge Requirements (WDR).

* Project is anticipated to initiate on a pilot basis in 2019 and on a full-scale basis in 2020.

** Project is anticipated to initiate on a pilot basis in 2020 and on a full-scale basis in 2021.

6.2.4 Planned Projects

Projects categorized as Planned Projects are expected to be completed and online prior to 2040. The projected supply of projects in this category will be considered as offsetting the projected 2040 supply imbalance. An estimated total of up to 88,637 AF/year groundwater demand reduction/offset/conservation is expected as a result of the 8 Planned Projects included in this GSP. This value exceeds the estimated 78,000 AF/year needed for the Subbasin to reach sustainability.

6.2.4.1 Project 1: Lake Grupe In-Lieu Recharge

The Lake Grupe In-Lieu Recharge Project, proposed by SEWD, is to construct a surface water diversion turn-out on the Calaveras River, upstream of Bellota, and to supply surface water to multiple farms/growers currently using groundwater. The proposed project is to allow 2,500 acres of orchard crops to irrigate with surface water from Lake Grupe instead of using groundwater. Lake Grupe is at the end of rolling hills fed by two or more natural episodic streams. The proposed project would pump water from the Calaveras River, transport the water in a 24-inch PVC pipeline for about 5,000 feet, with an elevation gain of 170 feet through private properties, discharge the water into one of the ravines feeding Lake Grupe, and then the surrounding growers would pump the water from the Lake for irrigation. The diverted water would flow through a ravine, currently on private lands, and recharge the groundwater basin underneath. The benefit of the project is the in-lieu banking of 7,000 AF of groundwater from irrigation conversion plus additional 13,000 AF of percolation in the ravine.

Project Summary	
Submitting GSA:	Stockton East Water District
Project Type:	In-lieu Recharge
Estimated Groundwater Offset and/or Recharge:	10,000 AF/year

<u>Measurable Objective Expected to Benefit</u>: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing in-lieu recharge opportunities.

<u>Project Status</u>: This project can be implemented immediately.

<u>Required Permitting and Regulatory Process</u>: This project requires the installation of a new intake in the Calaveras River and construction of a pipeline through private properties. The installation of a new intake in the Calaveras River would require permits from California Department of Fish and Wildlife (DFW), Central Valley Flood Protection Board (CVFPB), Regional Water Quality Control Board (RWQCB), and U.S. Army Corps of Engineers (USACE).

<u>Time-table for Initiation and Completion</u>: This project is expected to initiate in 2020 and be completed by 2022.

<u>Expected Benefits and Evaluation</u>: Groundwater Subbasin recharge through the in-lieu use of alternate water supply will be an important component of the GSP and will be critical to establishing long-term Subbasin sustainability. This project is anticipated to offset 4,750 AF/year in groundwater pumping in SEWD. Benefits to groundwater levels will be evaluated through Eastern San Joaquin Water Resources Model (ESJWRM) model simulations.

<u>How Project Will Be Accomplished/Evaluation of Water Source</u>: The surface water source of this proposed project is from SEWD's existing contract with the U.S. Bureau of Reclamation (USBR) for the New Hogan Reservoir. Surface water is diverted from the Calaveras River. This is an existing surface water right.

<u>Legal Authority</u>: SEWD is a local agency with its own enabling legislation established to serve water for agricultural and municipal demands. SEWD is also a GSA with authority on groundwater pumping.

<u>Estimated Costs and Plans to Meet Costs</u>: The estimated costs for this project includes $2.3 million in capital costs and $330,000 in annual operations and maintenance costs. Costs for this project will be met through SEWD District staffing and District rates to establish new accounts.

Circumstances for Implementation: This project is a Planned Project that is anticipated to move forward. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management. Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Subbasin. SEWD's Board of Directors is currently considering implementation of this project. Upon approval, this project will begin.

Trigger for Implementation and Termination: This project is planned and SEWD is seeking grant funding and approval by the Board of Directors. This project would terminate at the requests of the landowners and approval of the Board of Directors.

Process for Determining Conditions Requiring the Project have Occurred: Not applicable, this is a Planned Project that is anticipated to move forward.

6.2.4.2 Project 2: SEWD Surface Water Implementation Expansion

As part of the SEWD Surface Water Implementation Expansion Project, SEWD would require landowners adjacent to surface water conveyance systems (rivers or pipelines) to utilize surface water as part of the SGMA implementation. This would increase surface water usage by about 18,000 to 20,000 AF/year with in-lieu groundwater recharge benefits. Currently, there are about 6,000 acres irrigated with groundwater that could be converted to surface water. There are also an additional 1,500 acres with inactive surface water accounts. SEWD would be the lead agency in environmental/CEQA review and would assist landowners/growers in establishing a turnout for agricultural irrigation and acquiring necessary permits through federal and state regulatory agencies.

Project Summary	
Submitting GSA:	Stockton East Water District
Project Type:	In-lieu Recharge
Estimated Groundwater Offset and/or Recharge:	18,000 – 20,000 AF/year

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing in-lieu recharge opportunities.

Project Status: This project is in the design phase. The District has identified the parcels with possible connections.

Required Permitting and Regulatory Process: The required permitting for this project would include acquiring permits/approvals from California DFW, RWQCB, CVFPB, and USACE by private landowners/diverters. SEWD would be the lead agency for CEQA review and would assist landowners/diverters in obtaining the permits.

Time-table for Initiation and Completion: This project is expected to initiate in 2019 and be on-going, with benefits accrued by 2020.

Expected Benefits and Evaluation: Groundwater Subbasin recharge through the in-lieu use of alternate water supply will be an important component of the GSP and will be critical to establishing long-term Subbasin sustainability. This project is anticipated to offset 4,750 AF/year in groundwater pumping in SEWD. Benefits to groundwater levels will be evaluated through ESJWRM model simulations.

How Project Will Be Accomplished/Evaluation of Water Source: This project relies on water from New Hogan Reservoir (Calaveras River water) and New Melones Reservoir (Stanislaus River water). This is an existing surface water right. SEWD has long-term water supply contracts with USBR for both New Hogan Reservoir and New Melones Reservoir.

Legal Authority: SEWD is a local agency with its own enabling legislation established to serve water for agricultural and municipal demands. SEWD is also a GSA with authority on groundwater pumping.

Estimated Costs and Plans to Meet Costs: The estimated costs for this project includes $750,000 in capital costs and $100,000 in annual operations and maintenance costs. Costs for this project will be met through staffing and rates for new accounts.

Circumstances for Implementation: This project is a Planned Project that is anticipated to move forward. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management. Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Subbasin. SEWD's Board of Directors is considering implementation of this project. Upon approval, this project would begin.

Trigger for Implementation and Termination: This project is planned and SEWD is seeking grant funding and approval by their Board of Directors. This project would terminate at the requests of the landowners and approval of the Board of Directors.

Process for Determining Conditions Requiring the Project have Occurred: Not applicable, this is a Planned Project that is anticipated to move forward.

6.2.4.3 Project 3: City of Manteca Advanced Metering Infrastructure

The City of Manteca provides treated drinking water through approximately 20,696 service connections. In order to improve efficiency and reliability of water meters, the City has been replacing existing meters and upgrading the Encoder Receiver Transmitters (ERTs) on meters when required. The ERTs and new meters allow for remote reading of the flow via a radio signal to a radio receiver inside a city vehicle or at a fixed location. The City also plans to construct the infrastructure for an Advanced Metering Infrastructure (AMI) network, which will further increase efficiency. AMI also provides several other benefits beyond simple cost savings including improved customer service, leak detection, and real-time consumption information to the customer. Documented customer water savings and improved demand-side water conservation has occurred when real-time consumption information is available.

This project would apply advanced metering infrastructure to water meters in the City of Manteca Service Area. Improved technology would increase efficiency and decrease costs associated with manual reading. Additional benefits beyond cost savings include improved leak detection and demand-side water conservation.

Project Summary	
Submitting GSA:	City of Manteca
Project Type:	Conservation
Estimated Groundwater Demand Reduction:	272 AF/year

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing demand-side water conservation opportunities.

Project Status: The City of Manteca is in the process of updating meters throughout the City and is planning to construct a network which will include a combination of fiber optic cables and series of radio tower antennas.

Required Permitting and Regulatory Process: There are no permitting or regulatory requirements for this project at this time.

Time-table for Initiation and Completion: This project is currently underway and is expected to be completed by July 2021.

Expected Benefits and Evaluation: This project is anticipated to reduce groundwater demand by 272 AF/year in the City of Manteca through leak detection and real-time consumption information to the customer. Benefits to groundwater levels will be evaluated by quantifying resulting demand reduction.

How Project Will be Accomplished/Evaluation of Water Source: This project is a demand-side conservation project. No additional water source will be utilized for this project.

Legal Authority: This project is under the authority of the City of Manteca and implemented within the City's service area.

Estimated Costs and Plans to Meet Costs: The estimated costs for this project includes $650,000 in capital costs and $300,000 in annual operations and maintenance costs. The AMI Project is a Capital Improvement Project with available funding.

Circumstances for Implementation: This project is a Planned Project that is anticipated to move forward. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management. Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Subbasin. The City of Manteca has started to implement the AMI infrastructure in phases by purchasing meters that have the capability to be read remotely. Installation of other components like fiber optic cable and radio tower antennas are in the planning stage.

Trigger for Implementation and Termination: Not applicable.

Process for Determining Conditions Requiring the Project have Occurred: Not applicable, this is a Planned Project that is anticipated to move forward.

6.2.4.4 Project 4: City of Lodi Surface Water Facility Expansion & Delivery Pipeline

This project would extend the filter room at the City of Lodi Surface Water Facility and add an additional 10 million gallons per day (MGD) capacity of surface water treatment. In addition to the filter addition, the City will construct a second sedimentation basin and add pumps throughout the facility to handle the additional volume of water being moved. This project also includes an extension of the 36-inch transmission pipeline leaving the water plant approximately 5,000 feet to facilitate water deliveries to locations further from the water treatment facility.

There is potential to reduce dependency on groundwater during summer months when the City of Lodi is still pumping as much as 10 MGD from the ground to support the water plant. Groundwater savings could be as high as 6,000 AF/year; however, 4,500 to 5,000 AF/year is expected. The delivery of additional raw surface water will need to be secured for this project to proceed.

Project Summary	
Submitting GSA:	City of Lodi
Project Type:	In-lieu Recharge
Estimated Groundwater Offset and/or Recharge:	4,750 AF/year

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing in-lieu recharge opportunities.

Project Status: This project is in the planning/initial study phase. The required plumbing and infrastructure exist; however, pumps and corresponding equipment would need to be purchased. The City has not completed a study or performed engineering modelling related to feasibility. Increasing capacity would allow for more surface water diversion during summer months, but it is unlikely that during the winter months demand would exceed the current plant capacity. The City anticipates meeting peak summer demand with more surface water, which currently exceeds the 4,000 AF that is supplied by wells.

Required Permitting and Regulatory Process: This project requires SWRCB permitting and re-classification for plant upsizing. CEQA review will also need to be completed.

Time-table for Initiation and Completion: The timeline for this project has not yet been developed, but it is estimated that the project could initiate in 2030 and be complete by 2033. Benefits would be realized beginning the first summer following the plant expansion and remain in perpetuity.

Expected Benefits and Evaluation: Groundwater Subbasin recharge through the in-lieu use of alternate water supply will be an important component of the GSP and will be critical to establishing long-term Subbasin sustainability. This project is anticipated to offset 4,750 AF/year in groundwater pumping in the City of Lodi. Benefits to groundwater levels will be evaluated through ESJWRM model simulations.

How Project Will Be Accomplished/Evaluation of Water Source: The City of Lodi relies on Woodbridge Irrigation District (WID) for surface water deliveries and does not currently have a contract allowing for higher volumes to be supplied. This project relies entirely on the availability of additional surface water deliveries from WID (Mokelumne River water), which will need to be negotiated at the onset of the project.

Legal Authority: The City of Lodi has legal authority to administer this project through Water Code sections 71000-73000. Additional legal and contract negotiations will be needed with WID for additional surface water deliveries.

Estimated Costs and Plans to Meet Costs: The estimated costs for this project includes $4 million in capital costs, $240,000 in fixed annual operations and maintenance costs, and $2.1 million in annual variable costs (amount is variable depending on water purchase, power, and chemical needs). This project is a Capital Improvement Project Budgeted item, to be paid for from the water enterprise fund.

Circumstances for Implementation: This project is a Planned Project that is anticipated to move forward. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management. Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Subbasin.

Trigger for Implementation and Termination: Expansion of the Surface Water Treatment Facility (SWTF) will be initiated when the City of Lodi is unable to meet its growing water demand with the current infrastructure. There is no expectation that this project would be terminated based on a decision made by the City of Lodi. The availability of surface water supply from WID would be the only potential cause for a reduction in SWFT production.

Process for Determining Conditions Requiring the Project have Occurred: In reviewing current water demands, as well as future projections of use, City of Lodi staff will determine whether an expansion of the SWTF is appropriate or not and make a recommendation to City Council. This is a Planned project that is anticipated to move forward and be online by 2040.

6.2.4.5 Project 5: White Slough Water Pollution Control Facility Expansion

This project would include the construction of a 70-acre pond expansion with a storage capacity of 388 AF. The purpose of the project is to provide tertiary-treated Title-22 effluent for use as irrigation water on approximately 890 acres of agricultural land surrounding the White Slough Water Pollution Control Facility (WPCF) to offset groundwater pumping. The project is estimated to reduce the annual volume discharged to Dredger Cut (a dead-end slough of the Sacramento-San Joaquin Delta) by approximately 160 to 210 million gallons. Flow will be diverted from Dredger Cut at a rate up to 1,700 gallons per minute over an approximate 75 to 90-day period between October 1 and May 31 of each year. Project studies have demonstrated that the storage provided by this project will significantly offset groundwater pumping through in-lieu use.

Project Summary	
Submitting GSA:	City of Lodi
Project Type:	Recycling/In-lieu Recharge
Estimated Groundwater Offset and/or Recharge:	85-150 AF/year

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing water recycling and in-lieu recharge opportunities

Project Status: Construction of this project has completed. Roughly 85-150 AF/year of percolation recharge is expected. Additionally, the tertiary treated wastewater will be used to irrigate the on-site agricultural fields, thereby reducing groundwater pumping for irrigation.

Required Permitting and Regulatory Process: The permitting and regulatory processes required for this project have been completed.

Time-table for Initiation and Completion: Construction of this project has completed, with accrual of benefits expected by 2020.

Expected Benefits and Evaluation: Groundwater Subbasin recharge through the in-lieu use of alternate water supply will be an important component of the GSP and will be critical to establishing long-term Subbasin sustainability. This project is anticipated to offset 85-150 AF/year in groundwater pumping in the City of Lodi. Benefits to groundwater levels will be evaluated through ESJWRM model simulations.

How Project Will Be Accomplished/Evaluation of Water Source: This project will rely on the use of recycled water, in the form of tertiary-treated Title-22 effluent form the White Slough WPCF Expansion. No additional water source will be utilized for this project.

Legal Authority: The City of Lodi has legal authority to administer this project through Water Code sections 71000-73000.

Estimated Costs and Plans to Meet Costs: The estimated costs for this project includes $6 million in capital costs and $4,664 in annual operations and maintenance costs. This project will be financed through the DWR Proposition 84 Grant Funding Program.

Circumstances for Implementation: This project is a Planned Project that is anticipated to move forward. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management. Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Subbasin. Construction for this project has completed.

Trigger for Implementation and Termination: There is no plan to terminate this project, as it has been completed and the operations and maintenance cost is minimal.

Process for Determining Conditions Requiring the Project have Occurred: Not applicable, this is a Planned Project that is anticipated to move forward.

6.2.4.6 Project 6: CSJWCD Capital Improvement Program

CSJWCD provides assistance to users to convert groundwater fields to surface water use. The user applies for water credits based upon new surface water acres. The user is responsible for constructing a diversion facility. As water is diverted the District reduces the water charge until credit is used or 7 years since implementation has elapsed. The Capital Improvement Program has been on-going since 1996.

Project Summary	
Submitting GSA:	Central San Joaquin Water Conservation District
Project Type:	In-lieu Recharge
Estimated Groundwater Offset and/or Recharge:	5,000 AF/year

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing in-lieu recharge opportunities.

Project Status: This project is planned and on-going.

Required Permitting and Regulatory Process: CSJWCD is not required to comply with permits or regulatory processes to implement and oversee the Capital Improvement Program. However, individual applicants are required to have approval of the CSJWCD Board of Directors and may be required to obtain a streambed alteration permits.

Time-table for Initiation and Completion: The Capital Improvement Program has been on-going since 1996. New individual projects are anticipated to begin each year. Individual applicants are expected to complete their projects 7 years after initiation.

Expected Benefits and Evaluation: Groundwater Subbasin recharge through the in-lieu use of alternate water supply will be an important component of the GSP and will be critical to establishing long-term Subbasin sustainability. This project is anticipated to offset 5,000 AF/year in groundwater pumping in CSJWCD. Benefits to groundwater levels will be evaluated through ESJWRM model simulations.

Expected Benefits and Evaluation: Groundwater Subbasin recharge through the in-lieu use of alternate water supply will be an important component of the GSP and will be critical to establishing long-term Subbasin sustainability. This project is anticipated to offset 5,000 AF/year in groundwater pumping in CSJWCD. Benefit to the groundwater aquifer has already accrued and will continue to accrue as new projects are implemented. Benefits to groundwater levels will be evaluated through ESJWRM model simulations.

How Project Will Be Accomplished / Evaluation of Water Source: This project relies on this use of surface water from the New Melones Unit Central Valley Project. The surface water source is based upon a contract with the United States for delivery of surface water from the New Melones Unit of the Central Valley Project. The contract is long-term however water availability is subject to drought conditions. This is an existing water right.

Legal Authority: The California Water Code, Division 21, Section 74000 et seq. authorizes CSJWCD to acquire, sell, and distribute water and fix rates for service throughout the District.

Estimated Costs and Plans to Meet Costs: The estimated costs for this project includes $50,000 in capital costs and $50,000 in annual operations and maintenance costs. The project provides for the payment of delivered surface water at a reduced rate. Any deficit in cost of water is recovered by full cost of surface water to other users, groundwater extraction fees, and acre assessments.

Circumstances for Implementation: This project is an on-going Planned Project that is anticipated to move forward. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management. Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Subbasin.

Trigger for Implementation and Termination: Not applicable.

Process for Determining Conditions Requiring the Project have Occurred: Not applicable, this is a Planned Project that is anticipated to move forward.

6.2.4.7 Project 7: NSJWCD South System Modernization

This project will modernize the South System Pump and Distribution System to facilitate delivery of 9,000 AF/year of additional surface water to farmers in-lieu of groundwater pumping. Water would come from NSJWCD Permit 10477 supplies, which are available in about 55 percent of years.

Project Summary	
Submitting GSA:	North San Joaquin Water Conservation District
Project Type:	In-lieu Recharge
Estimated Groundwater Offset and/or Recharge:	4,500 AF/year

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing in-lieu recharge opportunities.

Project Status: Design for this project is at 60 percent complete, and environmental review is complete. Funding has been sought, with some state and federal grants awarded, and a landowner improvement district has been formed for assessments. Project design may be modified based on available funding or staging of project. The project has already started implementation with the rebuilding of the pump station in 2018 and 2019 at a cost of approximately $3 million. Approximately $2 million of this cost has been funded with grants and other outside funding, including contributions from a settlement with EBMUD. $1 million of the cost has been funded through a voluntary acreage assessment by landowners along the South System who want to use surface water. Work on the distribution system will start in 2019 and continue for several years. NSJWCD has secured a $3 million grant to cover a portion of the cost of the work needed for the pipeline. NSJWCD is continuing to work on other revenue raising efforts to raise additional funds to cover the cost of a complete rehabilitation of the distribution system.

Required Permitting and Regulatory Process: All permits for the pump station work have been obtained. Minor grading and road encroachment permits may be needed for on-going work to the distribution system.

Time-table for Initiation and Completion: This project initiated in 2018 and is expected to be completed by 2023.

Expected Benefits and Evaluation: Groundwater Subbasin recharge through the in-lieu use of alternate water supply will be an important component of the GSP and will be critical to establishing long-term Subbasin sustainability. This project is anticipated to offset 4,500 AF/year in groundwater pumping in NSJWCD. Benefits to groundwater levels will be evaluated through ESJWRM model simulations.

How Project Will Be Accomplished/Evaluation of Water Source: This project relies on surface water from NSJWCD Permit 10477 (Mokelumne River water). This is an existing surface water right.

Legal Authority: The legal authority for this project is covered under Water Code Section 74000 et seq.

Estimated Costs and Plans to Meet Costs: The estimated costs for this project includes $9 million in capital costs and $250,000 in annual operations and maintenance costs. Costs for this project will be met through grant funding, landowner assessments, and water charges

Circumstances for Implementation: This project is a Planned Project that is anticipated to move forward. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management. Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Subbasin.

Trigger for Implementation and Termination: Not applicable.

Process for Determining Conditions Requiring the Project have Occurred: Not applicable, this is a Planned Project that is anticipated to move forward.

6.2.4.8 Project 8: Long-Term Water Transfer to SEWD and CSJWCD

Oakdale Irrigation District (OID) and South San Joaquin Irrigation District (SSJID) have historically participated in long-term water transfers of surplus, pre-1914, surface water rights to other entities within the Eastern San Joaquin Subbasin. These transfers have included one-year transfers to CSJWCD, as well as a nearly 10-year transfer to SEWD for both agricultural and urban purposes. The most recent transfer with SEWD occurred in 2019. These areas of the Subbasin do have surface water available from the USBR's Central Valley Project; however, project water allocations become significantly reduced in below normal and dry water years. When surface water is not available, many of the agricultural customers in these areas have typically turned to groundwater in order to meet their annual and permanent crop water demands. Providing long-term water transfers from OID/SSJID to other agencies within the Subbasin would allow for increased average annual surface water deliveries to the Subbasin area, reducing groundwater reliance and overdraft within the Subbasin, especially during drought years. SEWD and CSJWCD overly a significant portion of the Subbasin dependent on groundwater and historical overdraft conditions.

No new facilities would need to be constructed to convey water from OID/SSJID to SEWD, and CSJWCD receives water through diversions from a tunnel just upstream of the OID/SSJID owned Goodwin Dam on the Stanislaus River. Historical transfers have been accomplished through the use of these existing facilities. Additional infrastructure may be necessary to increase distribution of surface water supplies to irrigated agriculture and to achieve adequate improvement toward sustainability goals.

Project funding could be provided directly from the districts participating in the water transfers. Additionally, additional infrastructure to promote additional surface water use and capital payments for surface water transfers could be provided indirectly by groundwater reliant entities, thereby providing a means of continuing to utilize groundwater while investing in a Subbasin-wide project that assures continued sustainability within the Subbasin.

Project Summary	
Submitting GSA:	South San Joaquin GSA
Project Type:	Intrabasin Transfer/In-lieu Recharge
Estimated Groundwater Offset and/or Recharge:	Up to 45,000 AF/year
Other Participating Entities:	Oakdale Irrigation District, Stockton East Water District, Central San Joaquin Water Conservation District

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing in-lieu recharge opportunities.

Project Status: No design is needed for this project, as the infrastructure is in place. Environmental review may need to be implemented.

Required Permitting and Regulatory Process: This project must comply with CEQA. Temporary transfers may have less rigorous permitting requirements.

Time-table for Initiation and Completion: Expected project time-table is 2019-2021. A new long-term transfer could begin immediately upon agreement among the parties. Transfers from OID/SSJID to SEWD/CSJWCD have historically been agreed to, with historical transfer amounts varying from 0 to 40,000 AF/year.

Expected Benefits and Evaluation: Groundwater Subbasin recharge through the in-lieu use of alternate water supply will be an important component of the GSP and will be critical to establishing long-term Subbasin sustainability. This project is anticipated to offset up to 45,000 AF/year in groundwater pumping in SEWD and CSJWCD. Benefits to groundwater levels will be evaluated through ESJWRM model simulations. Participating districts would report annually amount agreed to be transferred and the amount diverted under transfer.

How Project Will Be Accomplished/Evaluation of Water Source: OID and SSJID hold pre-1914 water rights on the Stanislaus River. USBR is junior in right to OID and SSJID. This is an existing surface water right.

Legal Authority: OID and SSJID are irrigation districts formed in accordance with State law and hold pre-1914 water rights on the Stanislaus River. SEWD and CSJWCD are water conservation districts also formed in accordance with State law. Historically, water transfers occurring between OID/SSJID and SEWD/CSJWCD are approved by mutual agreement.

Estimated Costs and Plans to Meet Costs: Costs for this project are estimated at up to $9 million annually ($200 per acre-foot). Costs for this project will be met by recipients of water or groundwater pumping benefit.

Circumstances for Implementation: This project is a Planned Project that is anticipated to move forward. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management. Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Subbasin. Short-term transfers are expected to occur on an as needed basis. A longer-term transfer must be mutually agreed to prior to implementation.

Trigger for Implementation and Termination: Transfers may take place upon mutual agreement. Termination would be subject to the terms of the agreement if applicable.

Process for Determining Conditions Requiring the Project have Occurred: Not applicable, this is a Planned Project that is anticipated to move forward.

6.2.5 Potential Projects

Projects categorized as Potential Projects are currently in the planning stages and may move forward if funding becomes available. Potential Projects represent a "menu of options" for the Subbasin to achieve long-term sustainability and offset the remaining imbalance above and beyond implementation of the Planned Projects. Together these projects total 32,287 AF/year in groundwater offset/recharge/conservation that could potentially be made available to the Subbasin if funding is secured.

6.2.5.1 Project 9: BNSF Railway Company Intermodal Facility Recharge Pond

Under this proposed project, CSJWCD would form an agreement with the BNSF railroad owner to access an existing drainage pond near the CSJWCD delivery channel to be used as a recharge area. This project would contribute an estimated 1,000 AF/year of groundwater offset through direct recharge to the groundwater aquifer.

Project Summary	
Submitting GSA:	Central San Joaquin Water Conservation District
Project Type:	Direct Recharge
Estimated Groundwater Offset and/or Recharge:	1,000 AF/year
Other Participating Entities:	BNSF Railway

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing direct recharge opportunities.

Project Status: This project is in the planning stages.

Required Permitting and Regulatory Process: A streambed alteration permit would be required to construct a diversion structure from the District delivery channel to feed the recharge pond.

Time-table for Initiation and Completion: This project would initiate in 2021 and be completed by 2023.

Expected Benefits and Evaluation: This project is anticipated to directly recharge 1,000 AF/year to the groundwater basin in CSJWCD. Benefits to groundwater levels will be evaluated through ESJWRM model simulations.

How Project Will Be Accomplished/Evaluation of Water Source: This project will rely on water from the New Melones Unit Central Valley Project. The surface water source is based upon a contract for delivery of surface water from the New Melones Unit of the Central Valley Project. The contract is long-term however water availability is subject to drought conditions. This is an existing water right.

Legal Authority: The California Water Code, Division 21, Section 74000 et seq. authorizes CSJWCD to acquire, sell, and distribute water and fix rates for service throughout the District.

Estimated Costs and Plans to Meet Costs: The estimated costs for this project includes $150,000 in capital costs and $50,000 in annual operations and maintenance costs. Costs for this project would be met by groundwater extraction fee revenue, private loans, and/or possible grant funding.

Circumstances for Implementation: This project is a Potential Project, meaning it is currently in the planning stages and may move forward if funding becomes available. Potential Projects represent a "menu of options" for the Subbasin to achieve long-term sustainability and offset the remaining imbalance above and beyond implementation of the Planned Projects. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management. In this case, the project parties plan to implement the project as soon as a finalized agreement with landowner is reached and permitting and funding are established.

Trigger for Implementation and Termination: Not applicable.

Process for Determining Conditions Requiring the Project have Occurred: Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Subbasin.

6.2.5.2 Project 10: Stockton Advanced Metering Infrastructure

The City of Stockton Municipal Utilities Department (MUD) provides treated drinking water through approximately 48,000 water meters, of which a portion are read via a touch-read system and the remainder are read manually by staff every month. Manual meter reading is the least efficient method of meter reading and the most costly. AMI using improved technology is far more efficient and generally very cost effective when compared to manual reading. AMI also provides several other benefits beyond simple cost savings including improved customer service, leak detection, and real-time consumption information to the customer. Documented customer water savings and improved demand-side water conservation has occurred when real-time consumption information is available.

This project would apply AMI to water meters in the City of Stockton Service Area. Improved technology would increase efficiency and decrease costs associated with manual reading. Additional benefits beyond cost savings include improved leak detection and demand-side water conservation.

Project Summary	
Submitting GSA:	City of Stockton
Project Type:	Conservation
Estimated Groundwater Demand Reduction:	2,000 AF/year

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing demand-side water conservation opportunities.

Project Status: An initial study for this project was completed in 2011.

Required Permitting and Regulatory Process: The required permitting and regulatory process for this project has not yet been determined.

Time-table for Initiation and Completion: This project is would initiate 2020-2025 and be completed by 2025-2028.

Expected Benefits and Evaluation: This project is anticipated to reduce groundwater demand by 2,000 AF/year in the City of Stockton through leak detection and real-time consumption information to the customer. Benefits to groundwater levels will be evaluated by quantifying resulting demand reduction.

How Project Will Be Accomplished/Evaluation of Water Source: This project is a demand-side conservation project. No additional water source will be utilized for this project.

Legal Authority: This project would be under the authority of the City of Stockton and implemented within the service area.

Estimated Costs and Plans to Meet Costs: The estimated costs for this project includes $11 million in capital costs and $550,000 in annual operations and maintenance costs. Costs for this project would be met by ratepayers and through grants or other funding sources.

Circumstances for Implementation: This project is a Potential Project, meaning it is currently in the planning stages and may move forward if funding becomes available. Potential Projects represent a "menu of options" for the Subbasin to achieve long-term sustainability and offset the remaining imbalance above and beyond implementation of the Planned Projects. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management. Circumstances for implementation include inclusion in Department planning, development, and Capital Improvement Program.

Trigger for Implementation and Termination: Triggers for project implementation and termination include availability of project funding.

Process for Determining Conditions Requiring the Project have Occurred: Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Subbasin.

6.2.5.3 Project 11: South System Groundwater Banking with EBMUD

NSJWCD, East Bay Municipal Utility District (EBMUD), and other entities in San Joaquin County entered into a Protest Dismissal Agreement in 2014 (the "PDA") to resolve various water right protests. The PDA Agreement includes a commitment to undertake a pilot-level groundwater banking project and a longer-term groundwater banking project. The pilot level banking project is called the "DREAM" project and is already underway. The DREAM project involves the delivery of 1,000 AF of EBMUD water into the NSJWCD service area along the South System to use for irrigation, effectuating 1,000 AF of in-lieu groundwater recharge. EBMUD will receive a banked water credit of 50 percent of the amount of water recharge, not to exceed 500 AF. EBMUD can withdraw the banked water in the future. NSJWCD will control the withdraw of the banked water by pumping groundwater from a well that is centrally located in the area of recharge and then conveying the pumping groundwater to the EBMUD Mokelumne Aqueduct. The extraction and return of the banked water is subject to a San Joaquin County groundwater export permit. The permit places additional conditions and restrictions on the extraction of the banked water, including a 5 percent per year annual loss factor and pumping restrictions to prevent impacts to other groundwater users.

EBMUD and NSJWCD have started the preliminary planning for the longer-term banking project. The longer-term banking project will use the same concept as the pilot project but will involve larger quantities of water and potential additional facilities to deliver and use the water for in-lieu recharge within NSJWCD, and to extract and return banked water credits to EBMUD. The longer-term project contemplates EBMUD providing surface water supplies of 3,000 AF/year to 6,000 AF/year in dry years and 8,000 AF/year in wet years to NSJWCD. These surface water supplies would come from EBMUD's water rights on the Mokelumne River and would be in addition to surface water available under NSJWCD's water right. EBMUD would receive a banked water credit for 50 percent of the additional supplies provided, leaving a net surface/groundwater increase to the NSJWCD area of 50 percent of all additional supplies provided. The net water gain to NSJWCD may increase if EBMUD does not extract its banked supplies regularly because of the 5 percent annual loss factor in the San Joaquin County export ordinance.

As part of both the pilot and longer-term projects, EBMUD is funding facilities in NSJWCD that will be necessary for the banking projects but can also be used by NSJWCD to deliver NSJWCD's own surface water supplies.

The PDA also provides that the wet year water supplies could be used by SEWD for groundwater banking if they cannot be used in NSJWCD.

Project Summary	
Submitting GSA:	North San Joaquin Water Conservation District
Project Type:	In-lieu Recharge
Estimated Groundwater Offset and/or Recharge:	4,000 AF/year
Other Participating Entities:	East Bay Municipal Utility District, Eastern Water Alliance, San Joaquin County and Stockton East Water District

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing in-lieu recharge opportunities.

Project Status: The agreement for this project is in place. Parties need to finalize design, perform environmental review, and obtain necessary permits to operate.

Required Permitting and Regulatory Process: This project would require a SWRCB Change Petition for Permit 10478, a San Joaquin County Groundwater Export Permit, and regulatory permits as needed for facilities such as pipelines.

Time-table for Initiation and Completion: This project is would initiate in 2020 and be completed by 2025.

Expected Benefits and Evaluation: Groundwater Subbasin recharge through the in-lieu use of alternate water supply will be an important component of the GSP and will be critical to establishing long-term Subbasin sustainability. This project is anticipated to offset 4,000 AF/year in groundwater pumping in NSJWCD. Benefits to groundwater levels will be evaluated through ESJWRM model simulations.

How Project Will Be Accomplished/Evaluation of Water Source: This project would use water supplies from EBMUD Permit 10478 (Mokelumne River water). This is an existing surface water right. EBMUD has a right tied to hydrology, with amounts are set by contract.

Legal Authority: The legal authority for this project is covered under Water Code Section 74000 et seq.

Estimated Costs and Plans to Meet Costs: The estimated costs for this project includes $5 million in capital costs and $400,000 in annual operations and maintenance costs. Costs for this project will be met by grant funding, banking fees, and water charges.

Circumstances for Implementation: This project is a Potential Project, meaning it is currently in the planning stages and may move forward if funding becomes available. Potential Projects represent a "menu of options" for the Subbasin to achieve long-term sustainability and offset the remaining imbalance above and beyond implementation of the Planned Projects. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management. The project parties plan to implement the project as soon as design, permitting and funding are established, by 2025.

Trigger for Implementation and Termination: Not applicable.

Process for Determining Conditions Requiring the Project have Occurred: Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Subbasin.

6.2.5.4 Project 12: NSJWCD North System Modernization/Lasko Recharge Project

This project will repair, upgrade, and modernize the North System Pump and Distribution System to facilitate delivery of 4,000 to 6,000 AF/year of surface water to farmers in-lieu of groundwater pumping. Water would come from NSJWCD Permit 10477 supplies, which are available in about 55 percent of years. Average deliveries would be 5,000

AF/year in about half of the years. In addition, there is a small, sandy recharge pond location on the Lasko property located along the upper portion of the North System pipeline along Tretheway Road. The pond is about 2 acres in size and can recharge about 2 AF/day. NSJWCD could convey water through the NSJWCD North System, to the Lasko recharge pond, to directly recharge surface water during times that water is available but there is not irrigation demand, such as during the December through May time period or during the interim period of years before the remainder of the North System pipeline is repaired or replaced.

Project Summary	
Submitting GSA:	North San Joaquin Water Conservation District
Project Type:	In-lieu Recharge/Direct Recharge
Estimated Groundwater Offset and/or Recharge:	2,600 AF/year

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing in-lieu and direct recharge opportunities.

Project Status: This project is in the planning/initial study phase. NSJWCD is soliciting landowner input on design and financing options.

Required Permitting and Regulatory Process: This project would require regulatory permitting as needed for minor construction related to rehabilitation of existing water delivery infrastructure.

Time-table for Initiation and Completion: This project is would initiate in 2021 and be completed by 2026.

Expected Benefits and Evaluation: Groundwater Subbasin recharge through the in-lieu use of alternate water supply will be an important component of the GSP and will be critical to establishing long-term Subbasin sustainability. This project is anticipated to offset 2,600 AF/year in groundwater pumping in NSJWCD. In addition, there is opportunity to directly recharge surface water to the groundwater basin at specified times. Benefits to groundwater levels will be evaluated through ESJWRM model simulations.

How Project Will Be Accomplished/Evaluation of Water Source: This project would use water supplies available through NSJWCD Permit 10477 (Mokelumne River water). This is an existing surface water right.

Legal Authority: The legal authority for this project is covered under Water Code Section 74000 et seq.

Estimated Costs and Plans to Meet Costs: The estimated costs for this project includes $7 million in capital costs and $150,000 in annual operations and maintenance costs. Costs for this project will be met by grant funding, landowner assessments (pending approval), and water charges.

Circumstances for Implementation: This project is a Potential Project, meaning it is currently in the planning stages and may move forward if funding becomes available. Potential Projects represent a “menu of options” for the Subbasin to achieve long-term sustainability and offset the remaining imbalance above and beyond implementation of the Planned Projects. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management. NSJWCD plans to implement the project as soon as funding is secured.

Trigger for Implementation and Termination: Not applicable.

Process for Determining Conditions Requiring the Project have Occurred: Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Subbasin.

6.2.5.5 Project 13: Manserro Recharge Project

NSJWCD is investigating constructing and operating a 10-acre recharge pond on the North side of the Mokelumne River on property owned by the Manserro family through a long-term lease. NSJWCD would use Permit 10477 water available during December 1 through June 30 that is not needed for irrigation, for recharge. The project could recharge 10,000 AF/year or more in years when water is available. Because the project can use water available during the direct diversion flood season, water is expected to be available more frequently under the NSJWCD water right for this project, or 80 percent of years. Capital costs are based on the assumption that NSJWCD would lease the 10-acre property for this project.

Project Summary	
Submitting GSA:	North San Joaquin Water Conservation District
Project Type:	Direct Recharge
Estimated Groundwater Offset and/or Recharge:	8,000 AF/year

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing direct recharge opportunities.

Project Status: This project is in the planning phase.

Required Permitting and Regulatory Process: This project would require CEQA review, a possible grading permit, and a possible water right change petition.

Time-table for Initiation and Completion: This project is would initiate in 2019 on a pilot basis, and in 2020 on a full-scale basis. This project would be completed by 2022.

Expected Benefits and Evaluation: This project is anticipated to directly recharge 8,000 AF/year to the groundwater basin in NSJWCD. Benefits to groundwater levels will be evaluated through ESJWRM model simulations.

How Project Will Be Accomplished/Evaluation of Water Source: This project would use water supplies available through NSJWCD Permit 10477 (Mokelumne River water). This is an existing surface water right. Once Permit 10477 supplies are fully committed to in-lieu recharge projects, NSJWCD could apply to appropriate Mokelumne River flood flows for this direct recharge project.

Legal Authority: The legal authority for this project is covered under Water Code Section 74000 et seq.

Estimated Costs and Plans to Meet Costs: The estimated costs for this project includes $300,000 in capital costs and $400,000 in annual operations and maintenance costs. Costs for this project will be met by grant funding and landowner assessments (pending approval).

Circumstances for Implementation: This project is a Potential Project, meaning it is currently in the planning stages and may move forward if funding becomes available. Potential Projects represent a "menu of options" for the Subbasin to achieve long-term sustainability and offset the remaining imbalance above and beyond implementation of the Planned Projects. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management. Circumstances for implementation include securing funding. Project may be implemented on a smaller scale depending on use of water by other projects in the District.

Trigger for Implementation and Termination: Not applicable.

Process for Determining Conditions Requiring the Project have Occurred: Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Subbasin.

6.2.5.6 Project 14: Tecklenburg Recharge Project

NSJWCD is investigating constructing and operating a 10-acre recharge pond on the South side of the Mokelumne River on property owned by the Tecklenburg family through a purchase. NSJWCD would use Permit 10477 water available during December 1 through June 30, and not needed for irrigation, for recharge. The project could recharge 10,000 AF/year or more in years when water is available. Because the project can use water available during the direct diversion flood season, water is expected to be available more frequently under the NSJWCD water right for this project, or 80 percent of years. Capital costs are based on the assumption that NSJWCD would purchase the 10-acre property for this project.

Project Summary	
Submitting GSA:	North San Joaquin Water Conservation District
Project Type:	Direct Recharge
Estimated Groundwater Offset and/or Recharge:	8,000 AF/year

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing direct recharge opportunities.

Project Status: This project is in the planning phase.

Required Permitting and Regulatory Process: This project would require CEQA review and a possible grading permit.

Time-table for Initiation and Completion: This project is would initiate in 2020 on a pilot basis, and in 2021 on a full-scale basis. This project would be completed by 2023.

Expected Benefits and Evaluation: This project is anticipated to directly recharge 8,000 AF/year to the groundwater basin in NSJWCD. Benefits to groundwater levels will be evaluated through ESJWRM model simulations.

How Project Will Be Accomplished/Evaluation of Water Source: This project would use water supplies available through NSJWCD Permit 10477 (Mokelumne River water). Once Permit 10477 supplies are fully committed to in-lieu recharge projects, NSJWCD could apply to appropriate Mokelumne River flood flows for this direct recharge project. This is an existing surface water right.

Legal Authority: The legal authority for this project is covered under Water Code Section 74000 et seq.

Estimated Costs and Plans to Meet Costs: The estimated costs for this project includes $1 million in capital costs and $400,000 in annual operations and maintenance costs. Costs for this project will be met by grant funding and landowner assessments (pending approval).

Circumstances for Implementation: This project is a Potential Project, meaning it is currently in the planning stages and may move forward if funding becomes available. Potential Projects represent a “menu of options” for the Subbasin to achieve long-term sustainability and offset the remaining imbalance above and beyond implementation of the Planned Projects. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management. Circumstances for implementation include securing funding. Project may be implemented on a smaller scale depending on use of water by other projects in the District.

Trigger for Implementation and Termination: Not applicable.

Process for Determining Conditions Requiring the Project have Occurred: Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Subbasin.

6.2.5.7 Project 15: City of Escalon Wastewater Reuse

This project entails the reuse of wastewater that would include tertiary treatment of the City of Escalon's effluent and blending in SSJID's irrigation distribution system. This additional source of supply could then be used for groundwater recharge or transfer within the Subbasin to offset groundwater demands using SSJID facilities and/or water right entitlements to facilitate the transfer. The treated water will meet Title-22 Water Standards.

The City of Escalon's Wastewater Treatment Plant treats approximately 600,000 gallons per day (1.84 AF per day) with peak flows up to 1 MGD. The plant is located near SSJID's Main Distribution Canal, and the effluent would need to be pumped and a pipeline of approximately 4,000 linear feet would need installed in addition to improvements at the plant to meet Title-22 Water Standards.

Project Summary	
Submitting GSA:	South San Joaquin GSA
Project Type:	Recycling/Direct Recharge/ Intrabasin Transfer
Estimated Groundwater Offset and/or Recharge:	672 AF/year
Other Participating Entities:	City of Escalon

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing water recycling and direct recharge opportunities.

Project Status: This project is in the planning/initial study phase.

Required Permitting and Regulatory Process: This project would require CEQA review, Regional Water Quality Control Board permitting, and road encroachment permits.

Time-table for Initiation and Completion: This project is would initiate in 2020 and would be completed by 2028.

Expected Benefits and Evaluation: This project is anticipated to offset 672 AF/year in groundwater pumping for use in direct recharge in the City of Escalon or in interbasin transfers to other areas of the Subbasin. Benefits to groundwater levels will be evaluated through ESJWRM model simulations

How Project Will Be Accomplished/Evaluation of Water Source: This project will rely on the use of recycled water, in the form of tertiary-treated Title-22 effluent form the City of Escalon's Wastewater Treatment Plant. No additional water source will be utilized for this project.

Legal Authority: The City of Escalon is an incorporated city and provides municipal services including wastewater treatment. SSJID is an irrigation district formed in accordance with State law.

Estimated Costs and Plans to Meet Costs: The estimated costs for this project includes $18 million in capital costs and $400,000 in annual operations and maintenance costs. Costs for this project will be met by developer impact fees, connection fees, and sewer rate fees.

Circumstances for Implementation: This project is a Potential Project, meaning it is currently in the planning stages and may move forward if funding becomes available. Potential Projects represent a "menu of options" for the Subbasin to achieve long-term sustainability and offset the remaining imbalance above and beyond implementation of the Planned Projects. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management. Provided the project is feasible as determined in the initial planning phase, the Escalon City Council would need to approve the project as well as the SSJID Board of Directors.

Trigger for Implementation and Termination: The project would need to be determined to be feasible with adequate funding likely from multiple sources such as development impact fees, connection fees, and sewer rate fees.

Process for Determining Conditions Requiring the Project have Occurred: Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Subbasin. The Escalon City Council would need to make the requisite findings and approve a financing package for the project.

6.2.5.8 Project 16: City of Ripon Surface Water Supply

The City of Ripon serves water to 15,000 residents along with businesses and industries located within the city limits. The purpose of this project is to supplement the City of Ripon's municipal water supply with treated surface water from the SSJID by constructing a 5-mile pipeline from the SSJID existing surface water transmission pipeline to Ripon's water distribution system, along with a booster pump station.

The City of Ripon is currently under contract with SSJID to withdraw a maximum of 6,000 AF/year, which is the expected water supply for this project.

Project Summary	
Submitting GSA:	South San Joaquin GSA
Project Type:	In-lieu Recharge
Estimated Groundwater Offset and/or Recharge:	6,000 AF/year
Other Participating Entities:	City of Ripon

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing in-lieu recharge opportunities.

Project Status: The design for this project is complete. The City is pursuing a National Environmental Policy Act (NEPA) Categorical Exclusion and CEQA Mitigated Negative Declaration. Construction of the project will begin once the project is fully funded. Construction is expected to take one year.

Required Permitting and Regulatory Process: This project will require a NEPA Categorical Exclusion and CEQA Mitigated Negative Declaration. Road encroachment permits will also be required.

Time-table for Initiation and Completion: This project is would initiate in 2020 and would be completed by 2024.

Expected Benefits and Evaluation: Groundwater Subbasin recharge through the in-lieu use of alternate water supply will be an important component of the GSP and will be critical to establishing long-term Subbasin sustainability. This project is anticipated to offset 6,00 AF/year in groundwater pumping in the City of Ripon. Benefits are expected to accrue for 50 years, through 2074. Benefits to groundwater levels will be evaluated through ESJWRM model simulations. This proposed conjunctive use project would provide the community of Ripon, along with the region that relies on the groundwater Subbasin, with numerous benefits, including:

- Conservation of groundwater through in-lieu recharge
- Use of renewable energy and energy conservation
- Safer and cleaner drinking water

How Project Will Be Accomplished/Evaluation of Water Source: SSJID holds pre-1914 water rights on the Stanislaus River. This is an existing surface water right. The City of Ripon has an agreement in place to divert a maximum of 6,000 AF/year from SSJID facilitates under SSJID's existing pre-1914 water right, which is the expected water supply for this project.

Legal Authority: The City of Ripon is an incorporated city and provides municipal water service. SSJID is an irrigation district formed in accordance with State law. SSJID holds pre-1914 water rights on the Stanislaus River.

Estimated Costs and Plans to Meet Costs: The estimated costs for this project includes $8.6 million in capital costs. Costs for this project will be met by grants, water rates, and development impact fees.

Circumstances for Implementation: This project is a Potential Project, meaning it is currently in the planning stages and may move forward if funding becomes available. Potential Projects represent a "menu of options" for the Subbasin to achieve long-term sustainability and offset the remaining imbalance above and beyond implementation of the Planned Projects. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management. The City of Ripon is in the process of completing the environmental process and securing the necessary finances to move forward.

Trigger for Implementation and Termination: Project implementation will initiate once the project is approved by the City of Ripon and the financing is in place. Termination would be subject to the terms of the agreement if applicable.

Process for Determining Conditions Requiring the Project have Occurred: Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Subbasin. The Ripon City Council would need to make the requisite findings under NEPA, CEQA, and approve a financing package for the project.

6.2.5.9 Project 17: City of Escalon Connection to Nick DeGroot Water Treatment Plant

The City of Escalon partnered in the construction of the Nick DeGroot Water Treatment Plant and continues to provide financial partnership in its operation. However, Escalon has not constructed the turnout and distribution system improvements necessary to receive their surface water allotments. Finance and construction of these improvements would make it possible for Escalon to receive their contract entitlements under Phase 1 (2,015 AF) further reducing Escalon's groundwater demand. Escalon, as a partner city in the plant, could readily begin receiving water once turnout improvements and distribution pipelines are constructed. SSJID operates the Nick DeGroot Water Treatment Plant and serves treated Stanislaus River water under its pre-1914 water right to the cities of Manteca, Lathrop and Tracy.

Project Summary	
Submitting GSA:	South San Joaquin GSA
Project Type:	In-lieu Recharge
Estimated Groundwater Offset and/or Recharge:	2,015 AF/year
Other Participating Entities:	City of Escalon and SSJID

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing in-lieu recharge opportunities.

Project Status: The project is in the conceptual design phase. Environmental review has been completed.

Required Permitting and Regulatory Process: This project will require road encroachment permits.

Time-table for Initiation and Completion: This project is would initiate in 2020 (pending funding) and be completed by 2023.

Expected Benefits and Evaluation: Groundwater Subbasin recharge through the in-lieu use of alternate water supply will be an important component of the GSP and will be critical to establishing long-term Subbasin sustainability. This project is anticipated to offset 2,015 AF/year in groundwater pumping in the City of Escalon. Benefits are expected to accrue for 50 years, through 2073. Benefits to groundwater levels will be evaluated through ESJWRM model simulations.

How Project Will Be Accomplished/Evaluation of Water Source: SSJID holds pre-1914 water rights on the Stanislaus River. This is an existing surface water right.

Legal Authority: The City of Escalon is an incorporated city and provides municipal water service. SSJID is an irrigation district formed in accordance with State law. SSJID holds pre-1914 water rights on the Stanislaus River. The City of Escalon is project partner in the Nick DeGroot Water Treatment Plant and has an existing agreement with SSJID which entitles Escalon to receive 2,015 AF/year of treated surface water.

Estimated Costs and Plans to Meet Costs: The estimated costs for this project includes $8,789,000 in capital costs and $250,000 in annual operations and maintenance costs. Costs for this project will be met by grants, water rates, and development impact fees.

Circumstances for Implementation: This project is a Potential Project, meaning it is currently in the planning stages and may move forward if funding becomes available. Potential Projects represent a “menu of options” for the Subbasin to achieve long-term sustainability and offset the remaining imbalance above and beyond implementation of the Planned Projects. As scenarios change, the Potential Projects can come online to bring additional resources for adaptive management. The City of Escalon is in the process of securing the necessary finances to move forward.

Trigger for Implementation and Termination: Project implementation will initiate once the project is approved by the City of Escalon and the financing is in place. Termination would be subject to the terms of the agreement if applicable

Process for Determining Conditions Requiring the Project have Occurred: Implementation of Potential Projects will be based on long-term management or changing needs of the GSA or Subbasin. The Escalon City Council would need to make the requisite findings and approve a financing package for the project.

6.2.6 Longer-term or Conceptual Projects

Projects categorized as Longer-term or Conceptual Projects are in the early conceptual planning stages and would require significant additional work to move forward. Longer-term/Conceptual Projects represent potential future projects that could conceptually provide a benefit to the Subbasin in the future, but that would need to be further developed. Together these projects total an approximated 67,043 AF/year in groundwater offset/recharge/conservation that could potentially be made available to the Subbasin if funding is secured.

6.2.6.1 Project 18: Farmington Dam Repurpose Project

This proposed project would convert the Farmington Dam, currently a flood control structure, into a water supply reservoir. This existing Farmington Dam has a flood control capacity of 52,000 AF. The proposed project would increase the total reservoir capacity to 112,000 AF which includes 60,000 AF for water supply and 52,000 AF for flood control. The water supply could be stored and used even in drought conditions. The increased water supply would also encourage growers to switch to surface water irrigation instead of reliance on groundwater.

USACE completed a reconnaissance report in 1997 with an estimated cost of $91.4 million based on an effective pricing date of October 1996. Including environmental and cultural resources mitigation costs, which were not included in 1997, the cost today would be about $175 million.

Other entities that would benefit from this project includes CSJWCD and potentially OID.

Project Summary	
Submitting GSA:	Stockton East Water District
Project Type:	Direct Recharge
Estimated Groundwater Offset and/or Recharge:	30,000 AF/year
Other Participating Entities:	USACE

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing direct recharge opportunities.

Project Status: The project is in the pre-planning stage. A reconnaissance study has been completed.

Required Permitting and Regulatory Process: The required permitting for this project would include acquiring permits/approvals from SWRCB, USBR, California DFW, RWQCB, CVFPB, and USACE.

Time-table for Initiation and Completion: This project is would initiate in 2030 and be completed by 2050.

Expected Benefits and Evaluation: This project is anticipated to directly recharge 30,000 AF/year to the groundwater basin in SEWD. Benefits to groundwater levels will be evaluated through model simulations.

How Project Will Be Accomplished/Evaluation of Water Source: SEWD and CSJWCD have a water supply contract with USBR to use water from the New Melones Reservoir (Stanislaus River water). This is an existing surface water right.

Legal Authority: SEWD is a local agency with its own enabling legislation established to serve water for agricultural and municipal demands. SEWD is also a GSA with authority on groundwater pumping. Farmington Dam is owned and operated by USACE and upon agreement, and USACE would be the agency with authority to modify the dam structure.

Estimated Costs and Plans to Meet Costs: The estimated costs for this project includes $175 million in capital costs and $2 million in annual operations and maintenance costs. Costs for this project will be met through the pursual of grant funding.

Circumstances for Implementation: This project is a Longer-term/Conceptual Project, meaning it is in the early conceptual planning stages and would require significant additional work to move forward. Longer-term/Conceptual Projects represent potential future projects that could conceptually provide a benefit to the Subbasin in the future. As scenarios change, Longer-term/Conceptual Projects can come online to bring additional resources for adaptive management. This project could be implemented when agreements are reached with all federal and state regulatory agencies and when funding is available.

Trigger for Implementation and Termination: The trigger for implementation and termination would be the water supply from New Melones Reservoir and groundwater levels in the Subbasin.

Process for Determining Conditions Requiring the Project have Occurred: Implementation of Longer-term/Conceptual Projects will be based on long-term management or changing needs of the GSA or Subbasin.

6.2.6.2 Project 19: Recycled Water Transfer to Agriculture

Under the Recycled Water Transfer to Agriculture project, the City of Manteca would sell recycled water to agricultural users northeast of the City, located within the CSJWCD service area, or provide the water to the local GSAs for use in groundwater basin recharge to overcome existing overdraft conditions and help sustain the Subbasin. The City would target customers located northeast of the City so that recycled water use for irrigation would offset groundwater pumping in an area with a significant cone of depression. No specific customers have been identified this alternative; rather, this alternative was developed primarily to support a cost estimate for designing and constructing a recycled water pipeline to this area of the county. Under this alternative, it is assumed that agricultural users would receive water during the 6-month irrigation season, resulting in a demand of 1,990 AF/year under current conditions and 5,190 AF/year at buildout.

Project Summary	
Submitting GSA:	City of Manteca
Project Type:	Recycling/Transfer/In-lieu Recharge
Estimated Groundwater Offset and/or Recharge:	5,193 AF/year

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing recycling, transfer, and in-lieu recharge opportunities.

Project Status: The project is in the planning/initial study phase. The project has been evaluated by the City in their Draft Reclaimed Water Facilities Master Plan planning efforts.

Required Permitting and Regulatory Process: This project would require an NPDES Permit amendment, CEQA review, and approval from the State Water Resources Control Board to deliver water from the current discharge location to the potential project.

Time-table for Initiation and Completion: The initiation and completion dates for this project are unknown at this time.

Expected Benefits and Evaluation: Groundwater Subbasin recharge through the in-lieu use of alternate water supply will be an important component of the GSP and will be critical to establishing long-term Subbasin sustainability. This project is anticipated to offset 5,193 AF/year in groundwater pumping in agricultural areas northeast of the City of Manteca. Benefits to groundwater levels will be evaluated through ESJWRM model simulations.

How Project Will Be Accomplished/Evaluation of Water Source: This project will rely on the use of recycled water, in the form of tertiary-treated Title-22 effluent form the City of Manteca's Wastewater Quality Control Facility. No additional water source will be utilized for this project.

Legal Authority: This project would be under the authority of the City of Manteca for portions located within its service area. Legal authority outside of city limits would be identified if the project moves forward to implementation.

Estimated Costs and Plans to Meet Costs: The estimated costs for this project includes $37,645,000 in capital costs and $679,000 in annual operations and maintenance costs. Funding sources would be identified if a project moves forward to implementation.

Circumstances for Implementation: This project is a Longer-term/Conceptual Project, meaning it is in the early conceptual planning stages and would require significant additional work to move forward. Longer-term/Conceptual Projects represent potential future projects that could conceptually provide a benefit to the Subbasin in the future. As scenarios change, Longer-term/Conceptual Projects can come online to bring additional resources for adaptive management. Implementation of this recycled water project is dependent on the identification of recycled water users and the installation of facilities to transmit recycled water to the location where it is needed. Agreement(s) between recycled water users and the City would also be required.

Trigger for Implementation and Termination: The trigger for project implementation would be the identification of recycled water users and agreements between recycled water users and the City.

Process for Determining Conditions Requiring the Project have Occurred: Implementation of Longer-term/Conceptual Projects will be based on long-term management or changing needs of the GSA or Subbasin.

6.2.6.3 Project 20: Mobilizing Recharge Opportunities

This project would put in place a framework to quickly mobilize and take advantage of recharge opportunities (e.g., existing storm ponds, lake features, temporary flood easements, agricultural field ponding, etc.) The project would provide access to funding to expedite recharge projects as opportunities arise. Additional governance and budgetary controls would need to be developed.

Project Summary	
Submitting GSA:	San Joaquin County
Project Type:	Direct Recharge
Estimated Groundwater Offset and/or Recharge:	To be determined

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing direct recharge opportunities.

Project Status: This project is still in the early conceptual planning stages.

Required Permitting and Regulatory Process: The required permitting and regulatory process for this project has not been determined.

Time-table for Initiation and Completion: The initiation and completion dates for this project are unknown at this time.

Expected Benefits and Evaluation: This project is anticipated to directly recharge the groundwater basin in areas that are geographically dispersed throughout the Subbasin. Benefits to groundwater levels will be evaluated through ESJWRM model simulations.

How Project Will Be Accomplished / Evaluation of Water Source: The identification of water source will occur as project develops.

Legal Authority: [Information pending]

Estimated Costs and Plans to Meet Costs: The estimated costs for this project and approach for meeting costs are unknown at this time.

Circumstances for Implementation: The circumstances for implementation of this project are unknown at this time.

Trigger for Implementation and Termination: The triggers for implementation and termination of this project are unknown at this time.

Process for Determining Conditions Requiring the Project have Occurred: Implementation of Longer-term/Conceptual Projects will be based on long-term management or changing needs of the GSA or Subbasin.

6.2.6.4 Project 21: Winery Recycled Water

This project will blend NSJWCD Permit 10477 water with wastewater from winery(ies) and deliver blended water for irrigation to accomplish in-lieu recharge or put in recharge ponds and accomplish direct groundwater recharge.

Project Summary	
Submitting GSA:	North San Joaquin Water Conservation District
Project Type:	Recycling/In-lieu Recharge/ Direct Recharge
Estimated Groundwater Offset and/or Recharge:	750 AF/year

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing recycling, in-lieu recharge, and direct recharge opportunities.

Project Status: This project is in the early stages of discussing concepts with a local winery.

Required Permitting and Regulatory Process: This project would require WDR permitting through the Central Valley Regional Water Quality Control Board (CVRWQCB). Minor permits would be required for pipeline construction.

Time-table for Initiation and Completion: This project is would initiate in 2025 and be completed by 2027.

Expected Benefits and Evaluation: This project is anticipated to offset 750 AF/year in groundwater pumping in NSJWCD for use in in-lieu or direct recharge.

How Project Will Be Accomplished/Evaluation of Water Source: This project will blend NSJWCD Permit 10477 (Mokelumne River water) with wastewater from wineries.

Legal Authority: The legal authority for this project is covered under Water Code Section 74000 et seq.

Estimated Costs and Plans to Meet Costs: The estimated costs for this project includes $1.5 million in capital costs and $100,000 in annual operations and maintenance costs. Costs for this project will be met by grant funding, landowner assessments (pending approval), and charges paid by the winery (pending contract).

Circumstances for Implementation: This project is a Longer-term/Conceptual Project, meaning it is in the early conceptual planning stages and would require significant additional work to move forward. Longer-term/Conceptual Projects represent potential future projects that could conceptually provide a benefit to the Subbasin in the future. As scenarios change, Longer-term/Conceptual Projects can come online to bring additional resources for adaptive management. Circumstances for implementation of this project include securing funding and winery cooperation contract.

Trigger for Implementation and Termination: Not applicable.

Process for Determining Conditions Requiring the Project have Occurred: Implementation of Longer-term/Conceptual Projects will be based on long-term management or changing needs of the GSA or Subbasin.

6.2.6.5 Project 22: Pressurization of SSJID Facilities

SSJID currently operates a 3,800-acre pilot pressurized irrigation project within its service area. The project provides irrigation water at pressure to a grower's turnout with nearly on-demand service. The service has promoted and influenced the adoption of high-efficiency irrigation systems and also promoted the use of SSJID surface water over private groundwater facilities in the area. SSJID is currently considering expansion of this type of irrigation service to the rest of its service territory. Further analysis needs to be done to understand the project benefits and impacts related to groundwater.

The remaining service area considered is 56,300 acres. In 2014, the District completed a feasibility study on delivering a full pressurization system. The study included projections on on-farm savings and benefits (pumping/electrical costs, water quality) and included converting current groundwater farmers. The study observed four alternatives and concluded that a decentralized system comprising of 6 pump stations and reservoirs at strategic locations throughout the District would be the most feasible alternative. The study found that pressurization is estimated to reduce groundwater pumping from 40,000 AF annually to 10,000 AF annually within the District's jurisdiction.

Project Summary	
Submitting GSA:	South San Joaquin GSA
Project Type:	Conservation
Estimated Groundwater Demand Reduction:	30,000 AF/year

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing demand-side water conservation opportunities.

Project Status: A feasibility study for this project has been completed. Inclusion in a Strategic Water Master Plan is in progress.

Required Permitting and Regulatory Process: This project would require CEQA review and road encroachment permits.

Time-table for Initiation and Completion: This project has been implemented on a pilot scale (3,800 acres, Division 9), and the project can be phased based on customer needs and system compatibility. The project is expected to be completed by 2030.

Expected Benefits and Evaluation: This project is anticipated to reduce groundwater demand by 30,000 AF/year in the SSJID service area. Benefits are expected to accrue for 30 years. Benefits to groundwater levels will be evaluated by quantifying resulting demand reduction.

How Project Will Be Accomplished/Evaluation of Water Source: This project is a demand-side conservation project. No additional water source will be utilized for this project.

Legal Authority: SSJID is an irrigation district formed in accordance with State law.

Estimated Costs and Plans to Meet Costs: The estimated costs for this project includes $328 million in capital costs and $8.5 million in annual operations and maintenance costs. Costs for this project will be met by existing sources (i.e., hydropower generation, user fees, and water transfers), and enhanced revenue sources (i.e., grants, additional user fees, additional water transfers).

Circumstances for Implementation: This project is a Longer-term/Conceptual Project, meaning it is in the early conceptual planning stages and would require significant additional work to move forward. Longer-term/Conceptual Projects represent potential future projects that could conceptually provide a benefit to the Subbasin in the future. As scenarios change, Longer-term/Conceptual Projects can come online to bring additional resources for adaptive management. The SSJID Strategic Water Master Plan is currently underway and is intended to prioritize system capital improvements based on customer and system needs. This project can be phased based on customer demand and available funding.

Trigger for Implementation and Termination: The trigger for implementation for this project is sufficient customer demand and a financial plan for necessary enhanced revenues. The trigger for termination is subject to irrigation service agreement terms if applicable.

Process for Determining Conditions Requiring the Project have Occurred: Implementation of Longer-term/Conceptual Projects will be based on long-term management or changing needs of the GSA or Subbasin. The SSJID Board of Directors would need to make the requisite findings and approve a financing package for the project.

6.2.6.6 Project 23: SSJID Storm Water Reuse

SSJID and the Cities of Ripon and Escalon have previously proposed storm water capture for storage and irrigation reuse, or for groundwater recharge to benefit the groundwater Subbasin. Currently, the City of Escalon, and to a limited extent the City of Ripon, discharge storm water into SSJID facilities during the winter months. This storm water is conveyed through SSJID's main canal or lateral irrigation distribution system and eventually is conveyed into the Stanislaus River or the San Joaquin River via French Camp Slough. Capturing and storing excess storm water would allow for quantities of water that could be used to offset or enhance groundwater in multiple ways. SSJID is in the process of quantifying the amount of storm water it discharges during the winter months that could be made available to be repurposed for sustainable groundwater management practices. Additional infrastructure may be needed to provide adequate storage for groundwater recharge.

The City of Escalon currently has a drainage area of approximately 1,200 acres with 10 drainage systems which accumulate to a maximum discharge capacity of approximately 50 cubic feet per second (cfs) that drains into 2 District Laterals. It is estimated on average that 700 AF/year of run-off comes from the City of Escalon.

The City of Ripon currently has a drainage area of approximately 2,200 acres with four drainage systems. The majority of the storm run-off discharges to the Stanislaus River. A portion of storm water discharges into the District's laterals and canals. It is estimated approximately 400 AF/year of run-off discharges to District facilities.

Additional monitoring will need to be implemented to obtain more accurate discharge flows from both cities.

Preliminary cost estimate includes 2 20-acre storm drain retention basins in each city strategically located near District facilities.

Project Summary	
Submitting GSA:	South San Joaquin GSA
Project Type:	Storm Water/In-lieu Recharge/ Direct Recharge
Estimated Groundwater Offset and/or Recharge:	1,100 AF/year
Other Participating Entities:	City of Escalon, City of Ripon, SSJID

Measurable Objective Expected to Benefit: This project addresses chronic lowering of groundwater levels in the Subbasin by enhancing storm water capture, in-lieu recharge, and direct recharge opportunities.

Project Status: The project is in the planning/initial study phase.

Required Permitting and Regulatory Process: This project will require CEQA review and road encroachment permits.

Time-table for Initiation and Completion: This project would initiate in 2027 and be completed by 2030.

Expected Benefits and Evaluation: This project is anticipated to offset 1,100 AF/year in groundwater pumping in SSJ GSA for use in in-lieu or direct recharge. Benefits are expected to accrue for 50 years, through 2080. Benefits to groundwater levels will be evaluated through ESJWRM model simulations.

How Project Will Be Accomplished/Evaluation of Water Source: This project would rely on the use of captured storm water. No additional water source will be utilized for this project.

Legal Authority: The Cities of Escalon and Ripon are incorporated cities and provide municipal stormwater/drainage services. SSJID is an irrigation district formed in accordance with State law and also provides limited drainage service.

Estimated Costs and Plans to Meet Costs: The estimated costs for this project includes $30 million in capital costs and $30,000 in annual operations and maintenance costs. Costs for this project will be met by developer impact fees, connection fees, and sewer rate fees.

Circumstances for Implementation: This project is a Longer-term/Conceptual Project, meaning it is in the early conceptual planning stages and would require significant additional work to move forward. Longer-term/Conceptual Projects represent potential future projects that could conceptually provide a benefit to the Subbasin in the future. As scenarios change, Longer-term/Conceptual Projects can come online to bring additional resources for adaptive management. The project proponents are in the process of determining the feasibility of the project including the possibility of securing the necessary finances to move forward.

Trigger for Implementation and Termination: Project implementation would begin once the project is approved by the cities of Escalon and Ripon, and the SSJID Board of Directors, and a financing plan is in place. Termination would be subject to the terms of the agreement if applicable.

Process for Determining Conditions Requiring the Project have Occurred: Implementation of Longer-term/Conceptual Projects will be based on long-term management or changing needs of the GSA or Subbasin.

6.2.7 Notification Process

Notification and public outreach around projects will be conducted at the GSA level. As part of disseminating information to the general public, GSAs will post project updates their websites to notify the public that the implementation of projects is being considered or has been implemented. This will include a description of the actions to be taken. These updates will also be provided to the other GSAs and will be published on the ESJ GWA website and other appropriate locations. Additional noticing for the public will be conducted consistent with permitting requirements in the case of the enactment of fees or assessments. Outreach may include public notices, meetings, website or social media presence, and email announcements.

6.3 MANAGEMENT ACTIONS

Management actions are generally administrative, locally implemented actions that the GSAs could take that affect groundwater sustainability. Typically, management actions do not require outside approvals, nor do they involve capital projects. Currently, no management actions related to pumping activities or groundwater allocations have been proposed for the Subbasin; however, GSAs maintain the flexibility to implement such demand-side management actions in the future if need is determined.

If consideration of a demand reduction program were to take place in the future, public outreach and education on the potential structure of the program, as well and feasible monitoring and enforcement mechanisms, would be necessary to enable a successful program. Outreach could include public notices, meetings, website or social media presence, and email announcements.

Additional management activities are discussed in Chapter 7: Plan Implementation, including:

- Monitoring and recording of groundwater levels and groundwater quality data
- Maintaining and updating the Subbasin Data Management System (DMS) with newly collected data
- Monitoring groundwater use through use of satellite imagery
- Annual monitoring of progress toward sustainability
- Annual reporting of Subbasin conditions to DWR as required by SGMA

6.4 POTENTIAL AVAILABLE FUNDING MECHANISMS

The SWRCB has identified potential funding mechanisms that can be used toward the planning, construction, and implementation of GSP projects. Several funding types may be applicable to the current list of Planned Projects and potential future projects for the Eastern San Joaquin GSP including: projects included in an Integrated Water Resource Management Plan (IRWMP), projects addressing drinking water, stormwater recharge, water recycling projects, wastewater and system improvement projects, and projects that focus on DAC or SDAC areas.

The range of applicable projects, per SWRCB Funding Opportunities fact sheet and per Water Code Section 10727.4(h), include recharge projects, groundwater contamination remediation, water recycling projects, in-lieu use, diversions to storage, conservation, conveyance, and extraction projects. Additional projects or management actions outside of this list that a GSA determines will help achieve the sustainability goal for the Subbasin may also be applicable (see GSP Regulations Section 354.44). Many of the available funding mechanisms accept applications on a continuing basis. Table 6-2 provides an overview of the project types and available funding and programs as well as important dates to consider for implementation.

Table 6-2: Overview of Project Types and Available Funding Mechanisms

Project Type and Purpose	Funding Type	Program	Important Dates
Water recycling projects	Planning and construction grants and financing	Water Recycling Funding Program (Prop 1 and 13)	Planning applications accepted on continuous basis. Construction applications received by December 31st of each year will be used to develop a priority score. Projects which receive a priority score equal to or greater than the yearly fundable list cutoff score will be placed on the fundable list for the upcoming fiscal year
Wastewater treatment for DAC & SDAC projects	Planning and construction grants and financing	Small Community Grant Fund (Prop 1 and CWSRF)	Applications accepted on continuous basis
Drinking Water	Planning and implementation grants	Groundwater Grant Program (Prop 1)	Round 2 awards late 2019, Round 3 Solicitation to be released 2020
Public water system improvements	Planning and construction grants and financing	Drinking Water Grants (Prop 1 and 68, and DWSRF)	Applications accepted on continuous basis
Stormwater recharge projects	Implementation grants	Storm Water Grant Program (Prop 1)	Solicitation Period Summer/Fall 2019
IRWM projects (included and implemented in an adopted IRWMP)	Implementation Grant	IRWM Implementation Grant Program (Prop 1)	Solicitation planned for release spring 2019. Round 1 applications likely due summer 2019. Round 2 solicitation in 2020.

Funding options are explained in greater detail in the Chapter 7: Plan Implementation of this GSP.

7. PLAN IMPLEMENTATION

The Eastern San Joaquin Groundwater Sustainability Agency (GSAs) will work together in mutual cooperation to implement the Eastern San Joaquin Subbasin Groundwater Sustainability Plan (GSP) in compliance with the Sustainable Groundwater Management Act (SGMA). Implementing the GSP includes implementation of the projects and management actions included in Chapter 6, as well as the following items:

- Eastern San Joaquin GSP implementation program management
- Eastern San Joaquin GSAs administration and management
- Implementation of the monitoring program and reporting
- Data collection and analysis
- Public outreach
- Development of 5-year update and reports
- Grant writing

This chapter provides a description of the above items, including contents of the annual and 5-year reports that will be provided to the Department of Water Resources (DWR) as required under SGMA regulations.

7.1 IMPLEMENTATION SCHEDULE

Development and adoption of a GSP by the January 31, 2020 deadline was a large task. During GSP development, the Eastern San Joaquin Groundwater Authority Board of Directors (GWA Board) identified key areas that would need to be further developed as part of 5-year updates.

Table 7-1 illustrates the Eastern San Joaquin GSP's schedule for implementation from 2020 to 2040, highlighting the high-level activities anticipated for each five-year period. A more detailed schedule is provided in Figure 7-1. These activities are necessary for ongoing GSP monitoring and updates, as well as tentative schedules for projects and management actions. Additional details on the activities included in the timeline are provided in these activities' respective sections of this GSP.

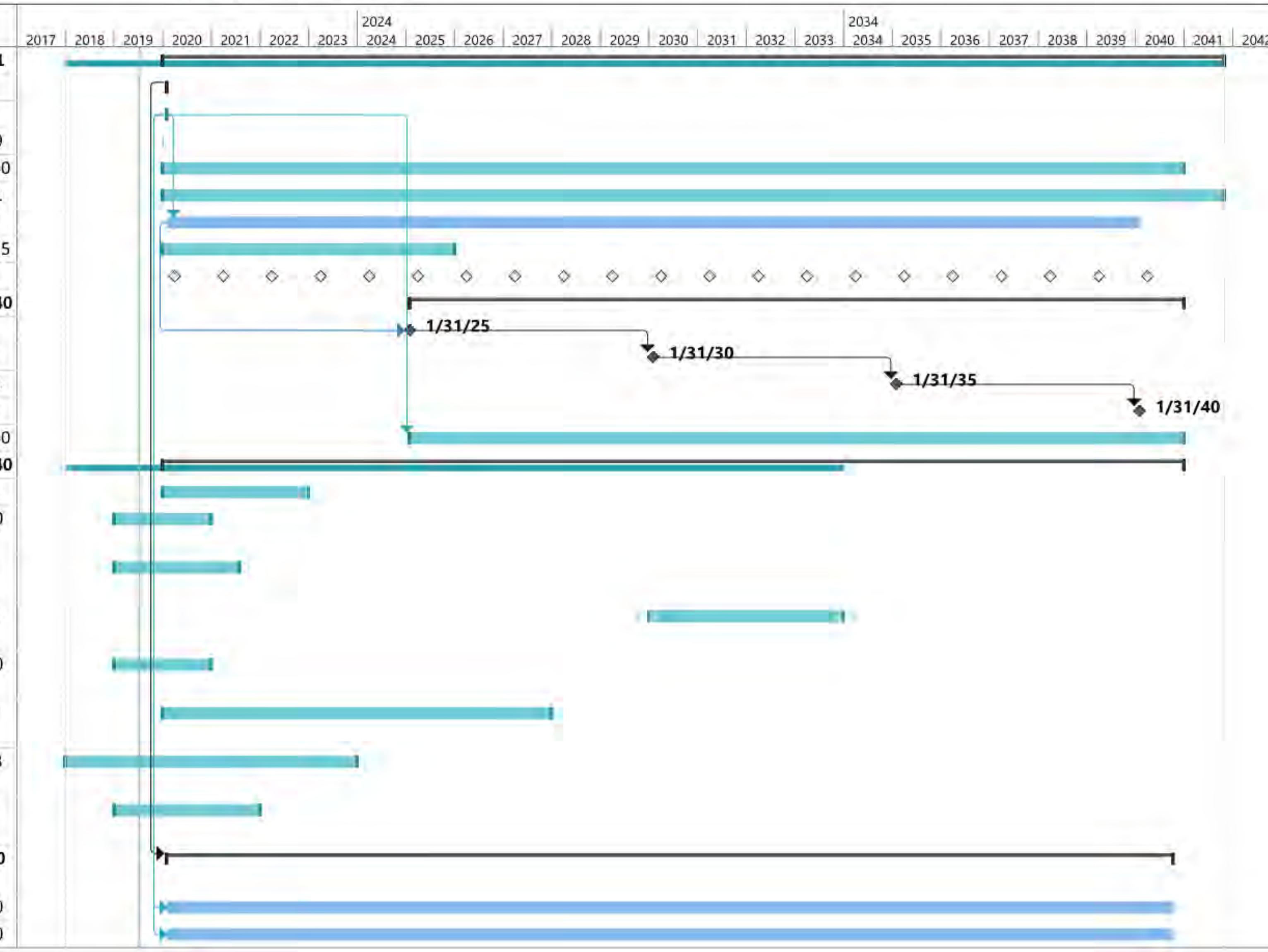
Table 7-1: GSP Schedule for Implementation 2020 to 2040

2020	2025	2030	2035 – 2040
Monitoring and Reporting	Project Implementation	Prepare for Sustainability	Implement Sustainable Operations
• Establish monitoring networks • Install new wells • Model refinement and verification studies • Initial project implementation • Ongoing outreach regarding GSP and projects	• GSAs conduct 5-year evaluation/update • Project implementation continues • Potential Project Evaluation and initiation • Monitoring and reporting continues • Outreach regarding GSP and projects continues	• GSAs conduct 5-year evaluation/update • Longer-term/Conceptual Project evaluation • Monitoring and reporting continues • Outreach continues	• GSAs conduct 5-year evaluation/update • Project implementation completed

Figure 7-1: GSP Implementation Schedule

GSP Implementation Schedule

ID	Task Name	Start	Finish
1	**GSP Implementation**	**Tue 12/31/19**	**Tue 10/29/41**
2	**Plan Implementation**	**Fri 1/31/20**	**Fri 1/31/20**
3	Plan submittal to the State	Fri 1/31/20	Fri 1/31/20
4	**GSP Implementation Program Management**	Tue 12/31/19	Tue 12/31/19
5	**GSA Administration**	Tue 12/31/19	Mon 12/31/40
6	**Public Outreach**	Tue 12/31/19	Tue 10/29/41
7	**Monitoring**	Fri 1/31/20	Tue 1/31/40
8	**Model Refinements & Data Collection**	Wed 1/1/20	Wed 12/31/25
9	**Annual Reports**	**Wed 4/1/20**	**Sun 4/1/40**
31	**Five-Year Evaluation Reports**	**Fri 1/31/25**	**Mon 12/31/40**
32	Five Year Report/Evaluation 1	Fri 1/31/25	Fri 1/31/25
33	Five Year Report/Evaluation 2	Thu 1/31/30	Thu 1/31/30
34	Five Year Report/Evaluation 3	Wed 1/31/35	Wed 1/31/35
35	Five Year Report/Evaluation 3	Tue 1/31/40	Tue 1/31/40
36	Plan Updates (as needed)	Fri 1/31/25	Mon 12/31/40
37	**Project Implementation**	**Tue 12/31/19**	**Mon 12/31/40**
38	Project 1: Lake Grupe In-lieu Recharge	Wed 1/1/20	Sat 12/31/22
39	Project 2: SEWD Surface Water Implementation Expansion	Tue 1/1/19	Thu 12/31/20
40	Project 3: City of Manteca Advanced Metering Infrastructure Project	Tue 1/1/19	Sat 7/31/21
41	Project 4: City of Lodi Surface Water Facility Expansion & Delivery Pipeline	Tue 1/1/30	Sat 12/31/33
42	Project 5: White Slough Water Pollution Control Facility Expansion	Tue 1/1/19	Thu 12/31/20
43	Project 6: CSJWCD Capital Improvement Program	Wed 1/1/20	Fri 12/31/27
44	Project 7: NSJWCD South System Modernization	Mon 1/1/18	Sun 12/31/23
45	Project 8: Long-term Water Transfer to SEWD and CSJWCD	Tue 1/1/19	Fri 12/31/21
46	**Adaptive Management Action Implementation (as-needed)**	**Fri 1/31/20**	**Thu 10/11/40**
47	Evaluate Unimplemented Projects	Fri 1/31/20	Thu 10/11/40
48	Revisit Projects not included in GSP	Fri 1/31/20	Thu 10/11/40



GSP Implementation Schedule

Task	Project Summary	Manual Task	Start-only	Deadline
Split	Inactive Task	Duration-only	Finish-only	Progress
Milestone	Inactive Milestone	Manual Summary Rollup	External Tasks	Manual Progress
Summary	Inactive Summary	Manual Summary	External Milestone	

7.2 IMPLEMENTATION COSTS

In implementing the GSP, the GSAs will incur costs which will require funding. Table 7-2 summarizes these activities and their estimated costs. The areas associated with GWA-wide management and GSP implementation will be borne by the GWA through contributions from the member GSAs, under a cost-sharing arrangement to be developed following GSP adoption. Projects will be administered by the GSA project proponents. GSAs may elect to implement projects individually or jointly with one or more GSAs or with the GWA.

Table 7-2: Costs to GSAs and GSP Implementation Costs

Activity	Estimated Cost[1]
GSP Implementation and Management for GSAs	
Monitoring and Reporting	
Monitoring	$80,000 - $100,000 annually
Annual Reporting	$50,000 - $75,000 annually
Data Management System Updates	$30,000 - $50,000 (first year only) $20,000 (following years, annually)
Data Collection and Analysis	
Mokelumne River Loss Study Project	$100,000 (one time)
Model Refinements	$275,000 (one time)
Additional Wells if needed	$200,000 per well (multi-level)
Review of water quality data in Broad network	$20,000 - $40,000 (annually)
Administrative Actions	$70,000 - $180,000 (annually)
Developing 5-Year Evaluation Reports	$800,000 - $2,000,000 every 5 years
Public Outreach and Website Maintenance	$35,000 - $45,000 (annually)
Grant Writing	By application type: $45,000 - $60,000 (State) $50,000+ (Federal)
Implementing GSP: Projects and Management Actions (Planned Projects Only)	
Project 1: Lake Grupe In-Lieu Recharge	$2.3 million (one time) $330,000 (annually)
Project 2: SEWD Surface Water Implementation Expansion	$750,000 (one time) $100,000 (annually)
Project 3: City of Manteca Advanced Metering Infrastructure	$650,000 (one time) $300,000 (annually)
Project 4: City of Lodi Surface Water Facility Expansion and Delivery Pipeline	$4 million (one time) $2,340,000 (annually)
Project 5: White Slough Water Pollution Control Facility Expansion	$6 million (one time) – complete $4664 (annually)
Project 6: CSJWCD Capital Improvement Program	$50,000 (annually)
Project 7: NSJWCD South System Modernization	$9 million (one time) $250,000 (annually)
Project 8: Long-term Water Transfer to SEWD and CSJWCD	Up to $9 million (annually), $200 per AF

[1] Estimates are rounded and based on full implementation years (FY2021 through FY2040). Different costs may be incurred in FY 2020 as GSP implementation begins.

7.3 MONITORING AND REPORTING

7.3.1 Monitoring

The GSAs will follow direction for the monitoring programs described in Chapter 4: Monitoring Networks to track conditions for the applicable sustainability indicators discussed in Chapter 3: Sustainable Management Criteria. Monitoring network data will be collected and used to determine whether undesirable results are occurring and whether minimum thresholds are being reached or exceeded, and to determine if adaptive management is necessary. This data will be managed using the Eastern San Joaquin Subbasin Data Management System (DMS; see Chapter 5: Data Management System). The GSP monitoring networks make use of existing monitoring programs and develop further monitoring to continue characterization of the system and support development of water budgets. Key components involved in the implementation of the monitoring network activities for the GSP include:

- Semi-annual groundwater level monitoring at 139 wells
- Coordinating between new GSP monitoring program and existing California Statewide Groundwater Elevation Monitoring (CASGEM) program
- Semi-annual groundwater quality monitoring at 43 wells

Components of the annual monitoring program costs include:

- Field crew ($50,000 - $60,000)
- Equipment rental with truck, level meter, and pumps ($7,000 - $10,000)
- Sampling costs ($24,000 - $30,000)
- Existing monitoring and reporting costs for CASGEM ($50,000 - $75,000)

7.3.2 Developing Annual Reports

Annual reports must be submitted by April 1 of each year following GSP adoption (California Code of Regulations, 2016). Annual reports must include 3 key sections: 1) General Information, 2) Basin Conditions, and 3) Plan Implementation Progress. An outline of what information will be provided in each of these sections in the annual report is included below. Annual reporting will be completed in a manner and format consistent with Section 356.2 of the SGMA regulations. As annual reporting continues, it is possible that this outline will change to reflect basin conditions, the priorities of GSAs, and applicable requirements from DWR. Annual reporting is estimated to cost approximately $50,000 to $75,000 annually.

7.3.2.1 General Information

General information will include an executive summary that highlights the key contents of the annual report. As part of the executive summary, this section will include a description of the sustainability goals, provide a description of GSP projects and their progress, and annually updated implementation schedule and map of the Subbasin. Key components as required by SGMA regulations include:

- Executive Summary
- Map of the Subbasin

7.3.2.2 Basin Conditions

Basin conditions will describe the current groundwater conditions and monitoring results. This section will include an evaluation of how conditions have changed in the Subbasin over the previous year and compare groundwater data for the year to historical groundwater data. Pumping data, effects of project implementation (e.g., recharge data, conservation, if applicable), surface water flows, total water use, and groundwater storage will be included. Key components as required by SGMA regulations include:

- Groundwater elevation data from the monitoring network
- Hydrographs and contour maps of elevation data
- Groundwater extraction data
- Surface water supply data
- Total water use data
- Change in groundwater storage, including maps

7.3.2.3 Plan Implementation Progress

Progress towards successful plan implementation would be included in the annual report. This section of the annual report would describe the progress made toward achieving interim milestones as well as implementation of projects and management actions. Key components as required by SGMA regulations include:

- Plan implementation progress
- Sustainability progress

7.3.3 DMS Updates

Updates and maintenance to the DMS will be made annually, including import of monitoring data and export of summarized data for annual reporting.

The first year will include refinements and is expected to cost $30,000 to $50,000, with following years expected to cost $20,000 annually.

7.4 DATA COLLECTION AND ANALYSIS

7.4.1 Mokelumne River Loss Study Project

This project will study reaches of the Mokelumne River downstream of Camanche Reservoir to better understand and account for losses due to percolation, evaporation, riparian evapotranspiration, and more to inform management actions and SGMA basin accounting. Results of the study will be used to support model refinement and validation (described below in Section 7.4.2) in this region. The project is expected to cost about $100,000 and will take 2 years to complete.

7.4.2 Model Refinements

The ESJWRM will be updated based on newly available information or additional information provided by GSAs. This will include extending the historical model time series through at least 2020 and refining the model grid to align with the most recently updated GSA boundaries. Once the model has been updated and calibrated, new SGMA scenarios will be developed, including the current, projected, and sustainable scenarios as well as associated water budgets and the evaluation of sustainability indicators based on project implementation. The historical model is expected to be updated and calibrated by 2023 so that updated scenarios can be developed before the first GSP update in 2025. Total model refinement costs are expected to be $275,000.

7.4.3 Additional Wells If Needed

Additional groundwater level monitoring wells may be installed throughout the Subbasin if needed to fill remaining data gaps or for other management purposes after separate currently planned monitoring well installations have been completed. Well installation costs can vary widely based on well depth and soil conditions. An estimate average cost for installing a groundwater level monitoring well is $200,000 per well.

7.4.4 Review of Water Quality Data in Broad Network

The GSAs will be reviewing water quality data in an exploratory fashion on an annual basis. This will include an evaluation of TDS, anions/cations, and arsenic on a Subbasin-wide scale to better inform basin conditions and management. This level of effort is expected to cost between $20,000 - $40,000 annually. Efforts include:

- Coordination with existing monitoring programs:
    - Monthly review of data submitted to the Department of Pesticide Regulation (DPR), Division of Drinking Water (DDW), Department of Toxic Substances Control (EnviroStor), and GeoTracker as part of the Groundwater Ambient Monitoring and Assessment (GAMA) database.
    - Quarterly check-ins with existing monitoring programs, such as CV-SALTS and ILRP.
    - Annual review of annual monitoring reports prepared by other programs, such as CV-SALTS and ILRP.
    - GSAs will invite representative(s) from the Regional Water Quality Control Board, San Joaquin County Division of Environmental Health, and ILRP to attend an annual meeting of the GSAs to discuss constituent trends and concerns in the Subbasin in relation to groundwater pumping.

7.5 ADMINISTRATIVE ACTIONS

Each of the 15 GSAs are administered independently and involve meetings and oversight of individual GSA projects and programs. As described in Chapter 1: Administrative Information, Plan Area, and Communication, GSAs can be made up of one or multiple agencies, cities, and counties. GSA administration will include: monthly coordination meetings within each GSA; coordination meetings of the GSP Implementation Ad-hoc Committee, regular email communications to update GSA members on on-going basin activities; coordination activities with the other GSAs, such as on projects or studies; administration of projects implemented by the GSA; and general oversight and coordination. Coordination meetings between the 15 GSAs are assumed to occur bi-monthly, with other oversight and administration activities occurring as needed and on an on-going basis. GSA administration is also expected to require additional effort during GSP updates, and around the time of annual report and 5-year evaluation report development. Other administrative actions may involve tracking and evaluating GSP implementation and sustainability conditions as well as assessing the benefit to the Subbasin. Annual costs for GSA administrative actions are estimated to range from $70,000 to $180,000.

7.6 DEVELOPING 5-YEAR EVALUATION REPORTS

SGMA requires that GSPs be evaluated regarding their progress towards meeting the approved sustainability goals at least every 5 years and to provide a written assessment to DWR. An evaluation must also be made whenever the GSP is amended. A description of the information that will be included in the 5-year report is provided below and would be prepared in a manner consistent with Section 356.4 of the SGMA regulations. Annual costs for 5-year GSP updates are estimated to range from $800,000 to $2,000,000.

7.6.1 Sustainability Evaluation

This section will contain a description of current groundwater conditions for each applicable sustainability indicator and will include a discussion of overall Subbasin sustainability. Progress towards achieving interim milestones and measurable objectives will be included, along with an evaluation of groundwater quality and groundwater elevations (being used as direct or proxy measures for several sustainability indicators) in relation to minimum thresholds. A chloride isocontour map will be developed to evaluate the seawater intrusion sustainability indicator.

7.6.2 Plan Implementation Progress

This section will describe the current status of project and management action implementation since the previous 5-year report. An updated project implementation schedule will be included, along with any new projects that were developed to support the goals of the GSP and a description of any projects that are no longer included in the GSP. The benefits of projects that have been implemented will be included, and updates on projects and management actions that are underway at the time of the 5-year report will be reported.

7.6.3 Reconsideration of GSP Elements

Part of the 5-year report will include a reconsideration of GSP Elements. As additional monitoring data is collected during GSP implementation, land uses and community characteristics change over time, and GSP projects and management actions are implemented, it may become necessary to revise the GSP. This section of the 5-year report will reconsider the basin setting, management areas (if applicable), undesirable results, minimum thresholds, and measurable objectives. If appropriate, the 5-year report will recommend revisions to the GSP. Revisions would be informed by the outcomes of the monitoring networks, and changes in the Subbasin, including but not limited to, changes to groundwater uses or supplies and outcomes of project implementation.

The water year types from the San Joaquin Valley Water Year Hydrologic Classification used in this Plan are based on stream inflows from a variety of streams in the San Joaquin Valley. In the future, a more locally-relevant index may be developed that would be more representative of conditions specific to the Subbasin.

7.6.4 Monitoring Network Description

A description of the monitoring network will be provided in the 5-year report. Data gaps, or areas of the Subbasin that are not monitored in a manner consistent with the requirements of the regulations, will be identified or re-assessed if previously identified. An assessment of the monitoring networks' function will be provided, along with an analysis of data collected to-date. If data gaps are identified, the GSP will be revised to include a program for addressing these data gaps, along with an implemented schedule for addressing data gaps and how the GSAs will incorporate updated data into the GSP.

7.6.5 New Information

New information that has become available since the last 5-year evaluation or GSP amendment would be described and the GSP evaluated in light of this new information. If the new information would warrant a change to the GSP, this would also be included.

7.6.6 Regulations or Ordinances

The 5-year report will include a summary of the regulations or ordinances related to the GSP that have been implemented by DWR since the previous report and address how these may require updates to the GSP.

7.6.7 Legal or Enforcement Actions

Enforcement or legal actions taken by the GSAs or their member agencies in relation to the GSP will be summarized in this section along with how such actions support sustainability in the Subbasin.

7.6.8 Plan Amendments

A description of amendments to the GSP will be provided in the 5-year report, including adopted amendments, recommended amendments for future updates, and amendments that are underway during development of the 5-year report.

7.6.9 Coordination

The Eastern San Joaquin GSP will be implemented by the GSAs identified in Chapter 1: Administrative Information, Plan Area, and Communication. These GSAs will work in collaboration with adjacent groundwater sustainability subbasins, namely: the Modesto, Cosumnes, South American, Solano, East Contra Costa, and Tracy Subbasins.

This section of the 5-year report will describe coordination activities between these entities, such as meetings, joint projects, or data collection efforts. If additional neighboring GSAs have been formed since the previous report, or changes in neighboring basins have occurred, resulting in a need for new or additional coordination within or outside the Subbasin, such coordination activities would be included as well.

7.7 PUBLIC OUTREACH

During GSP development, GSAs and the GWA used multiple forms of outreach to communicate SGMA-related information and solicit input. The GSAs intend to continue public outreach and provide opportunities for engagement during GSP implementation. This will include providing opportunities for public participation, at public meetings, providing access to GSP information online, and continued coordination with entities conducting outreach to diverse communities in the Subbasin. Announcements will continue to be distributed via email prior to public meetings. Emails will also be distributed as specific deliverables are finalized, when opportunities are available for stakeholder input and when this input is requested, or when items of interest to the stakeholder group arise, such as relevant funding opportunities. The Eastern San Joaquin SGMA website, managed as part of GSP administration, will be updated a minimum of monthly, and will house meeting agendas and materials, reports, and other program information. The website may be updated to add new pages as the program continues and additional activities are implemented. Additionally, public workshops will be held semi-annually to provide an opportunity for stakeholders and members of the public to learn about, discuss, and provide input on GSP activities, progress toward meeting the sustainability goal of this GSP, and the SGMA program.

7.8 IMPLEMENTING GSP-RELATED PROJECTS AND MANAGEMENT ACTIONS

Costs for the projects and management actions are described in Chapter 6: Projects and Management Actions of this GSP. Financing of the projects and management actions would vary depending on the activity. Potential financing for projects and management actions are provided in Table 7-3, although other financing may be pursued as opportunities arise or as appropriate. The GSAs may adopt adaptive management actions as needed to evaluate potential for unimplemented projects and revisiting projects not included within the 23 projects listed in this GSP. This includes Longer-term/Conceptual Projects provided in Chapter 6: Projects and Management Actions.

Table 7-3: Funding Mechanisms for Proposed Projects and Management Actions

Project/Management Action Title and Type		Responsible Agency[1]	Potential Funding Mechanism
Planned Projects			
Project 1: Lake Grupe In-Lieu Recharge	In-lieu Recharge	SEWD	District staffing and District rates to establish new accounts
Project 2: SEWD Surface Water Implementation Expansion	In-lieu Recharge	SEWD	District staffing and District rates to establish new accounts
Project 3: City of Manteca Advanced Metering Infrastructure	Conservation	City of Manteca	Capital Improvement Project budgeted item with available funding
Project 4: City of Lodi Surface Water Facility Expansion & Delivery Pipeline	In-lieu Recharge	City of Lodi	Capital Improvement Project budgeted item with available funding
Project 5: White Slough Water Pollution Control Facility Expansion	Recycling/In-lieu Recharge	City of Lodi	DWR Proposition 84 Grant Funding Program
Project 6: CSJWCD Capital Improvement Program	In-lieu Recharge	CSJWCD	Surface water sales, groundwater extraction fees, and acre assessments
Project 7: NSJWCD South System Modernization	In-lieu Recharge	NSJWCD	Grant funding, landowner assessments, and water charges
Project 8: Long-term Water Transfer to SWED and CSJWCD	Intra-basin Transfer/ In-lieu Recharge	SSJ GSA	Costs met by recipients of water or groundwater pumping benefit
Potential Projects			
Project 9: BNSF Railway Company Intermodal Facility Recharge Pond	Direct Recharge	CSJWCD	Groundwater extraction fee revenue, private loans, and/or possible grant funding
Project 10: Stockton Advanced Metering Infrastructure	Conservation	City of Stockton	Met by ratepayers and through grants or other funding sources
Project 11: PDA Banking	In-lieu Recharge	NSJWCD	Grant funding, banking fees, and water charges

Project/Management Action Title and Type		Responsible Agency[1]	Potential Funding Mechanism
Project 12: NSJWCD North System Modernization	In-lieu Recharge	NSJWCD	Grant funding, landowner assessments, and water charges
Project 13: Manserro Recharge Project		NSJWCD	Grant funding and landowner assessments
Project 14: Tecklenberg Recharge Project		NSJWCD	Grant funding and landowner assessments
Project 15: City of Escalon Wastewater Reuse	Recycling/In-lieu Recharge	SSJ GSA	Developer impact fees, connection fees, and sewer rate fees
Project 16: City of Ripon Surface Water Supply	In-lieu Recharge	SSJ GSA	Grants, water rates, and development impact fees
Project 17: City of Escalon Connection to Nick DeGroot Water Treatment Plant	In-lieu Recharge	SSJ GSA	Grants, water rates, and development impact fees
Longer-term or Conceptual Projects			
Project 18: Farmington Dam Repurpose Project	Direct Recharge	SEWD	Grant funding
Project 19: Recycled Water Transfer to Agriculture	Recycling/Transfer/ In-lieu Recharge	City of Manteca	To be identified
Project 20: Mobilizing Recharge Opportunities	Direct Recharge	San Joaquin County	To be identified
Project 21: NSJWCD Winery Recycled Water	Recycling/In-Lieu Recharge/Direct Recharge	NSJWCD	Grant funding, landowner assessments, and charges paid by the winery
Project 22: Pressurization of SSJID Facilities	Conservation	SSJ GSA	Existing sources (hydropower generation, user fees, water transfers) and enhanced sources (grants, additional user fees, additional water transfers)
Project 23: SSJID Storm Water Reuse	Storm Water/ Direct Recharge	SSJ GSA	Developer impact fees, connection fees, and property related fees

1 Acronyms defined: Stockton East Water District (SEWD), Central San Joaquin Water Conservation District (CSJWCD, North San Joaquin Water Conservation District (NSJWCD), and South San Joaquin Groundwater Sustainability Agency (SSJ GSA).

7.9 GSP IMPLEMENTATION FUNDING

Implementation of the GSP is projected to run between $450,000 and $900,000 per year excluding projects and management actions costs. Additional one-time costs are estimated to be on the order of $415,000. Development of this GSP was funded through a Proposition 1 Sustainable Groundwater Planning Grant. To the degree they become available, outside grants will be sought to assist in reducing cost of implementation to participating agencies, residents, and landowners of the Subbasin. However, there will be a need to establish funding mechanisms to support the implementation of the GSP and future SGMA compliance. At the April 10, 2019 GWA Board Meeting, the Board approved an action to conduct monitoring, measuring, and modeling at the basin-scale subject to a financing plan that will be developed after the GSP is approved. Costs for GSP project implementation will be met by project proponents. Also at the April 10, 2019 GWA Board Meeting, the Board took an action to approve development and implementation of projects in the GSP Implementation Plan at the GSA level, with the option for GSAs with projects in the GSP to work with additional parties in the development of their projects.

Costs of overall GSP administration are expected to be shared by the GSAs. Financing options under consideration could include pumping fees, assessments, loans, and grants. Individual GSAs will create their own financing plans to address their portion of the cost share according to the GWA JPA. Table 7-4 lists examples of potential financing options.

Prior to implementing any fee or assessment program, the GSAs would complete a rate assessment study or other analysis consistent with the regulatory requirements.

Table 7-4: Potential Funding Sources for GSP Implementation

Funding Source	Certainty
Ratepayers (within Project Proponent service area or area of project benefit)	High – User rates pay for operation and maintenance (O&M) of a utility's system. Depends upon rate structure adopted by the project proponent and the Proposition 218 rate approval process. Can be used for project implementation as well as project O&M.
General Funds or Capital Improvement Funds (of Project Proponents)	High – General or capital improvement funds are set aside by agencies to fund general operations and construction of facility improvements. Depends upon agency approval.
Special taxes, assessments, and user fees (within Project Proponent service area or area of project benefit)	High - Monthly user fees, special taxes, and assessments can be assessed by some agencies should new facilities directly benefit existing customers. Depends upon the rate structure adopted by the project proponent and the Proposition 218 rate approval process.
Clean Water State Revolving Fund (CWSRF) Loan Program administered by the California State Water Resources Control Board (SWRCB)	Medium – Historically, the SWRCB has had $200 to $300 million available annually for low-interest loans (typically ½ of the General Obligation Bond Rate) for water recycling, wastewater treatment, and sewer collection projects. During recent years, available funding has become limited due to high demand. Success in securing a low-interest loan depends on demand of the CWSRF Program and available funding. Applications are accepted on a continuous basis. SWRCB prepares a fundable list for each fiscal year. In order to receive funding, a project must be on the fundable list. Full applications must be submitted by the end of the calendar year to be considered for inclusion on the following year's fundable list.

Funding Source	Certainty
Water Recycling Funding Program (WRFP) – Planning and Construction Grants from SWRCB	High (planning) / Low (construction) – WRFP grants are funded by Proposition 1, as well as the general CWSRF Program. Planning grants (for facilities planning) are available and can fund 50% of eligible costs, up to $75,000. Construction grants have been exhausted. Low-interest loans through the CWSRF program are available and while limited, recycled water projects receive priority over wastewater projects (which are also eligible under CWSRF, the umbrella program for the WRFP).
Drinking Water State Revolving Fund Loan Program administered by the SWRCB Division of Drinking Water	High – Approximately $100 to $200 million is available on an annual basis for drinking water projects. Low-interest loans are available for project proponents should they decide to seek financing. Funding has become more limited; however, applicants are encouraged to apply.
Infrastructure State Revolving Fund Loan Program administered by the California Infrastructure and Economic Development Bank (I-Bank)	High – Low-interest loans are available from I-Bank for infrastructure projects (such as water distribution). Maximum loan amount is $25 million per applicant. Applications are accepted on a continuous basis.
Title XVI Water Recycling and Reclamation / Water Infrastructure Improvements for the Nation (WIIN) Program – Construction Grants administered by the United States Bureau of Reclamation (USBR)	Medium – Grants up to 25% of project costs or $20 million, whichever is less, are available from USBR for water recycling projects. A Title XVI Feasibility Study must be submitted to and approved by USBR to be eligible. USBR solicits grants annually.
WaterSMART Title XVI Water Recycling and Reclamation Program – Feasibility Study Grants administered by USBR	Low – Grants up to $150,000 have been available in the past for preparation of Title XVI Feasibility Studies. It is possible future rounds may be administered.
Bonds	Medium – Revenue bonds can be issued to pay for capital costs of projects allowing for repayment of debt service over 20- to 30- year timeframe. Depends on the bond market and the existing debt of project proponents.
Integrated Regional Water Management (IRWM) implementation grants administered by the California Department of Water Resources (DWR)	Medium – The Westside-San Joaquin IRWM Region, the primary IRWM region overlapping the Delta-Mendota Subbasin, will pursue grant funding through the Proposition 1, Round 1 IRWM Implementation Grants. Applications are expected to be due in summer 2019 through late 2019, depending on the Funding Area. Approximately $28 million will be available in the San Joaquin River Funding Area and approximately $30 million will be available in the Tulare-Kern Funding Area over two rounds (where Round 2 solicitation will begin in 2020), both of which overlap the Westside-San Joaquin IRWM Region.
Proposition 68 grant programs administered by various state agencies	Medium – Grant programs funded through Proposition 68, which was passed by California voters in June 2018, administered by various state agencies are expected to be applicable to fund GSP implementation activities. These grant programs are expected to be competitive, where $74 million has been set aside for Groundwater Sustainability statewide.

Funding Source	Certainty
Disadvantaged Community (DAC) Involvement Program	Medium – The Westside-San Joaquin IRWM Region will receive funding through DWR's DAC Involvement Program through the San Joaquin River Funding Area (which was awarded a total of $3.1 million for the Funding Area as a whole) and the Tulare/Kern Funding Area (which was awarded a total of $3.4 million for the Funding Area). This funding has been secured by the respective Funding Areas. Funding may be used to help develop a project within the Westside-San Joaquin IRWM Region in order to advance it toward implementation. This program is not guaranteed to be funded in the future.

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www.esjgroundwater.org

ATTACHMENT G

Groundwater Banking Plan

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Farmington
Groundwater Recharge Program

Summer 2007 Newsletter

Program Awaits Federal Funding Support

Launched in 2003, the **Farmington Groundwater Recharge & Seasonal Habitat Program** (Program) is a 10-year, $33.5 million effort to begin restoration of the Eastern San Joaquin Groundwater Basin (Basin), a Central California water resource in a state of critical overdraft and threatened by saline intrusion from under the Delta.

The Program is led by Stockton East Water District (SEWD), in partnership with other local water interests, and the Sacramento District of the U.S. Army Corps of Engineers. An award-winning effort, the Program works by partnering with local water interests and landowners to implement conjunctive management strategies for the utilization of available water resources.

When surface water supplies are abundant, the Program's objective is to recharge the Basin through in-lieu irrigation and partnerships with growers who rotate direct recharge activities with other land-uses via short- and long-term agreements.

Since its inception, the Program has evaluated and/or tested more than a dozen candidate recharge sites within the service boundaries of SEWD, North San Joaquin Water Conservation District and Central San Joaquin Water Conservation District.

Direct recharge facilities developed through the Program, and its preceding studies, now contribute more than 11,000 acre-feet per year towards the Program's original recharge goal of 35,000 acre-feet annually.

To date, the Program has been maintained through approximately $1.75 million in allocated Federal funds and more than $10 million in local and State funds. A schedule of continued Federal funding through 2013 was submitted to Congress in February, 2007.

With additional Federal appropriations, Program partners plan to advance selected candidate sites to demonstration facilities; begin evaluation of additional candidate sites; and resume active recruitment and outreach of Program participants.

In This Issue

STOCKTON EAST WATER DISTRICT

US Army Corps of Engineers

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(916) 557-7802

www.farmingtonprogram.org

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About the Farmington Program

Faced with limited surface water availability in Eastern San Joaquin County, growers, cities, rural neighborhoods and industries have relied heavily on mining water from underground aquifers. Groundwater use now exceeds nature's ability to self-replenish the aquifer by approximately 150,000 acre-feet per year. The cumulative effects:

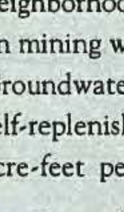
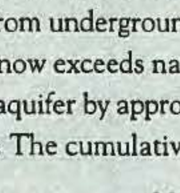
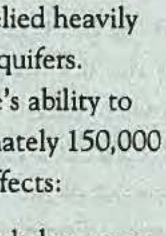
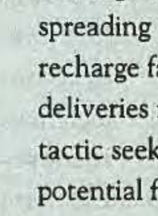
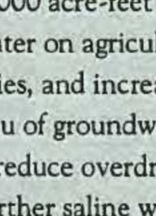
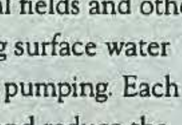
- Groundwater is now up to 80 feet below mean sea level
- Intrusion of saline-tainted water from the west
- Municipal and rural wells have closed or failed
- Continually higher groundwater pumping costs
- Accumulated overdraft of more than two million acre-feet

To address this trend, Stockton East Water District (SEWD), with other local water interests, took a lead role in 1996 to work with the U.S. Army Corps of Engineers (Corps) to develop a conjunctive management strategy for Eastern San Joaquin County. The result is the Farmington Groundwater Recharge & Seasonal Habitat Program (Program).

The Program's goal is to provide average annual recharge of 35,000 acre-feet of water through spreading of water on agricultural fields and other recharge facilities, and increasing surface water deliveries in-lieu of groundwater pumping. Each tactic seeks to reduce overdraft and reduce the potential for further saline water intrusion.

For direct groundwater recharge activities, the Program seeks to enroll 25 to 30 parcels totaling up to 1,200 acres in short- and long-term agreements with landowners. Each would be compensated at

Eastern San Joaquin County and the Farmington Groundwater

Report / Action	Eastern San Joaquin County Groundwater Study 	American River Water Resources Investigation 	Mokelumne Aquifer Recharge and Storage Project 	Stockton Metropolitan Area, California Reconnaissance Report 	Conjunctive Use Study 	Congressional Action 	Farmington Groundwater and Seasonal Habitat Study 
	1985	1995	1996	1997	1998	2000	2001
Report Conclusion	Concluded that the groundwater basin is overdrafted, saline water intrusion is a problem, and additional surface water supplies are needed	Considered extending the Folsom South Canal to deliver American River water in eastern San Joaquin County and reduce groundwater overdraft	Considered recharge and recovery of Mokelumne River water supplies to support Bay Area needs and reduce groundwater overdraft	Recommended study of Farmington Dam for conjunctive use purpose	Concluded that groundwater recharge is the most cost-effective approach to reducing overdraft	Congress authorized Program and Farmington Groundwater Recharge	Described Program components and general implementa[illegible] approach

market rates for the use of their land.

The recharge method of choice is field-flooding, a practice where a small perimeter levee is built around fallow farmland to allow winter flooding to a depth of up to 18 inches. In addition to groundwater recharge, this method often provides varying water depths that are ideal for a wide range of migratory waterfowl.

Lands can be cycled in and out of the Program with other traditional land uses, thereby making water a cash crop for enrolled landowners.

For in-lieu recharge, the Program seeks to expand surface water deliveries to the urban area, farms and other major groundwater users via existing and future transmission and distribution systems.

The Program is also investigating the feasibility of conducting direct groundwater recharge via flooding of vineyards when the plant is dormant. Early indications are that this type of field-flooding is an effective pest control for root-damaging nematodes, and has the potential of over 20,000 acre-feet per year of recharge in the region.

FOUR GROUNDWATER RECHARGE METHODS ARE FEATURED IN THE FARMINGTON GROUNDWATER RECHARGE PROGRAM:

Flooded Field

Often the lowest cost to design, engineer, and construct, a flooded field recharge involves pushing up two- to four-foot-tall berms and flooding to a depth of one to three feet. Such facilities can provide temporary habitat for migrating water fowl.

Spreading Basin

Longer lasting and developed to a higher level of design, engineering, and construction, the spreading basin method features a two- to six-foot-deep excavation to a field and berms up to 15 feet high. Water depths range from three to nine feet. To enhance percolation rates and minimize maintenance, SEWD is experimenting with a combination of ridges and furrows graded into the basin bottoms.

Pit Facility

This recharge methods features excavations with minimal to no side slope in the basin. This method is often employed in order to bypass a confining, hardpan or low-permeability soil layer.

In-Lieu

Rather than construct a recharge facility, in-lieu recharge features replacement of groundwater pumping with the delivery of surface water. Such practices reduce pumping stress on the basin and allow groundwater levels to rise through natural replenishment.

Recharge Program Milestones:

Program Cost Sharing

STOCKTON EAST WATER DISTRICT

US Army Corps of Engineers

2002

Project Cooperation Agreement sets Federal cost shares at 75 percent. $800,000 in Federal funding.

Recharge Facility Constructed

2003

Farmington Groundwater Recharge Program initiated. 7,000 AF direct recharge facility built at SEWD. $1 million in Federal funding.

Candidate Sites Identified

2004

12 candidate sites identified for evaluation, $1 million in Federal funding.

Demonstration Testing

2005

Demonstration-level testing at six candidate sites. $500,000 in Federal funding.

Peters Pipeline Completed

2006

Peters Pipeline Project complete, 1,488 acres of farmland gain access to surface water (in-lieu recharge of approx. 4,000 AF).

Farmington Groundwater Recharge Program

2007

Farmington Program's Federal actions on-hold pending further funding

Recharge Facilities

SITE		ACRES	POTENTIAL		STATUS
			Observations	Recharge Volume [1] (acre-feet per year)	
1	Detention Basin No. 2 (Morada Lane)	15	Extensive hardpan and clay soils not suitable for groundwater recharge.	NA	Eliminated from consideration.
2	Pettit	20	Ideal for excavated pit recharge basin facility, with integrate wetlands and aquatic habitat.	4,800	Pending additional study for water supply and site studies.
3	Togninali		Low permeability of soils and remote location away from surface water source.	NA	Eliminated from consideration.
4	Filipelli	15	Limited size and existing land use limits groundwater recharge opportunities.	NA	Eliminated from consideration.
5	Hansen	50	Undulating topography and location well to the east of primary recharge target area.	NA	Eliminated from continued consideration due to site location.
6	Rajkavich		Low permeable soils suggest that groundwater recharge would not be favorable.		Eliminated from consideration.
7	BNSF	60	Deepening of three stormwater retention ponds could enhance recharge potential.	3,600	On-hold pending further dialog with BNSF officers.
8	Mariposa Lakes (Creek Partners LP)	Approx. 200	Soils data provided by candidate indicate some areas suitable for various recharge techniques.	12,000	On-hold pending site evaluation, water supply, and other studies.
9	Hammer	17	Medium to high capacity surface soils, with good percolation rates.	2,000	Site has been pursued by North San Joaquin Water Conservation District.
10	Kautz	25	Medium to high capacity surface soil encountered with good percolation rates.	2,100	Pending - Potential future in-lieu site.
11	Micke Grove Park/ Golf Course	160	In-lieu recharge via supplemental supplies of surface water for irrigation.	610	Pending approval for construction, planning and facility design.
12	Micke Grove Trust	200	Field flooding of vineyards during dormancy for groundwater recharge and pest control.	12,000	Pending further dialog with landowner.
13	SEWD Spreading Basin Facility	60	Three spreading basins filled with Calaveras and/or Stanislaus River water supplies.	7,000 [2]	Completed in 2002.
14	SEWD Northwest	30	Soils suitable for flooded field and spreading basin techniques.	3,000 [2]	Construction pending.
	Peters Pipeline	1,488	Surface water conveyance for agricultural and municipal use.	4,100 [3]	Completed in 2006, with turnouts to 1,488 acres of farmland for in-lieu use.
Total Potential Recharge Volume (acre-feet per year)				52,210 [4]	

[1] Unless noted otherwise, potential recharge volumes based on test data or professional judgement.
[2] Figures represent recharge capacity based on water supplies available four of every seven years through Bellota and Peters Pipelines.
[3] Assumes surface waters available five of every seven years.
[4] Of this potential yearly recharge volume, approximately 11,000 acre-feet per year can be recharged via facilities at SEWD and agricultural lands supplied by Peters Pipeline.

1 Detention Basin No. 2 Site

Highway 99, east of Mosher Dr. Morada, Calif.

Parcel size: 15 acres
Zone: Stockton East Water District
Water: Mosher Creek
Tests (results): Flooded Field (.07 to .1 feet/day)
Findings: Significant layer of hardpan and extensive clay layers contributed to poor infiltration for flooded fields.
Recommendation: Soils at site are not conducive for groundwater recharge.
Status: Eliminated from continued consideration.

2 Petitt Site

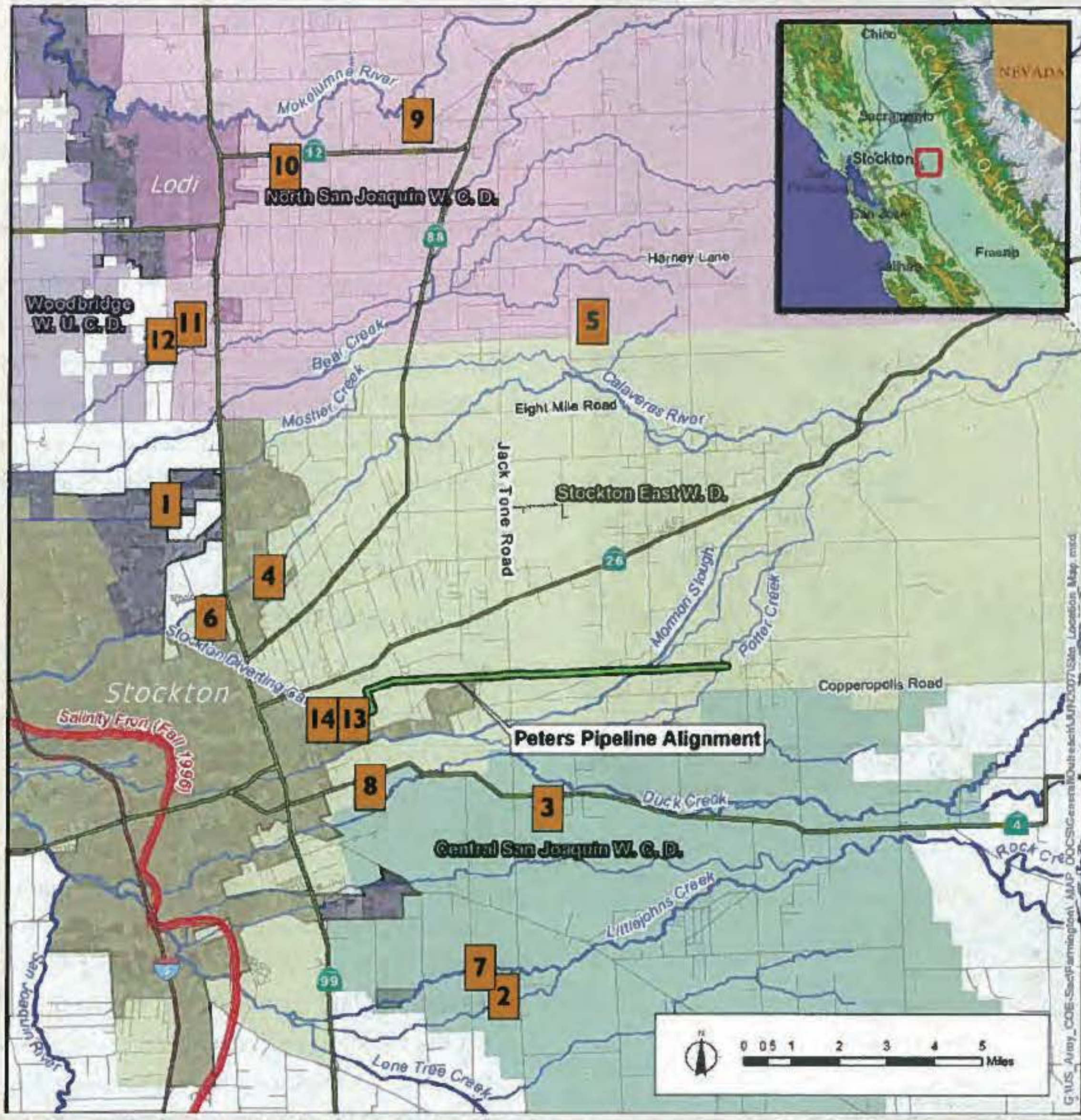
East of South Kaiser Road and north of the South Fork of Littlejohns Creek, San Joaquin County, Calif.

Parcel size: 20 acres
Zone: Central San Joaquin Water Conservation District
Water: South Fork Littlejohns Creek
Tests (results): Flooded Field (.1 to .5 feet/day) and Excavated Pit (10 to 19.2 feet/day)
Findings: Significant layer of hardpan and clay contributed to poor infiltration for flooded fields; however, recharge rates exceeded 10 feet/ day when this layer was excavated.
Recommendation: Full-scale, excavated recharge basin facility; opportunity to integrate wetlands and aquatic habitat.
Status: Pending additional study for water supply, site acquisition, and construction cost issues.

10 Kautz Site

Southeas Highwa Tree Rd. Lodi, Ca

Parcel size: 25 acres
Zone: North San Joaquin Water Con
Water: Mokelumne River
Tests (results): Flooded Field (.2 to
average)
Findings: Medium quality to high pe
site; comparable performance to ot
Recommendation: Advance to Demo
Testing
Status: Pending - Potentia e i



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.4 feet/day; .7 feet/day

rforming surface for this
er sites in the area.
nstration-Scale Recharge

te.

11 Mickey Grove Park and Golf Course

11793 N Micke Grove Rd.
Lodi, Calif.

Parcel size: 160 acres
Zone: North San Joaquin Water Conservation District
Water: Mokelumne River via Pixley Slough, with backup supply from Woodbridge Irrigation District and/or City of Lodi
Tests (results): In-lieu recharge through construction of a dual groundwater-surface-water system featuring a three-acre park pond.
Findings: Up to 610 acre-feet/year recharge and $23,180/year in energy savings through avoidance of groundwater pumping.
Recommendation: Construct project, including planning, facility design and implementation.
Status: Pending approval

14 SEWD Northwest Site

East Main Street, two miles east of Hwy 99,
Stockton, Calif.

Parcel size: 30 acres
Zone: Stockton East Water District
Water: Calaveras River or Stanislaus River
Tests (results): Flooded Field (.36 feet/day average); Spreading basin (.62 feet/day average)
Findings: Recharge rates for both methods are good. Flooded field the most feasible on a cost per unit basis.
Recommendation: Advance to Demonstration-Scale Recharge Testing for flooded field
Status: Construction pending. A component of an adjacent 60-acre facility named the Water/Environment Project of the Year, 2003, by the American Society of Civil Engineers, Sacramento Section.

Pipeline Expands Recharge Capabilities

Completed in 2006, the Peters Pipeline is a six-mile long, 60-inch diameter pipeline constructed as a direct and in-lieu recharge facility of the Farmington Groundwater Recharge Program.

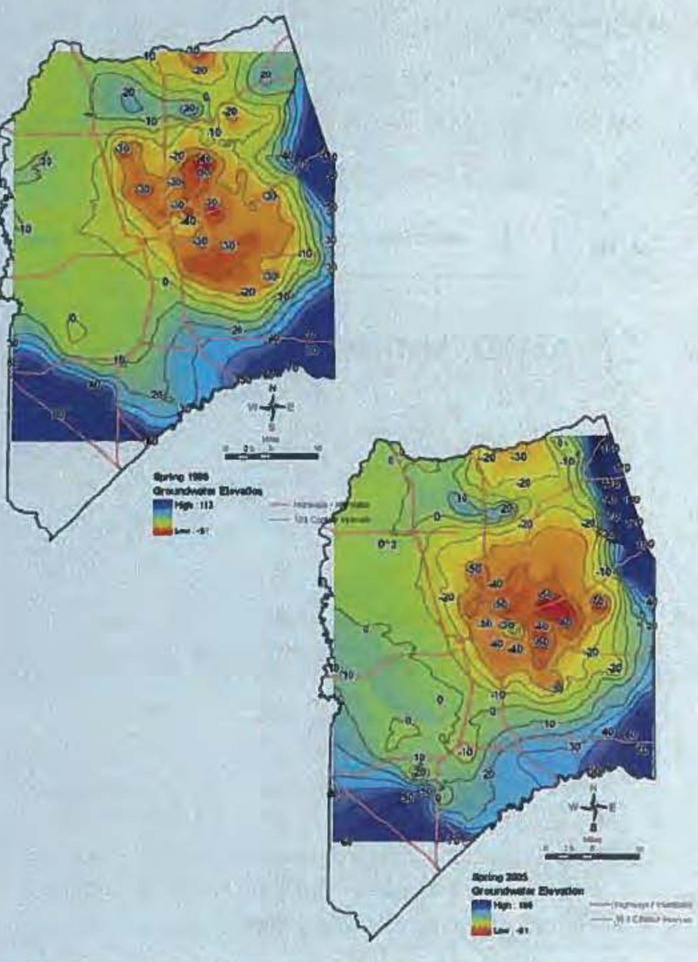
The $7.5 million pipeline was funded through a $3.7 million award from the Proposition 13 Groundwater Recharge Storage Construction Grant and bond funds shared by the City of Stockton, California Water Service Company, San Joaquin County and Stockton East Water District.

The pipeline carries water from the Stanislaus River and Calaveras River to the District's Dr. Joe Waidhofer drinking water treatment plant.

Approximately 1,500 acres of farmland receive wet year surface water supplies from the pipeline, an in-lieu recharge benefit of 4,000 acre-feet. Another 8,500 acres of farmland are eligible for this surface water supply.

The pipeline further enables a 60-acre complex of recharge ponds and fields adjacent to the District's Dr. Joe Waidhofer drinking water treatment plant to operate un-interrupted. Built via the Farmington Program, but funded with State and local money, the recharge facility returns up to 10,000 acre-feet of water annually to the groundwater tables. This stored water can be drawn and delivered to municipal and industrial customers during dry years.

The spreading basins component was awarded the American Society of Civil Engineers Water/Environmental Project of the Year in 2003, Sacramento Chapter, and the San Joaquin Council of Government Regional Excellence award in 2004.



STAGE I:
SITE SCREENING

- Is location appropriate for program objectives?
- Are soils appropriate for recharge?
- Are land uses compatible?
- Are water supplies available?
- Is property available?
- Are environmental impact mitigable?

STAGE 2:
FIELD INVESTIGATION

- Geology and soils data collection
- Land use/water conveyance - field confirmation
- Habitat issues - field inspection
- Aerial photo interpretation
- Groundwater conditions
- Confirm site history
- Confirm site suitability for recharge

STAGE 3:
SITE TESTING

- Monitoring well drilling and construction
- Baseline soil and water quality testing
- Site preparation
- Groundwater level monitoring
- Groundwater quality monitoring
- Conveyance water quality monitoring

STAGE 4:
LONG-TERM OPERATION & MAINTENANCE

- Continued management of recharge basins to maximize percolation

Stakeholder Outreach: Tapping Into Established Awareness

For many rural and family farmers in Eastern San Joaquin County, a reminder that groundwater levels continue to inch lower and lower arrives from PG&E.

Contained within the monthly electric bill, customers can track a well's energy consumption. If groundwater pumping hasn't changed, but the bill went up, then the water level must have dropped.

Tapping into this pocket-book reality has been a component of a proactive stakeholder outreach and involvement program conducted by the Program partners.

The main focus of outreach is to support communication among landowners to the issue of overdraft and rising pumping costs, and offer the Program as a viable solution. A particular focus has been to involve respected landowners in outreach activities.

Elements supporting this grassroots-oriented effort include:

- A comprehensive Program website (www.farmingtonprogram.org), including current and historical information, testimonials, and news articles.
- Informational materials distributed by mail, on-line and public counters.
- Program information kit tailored to participants, legislators, media and other interested parties.
- Comprehensive database of lands 20 acres and larger.
- An information booth at the Stockton Ag Expo, public meetings, and an active speakers bureau.
- Outreach to consumer and trade media outlets, including editorial board briefings.
- A water cost calculator for landowners (www.sewd.net) to determine the cost savings

November 2003 ribbon cutting ceremony for SEWD Recharge Basins

Farmington
Groundwater Recharge Program

A Program of

United States Army Core of Engineers

Stockton East Water District

Program Supporters

California Water Service Company
Central and South Delta Water Agencies
Central San Joaquin Water Conservation District
City of Lodi
City of Stockton
Ducks Unlimited
Natural Heritage Institute
North San Joaquin Water Conservation District
San Joaquin County
San Joaquin County Flood Control and Water Conservation District
San Joaquin Farm Bureau Federation
Woodbridge Irrigation District

ATTACHMENT H

Annual Water Quality Report

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ATTACHMENT H.1.

Annual Potable Water Quality – Urban

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2018

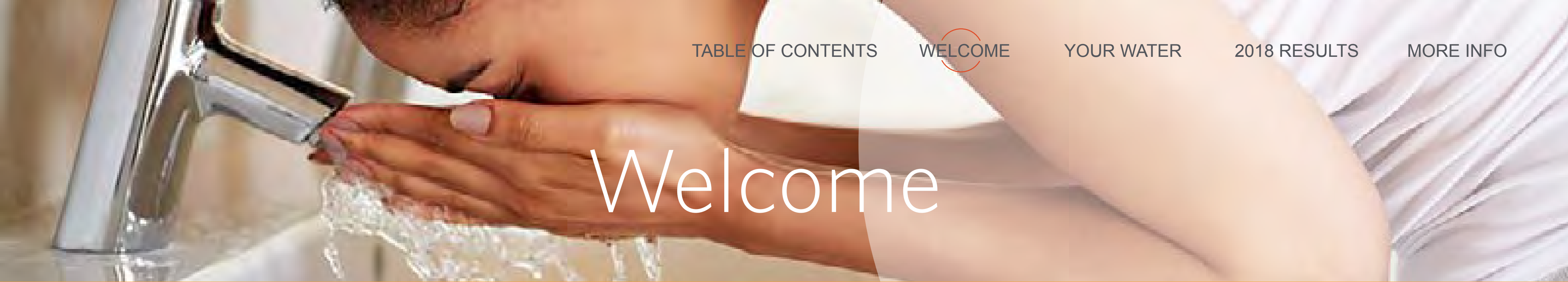
Water Quality Report

STOCKTON DISTRICT

Este informe contiene información muy importante sobre su agua potable.
Tradúzcalo o hable con alguien que lo entienda bien.

Quality. Service. Value.®

Table of Contents



Welcome

Since 1927, California Water Service (Cal Water) has been committed to providing quality, service, and value to our customers. Our highest priority is to deliver a reliable supply of water that meets all federal and state water quality standards, any and every time you turn on the tap. This means you don't have to wonder whether your water is safe to use and drink; we're dedicated to making sure it is.

In 2018, we conducted 428,037 tests on 66,551 water samples for 318 constituents. **W and secondary state and federal water quality standard last year.**

Ensuring that high-quality water is always available to you means maintaining and upgrading the infrastructure needed to move water from the source to your tap, and having expert professionals to assist you with both routine service needs and after-hours emergencies. Although the costs to obtain, treat, test, store, and deliver safe water continue to increase across the country, we work fordable — less than a penny per gallon in almost all of our service areas.

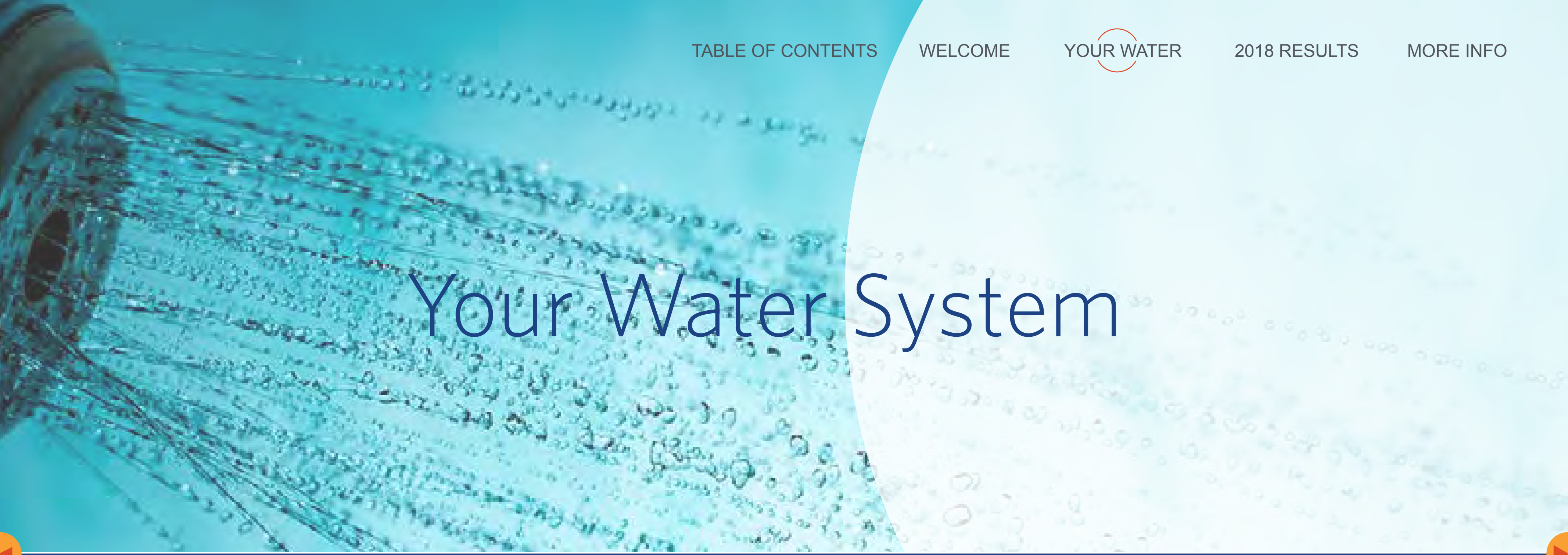
This annual water quality report details any constituents detected in your water supply in 2018 and shows how your water compares to federal and state water quality standards. It also highlights other current water quality issues and steps we take to protect your health and safety.

If you have any questions, you can contact us by phone, online at www.calwater.com, or in person at our local Customer Center. For important water service announcements, please visit our web site or watch for information in your monthly bill, and be sure your contact information is up to date by visiting ccu.calwater.com.

Sincerely,

Jeremiah Mecham, District Manager, Stockton District

[Stockton District 1505 East Sonora Street Stockton, CA 95205 (209) 547-7900]



Your Water System

Cal Water has provided high-quality water utility services in Stockton since 1927. To meet the needs of our customers, we use a combination of local groundwater and water purchased from the Stockton East Water District, which is obtained from the New Melones and New Hogan Reservoirs. The Stockton system includes 26 active wells, one well being prepared to go online, 16 booster pumps, and 13 storage tanks.

Our company-wide water quality assurance program includes vigilant monitoring throughout our systems and testing at our state-of-the-art laboratory. Additionally, we proactively maintain and upgrade our facilities to ensure a reliable, high-quality supply.

If you have any questions, suggestions, or concerns, please contact our local Customer Center, either by phone at (209) 547-7900 or through the Contact Us link at www.calwater.com.

USING WATER WISELY

As we await more information on the long-term water-use regulations from the State of California, it's important that we make

re that

we have enough water in dry years and for generations to come.

Cal Water has a robust water conservation program that includes rebates, kits, and other tools to help our customers save water. Visit www.calwater.com/conservation for details.

WATER QUALITY LABORATORY

Water professionals collect samples from throughout the water system for testing at our state-of-the-art water quality laboratory
stringent Environmental Laboratory Accreditation Program (ELAP). Scientists, chemists, and microbiologists test the water for 318 constituents with equipment so sensitive it can detect levels as low as one part per trillion. In order to maintain the ELAP
each year for every water quality test performed. Water quality test results are entered into our Laboratory Information Management System (LIMS), a sophisticated software program that enables us to react quickly to changes in water quality and analyze water quality trends in order to plan effectively for future needs.

CROSS-CONNECTION CONTROL

To ensure that the high-quality water we deliver is not compromised in the distribution system, Cal Water has a robust cross-connection control program in place. Cross-connection control is critical to ensuring that activities on customers' properties do not affect the public water supply. Our cross-connection

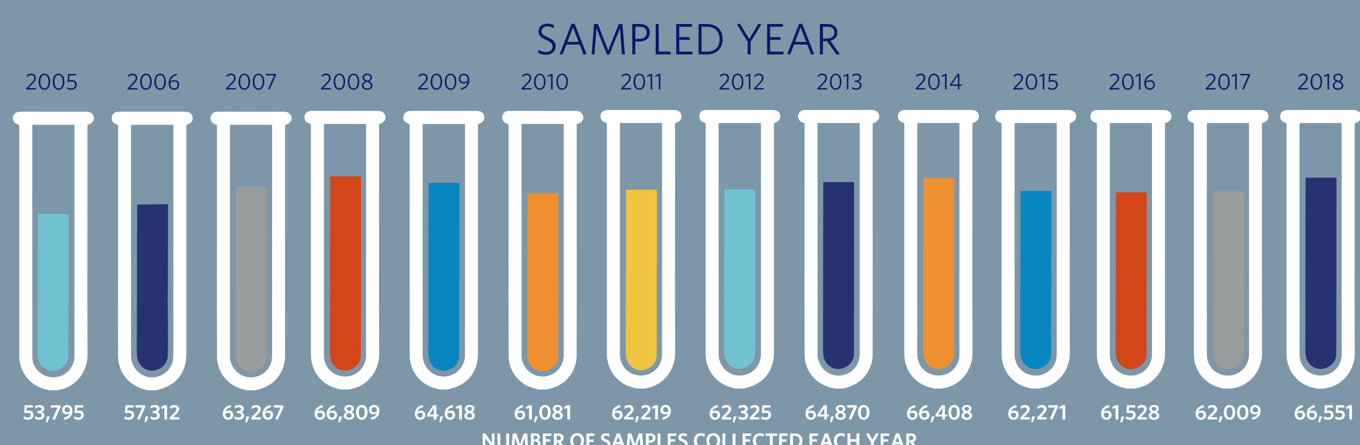
are tested annually, assess all non-residential connections, and enforce and manage the installation of new commercial and residential assemblies. Last year, our specialists oversaw installation of 2,243 new assemblies and testing of

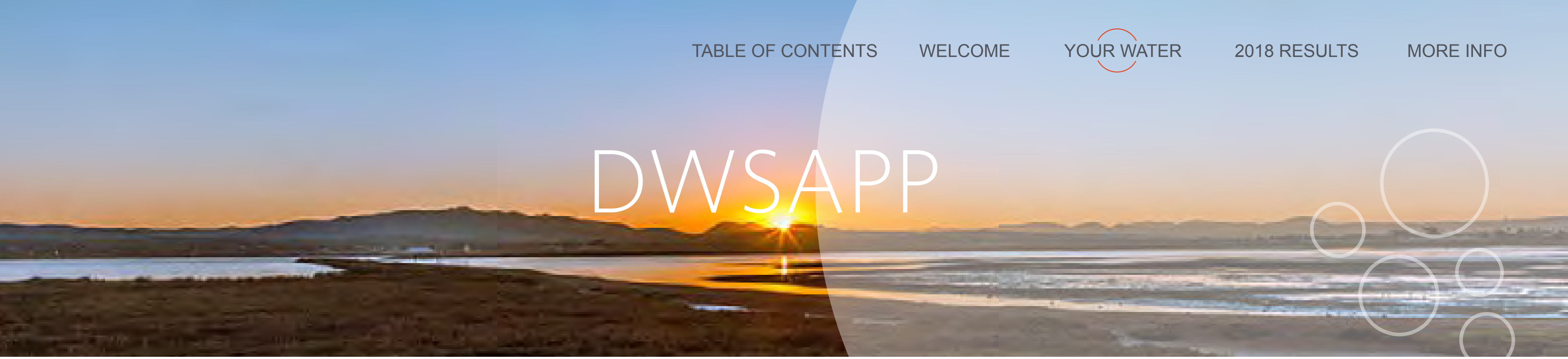
. A minor home improvement project can create a potentially hazardous situation, so careful adherence to plumbing codes and

standards will ensure the community's water supply remains safe. Please be

Many water use activities involve substances that, if allowed to enter the distribution system, would be aesthetically displeasing or could present health concerns. Some of the most common cross-connections are:

- Garden hoses connected to a hose bib without a simple hose-type vacuum breaker (available at a home improvement store)
- I
- L
  assembly installed on the supply line





DWSAPP

By the end of 2002, Cal Water had submitted to the Division of Drinking Water (DDW) a Drinking Water Source Assessment and Protection Program (DWSAPP) report for each water source in the water system. The DWSAPP

and pollution prevention efforts. All reports are available for viewing or copying at our Customer Center.

The water sources in your district are considered most vulnerable to the following activities associated with contaminants detected in the water supply:

- Sewer collection systems
- Agricultural drainage
- Irrigated crops
- Fertilizer/pesticide/herbicide applications
- Pesticide/fertilizer/petroleum storage and transfer areas
- Appliance/electronic repair
- Junk/scrap/salvage yards
- Machine shops
- M
- Golf courses
- Septic tanks
- Historic railroad right-of-ways
- Chemical/petroleum processing or storage
- Farm chemical distributor/ application service
- Farm machinery repair
- Automobile body and repair shops
- Fleet/truck/bus terminals
- Car washes
- Road right-of-ways
- Wells (water supply)
- Parks
- RV parks
- M
- Hospitals
- Lumber processing/manufacturing
- Electrical/electronic manufacturing
- Hardware/lumber/parts stores

The water sources are considered most vulnerable to the following activities, for which no associated contaminant has been detected:

- Gas stations
- Underground storage tanks
- Dry cleaners
- Railroad yards/maintenance/fueling areas
- Recreational areas (surface water source)
- Wells (agricultural)
- Photo processing/printing
- Storm drain discharge points

We encourage customers to join us in our efforts to prevent water pollution and protect our most precious natural resource.

2018 Results

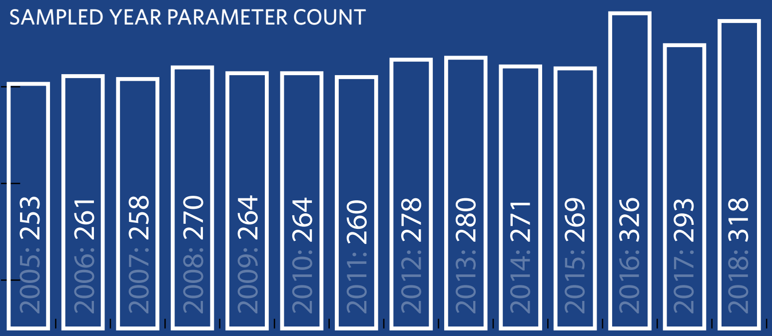
FLUORIDE

State law requires Cal W
is available to pay for it, and it is a practice endorsed by the American Medical Association and the American Dental Association to prevent tooth decay. In this
, and Cal Water doesn't add any to
the water supply. Show the table in this report to your dentist to see if he or she

found on the DDW web site at www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Fluoridation.html
visit us online at www.calwater.com.

NUMBER OF CONSTITUENTS TESTED ANNUALLY SINCE 2005

SAMPLED YEAR PARAMETER COUNT



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Water Hardness

Hardness is a measure of the magnesium, calcium, and carbonate minerals in the water. Water is considered **soft** if its hardness is less than 75 parts per million (ppm), **moderately hard** at 75 to 150 ppm, **hard** between 150 and 300 ppm, and **very hard** at 300 ppm or higher.

Hard water is generally not a health concern, but it can have an impact on how well soap

may also lead to mineral buildup in pipes or water heaters.

Some people with hard water opt to buy a water softener for aesthetic reasons. However, some water softeners add salt to the water, which can cause problems at wastewater treatment plants. Additionally, people on low-sodium diets should be aware that some water softeners increase the sodium content of the water.

For more information on water hardness, visit www.calwater.com/video/hardness**.**

Our testing equipment is so sensitive, it can detect mineral traces as small as 1 part per trillion.

That is equivalent to 1 penny in 1 billion dollars.

Possible Contaminants

All drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk.

More information about contaminants and potential health effects can be obtained by calling the United States Environmental Protection Agency (EPA) Safe Drinking Water Hotline at (800) 426-4791.

The sources of drinking water (both tap and bottled) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or human activity.

CONTAMINANTS THAT MAY BE PRESENT IN SOURCE WATER INCLUDE:

Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.

Inorganic contaminants, such as salts and metals, which can be naturally occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.

Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses.

Organic chemical contaminants, including synthetic and volatile organic chemicals, which are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural application, and septic systems.

Radioactive contaminants, which can be naturally occurring or the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, the EPA and DDW prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water, which must provide the same protection for public health.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immunocompromised people, such as those with cancer undergoing chemotherapy, those who have undergone organ transplants, and those with HIV/AIDS or other immune system disorders; some elderly people; and infants can be particularly at risk from infections. These people should seek advice from their health care providers about drinking water. EPA and Centers for Disease Control and Prevention (CDC) guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline.

About Lead

TESTING FOR LEAD IN SCHOOLS

The State of California now requires that all public schools built before 2010 test for lead in their drinking water by July 1, 2019. We are committed to supporting our school districts' efforts to protect students and ensure that the drinking water at their school sites are below lead limits. We have been working with school districts serving kindergarten through 12th grade to develop sampling plans, test samples, and conduct follow-up monitoring for corrective actions. We have published a summary of local school lead testing from the last year in this year's Water Quality report. For more information, please see our Testing for Lead in Schools web page.

As the issue of lead in water continues to be top of mind for many Americans, Cal Water wants to assure you about the quality of your water. We are compliant with health and safety codes mandating use of lead-free materials in water system replacements, repairs, and new installations. We have no known lead service lines in our systems. We test and treat (if necessary) water sources to ensure that the water delivered to customer meters meets all water quality standards and is not corrosive toward plumbing materials.

The water we deliver to your home meets lead standards, but what about your home's plumbing? In California, lead in drinking water comes primarily from materials and components used for in-home plumbing (for example, lead solder used

The lead and copper rule requires us to test water inside a representative number of homes that have plumbing most likely to contain lead and/or lead solder to determine the presence of lead and copper or an action level exceedance (AL). An action level is the concentration of a contaminant which, when exceeded, triggers corrective actions before it becomes a health concern. If action levels are exceeded, either at a customer's home or system-wide, we work with the customer to investigate the issue and/or implement corrosion control treatment to reduce lead levels.

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Cal Water is responsible for providing high-quality drinking water to our customers' meters, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the

If you are concerned about lead in your water, you may wish to have your water tested by a lab. More information about lead in drinking water can be found on the Safe Drinking Water Hotline or at www.epa.gov/safewater/lead.

In your system, results from our lead monitoring program, conducted in accordance with the Lead and Copper Rule, were below the action level for the presence of lead.

Key Definitions

MAXIMUM CONTAMINANT LEVEL (MCL)

The highest level of a contaminant that is allowed in drinking water. Primary MCLs protect public health and are set as close to the PHGs (or MCLGs) as are economically and technologically feasible. Secondary MCLs (SMCLs) relate to the odor, taste, and appearance of drinking water.

IN COMPLIANCE

Does not exceed any applicable primary MCL, secondary MCL, or action level, as determined by DDW. For some compounds, compliance is determined by averaging the results for one source over a one-year period.

REGULATORY ACTION LEVEL (AL)

The concentration of a contaminant which, if exceeded, triggers treatment or other required action by the water provider.

MAXIMUM CONTAMINANT LEVEL GOAL (MCLG)

The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the EPA.

MAXIMUM RESIDUAL DISINFECTANT LEVEL (MRDL)

The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

MAXIMUM RESIDUAL DISINFECTANT LEVEL GOAL (MRDLG)

The level of a drinking water disinfectant below which there is no known or

disinfectants to control microbial contaminants.

NOTIFICATION LEVEL (NL)

A health-based advisory level for an unregulated contaminant in drinking water. It is used by DDW to provide guidance to drinking water systems.

PRIMARY DRINKING WATER STANDARD (PDWS)

MCLs and MRDLs for contaminants that affect health, along with their monitoring, reporting, and water treatment requirements.

PUBLIC HEALTH GOAL (PHG)

The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency' Assessment without regard to cost or available detection and treatment technologies.

TREATMENT TECHNIQUE (TT)

A required process intended to reduce the level of a contaminant in drinking water.

Table Introduction

Cal Water tests your water for more than 140 regulated contaminants and dozens of unregulated contaminants. This table lists only those contaminants that were detected.

In the table, water quality test results are divided into four major sections: "Primary Drinking Water Standards," "Secondary Drinking Water Standards,"

Levels," and "Unregulated Compounds." Primary standards protect public health by limiting the levels of certain constituents in drinking water. Secondary standards are set for substances that don't impact health but could affect the water's taste, odor, or appearance. Some unregulated substances (hardness and sodium, for example) are included for your information. The State allows us to monitor for some contaminants less than once per year because the concentrations of these contaminants do not change frequently. Some of our data, though representative, are more than one year old.

SUBSTANCE SOURCES

BN	Banned nematocide that may still be present in soils due to runoff/leaching from former use on soybeans, cotton, vineyards, tomatoes, and tree fruit
CF	Discharge from industrial chemical factories
DI	Byproduct of drinking water disinfection
DS	Drinking water disinfectant added for treatment
EF	Discharge from electroplating factories, leather tanneries, wood preservation, chemical synthesis, refractory production, and textile manufacturing facilities
EN	Naturally present in the environment
ER	Erosion of natural deposits
FD	Discharge from factories, dry cleaners, and auto shops (metal degreaser)
FL	Water additive that promotes strong teeth; discharge from fertilizer and aluminum factories
FM	Primary component of some fumigants
FR	Runoff and leaching from fertilizer use; leaching from septic tanks and sewage
IA	Discharge from industrial and agricultural chemical factories; leaching from hazardous waste sites; used as cleaning and maintenance solvent, paint and varnish remover, and cleaning and degreasing agent; byproduct of production of other compounds and pesticides
IC	Internal corrosion of household plumbing systems
IM	Discharge from industrial manufacturers
IN	Runoff/leaching from insecticide used on cotton and cattle
IO	Substances that form ions when in water
IW	Industrial waste
MD	Discharge from metal-degreasing sites and other factories
OC	Runoff from orchards; glass and electronics production waste
OD	Discharges of oil-drilling waste and from metal
OM	Naturally occurring organic materials
PH	Inherent characteristic of water
RL	Runoff/leaching from natural deposits
SO	Soil runoff
SW	
VA	Various natural and manmade sources
WD	Leaching from wood preservatives
UR	Unregulated constituents with no source listed and that do not have standardized "source of substance" language

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2018 Water Quality

Primary Drinking Water Standards

						Groundwater		Surface Water[1]		
Microbiological	**Year Tested**	**Unit**	**MCL**	**PHG (MCLG)**	**In Compliance**	**Highest Monthly**		**Highest Monthly**		**Source**
Total coliform (systems with >40 samples/month) (total coliform rule)	2018	positive samples	5%	(0)	**Yes**	0		n/a		EN
Radiological	**Year Tested**	**Unit**	**MCL**	**PHG (MCLG)**	**In Compliance**	**Range**	**Average**	**Range**	**Average**	**Source**
Gross alpha particle activity	2010–2018	pCi/L	15	(0)	**Yes**	ND–8.6	2.70	n/a		ER
Uranium	2010–2018	pCi/L	20	0.43	**Yes**	ND–4.67	0.89	n/a		ER
Inorganic Chemicals	**Year Tested**	**Unit**	**MCL**	**PHG (MCLG)**	**In Compliance**	**Range**	**Average**	**Average**		**Source**
Arsenic[2]	2016–2018	ppb	10	0.004	**Yes**	ND–7	1.74	ND		ER, OC
Barium	2016–2018	ppm	1	2	**Yes**	ND–0.25	0.09	ND		ER, OD
Fluoride	2016–2018	ppm	2.0	1	**Yes**	ND–0.12	0.02	ND		ER, FL
Nitrate (as nitrogen)[3]	2016–2018	ppm	10	10	**Yes**	ND–7.77	1.33	ND		ER, FR
						Distribution System-Wide				
Lead and Copper	**Year Tested**	**Unit**	**AL**	**PHG (MCLG)**	**In Compliance**	**90th Percentile**		**Samples > AL**		**Source**
Copper	2018	ppm	1.3	0.3	**Yes**	ND		0 of 56		IC, ER, WD
Lead	2018	ppb	15	0.2	**Yes**	ND		0 of 56		IC, ER, IM
Schools that requested lead sampling in 2018: 48										

[1]Stockton East Water District (SEWD) supply data reported is from 2018. ater Data.

[2]While your drinking water meets the federal and state standards for arsenic, it does contain low levels of arsenic. The arsenic standards balance the current understanding of arsenic's possible health effects against the costs of removing arsenic from drinking water. The EPA continues to research the health effects of low levels of arsenic, which is a mineral known to cause cancer in humans at high concentrations and is linked to other health effects, such as skin damage and circulatory problems.

[3]The average nitrate level was 1.33 ppm, with a maximum level of 7.77 ppm. We are closely monitoring the nitrate levels. Nitrate in drinking water at levels above 10 ppm is a health risk for infants of less than six months of age. Such nitrate levels in drinking water can interfere with the capacity of the infant's blood to carry oxygen, resulting in a serious illness; symptoms include shortness of breath and blueness of the skin. Nitrate levels above 10 ppm may also af

2018 Water Quality

(Continued)

						Groundwater		Surface Water		
Volatile Organic Chemicals	**Year Tested**	**Unit**	**MCL**	**PHG (MCLG)**	**In Compliance**	**Range**	**Average**	**Range**	**Average**	**Source**
Tetrachloroethylene (PCE)	2016–2018	ppb	5	0.06	**Yes**	ND–0.73	0.18	n/a	n/a	FD
						Distribution System-Wide				
Disinfection Byproducts	**Year Tested**	**Unit**	**MCL**	**PHG (MCLG)**	**In Compliance**	**Range**		**Highest Annual Average**		**Source**
Haloacetic acids	2018	ppb	60	n/a	**Yes**	7.7–17		14.8		DI
Total trihalomethanes	2018	ppb	80	n/a	**Yes**	19–45.1		43		DI
						Distribution System-Wide				
Disinfectants	**Year Tested**	**Unit**	**MRDL**	**MRDLG**	**In Compliance**	**Range**		**Average**		**Source**
Chlorine	2018	ppm	4	4	**Yes**	0.11–1.69		0.64		DS
						Groundwater		Surface Water Only		
Surface Water—Turbidity and TOC	**Year Tested**	**Unit**	**MCL**	**PHG (MCLG)**	**In Compliance**	**Highest Level**	**Lowest Monthly Percent**	**Highest Level**	**Lowest Monthly Percent**	**Source**
Turbidity[4]	2018	NTU	TT	n/a	**Yes**	n/a	n/a	ND	0	SO
Total organic carbon[5]	2018	ppm	TT	n/a	**Yes**	n/a	n/a	3.3	1.0	VA

[4] Turbidity is a measure of the cloudiness of water. We monitor it because it is a good indicator of water quality. High turbidity can hinder the effectiveness of disinfectants.

[5] Total organic carbon (TOC) has no health effects; however, TOC provides a medium for the formation of disinfection byproducts. These byproducts include trihalomethanes and haloacetic acids. Drinking water containing these byproducts in excess of the MCL may lead to adverse health effects such as liver, kidney, or nervous system problems, and may lead to an increased risk of cancer. Concerns regarding disinfection byproducts are based upon exposure over many years.

2018 Water Quality

(Continued)

Secondary Drinking Water Standards

Inorganic Chemicals	Year Tested	Unit	SMCL	PHG (MCLG)	In Compliance	Groundwater Range	Groundwater Average	Surface Water Average	Source
Iron[6]	2016–2018	ppb	300	n/a	**Yes**	ND–440	7.46	ND	RL, IW
Manganese	2016–2018	ppb	50	n/a	**Yes**	ND–31.81	3	ND	RL
Turbidity (groundwater)	2016–2018	Units	5	n/a	**Yes**	ND–1.8	0.35	ND	SO
Zinc	2016–2018	ppm	5	n/a	**Yes**	ND–0.09	ND	ND	RL, IW
Total dissolved solids	2016–2018	ppm	1000	n/a	**Yes**	190–400	269.33	n/a	RL
	2016–2018	μS/cm	1600	n/a	**Yes**	250–570	407.86	84	SW, IN
Chloride	2016–2018	ppm	500	n/a	**Yes**	6.9–100	20.80	3	RL, SW
Sulfate	2016–2018	ppm	500	n/a	**Yes**	2.2–30	16.69	12.5	RL, IW

State-Regulated Contaminants with Notification Levels

Chemical	Year Tested	Unit	NL	PHG (MCLG)	In Compliance	Groundwater Range	Groundwater Average	Surface Water Average	Source
Hexavalent chromium[7]	2016–2018	ppb	n/a	n/a	**Yes**	ND–7.9	2.52	n/a	ER, EF
Manganese	2016–2018	ppb	500	n/a	**Yes**	ND–31.81	3.00	ND	UR
Vanadium	2016–2018	ppb	50	n/a	**Yes**	ND–41.49	15.76	ND	UR

[6]The SMCL for iron is 300 ppb. The average for the water system was 7.46 ppb, which is below the SMCL. The average is calculated by taking the running average of four consecutive quarters for the year. If any samples are collected in the distribution above the SMCL, DDW requires us to provide written notice to our customers.

[7]There is currently no MCL for hexavalent chromium. The previous MCL of 0.010 mg/L was withdrawn on September 11, 2017. The State still recommends that any hexavalent chromium results above the detection limit of 1 ppb be reported.

2018 Water Quality

(Continued)

Unregulated Compounds

Inorganic Chemicals	Year Tested	Unit	MCL	PHG (MCLG)	In Compliance	Groundwater Range	Groundwater Average	Surface Water Average	Source
Calcium	2016–2018	ppm	n/a	n/a	**Yes**	5.48–50	19.30	5	ER
Magnesium	2016–2018	ppm	n/a	n/a	**Yes**	1.83–26	8.22	2	ER
Molybdenum	2016–2018	ppb	n/a	n/a	**Yes**	0.18–0.84	0.54	n/a	ER
Strontium	2016–2018	ppb	n/a	n/a	**Yes**	120–680	416.67	n/a	ER
pH	2016–2018	Units	n/a	n/a	**Yes**	6.84–8.68	7.71	7.9	PH
Hardness	2016–2018	ppm	n/a	n/a	**Yes**	41–230	157.07	20.7	ER
Sodium	2016–2018	ppm	n/a	n/a	**Yes**	5.61–40.89	18.91	6	ER

Thank you.

Thanks for taking the time to learn more about your water quality! Even more information awaits you at **www.calwater.com.**
Visit our web site to get information about your account, water use history, water rates, and water system.

Y

- Conservation resources
- Lead in water
- Water treatment and disinfection
- Protecting the water supply

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Drinking Water Quality Report

January 2018 – December 2018 Dated: May 2019

2018 Drinking Water Quality Report

The City of Stockton has prepared its annual Drinking Water Quality Report to inform our customers and the community about the quality of drinking water the City delivers every day. We provide high-quality drinking water, which meets all State and Federal drinking water standards. This report includes a detailed water quality summary, monitoring and testing results, as well as the steps we take to protect health and safety. The report provides information required by law, as well as other useful and informative data.

The Science of Water

Drinking water sources (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

Microbial contaminants, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.

Inorganic contaminants, such as salts and metals, that can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.

Pesticides and herbicides, that may come from a variety of sources, such as agriculture, urban stormwater runoff, and residential uses.

Organic chemical contaminants, including synthetic and volatile organic chemicals that are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural application, and septic systems.

Radioactive contaminants, either naturally-occurring or resulting from oil and gas production and mining activities.

About Your Water

• • •

To meet the needs of our customers, the City of Stockton uses a combination of the following sources:

Surface water diverted from the **Sacramento San Joaquin Delta** and treated at the City's Delta Water Treatment Plant (DWTP)

Surface water from the **Mokelumne River** purchased from Woodbridge Irrigation District and treated at the City's DWTP

Local **groundwater** from wells owned and operated by the City

Treated water purchased from the Stockton East Water District (SEWD), which is imported from the **New Melones (Stanislaus River)** and **New Hogan (Calaveras River) Reservoirs**

Did You Know?

• • •

In 2018, the City of Stockton delivered **9 billion gallons** of water to more than **48,000** service connections, serving about **177,000 people**.

Este informe contiene información muy importante sobre su agua potable. Tradúzcalo o hable con alguien que lo entienda bien.

In order to ensure that tap water is safe to drink, the U.S. Environmental Protection Agency (USEPA) and the State Water Resources Control Board (State Board) prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. State Board1 regulations also establish limits for contaminants in bottled water that provide the same protection for public health. The U.S. Food and Drug Administration regulations and California law also establish limits for contaminants in bottled water that provide the same protection for public health. For additional bottled water information, visit the California Department of Public Health website: https://www.cdph.ca.gov/Programs/CEH/DFDCS/Pages/FDBPrograms/FoodSafetyProgram/Water.aspx

Drinking Water Safety and Your Health

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the U.S. EPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as cancer patients undergoing chemotherapy, individuals who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek drinking water advice from their health care providers. U.S. EPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water derives primarily from materials and components associated with service lines and home plumbing. The City of Stockton is responsible for providing high quality drinking water but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you do so, you may wish to collect the flushed water and reuse it for another beneficial purpose, such as watering plants. If you are concerned about lead in your water, you may wish to have it tested. Information about lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/lead.

Drinking Water Source Assessment & Protection Program (DWSAPP)

Drinking Water Source Assessments for the Water System were completed in 2001 and 2012. The sources are considered most vulnerable to the following activities, which are associated with contaminants detected in the water supply: urban stormwater; septic tanks and sewage spills; dredging; mining; construction; metal plating; electronics manufacturing; National Pollution Discharge Elimination System (NPDES) permitting discharges; dairy waste and agricultural operations. The sources are considered most vulnerable to the following activities, which are not associated with contaminants detected in the water supply: illegal activities/dumping; recreation; lagoons; leaking underground storage tanks; vehicle fueling, and maintenance and chemical/petroleum/plastics processing and storage. You may request assessment summaries by contacting Tahir Mansoor (State Water Resources Control Board) at (209) 948-7696.

How to Read the Water Quality Table

The City of Stockton tests your water for several regulated and unregulated contaminants. This table lists only those contaminants that were detected. In the table, water quality test results are divided into three main sections: "**Primary Drinking Water Standards," "Secondary Drinking Water Standards,"** and **"Unregulated Compounds."** Primary standards protect public health by limiting levels of certain constituents in drinking water. Secondary standards are set for substances that could affect the water's taste, odor or appearance. Unregulated substances are listed for your information. Data in the table represents sampling from 2016 through 2018, unless otherwise noted.

[1] In a previous rulemaking, "Department" was inadvertently changed to "State Board." The mandatory language will be updated as follows in a future rulemaking, and water systems may use this language in their CCRs in the interim: "*The U.S. Food and Drug Administration regulations and California law also establish limits for contaminants in bottled water that provide the same protection for public health.*" Additional information on bottled water is available on California Department of Public Health's website at https://www.cdph.ca.gov/Programs/CEH/DFDCS/Pages/FDBPrograms/FoodSafetyProgram/Water.aspx.

Drinking Water Quality Table

Primary Drinking Water Standards				Groundwater		Surface Water			
Constituent	Units	Primary MCL	PHG (MCLG)	Range	Average	Delta Water Treatment Plant (DWTP) Average	Stockton East Water District (SEWD) Average	Meets Regulation ?	Source of Constituent
Arsenic [1]	µg/L	10	0.004	3.0 – 5.7	4.5	< 2.0	< 2.0	Yes	Erosion of natural deposits; runoff from orchards, and electronics production wastes
Barium	mg/L	1	2	0.14 – 0.24	0.18	< 0.10	< 0.10	Yes	Erosion of natural deposits
Chromium, Total	µg/L	10	50	< 10 – 10	< 10	< 10	< 10	Yes	Discharge from electroplating facilities; erosion of natural deposits.
Fluoride	mg/L	2.0	1	< 0.10 – 0.20	< 0.10	< 0.10	< 0.10	Yes	Erosion of natural deposits
Nitrate (as N) [2]	mg/L	10	10	1.5 – 4.3	2.6	< 0.4	< 0.4	Yes	Runoff/leaching from fertilizer use; leaching from septic tanks and sewage; erosion of natural deposits
1,2,3-Trichloropropane	µg/L	0.005 [3]	0.0007	< 0.005 – 0.006	< 0.005	NR	NR	Yes	Discharge from industrial and agricultural chemical factories; leaching from hazardous waste sites; used as cleaning and maintenance solvent, paint and varnish remover, and cleaning and degreasing agent; byproduct during the production of other compounds and pesticides.
Alpha Activity, Gross [4]	pCi/L	15	(0)	4.42 – 7.11	5.58	NR	NR	Yes	Erosion of natural deposits
Uranium [4]	pCi/L	20	0.43	1.64 – 5.40	3.53	NR	NR	Yes	Erosion of natural deposits

FOOTNOTES

(1) While your drinking water meets federal and state standards for arsenic, it does contain low levels of arsenic. The arsenic standard balances the current understanding of arsenic's possible health effects against the costs of removing arsenic from drinking water. The USEPA continues to research the health effects of low levels of arsenic, which is a mineral known to cause cancer in humans at high concentrations and is linked to other health effects such as skin damage and circulatory problems.

(2) Nitrate in drinking water at levels above 10 mg/L is a health risk for infants of less than six months of age. Such nitrate levels in drinking water can interfere with the capacity of the infant's blood to carry oxygen, resulting in a serious illness; symptoms include shortness of breath and blueness of the skin. Nitrate levels above 10 mg/L may also affect the ability of the blood to carry oxygen in other individuals, such as pregnant women and those with certain specific enzyme deficiencies. If you are caring for an infant, or are pregnant, seek advice from your health care provider.

(3) Compliance is based on the quarterly Running Average. The highest level reported in the range is the result of an individual sample.

(4) The compliance cycle for monitoring this constituent can vary from three to nine years; some data may be from before 2016.

Drinking Water Quality Table

Primary Drinking Water Standards				Surface Water					
				DWTP		SEWD			
	Units	MCL	PHG (MCLG)	Highest Level	Lowest Monthly % (1)	Highest Level	Lowest Monthly % (2)	Meets Regulation?	Source of Constituent
Turbidity	NTU	TT	N/A	0.08	100	0.11	97	Yes	Soil runoff
		MCL	MCLG	Distribution System				Meets	
	Units	(MRDL)	(MRDLG)	Range		Average		Regulation?	Source of Constituent
Total Coliform Bacteria	% positive samples	5% (3)	0	0 – 0.7		0.2		Yes	Naturally present in the environment
Total Chlorine as Cl_2	mg/L	(4.0)	(4.0)	0.0 – 3.40		1.88		Yes	Drinking water disinfectant added for treatment
Free Chlorine as Cl_2	mg/L	(4.0)	(4.0)	0.01 – 1.17		0.60		Yes	Drinking water disinfectant added for treatment
Total Trihalomethanes (TTHM)	µg/L	80	N/A	14.0 – 70.0 (4)		48.5		Yes	Byproduct of drinking water disinfection
Haloacetic Acids 5 (HAA5)	µg/L	60	N/A	6.4 – 45.0 (4)		27.5		Yes	Byproduct of drinking water disinfection
	Units	Action Level (AL)	PHG	Level Detected at the 90th percentile		Samples exceeding the AL		Meets Regulation?	Source of Constituent
Copper (5)	mg/L	1.3	0.3	0.110		0 of 52		Yes	Internal corrosion of household plumbing systems
Lead (5)	µg/L	15	0.2	< 5		0 of 52		Yes	Internal corrosion of household plumbing systems

FOOTNOTES

(1) For surface water systems, the Treatment Technique requires that each month the turbidity level of the filtered water for membrane filtration facilities is less than or equal to 0.1 NTU in 95% of the measurements. It also shall not exceed 1.0 NTU at any time. Turbidity is a measure of the cloudiness of the water. It is monitored as a good indicator of the of the filtration system's effectiveness.
(2) For surface water systems, the Treatment Technique requires that each month the turbidity level of the filtered water is less than or equal to 0.3 NTU in 95% of the measurements and shall not exceed 1.0 NTU at any time. Turbidity is a measure of the cloudiness of the water. It is monitored as a good indicator of the filtration system's effectiveness.
(3) Presence of coliform bacteria in no more than 5% of monthly samples.
(4) Compliance is based on the quarterly Locational Running Annual Average (LRAA). The highest level reported in the range is the result of an individual sample.
(5) Lead and Copper are required to be monitored every three years. This data is from 2017. During 2018, 17 schools requested the City to provide lead sampling.

Drinking Water Quality Table

Secondary Drinking Water Standards			Groundwater		Surface Water				
					DWTP		SEWD		
Constituent	Units	MCL	Range	Average	Range	Average	Range	Average	Source of Constituent
Chloride	mg/L	500	14 – 19	17		11		3	Runoff/leaching from natural deposits; seawater influence
Color	units	15	ALL < 3	< 3	< 5 – 15	< 3		< 5	Naturally-occurring organic materials
Manganese	µg/L	50	< 20 – 27	< 20	ALL < 20	< 20		< 20	Leaching from natural deposits
Odor	units	3	< 1 – 2	< 1	< 1 – 2	< 1		2	Naturally-occurring organic materials
Specific Conductance	µS/cm	1,600	355 – 708	476	54 – 437	196	75 – 250	101	Substances that form ions when in water; seawater influence
Sulfate	mg/L	500	17.6 – 34.3	25		4.6		12.5	Runoff/leaching from natural deposits; industrial wastes
Total Dissolved Solids	mg/L	1,000	270 – 460	341	39 – 250	119	44 – 151	65	Runoff/leaching from natural deposits
Turbidity	NTU	5	0.10 – 0.20	0.12		0.13		< 0.10	Runoff/leaching from natural deposits; industrial wastes

Unregulated Compounds		Groundwater		Surface Water	
				DWTP	SEWD
Constituent	Units	Range	Average	Average	Average
Total Hardness (as $CaCO_3$) (1)	mg/L	180 – 204	191	30	21
Hexavalent Chromium (2)	µg/L	< 1.0 – 6.7	3.9	< 1.0	NR
Sodium	mg/L	15 – 20	18	11	6
Vanadium	µg/L	16 – 28	22	< 3.0	< 3.0

Other Compounds		Groundwater		Surface Water	
				DWTP	SEWD
Constituent	Units	Range	Average	Average	Average
Total Alkalinity	mg/L	150 – 190	164	33	20
Calcium	mg/L	40 – 51	45	7.0	5.0
Magnesium	mg/L	14 – 23	19	3.1	2.0
Potassium	mg/L	4.7 – 6.0	5.1	< 1	< 1

FOOTNOTES
(1) Conversion: Hardness (grains per gallon) = Hardness as $CaCO_3$ (mg/L) multiplied by 0.0584
(2) There is currently no MCL for hexavalent chromium. The previous MCL of 10 µg/L was withdrawn on September 11, 2017.

Drinking Water Quality Table

Unregulated Contaminant Monitoring Rule (UCMR3) Contaminants Monitored in 2015 [(1),(2)]		Groundwater		Surface Water - DWTP	
Constituent	Units	Range	Average	Range	Average
Chromium, Total	µg/L	< 0.20 – 6.3	4.4	< 0.20 – 3.2	0.85
Hexavalent Chromium	µg/L	0.049 – 6.6	4.4	< 0.030 – 0.061	0.043
Molybdenum	µg/L	< 1.0 – 1.2	< 1.0	< 1.0 – 1.6	1.0
Strontium	µg/L	160 – 590	452	48 – 260	167
Vanadium	µg/L	2.9 – 29	23	0.60 – 2.8	1.7
Chlorate	µg/L	< 20 – 310	31	94 – 440	223

FOOTNOTES

(1) Once every five years, the U.S. Environmental Protection Agency (EPA) issues a list of *unregulated* contaminants to be monitored by public water systems. The UCMR provides the EPA and other interested parties with scientifically valid data on the occurrence of certain contaminants in drinking water. An MCL for these contaminants listed above does not exist. The UCMR program examines what is in the drinking water, but additional health information is needed to know whether these contaminants pose a health risk. Further information on UCMR3 can be found at https://www.epa.gov/dwucmr/fact-sheets-about-third-unregulated-contaminant-monitoring-rule-ucmr-3, or contact the Safe Drinking Water Hotline (1-800-426-4791).

(2) Of the 30 unregulated contaminants tested for in UCMR3, only 6 were detected in the drinking water produced in 2018.

Key:

< – Less than
mg/L – Milligrams per Liter
µg/L – Micrograms per Liter
µS/cm – Micro-siemens per centimeter
ng/L - Nanograms per Liter
pCi/L – Picocuries per Liter
NTU – Nephelometric Turbidity Unit
N/A – Not Applicable
NR – Testing not required

Definitions

(AL) – Regulatory Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow.

(MCL) – Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. **Primary** MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. **Secondary** MCLs are set to protect the odor, taste and appearance of drinking water.

(MCLG) – Maximum Contaminant Level Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency.

(MRDL) – Maximum Residual Disinfectant Level: The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

(MRDLG) – Maximum Residual Disinfectant Level Goal: The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

(PDWS) – Primary Drinking Water Standard: MCLs and MRDLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

(PHG) – Public Health Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

(TT) – Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

For additional questions regarding this Report, please contact: Eric Houston (209) 937-7455 or eric.houston@stocktonca.gov
For additional paper copies, please call (209) 937-7031 • To view electronically, visit www.stocktongov.com/files/ccr.pdf

Water is a Precious Resource. Use Wisely!

The City of Stockton is committed to conserving water, an important resource with limited supply. The Water Conservation Program works year-round to increase water conservation and raise awareness about programs and services available to customers within the City's water service. Residential customers may be eligible for free water use surveys. For more information, call 1-866-STOKWTR (1-866-786-5987) or visit www.stocktongov.com/mud.

Este informe contiene información muy importante sobre su agua potable.
Tradúzcalo o hable con alguien que lo entienda bien.

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ATTACHMENT H.2.

Annual Irrigation Water Quality Results - Agricultural

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FGL
ENVIRONMENTAL AGRICULTURAL
Analytical Chemists

INORGANIC CHEMICALS ANALYSIS

Date of Report	:	July 16, 2018	Sample ID	:	STK1838732-001
Laboratory Name	:	**FGL Environmental**	Approved By **Kelly A. Dunnahoo, B.S.**		Digitally signed by Kelly A. Dunnahoo, B.S. Title: Laboratory Director Date: 2018-07-16
Sampled On	:	06/20/2018-07:35			
Received On	:	06/20/2018-08:20	Sampler	:	Ed Morley
Completed On	:	06/25/2018	Employed By	:	Stockton East Water

System Name : STOCKTON EAST WATER DISTRICT Number : 3910006-005 **EDT**

Name Or Number of Sample Source : CALAVERAS RIVER AT BELLOTA - RAW

User ID	:	PTA	Station Number	:	3910006-005
Date/Time of Sample	:	1806200735 YYMMDDTTTT	Laboratory Code	:	5 8 6 7
Submitted By	:	**FGL Environmental**	Phone #	:	(805) 392-2000

ADDITIONAL INORGANIC

MCL	UNITS	CHEMICALS	ENTRY	RESULT	DLR
6	ug/L	Perchlorate	A-031	ND	4

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR

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ENVIRONMENTAL FGL AGRICULTURAL
Analytical Chemists

INORGANIC CHEMICALS ANALYSIS

Date of Report : July 20, 2018 Sample ID : STK1838731-001

Laboratory Name : **FGL Environmental** Approved By **Kelly A. Dunnahoo, B.S.** Digitally signed by Kelly A. Dunnahoo, B.S. Title: Laboratory Director Date: 2018-07-20

Sampled On : 06/20/2018-07:35

Received On : 06/20/2018-08:20 Sampler : Ed Morley

Completed On : 07/09/2018 Employed By : Stockton East Water

System Name : STOCKTON EAST WATER DISTRICT Number : 3910006-005 **EDT**

Name Or Number of Sample Source : CALAVERAS RIVER AT BELLOTA - RAW

User ID : PTA Station Number : 3910006-005

Date/Time of Sample : 1806200735 Laboratory Code : 5 8 6 7

YYMMDDTTTT

Submitted By : **FGL Environmental** Phone # : (805) 392-2000

GENERAL MINERAL & PHYSICAL

MCL	UNITS	CHEMICALS	ENTRY	RESULT	DLR
	mg/L	Total Hardness (as CaCO3)	00900	64.6	1
	mg/L	Calcium (Ca)	00916	16	1
	mg/L	Magnesium (Mg)	00927	6	1
	mg/L	Sodium (Na)	00929	5	1
	mg/L	Potassium (K)	00937	2	1
	meq/L	Total Cations		1.6	
	mg/L	Total Alkalinity (as CaCO3)	00410	60	10
	mg/L	Hydroxide (OH)	71830	ND	10
	mg/L	Carbonate (CO3)	00445	ND	10
	mg/L	Bicarbonate (HCO3)	00440	80	10
* 2	mg/L	Sulfate (SO4)	00945	10.4	0.5
* 2	mg/L	Chloride (Cl)	00940	4	1
45	mg/L	Nitrate (NO3)	71850	ND	2
2	mg/L	Fluoride (F)	00951	ND	0.1
	meq/L	Total Anions		1.6	
	Std Units	pH	00403	8.3	
** 2	umhos/cm2	Specific Conductance (E.C.)	00095	165	1
*** 2	mg/L	Total Filterable Residue	70300	60	40
15	Units	Apparent Color (Unfiltered)	00081	10	5
3	TON	Odor Threshold at 60 °C	00086	2	1

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR
[2] Indicates Secondary Drinking Water Standards(Recommended-Upper-Short Term) * 250-500-600 ** 900-1600-2200 *** 500-1000-1500

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GENERAL MINERAL & PHYSICAL

MCL	UNITS	CHEMICALS	ENTRY	RESULT	DLR
5	NTU	Lab Turbidity	82079	0.7	0.1
0.5 [2]	mg/L	MBAS	38260	ND	0.05

REGULATED INORGANIC

MCL	UNITS	CHEMICALS	ENTRY	RESULT	DLR
1000	ug/L	Aluminum	01105	ND	50
6	ug/L	Antimony	01097	ND	6
10	ug/L	Arsenic	01002	ND	2
1000	ug/L	Barium	01007	ND	100
4	ug/L	Beryllium	01012	ND	1
5	ug/L	Cadmium	01027	ND	1
50	ug/L	Chromium (Total Cr)	01034	ND	10
1000 [2]	ug/L	Copper	01042	ND	50
300 [2]	ug/L	Iron	01045	ND	100
15	ug/L	Lead	01051	ND	5
50 [2]	ug/L	Manganese	01055	ND	20
2	ug/L	Mercury	71900	ND	1
100	ug/L	Nickel	01067	ND	10
50	ug/L	Selenium	01147	ND	5
100 [2]	ug/L	Silver	01077	ND	10
2	ug/L	Thallium	01059	ND	1
	ug/L	Zinc	01092	ND	50

ADDITIONAL INORGANIC

MCL	UNITS	CHEMICALS	ENTRY	RESULT	DLR
---	ug/L	Boron	01020	ND	100
		Langelier Index at 20 °C	71814	-0.07	
10	mg/L	Nitrate as N (Nitrogen)	00618	ND	0.4
10	mg/L	Nitrate + Nitrite as N	A-029	ND	0.2
1	mg/L	Nitrite as N (Nitrogen)	00620	ND	0.4
---	ug/L	Vanadium	01087	ND	3
		Aggressiveness Index	82383	11.7	

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR
[2] Indicates Secondary Drinking Water Standards(Recommended-Upper-Short Term)

ENVIRONMENTAL FGL AGRICULTURAL
Analytical Chemists

ORGANIC CHEMICALS ANALYSIS

Date of Report : February 01, 2018
Sample ID : STK1831029-001
Laboratory Name : **FGL Environmental**
Approved By **Kelly A. Dunnahoo, B.S.** Digitally signed by Kelly A. Dunnahoo, B.S. Title: Laboratory Director Date: 2018-02-01
Sampled On : 01/18/2018-11:15
Received On : 01/18/2018-14:45
Completed On : 01/25/2018
Sampler : Ed Morley
Employed By : Stockton East Water

System Name : STOCKTON EAST WATER DISTRICT Number : 3910006-005 **EDT**

Name Or Number of Sample Source : CALAVERAS RIVER AT BELLOTA - RAW

User ID : PTA
Station Number : 3910006-005
Date/Time of Sample : 1801181115
YYMMDDTTTT
Laboratory Code : 5 8 6 7
Submitted By : **FGL Environmental**
Phone # : (805) 392-2000

REGULATED ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
524MTC	1,2,3-Trichloropropane	77443	ND	0.005	0.005

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR

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ORGANIC CHEMICALS ANALYSIS

Date of Report	:	May 01, 2018	Sample ID	:	STK1835063-001
Laboratory Name	:	**FGL Environmental**	Approved By **Kelly A. Dunnahoo, B.S.** Digitally signed by Kelly A. Dunnahoo, B.S. Title: Laboratory Director Date: 2018-05-01		
Sampled On	:	04/18/2018-09:40			
Received On	:	04/18/2018-14:00	Sampler	:	Ed Morley
Completed On	:	04/20/2018	Employed By	:	Stockton East Water

System Name : STOCKTON EAST WATER DISTRICT Number : 3910006-005 **EDT**

Name Or Number of Sample Source : CALAVERAS RIVER AT BELLOTA - RAW

User ID	:	PTA	Station Number	:	3910006-005
Date/Time of Sample	:	1804180940 YYMMDDTTTT	Laboratory Code	:	5 8 6 7
Submitted By	:	**FGL Environmental**	Phone #	:	(805) 392-2000

REGULATED ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
SRL524	1,2,3-Trichloropropane	77443	ND	0.005	0.005

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR

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Analytical Chemists

ORGANIC CHEMICALS ANALYSIS

Date of Report : August 13, 2018
Sample ID : STK1850296-001
Laboratory Name : **FGL Environmental**
Approved By **Kelly A. Dunnahoo, B.S.** Digitally signed by Kelly A. Dunnahoo, B.S. Title: Laboratory Director Date: 2018-08-13
Sampled On : 07/18/2018-08:40
Received On : 07/18/2018-14:40
Sampler : Ed Morley
Completed On : 08/01/2018
Employed By : Stockton East Water

System Name : STOCKTON EAST WATER DISTRICT Number : 3910006-005 **EDT**

Name Or Number of Sample Source : CALAVERAS RIVER AT BELLOTA - RAW

User ID : PTA
Station Number : 3910006-005
Date/Time of Sample : 1807180840 YYMMDDTTTT
Laboratory Code : 5 8 6 7
Submitted By : **FGL Environmental**
Phone # : (805) 392-2000

REGULATED ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
SRL524	1,2,3-Trichloropropane	77443	ND	0.005	0.005

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR

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CA ELAP Certification No. 2810

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Analytical Chemists

ORGANIC CHEMICALS ANALYSIS

Date of Report : September 05, 2018 Sample ID : STK1851823-001

Laboratory Name : **FGL Environmental** Approved By **Kelly A. Dunnahoo, B.S.** Digitally signed by Kelly A. Dunnahoo, B.S. Title: Laboratory Director Date: 2018-09-05

Sampled On : 08/15/2018-11:30

Received On : 08/15/2018-13:25 Sampler : Ed Morley

Completed On : 08/21/2018 Employed By : Stockton East Water

System Name : STOCKTON EAST WATER DISTRICT Number : 3910006-005 **EDT**

Name Or Number of Sample Source : CALAVERAS RIVER AT BELLOTA - RAW

User ID : PTA Station Number : 3910006-005

Date/Time of Sample : 1808151130 Laboratory Code : 5 8 6 7

YYMMDDTTTT

Submitted By : **FGL Environmental** Phone # : (805) 392-2000

REGULATED ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
524.2	Bromodichloromethane	32101	ND	---	1
524.2	Bromoform	32104	ND	---	1
524.2	Chloroform (Trichloromethane)	32106	ND	---	1
524.2	Dibromochloromethane	32105	ND	---	1
524.2	Total Trihalomethanes (THM'S/TTHM)	82080	ND	80	
524.2	Benzene	34030	ND	1	0.5
524.2	Carbon Tetrachloride	32102	ND	0.5	0.5
524.2	1,2-Dichlorobenzene (o-DCB)	34536	ND	600	0.5
524.2	1,4-Dichlorobenzene (p-DCB)	34571	ND	5	0.5
524.2	1,1-Dichloroethane (1,1-DCA)	34496	ND	5	0.5
524.2	1,2-Dichloroethane (1,2-DCA)	34531	ND	0.5	0.5
524.2	1,1-Dichloroethylene (1,1-DCE)	34501	ND	6	0.5
524.2	cis-1,2-Dichloroethylene	77093	ND	6	0.5
524.2	trans-1,2-Dichloroethylene	34546	ND	10	0.5
524.2	Dichloromethane (Methylene Chloride)	34423	ND	5	0.5
524.2	1,2-Dichloropropane	34541	ND	5	0.5
524.2	Total 1,3-Dichloropropene	34561	ND	0.5	0.5
524.2	Ethyl Benzene	34371	ND	300	0.5
524.2	Monochlorobenzene (Chlorobenzene)	34301	ND	70	0.5
524.2	Styrene	77128	ND	100	0.5

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR

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REGULATED ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
524.2	1,1,2,2-Tetrachloroethane	34516	ND	1	0.5
524.2	Tetrachloroethylene (PCE)	34475	ND	5	0.5
524.2	Toluene	34010	ND	150	0.5
524.2	1,2,4-Trichlorobenzene	34551	ND	5	0.5
524.2	1,1,1-Trichloroethane (1,1,1-TCA)	34506	ND	200	0.5
524.2	1,1,2-Trichloroethane (1,1,2-TCA)	34511	ND	5	0.5
524.2	Trichloroethylene (TCE)	39180	ND	5	0.5
524.2	Trichlorofluoromethane (Freon 11)	34488	ND	150	5
524.2	Trichlorotrifluoroethane (Freon 113)	81611	ND	1200	10
524.2	Vinyl Chloride (VC)	39175	ND	0.5	0.5
524.2	Total Xylenes (m,p & o)	81551	ND	1750	0.5
524.2	Methyl tert-Butyl Ether (MTBE)	46491	ND	13	3.0
524.2	cis-1,3-Dichloropropene	34704	ND	0.5	0.5
524.2	trans-1,3-Dichloropropene	34699	ND	0.5	0.5

UNREGULATED ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
524.2	Bromobenzene	81555	ND	---	0.5
524.2	Bromochloromethane	A-012	ND	---	0.5
524.2	Bromomethane (Methyl Bromide)	34413	ND	---	0.5
524.2	n-Butylbenzene	A-010	ND	---	0.5
524.2	sec-Butylbenzene	77350	ND	---	0.5
524.2	tert-Butylbenzene	77353	ND	---	0.5
524.2	Chloroethane	34311	ND	---	0.5
524.2	Chloromethane (Methyl Chloride)	34418	ND	---	0.5
524.2	2-Chlorotoluene	A-008	ND	---	0.5
524.2	4-Chlorotoluene	A-009	ND	---	0.5
524.2	Dibromomethane	77596	ND	---	0.5
524.2	1,3-Dichlorobenzene (m-DCB)	34566	ND	---	0.5
524.2	Dichlorodifluoromethane	34668	ND	---	0.5
524.2	1,3-Dichloropropane	77173	ND	---	0.5
524.2	2,2-Dichloropropane	77170	ND	---	0.5
524.2	1,1-Dichloropropene	77168	ND	---	0.5
524.2	Hexachlorobutadiene	34391	ND	---	0.5
524.2	Isopropylbenzene (Cumene)	77223	ND	---	0.5
524.2	p-Isopropyltoluene	A-011	ND	---	0.5
524.2	Naphthalene	34696	ND	---	0.5
524.2	n-Propylbenzene	77224	ND	---	0.5

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR

UNREGULATED ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
524.2	1,1,1,2-Tetrachloroethane	77562	ND	---	0.5
524.2	1,2,3-Trichlorobenzene	77613	ND	---	0.5
524.2	1,2,4-Trimethylbenzene	77222	ND	---	0.5
524.2	1,3,5-Trimethylbenzene	77226	ND	---	0.5

ADDITIONAL ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
524.2	Ethyl tert-Butyl Ether (ETBE)	A-033	ND	---	3
524.2	Tert-amyl-methyl Ether (TAME)	A-034	ND	---	3
524.2	tert-Butanol	77035	ND	---	2
524.2	Diisopropyl Ether (DIPE)	A-036	ND	---	3

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR

ORGANIC CHEMICALS ANALYSIS

Date of Report	:	September 12, 2018	Sample ID	:	STK1851822-001
Laboratory Name	:	**FGL Environmental**	Approved By Kelly A. Dunnahoo, B.S.		Digitally signed by Kelly A. Dunnahoo, B.S. Title: Laboratory Director Date: 2018-09-13
Sampled On	:	08/15/2018-11:30			
Received On	:	08/15/2018-13:25	Sampler	:	Ed Morley
Completed On	:	09/07/2018	Employed By	:	Stockton East Water

System Name : STOCKTON EAST WATER DISTRICT Number : 3910006-005 **EDT**

Name Or Number of Sample Source : CALAVERAS RIVER AT BELLOTA - RAW

User ID	:	PTA	Station Number	:	3910006-005
Date/Time of Sample	:	1808151130 YYMMDDTTTT	Laboratory Code	:	5 8 6 7
Submitted By	:	**FGL Environmental**	Phone #	:	(805) 392-2000

REGULATED ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
504.1	Dibromochloropropane (DBCP)	38761	ND	0.2	0.01
504.1	Ethylene Dibromide (EDB)	77651	ND	0.05	0.02
515.3	Bentazon (Basagran)	38710	ND	18	2
515.3	2,4-D	39730	ND	70	10
515.3	2,4,5-TP (Silvex)	39045	ND	50	1
531.1	Carbofuran (Furadan)	81405	ND	18	5
515.3	Dalapon	38432	ND	200	10
515.3	Dinoseb (DNBP)	81287	ND	7	2
549.2	Diquat	78885	ND	20	4
548.1	Endothall	38926	ND	100	45
547	Glyphosate	79743	ND	700	25
531.1	Oxamyl (Vydate)	38865	ND	50	20
515.3	Pentachlorophenol (PCP)	39032	ND	1	0.2
515.3	Picloram	39720	ND	500	1

UNREGULATED ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
531.1	Aldicarb (Temik)	39053	ND	# 3	3

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR

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UNREGULATED ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
531.1	Aldicarb Sulfone	A-020	ND	# 2	2
531.1	Aldicarb Sulfoxide	A-019	ND	# 4	3
531.1	Carbaryl (Sevin)	77700	ND	---	5
515.3	Dicamba (Banvel)	82052	ND	---	5
531.1	3-Hydroxycarbofuran	A-021	ND	---	3
531.1	Methomyl	39051	ND	---	2

ADDITIONAL ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
515.3	2,4,5-T	39740	ND	---	1

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR
Federal MCL (postponed).

ORGANIC CHEMICALS ANALYSIS

Date of Report	:	November 15, 2018	Sample ID	:	STK1855478-001
Laboratory Name	:	**FGL Environmental**	Approved By **Kelly A. Dunnahoo, B.S.** Digitally signed by Kelly A. Dunnahoo, B.S. Title: Laboratory Director Date: 2018-11-15		
Sampled On	:	10/23/2018-09:15			
Received On	:	10/23/2018-15:15	Sampler	:	EM/Kyle
Completed On	:	10/29/2018	Employed By	:	Stockton East Water

System Name : STOCKTON EAST WATER DISTRICT Number : 3910006-005 **EDT**

Name Or Number of Sample Source : CALAVERAS RIVER AT BELLOTA - RAW

User ID	:	PTA	Station Number	:	3910006-005
Date/Time of Sample	:	1810230915 YYMMDDTTTT	Laboratory Code	:	5 8 6 7
Submitted By	:	**FGL Environmental**	Phone #	:	(805) 392-2000

REGULATED ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
SRL524	1,2,3-Trichloropropane	77443	ND	0.005	0.005

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR

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December 28, 2018

Stockton East Water Dist.
P.O. Box 5157
Stockton, CA 95205

Lab ID : STK1857077-001
Customer ID : 3-8528

Sampled On : November 29, 2018-10:00
Sampled By : Ed Morley
Received On : November 29, 2018-11:10
Matrix : Surface Water

Description : LFC @ Hwy 4
Project : RunOff

Sample Result - Inorganic

Constituent	Result	PQL	MDL	Units	Dilution	DQF	Sample Preparation			Sample Analysis		
							Method	ID	Time	Method	ID	Time
Metals, Total												
Aluminum	10.9	0.5	0.000050	mg/L	50	IP	3010	214370	12/06/18 07:00	200.8	217980-IX202	12/10/18-22:55AC
Antimony	ND	0.01	0.000044	mg/L	10	U	3010	214370	12/06/18 07:00	200.8	217927-IX202	12/08/18-15:44AC
Arsenic	0.00197	0.02	0.000047	mg/L	10	J	3010	214370	12/06/18 07:00	200.8	217927-IX202	12/08/18-15:44AC
Barium	0.281	0.002	0.000026	mg/L	10		3010	214370	12/06/18 07:00	200.8	217927-IX202	12/08/18-15:44AC
Beryllium	0.000220	0.002	0.000043	mg/L	10	J	3010	214370	12/06/18 07:00	200.8	217927-IX202	12/08/18-15:44AC
Cadmium	0.000270	0.002	0.000031	mg/L	10	J	3010	214370	12/06/18 07:00	200.8	217927-IX202	12/08/18-15:44AC
Chromium	0.0111	0.01	0.000066	mg/L	10		3010	214370	12/06/18 07:00	200.8	217927-IX202	12/08/18-15:44AC
Copper	0.0120	0.01	0.000071	mg/L	10		3010	214370	12/06/18 07:00	200.8	217927-IX202	12/08/18-15:44AC
Iron	6.33	0.05	0.0014	mg/L	1		3010	214360	12/05/18 16:50	200.7	217819-IT204	12/06/18-18:25AC
Lead	0.00554	0.002	0.000013	mg/L	10		3010	214370	12/06/18 07:00	200.8	217927-IX202	12/08/18-15:44AC
Manganese	0.323	0.01	0.00039	mg/L	1		3010	214360	12/05/18 16:50	200.7	217819-IT204	12/06/18-18:25AC
Mercury	0.0000425	0.00001	.0000021	mg/L	1		245.1	214833	12/18/18 09:00	245.1	218372-HG204	12/18/18-12:44AC
Nickel	0.0109	0.01	0.000040	mg/L	10		3010	214370	12/06/18 07:00	200.8	217927-IX202	12/08/18-15:44AC
Selenium	0.00205	0.05	0.00017	mg/L	25	J	3010	214370	12/06/18 07:00	200.8	217980-IX202	12/10/18-16:14AC
Silver	ND	0.01	0.000022	mg/L	10	U	3010	214370	12/06/18 07:00	200.8	217927-IX202	12/08/18-15:44AC
Thallium	0.0000800	0.002	0.000018	mg/L	10	J	3010	214370	12/06/18 07:00	200.8	217927-IX202	12/08/18-15:44AC
Zinc	0.194	0.25	0.00010	mg/L	25	J	3010	214370	12/06/18 07:00	200.8	217980-IX202	12/10/18-16:14AC

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Sample Result Notes- Inorganic

DQF Flags Definition:	
I	The MS/MSD did not meet QC criteria.
U	Constituent results were non-detect.
J	Reported value is estimated; detected at a concentration below the PQL and above the laboratory MDL.
P	Post Digestion Spike (PDS) not within Acceptance Range (AR).

ND=Non-Detected. PQL=Practical Quantitation Limit.

FGL
ENVIRONMENTAL AGRICULTURAL
Analytical Chemists

INORGANIC CHEMICALS ANALYSIS

Date of Report : July 16, 2018 Sample ID : STK1838732-002

Laboratory Name : **FGL Environmental** Approved By **Kelly A. Dunnahoo, B.S.** Digitally signed by Kelly A. Dunnahoo, B.S. Title: Laboratory Director Date: 2018-07-16
Sampled On : 06/20/2018-07:15
Received On : 06/20/2018-08:20 Sampler : Ed Morley
Completed On : 06/26/2018 Employed By : Stockton East Water

System Name : STOCKTON EAST WATER DISTRICT Number : 3910006-006 **EDT**

Name Or Number of Sample Source : STANISLAUS RIVER, END OF PIPELINE - RAW

User ID : PTA Station Number : 3910006-006
Date/Time of Sample : 1806200715 Laboratory Code : 5 8 6 7
YYMMDDTTTT
Submitted By : **FGL Environmental** Phone # : (805) 392-2000

ADDITIONAL INORGANIC

MCL	UNITS	CHEMICALS	ENTRY	RESULT	DLR
6	ug/L	Perchlorate	A-031	ND	4

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR

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INORGANIC CHEMICALS ANALYSIS

Date of Report : July 20, 2018 Sample ID : STK1838731-002

Laboratory Name : **FGL Environmental** Approved By **Kelly A. Dunnahoo, B.S.** Digitally signed by Kelly A. Dunnahoo, B.S. Title: Laboratory Director Date: 2018-07-20

Sampled On : 06/20/2018-07:15

Received On : 06/20/2018-08:20 Sampler : Ed Morley

Completed On : 07/09/2018 Employed By : Stockton East Water

System Name : STOCKTON EAST WATER DISTRICT Number : 3910006-006 **EDT**

Name Or Number of Sample Source : STANISLAUS RIVER, END OF PIPELINE - RAW

User ID : PTA Station Number : 3910006-006

Date/Time of Sample : 1806200715 YYMMDDTTTT Laboratory Code : 5 8 6 7

Submitted By : **FGL Environmental** Phone # : (805) 392-2000

GENERAL MINERAL & PHYSICAL

MCL	UNITS	CHEMICALS	ENTRY	RESULT	DLR
	mg/L	Total Hardness (as CaCO3)	00900	20.7	1
	mg/L	Calcium (Ca)	00916	5	1
	mg/L	Magnesium (Mg)	00927	2	1
	mg/L	Sodium (Na)	00929	2	1
	mg/L	Potassium (K)	00937	1	1
	meq/L	Total Cations		0.5	
	mg/L	Total Alkalinity (as CaCO3)	00410	20	10
	mg/L	Hydroxide (OH)	71830	ND	10
	mg/L	Carbonate (CO3)	00445	ND	10
	mg/L	Bicarbonate (HCO3)	00440	30	10
* 2	mg/L	Sulfate (SO4)	00945	1.6	0.5
* 2	mg/L	Chloride (Cl)	00940	ND	1
45	mg/L	Nitrate (NO3)	71850	ND	2
2	mg/L	Fluoride (F)	00951	ND	0.1
	meq/L	Total Anions		0.5	
	Std Units	pH	00403	7.6	
** 2	umhos/cm2	Specific Conductance (E.C.)	00095	57	1
*** 2	mg/L	Total Filterable Residue	70300	ND	40
15	Units	Apparent Color (Unfiltered)	00081	15	5
3	TON	Odor Threshold at 60 °C	00086	1	1

MCL - Maximum Contaminant Level, DLR - Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR
[2] Indicates Secondary Drinking Water Standards(Recommended-Upper-Short Term) * 250-500-600 ** 900-1600-2200 *** 500-1000-1500

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Date of Report : July 20, 2018 Sample ID : STK1838731-002

GENERAL MINERAL & PHYSICAL

MCL	UNITS	CHEMICALS	ENTRY	RESULT	DLR
5	NTU	Lab Turbidity	82079	3.9	0.1
0.5 [2]	mg/L	MBAS	38260	ND	0.05

REGULATED INORGANIC

MCL	UNITS	CHEMICALS	ENTRY	RESULT	DLR
1000	ug/L	Aluminum	01105	170	50
6	ug/L	Antimony	01097	ND	6
10	ug/L	Arsenic	01002	ND	2
1000	ug/L	Barium	01007	ND	100
4	ug/L	Beryllium	01012	ND	1
5	ug/L	Cadmium	01027	ND	1
50	ug/L	Chromium (Total Cr)	01034	ND	10
1000 [2]	ug/L	Copper	01042	ND	50
300 [2]	ug/L	Iron	01045	240	100
15	ug/L	Lead	01051	ND	5
50 [2]	ug/L	Manganese	01055	ND	20
2	ug/L	Mercury	71900	ND	1
100	ug/L	Nickel	01067	ND	10
50	ug/L	Selenium	01147	ND	5
100 [2]	ug/L	Silver	01077	ND	10
2	ug/L	Thallium	01059	ND	1
	ug/L	Zinc	01092	ND	50

ADDITIONAL INORGANIC

MCL	UNITS	CHEMICALS	ENTRY	RESULT	DLR
---	ug/L	Boron	01020	ND	100
		Langelier Index at 20 °C	71814	-1.7	
10	mg/L	Nitrate as N (Nitrogen)	00618	ND	0.4
10	mg/L	Nitrate + Nitrite as N	A-029	ND	0.2
1	mg/L	Nitrite as N (Nitrogen)	00620	ND	0.4
---	ug/L	Vanadium	01087	ND	3
		Aggressiveness Index	82383	10	

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR
[2] Indicates Secondary Drinking Water Standards(Recommended-Upper-Short Term)

FGL
ENVIRONMENTAL AGRICULTURAL
Analytical Chemists

ORGANIC CHEMICALS ANALYSIS

Date of Report : February 01, 2018 Sample ID : STK1831029-002

Laboratory Name : **FGL Environmental** Approved By **Kelly A. Dunnahoo, B.S.** Digitally signed by Kelly A. Dunnahoo, B.S. Title: Laboratory Director Date: 2018-02-01

Sampled On : 01/18/2018-11:00

Received On : 01/18/2018-14:45 Sampler : Ed Morley

Completed On : 01/24/2018 Employed By : Stockton East Water

System Name : STOCKTON EAST WATER DISTRICT Number : 3910006-006 **EDT**

Name Or Number of Sample Source : STANISLAUS RIVER, END OF PIPELINE - RAW

User ID : PTA Station Number : 3910006-006

Date/Time of Sample : 1801181100 YYMMDDTTTT Laboratory Code : 5 8 6 7

Submitted By : **FGL Environmental** Phone # : (805) 392-2000

REGULATED ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
524MTC	1,2,3-Trichloropropane	77443	ND	0.005	0.005

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR

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ENVIRONMENTAL FGL AGRICULTURAL
Analytical Chemists

ORGANIC CHEMICALS ANALYSIS

Date of Report	:	May 01, 2018	Sample ID	:	STK1835063-002
Laboratory Name	:	**FGL Environmental**	Approved By **Kelly A. Dunnahoo, B.S.** Digitally signed by Kelly A. Dunnahoo, B.S. Title: Laboratory Director Date: 2018-05-01		
Sampled On	:	04/18/2018-09:20			
Received On	:	04/18/2018-14:00	Sampler	:	Ed Morley
Completed On	:	04/20/2018	Employed By	:	Stockton East Water

System Name : STOCKTON EAST WATER DISTRICT Number : 3910006-006 **EDT**

Name Or Number of Sample Source : STANISLAUS RIVER, END OF PIPELINE - RAW

User ID	:	PTA	Station Number	:	3910006-006
Date/Time of Sample	:	1804180920 YYMMDDTTTT	Laboratory Code	:	5 8 6 7
Submitted By	:	**FGL Environmental**	Phone #	:	(805) 392-2000

REGULATED ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
SRL524	1,2,3-Trichloropropane	77443	ND	0.005	0.005

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR

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ORGANIC CHEMICALS ANALYSIS

Date of Report : August 13, 2018
Sample ID : STK1850296-002
Laboratory Name : **FGL Environmental**
Approved By **Kelly A. Dunnahoo, B.S.** Digitally signed by Kelly A. Dunnahoo, B.S Title: Laboratory Director Date: 2018-08-13
Sampled On : 07/18/2018-08:20
Received On : 07/18/2018-14:40
Sampler : Ed Morley
Completed On : 08/01/2018
Employed By : Stockton East Water

System Name : STOCKTON EAST WATER DISTRICT Number : 3910006-006 **EDT**

Name Or Number of Sample Source : STANISLAUS RIVER, END OF PIPELINE - RAW

User ID : PTA
Station Number : 3910006-006
Date/Time of Sample : 1807180820
YYMMDDTTTT
Laboratory Code : 5 8 6 7
Submitted By : **FGL Environmental**
Phone # : (805) 392-2000

REGULATED ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
SRL524	1,2,3-Trichloropropane	77443	ND	0.005	0.005

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR

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ORGANIC CHEMICALS ANALYSIS

Date of Report	:	September 05, 2018	Sample ID	:	STK1851823-002
Laboratory Name	:	**FGL Environmental**	Approved By Kelly A. Dunnahoo, B.S.		Digitally signed by Kelly A. Dunnahoo, B.S. Title: Laboratory Director Date: 2018-09-05
Sampled On	:	08/15/2018-11:00			
Received On	:	08/15/2018-13:25	Sampler	:	Ed Morley
Completed On	:	08/21/2018	Employed By	:	Stockton East Water

System Name : STOCKTON EAST WATER DISTRICT Number : 3910006-006 **EDT**

Name Or Number of Sample Source : STANISLAUS RIVER, END OF PIPELINE - RAW

User ID	:	PTA	Station Number	:	3910006-006
Date/Time of Sample	:	1808151100 YYMMDDTTTT	Laboratory Code	:	5 8 6 7
Submitted By	:	**FGL Environmental**	Phone #	:	(805) 392-2000

REGULATED ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
524.2	Bromodichloromethane	32101	ND	---	1
524.2	Bromoform	32104	ND	---	1
524.2	Chloroform (Trichloromethane)	32106	ND	---	1
524.2	Dibromochloromethane	32105	ND	---	1
524.2	Total Trihalomethanes (THM'S/TTHM)	82080	ND	80	
524.2	Benzene	34030	ND	1	0.5
524.2	Carbon Tetrachloride	32102	ND	0.5	0.5
524.2	1,2-Dichlorobenzene (o-DCB)	34536	ND	600	0.5
524.2	1,4-Dichlorobenzene (p-DCB)	34571	ND	5	0.5
524.2	1,1-Dichloroethane (1,1-DCA)	34496	ND	5	0.5
524.2	1,2-Dichloroethane (1,2-DCA)	34531	ND	0.5	0.5
524.2	1,1-Dichloroethylene (1,1-DCE)	34501	ND	6	0.5
524.2	cis-1,2-Dichloroethylene	77093	ND	6	0.5
524.2	trans-1,2-Dichloroethylene	34546	ND	10	0.5
524.2	Dichloromethane (Methylene Chloride)	34423	ND	5	0.5
524.2	1,2-Dichloropropane	34541	ND	5	0.5
524.2	Total 1,3-Dichloropropene	34561	ND	0.5	0.5
524.2	Ethyl Benzene	34371	ND	300	0.5
524.2	Monochlorobenzene (Chlorobenzene)	34301	ND	70	0.5
524.2	Styrene	77128	ND	100	0.5

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR

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REGULATED ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
524.2	1,1,2,2-Tetrachloroethane	34516	ND	1	0.5
524.2	Tetrachloroethylene (PCE)	34475	ND	5	0.5
524.2	Toluene	34010	ND	150	0.5
524.2	1,2,4-Trichlorobenzene	34551	ND	5	0.5
524.2	1,1,1-Trichloroethane (1,1,1-TCA)	34506	ND	200	0.5
524.2	1,1,2-Trichloroethane (1,1,2-TCA)	34511	ND	5	0.5
524.2	Trichloroethylene (TCE)	39180	ND	5	0.5
524.2	Trichlorofluoromethane (Freon 11)	34488	ND	150	5
524.2	Trichlorotrifluoroethane (Freon 113)	81611	ND	1200	10
524.2	Vinyl Chloride (VC)	39175	ND	0.5	0.5
524.2	Total Xylenes (m,p & o)	81551	ND	1750	0.5
524.2	Methyl tert-Butyl Ether (MTBE)	46491	ND	13	3.0
524.2	cis-1,3-Dichloropropene	34704	ND	0.5	0.5
524.2	trans-1,3-Dichloropropene	34699	ND	0.5	0.5

UNREGULATED ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
524.2	Bromobenzene	81555	ND	---	0.5
524.2	Bromochloromethane	A-012	ND	---	0.5
524.2	Bromomethane (Methyl Bromide)	34413	ND	---	0.5
524.2	n-Butylbenzene	A-010	ND	---	0.5
524.2	sec-Butylbenzene	77350	ND	---	0.5
524.2	tert-Butylbenzene	77353	ND	---	0.5
524.2	Chloroethane	34311	ND	---	0.5
524.2	Chloromethane (Methyl Chloride)	34418	ND	---	0.5
524.2	2-Chlorotoluene	A-008	ND	---	0.5
524.2	4-Chlorotoluene	A-009	ND	---	0.5
524.2	Dibromomethane	77596	ND	---	0.5
524.2	1,3-Dichlorobenzene (m-DCB)	34566	ND	---	0.5
524.2	Dichlorodifluoromethane	34668	ND	---	0.5
524.2	1,3-Dichloropropane	77173	ND	---	0.5
524.2	2,2-Dichloropropane	77170	ND	---	0.5
524.2	1,1-Dichloropropene	77168	ND	---	0.5
524.2	Hexachlorobutadiene	34391	ND	---	0.5
524.2	Isopropylbenzene (Cumene)	77223	ND	---	0.5
524.2	p-Isopropyltoluene	A-011	ND	---	0.5
524.2	Naphthalene	34696	ND	---	0.5
524.2	n-Propylbenzene	77224	ND	---	0.5

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR

UNREGULATED ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
524.2	1,1,1,2-Tetrachloroethane	77562	ND	---	0.5
524.2	1,2,3-Trichlorobenzene	77613	ND	---	0.5
524.2	1,2,4-Trimethylbenzene	77222	ND	---	0.5
524.2	1,3,5-Trimethylbenzene	77226	ND	---	0.5

ADDITIONAL ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
524.2	Ethyl tert-Butyl Ether (ETBE)	A-033	ND	---	3
524.2	Tert-amyl-methyl Ether (TAME)	A-034	ND	---	3
524.2	tert-Butanol	77035	ND	---	2
524.2	Diisopropyl Ether (DIPE)	A-036	ND	---	3

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR

ORGANIC CHEMICALS ANALYSIS

Date of Report : November 15, 2018
Sample ID : STK1855478-002

Laboratory Name : **FGL Environmental**
Approved By **Kelly A. Dunnahoo, B.S.** Digitally signed by Kelly A. Dunnahoo, B.S. Title: Laboratory Director Date: 2018-11-15

Sampled On : 10/23/2018-08:55
Received On : 10/23/2018-15:15
Completed On : 10/29/2018

Sampler : EM/Kyle
Employed By : Stockton East Water

System Name : STOCKTON EAST WATER DISTRICT Number : 3910006-006 **EDT**

Name Or Number of Sample Source : STANISLAUS RIVER, END OF PIPELINE - RAW

User ID :	PTA	Station Number :	3910006-006
Date/Time of Sample :	1810230855 YYMMDDTTTT	Laboratory Code :	5 8 6 7
Submitted By :	**FGL Environmental**	Phone # :	(805) 392-2000

REGULATED ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
SRL524	1,2,3-Trichloropropane	77443	ND	0.005	0.005

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR

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Analytical Chemists

INORGANIC CHEMICALS ANALYSIS

Date of Report : July 20, 2018 | Sample ID : STK1838731-003

Laboratory Name : **FGL Environmental** | Approved By **Kelly A. Dunnahoo, B.S.** Digitally signed by Kelly A. Dunnahoo, B.S. Title: Laboratory Director Date: 2018-07-20

Sampled On : 06/20/2018-06:45

Received On : 06/20/2018-08:20 | Sampler : Ed Morley

Completed On : 07/05/2018 | Employed By : Stockton East Water

System Name : STOCKTON EAST WATER DISTRICT Number : 3910006-002 **EDT**

Name Or Number of Sample Source : TREATMENT PLANT - FINAL TREATED-SA5

User ID : PTA | Station Number : 3910006-002

Date/Time of Sample : 1806200645 YYMMDDTTTT | Laboratory Code : 5 8 6 7

Submitted By : **FGL Environmental** | Phone # : (805) 392-2000

GENERAL MINERAL & PHYSICAL

MCL	UNITS	CHEMICALS	ENTRY	RESULT	DLR
	mg/L	Total Hardness (as CaCO3)	00900	20.7	1
	mg/L	Calcium (Ca)	00916	5	1
	mg/L	Magnesium (Mg)	00927	2	1
	mg/L	Sodium (Na)	00929	6	1
	mg/L	Potassium (K)	00937	ND	1
	meq/L	Total Cations		0.7	
	mg/L	Total Alkalinity (as CaCO3)	00410	20	10
	mg/L	Hydroxide (OH)	71830	ND	10
	mg/L	Carbonate (CO3)	00445	ND	10
	mg/L	Bicarbonate (HCO3)	00440	30	10
* 2	mg/L	Sulfate (SO4)	00945	12.5	0.5
* 2	mg/L	Chloride (Cl)	00940	3	1
45	mg/L	Nitrate (NO3)	71850	ND	2
2	mg/L	Fluoride (F)	00951	ND	0.1
	meq/L	Total Anions		0.8	
	Std Units	pH	00403	7.9	
** 2	umhos/cm2	Specific Conductance (E.C.)	00095	84	1
*** 2	mg/L	Total Filterable Residue	70300	70	40
15	Units	Apparent Color (Unfiltered)	00081	ND	5
3	TON	Odor Threshold at 60 °C	00086	2	1

MCL - Maximum Contaminant Level, DLR - Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR
[2] Indicates Secondary Drinking Water Standards(Recommended-Upper-Short Term) * 250-500-600 ** 900-1600-2200 *** 500-1000-1500

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Date of Report : July 20, 2018 Sample ID : STK1838731-003

GENERAL MINERAL & PHYSICAL

MCL	UNITS	CHEMICALS	ENTRY	RESULT	DLR
5	NTU	Lab Turbidity	82079	ND	0.1
0.5 [2]	mg/L	MBAS	38260	ND	0.05

REGULATED INORGANIC

MCL	UNITS	CHEMICALS	ENTRY	RESULT	DLR
1000	ug/L	Aluminum	01105	ND	50
6	ug/L	Antimony	01097	ND	6
10	ug/L	Arsenic	01002	ND	2
1000	ug/L	Barium	01007	ND	100
4	ug/L	Beryllium	01012	ND	1
5	ug/L	Cadmium	01027	ND	1
50	ug/L	Chromium (Total Cr)	01034	ND	10
1000 [2]	ug/L	Copper	01042	ND	50
300 [2]	ug/L	Iron	01045	ND	100
15	ug/L	Lead	01051	ND	5
50 [2]	ug/L	Manganese	01055	ND	20
2	ug/L	Mercury	71900	ND	1
100	ug/L	Nickel	01067	ND	10
50	ug/L	Selenium	01147	ND	5
100 [2]	ug/L	Silver	01077	ND	10
2	ug/L	Thallium	01059	ND	1
	ug/L	Zinc	01092	ND	50

ADDITIONAL INORGANIC

MCL	UNITS	CHEMICALS	ENTRY	RESULT	DLR
---	ug/L	Boron	01020	ND	100
		Langelier Index at 20 °C	71814	-1.5	
10	mg/L	Nitrate as N (Nitrogen)	00618	ND	0.4
10	mg/L	Nitrate + Nitrite as N	A-029	ND	0.2
1	mg/L	Nitrite as N (Nitrogen)	00620	ND	0.4
---	ug/L	Vanadium	01087	ND	3
		Aggressiveness Index	82383	10.3	

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR
[2] Indicates Secondary Drinking Water Standards(Recommended-Upper-Short Term)

INORGANIC CHEMICALS ANALYSIS

Date of Report : July 20, 2018
Sample ID : STK1839085-001
Laboratory Name : **FGL Environmental**
Approved By **Kelly A. Dunnahoo, B.S.** Digitally signed by Kelly A. Dunnahoo, B.S. Title: Laboratory Director Date: 2018-07-20
Sampled On : 06/27/2018-12:30
Received On : 06/27/2018-14:35
Completed On : 07/19/2018
Sampler : Ed Morley
Employed By : Stockton East Water

System Name : STOCKTON EAST WATER DISTRICT Number : 3910006-007 **EDT**

Name Or Number of Sample Source : TREATMENT PLANT - SA4-NO FINAL CHLOR

User ID : PTA
Date/Time of Sample : 1806271230 YYMMDDTTTT
Submitted By : **FGL Environmental**
Station Number : 3910006-007
Laboratory Code : 5 8 6 7
Phone # : (805) 392-2000

REGULATED INORGANIC

MCL	UNITS	CHEMICALS	ENTRY	RESULT	DLR
10	ug/L	Arsenic	01002	ND	2
300 ^{2}	ug/L	Iron	01045	ND	100
50 ^{2}	ug/L	Manganese	01055	ND	20

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR
^{2} Indicates Secondary Drinking Water Standards(Recommended-Upper-Short Term)

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INORGANIC CHEMICALS ANALYSIS

Date of Report	:	December 30, 2018	Sample ID	:	STK1857704-001
Laboratory Name	:	**FGL Environmental**	Approved By **Kelly A. Dunnahoo, B.S.** Digitally signed by Kelly A. Dunnahoo, B.S. Title: Laboratory Director Date: 2018-12-30		
Sampled On	:	12/11/2018-09:00			
Received On	:	12/11/2018-14:30	Sampler	:	Ed Morley
Completed On	:	12/19/2018	Employed By	:	Stockton East Water

System Name : STOCKTON EAST WATER DISTRICT Number : 3910006-001 **EDT**

Name Or Number of Sample Source : PLANT INFLUENT - MIXED SOURCES - RAW

User ID	:	PTA	Station Number	:	3910006-001
Date/Time of Sample	:	1812110900 YYMMDDTTTT	Laboratory Code	:	5 8 6 7
Submitted By	:	**FGL Environmental**	Phone #	:	(805) 392-2000

GENERAL MINERAL & PHYSICAL

MCL	UNITS	CHEMICALS	ENTRY	RESULT	DLR
	mg/L	Total Alkalinity (as CaCO3)	00410	40	10
	mg/L	Hydroxide (OH)	71830	ND	10
	mg/L	Carbonate (CO3)	00445	ND	10
	mg/L	Bicarbonate (HCO3)	00440	40	10

ADDITIONAL INORGANIC

MCL	UNITS	CHEMICALS	ENTRY	RESULT	DLR
---	mg/L	Total Organic Carbon (TOC) (mg/L)	00680	5.4	0.3

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR

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INORGANIC CHEMICALS ANALYSIS

Date of Report	:	December 30, 2018	Sample ID	:	STK1857704-002
Laboratory Name	:	**FGL Environmental**	Approved By **Kelly A. Dunnahoo, B.S.** Digitally signed by Kelly A. Dunnahoo, B.S. Title: Laboratory Director Date: 2018-12-30		
Sampled On	:	12/11/2018-09:10			
Received On	:	12/11/2018-14:30	Sampler	:	Ed Morley
Completed On	:	12/19/2018	Employed By	:	Stockton East Water

System Name : STOCKTON EAST WATER DISTRICT Number : 3910006-007 **EDT**

Name Or Number of Sample Source : TREATMENT PLANT - SA4-NO FINAL CHLOR

User ID	:	PTA	Station Number	:	3910006-007
Date/Time of Sample	:	1812110910 YYMMDDTTTT	Laboratory Code	:	5 8 6 7
Submitted By	:	**FGL Environmental**	Phone #	:	(805) 392-2000

ADDITIONAL INORGANIC

MCL	UNITS	CHEMICALS	ENTRY	RESULT	DLR
---	mg/L	Total Organic Carbon (TOC) (mg/L)	00680	2.3	0.3

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR

Corporate Offices & Laboratory
853 Corporation Street
Santa Paula, CA 93060
TEL: (805)392-2000
Env FAX: (805)525-4172 / Ag FAX: (805)392-2063
CA ELAP Certification No. 1573

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2500 Stagecoach Road
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FAX: (530)343-3807
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Office & Laboratory
9415 W. Goshen Avenue
Visalia, CA 93291
TEL: (559)734-9473
FAX: (559)734-8435
CA ELAP Certification No. 2810

December 30, 2018

Stockton East Water Dist.
P.O. Box 5157
Stockton, CA 95205

Lab ID : STK1857704-001
Customer ID : 3-8528

Sampled On : December 11, 2018-09:00
Sampled By : Ed Morley
Received On : December 11, 2018-14:30
Matrix : Drinking Water

Description : Plant Influent - Mixed Sources
Project : Disinfection By-product

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Wet Chemistry								
Alkalinity (as CaCO3)	40	10	mg/L		2320B	12/17/18:214754	2320B	12/17/18:218356
Bicarbonate	40	10	mg/L		2320B	12/17/18:214754	2320B	12/17/18:218356
Carbonate	ND	10	mg/L		2320B	12/17/18:214754	2320B	12/17/18:218356
Hydroxide	ND	10	mg/L		2320B	12/17/18:214754	2320B	12/17/18:218356

ND=Non-Detected. PQL=Practical Quantitation Limit. * PQL adjusted for dilution.

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ORGANIC CHEMICALS ANALYSIS

Date of Report	:	December 30, 2018	Sample ID	:	STK1857704-003
Laboratory Name	:	**FGL Environmental**	Approved By **Kelly A. Dunnahoo, B.S.** Digitally signed by Kelly A. Dunnahoo, B.S. Title: Laboratory Director Date: 2018-12-30		
Sampled On	:	12/11/2018-09:00			
Received On	:	12/11/2018-14:30	Sampler	:	Ed Morley
Completed On	:	12/15/2018	Employed By	:	Stockton East Water

System Name : STOCKTON EAST WATER DISTRICT Number : 3910006-002 **EDT**

Name Or Number of Sample Source : TREATMENT PLANT - FINAL TREATED-SA5

User ID	:	PTA	Station Number	:	3910006-002
Date/Time of Sample	:	1812110900 YYMMDDTTTT	Laboratory Code	:	5 8 6 7
Submitted By	:	**FGL Environmental**	Phone #	:	(805) 392-2000

REGULATED ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
524.2	Bromodichloromethane	32101	5.4	---	1
524.2	Bromoform	32104	ND	---	1
524.2	Chloroform (Trichloromethane)	32106	38.9	---	1
524.2	Dibromochloromethane	32105	ND	---	1
524.2	Total Trihalomethanes (THM'S/TTHM)	82080	44.3	80	

ADDITIONAL ORGANICS CHEMICALS

TEST METHOD	CHEMICAL ALL CHEMICALS REPORTED ug/L	ENTRY #	ANALYSES RESULTS	MCL ug/L	DLR ug/L
552.2	Dibromoacetic Acid	82721	2	---	1
552.2	Dichloroacetic Acid	77288	9	---	1
552.2	Monobromoacetic Acid	A-041	ND	---	1
552.2	Monochloroacetic Acid	A-042	ND	---	2
552.2	Trichloroacetic Acid	82723	18	---	1
552.2	Haloacetic acids (five)	A-049	29	60	

MCL - Maximum Contaminant Level, DLR -Detection Limit for Reporting Purpose, ND - Not Detected at or above DLR

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December 30, 2018

Stockton East Water Dist.
P.O. Box 5157
Stockton, CA 95205

Lab ID : STK1857704-001
Customer ID : 3-8528

Sampled On : December 11, 2018-09:00
Sampled By : Ed Morley
Received On : December 11, 2018-14:30
Matrix : Drinking Water

Description : Plant Influent - Mixed Sources
Project : Disinfection By-product

Sample Result - Organic

Constituent	Result	PQL	Units	MCL/AL	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
TOC								
TOC	5.4	0.3	mg/L		5310C	12/19/18:214801	5310C	12/19/18:218474

ND=Non-Detected. PQL=Practical Quantitation Limit. ‡Surrogate. * PQL adjusted for dilution.
MCL = Maximum Contamination Level. 2 - Secondary Standard. 3 - CDPH Notification Level. AL = Regulatory Action Level.

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December 30, 2018

Stockton East Water Dist.
P.O. Box 5157
Stockton, CA 95205

Lab ID : STK1857704-002
Customer ID : 3-8528

Sampled On : December 11, 2018-09:10
Sampled By : Ed Morley
Received On : December 11, 2018-14:30
Matrix : Drinking Water

Description : Treatment Plant - SA4-No Final
Project : Disinfection By-product

Sample Result - Organic

Constituent	Result	PQL	Units	MCL/AL	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
TOC								
TOC	2.3	0.3	mg/L		5310C	12/19/18:214801	5310C	12/19/18:218474

ND=Non-Detected. PQL=Practical Quantitation Limit. ‡Surrogate. * PQL adjusted for dilution.
MCL = Maximum Contamination Level. 2 - Secondary Standard. 3 - CDPH Notification Level. AL = Regulatory Action Level.

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December 30, 2018

Stockton East Water Dist.
P.O. Box 5157
Stockton, CA 95205

Lab ID : STK1857704-003
Customer ID : 3-8528

Sampled On : December 11, 2018-09:00
Sampled By : Ed Morley
Received On : December 11, 2018-14:30
Matrix : Drinking Water

Description : Treatment Plant - Final Treate
Project : Disinfection By-product

Sample Result - Organic

Constituent	Result	PQL	Units	MCL/AL	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
EPA 524.2								
4-Bromofluorobenzene‡	104	70-130	%		524.2	12/14/18:215098	524.2	12/15/18:218705
1,2-Dichlorobenzene-d4‡	98.9	70-130	%		524.2	12/14/18:215098	524.2	12/15/18:218705
Bromodichloromethane	5.4	0.5	ug/L		524.2	12/14/18:215098	524.2	12/15/18:218705
Bromoform	ND	0.5	ug/L		524.2	12/14/18:215098	524.2	12/15/18:218705
Chloroform	38.9	0.5	ug/L		524.2	12/14/18:215098	524.2	12/15/18:218705
Dibromochloromethane	ND	0.5	ug/L		524.2	12/14/18:215098	524.2	12/15/18:218705
Total Trihalomethanes	44.3	--	ug/L	80	524.2	12/14/18:215098	524.2	12/15/18:218705
EPA 552.2								
2,3-Dibromopropionic Acid‡	138	70-130	%		552	12/13/18:214656	552.2	12/14/18:218150
Bromoacetic Acid	ND	1	ug/L		552	12/13/18:214656	552.2	12/14/18:218220
Chloroacetic Acid	ND	2	ug/L		552	12/13/18:214656	552.2	12/14/18:218150
Dibromoacetic Acid	2	1	ug/L		552	12/13/18:214656	552.2	12/14/18:218150
Dichloroacetic Acid	9	1	ug/L		552	12/13/18:214656	552.2	12/14/18:218150
Trichloroacetic Acid	18	1	ug/L		552	12/13/18:214656	552.2	12/14/18:218150
Haloacetic acids (five)	29	--	ug/L	60	552	12/13/18:214656	552.2	12/14/18:218220

ND=Non-Detected. PQL=Practical Quantitation Limit. ‡Surrogate. * PQL adjusted for dilution.
MCL = Maximum Contamination Level. 2 - Secondary Standard. 3 - CDPH Notification Level. AL = Regulatory Action Level.

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ATTACHMENT I

Notices of District Education Programs Available to Customers

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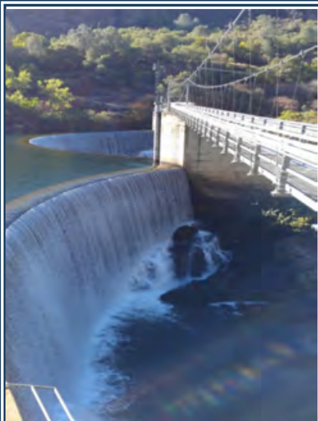
Newsletter & AG Water Report

2019 Spring ♠ Summer

2019 WATER SUPPLY OUTLOOK



Goodwin Dam

New Hogan Reservoir is currently at 191,343 acre-feet of water as of mid-February 2019. The U.S. Army Corps of Engineers will have to release a lot of water for flood purposes but we expect to be able to provide a normal irrigation season regardless.

New Melones Reservoir is currently at 1,944,826 acre-feet of water as of mid-February 2019. This figure is nearly identical to this time last year. However, this year there is also a good snowpack in the mountains above the reservoir. We expect that we will have a normal irrigation season in 2019.

Sustainable Groundwater Management Act (SGMA)

As you may recall, the District is part of an organization called the Eastern San Joaquin Groundwater Authority. This group includes all GSA participants within the Eastern San Joaquin groundwater basin and our collective mission is to write the Groundwater Sustainability Plan (GSP) as required by the Act. The GSP is the key to the success of groundwater management in that it will determine how the groundwater basin will be managed and report our success to the Department of Water Resources. This plan will estimate how much water is pumped from the basin and will also estimate how much water enters the basin to recharge it each year. Our task will be to find a way to balance those two numbers and prove to DWR that our basin is sustainable. Simply put, the GSP will determine **how your groundwater will be managed and what projects the District will have to pay for to ensure its sustainability in the future.**

The Eastern San Joaquin Groundwater Basin Authority meets each month on the second Wednesday and the meeting is held at the Robert J. Cabral Agricultural Center at 9:00 a.m. I encourage you to attend some of these meetings and be aware of what is happening to your groundwater!

2019 Tentative Dam Installation

The 2019 Irrigation Season will begin tentatively on Wednesday, May 1, 2019.

APRIL 15th — Bellota 2-foot weir & fish ladder removed and the Bellota Dam installed

APRIL 16th — Bellota Dam installed

APRIL 17th through 22nd — Dam installation on Mormon Slough and Potter Creek

APRIL 23rd through 26th — Dam installation on Old Calaveras River & Mosher Slough

APRIL 30th— Dam installation and system filling complete

The District will communicate any changes or updates by mail; water supply staff & the District's website: www.sewd.net.

Remember to look out for signage in the field! Be sure to check before you begin your agricultural operations!

Unimpaired Flow Criteria

On January 11, 2019 the District's general counsel, Herum Crabtree Suntag, filed suit in San Joaquin County Superior Court against the State Water Resources Control Board (Board) challenging amendments to the Sacramento San Joaquin River Bay-Delta Plan adopted by the Board in December.

The changes would divert 40 percent of the Stanislaus River runoff from farming and industrial uses, and instead use it to increase fish flows. This action constrains New Melones Reservoir operations and takes water from farmers and cities. The District holds a contractual right to receive 80,000 acre feet of water from the New Melones Project, that has been consistently providing surface water to San Joaquin County. According to the District's attorney, Jeanne Zolezzi, the District's water contract is "threatened by this unprecedented and unsupported water grab." This water is currently used for farming and industrial users. The District delivers irrigation water to approximately 70,000 acres of agricultural land. The District will continue the effort of opposition and provide updates as the lawsuit progresses.

BOARD OF DIRECTORS

The Regular Meeting of the Board of Directors is held every Tuesday at Noon located at 6767 East Main Street Stockton, 95215

DIVISION 1	Richard Atkins
DIVISION 2	Andrew Watkins, *Vice President*
DIVISION 3	Alvin Cortopassi
DIVISION 4	Melvin Panizza, *President*
DIVISION 5	Paul Sanguinetti
DIVISION 6	Loralee McGaughey
DIVISION 7	Thomas McGurk

SAWS After School Program

The Stockton East Water District is a member of the Stockton Area Water Suppliers (SAWS), an alliance of Stockton area water agencies that includes the City of Stockton, San Joaquin County, California Water Service Company and SEWD. SAWS sponsors a variety of community outreach efforts, including seven standards-based, in-class water education programs, special events, after school presentations and facility tours. Any school with a Stockton address is eligible for this fun, free, educational program. Left, Water Educator Kathy Kirchhof helps students understand the concepts of surface tension, cohesion and molecular hydrogen bonds by making paper clips "float" on water during a SAWS After School Program presentation. To learn more about the SAWS Water Education Program, visit SEWD's web page at http://www.sewd.net/ and click on "Water Conservation Education."

SEWD SOLAR UPDATE

Stockton East Water District commemorated the successful completion and operation of a Photovoltaic Solar System Project on Wednesday, January 30, 2019. Working in conjunction with Onyx Renewable Partners L.P., this Project was of zero-cost to the District and is estimated to have an annual savings in the amount of $150,000 per year. The Photovoltaic Solar System Project includes: a total Project site of approximately 13.1 acres; it serves the WTP Low Lift approximately 1104 kW; it serves the WTP High Service approximately 1104 kW; the total production per year for both systems will be 4141 MWh and based upon the District's 2014 usage, the energy offset from the Project will be ~44%.




Agriculture/Irrigation Pump Testing

Free Pump & Irrigation Efficiency Tests for Agriculture Water Irrigators. If you're interested in saving both water & energy this year on your Agricultural irrigation, contact Ed Morley, SEWD Water Quality Control Analyst at (209) 948-0537 to take advantage of this Program and schedule your test today! Funding is limited.

Aerial Spraying Notification Program

In 1997 the District implemented a voluntary Aerial Spraying Notification Program. Aerial spraying around the District's water treatment plant, Lower Farmington Canal, Upper Farmington Canal and natural creeks is of concern to the District. If you use an aerial spraying company which applies chemicals to treat your crops around these areas, please remind the company to contact the District at least 24-hours in advance of spraying at (209) 948-0537 and provide the following information: parcel to be sprayed, chemical to be sprayed, time to be sprayed, material safety data sheet and contact information (name & phone number).

Reclamation Reform Act (RRA)

When the Reclamation Act of 1902 was enacted, the primary goal of the Reclamation program was to develop the arid West by promoting farming opportunities for families and limiting speculation on land that would benefit from the introduction of irrigated agriculture. In response to a lawsuit against the Federal government in the 1970's alleging improper acreage limitation administration, Congress passed Public Law 97-293, which President Reagan signed into law on October 12, 1982 - Title II of Public Law 97-293 is known as the Reclamation Reform Act of 1982 (RRA). The concept of acreage limitation provisions with regard to Reclamation irrigation water means the ownership limitations and pricing restrictions specified in Federal reclamation law, including but not limited to certain provisions in the RRA. All SEWD irrigators must comply with RRA requirements. Additional information can be obtained at: http://www.usbr.gov/rra/index.html

SEWD In The Community

District employees enjoy giving back to the community! In October 2018, staff donated pails of candy to the Garden Acres Community Center as a special Halloween treat for patrons of the Center. And, in December 2018, due to the overwhelming donations provided by staff, the District donated 524-lbs. of non-perishables to the Emergency Food Bank of Stockton. (*See picture below*)

District Staff

ADMINISTRATION DEPARTMENT

Scot A. Moody, General Manager
Kristin Carido, Administrative Services Manager

FINANCE DEPARTMENT

Juan Vega, Finance Director
Priya Ram, Accountant

OPERATIONS DEPARTMENT

Cathy Lee, Assistant General Manager
Jim Wunderlich, Water Operations Manager
Jason Mathews, Chief Plant Operator

ENGINEERING DEPARTMENT

Justin Hopkins, District Engineer

MAINTENANCE DEPARTMENT

John Vernier, Maintenance Supervisor

WATER SUPPLY DEPARTMENT

Aaron Riojas, Construction/Water Supply Supervisor
Lou Mendez, Grounds/Water Supply Supervisor
Chris Donis, Operations/Water Supply Supervisor

WATER CONSERVATION

Kristin Coon, Water Conservation Coordinator

CONTACT US

(209) 948 0333 Administration
(209) 948 0537 Treatment Plant
(209) 469 3335 Ag Water Order
(209) 444 3126 Water Conservation
(209) 948 0423 Fax
www.sewd.net District Website
sewd@sewd.net District Email

6767 East Main Street
Stockton, CA 95215

Post Office Box 5157
Stockton, CA 95205

Our Mission is to ensure proper management of our groundwater basin and provide supplemental surface water supplies

ATTACHMENT J

District Agricultural Water Order Form

SEWD provides irrigators with two primary modes of placing agricultural water orders.

Water Orders can be placed by visiting the District's website and completing the 2019 Water Order Form: https://sewd.net/ag-water-order-form/ (next page).

Additionally, water orders can be placed by calling the District's Ag Water Order Hotline at (209) 469-3335 and leaving a message with the requested irrigation information.

District staff operate the irrigation system diligently to provide irrigation water orders. Equally, irrigators are required to provide their water order 48-hours in advance of irrigating per the Mandatory Water Order Program. Mandatory notification is required for any persons diverting surface water provided by the District per Revised Rule No. 120 adopted by the Board of Directors on April 2, 2019.

(This page left blank intentionally.)

AG Water Order Form

Please provide us with the following information.

PUMP OPERATOR

Operator First Name: *

Operator Last Name: *

Operator Phone: *

Operator Email: *

PUMP OWNER (if same as operator leave blank)

Owner First Name:

Owner Last Name:

Owner Phone:

Owner Email:

IRRIGATION SCHEDULE (In accordance with Rule No. 120 orders must be placed 48-hours in advance of irrigating.)

Pump ID#: *

Diversion Rate: (in gpm) *

Start Date: *

Start Time *

01 ▼ 00 ▼ AM ▼

HH MM AM/PM

End Date: *

End Time: *

01 ▼ 00 ▼ AM ▼

HH MM AM/PM

Run Time (hrs per day)

Comments/Notes:

Verification

Please enter any two digits *

Example: 12

Submit

ATTACHMENT K

Drainage Problem Area Report

(Not Applicable)

This attachment is not applicable to SEWD. Currently, no drainage problem areas exist within the district.

(This page left blank intentionally.)

ATTACHMENT L

SEWD/ USBR and SEWD/CCWD Contract for New Hogan Project Water Supply

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R.O. Draft 7/6-1970
Rev. W.O. 7/20-1970
Rev. R.O. 8/13-1970

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
New Hogan Project, California

Contract No.
14-06-200-5057A

CONTRACT BETWEEN THE UNITED STATES OF AMERICA AND STOCKTON AND EAST SAN JOAQUIN WATER CONSERVATION DISTRICT AND CALAVERAS COUNTY WATER DISTRICT PROVIDING FOR REPAYMENT AND CONSERVATION USE OF NEW HOGAN PROJECT

Table of Contents

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
New Hogan Project, California

Contract No.
14-06-200-5057A

CONTRACT BETWEEN THE UNITED STATES OF AMERICA AND STOCKTON AND EAST SAN JOAQUIN WATER CONSERVATION DISTRICT AND CALAVERAS COUNTY WATER DISTRICT PROVIDING FOR REPAYMENT AND CONSERVATION USE OF NEW HOGAN PROJECT

THIS CONTRACT, made this 25th day of August, 1970, in pursuance generally of the Act of June 17, 1902 (32 Stat. 388, 43 U.S.C. 391), and acts amendatory thereof and supplementary thereto, all collectively hereinafter referred to as the Federal reclamation laws, between THE UNITED STATES OF AMERICA, hereinafter referred to as the United States, and the STOCKTON AND EAST SAN JOAQUIN WATER CONSERVATION DISTRICT and the CALAVERAS COUNTY WATER DISTRICT, hereinafter collectively referred to as Districts and individually as District, political subdivisions of the State of California, duly organized, existing, and acting pursuant to the laws thereof, with their principal place of business in Stockton and San Andreas, California, respectively,

WITNESSETH, That:

EXPLANATORY RECITALS

WHEREAS, pursuant to the Act of December 22, 1944 (58 Stat. 887), the United States Army Corps of Engineers constructed the

Preamble
Explanatory Recitals--

New Hogan Project on the Calaveras River in the State of California primarily for flood control and secondarily for irrigation and other water use purposes; and

WHEREAS, under the terms of Contract No. 14-06-200-8213, dated March 2, 1960, hereinafter referred to as the 1960 contract, between the United States and the State of California, which contract provides for repayment of that portion of the cost of the Project allocated to conservation purposes, the United States may enter into a contract or contracts pursuant to Section 9 of the Reclamation Project Act of 1939 with other organizations for repayment of the New Hogan Project; and

WHEREAS, this contract is made pursuant to said Act and in accordance with the provisions of the 1960 contract;

NOW, THEREFORE, in consideration of the covenants herein contained, it is agreed as follows:

DEFINITIONS

1. When used herein, unless otherwise distinctly expressed or manifestly incompatible with the intent hereof, the term:

(a) "Secretary" or "Contracting Officer" shall mean the Secretary of the United States Department of the Interior or his duly authorized representative;

(b) "District Engineer" shall mean the District Engineer, Sacramento District, United States Army, Corps of Engineers, or his duly authorized representative;

(c) "Calaveras District" shall mean the Calaveras County Water District, and "Stockton District" shall mean the Stockton and East San Joaquin Water Conservation District;

(d) "New Hogan" shall mean the New Hogan Project;

(e) "agricultural water" shall mean water used primarily in the commercial production of agricultural crops or livestock, including domestic use incidental thereto, on tracts of land operated in units of more than two (2) acres;

(f) "municipal, industrial, and domestic water" shall mean water used for other than agricultural purposes;

(g) "year" shall mean the period from April 1 to March 31;

(h) "conservation storage space" shall mean that space in New Hogan which may be utilized, subject to flood control requirements, for agricultural and municipal, industrial, and domestic water use. It shall be limited to a maximum of three hundred and ten thousand (310,000) acre-feet at any one time and shall not include the storage space in New Hogan actually used for sediment and flood control; and

--Definitions--

(i) "water released from New Hogan" shall mean water released from the outlet works of New Hogan Dam or withdrawn directly from New Hogan Reservoir.

EFFECTIVE DATE

2. This contract shall be effective on the date first hereinabove written and at that time shall supersede Interim Contract No. 14-06-200-4659A, dated December 31, 1969, between the United States and the Stockton District relating to the use of New Hogan.

DISTRICTS TO APPOINT WATERMASTER--NONLIABILITY OF THE UNITED STATES

3. (a) The Districts by written agreement shall appoint a watermaster, and shall make his identity known to the Contracting Officer and the District Engineer. He shall be responsible for the following:

(1) Administration of the diversion into storage, storage regulation, and release of water pursuant to the terms of this contract; and

(2) Submittal of water use schedules to the Contracting Officer and the District Engineer pursuant to Article 5 and the coordination of schedules between the Districts.

(b) The United States shall not be liable or responsible for the carriage, distribution, or diversion of water after its release and/or diversion from New Hogan pursuant to this contract.

RESERVOIR OPERATION--USE OF WATER BY DISTRICTS

4. (a) Acting through the District Engineer, at the request of the watermaster, the United States shall store, regulate and/or release all flows of the Calaveras River at New Hogan for the purpose of making available agricultural and municipal, industrial, and domestic water for use by the Districts. Such storage, regulation, and release of water shall be subordinate only to storage and release of water for flood control, as conclusively determined by the District Engineer; to maintenance of a storage basin of fifteen thousand (15,000) acre-foot capacity for silting and storage of water for recreational and incidental uses, including recreational use on United States lands adjacent to the Reservoir; and to release of the portion of the unregulated runoff in the Calaveras River which is passed through New Hogan as it occurs in recognition of prior downstream water rights entitlements.

(b) Acting through the District Engineer, the United States may temporarily reduce or discontinue storage, regulation, and/or release of water for purposes of investigation, inspection, maintenance, repair, or replacement of any of the facilities of New Hogan. So far as feasible, however, the District Engineer will give the watermaster notice in advance of such temporary interruption except in case of emergency when notice need not be given.

(c) After meeting prior downstream water rights entitlements, the release and entitlement to water from New Hogan shall be in accordance with the schedule submitted pursuant to Article 5.

(d) For purposes of subdivision (b) of Article 6 the Stockton District shall be deemed to have diverted municipal, industrial, and domestic water during this contract as follows:

(1) 1st through 10th year - as determined by actual deliveries to municipal, industrial, and domestic customers;

(2) 11th through 20th year - ten thousand (10,000) acre-feet or actual municipal, industrial, and domestic water deliveries, whichever is greater;

(3) 21st through 30th year - twenty thousand (20,000) acre-feet or actual municipal, industrial, and domestic water deliveries, whichever is greater; and

(4) 31st through 40th year - thirty thousand (30,000) acre-feet or actual municipal, industrial, and domestic water deliveries, whichever is greater.

WATER USE SCHEDULE

5. (a) Prior to April 1 the watermaster shall submit a written schedule to the District Engineer and the Contracting Officer indicating the desired times and quantities of water to be released from New Hogan during the year. The watermaster shall inform the District Engineer of any revision in said schedule within a reasonable time before the desired change of time of delivery.

(b) Prior to May 1 of each year the watermaster shall submit to the Contracting Officer a water use report indicating for the preceding year the total quantity of water actually used for municipal, industrial, and domestic purposes.

(c) Each day the watermaster shall submit to the District Engineer a water use report indicating for the previous day the total quantity of water actually withdrawn directly from New Hogan Reservoir.

RATE AND METHOD OF PAYMENT

6. (a) The Districts shall pay to the United States their share of the construction, operation, maintenance, replacement, and contract administration costs of New Hogan in the following manner:

(1) Construction Costs - The total reimbursable construction allocation of New Hogan, which is thirty-six and two-tenths percent (36.2%) of the construction cost of New Hogan, excluding any specific costs associated with recreational use, as determined by the Secretary of the Army, in forty (40) equal annual installments commencing on September 1 following the execution of this contract. Payments shall be made to the Bureau of Reclamation and mailed to 2800 Cottage Way, Sacramento, California 95825. Revenues received from prior interim contracts between the Stockton District and the United States for water service from New Hogan, less operation and maintenance and contract administration expenses chargeable to such contracts, shall be credited to payments due until such credits are depleted. The Contracting Officer shall notify the Districts in writing by August 1 following execution of this contract the amount of accumulated credits and the application thereof. If the actual construction cost shall not have been determined on the date of this contract the Contracting Officer shall announce the

Article 6(a)(1)--

estimated construction cost. Such estimated construction cost shall govern the amount of the construction obligation until the actual construction obligation can be determined and a statement thereof furnished to the Districts. Installments coming due after the determination of the actual construction cost shall be adjusted to reflect any difference between the estimated and the actual construction cost;

(2) Operation, Maintenance, and Replacement Costs - The Districts shall pay to the United States thirty-eight percent (38%) of the total operation, maintenance, and replacement costs of New Hogan, excluding any specific costs associated with recreational use of New Hogan, to be paid in equal annual amounts for 5-year periods which shall begin on April 1 of the first year of each period and end March 31 of the fifth year. During the first 5-year period beginning April 1 of the year following the year in which this contract is executed, the Districts shall pay to the United States annually the sum of Seventy-two Thousand Two Hundred ($72,200). This amount is estimated to cover the annual operation, maintenance, and replacement costs chargeable to the Districts during the first 5-year period plus the operation, maintenance, and replacement costs allocated to the Districts from the date of execution of this contract to April 1 of the following year. At the end of each 5-year period an estimate shall be made by the District Engineer of the

annual operation, maintenance, and replacement costs for the next 5-year period payable by the District and the Districts will be notified of the annual amount within thirty (30) days after the end of the preceding 5-year period. After the first 5-year period the annual installments due for succeeding 5-year periods shall be adjusted to reflect the difference between the actual operation, maintenance, and replacement costs allocated to the Districts for the previous 5-year period and the sum advanced by the Districts. Annual payments for operation, maintenance, and replacement costs shall be due June 1 of each year and shall be made payable to the Treasurer of the United States and deposited with the Disbursing Officer, United States Army, Corps of Engineers, 650 Capitol Mall, Sacramento, California 95814; and

(3) Contract Administration Costs - Upon execution of this contract, the Districts shall pay Five Thousand Dollars ($5,000) to the Contracting Officer for contract administration costs. Not later than August 1 of each year thereafter the Contracting Officer shall furnish to the Districts a statement of the actual costs of the Bureau of Reclamation incurred in administering this contract and the recordable contracts in the preceding fiscal year made in accordance

with Article 19 and such amount shall be paid by the Districts to the Contracting Officer by September 1 of each year in order to restore the account to Five Thousand Dollars ($5,000): Provided, That this amount may be exceeded to the extent of the costs of appraisals provided for in Article 20: Provided further, That at any time it appears that this amount will be insufficient to cover the costs of appraisals for the remainder of the year the Districts shall advance within thirty (30) days after receipt of notice the additional amount which the Contracting Officer estimates will be necessary to cover such costs.

(b) Each year prior to September 1 the Districts shall pay interest at two and six-tenths percent (2.6%) annually on that portion of the unpaid construction obligation which is allocated to municipal, industrial, and domestic water use computed in the ratio that such use or contract obligation bears to sixty-nine thousand (69,000) acre-feet minus one-tenth (0.1) of the amount of municipal and industrial water contract obligation or water used. The interest for the period from the date of execution to the following March 31 shall be computed on that portion of the unpaid construction obligation allocated to municipal and industrial water use in the ratio that such use bears to twenty-nine thousand (29,000) acre-feet.

(c) After the construction cost allocated to conservation has been paid with interest when applicable as provided in subdivision (b) of this article, the only cost to be paid by the Districts will be for operation, maintenance, and replacement and contract administration as provided in subsections (2) and (3) of subdivision (a) of this article.

(d) All payments to be made by the Districts under this article shall be by certified check, money order, bank draft, or District warrant.

QUALITY OF WATER

7. The operation and maintenance of the New Hogan facilities for the provision of water under this contract shall be performed in such manner as is practicable to maintain the quality of raw water released from New Hogan. The United States is under no obligation to construct or furnish water treatment facilities to maintain or to better the quality of water. Further, the United States does not warrant the quality of water to be released from New Hogan pursuant to this contract.

POINTS OF DIVERSION--MEASUREMENT OF WATER

8. (a) Water will be made available to the Districts at the outlet works of New Hogan or at such points adjacent to New Hogan as may be jointly agreed upon in writing by the Contracting Officer, the District Engineer, and the watermaster.

(b) Water withdrawn directly from New Hogan Reservoir shall be measured by the Districts at a point located in accordance with subdivision (a) of this article. Water furnished by the Districts for municipal, industrial, and domestic use shall be measured by the Districts at the point or points of delivery to such users. Measurements shall be made with equipment installed, operated, and maintained by the Districts: Provided, That upon the request of the Contracting Officer the Districts shall investigate the accuracy of all measuring equipment installed by the Districts to determine the quantity of municipal, industrial, and domestic water diverted and shall adjust any errors disclosed by such investigation. The United States shall be afforded reasonable opportunity to be present during the inspection and testing procedure by the Districts and the United States shall have full and free access at all reasonable times to inspect said measuring equipment for the purpose of determining the accuracy and condition thereof. If said facilities are found to be defective or inaccurate they shall be readjusted or repaired, or both, or replaced by the Districts. In the event the Districts neglect or fail to make such repairs or replacements within a reasonable time as may be necessary to satisfy the operating requirements of the Contracting Officer, the United States may cause the repairs or replacements to be made and charge the costs thereof to the Districts, which charge the Districts shall pay to the United States on or before June 1 of the year following that in which the cost was incurred and a statement thereof furnished by the Contracting Officer.

SUBCONTRACTS

9. The Districts shall be responsible for the furnishing of agricultural water from New Hogan only to lands within the confines of each District's area of jurisdiction. Nothing herein shall prohibit the Districts or water users within the Districts from commingling municipal, industrial, and domestic water from New Hogan with water from other sources and exporting an amount of municipal, industrial, and domestic water not in excess of the water from those other sources beyond the boundaries of the Districts. Each District, without the consent of the other District or of the Contracting Officer, may enter into subcontracts for the furnishing of agricultural or municipal, industrial, and domestic water, and each such subcontract shall contain a provision whereby the subcontractor specifically agrees to be bound by the provisions of this contract. Nothing contained in any such subcontract shall be deemed in any way to release the Districts from their primary liability to the United States with respect to each and all of the obligations undertaken by each District pursuant to this contract. Copies of subcontracts for the furnishing of New Hogan water shall be furnished to the Contracting Officer.

UNITED STATES NOT LIABLE FOR WATER SHORTAGE--RESPONSIBILITY OF DISTRICTS--RETURN FLOWS--RIGHT OF ACCESS TO WORKS

10. (a) In no event shall any liability accrue against the United States or any of its officers, agents, or employees for any damage, direct or indirect, arising from a shortage of water on account of errors in operation, drought, or other unavoidable causes whatsoever.

(b) The Districts agree to take water released from New Hogan pursuant to this contract at the delivery points established pursuant to Article 8 hereof and to perform any and all acts necessary thereafter to maintain control over such water. The Districts assume full responsibility for the control and distribution of such water: Provided, That the United States reserves the right to all waste, seepage, and return-flow water derived from water furnished to the Districts which escapes or is discharged beyond the Districts' boundaries, and nothing herein shall be construed as an abandonment or a relinquishment by the United States of any such water, but this shall not be construed as claiming for the United States any right, as waste, seepage, or return flow, to water being used pursuant to this contract for surface irrigation or underground storage within the Districts' boundaries by the Districts.

(c) All works, including pipelines, pumps, and meters necessary to enable the Districts to take and distribute water from New Hogan pursuant to this contract shall be constructed, operated, and maintained, or caused to be constructed, operated, and maintained by the Districts without cost or expense to the United States. An easement is necessary and will be granted pursuant to 10 U.S.C. 2669 for the installation, operation, and maintenance of these works on property of the United States. In addition, it is understood that installation, operation, and maintenance of such works on property of the United States shall also be subject to such restrictions and regulations as to location, method of installation, operation, and maintenance as may be prescribed by the Contracting Officer and the District Engineer and subject further to the provisions of subdivision (d) of this article. It is specifically recognized and agreed that this contract does not grant to the Districts any right of access to the stored waters at New Hogan or to the adjacent lands of the United States for any purpose except as provided herein for installation, operation, and maintenance of facilities.

(d) Works installed pursuant to subdivision (c) of this article shall be installed in accordance with plans and specifications approved by the Contracting Officer and the District Engineer. The Contracting Officer and the District Engineer shall have the right of ingress and egress at all reasonable times over and across the land of the Districts for the purpose of inspecting and reading the meters which may be installed and the Districts hereby grant a right-of-way to said parties for such purpose.

(e) The Districts do not assume any obligation, liability, or responsibility for conditions arising out of the operation of New Hogan for flood control or the release of any water for flood control, or for any defect in or failure of New Hogan works.

WATER POLLUTION CONTROL

11. The Districts agree that they will comply fully with all applicable Federal laws, orders, and regulations, and the laws of the State of California, all as administered by appropriate authorities, concerning the pollution of streams, reservoirs, groundwater, or water courses with respect to thermal pollution or the discharge of refuse, garbage, sewage effluent, industrial waste, oil, mine tailings, mineral salts or other pollutants. The Districts agree further that any contract they may enter into with a third party for the furnishing of New Hogan water will contain a similar water pollution control article.

TITLE AND PHYSICAL OPERATIONS TO BE WITH THE UNITED STATES

12. (a) Title to all of New Hogan works shall be and remain in the name of the United States.

(b) Any and all physical operations of New Hogan pursuant to this contract shall be performed by the Corps of Engineers on behalf of the United States.

Article 10(e)
Article 11
Article 12

CHARGES A GENERAL OBLIGATION--LEVIES THEREFOR

13. (a) The Districts, notwithstanding the default in the payment by individual water users of assessments, tolls, or other charges levied by the Districts, are obligated to pay to the United States the charges becoming due as provided in this contract in the manner and proportions prescribed in the operating agreement entered into by the Districts pursuant to Article 34.

(b) The Districts shall cause to be levied and collected all necessary assessments, tolls, and other charges, and shall use all of the authority and resources of the Districts to meet their obligations hereunder.

ALL BENEFITS CONDITIONED UPON PAYMENT

14. (a) It is agreed that the payment of charges upon the terms and conditions provided for herein is a prerequisite to the right to the use of water released to the Districts pursuant to this contract.

(b) Should the Districts fail to levy the assessments, tolls, or charges against any lands or water user required to meet the Districts' obligation to the United States under this contract or, having levied, should the Districts be prevented from collecting such assessments, tolls, or charges by judicial proceedings, or otherwise fail to collect them, such lands or water users shall not be entitled to receive water from New Hogan and the Districts, except as otherwise ordered by a court of competent jurisdiction, shall not deliver water to such lands or water users from New Hogan unless and until arrangements for its delivery satisfactory to the Contracting Officer have been made.

COVENANT AGAINST CONTINGENT FEES

15. The Districts warrant that no person or selling agency has been employed or retained to solicit or secure this contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Districts for the

Article 14
Article 15--

purpose of securing business. For breach or violation of this warranty the United States shall have the right to annul this contract without liability, or in its discretion to add to the contract repayment obligation or consideration the full amount of such commission, percentage, brokerage, or contingent fee.

PENALTY FOR DELINQUENT PAYMENTS

16. The Districts shall pay a penalty on installments or charges which become delinquent computed at the rate of one-half of one percent per month of the amount of such delinquent installments or charges for each day from the date of such delinquency until paid: Provided, That no penalty shall be charged to the Districts unless such delinquency continues for more than thirty days.

BOOKS, RECORDS, AND REPORTS

17. The Districts shall establish and maintain accounts and other books and records pertaining to their financial transactions, land use and crop production, water use, and to such other matters as the Contracting Officer may require. Reports thereon shall be furnished to the United States in such form and on such date or dates as may be required by the Contracting Officer. Each party shall have the right, during office hours, to examine and make copies of the other parties' books and official records relating to matters covered by this contract.

CHANGES IN DISTRICT ORGANIZATION

18. While this contract is in effect, no change shall be made in the Districts, by inclusion or exclusion of lands, by dissolution, consolidation, or merger or otherwise, except upon the Contracting Officer's written consent thereto.

LAND NOT TO RECEIVE WATER FURNISHED TO DISTRICTS BY UNITED STATES UNTIL OWNERS THEREOF EXECUTE CERTAIN CONTRACTS

19. (a) No New Hogan water released to a District pursuant to this contract shall be furnished by the District or a subcontractor thereof to any excess lands as defined in Article 21 unless the owners thereof shall have executed valid recordable contracts in form prescribed by the United States, agreeing to the provisions of this article and Articles 20 and 21 hereof, agreeing to the appraisal provided for in Article 20 hereof and that such appraisal shall be made on the basis of the actual bona fide value of such lands at the date of the appraisal without reference to the construction of New Hogan, all as hereinafter provided, and agreeing to the sale of such excess lands under terms and conditions satisfactory to the Secretary and at prices not to exceed those fixed, as hereinafter provided. No sale of any excess lands shall carry the right to receive water made available pursuant to this contract, unless and until the purchase price involved in such sale is approved by the Contracting Officer and upon proof of fraudulent representation as to the true

consideration involved in such sales the United States may instruct the District by written notice to refuse to furnish any water subject to this contract to the land involved in such fraudulent sales and the District thereafter shall not furnish said water to such lands.

(b) If New Hogan water furnished to a District pursuant to this contract reaches the underground strata of excess land owned by a large landowner, as defined in Article 21, who has not executed a recordable contract and the large landowner pumps such New Hogan water from the underground, the District will not be deemed to have furnished such water to said lands within the meaning of this contract if such water reached the underground strata of the aforesaid excess land as an unavoidable result of the furnishing of New Hogan water by the District to nonexcess lands or to excess lands with respect to which a recordable contract has been executed.

VALUATION AND SALE OF EXCESS LANDS

20. (a) The value of the excess irrigable lands within a District as defined in Article 21, held in private ownership of large landowners as defined in said article, for the purposes of this contract, shall be appraised in a manner to be prescribed by the Secretary. At the option of the large landowner, however, the value of such land may be appraised, subject to the approval thereof by the Secretary, by three appraisers. One of said appraisers shall

be designated by the Secretary and one shall be designated by the respective District in which the land is located, and the two appraisers so appointed shall name the third. If the appraisers so designated by the Secretary and the District are unable to agree upon the appointment of the third, the Presiding Justice of the Third District Court of Appeal of the State of California shall be requested to name the third appraiser.

(b) The following principles shall govern the appraisal:

(1) No value shall be given such lands on account of the existing or prospective possibility of securing water from New Hogan; and

(2) The value of improvements on the land at the time of said appraisal shall be included therein, but shall also be set forth separately in such appraisal.

(c) The excess land of any large landowner shall be reappraised in the manner provided in subdivision (a) hereof at the instance of the United States or at the request of said landowner. The cost of the first two appraisals of each tract of excess land shall be paid by the United States. The cost of each appraisal thereafter shall be paid by the party requesting such appraisal.

(d) Any improvements made or placed on the appraised land after the appraisal hereinabove provided for prior to sale of the land by a large landowner may be appraised in like manner.

--Article 20(a) - (d)

(e) Excess irrigable lands sold by large landowners within a District shall not carry the right to receive water made available pursuant to this contract for such land and the Districts agree to refuse to furnish such water to lands so sold until, in addition to compliance with the other provisions hereof, a verified statement showing the sale price upon any such sale shall have been filed with the District and the sale price is not in excess of the appraised value as provided herein.

(f) Each District agrees to take all reasonable steps requested by the Contracting Officer to ascertain the occurrence and conditions of all sales of irrigable lands of large landowners in such District made subsequent to the execution of this contract and to inform the United States concerning the same.

(g) A true copy of this contract, of each recordable contract executed pursuant to this article and Articles 19 and 21 hereof, and of each appraisal made pursuant thereto shall be furnished to the respective District by the United States and shall be maintained on file in the office of said District and like copies in such offices of the Bureau of Reclamation as may be designated by the Contracting Officer and shall be made available for examination during the usual office hours by all persons who may be interested therein.

Article 20(e) - (g)

EXCESS LANDS

21. (a) As used herein, the term "excess land" means that part of the irrigable land in excess of one hundred and sixty (160) acres held within the area served by a District and its subcontractors in the beneficial ownership of any single person, whether a natural person, a corporation, or the beneficiary of a trust approved by the Contracting Officer. With respect to land held in co-ownership, such as a tenancy in common, joint tenancy, or community property, the beneficial ownership of each co-owner shall be that fraction of the total acreage held in co-ownership which equals the co-owner's fractional interest therein. The term "large landowner" means an owner of excess lands, and the term "nonexcess land" means all irrigable land within each District which is not excess land as defined herein.

(b) Each large landowner as a condition precedent to the right to receive water made available pursuant to this contract for any of his excess lands shall:

(1) Before any New Hogan water is furnished by the District to his excess land, execute a valid recordable contract in form prescribed by the United States, agreeing to the provisions contained in this article and Articles 19 and 20 hereof and agreeing to dispose of his excess lands in accordance therewith to persons who can take title thereto as nonexcess land as

herein provided and at a price not to exceed the approved, appraised value of such excess land and within a period of ten (10) years after the date of the execution of said recordable contract and agreeing further that if said land is not so disposed of within said period of ten (10) years, the Secretary shall have the power to dispose of said land at the appraised value thereof fixed as provided herein or such lower price as may be approved by the owner of such land, subject to the same conditions on behalf of such large landowner; and each District agrees that it will refuse to furnish said water to any large landowner other than for his nonexcess lands until such owner meets the conditions precedent herein stated; and

(2) Within thirty (30) days after the date of notice from the United States requesting such large landowner to designate his irrigable lands within a District which he desires to designate as nonexcess lands, file in the office of such District, in duplicate, one copy thereof to be furnished by said District to the Bureau of Reclamation, his written designation and description of lands so selected to be nonexcess lands and upon failure to do so the District shall make such designation and mail a notice thereof to such large landowner, and in the event the District fails to act within such period of time as

the Contracting Officer considers reasonable, such designation will be made by the Contracting Officer, who will mail a notice thereof to the District and the large landowner. The large landowner shall become bound by any such action on the part of the District or the Contracting Officer and the District will furnish said water only to the land so designated to be nonexcess land. A large landowner may with the consent of the Contracting Officer designate land other than that previously designated as nonexcess land: Provided, That an equal acreage of the land previously designated as nonexcess, shall, upon such new designation, become excess land thereafter subject to the provisions of this article and Articles 19 and 20 hereof and shall be described in an amendment of such recordable contract as may have been executed by the large landowner, in the same manner as if such land had been excess land at the time of the original designation.

REPEAL OR AMENDMENT OF FEDERAL RECLAMATION LAWS

22. In the event that the Congress of the United States repeals the so-called excess land provisions of the Federal reclamation laws, Articles 19, 20, and 21 of this contract will no longer be of any force or effect, and, in the event that the Congress amends the excess-land provision or other provisions of the Federal reclamation laws, the

United States agrees, at the option of the Districts, to negotiate amendments of appropriate articles of this contract, all consistently with the provisions of such amendment.

WATER ACQUIRED BY DISTRICTS OTHER THAN FROM THE UNITED STATES

23. (a) The provisions of this contract shall not be applicable to or affect water or water rights now owned or hereafter acquired by the Districts or landowners within the Districts other than from the United States. Water furnished pursuant to the terms of this contract may be transported by means of the same facilities as water now available or which may become available to the Districts or landowners within the Districts other than pursuant to the terms of this contract if the Contracting Officer determines that such mingling is necessary to avoid a duplication of facilities; and notwithstanding such mingling of water, the provisions of this contract shall be applicable to the quantity of water furnished to the Districts pursuant to the terms hereof, and such mingling of water shall not in any manner subject to the provisions of this contract the quantity of water acquired by or available to the Districts or landowners within the Districts other than from the United States.

(b) With respect to the facilities or portions thereof in which mingling is permitted as provided in subdivision (a) hereof, the Districts shall take or cause to be taken such action as may in the opinion of the Contracting Officer be necessary to assure that the quantity of water furnished by the United States during each 24-hour period will be delivered by the Districts only to lands eligible to receive the same under Articles 19, 20, and 21 herein. The Districts shall be deemed to be in breach of this article and Articles 19, 20, and 21 of this contract if at any time there is furnished to excess lands not covered by recordable contracts and served by the facilities or portions thereof in which mingling is permitted, a quantity of water which is greater than that which the District or landowners within the Districts have introduced into said facilities from the supply available other than pursuant to this contract.

CONTINGENT ON APPROPRIATION OR ALLOTMENT OF FUNDS

24. The expenditure of any money or the performance of any work by the United States hereunder which may require appropriation of money by the Congress or the allotment of funds shall be contingent upon such appropriation or allotment being made. The failure of the Congress so to appropriate funds or the absence of any allotment of funds shall not relieve the Districts from any obligations then accrued under this contract and no liability shall accrue to the United States in case such funds are not appropriated or allotted.

OFFICIALS NOT TO BENEFIT

25. (a) No Member of or Delegate to Congress or Resident Commissioner shall be admitted to any share or part of this contract or to any benefit that may arise therefrom. This restriction shall not be construed to extend to this contract if made with a corporation or company for its general benefit.

(b) No official of the Districts shall receive any benefit that may arise by reason of this contract other than as a landowner within the Districts and in the same manner as other landowners within the Districts.

NOTICES

26. (a) Any notice authorized or required to be given to the United States shall be deemed to have been given when mailed, postage prepaid, or delivered to the Regional Director, Region 2, Bureau of Reclamation, 2800 Cottage Way, Sacramento, California 95825. Any notice authorized or required to be given to the Districts shall be deemed to have been given when mailed in a postage-prepaid or franked envelope or delivered to:

(1) Stockton and East San Joaquin Water Conservation District, Post Office Box 5157, Stockton, California 95205; and

(2) Calaveras County Water District, Post Office Box 846, San Andreas, California 95249.

(b) The designation of the addressee or the address given above may be changed by notice given in the same manner as provided in this article for other notices.

(c) This article shall not preclude the effective service of any such notice or announcement by other means.

ASSIGNMENT LIMITED--SUCCESSORS AND ASSIGNS OBLIGATED

27. The provisions of this contract shall apply to and bind the successors and assigns of the parties hereto, but no assignment or transfer of this contract or any part or interest therein shall be valid until approved by the Secretary.

REMEDIES UNDER CONTRACT NOT EXCLUSIVE--WAIVERS

28. Nothing contained in this contract shall be construed as in any manner abridging, limiting, or depriving the United States of any means of enforcing any remedy, either at law or in equity, for the breach of any of the provisions hereof which it would otherwise have. Any waiver at any time by either party to this contract of its rights with respect to a default, or any matter arising in connection with this contract, shall not be deemed to be a waiver with respect to any subsequent default or matter.

DETERMINATIONS

29. (a) Where the terms of this contract provide for action to be based upon the opinion or determination of either party to this contract, whether or not stated to be conclusive, said terms shall not be construed as permitting such action to be predicated upon arbitrary, capricious, or unreasonable opinions or determinations.

(b) In the event the Districts question any factual determination made by a representative of the Secretary as required in the administration of this contract, any findings, as to the facts in dispute thereafter made by the Secretary shall be made only after consultation with the Board of Directors of each District.

(c) Except as otherwise provided herein, the Secretary's decision on all questions of fact arising under this contract shall be conclusive and binding upon the parties hereto.

ASSURANCE RELATING TO VALIDITY OF CONTRACT

30. Promptly after the execution and delivery of this contract. each District shall file and prosecute to a final decree, including any appeal therefrom to the highest court of the State of California, in a court of competent jurisdiction a special proceeding for the judicial examination, approval, and confirmation of the proceedings had for the organization of the District and the proceedings of the District's Board of Directors and of the District leading up to and

including the making of this contract and the validity of the provisions hereof; and this contract shall not be binding on the United States until each District's organization and proceedings and this contract shall have been so confirmed by a court of competent jurisdiction or pending appellate action in any court if ground for appeal be laid. The Districts shall furnish to the Contracting Officer certified copies of such decree and of all pertinent supporting documents.

TITLE VI, CIVIL RIGHTS ACT OF 1964

31. (a) The Districts hereby agree that they will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352) and all requirements imposed by or pursuant to the Department of the Interior Regulation (43 CFR 17) issued pursuant to that title, to the end that, in accordance with Title VI of that Act and the Regulation, no person in the United States shall, on the ground of race, color, or national origin be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Districts receive financial assistance from the Bureau of Reclamation and hereby give assurance that they will immediately take any measures to effectuate this agreement.

(b) If any real property or structure thereon is provided or improved with the aid of Federal financial assistance extended to

--Article 30
Article 31(a) - (b)--

the Districts by the Bureau of Reclamation, this assurance obligates the Districts, or in the case of any transfer of such property, any transferee for the period during which the real property or structure is used for a purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance obligates the Districts for the period during which they retain ownership or possession of the property. In all other cases, this assurance obligates the Districts for the period during which the Federal financial assistance is extended to them by the Bureau of Reclamation.

(c) This assurance is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property, discounts, or other Federal financial assistance extended after the date hereof to the Districts by the Bureau of Reclamation, including installment payments after such date on account of arrangements for Federal financial assistance which were approved before such date. The Districts recognize and agree that such Federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall reserve the right to seek judicial enforcement of this assurance. This assurance is binding on the Districts, their successors, transferees, and assignees.

EQUAL OPPORTUNITY

32. During the performance of this contract, the Districts agree as follows:

(a) The Districts will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Districts will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Districts agree to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Contracting Officer setting forth the provisions of this Equal Opportunity clause.

(b) The Districts will, in all solicitations or advertisements for employees placed by or on behalf of the Districts, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(c) The Districts will send to each labor union or representative of workers with which they have a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency Contracting Officer, advising the labor union or workers' representative of the Districts' commitments under this Equal Opportunity clause, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(d) The Districts will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(e) The Districts will furnish all information and reports required by said Executive Order and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to their books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(f) In the event of the Districts' noncompliance with the Equal Opportunity clauses of this contract or with any

Article 32(c) - (f)--

EQUAL OPPORTUNITY

32. During the performance of this contract, the Districts agree as follows:

(a) The Districts will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Districts will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Districts agree to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Contracting Officer setting forth the provisions of this Equal Opportunity clause.

(b) The Districts will, in all solicitations or advertisements for employees placed by or on behalf of the Districts, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(c) The Districts will send to each labor union or representative of workers with which they have a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency Contracting Officer, advising the labor union or workers' representative of the Districts' commitments under this Equal Opportunity clause, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(d) The Districts will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(e) The Districts will furnish all information and reports required by said Executive Order and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to their books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(f) In the event of the Districts' noncompliance with the Equal Opportunity clauses of this contract or with any

Article 32(c) - (f)--

of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended, in whole or in part, and the Districts declared ineligible for further Government contracts in accordance with procedures authorized in said Executive Order, and such other sanctions may be imposed and remedies invoked as provided in said Executive Order, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(g) The Districts will include the provisions of subdivisions (a) through (g) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of said Executive Order so that such provisions will be binding upon each subcontractor or vendor. The Districts will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, That in the event the Districts become involved in, or are threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the Districts may request the United States to enter into such litigation to protect the interests of the United States.

RULES AND REGULATIONS

33. The Secretary reserves the right to make, after consultation with the Districts, such rules and regulations consistent with the provisions of this contract, the laws of the United States and the State of California, and to add to or to modify them as may be deemed proper and necessary to carry out this contract, and to supply necessary details of its administration which are not covered by express provisions of this contract. The Districts agree to observe such rules and regulations.

DISTRICTS TO MAKE OPERATING AGREEMENT

34. Prior to the execution of this contract the Districts shall enter into an operating agreement providing, among other things, for the division between **the Districts of the New Hogan** water and the payment of the costs becoming due pursuant to this contract. Such agreement shall be in accordance with the terms and conditions of this contract and shall be subject to approval by the Contracting Officer prior to execution.

IN WITNESS WHEREOF, the parties have executed this contract the day and year first herein written.

THE UNITED STATES OF AMERICA

Rita Singer
Appd. Sol. Off.

By [signature]
Regional Director, Region 2
Bureau of Reclamation

STOCKTON AND EAST SAN JOAQUIN
WATER CONSERVATION DISTRICT

(SEAL)

ATTEST:

By William C [signature]
President

[signature]
Secretary

CALAVERAS COUNTY WATER DISTRICT

(SEAL)

ATTEST:

By William D. Hart
President

[signature] Stanley Edwards
Secretary

APPROVED:

DEPARTMENT OF THE ARMY

By Stanley R. Reas

Date: September 15, 1970

RESOLUTION NO. 1255

RESOLUTION OF THE BOARD OF DIRECTORS OF THE CALAVERAS COUNTY WATER DISTRICT AUTHORIZING EXECUTION OF CONTRACT BETWEEN THE UNITED STATES OF AMERICA AND THE STOCKTON & EAST SAN JOAQUIN WATER CONSERVATION DISTRICT AND THE CALAVERAS COUNTY WATER DISTRICT PROVIDING FOR REPAYMENT AND CONSERVATION USE OF NEW HOGAN PROJECT

WHEREAS, there has been presented to this Board a proposed "Contract Between the United States of America and Stockton & East San Joaquin Water Conservation District and Calaveras County Water District Providing for Repayment and Conservation Use of New Hogan Project Numbered R.O. Draft 7/6-1970, Rev. W.O. 7/20-1970, Rev. R.O. 8/13-1970"; and

WHEREAS, said contract has been approved by the United States Department of the Interior and the Corps of Army Engineers; and

WHEREAS, the Secretary - Manager of this District recommends that said Contract be approved by this Board and that the President and Secretary of this District be authorized to execute said Contract on behalf of this District;

NOW, THEREFORE, BE IT RESOLVED:

That said Contract is approved and the President and Secretary of this District are authorized and directed to execute said "Contract Between the United States of America and the Stockton & East San Joaquin Water Conservation District and Calaveras County Water District Providing for Repayment and Conservation Use of the New Hogan Project" on behalf of this District.

PASSED AND ADOPTED this 19th day of August 1970, by the following vote:

AYES: Directors Irvin Tanner, Elliott McCombs, Oliver Turner, Kenneth Mitchell and William Hart

NOES: None

ABSENT: None

CALAVERAS COUNTY WATER DISTRICT

RESOLUTION NO. 1255

William D. Hart

President of the Board of Directors
of Calaveras County Water District

ATTEST:

Stanley Edwards

Secretary of the Board of Directors
of Calaveras County Water District

CERTIFIED A TRUE COPY

Stanley Edwards

SECRETARY

Calaveras County Water District

R.O. Draft 10/16-1987

Contract No.
14-06-200-5057A
Amendatory

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
New Hogan Project, California

AMENDATORY CONTRACT AMONG THE UNITED STATES OF AMERICA, STOCKTON EAST WATER DISTRICT AND CALAVERAS COUNTY WATER DISTRICT PROVIDING FOR REPAYMENT AND CONSERVATION USE OF NEW HOGAN PROJECT

THIS AMENDATORY CONTRACT, made this 25th day of March, 1988 between the UNITED STATES OF AMERICA, hereinafter referred to as the United States, represented by the Contracting Officer executing this amendment, and STOCKTON EAST WATER DISTRICT AND CALAVERAS COUNTY WATER DISTRICT hereinafter referred to as the Contractors,

WITNESSETH, That:

EXPLANATORY RECITALS

WHEREAS, the parties have entered into a repayment contract, dated August 25, 1970 and identified as contract No. 14-06-200-5057A, as amended, which provides repayment and conservation use of New Hogan Dam and Reservoir and is hereinafter referred to as the repayment contract; and

WHEREAS, pursuant to Section 212 of Public Law 97-293 the Reclamation Reform Act of October 12, 1982, the Contractors' water supply from the abovestated reservoir is exempt from the provisions of Federal reclamation law; and

WHEREAS, the Contractors desire to amend the repayment contract to reflect the intent so stated in Section 212 of Public Law 97-293;

NOW, THEREFORE, in consideration of the mutual and dependent stipulations and covenants herein contained, it is mutually agreed by the parties hereto as follows:

1. The following changes to the repayment contract between the United States and the Contractors, shall be effective commencing October 12, 1982.

2. Articles 19, 20, 21 and 22 of the repayment contract and all references to such articles in other articles of the repayment contract are hereby deleted in their entirety.

3. Nothing in this amendatory contract shall terminate, cancel or affect any sales of land heretofore made under recordable contract.

4. Except as herein amended, all provisions of the repayment contract shall remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have signed their names as of the day and year first above written.

UNITED STATES OF AMERICA

ACTING By ______________________
Regional Director, Mid-Pacific Region
Bureau of Reclamation

(SEAL)

Attest:

____
Secretary

STOCKTON-EAST WATER DISTRICT

By ______________________
President

(SEAL)

Attest:

____
Secretary
CORP20

CALAVERAS COUNTY WATER DISTRICT

By ______________________
President

RESOLUTION NO. 87-160

WHEREAS, the Bureau of Reclamation has proposed amendments to the contract for New Hogan Water to delete those sections relating to ownership or pricing limitations of Federal Reclamation Law.

BE IT RESOLVED that the Board of Directors of CALAVERAS COUNTY WATER DISTRICT does hereby authorize the execution of the "Amendatory Contract Among the UNITED STATES OF AMERIÇA, STOCKTON EAST WATER DISTRICT and CALAVERAS COUNTY WATER DISTRICT Providing For Payment and Conservation Use of the New Hogan Project."

BE IT FURTHER RESOLVED that the President is hereby authorized to execute said Amendatory Contract.

PASSED AND ADOPTED this 10th day of December, 1987 by the following vote:

AYES: Directors Clark, Johnson, Neilsen, Gleason and Queirolo

NOES: None

ABSENT: None

CALAVERAS COUNTY WATER DISTRICT

President

ATTEST:

Steve Felts

Secretary

CERTIFIED A TRUE COPY

Linda Okeefe

Assistant Secretary

Calaveras County Water District

WIH 3/17

RESOLUTION OF THE BOARD OF DIRECTORS
OF STOCKTON EAST WATER DISTRICT

RESOLUTION 87-88-26

RESOLUTION AUTHORIZING SIGNATURES ON AMENDMENT TO CONTRACT
FOR USE OF NEW HOGAN WATER

WHEREAS, on February 16, 1988 the Board of Directors of Stockton East Water District adopted the Amendatory Contract Among the United States of America, Stockton East Water District and Calaveras County Water District Providing For Repayment And Conservation Use of New Hogan Project; and

WHEREAS, the United States of America has requested that signatures on the Amendatory Contract be authorized by Resolution of the Board of Directors of Stockton East Water District;

NOW, THEREFORE, BE IT RESOLVED, that the Board of Directors of Stockton East Water District approves and authorizes the Board President and Secretary of the Board to execute and sign the Amendatory Contract approved at the February 16, 1988 Board meeting.

PASSED AND ADOPTED by the Board of Directors of Stockton East Water District at a regular meeting held on March 15, 1988, by the following vote:

AYES: Solari, Dondero, Laven, Bozzano, MacNear, Huckins
NOES: Tone
ABSENT: None

Roger M. Huckins
ROGER M. HUCKINS, President
Stockton East Water District

ATTEST:

EDWARD M. STEFFANI, Secretary
Stockton East Water District

SECRETARY'S CERTIFICATE

I, EDWARD M. STEFFANI, Secretary of the Board of Directors of the STOCKTON-EAST WATER DISTRICT, Stockton, California, do hereby certify as follows:

The foregoing is a full, true and correct copy of a resolution duly adopted at a Regular Meeting of the Board of Directors of said District duly and regularly and legally held at the regular meeting place thereof on March 15, 1988, of which meeting all of the members of said Board of Directors had due notice and at which a majority thereof were present.

I have carefully compared the same with the original minutes of said meeting on file and of record in my office, and the foregoing is a full, true, and correct copy of the original resolution adopted at said meeting and entered in said minutes.

Said resolution has not been amended, modified, or rescinded since the date of its adoption, and the same is now in full force and effect.

Dated: 3/15/88

EDWARD M. STEFFANI
Secretary of the Board
STOCKTON-EAST WATER DIST

(SEAL)

MEMORANDUM OF UNDERSTANDING

BETWEEN

CALAVERAS COUNTY WATER DISTRICT

AND

STOCKTON EAST WATER DISTRICT

WHEREAS, on August 25, 1970 Calaveras County Water District (Calaveras) and Stockton East Water District (Stockton) entered into a contract with the United States of America providing for repayment and conservation use of New Hogan Project; and

WHEREAS, on August 25, 1970 Calaveras and Stockton entered into a contract providing for the use, repayment and administration of water from the New Hogan Project; and

WHEREAS, the New Hogan Project is operated by the US Corps of Engineers as a multi-purpose reservoir for recreation, flood control and conservation use; and

WHEREAS, contract between Calaveras, Stockton and United States reserves a storage basin of 15,000 acre feet for silting and storage of water for recreational and incidental uses; and

WHEREAS, the US Corps of Engineers through the District Engineer has developed an operational plan for the storage, regulation and release of flood control waters; and

WHEREAS, Calaveras filed an Application with the Federal Energy Regulatory Commission (FERC) for License to construct an electrical generating facility at New Hogan Dam; and

WHEREAS, it is the desire of Calaveras and Stockton to maximize the combined conservation and power generation potential of New Hogan and the Calaveras watershed.

NOW, THEREFORE, BE IT RESOLVED that Calaveras and Stockton are entering into this Memorandum of Understanding (MOU) to cooperatively pursue the greater use of water from New Hogan, to clarify the application of various contract terms, to resolve the conflict of the parties with respect to the proposed New Hogan Power Plant Project and to jointly investigate the availability and development of additional water supplies.

The Contract between Calaveras and Stockton provides for a distribution of the conservation yield based on a yield study prepared by Murray, Burns and Kienlen dated May 4, 1970. As a result of a study dated November 4, 1980 by Murray, Burns and Kienlen, Calaveras and Stockton wish to consider modification of the parameters used to develop the original yield study and thus increase the amount of water yield and assume risks which differ from those on which the 1970 study was based. In so doing, each party recognizes the need to protect and provide for certain needs and therefore wish to define the minimum delivery amounts which shall dictate the maximum reservoir drawdown. [redacted].

The parties recognize that certain contract provisions may be conflicting due to this MOU but agree that at such time as conflicts arise the parties shall confer to resolve any conflict in keeping with the concepts developed in this MOU. With respect to the provisions of Paragraph 5(A)(1) of the District's contract, the definition of "P", project water, shall be "Project Water, but in no event less than 71,100 acre feet".

Stockton shall prepare and submit to Calaveras a revised Operations Plan which Calaveras shall in good faith review and comment on, and then the parties shall jointly agree on a Final Operations Plan no later than December 31, 1982. This Plan may thereafter be modified by agreement of the parties.

Calaveras shall review its ultimate use and buildup schedule set forth in said August 25, 1970 contract and shall submit a revised use and buildup schedule to Stockton for good faith review and comment by July 1, 1983.

Calaveras filed an Application for License on October 13, 1981 with the Federal Energy Regulatory Commission (FERC) for Project No. 2903-001, a proposed 2.5 megawatt unit at New Hogan Dam. Stockton, on February 19, 1982, filed a petition to intervene and a Notice of Intent to file a competing application. In recognition of the desires and interests expressed in this MOU, and immediately upon mutual agreement between Calaveras and Stockton of this MOU or any modification thereof, then Stockton agrees to withdraw its petition, not file a competing application and to cooperate with Calaveras' efforts to develop and operate the hydroelectric project.

Stockton and Calaveras have a mutual need for additional water supplies as noted above, and Calaveras has submitted to Stockton a number of options for developing additional water supplies within Calaveras County. The parties agree that they shall investigate joint development of these options and in so doing Calaveras shall provide to Stockton its records, maps and other data regarding those options. The parties shall then jointly consider the feasibility of pursuing in additional detail development of one or more of those alternative projects. It is further understood that if one party desires not to proceed, the other may do so independently, and will not be hindered or opposed by the non-participating party.

PASSED AND ADOPTED by the Board of Directors of STOCKTON-EAST WATER DISTRICT on the 15th day of June, 1982 by Resolution No. 82-83-07.

STOCKTON-EAST WATER DISTRICT

By Perry H. Taft
President

ATTEST:

Secretary

PASSED AND ADOPTED by the Board of Directors of CALAVERAS COUNTY WATER DISTRICT on the 10th day of June, 1982 by Resolution No. 3441.

CALAVERAS COUNTY WATER DISTRICT

By David J. Silva
President

ATTEST:

Steve Felte
Secretary

Resolution No. 82-83-07

RESOLUTION OF THE BOARD OF DIRECTORS OF THE STOCKTON-EAST WATER DISTRICT RELATIVE TO ADOPTION OF THE MEMORANDUM OF UNDERSTANDING BETWEEN CALAVERAS COUNTY WATER DISTRICT (CCWD) AND STOCKTON-EAST WATER DISTRICT (SEWD) REGARDING THE PROPOSED NEW HOGAN POWER PLANT PROJECT AND RELATIVE TO JOINTLY INVESTIGATING THE AVAILABILITY AND DEVELOPMENT OF ADDITIONAL WATER SUPPLIES

WHEREAS, on August 25, 1970 Stockton-East Water District (SEWD) and Calaveras County Water District (CCWD) entered into a contract with the United States of America providing for repayment and conservation use of New Hogan Project; and

WHEREAS, on August 25, 1970 SEWD and CCWD entered into a joint contract providing for the use, repayment and administration of water from the New Hogan Project; and

WHEREAS, it is the desire of SEWD and CCWD to maximize the conservation use and power generation potential of New Hogan and the Calaveras watershed; and

WHEREAS, it is the desire of SEWD and CCWD to enter into a Memorandum of Understanding to cooperatively pursue the greater use of water from New Hogan, to clarify the application of various contract terms, to resolve the conflict of the parties with respect to the proposed New Hogan Power Plant Project and to jointly investigate the availability and development of additional water supplies.

NOW, THEREFORE, BE IT RESOLVED, that the Board of Directors of SEWD approves and adopts said Memorandum of Understanding, dated May 25, 1982.

PASSED AND ADOPTED BY THE BOARD OF DIRECTORS OF THE STOCKTON-EAST WATER DISTRICT ON THE 15TH DAY OF JUNE, 1982.

Perry H. Taft

PERRY H. TAFT, President
Board of Directors
Stockton-East Water District

ATTEST

James D. Beard

JAMES D. BEARD, II, Secretary
Board of Directors
Stockton-East Water District

(SEAL)

SECRETARY'S CERTIFICATE

I, JAMES D. BEARD, II, Secretary of the Board of Directors of the STOCKTON-EAST WATER DISTRICT, Stockton, California, do hereby certify as follows:

The foregoing is a full, true and correct copy of a resolution duly adopted at a Regular Meeting of the Board of Directors of said District duly and regularly and legally held at the regular meeting place thereof on ______________________, of which meeting all of the members of said Board of Directors had due notice and at which a majority thereof were present.

I have carefully compared the same with the original minutes of said meeting on file and of record in my office, and the foregoing is a full, true, and correct copy of the original resolution adopted at said meeting and entered in said minutes.

Said resolution has not been amended, modified, or rescinded since the date of its adoption, and the same is now in full force and effect.

Dated: 4/15/82

James D Beard II

JAMES D. BEARD, II
Secretary of the Board
STOCKTON-EAST WATER DISTRICT

(SEAL)

RESOLUTION NO. 3441

WHEREAS, CALAVERAS COUNTY WATER DISTRICT (CCWD) and STOCKTON EAST WATER DISTRICT (SEWD) entered into an agreement with the U.S. Corps of Engineers on August 25, 1970 for use of water out of New Hogan Reservoir, and also entered into an agreement jointly concerning use, repayment and administration of water from said New Hogan Reservoir; and

WHEREAS, it is the desire of CCWD and SEWD to maximize the combined conservation and power generation potential of New Hogan and the Calaveras watershed; and

WHEREAS, CCWD and SEWD have hereby decided to enter into a Memorandum of Understanding to cooperatively pursue the greater use of water from New Hogan, to clarify the application of various contract terms, to resolve the conflict of the parties with respect to the proposed New Hogan Power Plant Project and to jointly investigate the availability and development of additional water supplies.

NOW, THEREFORE, BE IT RESOLVED that the President of the Board of Directors of CALAVERAS COUNTY WATER DISTRICT be authorized to execute said Memorandum of Understanding.

PASSED AND ADOPTED this 10th day of June, 1982, by the following vote:

AYES: Directors Queirolo, Neilsen, Sisco and Silveira
NOES: None
ABSENT: Director Johnson

CALAVERAS COUNTY WATER DISTRICT

President

ATTEST:

Secretary

Execution Copy

August 25, 1970

CONTRACT BETWEEN THE STOCKTON & EAST SAN JOAQUIN WATER CONSERVATION DISTRICT AND THE CALAVERAS COUNTY WATER DISTRICT PROVIDING FOR THE USE, REPAYMENT, AND ADMINISTRATION OF WATER FROM THE NEW HOGAN PROJECT OF THE UNITED STATES.

THIS CONTRACT is made this 25th day of August, 1970, between the STOCKTON & EAST SAN JOAQUIN WATER CONSERVATION DISTRICT, a political subdivision of the State of California, and the CALAVERAS COUNTY WATER DISTRICT, a political subdivision of the State of California.

EXPLANATORY RECITALS

I.

The United States of America has agreed that the two contracting parties herein may contract for the water of the New Hogan Project, upon terms to be mutually agreed, provided that prior to the execution of any contract with the United States the two contracting parties herein enter into an operating agreement providing among other things for the division between the parties of the water from the New Hogan Project, the payment of the costs becoming due the United States under the proposed contract, and the appointment of a watermaster.

II.

The contracting parties herein, that is the DISTRICTS, have jointly requested and reviewed a yield study for the New Hogan Project prepared by the United States Bureau of Reclamation dated August 1968, have sponsored for their respective service areas a study of water use and water rights on the Calaveras River prepared by Murray, Burns & Kienlen Civil Engineers dated February 7, 1969, and have caused to be made an Operation Study, and on the basis of the information contained in those studies have apportioned the New Hogan Project water as set forth by this CONTRACT.

III.

The parties recognize that STOCKTON DISTRICT may enter into a separate long-term contract with the United States for delivery of water from Folsom South Canal to supplement the supplies available to STOCKTON DISTRICT under this CONTRACT, the Bureau Contract, and otherwise.

IV.

The Bureau is authorized and is now constructing Folsom South Canal pursuant to Congressional authorization and said canal will have a hydraulic capacity substantially in excess of the requirements of the service area in Sacramento and San Joaquin Counties. Said excess capacity is anticipated to be used to convey water for the proposed East Side Division of the Central Valley Project, the feasibility of which has been reported on by the Bureau of Reclamation and is now under review by the State of California. The parties recognize that when and if said East Side Division is authorized and constructed the CALAVERAS DISTRICT may be able to obtain additional supplemental water supplies from said Division.

THEREFORE, IN CONSIDERATION OF THE TERMS AND CONDITIONS HEREIN CONTAINED, IT IS AGREED AS FOLLOWS:

1. Definitions. As used herein, the following terms shall have the stated meanings:

1. (A) "accounting year" shall mean the twelve consecutive calendar months beginning April 1 of each year and ending March 31 of the succeeding year.

1. (B) "agricultural water" shall mean Project Water used primarily in the commercial production of agricultural crops or livestock, including domestic use incidental thereto, on tracts of land operated in units of more than two (2) acres.

1. (C) "Articles" are preceded by an Arabic number; "Sub-articles" are preceded by a capital-case letter in parenthesis; "Paragraphs" are preceded by an Arabic number in parenthesis; "sub-paragraphs" are preceded by a lower-case letter in parenthesis.

1. (D) "assumed water rights" shall mean the rights to the natural flow of the Calaveras River, including the percolation losses necessary to deliver the water required to satisfy said rights as agreed upon by the parties in this CONTRACT.

1. (E) "Bureau" shall mean the Bureau of Reclamation of the United States Department of the Interior.

1. (F) "Bureau Contract" shall mean a repayment contract signed by the DISTRICTS and the United States.

1. (G) "CALAVERAS DISTRICT" shall mean the CALAVERAS COUNTY WATER DISTRICT.

1. (H) "DISTRICTS" shall mean the CALAVERAS DISTRICT and the STOCKTON DISTRICT collectively.

1. (I) "Folsom South Canal" shall mean the Folsom South Canal of the American River Division of the Central Valley Project, California.

1. (J) "Initial Delivery Date" shall mean January 1st of the year in which the Secretary of the Interior of the United States announces that water from the Folsom South Canal is first available for delivery to STOCKTON DISTRICT under a long-term contract.

1. (K) "irrigation season" shall mean the first seven consecutive calendar months of each accounting year, i.e., the period

extending from April 1 to October 31 of each such year.

1. (L) "M & I Water" shall mean Project Water other than agricultural water.

1. (M) "New Hogan Project" shall mean the New Hogan Project of the United States located on the Calaveras River, in Calaveras County, California.

1. (N) "Operations Study" shall mean that study prepared by Murray, Burns & Kienlen under date of May 4, 1970, a copy of which is on file in each of the DISTRICT offices.

1. (O) "Project Water" shall mean the total amount of water available to the DISTRICTS from New Hogan Reservoir each year under the Bureau Contract less the amounts of water necessary to satisfy assumed water rights. Project Water may be determined by the following formula: $P = D + C_r - W_c - W_s$.

1. (P) "Repayment Obligation" is the amount set out in the Bureau Contract as the "total reimbursable construction allocation".

1. (Q) "STOCKTON DISTRICT" shall mean the STOCKTON AND EAST SAN JOAQUIN WATER CONSERVATION DISTRICT.

1. (R) "Water entitlement" shall mean the percent of the Project Water that each DISTRICT at a given time is entitled to in accordance with the provisions of this CONTRACT. Any computation using this term shall be made using the water entitlement as it exists at the time of the computation.

1. (S) "Watermaster" shall be as defined in Article 11 herein.

1. (T) (Letters):

1. (T) (1) "AF" shall mean acre feet.

1. (T) (2) "C_c" shall mean annual diversions to CALAVERAS DISTRICT, including W_c, from the channel of the Calaveras River downstream from New Hogan Dam measured in AF.

1. (T) (3) "C_{cm}" shall mean the portion of C_c used as M & I water.

1. (T) (4) "C_r" shall mean annual diversions from the New Hogan Reservoir pool to CALAVERAS DISTRICT measured in AF.

1. (T) (5) "C_{rm}" shall mean the portion of C_r used as M & I water.

1. (T) (6) "D" shall mean the annual releases from the New Hogan Reservoir Pool in AF measured at the gage located on the Calaveras River approximately 1/2 mile downstream from New Hogan Dam which releases are made pursuant to direction of the Watermaster (thus excluding spills and flood control releases).

1. (T) (7) "P" shall mean Project Water as defined in Subarticle (O) of this Article.

1. (T) (8) "S" shall mean the quantity of water in AF available annually to STOCKTON DISTRICT determined by the following formula: $S = D - C_c$.

1. (T) (9) "S_m" shall mean the portion of S used as M & I water.

1. (T) (10) "W_c" shall mean the quantity of water in AF necessary annually to satisfy the assumed water rights within CALAVERAS DISTRICT. The parties agree that, subject to revision as provided in Subarticle 3(A), said quantity of water necessary for CALAVERAS DISTRICT is 350 AF.

1. (T) (11) "W_s" shall mean the quantity of water in AF necessary annually to satisfy the assumed water rights within STOCKTON DISTRICT. The parties agree that, subject to revision as provided in Subarticle 3(A), said quantity of water necessary for STOCKTON DISTRICT is 12,650 AF.

2. Payment of Obligations Under the Bureau Contract. STOCKTON DISTRICT, subject to the execution of the Bureau Contract, shall pay the charges imposed by the Bureau Contract.

3. Determination of Project Water.

3. (A) It is agreed by the parties that initially the sum of W_c and W_s shall equal 13,000 AF and that release of this quantity

annually from New Hogan Reservoir to the Calaveras River will satisfy the assumed water rights within the DISTRICTS. The amounts of water necessary to satisfy W_c and W_s shall be considered to remain constant for ten year periods, the first of which shall begin with the date of this CONTRACT. At any time after the expiration of a ten year period either DISTRICT can request that a redetermination be made whether either or both W_c or W_s should be changed to reflect changes in use of lands by owners having rights to use of the natural flow of the Calaveras River under the laws of the State of California. If the DISTRICTS cannot agree on the changes, if any, to be made, the issue shall be submitted to a civil engineer experienced in water matters and his decision shall be final. If the DISTRICTS cannot agree on an engineer, the matter shall be submitted to arbitration as set out in Article 12. After any agreement between the DISTRICTS to change W_c or W_s, or both, or after any decision rendered by a civil engineer or by arbitration as provided herein, no new request for such a redetermination may be made by either DISTRICT until the expiration of the new ten year period commencing with the date of the preceding request for a redetermination.

3. (B) Water shall be scheduled by the DISTRICTS as follows:

3. (B) (1) (a) On or before March 15 of each accounting year, CALAVERAS DISTRICT shall furnish to Watermaster an initial schedule setting forth its desired monthly quantities of water in AF for the next succeeding accounting year. The total of the monthly amounts of water in said initial schedule shall not exceed, by more than the amount of W_c, the maximum water entitlement of CALAVERAS DISTRICT under this CONTRACT during the succeeding accounting year. The initial schedule shall be accompanied by the advance payment specified in Subarticle 5(D) below.

3. (B) (1) (b) Watermaster shall combine the initial schedule furnished by CALAVERAS DISTRICT with a similar initial

schedule for STOCKTON DISTRICT to determine the total amount of water and the scheduled availability thereof as desired by both DISTRICTS during the succeeding accounting year.

3. (B) (1) (c) The total amount of water scheduled initially pursuant to subparagraph 3(B)(1)(b) above shall not exceed 84,100 AF.

3. (B) (2) On April 1 of each accounting year the Watermaster, using the total amounts of water initially scheduled pursuant to Paragraph 3(B)(1) above, shall estimate whether a reduction should be made in the total amount of water from that initially scheduled by both DISTRICTS for the accounting year. The estimate shall be based on a forecast of the content in AF of New Hogan Reservoir on the last day of the current irrigation season, which forecast shall be made by the Watermaster as follows:

3. (B) (2) (a) Utilizing the techniques employed in the Operation Study and beginning with the amount of water in, and the surface area of, the reservoir on March 31, the monthly quantities of total water initially scheduled by both DISTRICTS during the irrigation season shall be assumed withdrawn as scheduled. Inflows to the reservoir and rates of evaporation each month shall be assumed to occur as set forth in the following table:

Month	Inflow (AF)	Evaporation Rate (feet per month)
April	3,500	0.3
May	2,800	0.4
June	1,900	0.6
July	1,600	0.9
August	1,400	0.7
September	900	0.5
October	600	0.3

Amounts of evaporation in AF each month shall be the product of the evaporation rate for that month and the area of reservoir water surface corresponding to the amount of water in storage at the end of the prior month.

3. (B) (2) (b) In the event the estimate made pursuant to subparagraph 3(B)(2)(a) above indicate that withdrawal of the total water initially scheduled by the DISTRICTS will result in less than 71,400 AF of water remaining in the reservoir on the last day of the irrigation season, the total amount of water available for both DISTRICTS during the accounting year shall be reduced by 17,800 AF so that such total amount of available water will not exceed 66,300 AF.

3. (B) (2) (c) In the event said reduction of 17,800 AF in total scheduled water is required pursuant to subparagraph 3(B)(2)(b) above, and subject to the provisions of Subarticle 4(C) below, Watermaster shall adjust downward the total amount of water available to CALAVERAS DISTRICT from that scheduled initially under subparagraph 3(B)(1)(a) above. Said downward adjustment shall be made by reducing the total water scheduled by CALAVERAS DISTRICT during the irrigation season by the product of 17,800 AF and the percent of Project Water initially scheduled by CALAVERAS DISTRICT in the schedule submitted pursuant to subparagraph 3(B)(1)(a) above.

3. (B) (2) (d) Watermaster, after adjusting downward CALAVERAS DISTRICT'S initial schedule as provided in subparagraph 3(B)(2)(c) above, shall adjust downward STOCKTON DISTRICT'S initial schedule, subject to the provisions of Subarticle 4(C), so the total water scheduled by both DISTRICTS for the accounting year shall not exceed 66,300 AF.

As an example illustrating the adjustments to the initial schedules of both DISTRICTS under subparagraphs 3(B)(2)(c) and (d) above in the event the total of the water desired by both DISTRICTS during the accounting year must be limited to 66,300 AF pursuant to subparagraph 3(B)(2)(b) above, let it be assumed that, with applicable W_c at 350 AF, CALAVERAS DISTRICT initially schedules 4,350 AF of water for diversion during the accounting year, an amount which does not exceed its maximum water entitlement at the time. STOCKTON DISTRICT initially schedules the remaining 79,750 AF of the total scheduled supply of 84,100 AF.

Thus, Project Water initially scheduled by CALAVERAS DISTRICT is 4,350 minus 350, or 4,000 AF, or 5.63% of the total Project Water (71,100 AF) initially scheduled. Pursuant to subparagraph 3(B)(2)(c), the 4,000 AF of Project Water initially scheduled for diversion during the irrigation season by CALAVERAS DISTRICT will be reduced by 17,800 x 0.0563, or 1,002 AF, to 2,998 AF, and the total diversion by CALAVERAS DISTRICT during the accounting year will be limited to 2,998 plus 350, or 3,348 AF. STOCKTON DISTRICT will adjust its initial schedule for the accounting year to accord with the remainder of the available Project Water which is 66,300 minus 13,000 minus 2,998, or 50,302 AF, and accordingly will have available during the accounting year 50,302 plus 12,650, or 62,952 AF.

3. (B) (2) (e) For use in the forecasting provided in this Paragraph 3(B)(2) the Watermaster shall treat any releases scheduled from New Hogan Reservoir during November through March following the irrigation season as though such releases were made during the irrigation season and during the month of October.

3. (B) (2) (f) For the purposes of computing the reductions in total scheduled water pursuant to subparagraphs 3(B)(1)(c) and (d) above, the Watermaster shall treat any irrigation releases scheduled from New Hogan Reservoir during January, February, and March immediately preceding the irrigation season as though such releases had been made during the irrigation season and during April and shall treat any irrigation releases scheduled from the

reservoir in November and December as though such releases were made in October.

3. (B) (3) In the event the March 31 reservoir content and anticipated inflow to and evaporation from the reservoir indicate that reservoir content on the last day of the irrigation season will exceed 162,000 AF, Watermaster may, and at the request of CALAVERAS DISTRICT shall, make an estimate in a manner similar to that provided for in Paragraph 3(B)(2) above to determine whether water will be available in excess of the total amount scheduled for use during the irrigation season in the initial schedules prepared pursuant to Paragraph 3(B)(1). Said estimate may be made any time during the month of April but shall be considered tentative until confirmed or revised to reflect the content of the reservoir on April 30. The difference between 162,000 AF and the reservoir content estimated pursuant to this Paragraph 3(B)(3) to exist on the last day of the irrigation season shall be available to either or both DISTRICTS for use during the irrigation season as follows:

3. (B) (3) (a) Watermaster shall inform CALAVERAS DISTRICT promptly of the results of any forecast made pursuant to this Paragraph 3(B)(3) and CALAVERAS DISTRICT shall have the option of increasing the amounts of water initially scheduled by it under Paragraph 3(B)(1) for diversion during the irrigation season. The amount of said increase shall be not more than the product of the percent of Project Water initially scheduled by CALAVERAS DISTRICT and the forecasted excess over 162,000 AF of the reservoir content on the last day of the irrigation season. CALAVERAS DISTRICT shall inform Watermaster whether it chooses to exercise the option herein provided within five days after being notified that excess water is available and shall furnish to Watermaster a schedule revised to conform with this subparagraph 3(B)(3)(a) at the time CALAVERAS DISTRICT so informs Watermaster. No additional advance payment shall accompany any schedule revised in accordance with this subparagraph 3(B)(3)(a).

3. (B) (3) (b) STOCKTON DISTRICT shall have the option of using all water available under Paragraph 3(B)(3) above, and not desired by CALAVERAS DISTRICT under its option exercised pursuant to subparagraph 3(B)(3)(a). Watermaster shall revise STOCKTON DISTRICT'S initial schedule of water use during the irrigation season to conform with the water available to it under this subparagraph 3(B)(3)(b), and shall inform CALAVERAS DISTRICT promptly of the revised schedule.

3. (B) (3) (c) In the event Watermaster estimates prior to April 30 of an accounting year that excess water will be available to DISTRICTS under Paragraph 3(B)(3) and the confirming forecast reflecting the actual reservoir content on April 30 indicates that withdrawal of the excess water scheduled pursuant to subparagraphs 3(B)(3)(a) and (b) will result in a reservoir content of less than 162,000 AF on the last day of the irrigation season, the amounts of the excess water tentatively made available to each DISTRICT shall immediately be reduced proportionately in such total amounts as will result in an estimated reservoir content of not less than 162,000 AF on the last day of the irrigation season.

3. (B) (4) On or before April 2 of each year the Watermaster shall deliver to the office of CALAVERAS DISTRICT a written report showing his estimates of the total amounts of water to be available to each DISTRICT during the accounting year beginning April 1, as determined pursuant to Paragraphs 3(B)(2), and the monthly schedule of deliveries of such totals. If the total water available to both DISTRICTS during the irrigation season is reduced in accordance with subparagraphs 3(B)(2)(c) and (d) the revised schedule prepared by Watermaster for CALAVERAS DISTRICT shall adjust the monthly amounts initially scheduled each month proportionately and the revised schedule for STOCKTON DISTRICT shall conform to said revised schedule of CALAVERAS DISTRICT within the total amount of water available to both DISTRICTS during the accounting

year. If CALAVERAS DISTRICT is for any reason in disagreement with the foregoing determination and report by Watermaster, CALAVERAS DISTRICT shall give written notice of said disagreement to Watermaster on or before April 5. If such a notice of disagreement is received by the Watermaster on or before April 5, Watermaster shall arrange a joint meeting of the Boards of Directors of the DISTRICTS to be held not later than April 10. Said determination of the Watermaster may be revised at said joint meeting by action approved by a majority of each Board of Directors. If said Boards do not agree on a revision and CALAVERAS DISTRICT continues to object to the determination made by the Watermaster, then the matter shall be submitted to a civil engineer experienced in water matters and his decision shall be final. If the DISTRICTS cannot agree on a civil engineer, the matter shall be submitted to arbitration pursuant to Article 12 of this CONTRACT. During the period following April 2 and until the determination of the Watermaster has been modified by agreement of the Boards of Directors or by a decision of a civil engineer or through arbitration, the scheduled amounts of water set forth in the report of the Watermaster shall be complied with by both DISTRICTS.

3. (B) (5) In the event the forecast made pursuant to Paragraph 3(B)(3) indicates that water in excess of the initial schedules prepared pursuant to Paragraph 3(B)(1) will be available during the irrigation season and CALAVERAS DISTRICT informs the Watermaster that it chooses to exercise its option in accordance with subparagraph 3(B)(3)(a), such action of CALAVERAS DISTRICT shall be deemed to indicate its approval of the determination of the Watermaster. In the event CALAVERAS DISTRICT does not choose to exercise said option and also, within the five days provided it for such choice, informs Watermaster of its disagreement with the Watermaster's estimate that excess water will be available during the irrigation season, Watermaster will arrange for a joint meeting

of the Boards of Directors of the DISTRICTS to be held on one of the days May 1-5, inclusive, when results of the confirming forecast made pursuant to Paragraph 3(B)(3) may be revised at said joint meeting by action of a majority of each Board of Directors. If said Boards do not agree on a revision and CALAVERAS DISTRICT continues to object to the determination made by the Watermaster, then the matter shall be submitted to a civil engineer experienced in water matters and his decision shall be final. If the DISTRICTS cannot agree on a civil engineer, the matter shall be submitted to arbitration as set out in Particle 12. During the period following CALAVERAS DISTRICT'S notification of disagreement with the determination of the Watermaster made pursuant to Paragraph 3(B)(3) and until that determination has been confirmed or modified by agreement of the Boards of Directors or by decision of a civil engineer or through arbitration, only the amounts of water initially scheduled pursuant to Paragraph 3(B)(1) shall be available to each DISTRICT.

3. (B) (6) In entering into this CONTRACT the DISTRICTS are agreed that scheduling of, and diversion and releasing of water from, New Hogan Reservoir and the channel of Calaveras River by each DISTRICT and the individual water users therein, shall be so administered as to enable the water entitlements of each DISTRICT to be fully supplied, subject to all of the applicable provisions of this Article 3 and of Article 4, during a recurrence of the water-supply conditions of the period of years covered by the Operation Study. If as shown in the calculations made pursuant to Paragraph 5(D)(3) CALAVERAS DISTRICT has taken in excess of the total amount of water scheduled pursuant to Paragraph 3(B)(1) or as that schedule may have been revised pursuant to Paragraphs 3(B)(2), 3(B)(3), or 5(D)(2), or if Watermaster has caused to be released from New Hogan Reservoir water in excess of the total amount scheduled for STOCKTON DISTRICT pursuant to Paragraphs 3(B)(1) or as that schedule may have been revised pursuant to Paragraphs 3(B)(2) or 3(B)(3), the DISTRICTS recognize that in subsequent years the ability of either or both DISTRICTS to fully secure its or their water entitlements

under said water-supply conditions may be jeopardized. Accordingly, if CALAVERAS DISTRICT has so taken excess water, or if Watermaster has so caused excess water to be released to STOCKTON DISTRICT, the following actions shall be taken.

3. (B) (6) (a) If CALAVERAS DISTRICT has taken water during an accounting year in excess of the amounts so scheduled, Watermaster in the succeeding accounting year, shall reduce the total amount of water scheduled by STOCKTON DISTRICT pursuant to subparagraphs 3(B)(1)(b) and (c), or 3(B)(2)(b) and (d), by the amount of such excess taking by CALAVERAS DISTRICT, <u>and</u> CALAVERAS DISTRICT shall make the payment to STOCKTON DISTRICT provided for in Paragraph 5(D)(4) below.

3. (B) (6) (b) If Watermaster has caused to be released from New Hogan Reservoir water in excess of the total amount scheduled for STOCKTON DISTRICT, then Watermaster, in the succeeding accounting year, shall reduce the total amount of water scheduled by STOCKTON DISTRICT pursuant to subparagraphs 3(B)(1)(b) and (c), or 3(B)(2)(b) and (d), by the amount of such excess releases.

3. (B) (6) (c) The actions provided for in this Paragraph 3(B)(6) shall not be required if <u>either</u> flood control releases are made during the November through March portion of the accounting year in which the excess taking or releasing of water occurred, <u>or</u>, if the Watermaster in a forecast made pursuant to Paragraph 3(B)(3) anticipates an October 31 reservoir content of more than 162,000 AF in the accounting year following the one in which the excess diversions or releases occurred.

3. (B) (7) Subject to the provisions of Subarticle 5(D) below, CALAVERAS DISTRICT may change its rates of diversion or its monthly schedule of diversion during the accounting year as follows:

3. (B) (7) (a) Rates of diversion at points located on the reservoir above New Hogan Dam may be changed at any time.

3. (B) (7) (b) Notification of a desire to change the rates of diversion from the channel of Calaveras River below New Hogan Dam shall be furnished the Watermaster a reasonable time in advance of the desired time of change to enable Watermaster to communicate with the District Engineer as provided in the Bureau Contract. The change in rate of diversion shall be made at the time established by the District Engineer and the Watermaster shall inform CALAVERAS DISTRICT of said time.

3. (C) (1) The Operation Study was adopted by the DISTRICTS to express certain principles of operating New Hogan Reservoir and to define certain limiting conditions governing operation of said reservoir. The Operation Study is based on the anticipated characteristics of the requirements of the DISTRICTS for water at the time of negotiating and executing this CONTRACT, which requirements are anticipated to be for irrigation service only, except for the use by CALAVERAS DISTRICT of a nominal quantity of M & I water. In the event either DISTRICT begins to deliver significant water from New Hogan Project for municipal and industrial purposes, and from time to time as such deliveries for municipal and industrial purposes are increased or decreased, it may be necessary to revise said Operation Study to conform with such changed use and to accordingly redefine the limiting conditions governing operation of said Reservoir. Upon the request of the Board of Directors of either of the DISTRICTS the Watermaster shall prepare, or cause to be prepared, such a revised study. Any such revisions shall employ the basic data in the Operation Study or agreed upon modifications of such data and shall comply with the following principles: First, the revised requirements on the Reservoir shall be so established as to make it unnecessary to reduce the content of New Hogan Reservoir below 15,000 AF at any time. Second, requirements by either DISTRICT for municipal and industrial water to the extent provided in

Subarticle 4(C) shall at all times be served without deficiency. Third, new operating limitations similar to those provided in subparagraphs 3(B)(1)(c), 3(B)(2)(b), and Paragraph 3(B)(3) shall be determined. Fourth, each revised Operation Study shall cover the same period of years, or an extension thereof, as were employed in the Operation Study.

3. (C) (2) Upon approval of any revised Operation Study by both DISTRICTS, said revised study shall become the Operation Study defined in Subarticle 1(N), and the limitations provided in subparagraphs 3(B)(1)(c), 3(B)(2)(b), and Paragraph 3(B)(3) shall be automatically amended accordingly.

3. (C) (3) If the DISTRICTS are unable to agree upon such a revised Operation Study or upon the need to make a revision in the Operation Study all of said issues shall be submitted to a civil engineer experienced in water matters and his decision shall be final, and if the DISTRICTS cannot agree on an engineer the matter shall be submitted to arbitration as set out in Article 12.

4. <u>District Water Entitlements</u>. The water entitlements of the DISTRICTS shall be as follows:

4. (A) The maximum water entitlement of CALAVERAS DISTRICT shall be 43.50% of the Project Water, provided that:

4. (A) (1) Until April 1, 1985, or until April 1 of the accounting year which begins after the initial delivery date, whichever is earlier, the CALAVERAS DISTRICT shall not take more than 10,000 AF of Project Water per year.

4. (A) (2) In the event CALAVERAS DISTRICT does not pay 43.50% of 1/40th of the repayment obligation in the 15th accounting year after the initial delivery date, the maximum water entitlement of CALAVERAS DISTRICT shall be reduced to such lesser percentage of 1/40th of the repayment obligation which the CALAVERAS DISTRICT does in fact pay in the 15th accounting year after the

initial delivery date. For example, if in the 15th accounting year referred to, CALAVERAS DISTRICT'S payment is 43.50% of 1/40th of the repayment obligation, then no adjustment shall be made in CALAVERAS DISTRICT'S maximum water entitlement. If, however, CALAVERAS DISTRICT'S payment in said 15th accounting year amounts to 25.00% of 1/40th of the repayment obligation, then CALAVERAS DISTRICT'S maximum water entitlement shall thereafter be no more than 25.00%.

4. (A) (3) It is anticipated, based on information presently available to the DISTRICTS, that the Folsom South Canal water service contract which hereafter may be made between the United States and STOCKTON DISTRICT will contain an option, which option may be exercised by STOCKTON DISTRICT at any time or times prior to the end of the 15th year after the initial delivery date, and which option will permit STOCKTON DISTRICT to take at least 30,928 AF more water than it is otherwise obligated to take under such Folsom South Canal water service contract. Insofar as concerns securing said option to take at least 30,928 AF within 15 years STOCKTON DISTRICT, in the course of negotiations with the Bureau, shall consult with CALAVERAS DISTRICT and shall permit CALAVERAS DISTRICT to participate in said negotiations. If STOCKTON DISTRICT enters into a contract for water service from the Folsom South Canal and such water service contract does not contain the full option set forth above but contains either, or both, an option period shorter or longer than 15 years, or an option which will not permit it to take at least 30,928 AF more than it is otherwise obligated to take, then Paragraph 4(A)(2) shall be automatically amended as follows:

4. (A) (3) (a) If said 15 year option period is reduced to a lesser period, or increased to a longer period, then the time in which CALAVERAS DISTRICT may build up to its maximum water entitlement shall be reduced or increased to the length of option

time granted to the STOCKTON DISTRICT in said Folsom South Canal water service contract.

4. (A) (3) (b) Upon execution of this CONTRACT by the parties, CALAVERAS DISTRICT will have an option to a water entitlement of 43.50% of the Project Water (0.4350 x 71,100) or 30,928.50 AF taken for purposes of calculations herein as 30,928 AF. If the amount of water subject to an option on the part of the STOCKTON DISTRICT in the Folsom South Canal water service contract is less than 30,928 AF then, not later than April 1 of the accounting year which begins after the initial delivery date, said maximum water entitlement of 43.50% shall be reduced by multiplying said 43.50% by the ratio of the amount of water in AF which the STOCKTON DISTRICT has under option to 30,928 AF, provided, however, that CALAVERAS DISTRICT, at its option, may avoid any part or all of such reduction by commencing and continuing annual payments toward the repayment obligation, which payments are proportional to the maximum water entitlement which CALAVERAS DISTRICT chooses to retain. For example, if the option accorded STOCKTON DISTRICT in its Folsom South Canal contract is for 20,000 AF, CALAVERAS DISTRICT's maximum water entitlement will be reduced to $\frac{20,000 \times 100}{30,928} \times 0.4350$, or 28.13%; however, if CALAVERAS DISTRICT chooses under its option to avoid this reduction in maximum water entitlement, and instead wishes to retain a maximum water entitlement of 43.50%, it shall commence and continue paying annually not less than 43.50 minus 28.13, or 15.37% of 1/40th of the repayment obligation. In the same example, with STOCKTON DISTRICT securing an option to only 20,000 AF in its Folsom South Canal contract, if CALAVERAS DISTRICT chooses to retain a maximum water entitlement of 40.00%, then it shall commence and continue paying annually 40.00 minus 28.13, or 11.87% of 1/40th, of the repayment obligation. Payments made under this subparagraph 4(A)(3)(b) shall in all respects be treated as though they were payments made for water actually used.

4. (A) (4) At any time that this CONTRACT is in effect CALAVERAS DISTRICT may obtain a supply of water from the proposed East Side Division of the Central Valley Project or from any other source and may exchange water so obtained for water to which STOCKTON DISTRICT has become entitled pursuant to this CONTRACT provided that STOCKTON DISTRICT shall in any event be entitled to take without exchange 56.50% of the Project Water, and provided further, that water shall not be so exchanged unless:

4. (A) (4) (a) It is delivered to STOCKTON DISTRICT without additional charge to STOCKTON DISTRICT.

4. (A) (4) (b) It is delivered to STOCKTON DISTRICT without the STOCKTON DISTRICT being required to make any expenditure for purposes of receiving such exchange water which it would not otherwise be required to make were it not for the delivery of such exchange water.

4. (A) (4) (c) Such exchange water is of a quality equal to or better than the quality of water flowing in the Folsom South Canal at its intersection with the Calaveras River.

4. (A) (4) (d) Such exchange water is delivered to the STOCKTON DISTRICT at a point within the DISTRICT at or east of the Folsom South Canal and at an elevation not lower than the water surface in the Folsom South Canal at its intersection with the Calaveras River.

The right to so exchange water as set forth above in this Paragraph 4(A)(4) shall immediately terminate at any time that the CALAVERAS DISTRICT fails to comply with each and every condition set forth above in this Paragraph 4(A)(4).

4. (B) Subject to the payment obligations imposed on STOCKTON DISTRICT by this CONTRACT, STOCKTON DISTRICT shall be entitled, at its option, to take and use all Project Water CALAVERAS DISTRICT is not entitled to under this CONTRACT, or does not in fact use.

4. (C) In the event the Watermaster determines pursuant to Paragraph 3(B)(2) above that the total amount of available water

in any accounting year shall be 66,300 AF or less, the DISTRICTS shall apply the reduction in water available to each proportionately to so much of the water otherwise scheduled by each as is in excess of an amount of 7,700 AF plus W_c for use in CALAVERAS DISTRICT and 10,000 AF plus W_s for use in STOCKTON DISTRICT, which amounts shall be available to each DISTRICT respectively without deficiencies to the extent of assumed water rights and estimated municipal, industrial, and domestic use. Estimated municipal, industrial, and domestic use shall be determined from actual use during the preceding accounting year plus anticipated new uses for the current accounting year.

5. Payments By The Calaveras District.

5. (A) CALAVERAS DISTRICT shall pay to STOCKTON DISTRICT a sum equal to the product of CALAVERAS DISTRICT'S ultimate water entitlement determined pursuant to Paragraph 4(A)(2), expressed as a percentage, and the total Repayment Obligation as payment in full thereof by CALAVERAS DISTRICT of its share thereof. Said payment shall be made in the following manner until the entire amount with interest, where applicable, is paid:

5. (A) (1) During each accounting year no less than that percentage of the equal annual installment of the total Repayment Obligation, whether or not such an installment is due and payable in that particular accounting year, equal to the percentage of Project Water used by CALAVERAS DISTRICT during that accounting year; said percentage of the equal annual installment being determined by the formula $100 \left(\frac{C_r + C_c - W_c}{P}\right)$. If a balance is still outstanding at the time STOCKTON DISTRICT completes full repayment of the Repayment Obligation, the total amount then payable by CALAVERAS DISTRICT must be paid within 15 accounting years after STOCKTON DISTRICT completes full repayment of the total Repayment Obligation. During each accounting year of said 15 year period

CALAVERAS DISTRICT must pay no less than 1/15th of its total obligation due on the date said period begins.

5. (A) (2) During each accounting year, that percentage of the interest payable by STOCKTON DISTRICT to the Bureau for the use of M & I water that equals the percentage of M & I water used by CALAVERAS DISTRICT of the entire amount of M & I water allocated to that year under the Bureau Contract; said percentage of interest payable being determined by the formula $\frac{(C_{rm} + C_{cm})\ 100}{C_{rm} + C_{cm} + S_m}$. Payments under this Paragraph 5(A)(2) shall not be credited to CALAVERAS DISTRICT'S obligation under Subarticle 5(A) above.

5. (A) (3) When any payment provided for in Paragraph 5(A)(1) herein is due and payable in an accounting year subsequent to STOCKTON DISTRICT'S full repayment of the Repayment Obligation due under the Bureau Contract, CALAVERAS DISTRICT shall pay interest annually at the rate of four and one-half percent (4½%) on the full unpaid decreasing balance due under Subarticle 5(A).

5. (B) CALAVERAS DISTRICT shall pay to STOCKTON DISTRICT for each accounting year a sum equal to that percentage of the administration costs and operation, maintenance, and replacement costs that STOCKTON DISTRICT must pay to the Bureau each accounting year under the Bureau Contract that equals the percentage of Project Water used by CALAVERAS DISTRICT during that year; said percentage of contract administration costs and operation, maintenance, and replacement costs being determined by the formula $\frac{(C_r + C_c - W_c)}{P}$ 100.

5. (C) Subject to the provisions herein on maximum use, CALAVERAS DISTRICT shall pay for, per accounting year, as a minimum, the amount of water shown on its buildup schedule attached hereto as Exhibit "A".

5. (D) An advance payment shall be made and adjusted as follows:

5. (D) (1) Upon submitting the initial schedule provided for in Paragraph 3(B)(1), CALAVERAS DISTRICT shall pay to STOCKTON DISTRICT an advance payment for the number of AF of Project Water ordered in such schedule. Such advance payment shall be computed as follows:

$$\frac{\text{Total AF scheduled minus } W_c}{40 \times 71{,}100} \quad \times \quad \text{Repayment Obligation}$$

plus

$$\frac{\text{Total AF scheduled minus } W_c}{71{,}100} \quad \times$$

The operation, maintenance, replacement, and administrative costs to be paid by STOCKTON DISTRICT for the current year pursuant to the Bureau Contract.

5. (D) (2) At any time CALAVERAS DISTRICT may request a revision in its then current schedule of monthly AF for the remainder of the accounting year. Such request for revision shall be submitted in writing to STOCKTON DISTRICT. If the request is for an increase in the total quantity of water scheduled for the accounting year, an additional advance payment shall be submitted to the Watermaster along with the request to STOCKTON DISTRICT; said additional advance payment shall be computed in the same manner as set forth in Paragraph 5(D)(1) above. Upon receipt of said request STOCKTON DISTRICT shall consider the same and shall within its sole discretion determine whether or not it will grant the request of CALAVERAS DISTRICT. STOCKTON DISTRICT shall reply to the request of the CALAVERAS DISTRICT within ten days. If an increase has been requested and STOCKTON DISTRICT does not approve said request for increase or approves a lesser amount than is covered by the additional payment accompanying the request for an increase, the Watermaster shall immediately make an appropriate refund of the advance payment or a proportional part thereof. If the request was for a reduction in the scheduled amount and STOCKTON DISTRICT has approved said reduction, the Watermaster shall immediately make a refund to

CALAVERAS DISTRICT, said refund to be calculated in the same manner as set forth in Paragraph 5(D)(1).

5. (D) (3) The Watermaster shall calculate the final amounts owed by CALAVERAS DISTRICT as of March 31 of each accounting year and shall present his calculations in a statement to CALAVERAS DISTRICT by June 1 of the succeeding accounting year. Failure of the Watermaster to present his calculations as provided herein shall not affect CALAVERAS DISTRICT'S obligations under this Article, but CALAVERAS DISTRICT shall not be in default for failure to pay said amounts during any period of such failure by the Watermaster. The Watermaster shall show in said statement any additional sums due STOCKTON DISTRICT because of water use in excess of the amount covered by the advance payment provided for in Paragraph 3(B)(1) and the amount of interest due for the preceding accounting year under Paragraphs 5(A)(2) and (3). Within 30 days after receiving the statement of the Watermaster CALAVERAS DISTRICT shall pay to STOCKTON DISTRICT any additional sums due STOCKTON DISTRICT.

5. (D) (4) In the event that as shown in the calculations made pursuant to Paragraph 5(D)(3) the use of CALAVERAS DISTRICT during the preceding accounting year has not been in accordance with its schedule as submitted pursuant to Paragraph 3(B)(1) or as said schedule may have been revised pursuant to Paragraphs 3(B)(2) or 5(D)(2), then in such event if the use has been less than scheduled STOCKTON DISTRICT shall retain any advance funds having been paid to it for that accounting year and the same shall be accounted for as though CALAVERAS DISTRICT had used the scheduled water in that accounting year. If CALAVERAS DISTRICT has taken in excess of the amount so scheduled and STOCKTON DISTRICT in the ensuing accounting year reduces its total scheduled water in accordance with the provisions of subparagraph 3(B)(6)(a), then CALAVERAS DISTRICT shall pay STOCKTON DISTRICT $15.00 for each acre foot of such

reduction by STOCKTON DISTRICT. Any amount due under this Paragraph 5(D)(4) shall be included in the statement rendered by the Watermaster to CALAVERAS DISTRICT on or before June 1 of each accounting year. In the event that STOCKTON DISTRICT is required to reduce its total scheduled water in accordance with the provisions of subparagraph 3(B)(6)(a) for one or more successive years, then for each of such successive years after the first year said sum of $15.00 for each AF shall be increased for each successive year by $5.00; that is, in the second successive year the rate per AF would be increased to $20.00 and in the fourth successive year the rate would be increased to $30.00. Said sums of $15.00 and $5.00 may from time to time be increased or decreased as the cost of water in the general area increases or decreases. Either DISTRICT may at any time request such an increase or decrease and if the DISTRICTS cannot agree upon the question of an increase or decrease the matter shall be submitted to a civil engineer experienced in water matters and his decision shall be final. If the DISTRICTS cannot agree on a civil engineer, the matter shall be submitted to arbitration pursuant to Article 12 of this CONTRACT. The provisions of this Subarticle 5(D) shall not relieve CALAVERAS DISTRICT from the obligation to use not more than the amount of water scheduled nor shall it in any way relieve the Watermaster from taking necessary action to enforce use of water by <u>both</u> DISTRICTS in accordance with applicable schedules.

5. (E) Irrespective of any of the foregoing, the total sum to be paid to STOCKTON DISTRICT by CALAVERAS DISTRICT for each accounting year pursuant to Paragraph 5(A)(1) until the Repayment Obligation under the Bureau Contract has been fully discharged, shall be not less than the amount paid the preceding accounting year.

6. <u>Remedies of Stockton District</u>. The right of CALAVERAS DISTRICT and the water users within that DISTRICT to receive Project Water is dependent upon performance by CALAVERAS DISTRICT of its obligations under this CONTRACT. If CALAVERAS DISTRICT fails for any reason to pay any sum due STOCKTON DISTRICT under this CONTRACT:

6. (A) Interest shall be payable by CALAVERAS DISTRICT on the delinquent sum at the rate of nine percent (9%) per annum on the delinquent amount.

6. (B) If any sum due under this CONTRACT remains delinquent for 12 months or longer, STOCKTON DISTRICT prior to any such sum being fully repaid, may upon written notice cause CALAVERAS DISTRICT'S water entitlement to Project Water to be reduced by the percentage that said delinquent sums bear to the total obligation at that time of the CALAVERAS DISTRICT under Subarticle 5(A). Any amounts so used to reduce CALAVERAS DISTRICT'S water entitlement and the interest on any such amounts shall no longer be an obligation of CALAVERAS DISTRICT and shall be deemed fully compensated by the increased water entitlement of STOCKTON DISTRICT. For example, during the period to the 15th accounting year referred to in Paragraph 4(A)(2) CALAVERAS DISTRICT'S maximum water entitlement is 43.50% and its Repayment Obligation under Subarticle 5(A) is 0.435 x $5,597,000 (said sum of $5,597,000 shall be automatically adjusted if the total reimburseable construction allocation announced by the Secretary of the Army pursuant to the Bureau Contract is a different sum), or $2,434,695. If CALAVERAS DISTRICT orders 7,110 AF of Project Water in such an accounting year, its advance payment which should accompany that order is 10% ($\frac{100 \times 7{,}110}{71{,}100}$) of the annual payment of $210,000 due from the STOCKTON DISTRICT to the Bureau (assuming $140,000 due on Repayment Obligation = $65,000 O, M, & R + $5,000 administration). If the advance payment does not accompany the order and a 12-month period goes by, then the $2,434,695 will be reduced in the amount of $21,000 (10% of $210,000) to $2,413,695, and thereafter the CALAVERAS DISTRICT'S maximum water entitlement is $\frac{100 \times 2{,}413{,}695}{5{,}597{,}000}$, or 43.12%.

6. (C) If any sum due under this CONTRACT remains delinquent for 36 months or longer, STOCKTON DISTRICT, acting as Watermaster or otherwise, upon 30 days written notice to CALAVERAS DISTRICT, may terminate the total water entitlement of CALAVERAS DISTRICT, and STOCKTON DISTRICT in such event is authorized to sell

and dispose of the water to which CALAVERAS DISTRICT would otherwise but for such nonpayment be entitled, to any person, firm, or corporation within or without the DISTRICTS upon such terms and conditions as the STOCKTON DISTRICT shall determine, provided, that CALAVERAS DISTRICT may reacquire its said water entitlement at such time, if any, as said water entitlement is not disposed of or committed to others or in use in place of other water supplies which the STOCKTON DISTRICT has relinquished. If only a portion of such water entitlement is so available, then the CALAVERAS DISTRICT may reacquire such portion that is available. The ability of the CALAVERAS DISTRICT to reacquire water entitlement pursuant to this Subarticle 6(C) shall be subject to reduction by the operation of Subarticle 6(B), Paragraph 4(A)(2), and Paragraph 4(A)(3). Such right to reacquire water shall be subject to the condition that CALAVERAS DISTRICT shall pay to STOCKTON DISTRICT a sum calculated as follows: All delinquent sums including sums becoming delinquent after the exercise of the STOCKTON DISTRICT'S rights under this Subarticle 6(C), plus interest as set forth in Subarticle 6(A), less any income that STOCKTON DISTRICT has had during the period of termination from the sale or other disposition of the subject water, plus actual expenses of STOCKTON DISTRICT in temporarily disposing of water subject to such termination.

6. (D) During any period that CALAVERAS DISTRICT is in default under this CONTRACT, STOCKTON DISTRICT may require that CALAVERAS DISTRICT and all users of Project Water within CALAVERAS DISTRICT cease diversion from any pumps or other diversion works owned, operated, maintained, or authorized by CALAVERAS DISTRICT, whether such pumps or other diversion works are located at the New Hogan Reservoir pool or below, and if said diversion or any part

of it does not cease, CALAVERAS DISTRICT authorizes the Watermaster to shut off, and in any reasonable fashion, temporarily disable any such pump or other diversion works. CALAVERAS DISTRICT expressly gives authority to the United States and the Watermaster during the perod of such default to shut off, and by any reasonable means, temporarily disable any of said pumps or other diversion works, provided, however, that within the limits of CALAVERAS DISTRICT'S water entitlement the Watermaster shall furnish water to CALAVERAS DISTRICT water users upon payment in advance by those users of a charge per AF not in excess of what STOCKTON DISTRICT charges its water users for water of a similar type for a similar use. All amounts collected pursuant to this Subarticle 6(D) shall be credited, less actual expenses, to the delinquent sums owed by CALAVERAS DISTRICT.

6. (E) The remedies under this Article are cumulative and non restrictive. STOCKTON DISTRICT may use any, or any combination of, the remedies specified in this Article 6 and any other remedy or remedies allowed to it in law or equity, whether based upon breach of contract or otherwise.

6. (F) Any water use or diversion agreements made by CALAVERAS DISTRICT with its water users shall be expressly made subject to this CONTRACT and the remedies herein.

7. Remedies of Calaveras District. The right of STOCKTON DISTRICT and the water users within that DISTRICT to receive Project Water is dependent upon performance by the STOCKTON DISTRICT of its obligations under this CONTRACT.

7. (A) If STOCKTON DISTRICT fails to pay any sum due under the Bureau Contract, or fails to perform any other obligation due thereunder, the CALAVERAS DISTRICT may in its stead perform said obligation. To the extent that CALAVERAS DISTRICT pays any sum due under the Bureau Contract, such sum shall be credited to CALAVERAS DISTRICT'S obligation under Subarticle 5(A) herein. To the

extent that CALAVERAS DISTRICT'S payments exceed the amount that CALAVERAS DISTRICT would have had to pay under Subarticle 5(A) herein, such excess amount shall be deemed immediately delinquent and STOCKTON DISTRICT shall pay interest on said delinquent amounts at the rate of nine percent (9%) per annum until paid.

7. (B) If STOCKTON DISTRICT fails to pay any sum due under the Bureau Contract, or fails to perform any obligation due thereunder, including but not limited to the performance of the duties of the Watermaster, on 30 days written notice in advance to STOCKTON DISTRICT, CALAVERAS DISTRICT may exclude the STOCKTON DISTRICT as Watermaster hereunder and without any other authorization than herein contained, CALAVERAS DISTRICT is authorized to take over and perform all of the duties and responsibilities of STOCKTON DISTRICT as Watermaster, and to substitute CALAVERAS DISTRICT in all respects as Watermaster. Said right to so function as Watermaster shall continue until such time as STOCKTON DISTRICT has corrected the delinquency in payment or other failure.

7. (C) If any sum due under this CONTRACT remains delinquent for 36 months or longer, CALAVERAS DISTRICT, acting as Watermaster or otherwise, upon 30 days written notice to STOCKTON DISTRICT, may terminate the total water entitlement of STOCKTON DISTRICT, and CALAVERAS DISTRICT in such event is authorized to sell and dispose of the water to which STOCKTON DISTRICT would otherwise but for such nonpayment be entitled, to any person, firm, or corporation within or without the DISTRICTS (to the extent permitted by the Bureau Contract or any amendment thereto) upon such terms and conditions as the CALAVERAS DISTRICT shall determine, <u>provided</u>, that the STOCKTON DISTRICT may reacquire its said water entitlement at such time, if any, as said water entitlement is not disposed of or committed to others or in use in place of other water supply which CALAVERAS DISTRICT has relinquished. If only a portion of such water entitlement

is so available, then STOCKTON DISTRICT may reacquire such portion that is available. Such right to reacquire water shall be subject to the condition that STOCKTON DISTRICT shall pay to CALAVERAS DISTRICT a sum calculated as follows: All delinquent sums including sums becoming delinquent after the exercise of CALAVERAS DISTRICT'S rights under this Subarticle 7(C), plus interest as set forth in Subarticle 7(A) above, less any income that CALAVERAS DISTRICT has had during the period of termination from the sale or other disposition of the subject water, plus actual expenses of CALAVERAS DISTRICT in temporarily disposing of water subject to such termination.

7. (D) The remedies under this Article are cumulative and nonrestrictive. CALAVERAS DISTRICT may use any, or any combination of, the remedies specified in this Article 7 and any other remedy or remedies allowed to it in law or equity, whether based upon breach of contract or otherwise.

7. (E) Any water use or diversion agreements made by STOCKTON DISTRICT with its water users shall be expressly made subject to this CONTRACT and the remedies herein.

8. Delay in Payment. If, due to adverse economic conditions, or for any other reason, either or both DISTRICTS are unable to make payments required under this CONTRACT, or by the Bureau Contract, and the United States because of such inability grants a delay of a definite or indefinite period for payment under the Bureau Contract, then such delay shall be applied for the benefit of the DISTRICT experiencing such inability to make payments, and if both DISTRICTS are subject to such inability then the benefit of such delay shall be applied pro rata on the basis of the affected then current payment obligations of the respective DISTRICTS. This Article 8 shall be liberally construed to the end that any loss of water, the right to use water, or water entitlement by either DISTRICT, as a result of adverse economic conditions, or other causes beyond the control of a DISTRICT, shall be reduced or eliminated.

9. Vesting of Water Entitlements; Continuation of Agreement. At the conclusion and complete performance of both the Repayment Obligation of the Bureau Contract and the repayment provided under Subarticle 5(A) of this CONTRACT, both DISTRICTS shall become vested with the water entitlements for which they have respectively paid, subject only to what rights remain in the United States at the conclusion of the Repayment Obligation of the Bureau Contract. This CONTRACT shall then continue in effect in perpetuity, subject to all of its terms.

10. Area of Water Use. The CALAVERAS DISTRICT expressly agrees that no water from the New Hogan Project shall be used by it or through it by a third party beyond the boundaries shown on the attached map marked Exhibit "B". All water sales, use, or distribution contracts made by CALAVERAS DISTRICT shall be expressly subject to the provisions of this Article 10.

11. Watermaster.

11. (A) The STOCKTON DISTRICT is hereby appointed Watermaster under this CONTRACT and the Bureau Contract. The function of the Watermaster shall be exercised by the Secretary-Manager of STOCKTON DISTRICT or by any other person or position designated by resolution of the Board of Directors of STOCKTON DISTRICT. It shall be the duty of the Watermaster to:

11. (A) (1) Exercise general supervision over the administration of this CONTRACT and general administration on behalf of the DISTRICTS over the operation of the Bureau Contract.

11. (A) (2) Exercise general supervision over the diversion and use of water from the New Hogan Project by the DISTRICTS.

11. (A) (3) Administer the diversion into storage, the storage regulation and the release of water.

11. (A) (4) Compile and submit water use schedules to the Contracting Officer and the District Engineer as set forth in the Bureau Contract.

11. (A) (5) Calculate and determine the sums, including interest, owed by CALAVERAS DISTRICT to STOCKTON DISTRICT under this CONTRACT.

11. (A) (6) Exercise such other duties given to the Watermaster elsewhere in this CONTRACT.

11. (B) CALAVERAS DISTRICT shall pay the expenses of the Watermaster directly attributed to that DISTRICT'S activities on the following basis: Two (2) times the hourly wage or salary of any non-CALAVERAS DISTRICT personnel used, for the actual hours of time spent by such personnel, and other costs, actually incurred, including automobile and truck costs, insurance costs, and audit costs, all as may be agreed upon by the DISTRICTS from time to time in writing. If the DISTRICTS are unable at any time to agree upon the amount of the Watermaster's expenses properly chargeable to CALAVERAS DISTRICT, then the matter shall be submitted to arbitration as set forth in Article 12.

11. (C) All diversions from the Calaveras River from the New Hogan Reservoir pool or from below New Hogan Dam within CALAVERAS DISTRICT shall be metered by meters of a type approved by the Watermaster. These meters shall be installed, services, maintained, and replaced as necessary by CALAVERAS DISTRICT and the Watermaster shall be free to inspect any such meter at any reasonable time. CALAVERAS DISTRICT shall read and inspect all of the aforementioned meters monthly and shall supply the information required by the Watermaster and certify the correctness of the meters to the Watermaster by the 10th day of each following month. If a diversion is unmetered, or if the meter is not approved, or

if the data from an approved meter is not supplied as required, the Watermaster may estimate the amount of water used for each such diversion, using, when possible, the criteria then in use by STOCKTON DISTRICT within its own DISTRICT for estimating the consumption of water for various types and classes of water use. The Watermaster shall determine the amount of M & I water used by the CALAVERAS DISTRICT. In determining the total quantity of Project Water diverted by CALAVERAS DISTRICT each year for use in preparing the statement provided for in Paragraph 5(D)(3) above, the Watermaster shall do so either by adding the amounts metered or estimated monthly, or alternatively, at the option of STOCKTON DISTRICT, by subtracting from D, as defined in Paragraph 1(T)(6) the amount of water entering STOCKTON DISTRICT in the Calaveras River and adding C_r as defined in Paragraph 1(T)(4). In case the alternative method is employed, the amount of water entering STOCKTON DISTRICT shall be measured by a device whose type, location, and installation is approved by CALAVERAS DISTRICT and which is installed and maintained by STOCKTON DISTRICT entirely at STOCKTON DISTRICT'S expense, and representatives of CALAVERAS DISTRICT may inspect any such measuring device at any reasonable time. The determination of the Watermaster is bound by the data supplied by an approved meter unless the Watermaster can show that the information recorded by meter is substantially in error.

11. (D) The Watermaster shall cause to be measured by meter diversions for M & I use within STOCKTON DISTRICT (S_m). Representatives of CALAVERAS DISTRICT may inspect such meters at any reasonable time.

11. (E) STOCKTON DISTRICT by undertaking and performing the functions of Watermaster does not warrant to either CALAVERAS DISTRICT or to the water users of CALAVERAS DISTRICT, as to conditions beyond the control of said Watermaster, a supply of water of any given quantity at any given time, or of any particular quality.

11. (F) By July 1 of each year the Watermaster shall submit a report to each DISTRICT giving a full accounting of the use of New Hogan water for the preceding accounting year, all money paid to the Bureau under the Bureau Contract, and all money paid to STOCKTON DISTRICT under this CONTRACT. Said report shall contain any suggestions for improving operations under this CONTRACT. The Watermaster shall cause an annual audit to be made of the financial transactions under this CONTRACT by a certified public accountant and shall send a copy of each said annual audit to each DISTRICT.

12. Arbitration. In any instance in which the DISTRICTS fail to reach agreement as required herein, or in any instance in which a DISTRICT disagrees with a determination of the Watermaster, a DISTRICT may submit the disagreement to arbitration in the manner provided in this Article 12. Matters for which arbitration is specifically provided elsewhere in this CONTRACT shall also be subject to the procedures set forth in this Article 12. The procedure for arbitration shall be as follows:

12. (A) Either party may give notice requesting arbitration to the other.

12. (B) Within ten (10) days of the giving of a notice pursuant to Subarticle 12(A) of this Article, the DISTRICTS shall each select one arbitrator and the two arbitrators so selected shall together select a third arbitrator. If the third arbitrator has not been appointed by the expiration of the ten (10) day period specified above in this Subarticle 12(B) then either party may request the American Arbitration Association to make the selection of any arbitrator or arbitrators who have not been so selected. During the fifteen (15) days next following the selection of the third member of said board of arbitration, the board of arbitration shall meet together from time to time and hear evidence and arguments orally and in writing from the DISTRICTS relative to the matters before it and shall then render its decision with respect

to any matter submitted to it. The decision of said board of arbitration with respect to any matter submitted to it pursuant to this Article 12 shall be final and binding on both parties. The Watermaster shall cause notice of any decision of a board of arbitration hereunder to be given to both DISTRICTS.

12. (C) The costs of arbitration pursuant to this Article 12, including the fees and expenses of the members of the board of arbitration, if any, shall be borne equally by the DISTRICTS.

12. (D) As to any matter not specifically provided for herein as to the procedure for arbitration, the rules of the American Arbitration Association shall apply unless the DISTRICTS agree to the contrary.

13. Attorneys' Fees and Costs. In any case where court action is instituted by one DISTRICT against the other to interpret this CONTRACT, the rights of the parties thereunder, or to enforce a right or obligation created by this CONTRACT, the prevailing party shall receive its costs and reasonable attorneys' fees to be set by the court.

14. Captions and Calculations. The captions to the Articles herein are not part of this CONTRACT, and are not to be used in its interpretation. Any computations made pursuant to this CONTRACT concerning numbers of AF shall be carried out to the nearest acre foot. Any computations made pursuant to this CONTRACT involving percentages shall be carried out to the closest 1/100th of one percent.

15. Binds and Inures. This CONTRACT shall bind and inure to the legal successors of the DISTRICTS and is not made for the benefit of any third party.

16. Subordinate to Bureau Contract. This CONTRACT at all times is subject and subordinate to the provisions of the Bureau Contract.

17. Notices. Notices required to be given under this CONTRACT shall be made by prepaid registered or certified mail deposited

in a United States Post Office mail box addressed as follows:

CALAVERAS DISTRICT:

Secretary-Manager
Calaveras County Water District
P. O. Box 846
San Andreas, California 95249

STOCKTON DISTRICT:

Secretary-Manager
Stockton and East San Joaquin Water Conservation District
P. O. Box 5157
Stockton, California 95205

Notices so posted shall be deemed delivered on the second day following said posting. Changes in these addresses shall be given in writing by the method specified herein.

18. Effective Date and Delay in Payment.

18. (A) This CONTRACT shall not be effective until the Bureau Contract has been signed and approved by the United States.

18. (B) It is understood that certain of the water users identified in the Murray, Burns & Kienlen Civil Engineers study dated February 7, 1969 and located within CALAVERAS DISTRICT have for some time been making diversions for agricultural purposes from the Calaveras River below New Hogan Dam and that said diversions have included, in part, stored water which has been released from the New Hogan Project pursuant to interim contracts now and heretofore in effect between the STOCKTON DISTRICT and the Bureau by which contracts the STOCKTON DISTRICT has paid the Bureau at the rate of $4.00 per AF for said release of stored water and will so pay the Bureau during 1970. It is anticipated by the parties that in 1971 and subsequently these water users will divert water, part of which will be Project Water and part of which will be W_c as defined in this CONTRACT. It is further understood that CALAVERAS DISTRICT may need to complete certain internal arrangements before it can pay STOCKTON DISTRICT for the Project Water diverted by these users. CALAVERAS DISTRICT shall include within the initial schedules submitted on March 15, 1971 pursuant to Paragraph 3(B)(1) the monthly quantity of water estimated to be required by the aforementioned diverters during the 1971 year and shall similarly include the amount so required in the initial schedules submitted on March 15 of each year thereafter. Notwithstanding the provisions of Paragraph 3(B)(1) and Subarticle 5(D) related to advance payments, the advance payment made by CALAVERAS DISTRICT on March 15, 1971 need not include the amount representing planned diversions by these water users but

may be deferred by the CALAVERAS DISTRICT to and including April 1, 1972, provided that any sum so deferred pursuant to this Subarticle 18(B) shall bear interest at the rate of nine percent (9%) per annum until paid in full. On March 15, 1972 and in all years thereafter, the water and advance payment therefor for these users shall be included in the initial schedules and advance payments submitted by CALAVERAS DISTRICT pursuant to Paragraph 3(B)(1).

IN WITNESS WHEREOF, the parties have executed this CONTRACT the day and year first herein written.

CALAVERAS COUNTY WATER DISTRICT

By William D. Hart
President

ATTEST: J. Stanley Edwards
Secretary

STOCKTON & EAST SAN JOAQUIN WATER CONSERVATION DISTRICT

By William C. Sheie
President

ATTEST: Robert C. Hagelow
Secretary

EXECUTION OF THE FOREGOING CONTRACT APPROVED BY THE DEPARTMENT OF THE INTERIOR OF THE UNITED STATES.

By R. J. Pafford Jr.
Contracting Officer

Year	Delivery AF/Annum AG	M & I	Total AF/Annum
1972	6340	60	6400
1973	6632	75	6707
1974	6923	93	7016
1975 -	7215	110	7325
1976	7507	133	7640
1977	7798	156	7954
1978	8090	182	8272
1979	8382	210	8592
1980 -	8673	240	8913
1981	8965	275	9240
1982	9257	310	9567
1983	9548	355	9903
1984	9840	400	10240
1985 -	11560	450	12010
1986	13280	500	13780
1987	15000	570	15570
1988	16720	630	17350
1989	18440	700	19140
1990 -	20160	790	20950
1991	21880	880	22760
1992	23600	940	24540
1993	25290	1010	26300
1994	27040	1080	28120
1995 -	27040	1160	28200
1996	27040	1250	28290
1997	27040	1340	28380
1998	27040	1440	28480
1999	27040	1550	28590
2000 -	27040	1680	28720
2001	27040	1780	28820
2002	27040	1880	28920
2003	27040	1990	29030
2004	27040	2150	29190
2005 -	27040	2220	29260
2006	27040	2340	29380
2007	27040	2480	29520
2008	27040	2630	29670
2009	27040	2790	29830
2010 -	27040	2960	30000

AG - Agriculture

M & I - Municipal & Industrial

AF/Annum - Acre Feet Per Annum

EXHIBIT "A"

Water Delivery

For

New Hogan Project

Calaveras County Water District

1972	6340	60	6400
1973	6632	75	6707
1974	6923	93	7016
1975 -	7215	110	7325
1976	7507	133	7640
1977	7798	156	7954
1978	8090	182	8272
1979	8382	210	8592
1980 -	8673	240	8913
1981	8965	275	9240
1982	9257	310	9567
1983	9548	355	9903
1984	9840	400	10240
1985 -	11560	450	12010
1986	13280	500	13780
1987	15000	570	15570
1988	16720	630	17350
1989	18440	700	19140
1990 -	20160	790	20950
1991	21880	880	22760
1992	23600	940	24540
1993	25290	1010	26300
1994	27040	1080	28120
1995 -	27040	1160	28200
1996	27040	1250	28290
1997	27040	1340	28380
1998	27040	1440	28480
1999	27040	1550	28590
2000 -	27040	1680	28720
2001	27040	1780	28820
2002	27040	1880	28920
2003	27040	1990	29030
2004	27040	2150	29190
2005 -	27040	2220	29260
2006	27040	2340	29380
2007	27040	2480	29520
2008	27040	2630	29670
2009	27040	2790	29830
2010 -	27040	2960	30000

AG - Agriculture
M & I - Municipal & Industrial
AF/Annum - Acre Feet Per Annum

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EXHIBIT "A"
Water Delivery

R.O. Draft 10/16-1987

Contract No.
14-06-200-5057A
Amendatory

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
New Hogan Project, California

AMENDATORY CONTRACT AMONG THE UNITED STATES OF AMERICA, STOCKTON EAST WATER DISTRICT AND CALAVERAS COUNTY WATER DISTRICT PROVIDING FOR REPAYMENT AND CONSERVATION USE OF NEW HOGAN PROJECT

THIS AMENDATORY CONTRACT, made this 25th day of March, 1988 between the UNITED STATES OF AMERICA, hereinafter referred to as the United States, represented by the Contracting Officer executing this amendment, and STOCKTON EAST WATER DISTRICT AND CALAVERAS COUNTY WATER DISTRICT hereinafter referred to as the Contractors,

WITNESSETH, That:

EXPLANATORY RECITALS

WHEREAS, the parties have entered into a repayment contract, dated August 25, 1970 and identified as contract No. 14-06-200-5057A, as amended, which provides repayment and conservation use of New Hogan Dam and Reservoir and is hereinafter referred to as the repayment contract; and

WHEREAS, pursuant to Section 212 of Public Law 97-293 the Reclamation Reform Act of October 12, 1982, the Contractors' water supply from the abovestated reservoir is exempt from the provisions of Federal reclamation law; and

WHEREAS, the Contractors desire to amend the repayment contract to reflect the intent so stated in Section 212 of Public Law 97-293;

NOW, THEREFORE, in consideration of the mutual and dependent stipulations and covenants herein contained, it is mutually agreed by the parties hereto as follows:

1. The following changes to the repayment contract between the United States and the Contractors, shall be effective commencing October 12, 1982.

2. Articles 19, 20, 21 and 22 of the repayment contract and all references to such articles in other articles of the repayment contract are hereby deleted in their entirety.

3. Nothing in this amendatory contract shall terminate, cancel or affect any sales of land heretofore made under recordable contract.

4. Except as herein amended, all provisions of the repayment contract shall remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have signed their names as of the day and year first above written.

UNITED STATES OF AMERICA

ACTING By Regional Director, Mid-Pacific Region
Bureau of Reclamation

(SEAL)

Attest:

Secretary

STOCKTON-EAST WATER DISTRICT

By Roger N. Huckins
President

(SEAL)

Attest:

Steve Felte
Secretary
CORP20

CALAVERAS COUNTY WATER DISTRICT

By
President

RESOLUTION NO. 87-160

WHEREAS, the Bureau of Reclamation has proposed amendments to the contract for New Hogan Water to delete those sections relating to ownership or pricing limitations of Federal Reclamation Law.

BE IT RESOLVED that the Board of Directors of CALAVERAS COUNTY WATER DISTRICT does hereby authorize the execution of the "Amendatory Contract Among the UNITED STATES OF AMERICA, STOCKTON EAST WATER DISTRICT and CALAVERAS COUNTY WATER DISTRICT Providing For Payment and Conservation Use of the New Hogan Project."

BE IT FURTHER RESOLVED that the President is hereby authorized to execute said Amendatory Contract.

PASSED AND ADOPTED this 10th day of December, 1987 by the following vote:

AYES: Directors Clark, Johnson, Neilsen, Gleason and Queirolo

NOES: None

ABSENT: None

CALAVERAS COUNTY WATER DISTRICT

President

ATTEST:

Steve Felts

Secretary

CERTIFIED A TRUE COPY

Linda OKeefe

Assistant Secretary

Calaveras County Water District

WH
3/17

RESOLUTION OF THE BOARD OF DIRECTORS
OF STOCKTON EAST WATER DISTRICT

RESOLUTION 87-88-26

RESOLUTION AUTHORIZING SIGNATURES ON AMENDMENT TO CONTRACT
FOR USE OF NEW HOGAN WATER

WHEREAS, on February 16, 1988 the Board of Directors of Stockton East Water District adopted the Amendatory Contract Among the United States of America, Stockton East Water District and Calaveras County Water District Providing For Repayment And Conservation Use of New Hogan Project; and

WHEREAS, the United States of America has requested that signatures on the Amendatory Contract be authorized by Resolution of the Board of Directors of Stockton East Water District;

NOW, THEREFORE, BE IT RESOLVED, that the Board of Directors of Stockton East Water District approves and authorizes the Board President and Secretary of the Board to execute and sign the Amendatory Contract approved at the February 16, 1988 Board meeting.

PASSED AND ADOPTED by the Board of Directors of Stockton East Water District at a regular meeting held on March 15, 1988, by the following vote:

AYES: Solari, Dondero, Laven, Bozzano, MacNear, Huckins
NOES: Tone
ABSENT: None

Roger M. Huckins
ROGER M. HUCKINS, President
Stockton East Water District

ATTEST:

EDWARD M. STEFFANI, Secretary
Stockton East Water District

SECRETARY'S CERTIFICATE

I, EDWARD M. STEFFANI, Secretary of the Board of Directors of the STOCKTON-EAST WATER DISTRICT, Stockton, California, do hereby certify as follows:

The foregoing is a full, true and correct copy of a resolution duly adopted at a Regular Meeting of the Board of Directors of said District duly and regularly and legally held at the regular meeting place thereof on March 15, 1988, of which meeting all of the members of said Board of Directors had due notice and at which a majority thereof were present.

I have carefully compared the same with the original minutes of said meeting on file and of record in my office, and the foregoing is a full, true, and correct copy of the original resolution adopted at said meeting and entered in said minutes.

Said resolution has not been amended, modified, or rescinded since the date of its adoption, and the same is now in full force and effect.

Dated: 3/15/88

EDWARD M. STEFFANI
Secretary of the Board
STOCKTON-EAST WATER DIST

(SEAL)

ATTACHMENT M

SEWD/ USBR and SEWD/CSJWCD Contract for Central Valley Project Water Supply (New Melones)

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R.O. Draft 4/30-1982
Rev. R.O. 7/21-1982
Rev. R.O. 8/10-1982
Rev. R.O. 9/15-1982
Rev. R.O. 9/20-1982
W.O. Draft 10/28-1982
Rev. R.O. 2/17-1983
Rev. R.O. 2/28-1983
Rev. R.O. 3/2-1983
Rev. R.O. 9/7-1983

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
Central Valley Project, California

Contract No.
4-07-20-W0329

CONTRACT BETWEEN THE UNITED STATES
AND
STOCKTON-EAST WATER DISTRICT
PROVIDING FOR PROJECT WATER SERVICE

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UNITED STATES
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Central Valley Project, California

CONTRACT BETWEEN THE UNITED STATES
AND
STOCKTON-EAST WATER DISTRICT
PROVIDING FOR PROJECT WATER SERVICE

THIS CONTRACT, made this 19TH day of December 1983, in pursuance generally of the Act of June 17, 1902 (32 Stat. 388), and acts amendatory or supplementary thereto including but not limited to the Act of August 26, 1937 (50 Stat. 844), as amended and supplemented, and the Act of August 4, 1939 (53 Stat. 1187), as amended and supplemented, all collectively hereinafter referred to as the Federal reclamation laws between THE UNITED STATES OF AMERICA, hereinafter referred to as the United States, and STOCKTON-EAST WATER DISTRICT, hereinafter referred to as the Contractor, a public agency of the State of California, duly organized, existing, and acting pursuant to the laws thereof, with its principal place of business in Stockton, California.

WITNESSETH, That:

EXPLANATORY RECITALS

WHEREAS, the United States is constructing and operating the Central Valley Project, California for the purpose, among others, of furnishing water for irrigation, municipal, industrial, domestic, and other beneficial uses; and

WHEREAS, pursuant to the Flood Control Acts of December 22, 1944 (58 Stat. 887) and October 23, 1962 (76 Stat. 1173), the Corps of Engineers, United States Army was authorized to construct the New Melones Dam on the

Stanislaus River, California, for the multipurpose uses of flood control, irrigation, municipal and industrial, power generation, and recreation, among other beneficial purposes; and

WHEREAS, pursuant to said acts, New Melones Dam and Reservoir were constructed by the Corps of Engineers and transferred to the Secretary of the Interior to become an integral part of the Central Valley Project to be operated and maintained pursuant to the authorizing acts and Federal reclamation laws; and

WHEREAS, investigations by the United States indicate that the Contractor has a present and potential need for an irrigation and municipal and industrial water supply; and

WHEREAS, Stockton-East Water District has sought a long-term water supply from the Folsom South Canal of the Central Valley Project which is not currently available; and

WHEREAS, the Flood Control Act of 1962 provides "That before initiating any diversions of water from the Stanislaus River Basin in connection with the operation of the Central Valley project, the Secretary of the Interior shall determine the quantity of water required to satisfy all existing and anticipated future needs within that basin and the diversions shall at all times be subordinate to the quantities so determined . . ."; and

WHEREAS, in the Record of Decision dated June 29, 1981, the Secretary determined the Stanislaus River Basin and the needs therein; and

WHEREAS, although Stockton-East Water District is not within the Basin, said Secretarial determination and investigations by the United States indicate that there will be an interim water supply available from the

Central Valley Project for furnishing to the Contractor for surface diversion and direct application for irrigation and municipal and industrial and other purposes; and

WHEREAS, the Contractor desires to contract pursuant to Federal reclamation laws and the laws of the State of California, for water service from the Central Valley Project pursuant to the conditions hereinafter set forth;

NOW, THEREFORE, in consideration of the covenants herein contained, it is agreed as follows:

DEFINITIONS

1. When used herein, unless otherwise distinctly expressed or manifestly incompatible with the intent hereof, the term:

(a) "Secretary" or "Contracting Officer" shall mean the Secretary of the Interior or his duly authorized representative;

(b) "Project" shall mean the Central Valley Project, California, of the Bureau of Reclamation;

(c) "year" shall mean calendar year;

(d) "Basin" shall mean the Stanislaus River Basin area for which a reservation of water is required by the Flood Control Act of 1962 and which is defined in the special report entitled "New Melones Unit, Central Valley Project, California, Stanislaus River Basin Alternative and Water Allocation, September 1980," approved by the Under Secretary in his June 29, 1981, Record of Decision;

(e) "agricultural water" shall mean water used primarily in the commercial production of agricultural crops or livestock including domestic use incidental thereto, on tracts of land operated in units of more than five acres;

(f) "municipal, industrial, and domestic water" (hereinafter referred to as M&I) shall mean water used for other than agricultural purposes;

(g) "interim water supply" shall mean that portion of the water supply available from the New Melones Unit during the buildup to full Basin requirements which will be withdrawn as the needs within the Basin develop.

TERM OF CONTRACT--RIGHT TO USE OF WATER

2. (a) This contract shall be effective on the date first hereinabove written and shall remain in effect through December 31, 2022.

(b) The Contracting Officer shall provide a written notification to the Contractor announcing the initial delivery date which shall be January 1 of the year following the date that water from the Project is first available to the Contractor: Provided, That water availability shall not be declared until all applicable requirements of State and Federal law with respect to utilization and delivery of Stanislaus River water for the purpose of this contract have been complied with: Provided further, That the land classification requirements of Federal reclamation law must be satisfied prior to the announcement of water availability.

(c) If within a period of 5 years, commencing with the year in which the initial delivery date occurs, the Contractor does not own or have available to it for the remainder of the term hereof, facilities which in the opinion of the Contracting Officer are adequate for the conveyance and distribution of water to be made available pursuant to the terms of this contract, this contract shall terminate. If in the opinion of the Contracting Officer, at the end of said 5-year period, the Contractor is diligently proceeding toward completion of the conveyance and distribution facilities, the Contracting Officer shall extend said period from year to year to permit completion of said facilities.

WATER TO BE FURNISHED TO THE CONTRACTOR

3. (a) The Contractor understands and agrees that the water supply provided pursuant to this contract is an interim water supply. As the Basin use develops or if the interim water supply available to Central San Joaquin Water Conservation District pursuant to its contract with the United States is increased, the Contractor's interim water supply may be reduced for subsequent years as determined by the Contracting Officer upon a minimum of one year written notification to the Contractor. The Contractor's interim water supply also may be reduced, as determined by the Contracting Officer, to provide South Delta Water Agency an interim water supply in dry and critically dry water years, as determined by the Contracting Officer, but only in the event that the United States and said Agency execute a contract for that interim water supply during those dry and critically dry water years.

(b) Subject to the terms and conditions herein stated, the United States shall make available annually to the Contractor a maximum of 75,000 acre-feet of interim water: Provided, That this quantity may be increased pursuant to subdivisions (f) and (g) of this article: Provided further, That if the total water quantity is reduced pursuant to subdivision (a) of this article, the maximum and minimum quantities specified in subdivisions (c) and (d) shall be adjusted proportionately to such reduction or otherwise adjusted in a manner mutually agreed to by the Contracting Officer and the Contractor: And provided further, That in the event litigation by a third party prevents delivery of Project water for a period of time during the term of this contract, upon approval of the Contracting Officer the minimum payments as described in subdivisions (c) and (d) of this article during that same period shall be suspended.

(c) The United States shall make available to the Contractor the annual quantities of agricultural water up to a maximum quantity of 65,000 acre-feet as specified in the schedule submitted by the Contractor in accordance with Article 4 and the Contractor shall pay for said water in accordance with Article 5: Provided, That the United States shall make available and the Contractor shall pay for, as a minimum, such quantities of agricultural water as specified below:

(1) Each year, for the first five years commencing with the year in which the initial delivery date occurs pursuant to Article 2, the quantity of water specified in a schedule, or any revision thereof, submitted in accordance with Article 4.

(2) Each year for years 6 through 8 a minimum quantity of 22,750 acre-feet and for years 9 and 10 the minimum quantity of 45,500 acre-feet: Provided, That if in any year the Contractor schedules a quantity larger than the stated minimum, such increased quantity shall

constitute a new minimum for each subsequent year until such time as the above-stated minimums exceed that quantity.

(3) Each year beginning in the 11th year and continuing for the remaining contract term, the quantity of water scheduled in the 11th year (which quantity shall be at least equal to or greater than the quantity made available and paid for in the 10th year except as reduced pursuant to subdivision (a) of this article). In no event shall the annual quantity furnished for agricultural purposes exceed 65,000 acre-feet, except as provided pursuant to subdivisions (f) and (g) of this article: Provided, That the United States shall not be obligated to furnish any quantity greater than the quantity scheduled in the 11th year and such quantity shall constitute the new contract maximum for the remaining contract term.

(d) The United States shall make available to the Contractor the annual quantities of M&I water up to a maximum quantity of 10,000 acre-feet as specified in the schedule submitted by the Contractor in accordance with Article 4 and the Contractor shall pay for said water in accordance with Article 5: Provided, That the United States shall make available and the Contractor shall pay for, as a minimum, such quantities of M&I water as specified in the following table except as reduced pursuant to subdivision (a) of this article: Provided, however, That at any time or times after the

TABLE OF MINIMUM M&I WATER QUANTITIES

(In acre-feet)

Years Beginning With Initial Delivery Date	Minimum Annual M&I Water Delivery	Years Beginning With Initial Delivery Date	Minimum Annual M&I Water Delive
1	100	21	8,700
2	200	22	9,400
3	300	23	10,000
4	400	24	10,000
5	500	25	10,000
6	600	26	10,000
7	700	27	10,000
8	800	28	10,000
9	900	29	10,000
10	1,000	30	10,000
11	1,700	31	10,000
12	2,400	32	10,000
13	3,100	33	10,000
14	3,800	34	10,000
15	4,500	35	10,000
16	5,200	36	10,000
17	5,900	37	10,000
18	6,600	38	10,000
19	7,300	39	10,000
20	8,000	40	10,000

Contractor's requirement for M&I water exceeds 10,000 acre-feet per year, any or all of the Project water to be furnished for agricultural use, as specified in subdivision (c) of this article, may be converted to M&I use and shall be added to said 10,000 acre-feet and shall become the minimum quantity the Contractor shall pay for as M&I water each year thereafter during the term of this contract. Any time or times water for agricultural use is converted to M&I use, the minimum quantities of agricultural water for which payment is required pursuant to subdivision (c) of this article shall be adjusted accordingly.

(e) In any year the Contractor schedules a quantity larger than the minimum stated in the Table of Minimum M&I Water Quantities for that year, such scheduled quantity shall constitute a new minimum for each subsequent year until such time as the minimum stated on the Table exceeds that quantity.

(f) The Contracting Officer will review the supplemental needs of the Contractor following restudy of the available groundwater and with the mutual agreement of the Contractor the maximum water quantity of 75,000 acre-feet may be adjusted: Provided, That said maximum quantity may be increased only if the Contracting Officer has determined that additional Project water is available: Provided, however, That the increase shall not cause the adjusted maximum quantity to exceed 90,000 acre-feet; And Provided further, That if the total water quantity is increased pursuant to this subdivision, the maximum and minimum annual quantities specified in subdivisions (c) and (d) of this article shall be adjusted proportionately to such increase or otherwise adjusted in a manner mutually agreed to by the Contracting Officer and the Contractor.

(g) If the Contractor in any year requires a quantity of water in addition to the maximum quantities stated in subdivisions (b), (c), and/or (d) herein which the United States is obligated to furnish, additional Project water, if available as determined by the Contracting Officer, may be furnished upon receipt of a schedule from the Contractor indicating the quantity of water and the desired time of delivery and appropriate payment. The furnishing by the United States and acceptance by the Contractor of such additional water shall neither entitle nor obligate the Contractor to receive or pay for such quantities in subsequent years.

(h) The United States and the Contractor by mutual agreement may reduce the annual quantity of water which the United States is obligated to make available and the Contractor obligated to pay for during the remainder of the term of this contract.

(i) The Contractor will use all proper methods to secure the economical and beneficial use of water furnished pursuant to this contract.

(j) If in any year after the Contracting Officer has approved a schedule or any revision thereof submitted by the Contractor, the United States is unable to furnish any of the water in the quantities and at the times requested in the schedule or revision thereof and the Contractor does not elect to receive and does not receive such water at other times during such year, the Contractor shall be entitled to an adjustment as provided in Article 6.

DELIVERY SCHEDULES

4. (a) For each year the Contractor will submit a schedule, subject to the provisions of Article 3, indicating the amounts of agricultural and M&I water required monthly. The first schedule shall be submitted 2 months prior to the initial delivery of water. Thereafter, annual schedules indicating monthly water requirements for the subsequent years shall be submitted not later than November 1 of each year or at such other times as determined by the Contracting Officer

to assure coordination of Project operations. The United States shall attempt to deliver water in accordance with said schedules, or any revisions thereof satisfactory to the Contracting Officer which are submitted to the Contracting Officer within a reasonable time before the desired time of delivery. The inability, failure, or refusal of the Contractor to submit a schedule shall not relieve it of its payment obligations.

(b) If the Contractor during any month is furnished a quantity of water in addition to that which it has requested for such month in its schedule and accepts such additional water, the Contractor shall be deemed to have revised its schedule and ordered and obligated itself to pay for such additional water and the United States shall be deemed to have accepted such revision as satisfactory. As soon thereafter as possible the Contractor shall submit a revised schedule to the United States for the remaining quantity to be delivered during that year.

RATES AND METHOD OF PAYMENT FOR WATER

5. (a) The rates of payment to be made by the Contractor for water made available pursuant to this contract shall be:

(1) \$3.50 per acre-foot for agricultural water: Provided, That this rate shall be redetermined annually in accordance with reclamation law and the then current agricultural rate policy of the Project.

(2) \$9.00 per acre-foot for M&I water: Provided, That this rate shall be redetermined annually in accordance with reclamation law and the then current M&I rate policy of the Project.

(b) At the time the Contractor submits the first schedules pursuant to Article 4 hereof to the Contracting Officer, the Contractor shall pay the amount payable for water to be delivered during the first two months. Before the end of the first month or part thereof, of delivery of water pursuant to this contract and before the end of each month thereafter, the Contractor shall pay for the water to be delivered in accordance with the latest approved schedules during the second month immediately following. Adjustments between the payment for the scheduled amounts of water and the payment for quantities delivered each month shall be made during the following month: Provided, That any revised schedule which increases the Contractor's water deliveries shall be accompanied with an appropriate payment to assure water is not delivered in advance of payment. By December 1 of each year, the Contractor shall make any additional payment it is obligated to make for that year pursuant to Article 3.

(c) In the event the Contractor in any year is unable, fails, or refuses to accept delivery of the quantities of water scheduled and made available for delivery and for which payment is required pursuant to this contract or if the Contractor in any year fails to submit a schedule under subdivision (a) of Article 4, said inability, failure, or refusal shall not relieve the Contractor of the obligation to pay for said water and the Contractor agrees to make payment therefor in the same manner as if said water had been delivered to and accepted by the Contractor in accordance with this contract.

ADJUSTMENTS

6. The amount of any overpayment by the Contractor due to the quantity of water actually available for the Contractor during any year, as determined by the Contracting Officer, having been less than the quantity for which the Contractor was required to pay shall be applied first to any accrued indebtedness then due and payable by the Contractor pursuant to this contract. Any amount

of such overpayment then remaining shall, at the option of the Contractor, be refunded to the Contractor or credited upon amounts to become due to the United States from the Contractor under the provisions hereof in the ensuing year. Such adjustment shall constitute the sole remedy of the Contractor or anyone having or claiming to have the right to the use of any of the water supply provided for herein.

POINT OF DIVERSION—MEASUREMENT AND RESPONSIBILITY FOR DISTRIBUTION OF WATER

7. (a) The water to be furnished to the Contractor pursuant to this contract will be released from Project facilities and diverted at such location or locations as mutually agreed to by the Contracting Officer and the Contractor.

(b) The Contractor shall construct and install, without cost or expense to the United States, facilities required by the Contractor to take and convey the water from the point or points of delivery. In the event the Contractor's facilities are installed, operated, and maintained on property of the United States, the Contractor will furnish for approval of the Contracting Officer drawings showing the construction to be performed by the Contractor at least 6 months before starting said construction. The Contractor will not commence construction of any facilities on the property of the United States without the Contracting Officer's written approval of the drawings submitted by the Contractor. It is specifically recognized and agreed that this contract does not grant to the Contractor any right of access to Project water or to lands of the United States for any purpose except as provided herein for installation, operation, and maintenance of the Contractor's facilities to take Project water.

(c) All water diverted by the Contractor pursuant to this contract shall be measured with equipment furnished, installed, operated, and maintained by the Contractor at the point or points of diversion established pursuant to subdivision (a) of this article. The Contractor's maintenance program shall be approved by the Contracting Officer.

(d) M&I water furnished to the Contractor and delivered to its customers shall be measured, or caused to be measured, by the Contractor at the point or points of delivery provided from the Contractor's facilities. All measuring equipment required to determine such quantities shall be furnished, installed, operated, and maintained by the Contractor without expense to the United States.

(e) Measuring equipment required by subdivisions (c) and (d) of this article and its installation, maintenance, and use shall be approved by the Contracting Officer: Provided, That at least once each year, or upon request of the Contracting Officer, the Contractor shall investigate the accuracy of all measuring equipment used pursuant to subdivisions (c) and (d) of this article and shall correct any errors in measurement disclosed by such investigation. The United States shall be afforded reasonable opportunity to be present during the inspecting and testing procedure by the Contractor. The Contracting Officer shall have full and free access at all reasonable times to inspect said measuring equipment for the purpose of determining the accuracy and condition thereof. If said facilities are found to be defective or inaccurate, they shall be readjusted or repaired, or both, or replaced without expense to the United States. In the event the Contractor neglects or fails to make such repairs or replacements within a reasonable time as may be necessary to satisfy the operating requirements of the Contracting Officer, the Contracting Officer may cause the repairs or replacements to be made and the costs thereof charged to the Contractor, which charge the Contractor shall pay to the United States on or before March 1 of the year following that in which the cost was incurred and a statement thereof furnished by the Contracting Officer to the Contractor.

(f) The Contractor shall maintain, in a manner satisfactory to the Contracting Officer, records of the quantities of water measured by the Contractor pursuant to subdivisions (c) and (d) of this article and will a report to the Contracting Officer before the 7th day of each month following the month in which water is so measured. The difference between the water measured by the Contractor pursuant to subdivision (d) and all water furnished by the Contracting Officer as measured pursuant to subdivision (c) shall be considered to be agricultural water.

(g) The United States shall not be responsible for the control, carriage, handling, use, disposal, or distribution of water beyond the delivery points and the Contractor shall hold the United States harmless on account of damage or claim of damage of any nature whatsoever, including property damage, personal injury or death arising out of or connected with the control, carriage, handling, use, disposal, or distribution of such water.

MAINTENANCE OF FLOWS AND LEVELS--TEMPORARY REDUCTION--
RETURN FLOWS

8. (a) The United States shall make all reasonable efforts, consistent with the most efficient overall operation of the Project, to furnish water to the Contractor at the delivery points established pursuant to Article 7.

(b) The United States may temporarily discontinue or reduce the quantity of water to be furnished to the Contractor as herein provided for the purposes of such investigation, inspection, maintenance, repair, or replacement of any of the Project facilities or any part thereof necessary for the furnishing of water to the Contractor, but so far as feasible the United States will give the Contractor due notice in advance of such temporary discontinuance or reduction, except in case of emergency, in which case no notice need be given: Provided, however, That the United States shall use its best efforts to avoid any discontinuance or reduction in service. Upon resumption of service after such reduction or discontinuance and if requested by the Contractor, the United States will attempt to deliver the quantity of water which would have been furnished hereunder in the absence of such discontinuance or reduction.

(c) The United States reserves the right to all waste, seepage, and return-flow water derived from water furnished to the Contractor which escapes or is discharged beyond boundaries of the Contractor's service area. Nothing herein shall be construed as claiming for the United States any right, as waste, seepage, or return flow, to water being used pursuant to this contract for surface irrigation or underground storage within the Contractor's service area by the Contractor, or those claiming by or through the Contractor.

WATER SHORTAGE AND APPORTIONMENT

9. (a) In its operation of the Project, the United States will use all reasonable means to guard against a condition of shortage in the quantity of water available to the Contractor pursuant to this contract. Nevertheless, if a shortage does occur during any year because of drought, or other causes which, in the opinion of the Contracting Officer, are beyond the control of the United States, no liability shall accure against the United States or any of its officers, agents, or employees for any damage, direct or indirect, arising therefrom.

(b) In any year that the Contracting Officer determines that there is a shortage in the quantity of water available to customers of the United States from the New Melones Unit of the Project, the Contracting Officer will apportion available water among the water users capable of receiving water from said Unit, consistent with the existing contracts and Project authorizations. During such water short years, the quantity of water available to the Contractor pursuant to the terms of this contract shall be reduced, as necessary, to meet the full needs of the Basin contractors and the needs of Central San Joaquin Water Conservation District for its firm and interim water supply. The Contractor's water supply may be further reduced to meet the needs of South Delta Water Agency pursuant to the terms of subdivision (a) of Article 3.

TRANSFERS OR EXCHANGES OF WATER

10. Water furnished to the Contractor pursuant to this contract shall not be sold, exchanged, or otherwise disposed of for use outside the Contractor's service area without prior written consent of the Contracting Officer.

WATER ACQUIRED BY CONTRACTOR OTHER THAN FROM THE UNITED STATES

11. (a) Water or water rights now owned or hereafter acquired by the Contractor other than from the United States and Project water furnished pursuant to the terms of this contract may be transported through distribution facilities of the Contractor if the Contracting Officer determines that such mingling is necessary to avoid a duplication of facilities: Provided, That such water is not transported through the Contractor's facilities constructed or financed by the United States. Notwithstanding such mingling, the provisions of this contract shall apply only to the quantity of water furnished to the Contractor pursuant to the terms hereof and the quantity of water acquired by or available to the Contractor other than from the United States shall not in any manner be subject to the provisions of this contract.

(b) With respect to the distribution works or portions thereof in which mingling is permitted as provided in subdivision (a) of this article, the Contractor:

(1) At the request of the Contracting Officer, the Contractor will be responsible for the installation, operation, and maintenance of watermeasuring equipment at delivery points to excess lands and, further, will be responsible for the installation, operation, and maintenance of similar equipment for measuring the water available to the Contractor or landowners within the Contractor's service area other than from the Project, and the Contracting Officer may check and inspect said equipment at any time; and

(2) Agrees that the quantity of water furnished to it by the United States during each 24-hour period will be delivered by the Contractor through the aforesaid outlets to eligible lands only. The Contractor shall be deemed to be in breach of this article and Article 12 of this contract

if at any time there is furnished to all excess lands not covered by recordable contracts and served by the distribution works or portions thereof in which mingling is permitted, a quantity of water which is greater than that which the Contractor or landowners within the Contractor's service area have introduced into said system from the supply available other than pursuant to this contract.

RULES, REGULATIONS, AND DETERMINATIONS

12. (a) The parties agree that the delivery of irrigation water or the use of Federal facilities pursuant to this contract is subject to the acreage and ownership limitations and pricing provisions of Reclamation law, as amended and supplemented, including but not limited to the Reclamation Reform Act of 1982 (Public Law 97-293, Title II).

(b) The Contractor further agrees to abide by final rules and regulations promulgated by the Secretary of the Interior covering the enforcement and administration of said limitations and provisions of Reclamation law as amended and supplemented by the Reclamation Reform Act of 1982, including the payment of full costs as provided therein.

(c) The Contracting Officer shall have the right to make, after an opportunity has been offered to the Contractor for consultation, rules and regulations consistent with the provisions of this contract, the laws of the United States and the State of California, to add or to modify them as may be deemed proper and necessary to carry out this contract, and to supply necessary details of its administration which are not covered by express provisions of this contract. The Contractor shall observe such rules and regulations.

(d) Where the terms of this contract provide for action to be based upon the opinion or determination of either party to this contract, whether or not stated to be conclusive, said terms shall not be construed as permitting such action to be predicated upon arbitrary, capricious, or unreasonable opinions or determinations. In the event that the Contractor questions any factual determination made by the Contracting Officer, the findings as to the facts shall be made by the Secretary only after consultation with the Contractor and shall be conclusive upon the parties.

GENERAL OBLIGATION—BENEFITS CONDITIONED UPON PAYMENT

13. (a) The obligation of the Contractor to pay the United States as provided in this contract is a general obligation of the Contractor notwithstanding the manner in which the obligation may be distributed among the Contractor's water users and notwithstanding the default of the individual water users in their obligations to the Contractor.

(b) The payment of charges becoming due hereunder is a condition precedent to receiving benefits under this contract. No water will be made available to the Contractor through Project facilities during any period in which the Contractor may be in arrears in the advance payment of any charges due the United States. The Contractor shall not furnish water made available pursuant to this contract for lands or parties which are in arrears in the advance payment of charges as levied or established by the Contractor.

CHARGE FOR LATE PAYMENTS

14. The Contractor shall pay a late payment charge on installments or charges which are received after the due date. The late payment charge percentage rate calculated by the Department of the Treasury and published quarterly in the Federal Register shall be used: Provided, That the late payment charge percentage rate will not be less than 0.5 percent per month. The late payment charge percentage rate applied on an overdue payment will remain in effect until payment is received. The late payment rate for a 30-day period will be determined on the day immediately following the due date and will be applied to the overdue payment for any portion of the 30-day period of delinquency. In the case of partial late payments, the amount received will first be applied to the late charge on the overdue payment and then to the overdue payment.

QUALITY OF WATER

15. The operation and maintenance of Project facilities shall be performed in such manner as is practicable to maintain the quality of raw water made available through such facilities as the highest level reasonably attainable as determined by the Contracting Officer. The United States does not warrant the quality of water and is under no obligation to construct or furnish water treatment facilities to maintain or better the quality of water.

WATER AND AIR POLLUTION CONTROL

16. The Contractor, in carrying out this contract, shall comply with all applicable water and air pollution laws and regulations of the United States and the State of California and shall obtain all required permits or licenses from the appropriate Federal, State, or local authorities.

EQUAL OPPORTUNITY

17. During the performance of this contract, the Contractor agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Contracting Officer setting forth the provisions of this nondiscrimination clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without discrimination because of race, color, religion, sex, or national origin.

(3) The Contractor will send to each labor union or representative of workers, with which it has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the Contracting Officer, advising the said labor union or workers' representative of the Contractor's commitments under Section 202 of Executive Order 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The Contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The Contractor will furnish all information and reports required by said amended Executive Order and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records, and accounts by the Contracting Officer and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended, in whole or in part, and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in said amended Executive Order, and such other sanctions may be imposed and remedies invoked as provided in said Executive Order, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The Contractor will include the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by the rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of said amended Executive Order, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, That in the event a Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

TITLE VI, CIVIL RIGHTS ACT OF 1964

18. (a) The Contractor agrees that it will comply with Title VI of the Civil Rights Act of July 2, 1964 (78 Stat. 241) and all requirements imposed by or pursuant to the Department of the Interior Regulation (43 CFR 17) issued pursuant to that title, to the end that, in accordance with Title VI of that Act and the Regulation, no person in the United States shall, on the grounds of race, color, or national origin be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Contractor receives financial assistance from the United States and hereby gives assurance that it will immediately take any measures to effectuate this agreement.

(b) If any real property or structure thereon is provided or improved with the aid of Federal financial assistance extended to the Contractor by the United States, this assurance obligates the Contractor, or, in the case of any transfer of such property, any transferee for the period during which the real property or structure is used for a purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance obligates the Contractor for the period during which it retains ownership or possession of the property. In all other cases, this assurance obligates the Contractor for the period during which the Federal financial assistance is extended to it by the United States.

(c) This assurance is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property, discounts, or other Federal financial assistance extended after the date hereof to the Contractor by the United States, including installment payments after such date on account of arrangements for Federal financial assistance which were approved before such date. The Contractor recognizes and agrees that such Federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall reserve the right to seek judicial enforcement of this assurance. This assurance is binding on the Contractor, its successors, transferees, and assignees.

WATER CONSERVATION PROGRAM

19. (a) While the contents and standards of a given water conservation program are primarily matters of State and local determination, there is a strong Federal interest in developing an effective water conservation program because of this contract. The Contractor shall develop and implement an effective water conservation program for all uses of water which is provided from, or conveyed through, Federally constructed or Federally financed facilities for the Contractor's use. The original water conservation program shall specify definite objectives, appropriate existing and proposed water conservation measures including, but not limited to, changes in water uses and modifications in the design or operation of existing or proposed distribution systems, and time schedules for meeting the water conservation objectives.

(b) The original water conservation program shall be submitted to and approved by the Contracting Officer prior to one or all of the following: (1) service of Federally stored/conveyed water; (2) transfer of operation and maintenance of the Project facilities to the Contractor; or (3) transfer of the Project to an operation and maintenance status. The distribution and use of Federally stored/conveyed water and/or the operation of Project facilities transferred to the Contractor shall be consistent with the approved water conservation program. Following date of execution of this contract, and at subsequent 5-year intervals, the Contractor and Contracting Officer shall review the original water conservation plan to determine if the objectives set forth therein are being met. If it is determined that the water conservation measures set forth therein require modification to further the established objectives, the Contractor and the Contracting Officer shall work together to formulate the modifications which the Contractor shall then be required to implement.

BOOKS, RECORDS, AND REPORTS

20. The Contractor shall establish and maintain accounts and other books and records pertaining to its financial transactions, land use and crop census, water use, and other matters as the Contracting Officer may require. Reports thereon shall be furnished to the Contracting Officer in such form and on such date or dates as he may require. Subject to applicable Federal laws and regulations, each party shall have the right during office hours to examine and make copies of each other's books and official records relating to matters covered by this contract.

CONTINGENT ON APPROPRIATION OR ALLOTMENT OF FUNDS

21. The expenditure or advance of any money or the performance of any work by the United States hereunder which may require appropriation of money by the Congress or the allotment of funds shall be contingent upon such appropriation or allotment being made. The failure of Congress to appropriate funds or the absence of any allotment of funds shall not relieve the Contractor from any obligation under this contract. No liability shall accrue to the United States in case such funds are not appropriated or allotted.

CHANGES IN CONTRACTOR'S SERVICE AREA

22. While this contract is in effect, no change shall be made in the Contractor's service area by inclusion or exclusion of lands, by dissolution, consolidation, merger, or otherwise, except upon the Contracting Officer's written consent.

ASSIGNMENT LIMITED--SUCCESSORS AND ASSIGNS OBLIGATED

23. The provisions of this contract shall apply to and bind the successors and assigns of the parties hereto, but no assignment or transfer of this contract or any part or interest therein shall be valid until approved by the Contracting Officer.

OFFICIALS NOT TO BENEFIT

24. (a) No Member of or Delegate to Congress or Resident Commissioner shall be admitted to any share or part of this contract or to any benefit that may arise herefrom. This restriction shall not be construed to extend to this contract if made with a corporation for its general benefit.

(b) No official of the Contractor shall receive any benefit that may arise by reason of this contract other than as a water user within the Project and in the same manner as other water users within the Project.

CONFIRMATION OF CONTRACT

25. Upon execution of this contract, the Contractor promptly shall secure a final decree of the proper court of the State of California, approving and confirming the contract and decreeing and adjudging it and the apportionment of the benefits and thereunder to be lawful, valid, and binding on the Contractor. The Contractor shall furnish to the United States a certified copy of such decree and of all pertinent supporting records.

WATER CONSERVATION PROGRAM

19. (a) While the contents and standards of a given water conservation program are primarily matters of State and local determination, there is a strong Federal interest in developing an effective water conservation program because of this contract. The Contractor shall develop and implement an effective water conservation program for all uses of water which is provided from, or conveyed through, Federally constructed or Federally financed facilities for the Contractor's use. The original water conservation program shall specify definite objectives, appropriate existing and proposed water conservation measures including, but not limited to, changes in water uses and modifications in the design or operation of existing or proposed distribution systems, and time schedules for meeting the water conservation objectives.

(b) The original water conservation program shall be submitted to and approved by the Contracting Officer prior to one or all of the following: (1) service of Federally stored/conveyed water; (2) transfer of operation and maintenance of the Project facilities to the Contractor; or (3) transfer of the Project to an operation and maintenance status. The distribution and use of Federally stored/conveyed water and/or the operation of Project facilities transferred to the Contractor shall be consistent with the approved water conservation program. Following date of execution of this contract, and at subsequent 5-year intervals, the Contractor and Contracting Officer shall review the original water conservation plan to determine if the objectives set forth therein are being met. If it is determined that the water conservation measures set forth therein require modification to further the established objectives, the Contractor and the Contracting Officer shall work together to formulate the modifications which the Contractor shall then be required to implement.

BOOKS, RECORDS, AND REPORTS

20. The Contractor shall establish and maintain accounts and other books and records pertaining to its financial transactions, land use and crop census, water use, and other matters as the Contracting Officer may require. Reports thereon shall be furnished to the Contracting Officer in such form and on such date or dates as he may require. Subject to applicable Federal laws and regulations, each party shall have the right during office hours to examine and make copies of each other's books and official records relating to matters covered by this contract.

CONTINGENT ON APPROPRIATION OR ALLOTMENT OF FUNDS

21. The expenditure or advance of any money or the performance of any work by the United States hereunder which may require appropriation of money by the Congress or the allotment of funds shall be contingent upon such appropriation or allotment being made. The failure of Congress to appropriate funds or the absence of any allotment of funds shall not relieve the Contractor from any obligation under this contract. No liability shall accrue to the United States in case such funds are not appropriated or allotted.

CHANGES IN CONTRACTOR'S SERVICE AREA

22. While this contract is in effect, no change shall be made in the Contractor's service area by inclusion or exclusion of lands, by dissolution, consolidation, merger, or otherwise, except upon the Contracting Officer's written consent.

ASSIGNMENT LIMITED—SUCCESSORS AND ASSIGNS OBLIGATED

23. The provisions of this contract shall apply to and bind the successors and assigns of the parties hereto, but no assignment or transfer of this contract or any part or interest therein shall be valid until approved by the Contracting Officer.

OFFICIALS NOT TO BENEFIT

24. (a) No Member of or Delegate to Congress or Resident Commissioner shall be admitted to any share or part of this contract or to any benefit that may arise herefrom. This restriction shall not be construed to extend to this contract if made with a corporation for its general benefit.

(b) No official of the Contractor shall receive any benefit that may arise by reason of this contract other than as a water user within the Project and in the same manner as other water users within the Project.

CONFIRMATION OF CONTRACT

25. Upon execution of this contract, the Contractor promptly shall secure a final decree of the proper court of the State of California, approving and confirming the contract and decreeing and adjudging it and the apportionment of the benefits and thereunder to be lawful, valid, and binding on the Contractor. The Contractor shall furnish to the United States a certified copy of such decree and of all pertinent supporting records.

NOTICES

26. Any notice, demand, or request authorized or required by this contract shall be deemed to have been given, on behalf of the Contractor, when mailed, postage prepaid, or delivered to the Regional Director, Bureau of Reclamation, 2800 Cottage Way, Sacramento, California 95825, and on behalf of the United States, when mailed, postage prepaid, or delivered to the Board of Directors of the Stockton-East Water District, Post Office Box 5157, Stockton, California 95205. The designation of the addressee or the address may be changed by notice given in the same manner as provided in this article for other notices.

IN WITNESS WHEREOF, the parties hereto have executed this contract the day and year hereinabove written.

THE UNITED STATES OF AMERICA

By David G. Houston
Regional Director, Mid-Pacific Region
Bureau of Reclamation

(SEAL)

STOCKTON-EAST WATER DISTRICT

By Richard Bogar
President

Attest:

Secretary

Article 26
Signatures

RESOLUTION NO. 83-84-06

RESOLUTION BEFORE THE BOARD OF DIRECTORS OF STOCKTON EAST WATER DISTRICT AUTHORIZING EXECUTION OF NEW MELONES CONTRACT

WHEREAS, the Bureau of Reclamation has presented to the District a proposed contract between the United States and Stockton East Water District providing for project water service, Contract No. REV. R.O. 9/7-1983; and

WHEREAS, the District has reviewed this contract; and

WHEREAS, it is to the District's advantage to execute this contract providing for access to water from New Melones Reservoir; and

WHEREAS, the contract may be terminated within a period of five (5) years if the District does not own or have available to it facilities adequate for the conveyance and distribution of water;

NOW, THEREFORE BE IT RESOLVED and it is hereby resolved that Stockton East Water District shall enter into this contract with the United States Department of Interior, Bureau of Reclamation; and

BE IT FURTHER RESOLVED that the President and Secretary of the Board of Directors of the District are hereby authorized and directed to execute all necessary documents in order to carry out this resolution.

PASSED AND ADOPTED this 4th day of October, 1983 at a regular meeting of the Board of Directors of Stockton East Water District by the following vote. TO WIT:

AYES: EILERS, DONDERO, TAFT, HUCKINS, BOZZANO
NOES: NONE
ABSTENTION: NONE
ABSENT: MACNEAR

Perry H Taft

PERRY H. TAFT, President
Board of Directors
Stockton East Water District

ATTEST:

EDWARD M. STEFFANI, Secretary
Board of Directors
Stockton East Water District

(SEAL)

SECRETARY'S CERTIFICATE

I, EDWARD M. STEFFANI, Secretary of the Board of Directors of the STOCKTON-EAST WATER DISTRICT, Stockton, California, do hereby certify as follows:

The foregoing is a full, true and correct copy of a resolution duly adopted at a Regular Meeting of the Board of Directors of said District duly and regularly and legally held at the regular meeting place thereof on OCTOBER 4, 1983, of which meeting all of the members of said Board of Directors had due notice and at which a majority thereof were present.

I have carefully compared the same with the original minutes of said meeting on file and of record in my office, and the foregoing is a full, true, and correct copy of the original resolution adopted at said meeting and entered in said minutes.

Said resolution has not been amended, modified, or rescinded since the date of its adoption, and the same is now in full force and effect.

Dated: October 4, 1983

EDWARD M. STEFFANI
Secretary of the Board
STOCKTON-EAST WATER DIST

(SEAL)

JM

CONTRACT BETWEEN
CENTRAL SAN JOAQUIN WATER CONSERVATION DISTRICT
AND
STOCKTON EAST WATER DISTRICT

THIS CONTRACT, made this 29th day of August, 1991, between Central San Joaquin Water Conservation District, hereinafter referred to as "CSJWCD", a public agency of the State of California, duly organized, existing and acting pursuant to the laws thereof, with its primary place of business in Stockton, California, and Stockton East Water District, hereinafter referred to as "SEWD", a public agency of the State of California, duly organized, existing and acting pursuant to the laws thereof, with its primary place of business in Stockton, California.

RECITALS

WHEREAS, CSJWCD has executed a Water Service Contract with the United States, providing for the delivery and purchase of Project Water from the New Melones Unit of the Central Valley Project in the annual quantity of 80,000 acre feet; and

WHEREAS, SEWD has executed a Water Service Contract with the United States, providing for the delivery and purchase of Project Water from the New Melones Unit of the Central Valley Project in the annual quantity of 75,000 acre feet; and

WHEREAS, SEWD is constructing and will be constructing various components of a water conveyance system to bring Project water into its service area; and

WHEREAS, CSJWCD and SEWD have executed a Wheeling contract wherein SEWD has agreed to transport and convey Project Water for CSJWCD to its service area; and

WHEREAS, CSJWCD is designing and will construct an internal distribution system to convey and transport its Project Water throughout its service area; and

WHEREAS, SEWD is constructing as part of its water conveyance facilities a Lower Farmington Canal from Farmington Dam into its service area; and

WHEREAS, said Lower Farmington Canal can be designed, constructed, and utilized to allow the conveyance of CSJWCD Project Water into the Duck Creek system of its service area;

WHEREAS, CSJWCD and SEWD wish to cooperate and utilize facilities to the joint and mutual benefit of each of the parties for the conveyance of Project Water;

NOW, THEREFORE, in consideration of the covenants herein contained, it is agreed as follows:

1. **Definition:** When used herein, unless otherwise distinctly expressed or manifestly incompatible with the intent hereof, the term:

(a) "Internal Distribution Facility" shall mean such channel clearing, crossing, piping, check dams, and other necessary improvements within each party's separate service area;

(b) "Lower Farmington Canal" shall mean a canal approximately 9.6 miles in length from Farmington Dam to the SEWD service area;

(c) "Project Water" shall mean water available to each party pursuant to the terms of a water service contract with the United

States for delivery of water from the New Melones unit of the Central Valley Project;

2. **Purpose of Agreement:** The purpose and intent of this contract is to specify the terms on which SEWD will convey Project Water of CSJWCD through the Lower Farmington Canal to the service area of CSJWCD.

3. **Covenant of Cooperation:** The parties to this contract do hereby covenant to cooperate in good faith to enable CSJWCD to take delivery of its Project Water in conformance with this contract.

4. **Construction of Lower Farmington Canal:** SEWD has designed, and intends to place out for bid, a water conveyance canal called the Lower Farmington Canal with a design capacity at a minimum flow of 200 CFS. Construction is intended to be completed by the latter part of 1991. SEWD agrees that CSJWCD will prepare an addendum to the Lower Farmington Canal design contract documents dated July, 1990, changing and modifying the first Fourteen Thousand (14,000) feet of the Canal to allow a minimum flow of 300 CFS and adding gates at the Funck Road pipe crossing and one (1) turnout structure. Such modification shall allow diversion of Project Water into the Duck Creek area of CSJWCD.

SEWD shall be fully responsible for the construction and construction schedule of the Lower Farmington Canal. SEWD shall bear no responsibility nor liability caused by delays in the construction schedule, for whatever reason.

5. **Use of Facility:** SEWD agrees to utilize the canal for, among other uses, conveyance of Project Water of CSJWCD to the

service area of CSJWCD at a maximum rate of 100 CFS. Nothing herein shall prevent the parties from agreeing to other sharing or utilization of other available capacity. It is understood that a separate agreement will be executed by the parties setting forth the specific terms for operation and delivery of water through the Canal by SEWD on behalf of CSJWCD.

6. **Compensation for Use of Lower Farmington Canal:** CSJWCD shall pay to SEWD an amount equal to the additional bid cost for gates at the Funck Road pipe crossing, one (1) turnout structure, an amount equal to the additional cost for increased excavation and improvement to expand the canal capacity, from 200 CFS to 300 CFS, an amount equal to the additional cost for increasing the Rock Creek Diversion structure capacity from 200 to 300 CFS, and an amount equal to the cost for increasing the Highway 4 pipe crossing capacity from 200 to 300 CFS. Said increased excavation cost shall be calculated on the unit price bid for excavation multiplied by the additional excavation quantity. CSJWCD shall make payment to SEWD for said modifications during the construction of the Lower Farmington Canal and at such time as SEWD is obligated to pay under the terms of the construction contract.

Any additional unforeseen costs which may arise as a result of oversizing the project for CSJWCD participation shall be borne by CSJWCD.

Upon receipt of bids for construction and prior to award of a construction contract thereof, should CSJWCD, in its sole discretion, deem the bided costs to be excessive or unacceptable then CSJWCD may withdraw from this agreement and the terms and conditions herein will be void.

7. **Additional Compensation:** Notwithstanding any other provision of this Agreement, if, and only if, the amounts paid by CSJWCD pursuant to Paragraph 6 of this Agreement are less than Two Hundred Thousand Dollars ($200,000.00), then CSJWCD shall pay to SEWD an additional sum, which shall be Two Hundred Thousand Dollars ($200,000.00) less the amount paid pursuant to Paragraph 6 of this Agreement. CSJWCD shall pay the additional compensation within thirty (30) days of SEWD acceptance of completion of the Lower Farmington Canal.

8. **Operation and Maintenance:** The operation and maintenance expense for the first fourteen thousand (14,000) feet of the Canal shall be determined annually by multiplying the actual operation and maintenance cost by the quotient of total acre feet wheeled for CSJWCD divided by the total acre feet wheeled for CSJWCD plus the total acre feet conveyed for SEWD. Operation and maintenance costs shall not include costs for repair and replacement due to faulty or negligent construction of the Canal or negligent operation and maintenance. Annual review of all operation and maintenance costs shall be provided to CSJWCD. CSJWCD shall be notified of any Committee and Board Meetings when operation and maintenance procedures and costs are discussed. CSJWCD shall pay operation and maintenance costs annually on January 31, for the previous calendar year.

9. **Term of Contract:** This Contract shall be effective on

the date first above written and shall remain in effect through December 21, 2022 or until such time as both parties Water Service Contract with the United States shall terminate; provided, however, that this Contract shall automatically renew for a period of one (1) year, and at the expiration of such renewal period, or any subsequent renewal period, for one (1) year, unless either party shall give notice of non-renewal in writing prior to thirty (30) days before the commencement of any renewal period.

10. **Attorneys fees and Costs:** In any case where court action is instituted by one or more parties against one or more other parties to interpret this Agreement, the rights of the respective parties hereunder, or to enforce a right or obligation created by this Agreement, the prevailing party or parties shall receive costs and reasonable attorneys fees to be set by the court.

11. **Specific Performance:** By reason of the specialized nature of the water service to be rendered, and for the further reason that the extent of any damage caused to any party by another by reason of any breach of this Agreement may be extremely difficult to determine, it is agreed by the parties hereto that an action for damages is an inadequate remedy for any breach, and that specific performance, without precluding any other remedy available in equity or at law, will be necessary to furnish any party hereto with an adequate remedy for the breach by any other party hereto of any covenant or obligation for the benefit of the aggrieved party.

12. **Partial Invalidity:** If any term of this Agreement is held by a court of competent jurisdiction to be void or unenforceable,

the remainder of the contract terms shall remain in full force and effect and shall not be affected.

13. **Assignability:** The provisions of this contract shall apply to and bind the successors and assigns of the parties hereto, but no assignment or transfer of this contract or any part or interest therein shall be valid until approved in writing by the parties.

14. **Notices:** Any notice, demand, or request authorized or required by this contract shall be deemed to have been given, on behalf of the Contractor, when mailed, postage prepaid, or delivered to the Central San Joaquin Water Conservation District, 311 East Main Street, Suite 202, Stockton, California , 95202, and on behalf of SEWD when mailed postage prepaid, or delivered to Stockton East Water District, 6767 East Main Street, Stockton, California, 95205. The designation of the addressee or the address may be changed by notice given in the same manner as provided in this article for other notices.

IN WITNESS WHEREOF, the parties hereto have executed this contract the day and year hereinabove written.

CENTRAL SAN JOAQUIN WATER CONSERVATION DISTRICT	STOCKTON EAST WATER DISTRICT
By: Grant Thompson	By: Jack Tone
GRANT THOMPSON, President	JACK TONE

CONTRACT BETWEEN CENTRAL SAN JOAQUIN WATER CONSERVATION DISTIRCT AND STOCKTON EAST WATER DISTRICT

This Contract, made this 4th day of January, 2000, BETWEEN CENTRAL SAN JOAQUIN WATER CONSERVATION DISTRICT (CSJWCD), a public agency of the State of California, duly organized, existing and acting pursuant to the laws thereof, with its primary place of business in Stockton, California, and the STOCKTON EAST WATER DISTRICT (SEWD), a public agency of the State of California, duly organized, existing and acting pursuant to the laws thereof, with its primary place of business in Stockton, California.

1. Recitals.

   a. CSJWCS has executed a Water Service Contract with the United States Bureau of Reclamation, providing for the delivery and purchase of Project water from the New Melones Unit of the Central Valley Project in the annual quantity of 80,000 acre feet.

   b. SEWD has executed a Water Service Contract with the United States Bureau of Reclamation, providing for the delivery and purchase of water from the New Melones Unit of the Central Valley Project in the annual quantity of 75,000 acre feet.

   c. SEWD has constructed a water conveyance system to bring water from the New Melones Project into its service area.

   d. CSJWCD and SEWD have executed a Contract dated January 30, 1990, wherein SEWD has agreed to transport and convey water from the New Melones Project for CSJWCD to its service area (1990 Wheeling Agreement).

   e. SEWD has constructed a Lower Farmington Canal for the conveyance of water from Farmington Dam into its service area.

   f. CSJWCD and SEWD have executed a second Contract dated August 29, 1991, providing for the conveyance of CSJWCD water from the New Melones Project through the Lower Farmington Canal and into the Duck Creek system of its service area (1991 Wheeling Agreement).

   g. CSJWCD and SEWD wish to cooperate and utilize facilities to the joint and mutual benefit of each of the parties for the conveyance of water from the New Melones Project.

NOW, THEREFORE, in consideration of the covenants herein contained, it is agreed as follows:

2. Definitions. When used herein, unless otherwise distinctly expressed or manifestly incompatible with the intent hereof, the term:

   a. "Internal Distribution Facility" shall mean such channel clearing, crossing, piping, check dams and other improvements within the CSJWCD service area owned, operated and maintained by CSJWCD.

   b. "Lower Farmington Canal" shall mean a canal approximately 9.6 miles in length from Farmington Dam to the SEWD service area owned, operated and maintained by SEWD.

   c. "CJWCD Project Water" shall mean irrigation water available to CSJWCD pursuant to the terms of its water service contract with the United States for delivery of water from the New Melones Unit of the Central Valley Project.

   d. "SEWD Project Water" shall mean irrigation water available to SEWD pursuant to the terms of its water service contract with the United States for delivery of water from the New Melones Unit of the Central Valley Project.

   e. "Year" shall mean the calendar year.

3. Purpose of Agreement. The purpose and intent of this Contract is to specify the terms on which CSJWCD and SEWD will convey water belonging to the other party through their respective facilities to the service area of the other party. The parties intend that each party will convey a like amount of water for the other party, that actions will be taken by the parties to insure equivalency and that the parties will try to maximize the use of surface water within their respective service areas.

4. Covenant of Cooperation. The parties to this Contract do hereby covenant to cooperate in good faith each to enable the other to take delivery of water in conformance with this Contract.

5. Use of Lower Farmington Canal. SEWD agrees to utilize the Lower Farmington Canal for conveyance of quantities of CSJWCD Project Water into the service area of CSJWCD below the turnout for Duck Creek, in accordance with the terms and conditions of this Contract.

6. Use of Internal Distribution Facilities. CSJWCD agrees to utilize its Internal Distribution Facilities for conveyance of quantities of SEWD Project Water into the service area of SEWD in accordance with the terms and conditions of this Contract.

7. Quantities of Water. The quantity of wheeling capacity available in each facility for the use of the other party shall be that capacity not being utilized at the time of conveyance by the party owning the facility, up to the design capacity of the facility.

8. Prior Approval. The quantity and timing of water to be conveyed pursuant to this Contract each Year shall be approved in writing by the conveying party. The party requesting conveyance shall submit requests in writing to the other party by February 1 of each Year, and written response shall be provided by March 1 of each Year. Such written request shall include the total quantity of water to be conveyed, location and purpose of use, facilities to be utilized, plans and specifications for any proposed facilities to be constructed, proposed method of measurement, and duration of conveyance.

9. Improvements. Upon receipt of written approval of the terms of the conveyance, as set forth above, the party to convey water shall construct any and all improvements determined to be needed by the approving party in accordance with the terms of approval.

10. Record Keeping and Accounting. Each party shall keep records of the quantities of water wheeled through its facilities for the other party hereto pursuant to this Contract. At the end of each Year, the parties shall prepare an accounting of the quantities of water conveyed ("Annual Accounting"). It is the intent of the parties that the quantities of water conveyed by each party be approximately equivalent.

11. Compensation. This is intended to be a trade of equivalent value for the conveyance of like quantities of water by each party. As a result, no monetary compensation is intended to be paid from either party to the other for the rights, duties, and obligations expressed herein, provided the Annual Accounting indicates the original intention of this agreement is being achieved.

12. Term. This Contract shall be effective upon the first date written and shall remain in effect until terminated by either party as provided herein. Either party may terminate by providing notice to the other in writing by December 31 of any year.

13. Indemnity. Each party to this Contract shall indemnify, defend, and hold harmless the other party, its employees, agents, and officers, and their respective successors and assigns, from and against any and all claims, demands, losses, liability, or damages, including, but not limited to, attorneys' fees and court costs incurred in defending against the same, for personal injury, death, or property damage arising from, or in any way connected with, that party's operation of its water conveyance system as provided in this Contract.

14. Attorneys Fees and Costs. In any case where court action is instituted by a party against another party to interpret this Contract, the rights of the respective parties hereunder, or to enforce a right or obligation created by this Contract, the prevailing party or parties shall receive costs and reasonable attorneys fees to be set by the court.

15. Assignability. The provisions of this Contract shall apply to and bind the successors and assigns of the parties hereto, but no assignment or transfer of this Contract or any part or interest therein shall be valid until approved in writing by the parties.

16. Notices. Any notice, demand, or request authorized or required by this Contract shall be deemed to have been given, on behalf of the party, when mailed, postage prepaid, or delivered to a party at the following address:

Central San Joaquin Water Conservation District
311 East Main Street, Suite 202
Stockton, California 95202

Stockton East Water District
Post Office Box 5157
6767 East Main Street
Stockton, California 95205

The designation of the addressee or the address may be changed by notice given in the same manner as provided in this article for other notices.

17. Continued Validity. Nothing in this Contract shall alter the terms of the 1990 Wheeling Agreement or the 1991 Wheeling Agreement.

CENTRAL SAN JOAQUIN WATER CONSERVATION DISTRICT

By ______________________

Attest: ______________________

STOCKTON EAST WATER DISTRICT

By ______________________

Attest: ______________________
Kevin M. Kauffman, Secretary

ATTACHMENT N

Sample Owner's Water Use Statement

(This page left blank intentionally.)

Stockton East Water District
6767 East Main Street Stockton, CA 95215
P.O. Box 5157 Stockton, CA 95205
(209) 948-0333 Phone
(209) 948-0423 Fax
Website: www.sewd.net
E-mail: sewd@sewd.net

Account No.	
Parcel No.	
Gross Acres	
Net Ag Acres	
Domestic Units	
Pump ID	
Meter Size "	
Water Right	
Site:	

OWNER'S WATER USE STATEMENT FOR CALENDAR YEAR XXXX

Name Change:_______________________________

Mailing Address Change:_______________________________

____

INSTRUCTIONS:

Complete this owner's water use statement and return it to the district no later than **January 15, XXXX**

The information you provide will be used to determine your water bill.

A 5% penalty will be added to your water bill if this statement is not returned to the district by such date.

To complete this form, please choose one of the options below by checking the appropriate box, then follow that option's instructions:

☐ **Property has been sold.** Date of sale _________________.

☐ **Option 1 - NO CHANGE - The information in Tables 1 and/or 2 reflects current agricultural irrigation and/or non-ag use.**

Check the box, sign and date at the bottom of this form, and return to the district.

☐ **Option 2 - CHANGE - I have corrected the information in Tables 1 and/or 2.**

Check the box, write the corrections on Tables 1 and/or 2, sign and date at the bottom of this form, and return to the district.

TABLE 1 - Statement of Agricultural Irrigation Use

Crop	Method of Irrigation	Acres Fallow/ Not Irrigated	Acres on Well Water	Acres on Surface Water

Statement Audit For District Use	

Water Meter Readings:

Ending _______________

Beginning _______________

Usage _______________

No. of Users _______________

TABLE 2 - Statement of Non-Agricultural Irrigation Use

Single Family Residences		
Multiple Family Residences		
Commercial Buildings		

I declare (or certify, verify, or state) under penalty of perjury that the foregoing is true and correct.

Sign	Print Name	Date	Telephone Number

ATTACHMENT O

Calaveras River Habitat Conservation Plan Project, Central California Traction Railroad Crossing Project Preliminary Design and Plan

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ATTACHMENT O.1.

Central California Traction Company Railroad Bridge Preliminary Design

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STATE OF CALIFORNIA

CALIFORNIA NATURAL RESOURCES AGENCY

DEPARTMENT OF WATER RESOURCES

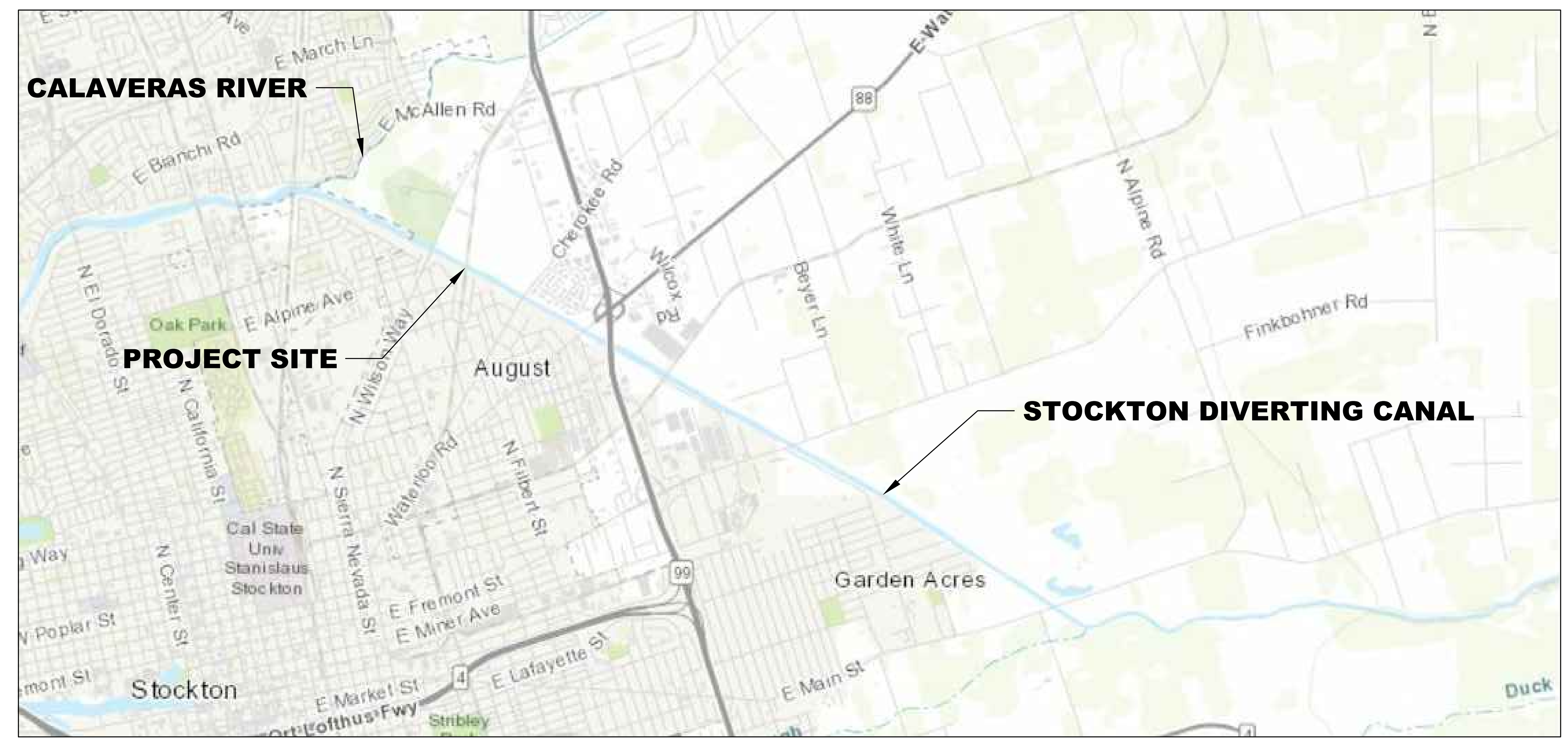
DIVISION OF INTEGRATED REGIONAL WATER MANAGEMENT

ENVIRONMENTAL RESTORATION AND ENHANCEMENT BRANCH

FISH PASSAGE IMPROVEMENT PROGRAM

CENTRAL CALIFORNIA TRACTION COMPANY RAILROAD BRIDGE
PRELIMINARY DESIGN

PROJECT LOCATION



PROJECT VICINITY

SHEET INDEX

C-1	COVER SHEET
C-2	GENERAL PLAN
C-3	EXISTING CHANNEL BASE MAP AND PROFILE
C-4	PROPOSED CHANNEL PLAN AND PROFILE
C-5	FLUME AND NOTCH PLAN
C-6	FLUME AND NOTCH PROFILES
C-7	TYPICAL SECTIONS A & B
C-8	TYPICAL SECTIONS C, D, & E
C-9	FLOOD ELEVATIONS AT FLUMES AND WING WALLS

ABBREVIATIONS

D	DEEP
DIA	DIAMETER
ESM	ENGINEERED STREAMBED MATERIAL
L	LONG
MAX	MAXIMUM
MIN	MINIMUM
TWG	THALWEG
W	WIDE

NOTES

ALL ELEVATIONS ARE NGVD 29 AND WERE DERIVED FROM CITY OF STOCKTON BENCHMARK 90.

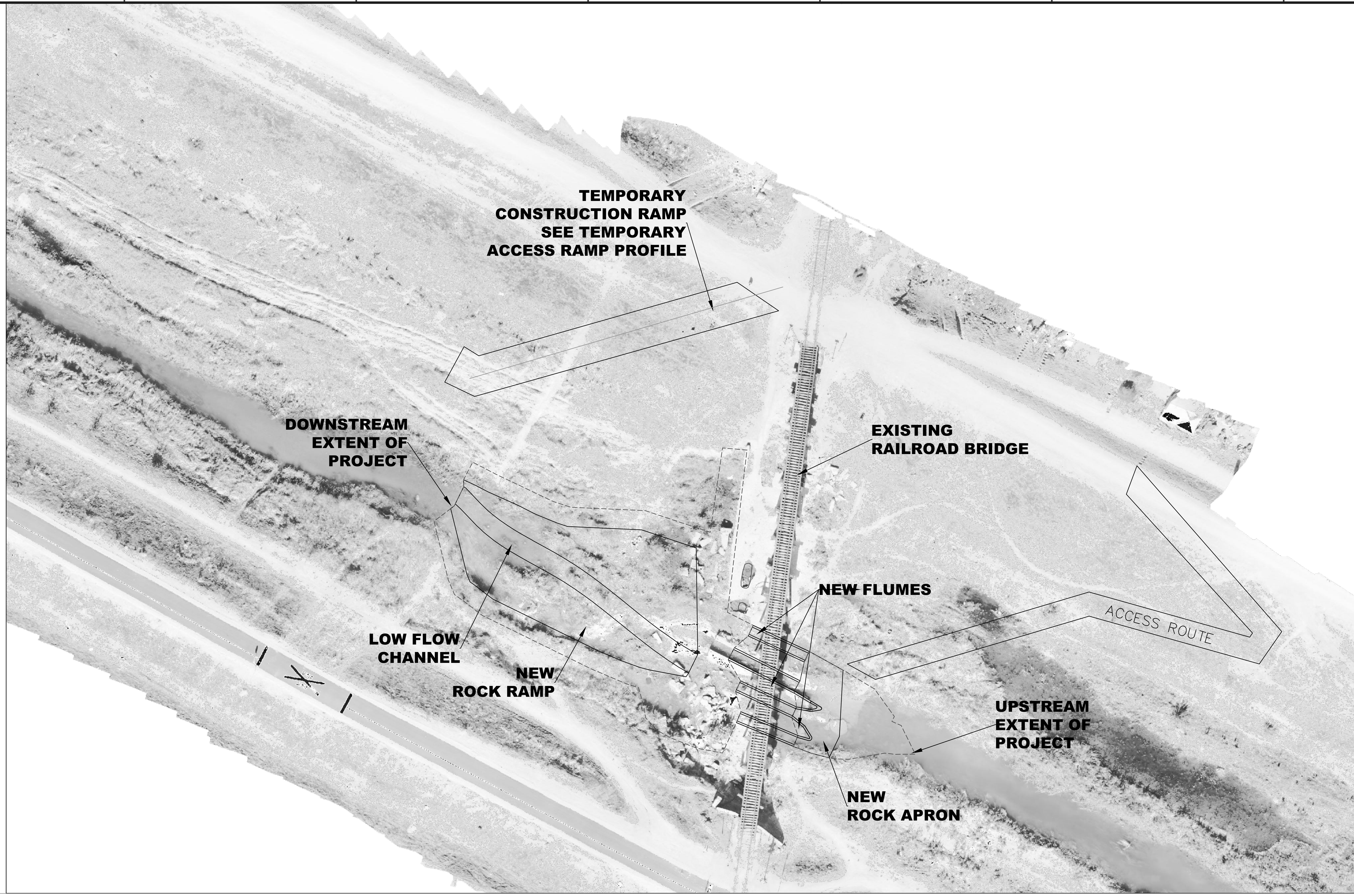
PREPARED BY:
CALIFORNIA DEPARTMENT OF WATER RESOURCES,
FISH PASSAGE IMPROVEMENT PROGRAM

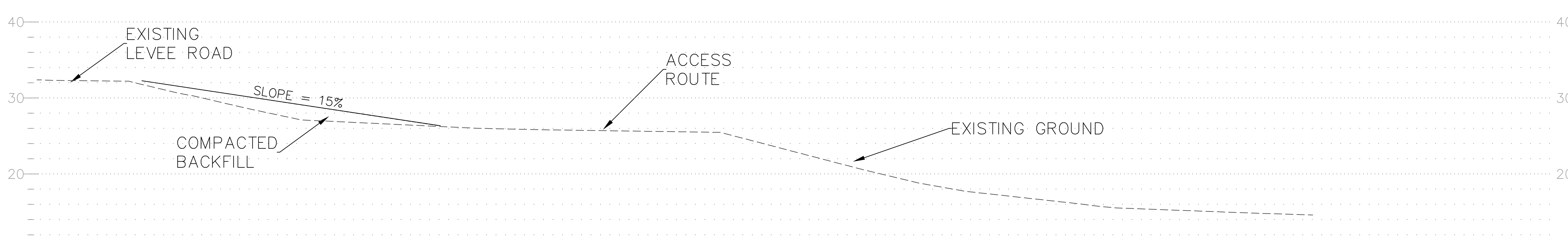
IN PARTNERSHIP WITH:
STOCKTON EAST WATER DISTRICT

LEGEND

EXISTING GROUND CONTOURS — 19 — 20 — 21 —

PROPOSED GRADE CONTOURS — 19 — 20 — 21 —





TEMPORARY ACCESS RAMP PROFILE

STATE OF CALIFORNIA
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DEPARTMENT OF WATER RESOURCES
DIVISION OF ENGINEERING
STATE WATER FACILITIES

DEPARTMENT OF WATER RESOURCES · STATE OF CALIFORNIA

REV.	DESCRIPTION	SUB.	APP.

REGISTERED PROFESSIONAL ENGINEER · ENTER PROFESSIONAL NAME · No. ##### · Exp. ____ · CIVIL · STATE OF CALIFORNIA

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DA DEPT OF WATER RESOURCES
ENVIRO RESTORATION AND ENHANCEMENT

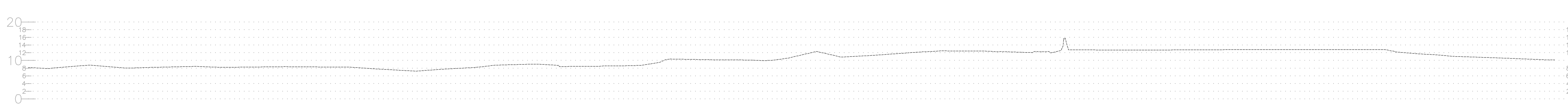
CALAVERAS RIVER
CENTRAL CA TRACTION RAILROAD

FISH PASSAGE IMPROVEMENT

GENERAL PLAN

SPEC. NO.	SHEET NO.	REVISION	DRAWING NO.
			C - 2

V# $$$$PRFNAME$$$$$$$$
$$$DATE$$$$



EXISTING_THAWEG

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DIVISION OF ENGINEERING
STATE WATER FACILITIES

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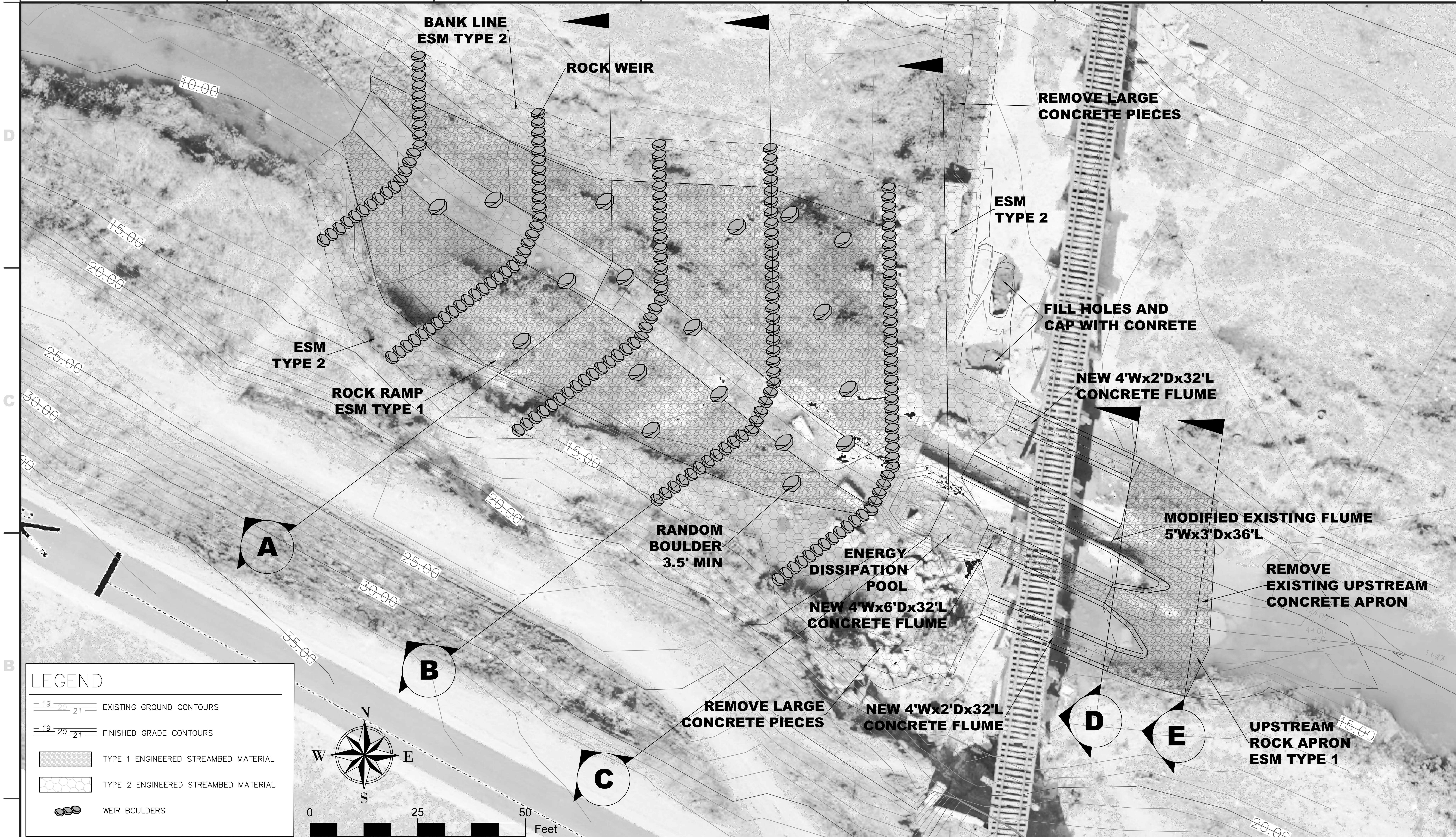
CENTRAL CA TRACTION RAILROAD

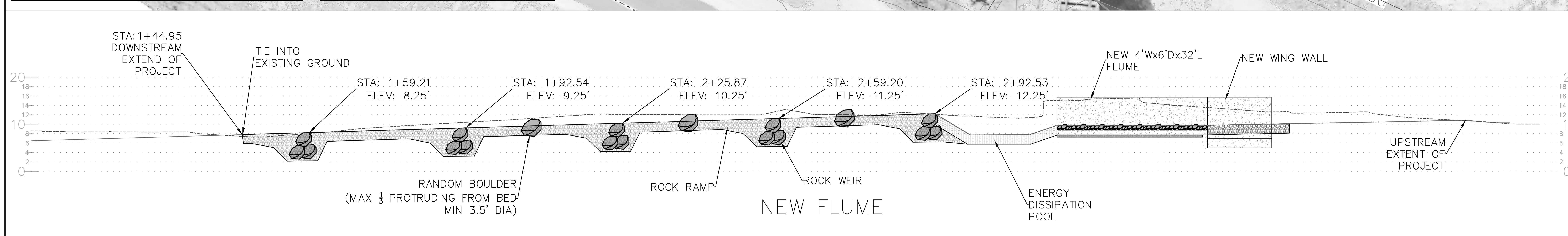
FISH PASSAGE IMPROVEMENT

EXISTING CHANNEL BASE MAP AND PROFILE

SPEC. NO.	SHEET NO.	REVISION	DRAWING NO.
			C - 3

VI= $$$$PRFNAME$$$$$$$$
$$$DATE$$$





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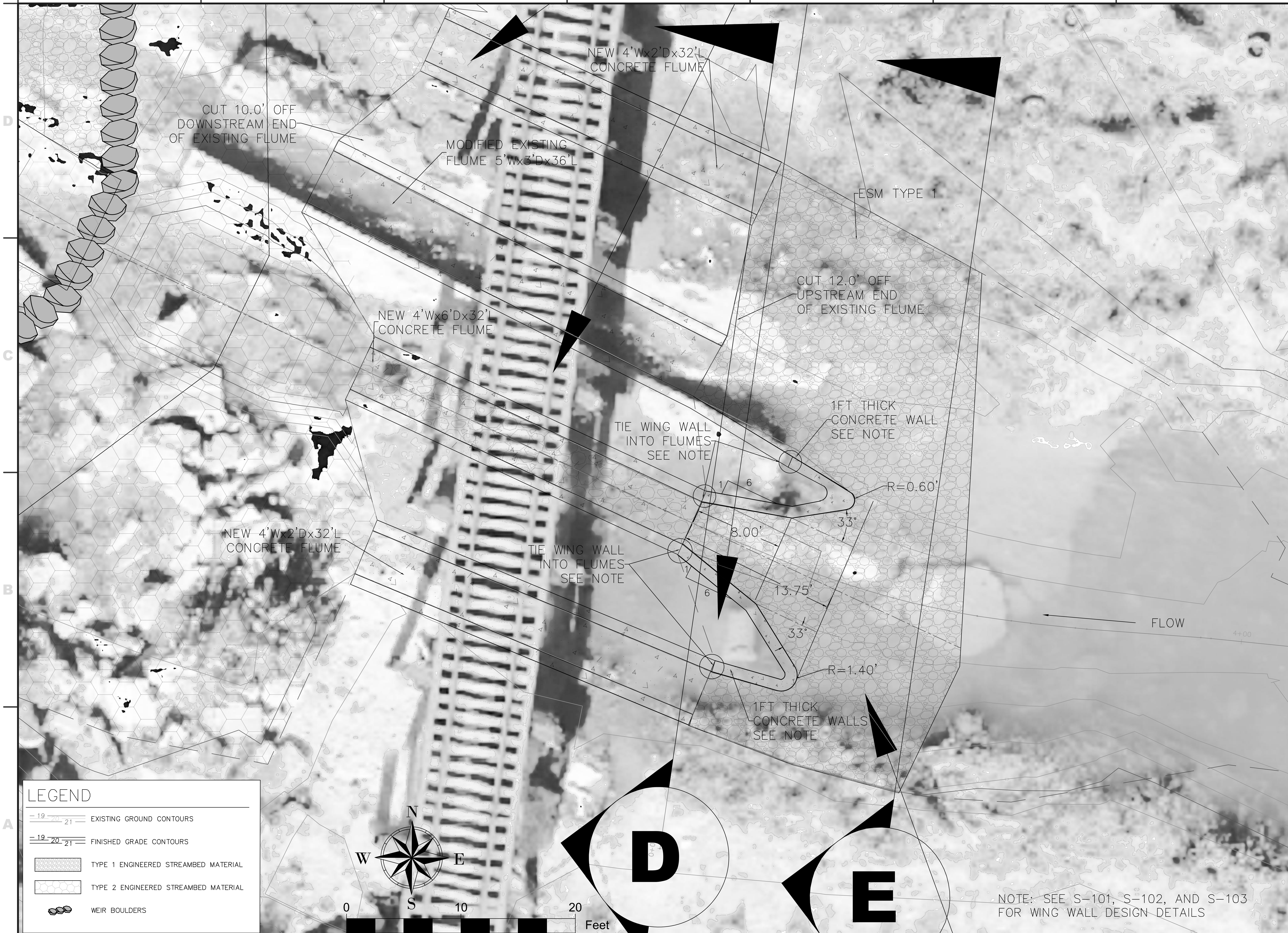
CENTRAL CA TRACTION RAILROAD

FISH PASSAGE IMPROVEMENT

PROPOSED CHANNEL PLAN AND PROFILE

SPEC. NO.	SHEET NO.	REVISION	DRAWING NO.
			C - 4



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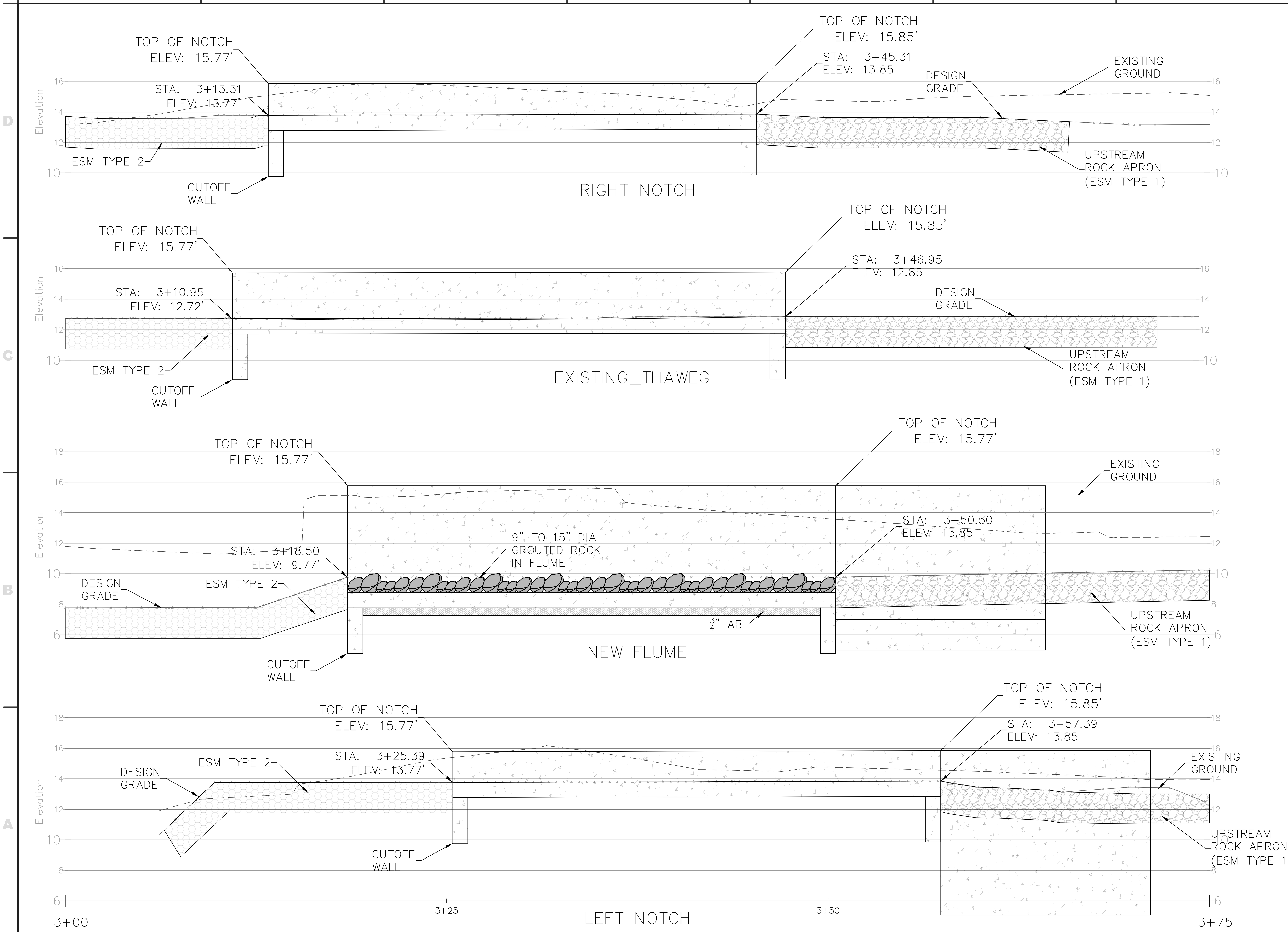
CENTRAL CA TRACTION RAILROAD

FISH PASSAGE IMPROVEMENT

FLUME AND NOTCH PLAN

SPEC. NO.	SHEET NO.	REVISION	DRAWING NO.
			C - 5



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CALAVERAS RIVER
CENTRAL CA TRACTION RAILROAD

FISH PASSAGE IMPROVEMENT

FLUME AND
AND NOTCH PROFILES

SPEC. NO.	SHEET NO.	REVISION	DRAWING NO.
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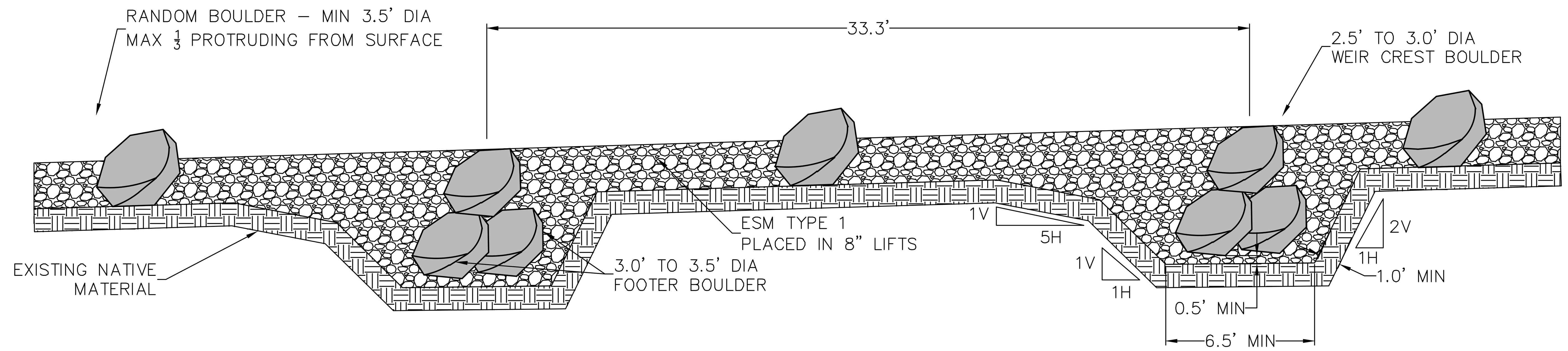
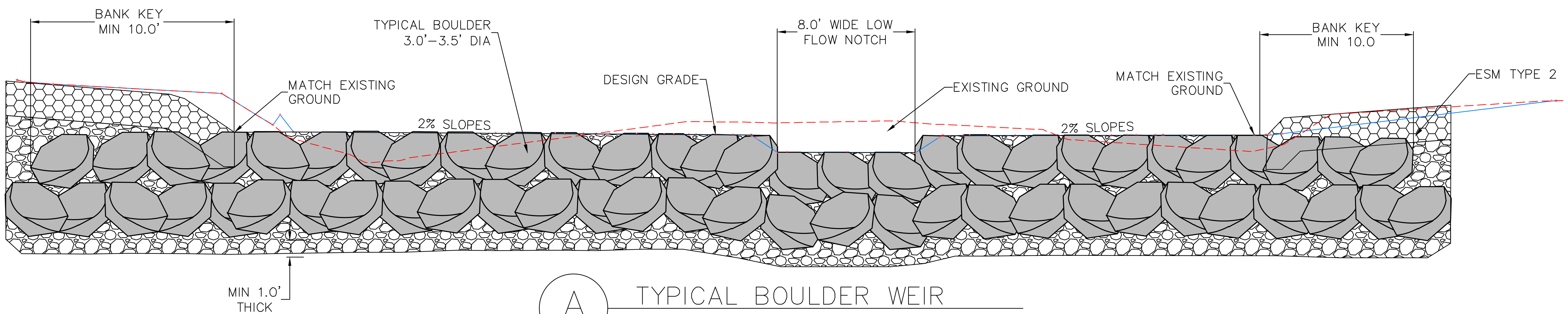
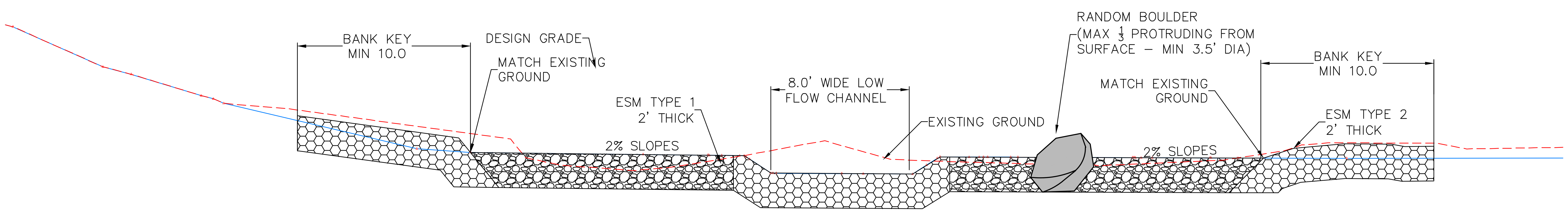


CHANNEL PROFILE DETAIL



A TYPICAL BOULDER WEIR



B TYPICAL ROCK RAMP

TYPE 1 ESM GRADATION	
15%	LIGHT RIPRAP
25%	5" X 12" RIPRAP
20%	2" X 4" COBBLE
35%	1.5" AGGREGATE
5%	NATIVE MATERIAL (FINES)

TYPE 2 ESM GRADATION	
10%	¼ TON RIPRAP
10%	LIGHT RIPRAP
25%	5" X 12" RIPRAP
50%	2" X 4" COBBLE
30%	1.5" AGGREGATE
5%	NATIVE MATERIAL (FINES)

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CALAVERAS RIVER
CENTRAL CA TRACTION RAILROAD

FISH PASSAGE IMPROVEMENT

TYPICAL SECTIONS
A & B

SPEC. NO.	SHEET NO.	REVISION	DRAWING NO.
			C - 7

$$$$$PRYNAME$$$$$$$$$
$$$DATE$$$$

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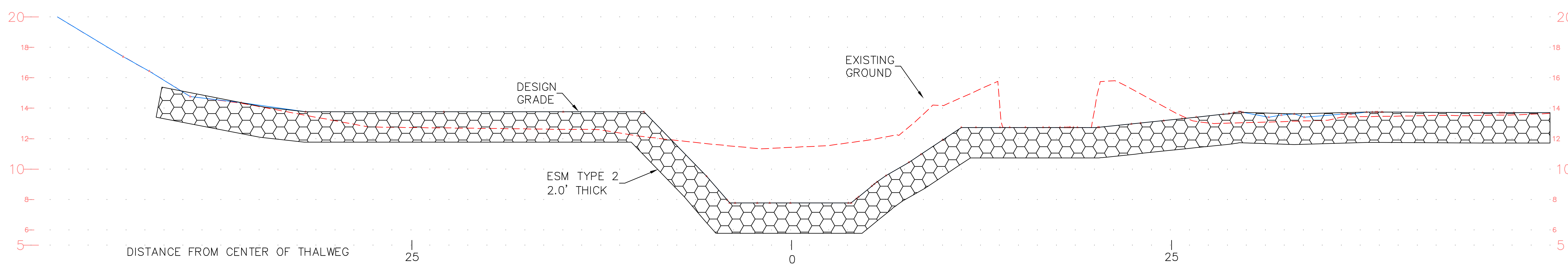
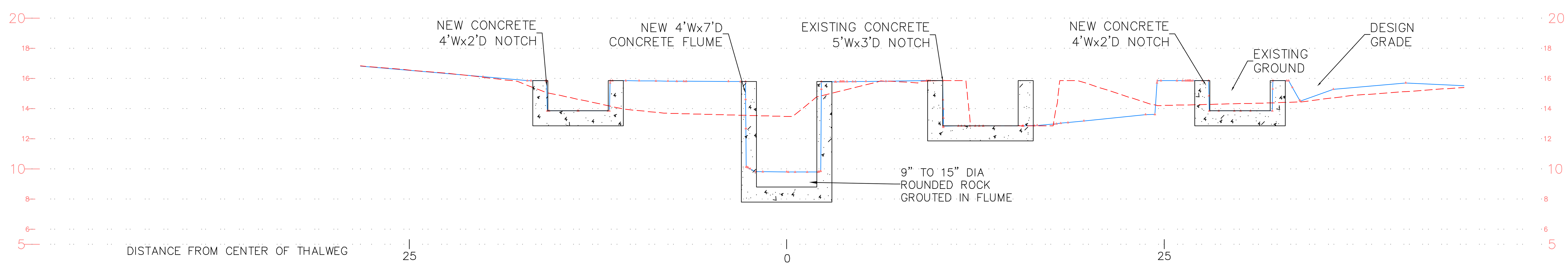
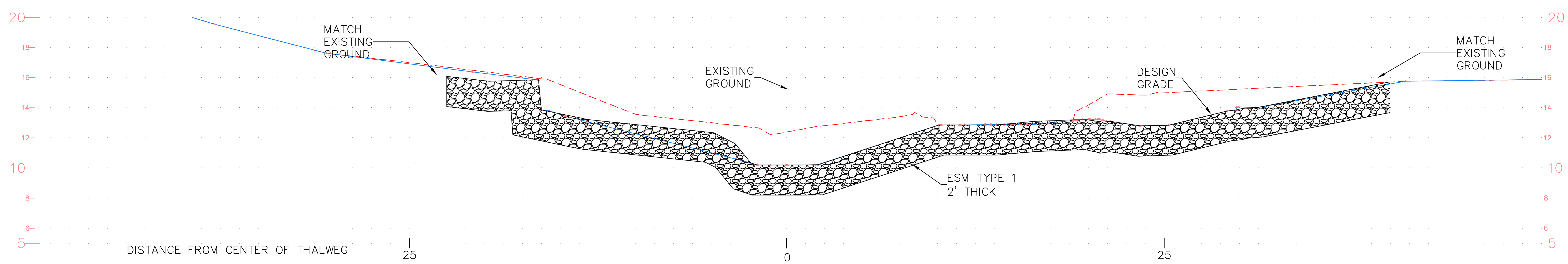
DEPARTMENT OF WATER RESOURCES
DIVISION OF ENGINEERING
STATE WATER FACILITIES



C CROSS–SECTION AT POOL



D CROSS–SECTION AT FLUMES



E CROSS–SECATION AT ROCK APRON

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CALAVERAS RIVER
CENTRAL CA TRACTION RAILROAD

FISH PASSAGE IMPROVEMENT

SECTIONS C, D, & E
AND PROFILE

SPEC. NO.	SHEET NO.	REVISION	DRAWING NO.
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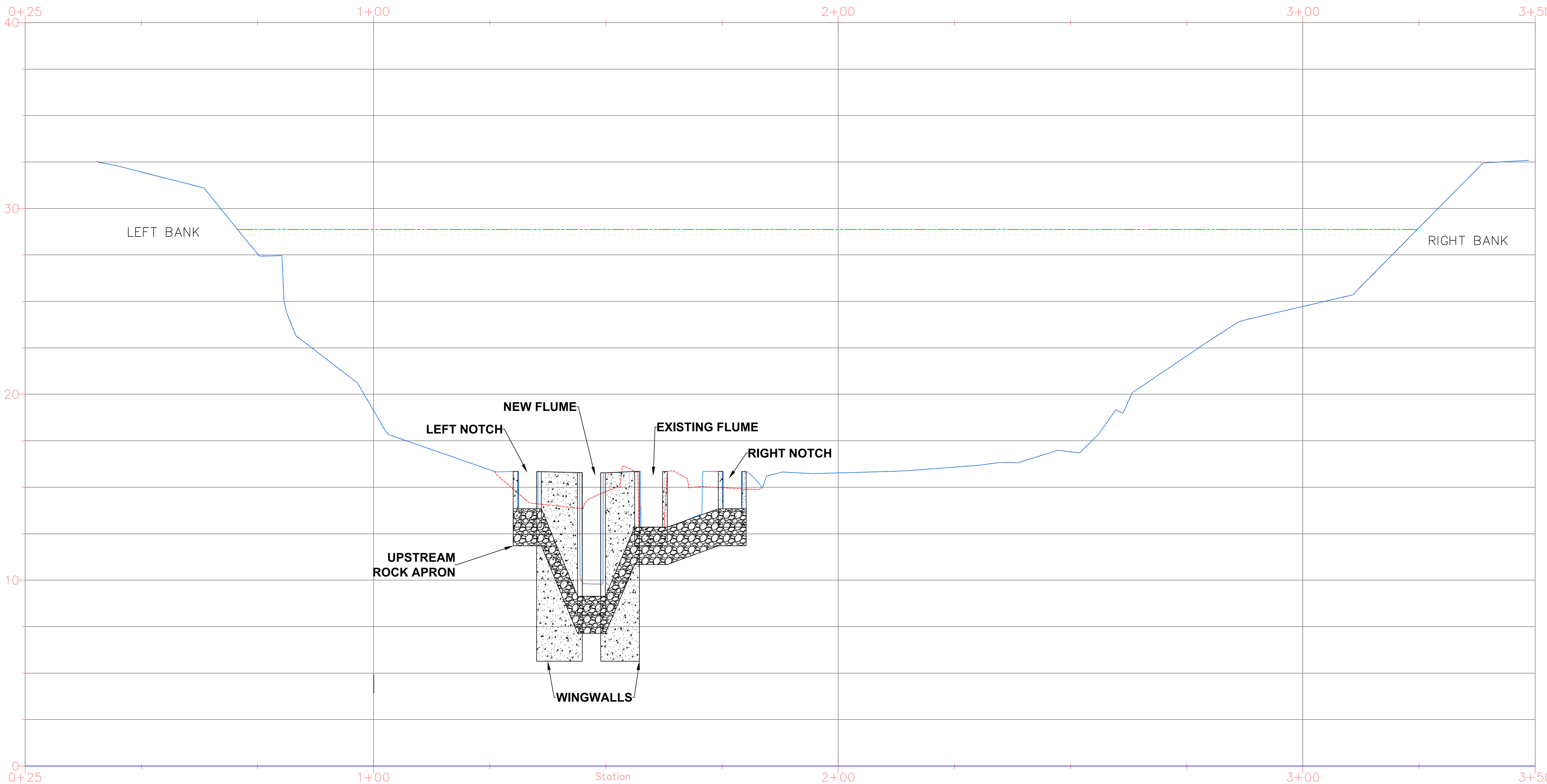

LEGEND:
- 200-YEAR WATER SURFACE (28.87FT, NGVD 29)
- 100-YEAR WATER SURFACE (28.58FT, NGVD 29)
- DESIGN GRADE
- EXISTING GROUND

CROSS SECTION AT WINGWALLS

REV.	DESCRIPTION	SUB.	APP.

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CALAVERAS RIVER
CENTRAL CA TRACTION RAILROAD

FISH PASSAGE IMPROVEMENT

FLOOD ELEVATIONS AT FLUMES AND WINGWALLS

SPEC. NO.	SHEET NO.	REVISION	DRAWING NO.
			C - 9

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ATTACHMENT O.2.

CCTR Project Description

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CCTR Project Description

The Lower Calaveras Anadromous Fish Barrier Improvement Project consists of replacing or retrofitting up to 37 instream structures identified as passage impediments to salmon and steelhead trout in the lower Calaveras River system below Bellota Weir. High quality spawning and rearing habitat has been identified above Bellota Weir and it is expected that salmonid population numbers will increase once passage opportunities are improved. Four barriers have been initially identified and assessed for removal/retrofit. The Budiselich Flashboard Dam site was remediated in September 2011 and the Caprini Low-Flow Crossing site was completed in October 2013. Designs for the next site, the Central California Traction Railroad Crossing are complete and construction is planned for August-October 2018. This project will provide improved upstream fish passage and access to over 17 miles of important migratory habitat.

The Central California Traction Railroad Crossing Fish Passage Improvement Project will retrofit the existing concrete railroad bridge foundation located on APN 132-010-030 between North Wilson Way and Cherokee Road (Exhibits A through A-4) to provide improved salmon and steelhead passage on the Stockton Diverting Canal. The primary features of the project include the construction of a rock ramp (roughened channel) downstream of the bridge and the addition of second flume through the existing bridge foundation. These features will result in the crossing meeting fish passage criteria at all flows, reducing high water velocities and increasing water depths during lower flows.

The rock ramp will consist of Engineered Streambed Material (ESM), which will bury a series of five boulder weirs. The weirs are spaced 33 feet apart in the channel downstream of the crossing and will provide grade control for the ramp. The ramp will have a 3% downstream slope and contain an 8-foot-wide low-flow channel to provide at least one foot of water depth at flows above 35 cfs. The upper weir of the ramp will backwater an energy dissipation pool downstream of the flumes, which increases depths and lowers velocities through the flumes.

The new flume will be four feet wide and six feet deep, and will be installed in the bridge bay adjacent to and south of the existing flume between pillars 5 and 6 as shown in Exhibit A-3. The bottom of the new flume will be lined with 9” – 15” rock to increase boundary roughness and provide a lower velocity passage route. Thus, the invert of the new flume will be two feet below that of the existing flume, which will provide greater depth at lower flows. Two 2’ deep notches will also be cut into the concrete bridge foundation in the bays on either side of the existing and new flume bays (between pillars 3 and 4 and pillars 6 and 7) to provide alternate migratory routes for those fish moving along the fringes of the channel. Concrete will be used to cover the areas disturbed by construction under the bridge, fill the holes in the existing downstream apron, and construct the upstream wing walls. Upstream of the flumes, ESM will be used as an apron, to stabilize the channel as water constricts to enter the flumes and notches.

Earthwork for the project involves the removal of approximately 2,200 yd^3 of native material and 500 yd^3 of broken concrete that was previously part of the erosion control effort for the bridge. As for fill, approximately 1,900 yd^3 of ESM will be brought in to form the rock ramp and streambanks. The ESM will consist of a mix of particles ranging from 2-foot boulders down to a small portion of sand and silt (used to decrease the porosity of the mix and help water flow above the surface of the ESM). The ESM is sized to remain stable at all flows. In total, the project will result in the net removal of 155 yd^3 of material from the channel.

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ATTACHMENT O.3.

Project Site Vicinity Map

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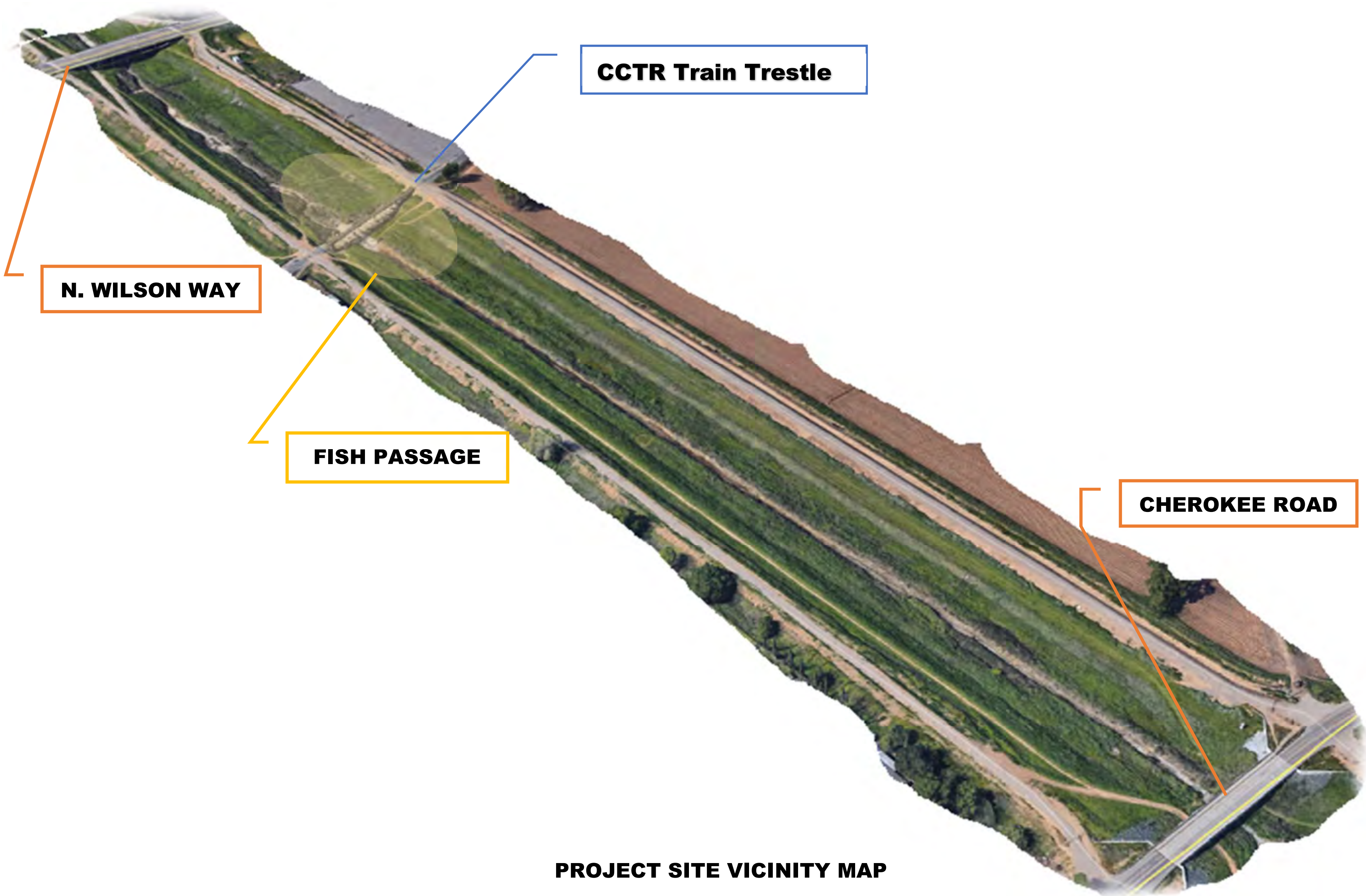
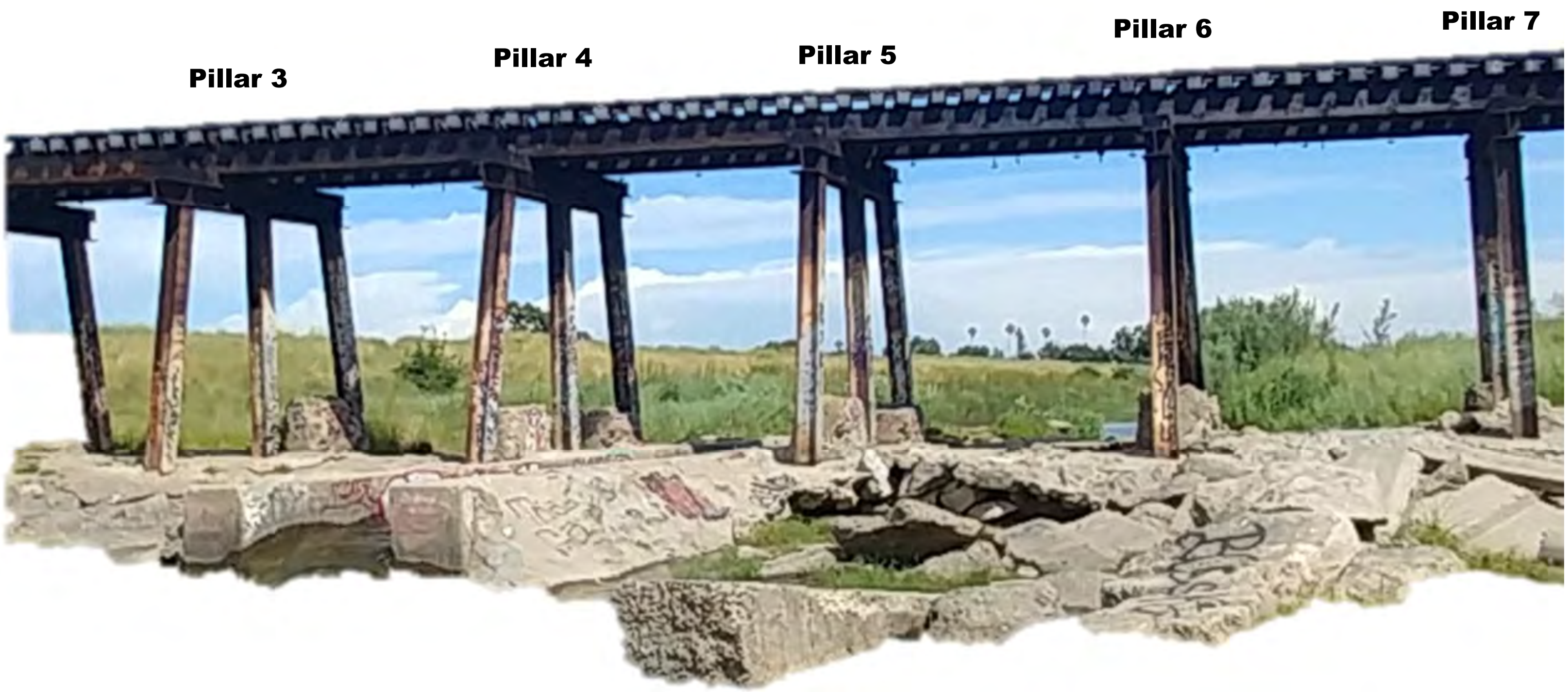


PROJECT SITE VICINITY MAP

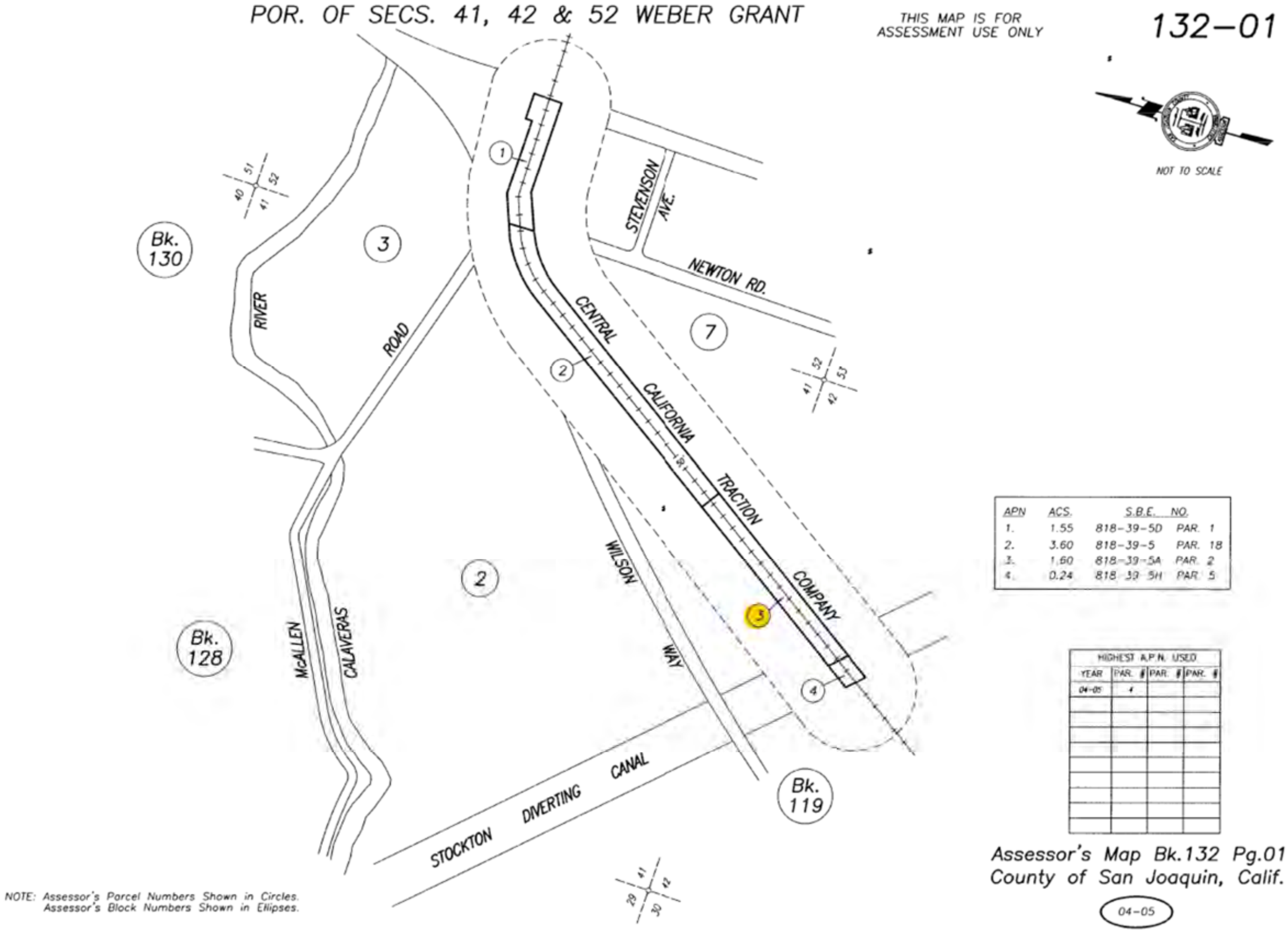
TRAIN TRESTLE SITE MAP
AND
CONSTRUCTION NEAR STEEL PILLAR SUPPORTS

CENTRAL CALIFORNIA TRACTION COMPANY TRAIN TRESTLE APN: 132-010-030

- Steel pillar supports are “One” thru “Nine” from left to right
- Construction will occur between steel pillars 3 thru 7

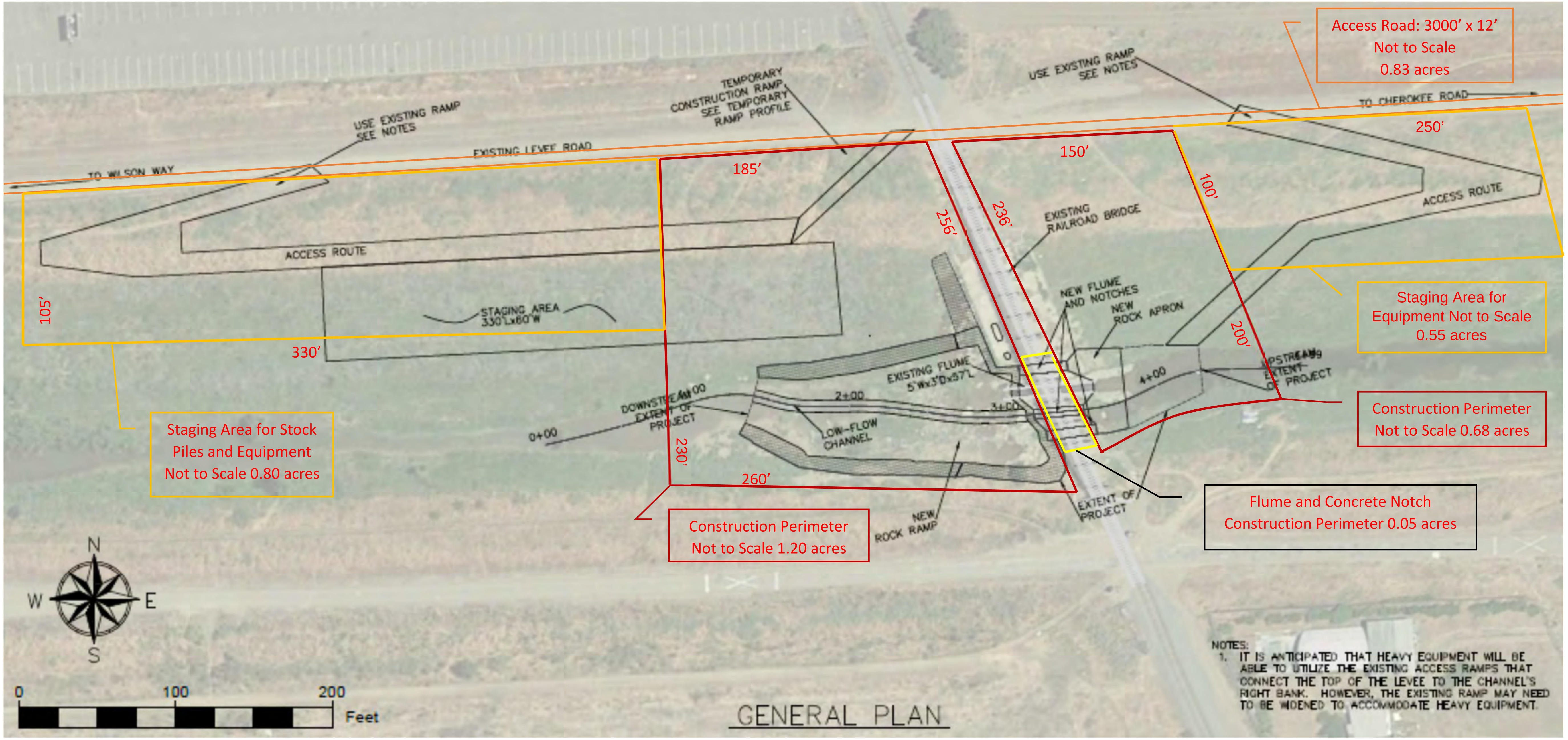


CONSTRUCTION BETWEEN STEEL PILLARS



APN	ACS.	S.B.E. NO.	
1.	1.55	818–39–5D	PAR. 1
2.	3.60	818–39–5	PAR. 18
3.	1.60	818–39–5A	PAR. 2
4.	0.24	818–39–5H	PAR. 5

ASSESSORS PARCEL MAP FOR TRAIN TRESTLE



Construction Site Disturbance Zones


Todd

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ATTACHMENT O.4.

California Traction Railroad Wetland Determination Letter

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FISHBIO
1617 S. Yosemite Avenue • Oakdale, CA 95361 • Phone: (209) 847-6300 • Fax: (209) 847-1925

Scot A. Moody
General Manager
Stockton East Water District
6767 E. Main Street
Stockton, CA 95215

July 31, 2018

RE: Potential impact to wetlands by the Central California Traction Railroad Crossing Fish Barrier Removal Project, Stockton Diverting Canal, San Joaquin County, CA.

Dear Mr. Moody:

Central California Traction Railroad Crossing (CCTRC) is located at RM 6.5 (latitude & longitude: 37°59'16.63"N; 121°15'51.85"W; USGS Quadrangle: Stockton West: Section, Township, Range: Sec.42,T.2 N.,R.6 E.) within Stockton Diverting Canal in the Calaveras River watershed, San Joaquin County, CA (Figures 1 and 2). The Mormon Slough/Stockton Diverting Canal is an actively maintained flood control channel that was modified in 1969 by the US Army Corps of Engineers to provide a 12,500 cfs flood control capacity.

The existing CCTRC structure has a footing and apron structure with 16 piers (Figures 3-6). The crest of the apron is about five (5) feet above the upstream channel invert and acts as a weir. A 6-foot-wide flume cuts the apron between the 5th and 6th pier to about three (3) feet deep, allowing lower flows to pass and reducing the amount of backwater in the upstream channel (Figure 4). Downstream of the apron, flow spreads out and runs over 55 ft of riprap before becoming channelized again (Figure 6). CCTRC presents a significant barrier to fish migration on the Stockton Diverting Canal because the crossing footings and apron form a weir across the channel with a steep drop (8 ft) over the downstream side and the flume does not reach passage depths and velocities until the channel flow reaches 1,900 cfs. The proposed project design for improving fish passage at the structure includes creating a ramped stream channel by installing six grade control structures (i.e., boulder weirs), similar to those constructed upstream at Budiselich Flashboard Dam in 2011. These passage improvements will concentrate flows into a low flow channel downstream of the weir meeting passage depth and velocity criteria to overcome the 8-foot-drop downstream of the apron/weir, and achieve acceptable velocities at the structure for fish passage.

Based on a general reconnaissance survey of the Project site and staging area conducted on April 20, 2012, aerial imagery from May 17, 2017 and a USFWS Wetlands Database query conducted on July 31, 2018 (Figure 7), there are no wetlands within the Project's Area of Potential Effects (APE). The Project temporary staging area is located off site on top of an adjacent levee road. The APE is comprised of a wide channel with steep, mostly degraded and irregularly contoured banks having little to no vegetative cover. Lack of vegetative cover is a result of flood control maintenance required by the San Joaquin County Flood Control Agency; whereby vegetation must be removed annually from the streambanks and channel bed. The channel substrate consists of compacted clay, sand, and silts with concrete or rock riprap. Neither the Project footprint nor staging area possesses the hydrology, soils, or flora to meet the definition of a wetland.

Sincerely,

Jim Inman
Wetland Delineator

Enclosures:
Figures depicting the Project Location (2)
Figures depicting Project site conditions (4)
USFWS National Wetlands Inventory (1)

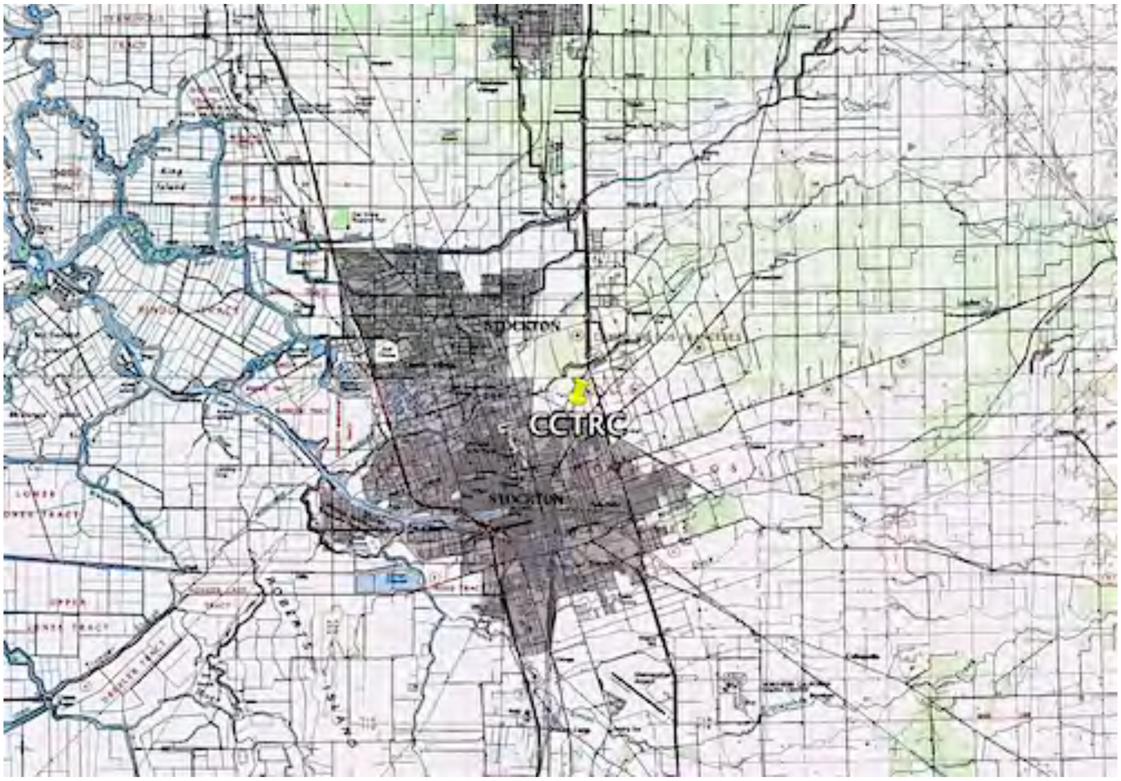

Figure 1. Location of the **Central California Traction Railroad Crossing.**

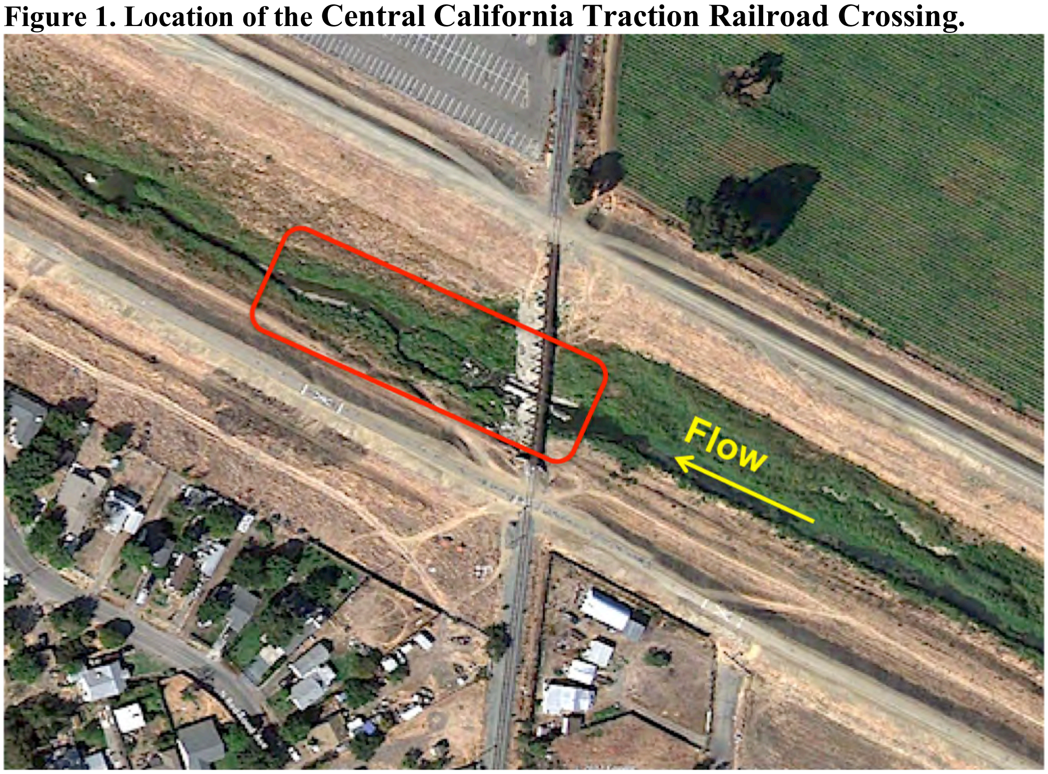

Photo 2. Aerial view of Central California Railroad Crossing with approximate Project footprint.

Photo 3. Upstream of Central California Railroad Crossing.

Photo 4. Downstream of Central California Railroad Crossing apron and flume.


Photo 5. Looking upstream from the Central California Railroad Crossing.


Photo 6. Looking downstream from the Central California Railroad Crossing.

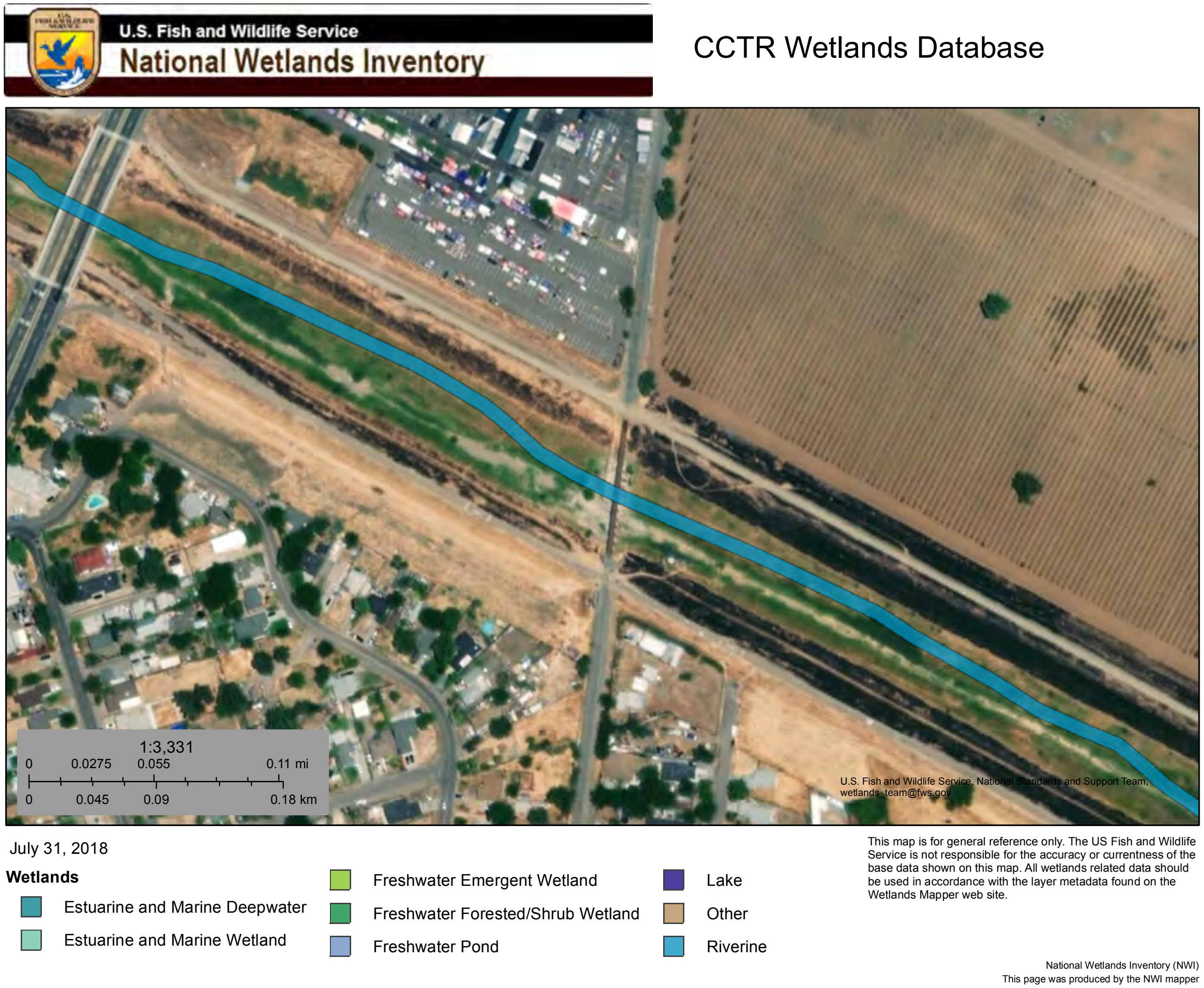

Figure 7. USFWS Wetlands Database query- vicinity of Central California Traction Railroad Crossing Fish Barrier Improvement Project, Stockton Diverting Canal, CA.

ATTACHMENT P

California Act Establishing the Stockton East Water District

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CHAPTER 819

An act to repeal Chapter 1775 of the Statutes of 1963, to change the name of the Stockton and East San Joaquin Water Conservation District to the Stockton-East Water District and to grant certain powers to such district, relating to water conservation and water supply, and declaring the urgency thereof to take effect immediately.

[Approved by Governor September 29, 1971. Filed with Secretary of State September 29, 1971.]

CHAPTER 553

An act to amend Section 4 of, and to add Section 21.5 to Chapter 819 of the Statutes of 1971, relating to the Stockton-East Water District.

[Approved by Governor September 5, 1975. Filed with Secretary of State September 6, 1975.]

CHAPTER 1126

(Senate Bill No. 1120)

An act to repeal and add Sections 4 and 9 of, and to add Sections 9.2, 9.3 and 9.4 to, Chapter 819 of the Statutes of 1971, relating to the Stockton-East Water District, and declaring the urgency thereof, to take effect immediately.

[Approved by Governor September 27, 1979 Filed with Secretary of State September 25, 1979.]

CHAPTER 1287

(Senate Bill No. 1449)

An act to amend Sections 4247, 4402, 5019, 5020, and 5021 of the Education Code, to amend Sections 75, 318, 512, 1007, 1017, 1340, 1508.5, 1515, 3520, 3521, 4011, 4055, 5353, 6460, 10211, 14213, and 35006 of, to repeal Section 6509 of, and to repeal and add Section 14000 of, the Elections Code, to amend Sections 24001 and 31105.2 of the Government Code, and to amend Section 34 of Chapter 819 of the Statutes of 1971, relating to elections, and declaring the urgency thereof, to take effect immediately.

The people of the State of California do enact as follows:

SECTION 1
Chapter 1775 of the Statutes of 1963 is repealed.

SECTION 2
(a) The name of the Stockton and East San Joaquin Water Conservation District is changed to the Stockton-East Water District.
(b) In all respects not inconsistent with this act, the Stockton-East Water District shall continue to be organized under; and governed by, the Water Conservation District Law of 1931, Division 21 (commencing with Section 74000) of the Water Code as the same now exists and as it may be amended hereafter. The provisions of Division 21 (commencing with Section 74000) of the Water Code and all other acts of the Legislature applicable to the district and not inconsistent with the provisions of this act shall remain in full force and effect and shall be fully applicable to the district.
(c) In all cases in which it may be otherwise required that the district be described as a "water conservation district" it shall be sufficient to describe the district as a "water district".

SECTION 3
(a) The Legislature finds and declares that the problems of providing for the management of the underground water basin and the provision of supplemental water supplies, in the area of the Stockton-East Water District are peculiar to that district and that area and for that reason it is necessary to deal specially with such area and to provide special provisions for the government and operation of that district.
(b) The Legislature further finds and declares that this act is necessary to the solution of a problem arising out of the following unique and special circumstances: The water supplies in the underground basin in the area of the-Stockton-East Water District are insufficient to meet the water demands of the area, and, because of the geologic conditions peculiar to the area and because excessive pumping has seriously depleted the underground water storage, there has been an intrusion of saline waters into the underground water basin causing serious water quality deterioration and the destruction of the usefulness of a portion of the underground water basin. Further excessive pumping, without proper management of the underground water basin and the provision of supplemental water supplies, is certain to destroy the usefulness of a major portion of the underground water basin and endanger the health and welfare of the district.
(c) The Legislature further finds and declares that the district includes within its territory a large urban area, a large agricultural area, and territory formerly within an irrigation district, and that for these reasons it is necessary in order to accommodate the various interests within the district to provide special procedures to be observed by the district in its government and operation.
(d) The Legislature further finds and declares that only a portion of the City of Stockton and only a portion of the Metropolitan Stockton Planning Area as defined by the City of Stockton and the County of San Joaquin are within the district, and that unless all of such city and all of the Metropolitan Stockton Planning Area are within the district there will be uneconomic duplications and inefficiencies and it will be both more costly and more difficult to solve the grave and urgent water problems of the Stockton Metropolitan Area and the existing Stockton-

East Water District. The Legislature further finds and declares that the territory that is outside the district but within the Metropolitan Stockton Planning Area includes territory that is within the City of Stockton, within county maintenance districts, within other water conservation districts, and within an irrigation district. The Legislature further finds and declares that the special problems of including all of the City of Stockton and the Metropolitan Stockton Planning Area within the Stockton-East Water District are peculiar to that district and that area, and for that reason it is necessary to deal specially with such inclusion and to provide special provisions and procedures for such inclusion and the necessary adjustment of district boundaries.

SECTION 4

(a) The definition of a word applies to any of its variants.

(b) The following words and phrases shall have the following meanings:

(l) "Accumulated overdraft" means the aggregate amount by which the quantity of ground water removed from the ground water supplies within the district during all preceding water years shall have exceeded the quantity of water replaced therein by the replenishment of the, ground water supplies in such water years by any natural or artificial means, based upon reports, records, and other data or evidence appropriate for the purpose of making such determination.

(2) "Administration division" means the budgeting and accounting division established by Section 9 which is primarily concerned with administration of the district and with obtaining and making available to the other divisions a supply of water.

(3) "Advisory commission" means the California District Securities Advisory Commission.

(4) "Agricultural division" means the budgeting and accounting division established by Section 9 which is primarily concerned with the supply of water for agricultural purposes.

(5) "Agricultural water" and "water used for agricultural purposes" shall mean water used primarily in the commercial production of agricultural crops or livestock on parcels of land of more than two acres and shall not include water used for agricultural product-processing purposes.

(6) "Annual overdraft" means the amount by which the production of water from the ground water supplies within the district during the water year exceeds the natural replenishment of such ground water supplies in such year.

(7) "Assessor" means the assessor of the county.

(8) "Auditor" means the auditor of the county.

(9) "Benefit review procedure" means the procedure set forth in subdivisions (g) through (i) of Section 28.

(10) "Board" means the board of directors of the Stockton-East Water District.

(11) "Board of Supervisors" means the board of supervisors of the county.

(12) "Collector" means the person appointed by the board to determine and collect the accounts due the district prior to their transfer to the auditor, as set forth in this act. The collector shall be appointed by the board and hold office at the pleasure of the board. The collector may hold other offices, including, but not limited to, the office of secretary, or may perform other duties for the district but shall not be a member of the board.

(13) "Committee" means a group of directors of the district consisting of three directors, one of whom shall be appointed chairperson by the president of the board, together with

an alternate member, which shall study particular areas and recommend policy to the full board. The members and alternate member shall be appointed by the president of the board. There shall be the Agricultural Operations Committee and the Municipal Operations Committee, and there may be such other committees as may be established by the board.
(14) “County” means the County of San Joaquin.
(15) “Delinquent account” means any sum or sums due the district from an owner as disclosed by an annual bill presented by the collector pursuant to Section 13 which is not paid within the times set forth in Section 15, together with all penalties applicable to such sum or sums pursuant to this act.
(16) “Delinquent landowner” means the owner or owners of a parcel of land upon which one or more delinquent water-producing facilities are located as such ownership is disclosed by the last equalized assessment roll of the county.
(17) “Delinquent parcel” means a parcel of land upon which one or more delinquent water-producing facilities are located.
(18) “Delinquent water-producing facility” means a water-producing facility for which payment is required by this act and for which payment in full, has not been received by the district within the times set forth in Section 15.
(19) “Director” means a member of the board.
(20) “District” means the Stockton-East Water District.
(21) “Division” means a division of the district established pursuant to the Water Conservation District Act of 1931, Division 21 (commencing with Section 74000) of the Water Code.
(22) “Domestic ground water” means water produced from the underground on any parcel of two acres or less where the water is used and disposed of on that parcel, and also means water produced from the underground and used for residential or commercial purposes on agricultural parcels larger than two acres.
(23) “Dry year” means any year in which the board determines that there may be insufficient quantities of surface water to meet the needs of users who are dependent upon surface water sources.
(24) “Full tax area” means any area within a planning area which has been excluded from the partial tax area; in the manner provided in subdivision (b) of Section 27.
(25) “Ground water” means potable water beneath the surface of the ground suitable for municipal, domestic and irrigation use.
(26) “Municipal division” means the budgeting and accounting division established by Section 9 which is primarily concerned with the supply of water for municipal and industrial purposes.
(27) “Municipal ground water” means water produced from the underground other than domestic ground water or agricultural ground water.
(28) “Owner” means the person or persons owning any water-producing facility or any interest therein other than a lien to secure the payment of a debt or other obligation. Unless there is filed with the district by an owner, information to the contrary, the district may presume that the owner of the parcel of land on which a water-producing facility is located is the owner of the water-producing facility.
(29) “Partial tax area” means all areas of the district which pursuant to the terms of subdivision (a) of Section 27 are not required to pay the taxes, assessments, and charges

specified in subdivision (a) of Section 27.
(30) “Person” means any public agency or public corporation, whether federal, state, or local, or any private corporation, firm, partnership, individual, or group of individuals.
(31) “Planning area” means any one of the planning areas mentioned in subdivision (a) of Section 24 or in Section 35.
(32) “Prior act” means Chapter 1775 of the Statutes of 1963, as amended.
(33) “Production” or “producing” means the diversion or taking of stream-delivered water or the extraction or extracting of ground water, by any means, for domestic, municipal, irrigation, industrial, or other beneficial use.
(34) “Revenue sources” means those sources of expected revenue which shall be used to establish a budget, respectively, for each of the administration, agricultural, and municipal divisions. These revenue sources for each division are as follows:

(i) Administration division: General property taxes, other general revenue sources which may be provided by state law, payments from other divisions, or other sources of revenue which may be established in the future by law or by rule of the board.

(ii) Agricultural division: Stream-delivered water charges, domestic ground water assessments, agricultural ground water assessments, penalties collected on such charges and assessments, and other sources of revenue which may be established in the future by law or by rule of the board.

(iii) Municipal division: Contract sales of treated surface water, contract sales of ground water, municipal ground water assessments, penalties collected on such sales and assessments, and other sources of revenue which may be established in the future by law or by rule of the board.

(35) “Stream delivered water” means surface water used for agricultural purposes and taken by an owner’s water-producing facility directly from the Stockton Diverting Canal, the Calaveras River, the Old Calaveras River, Mosher Creek, Mormon Slough, Potter Creek, or any other watercourse within the district except those portions of any of the foregoing watercourses which are located within the boundaries of the Sacramento-San Joaquin Delta, as such boundaries are presently defined by Section 12220 of the California Water Code.
(36) “Tax collector” means the tax collector of the county.
(37) “Treasurer” means the treasurer of the county.
(38) “Water-producing facility” means any device or method, mechanical or otherwise, for the production of ground water from the ground water supplies within the district, or for the diversion of stream delivered water.

SECTION 5

In addition and supplemental to the powers conferred upon the district by the Water Conservation District Law of 1931, Division 21 (commencing with Section 74000) of the Water Code, and by all other laws applicable to the district, the district shall have power:
(a) To acquire, control, distribute, store, spread, sink, treat, purify, reclaim, recapture, process, and salvage any water, including sewage and storm waters for the beneficial use or uses of the district, its inhabitants, or the owners of the rights to water in the district.
(b) To sell treated and untreated water under its control to any municipal corporation, political subdivision of the State of California, public utility, or other person at such charges and rates

as shall be set by the board by contract, agreement, rule, or otherwise, for use within the district.
(c) Subject to the requirements of Section 6, to sell treated and untreated water under its control to any municipal corporation, political subdivision of the State of California, public utility, or other person for use outside the district.
(d) Within or outside the district to construct, purchase, lease, or otherwise acquire, and to operate and maintain, waterworks, water treatment plants, spreading grounds, pipelines, conduits, canals and other facilities for the distribution of water, pumps and other facilities for the production of water, dams, weirs, reservoirs, and other facilities, installations, works, equipment, and machinery useful or necessary to replenish the underground water basin within the district, to manage, for the purpose of repelling saline intrusion, the underground water basin within the district for the common benefit of the district, to augment the common water supplies of the district, or to otherwise provide water for the beneficial use or uses of the district, its inhabitants, or the owners of rights to water in the district.
(e) For the common benefit of the district to store water in underground water basins or surface reservoirs within or outside the district, to appropriate and acquire water or water rights within or outside the district, to purchase or import water into the district, and to conserve water within or outside the district.
(f) Subject to the provisions of Sections 9 to 19, inclusive, to levy and collect a ground water assessment for the production of water from the ground water supplies within the district, and to fix and collect charges for stream-delivered water and to require such measuring devices as may be necessary for the purposes of this act and to inspect and test any such measuring devices whether installed by the district or by others.
(g) To maintain reserve funds in amounts deemed advisable by the board for the purpose of water for replenishment purposes, the stream delivery of agricultural surface water, or for other district purposes.
(h) To acquire real and personal property and interests therein, but the district shall not exercise the power of eminent domain for any purpose of this act or in carrying out any power granted by this act outside the boundaries of the district unless the board of supervisors of the county in which the property to be acquired is located has consented to such acquisition.

SECTION 6
(a) The district may sell treated and untreated water under its control for use outside of the district only pursuant to a written agreement made as provided in this section.
(b) The district may make an agreement to sell water for use outside the district for periods not in excess of one year where the board prior to the district's agreement to sell such water has found and declared by resolution that such water is not required for use within the district during the period, not to exceed one year, for which the agreement is to be made. The board's resolution shall be adopted no earlier than three months preceding the commencement of the period for which the agreement is to be made. The price charged for water sold pursuant to an agreement made pursuant to this subdivision shall be sufficient to at least cover the costs of the district, as determined by the board, in furnishing and delivering the subject water to its point of delivery.
(c) The district may make agreements to sell water for use outside the district for periods in excess of one year if the board prior to the district's agreement to sell water has by resolution found and declared that the subject water will not be required for use within the district for the

period for which the agreement is made and declares that the sale of the water and its use in the manner provided in the applicable agreement is for the direct and substantial furtherance of the purposes of the district. The charge for water sold pursuant to an agreement made pursuant to this subdivision shall at least be sufficient to cover the costs of the district, as determined by the board, in furnishing and delivering such water to its point of delivery, plus the equivalent of all applicable ad valorem property taxes that would be assessed by district on the property upon which such water is to be used, or in the case of a sale to a political subdivision, municipal corporation, public utility, or other operator of a common water distribution system on all of the property served by such common water distribution system, if the subject property were included within the district during the period covered by the agreement.

(d) The district may make agreements to sell water that would not be otherwise owned or possessed by the district that comes into the district's possession due to provisions of a contract with another political subdivision that operate when such other political subdivision fails to pay for such water or the costs related to such water, on any basis the board determines if the board makes the determination that such water is not needed for sale within the district for the period of the agreement.

SECTION 7

The board shall, from time to time, order an investigation and report to be made by an engineer or engineers employed by the district for the purpose of investigating and reporting upon the ground water conditions of the district and making recommendations as to water management practices to be followed by the district. The report shall include an estimate as to the accumulated overdraft, if any, as of the date of the report, estimates of the ground water production anticipated by years for the period covered by the report, and an estimate of the average annual overdraft, if any, for the period covered by the report. The report shall also include recommendations as to necessary and desirable surface and underground water management practices to be followed during the period covered by the report.

SECTION 8

The engineering investigation and report shall be delivered to the secretary in writing. The secretary shall publish pursuant to Section 6061 of the Government Code a notice of the receipt of such report and fixing a date for a public hearing to be held by the board, the publication to be in a newspaper of general circulation, printed and published within the district, at least 10 days prior to the date at which the public hearing is to be held. The notice, among other information which the district may include, shall contain an invitation to all owners of water-producing facilities within the district and all other interested parties to call at the office of the district to examine the engineering investigation and report.

SECTION 9

(a) There are hereby established within the district, budgeting and accounting divisions as follows: administration, agricultural, and municipal. Each such budgeting and accounting division shall have established a separate budget, and separate accounts shall be kept of the revenues and expenditures for each division.

(b) Notwithstanding the establishment of such divisions, the board shall have authority to approve temporary transfers between divisions on such terms and with such repayment provisions, as may be approved by the board.

SECTION 9.2

(a) The board at a regular, special, or continued meeting between November 1st and December 15th of each year shall hold a public hearing to consider the budget for each of the administration, agricultural and municipal divisions, and an overall budget for the district, for the next calendar year.

(b) Notice of the hearing shall be published pursuant to Section 6061 of the Government Code at least 10 days prior to the date of the hearing. Any person interested in the district may, in person or by representative, appear and submit evidence concerning the water conditions of the district, the financial needs of the district, proposals for rates, and other relevant matters.

(c) The board shall at the hearing receive recommendations from the. Agricultural Operations Committee as to the budget to be established for the agricultural division and from the Municipal Operations committee as to the budget to be established for the municipal division. Each of such committees shall also make recommendations to the board as to the budget of the administration division.

(d) Following the budget hearing by the full board, the board shall adopt by resolution prior to December 15 of each year a budget for the administration division, for the agricultural division for the municipal division and for the district overall.

SECTION 9.3

The rates to be established pursuant to Section 9.4 shall equitably divide the cost of meeting a balanced agricultural division budget among the sources of revenue for the agricultural division, but in a manner which will encourage the use of surface water available for agricultural use within the district.

SECTION 9.4

(a) The board at a regular, special, or continued meeting between March 15 and April 15 of each year shall hold a public hearing to consider the necessity, amount, and rates of a municipal ground water assessment, an agricultural ground water assessment, and a domestic ground water assessment, if any, to be levied for the then current calendar year and charges to be made for stream delivered water to the extent that such charges for stream delivered water are not controlled by contract or agreement.

(b) Notice of the hearing shall be published pursuant to Section 6061 of the Government Code at least 10 days prior to the date of the hearing. Any person interested in the district may, in person or by representative, appear and submit evidence concerning the water conditions of the district, the financial needs of the district, proposals for rates, and other relevant matters.

(c) Following the hearing, and prior to April 15 of that year, the board may, by adoption of an ordinance, determine, levy, and assess a municipal ground water assessment against all owners of water-producing facilities within the district which produce municipal ground water during the current year and an agricultural ground water assessment against all owners of water-producing facilities within the district which produce water from the ground during the current year for agricultural purposes and a domestic ground water assessment against all owners of water-producing facilities within the district which produce domestic ground water and shall determine and fix charges for stream delivered water for the current year to the extent that such charges for stream delivered water are not governed by contract or agreement.

(d) The method of computing ground water assessments and charges for stream-delivered water may be uniform for all water-producing facilities or may be uniform for each of several classes of water-producing facilities. The board shall, by rule, establish one or more methods to be used in computing the amount of water production from a water-producing facility which is not measured by a water-measuring device approved by the collector. Such methods shall be established by rule adopted by the board and may be based on any criteria which may be used to determine or estimate with reasonable accuracy the amount of water production.

(e) The board, by rule, may waive any assessment upon any class or classes of water-producing facilities which it determines because of the small amount of water produced by such facilities, would yield to the district a sum less than the estimated cost of making and collecting the assessment.

(f) Any ground water assessment or charges for stream-delivered water levied or made pursuant to this section shall be in addition to any general assessment levied by the district.

(g) Clerical errors in the name of any owner or in other recorded information, or in the making or extension of any assessment upon the records which do not affect the substantial rights of the subject owner or owners shall not invalidate the assessment.

(h) The procedures established by Sections 9 to 9.4 inclusive, shall not be applicable for calendar year 1979. The rates for calendar year 1979 only are established as fol1ows:

(1) The domestic ground water assessment shall be ten dollars ($10) per domestic use unit, as such unit is established by the board.

(2) The rate for sales of stream-delivered water shall be seven dollars and sixty cents ($7.60) per acre-foot of water.

(3) The agricultural ground water assessment rate shall be one dollar and sixteen cents ($1.16) per acre-foot of water.

(4) The municipal ground water assessment rate shall be set at three dollars ($3) per acre-foot of water. It is not the intent of the Legislature that the rates set for 1979 shall serve as precedent for future rates.

(i) For calendar year 1980 and thereafter, water rates shall be established in accordance with Sections 9 to 9.4 except that no rate may be established in any calendar year which exceeds the individual rates set in paragraph (1), (2), or (3) of subdivision (h) by 20 percent plus a factor to reflect the percentage increase in the federal consumer price index with calendar year 1979 as a base; provided, however, that this subdivision (i) shall not be effective from and after the date of any election in which a majority of those electors voting approve a contract by the district for new supplement water or approve bonds for financing a distribution system for new supplemental water.

(j) During calendar year 1980 and thereafter, water rates shall be established by ordinance following public notice. Such ordinances shall be subject to referendum; provided, however, that no referendum shall modify or affect the terms of any bond resolution issuing bonds approved by the voters.

SECTION 10

All assessments and charges due for water produced within the district during the 1971 calendar year and for water produced within the district prior to 1971 shall be assessed, charged, calculated, determined, billed, and collected pursuant to the prior act and all applicable rules duly adopted by the board, and for those purposes the prior act shall remain in effect until such sums have been collected in full or otherwise discharged in the manner provided by the prior act and the applicable rules duly adopted by the board.

SECTION 11

(a) Commencing with 1972, not later than the first day of October of each year the collector shall mail progress bills to each owner of one or more water-producing facilities within the district. The progress bills shall state an amount due which shall be computed by multiplying one-half of each owner's water production for the preceding calendar year in acre-feet by the respective ground water assessment rates and the stream-delivered water charges applicable for the current year.

(b) Any progress bill may be reduced in amount or canceled by the collector, if upon good cause shown, the collector determines that the production of water from the water-producing facility or facilities of the owner during the current year, to the date of the collector's determination, is such that a progress payment based on one-half of the preceding year's water production will be substantially in excess of one-half of such owner's next succeeding annual bill as the same will ultimately be determined pursuant to Sections 12, 13, and 14.

(c) The board may, by rule, establish alternate procedures for the computation and payment of progress bills in the case of water-producing facilities within the district, the water production of which is measured by a water measuring device approved by the collector.

(d) Should any owner of a water-producing facility fail to pay on or before the 31st day of October, or any alternate date specified in a rule adopted pursuant to subdivision (c) of this section, the amount disclosed by a progress bill the district shall impose a penalty against such owner in an amount of 5 percent of the total sum due the district for the current calendar year as such sum is finally determined in accordance with Sections 12, 13, and 14. The 5-percent penalty shall be added to the annual bill and shall be due and payable at the same time as the other amounts included in the annual bill.

(e) The board may, by rule, waive the requirement of making a progress payment as required by this section as to any one or more classes of water-producing facilities.

SECTION 12

(a) Commencing with 1973, each owner of one or more water-producing facilities within the district shall, after January 1st and not later than January 15th, file with the collector on a form acceptable to the collector a water use statement showing the amount of water produced by the water-producing facility or facilities of such owner in the case of facilities the water production of which is measured by a water-measuring device approved by the collector and as to all other facilities the information the collector determines to be reasonably necessary to permit the determination, or estimation with reasonable accuracy, of the amount of water produced during the preceding calendar year by the subject water-producing facility or facilities. The collector may require that all statements of fact in the water use statement be verified by a written declaration that they are made under the penalties of perjury.

(b) The board, by rule, may waive the filing of water use statements as to any one or more classes of water-producing facilities.

SECTION 13

(a) Commencing with 1973, not later than the last day of February, the collector shall mail an annual bill for the preceding calendar year to each owner of one or more water-producing facilities within the district.

(b) The collector in preparing the annual bill for submission to each owner of water-producing facilities shall consider the information disclosed by the annual water use statement if one has been filed, the information disclosed by existing district records, district inspections, if any, of the water-producing facilities or the area served by such water-producing facilities, and any other information, of which the collector is aware and which is relevant to the amount of water production by each of the owner's water-producing facilities and shall determine the amount of each owners water production.

(c) In all cases where an annual water use statement has been filed and where a water-measuring device approved by the collector is permanently attached to a water-producing facility and the water production has been reported on the basis of the approved water-measuring device, the record of water production as disclosed by such water-measuring device shall be presumed to be accurate and the burden is upon the collector to establish to the contrary.

(d) The amount of the annual bill shall be computed by multiplying the production in acre feet of water as determined by the collector by the respective ground water assessment rates and stream-delivered water charges. After determining the amount due the collector shall add the penalty provided in Section 11, if applicable, and shall also add a penalty of 5 percent of the total sum due the district for water produced during the preceding year by any water-producing facility for which an annual water use statement was required and not filed within the time specified in Section 12.

(e) Upon the discovery by the collector of any water-producing facility within the district:

> (1) For which no water use statement has been filed for any year in which the same was required by virtue of Section 12 and any applicable rules of the district and for which no annual bill was submitted pursuant to this section; or
>
> (2) For which a water use statement was filed as required but for which the collector has good cause to believe that the production of water from such water-producing facility was in excess of that disclosed by a filed water use statement; or
>
> (3) For which no water use statement was required to be filed by virtue of Section 12 and the applicable rules of the district but for which no annual bill has been submitted by the collector pursuant to this section; the collector shall immediately investigate and estimate the amount of unreported or unbilled water production by such water-producing facility. In making such estimate, as to cases arising under subparagraph (3) above, the estimate of prior water production shall not include water production for more than three (3) preceding calendar years.

(f) After making an estimate of water production pursuant to subdivision (e) of this section, the collector shall calculate the amount due for ground water assessments and stream-delivered water charges during the subject years at the rates applicable during those years, and add the amount so calculated as a separate item to the next annual bill submitted to the owner of such water-producing facility together with the penalties, if any, applicable pursuant to subdivision (d) of Section 11 and subdivision (d) of this section.

(g) After computing the amount of the annual bill the collector shall allow as a credit against the amount due, and show such allowance on the annual bill, the sums paid for the subject water-producing facilities as a result of the applicable progress bill or bills for the subject year.

SECTION 14
(a) An annual bill shall be conclusive on all persons having an interest in the subject water-producing facilities unless the owner files with the secretary on or before March 15th a written objection on forms made available by the district setting forth the owner's ground or grounds for objecting to the amount of current or prior, if any, production and the assessments, charges, and penalties so fixed.
(b) Upon the filing of an objection the secretary shall schedule a hearing on the objection before the board at which time the total amount of the water production and the ground water assessment and stream-delivered water charges thereon shall be determined together with any applicable penalties, which determinations by the board shall be conclusive if based upon substantial evidence.
(c) A notice of such hearing before the board shall be mailed to the objector at least 10 days before the date fixed for the hearing unless the form furnished by the district for the filing of the objection specifies the date, time, and place for the hearing.
(d) Notice of the final determination by the board as to his objection shall be mailed to each objector by the secretary.

SECTION 15
(a) All annual bills presented by the collector pursuant to Section 13 shall be due when mailed by the collector and shall be delinquent after April 30th with the exception of any bill as to which an objection has been filed pursuant to Section 14.
(b) Annual bills, as to which an objection is filed, shall become delinquent not later than April 30th, or 20 days from the date of mailing by the secretary to the owner a notice of the final determination by the board as to his objection, whichever is later.

SECTION 16
Any annual bill not paid when delinquent shall be subject, on the date of its delinquency, to a further penalty of 5 percent of the amount of the ground water assessment and stream-delivered water charges set forth in the annual bill.

SECTION 17
(a) Upon the delinquency of all or any portion of an annual bill the collector shall transmit to the secretary the amount of the delinquent account, together with the name of the delinquent landowner and the current description of the delinquent parcel as such is then disclosed by the applicable records of the assessor. The description provided for in this section shall be the description or other designation currently used by the assessor and shall include the tax account number and the code area of the delinquent parcel.
(b) The secretary shall maintain a list of delinquent accounts as furnished to him by the collector. If prior to the transmission of the list of delinquent accounts to the auditor pursuant to subdivision (d) of this section, all or any portion of a delinquent account is collected by the collector, the collector shall report such payment to the secretary and the secretary shall reflect such payment in his list of delinquent accounts.
(c) Annually as of August 1st the secretary shall add to each delinquent account then on the list of delinquent accounts a penalty of 5 percent of the sum of the ground water assessments and stream-delivered water charges included in each delinquent account.
(d) Annually after August 1st and on or before August 10th the secretary shall transmit a

certified copy of his current list of delinquent accounts to the auditor. The list of delinquent accounts may combine all assessments, charges, and penalties into a single sum due for each delinquent account.
(e) Upon receipt of the certified copy of the list of delinquent accounts, the auditor shall enter the amount of each delinquent account against the delinquent parcel designated in the list of delinquent accounts as such parcel appears on the then current assessment roll.
(f) The tax collector shall then include the amount of each delinquent account on bills for county taxes levied against the delinquent parcel.
(g) Thereafter the amount of each delinquent account shall be collected at the same time and in the same manner as county taxes are collected, and are subject to the same penalties and the same procedure and sale in case of delinquency, as provided for ordinary county taxes.
(h) Upon collection of delinquent accounts, within a reasonable time the auditor shall deposit the sums so collected to the account of the district, but the auditor may deduct, from time to time, an amount not to exceed one-quarter of 1 percent of the sums collected pursuant to this section to defray the costs of the county in processing such accounts.
(i) All laws applicable to the levy, collection, and enforcement of county taxes are applicable to such delinquent accounts so transmitted to the auditor pursuant to this section.
(j) All or any portion of any such delinquent accounts shall on order of the board of supervisors be canceled by the auditor if uncollected, or except in the case provided for in paragraph (5) of this subdivision, refunded by the treasurer out of district funds, if collected, if it or they were entered, charged, or paid:

(1) More than once;

(2) Through clerical error;

(3) Through the error or mistake of the collector, secretary, or board in respect to any material fact, in the course of establishing the amount of the assessments, charges, and penalties due upon said delinquent account under this act;

(4) Illegally; or

(5) On property acquired after the lien date by the State of California or by any county, city, school district, or other political subdivision of the State of California and because of such public ownership not subject to sale for delinquent taxes.

(k) No order for a refund under the subdivision (j) shall be made except on a claim:

(l) Verified by the person who paid said delinquent account and penalties or his guardian, conservator, executor, or administrator; and

(2) Filed within three years after making the payment sought to be refunded.

(l) The provisions of this subdivision do not apply to cancellation. The provisions of this Section 17 shall not be applicable to a delinquent parcel owned by the State of California or by any county, city, school district or other political subdivision of the State of California.

SECTION 18

The owner of any parcel of land within the district, two acres or more in size, on which no water is produced during any calendar year, shall file an annual report stating that no water was produced on the property during the subject calendar year. The annual report shall be filed annually on or before January 15th of each year for the immediately preceding calendar year.

SECTION 19
The board shall establish rules providing for the making of refunds in the event of the overpayment of any ground water assessment or stream-delivered water charges. Such rules shall provide that no overpayment shall be refunded unless a request for refund is filed with the secretary within three years of such overpayment, Such rules may provide for the payment of a fee to cover all or a portion of the district's costs in processing a request for refund.

SECTION 20
The district may bring a suit in any court of competent jurisdiction against any person or persons indebted to the district for the collection of any delinquent sums due the district for any ground water assessment, stream-delivered water charge, penalties, or charges due for any sale or use of water by contract, or otherwise. Should the district, as a provisional remedy in bringing suit, seek an attachment against any property of any named defendant therein, the district shall not be required to provide a bond or undertaking as is otherwise provided in Chapter 4 (commencing with Section 537) of Title 7 of Part 2 of the Code of Civil Procedure. All procedures and remedies applicable to the processing, collection, and enforcement of delinquent accounts and penalties granted to the district by this act or otherwise are alternative and the utilization of one such procedure shall not bar the use of another.

SECTION 21
Any person who injures, alters, removes, resets, adjusts, manipulates, obstructs or in any manner interferes or tampers with or procures or causes or directs any person to injure, alter, remove, reset, adjust, manipulate, obstruct or in any manner interfere or tamper with any water-measuring device affixed to any water producing facility as required by this act, so as to cause such water-measuring device to improperly or inaccurately measure and record such water production, is guilty of a misdemeanor and is punishable by a fine not to exceed five hundred dollars ($500) or imprisonment in the county jail not to exceed six months, or by both such fine and imprisonment.

SECTION 21.5
The board is authorized to establish a reserve fund financed by the transfer of up to ten cents ($0.10) for each acre-foot of water to which the ground water assessment rate or the stream-delivered surface water charges levied pursuant to subdivision (a) of Section 9, in addition to ten cents ($0.10) for each acre-foot of treated water sold by the district under either an existing or future water service contract executed pursuant to Section 6. Such amounts transferred into a reserve fund created pursuant to this section shall be a part of, and not in addition to, the above-referenced ground water assessment rates, stream-delivered surface water charges, and contract prices. The reserve fund established under the authority of this section shall be a limited-purpose reserve fund. Expenditures out of such fund shall only he made for the purpose of constructing, leasing or purchasing, maintaining, and operating ground water pumping facilities capable of delivering ground water into then existing district watercourses, water supply, or distribution facilities for the purpose of insuring the availability, to the extent possible, of a full supply of water to all users during dry years.

SECTION 22
The board is authorized to adopt the rules it deems necessary and proper for carrying out the provisions of this act, including but not limited to, rules providing that the district shall not deliver or make available water to water users who fail to pay for water when required by statute, contract, or rule.

SECTION 23
No rules shall be adopted by the board without first reviewing such at a public hearing held by the board. Notice of the public hearing shall be published pursuant to Section 6061 of the Government Code at least 10 days prior to the date of such a hearing and the notice shall contain a brief description of any rule to be considered at the hearing.

SECTION 24
(a) There is hereby included within the Stockton-East Water District the following territories:

(1) The North Stockton Planning Area which shall include the following territory:
Beginning at a point on the Stockton and East San Joaquin Water Conservation District boundary, said point being on the intersection of the North line of Township Two (2) North and the centerline of State Highway 99, said Stockton and East San Joaquin Water Conservation District boundary being described in notice of election for the organization of the Stockton and East San Joaquin Water Conservation District, said election being held on June 1, 1948; thence Southerly 3.5 miles, more or less, along said District boundary and along said centerline of State Highway 99 to intersection with the centerline of the Calaveras River; thence Westerly six (6 miles, more or less, along said District boundary and said centerline of the Calaveras River downstream to intersection with the centerline of the Stockton Deep Water Channel; thence leaving said District boundary Northwesterly one (1) mile, more or less, along said centerline of the Stockton Deep Water Channel to centerline Station 286+00, said Station 286+00 bearing Southwesterly 375 feet at right angles to said centerline from U.S.E.D., B.M. 4008; thence Northeasterly at right angle to said centerline 300 feet, more or less, to a point on the Southerly boundary of the Elmwood Tract; thence Easterly and Northerly along the Southerly and Easterly boundary of said Elmwood Tract 1.9 miles, more or less, to the point of intersection of said Easterly boundary with the Southerly levee of Fourteen Mile Slough (formerly called Twelve Mile Slough); thence North 500 feet, more or less, to the Stockton City Limits Line, said City Limits Line being along the centerline of said Fourteen Mile Slough; thence Westerly, Northwesterly, and Northeasterly 0.6 mile, more or less, along said City Limits Line and said centerline of Fourteen Mile Slough to a point on the West line of Section 19, Township 2 North, Range 6 East, Mount Diablo Base and Meridian; thence Northerly 0.5 mile, more or less, along said West line of Section 19 and said City Limits Line to the Southeasterly corner of Mitchell Slough-Wright Tract Annexation—A-7-67; thence along the City Limits Lines established by Annexation—A-7-67 and by Wright Tract Annexation—A-1-62 the following eight (8) courses, (1) South 57° 47’ 30” West 150 feet, more or less, to a point, said point being on the water toe of levee of said Fourteen Mile Slough, (2) South 57° 47’ 30” West 949.75 feet, (3) South 58° 35’ 30” West 1011.23 feet to a point on the centerline of an existing drainage ditch, (4) Northerly along said drainage ditch centerline to intersection with centerline of a 75 foot wide Pacific Gas & Electric Company easement, as described in deed recorded in

Book of Official Records, Volume 2076, Page 470, San Joaquin County Records, (5) continuing Northerly along said drainage ditch centerline to a point on the water toe of the South levee of said Fourteen Mile Slough, (6) meandering Easterly along said water toe of the South levee to intersection with centerline of said 75 foot wide Pacific Gas & Electric Company easement, (7) continue meandering Easterly along said water toe of said South levee to a point bearing South 45° 00’ West from the Northwest corner of said-Section 19, and (8) North 45° 00’ East to said Northwest corner of Section 19; thence Easterly 1900 feet, more or less, along the North line of said Section 19 and along Stockton City Limits Line to the Southeast corner of the Shima Tract thence leaving said City Limits Line Northerly 6600 feet, more or less, along the Easterly boundary of said Shima Tract to a corner thereof; thence Westerly 1500 feet, more or less, along the Northerly boundary of said Shima Tract to the Southeast corner of the Atlas Tract; thence Northerly 3,800 feet, more or less, along the Easterly boundary of said Atlas Tract to the Southwest corner of Section 6, Township 2 North, Range 6 East, Mount Diablo Base and Meridian; thence Northerly one (1) mile, more or less, along the West line of said Section 6 to the Northwest corner thereof; thence Easterly six (6) miles, more or less, along said North line of Township 2 North to the point of beginning, containing 20,200 acres, more or less.

(2) <u>The Central Stockton Planning Area</u> which shall include the following territory:
Beginning at the point of intersection of the centerline of the Calaveras River with the centerline of the Stockton Deep Water Channel; thence Southerly and Easterly along the Southerly and Westerly line of the Stockton and East San Joaquin Water Conservation District Boundary to the point of intersection of the North line of Section 23, C. M. Weber Grant with the Easterly line of McKinley Avenue, said Stockton and East an Joaquin Water Conservation District Boundary being described in Notice of Election for the organization of the Stockton and East San Joaquin Water Conservation District, said election being held on June 1, 1948; thence Southerly 0.5 mile, more or less, along the Easterly line of McKinley Avenue to intersection with the centerline of Duck Creek; thence Westerly 1.3 miles, more or less, along the centerline of said Duck Creek and along the centerline of Walker Slough and the Southwesterly projection of said centerline of Walker Slough to a point on the Southerly bank of French Camp Slough, said point being on the boundary of Reclamation District No. 17; thence Westerly one (1) mile, more or less, along said boundary of Reclamation District No. 17 to the right or Easterly bank of the San Joaquin River; thence Northwesterly 1.0 mile, more or less, downstream along the said right or Easterly bank of the San Joaquin River to a point bearing East 500 feet, more or less, from the Southeast corner of the 3.55 acre parcel of Oxidation Pond Annexation No. 3—A-1-66; thence West 500 feet, more or less, to said Southeast corner; thence Westerly 1.6 miles, more or less, along the Stockton City Limits Line to the Easterly line of Dagget Road; thence Northerly one (1) mile, more or less, along said Easterly line of Dagget Road and along the Stockton City Limits Line to a point on the centerline of Burns Cutoff; thence in a general Westerly, Northerly, and Northeasterly direction 3.09 miles, more or less, along said centerline of Burns Cutoff to intersection with said centerline of the Stockton Deep Water Channel; thence Southeasterly 0.1 mile, more or less, along said centerline of the Stockton Deep Water Channel to the point of beginning, containing 4,900 acres, more or less.

(3) The South Stockton Planning Area which shall include the following territory: Beginning at the Northeast corner of Section 58, C. M. Weber Grant, said corner being a point on the boundary of the Central San Joaquin Water Conservation District; thence along said Central San Joaquin Water Conservation District boundary the following four (4) courses, (1) Southerly along the West line of Sections 68, 69, and 70 of said C. M. Weber Grant to the Southerly line of said Grant being also the North line of Section 28, Township 1 North, Range 7 East, Mount Diablo Base and Meridian; (2) Westerly along said Weber Grant line and along said North line of Section 28 to the Northwest corner of said Section 28; (3) Southerly along the West line of said Section 28 to intersection with the South line of Section 59, C. M. Weber Grant; and (4) Westerly along the said South line of Section 59 to a point on the Easterly right-of-way line of Highway 99; thence Southerly 3.4 miles, more or less, along said Easterly right-of-way line of Highway 99 to the intersection of said Easterly right-of-way with the Southwesterly boundary of French Camp Road, also known as French Camp Toll Road or Turnpike; thence Northwesterly 3 miles, more or less, along said Southwesterly boundary of French Camp Road to the Westerly right-of-way line Of the Western Pacific Railroad Company property; thence Southerly 1.8 miles, more or less, along said Westerly right-of-way to a point on the Southerly line of Section P of C. M. Weber Grant; thence Westerly 1.2 miles, more or less, along the South line of said C. M. Weber Grant to the Northeast corner of the Northwest ¼ of the Northwest ¼ of Section 14, Township 1 South, Range 6 East, Mount Diablo Base and Meridian, said corner being a point in the boundary of Reclamation District No. 17; thence Westerly 0.75 mile, more or less, along the boundary of said Reclamation District No. 17 to the Southeast corner of fractional Section 10 of said Township and Range and being the Southwest corner of the C.M. Weber Grant; thence along the boundary of said Reclamation District No. 17 and the boundary of said C. M. Weber Grant the following four (4) courses, (1) Northerly 232.41 chains, more or less, along the Easterly boundary of fractional Sections 10 and 3 of said Township and Range and along the Easterly boundary of fractional Section 34, Township 1 North, Range 6 East, Mount Diablo Base and Meridian to the Northeast corner of said fractional Section 34, (2) East 20 chains, (3) North 40 chains, and (4) East 1076 feet; thence leaving said C. M. Weber Grant boundary and continuing along the boundary of said Reclamation District No. 17 the following five (5) courses, (1) North 255.64 feet, (2) North 89° 15’ East 364.98 feet, (3) North 66° 30’ East 1246.34 feet to a point on the West line of said French Camp Road, (4) Northerly 1850 feet, more or less, along said West line of French Camp Road to the South bank of French Camp Slough, and (5) Westerly 0.75 mile, more or less, downstream along the Southerly bank of French Camp Slough to the intersection of said Reclamation District No. 17 boundary with the Southwesterly projection of the centerline of Walker Slough; thence Easterly 1.5 miles, more or less, along said centerline of Walker Slough and the centerline of Duck Creek to the Easterly line of McKinley Avenue; thence Northerly 0.3 mile, more or less, along said Easterly line of McKinley Avenue to a point of intersection with the North line of Section 23, C. M. Weber Grant, said point being on the Southerly boundary of the Stockton and East San Joaquin Water Conservation District; thence Easterly 3.6 miles, more or less, along said Southerly boundary of said Stockton and East San Joaquin Water Conservation District to the point of beginning, containing 12,800 acres, more or less.

(b) The inclusion of each of such three planning areas (the North Stockton Planning Area, the Central Stockton Planning Area, and the South Stockton Planning Area) shall occur and be complete for all purposes, subject to Section 26, unless on or before the 60th day after the effective date of this act there is filed with the secretary of the district, at the district's office, a petition requesting an election signed by at least 25 percent of the registered voters in such planning area.
(c) A petition may consist of any number of separate instruments, which identify the planning area to which it is applicable and shall contain a request that an election shall be held to determine whether such planning area shall be included within the district.
(d) Within 20 days of the date of the filing of such a petition the secretary of the district shall examine the same and ascertain whether or not such petition is signed by the requisite number of voters.
(e) When the secretary of the district has completed his examination of the petition he shall attach to the same his certificate properly dated showing the result of such examination, and if from such examination he finds that such petition is signed by the requisite number of voters or is not so signed, he shall certify that the same is sufficient or insufficient, as the case may be.
(f) If such petition is sufficient the proposition of whether or not the subject planning area shall be included within the district shall be submitted to the vote of the voters in the subject planning area at an election called by the board and held within 70 days after the filing of a sufficient petition requesting an election.
(g) The manner of holding and conducting the election, the selection of officers to conduct it, the designation of precincts and polling places, the preparation, receipt, counting, and returning of ballots, and the canvassing and determining results of the election shall be as provided in Chapter 3 (commencing with Section 74790) of Part 6 of Division 21 of the Water Code, and in particulars not so provided shall be in accordance with the general laws of the state relative to elections at which propositions are submitted and voted upon.
(h) Upon the canvassing of the votes cast in the election if it appears that a majority of all votes cast are in favor of the inclusion of the subject planning area, then the inclusion of the subject planning area shall occur and be considered completed at the conclusion of the canvass, subject to the provisions of Section 26. Upon the canvassing of the votes cast in the election if it appears that a majority of all votes cast are against the inclusion of the subject planning area within the district, the inclusion shall be of no force and effect.
(i) If on or before the 60th day after the effective date of this act sufficient petitions have been filed with the secretary of the district requesting elections in more than one planning area, then the question of such inclusion shall be submitted to the vote of the voters in each of the subject planning areas at an election called and held on the same day.
(j) The secretary of the district may contract with the County Clerk of San Joaquin County to perform any of the duties imposed upon the secretary by this section. In such cases the costs of the county clerk in connection with such duties shall be paid by the district.

SECTION 25
(a) There is hereby excluded from the Central San Joaquin Water Conservation District the following territory:
Beginning at the intersection of the North line of Section 24, C. M. Weber Grant, with the Easterly line of the Tidewater and Southern Railroad, and being a point on the Central San

Joaquin Water Conservation District Boundary; thence along said Central San Joaquin Water Conservation District Boundary the following five (5) courses, (1) Southeasterly along the Easterly boundary of said railroad to its intersection with the North line of Section 39, C. M. Weber Grant, (2) Northeasterly along the Northerly line of said Section 39 and its extension to a point on the West line of fractional Section 5, Township 1 South, Range 7 East, Mount Diablo Base and Meridian, (3) Southerly along said Westerly line of fractional Section 5 and the Easterly line of C. M. Weber Grant to the North line of the property conveyed to Joe Marchesotti, a married man, by Deed recorded January 8, 1957 in Book of Official Records, Volume 1933, Page 221, San Joaquin County Records, (4) Easterly along the North line of said Marchesotti property to the Easterly line of Highway 99, and (5) Northerly along said Easterly line of Highway 99 to the intersection of the North line of Section 4, Township 1 North, Range 7 East, Mount Diablo Base and Meridian; thence leaving said Central San Joaquin Water Conservation District Boundary Northerly along said Easterly line of Highway 99 to its intersection with the Southerly line of Section 59, C. M. Weber Grant and being a point on the Northerly boundary of said Central San Joaquin Water Conservation District; thence along said Central San Joaquin Water Conservation District Boundary the following six (6) courses, (1) Westerly along the Southerly lines of Sections 59 and 48 of C. M. Weber Grant to the Southwest corner of said Section 48, (2) Northerly along the West line of said Section 48 and Section 47 of said C. M. Weber Grant to the Northeast corner of land described in Deed to John S. Ladd, Jr. recorded September 17, 1947 in Book of Official Records, Volume 1082, Page 344, San Joaquin County Records, (3) South 72' 35' West along the North line of said Ladd land 35 chains, (4) South 73° 10' West 34.72 chains to a point on the West line of Section 35, C. M. Weber Grant, (5) Southerly along said West line of Section 35 to the Northeast corner of said Section 24, C. M. Weber Grant, and (6) Westerly along the Northerly line of said Section 24 to the point of beginning, containing 3150 acres, more or less.

(b) Such exclusion shall take effect at the same time that the inclusion of the South Stockton Planning Area takes effect, and if the inclusion of the South Stockton Planning Area is of no force and effect by virtue of an election held pursuant to Section 24, such exclusion from the Central San Joaquin Water Conservation District shall similarly be of no force and effect.

(c) The inclusion of territory into the district pursuant to this act, except as specifically provided in this section, shall have no effect upon the continuing inclusion of the subject territory in other water conservation districts or in any irrigation district or any other special districts.

SECTION 26

(a) After the time for filing petitions pursuant to Section 24 has expired or an election has been held pursuant to Section 24, as the case may be, the board shall adopt a resolution confirming the inclusion of any planning area within the district pursuant to Section 24 and the exclusion of territory from the Central San Joaquin Water Conservation District pursuant to Section 25 if such inclusion and exclusion has not been disapproved at an election held pursuant to Section 24, and the secretary shall then prepare and execute a certificate of completion. Such certificate shall contain the following:

(1) The name of each district affected.

(2) A description of any territory included in the district and any territory excluded from the Central San Joaquin Water Conservation District, which descriptions may be made by

reference to the boundary shown on a map attached to such certificate.

(3) The date of adoption of the resolution confirming the inclusion and exclusion.

(4) A statement of the fact that the territory included shall be subject to a one-half-mill tax rather than the tax permitted by Section 75357 of the Water Code, as provided in Section 27.

(b) The secretary shall file his certificate of completion with the Secretary of State. Thereupon the Secretary of State shall execute a certificate of filing identifying the certificate of completion filed with him and stating the date of such filing. The Secretary of State shall transmit to the secretary a counterpart original of the certificate of filing.

(c) After receipt of the Secretary of State's certificate of filing, the secretary shall file with the County Recorder of the County of San Joaquin:

(1) A counterpart original of the secretary's certificate of completion; and

(2) The original or a counterpart original of the Secretary of State's certificate of filing.

(d) After recordation of the secretary's certificate of completion the Recorder of the County of San Joaquin shall file with the County Surveyor of the County of San Joaquin a copy of each of the boundary descriptions included in the certificate of completion.

(e) Any inclusion or exclusion confirmed by resolution of the board adopted pursuant to this section shall be completed from the date of filing the certificate of completion with the Secretary of State and shall be effective upon the date of the recordation made with the county recorder.

(f) The secretary shall also make such filings as may be provided for by Chapter 8 (commencing at Section 54900) of Part 1 of Division 2 of Title 5 of the Government Code, and for such purpose the inclusion and exclusion shall be deemed to be effective from the date of filing of the certificate of completion with the Secretary of State.

SECTION 27

(a) Upon the effective date of the inclusion of a planning area into the district pursuant to this act, each planning area shall thereafter be treated in all respects as a part of the district, except that the following special provisions shall apply within each planning area included within the district:

(1) The assessment permitted by Section 75357 of the Water Code shall not exceed one-half mill ($0.0005) on each one hundred cents ($1) of the assessed value of the lands within such planning area according to the last assessment rolls instead of the maximum two and one-half mills ($0.0025) permitted by Section 75357 of the Water Code.

(2) No ground water assessment or stream-delivered water charge shall be levied.

(b) A parcel of land within a planning area shall cease to be excluded from the full taxes, assessments, and charges as such exclusions are set forth in subdivision (a) in the event of either of the following:

(1) A parcel within a planning area is within the service area of a publicly or privately owned water utility which distributes domestic and industrial water which is all or in part furnished to such utility as treated surface water by the district; or

(2) The independent benefit commission pursuant to procedures set forth in Section 28 determines that a subject parcel is receiving a substantial benefit from district operations.

(c) In the case of the North Stockton Planning Area, the Central Stockton Planning Area, and the South Stockton Planning Area, no removal from the partial tax area shall take effect for any purpose prior to July 1, 1974.

(d) As used in this act “substantial benefit”, means an actual raising by prior district operations, of ground water levels under a subject parcel or the actual retarding, by prior district operations, of the lowering of ground water levels under a subject parcel.
(e) Whenever one or more parcels are transferred from a partial tax area to a full tax area, the secretary shall file a statement as to all parcels which are transferred to a full tax area, as required by Chapter 8 (commencing at Section 54900) of Part 1 of Division 2 of Title 5 of the Government Code.
(f) After a parcel has been excluded from a partial tax area such exclusion shall be permanent.

SECTION 28
(a) If any one or more of the planning areas are finally included within the district, then following such final inclusion the board shall give written notice to the California District Securities Advisory Commission, and the advisory commission shall thereupon appoint a three-member commission, one of whom shall be a civil engineer whose practice encompasses irrigation, and one of whom shall be a civil engineer whose practice encompasses municipal water supply. Such independent benefit commission shall serve at the pleasure of the advisory commission. When a vacancy occurs in the membership of the independent benefit commission the secretary shall give notice to the advisory commission, and the advisory commission shall promptly appoint a successor. If the advisory commission fails to appoint a successor or to initially appoint the three members of the independent benefit commission, then after 60 days notice in writing to the advisory commission by the board, the board may fill such vacancy or make such appointments and the person so appointed by the board shall serve until such time as they are replaced by the advisory commission. The advisory commission may charge the district for the actual cost of performing the services required of the State Treasurer by this section.
(b) It shall be the duty of the independent benefit commission from time to time, in the manner set forth in this section, to determine whether a parcel within a planning area is receiving a substantial benefit from district operations.
(c) No member of the independent benefit commission shall have any interest in any land in the district, either directly or indirectly.
(d) Each member of the independent benefit commission, before entering upon his duties, shall take and subscribe an oath that he is not in any manner interested either directly or indirectly in any land in the district, and that he will perform the duties of commissioner to the best of his ability.
(e) The members of the independent benefit commission shall be paid by the district compensation for the services rendered by them in the amount or amounts fixed by the State Treasurer from time to time.
(f) The members of the independent benefit commission, upon their appointment and thereafter from time to time, shall select one of their members as chairman.
(g) Within 60 days of its appointment, and thereafter as provided in subdivision (j) of this section, the independent benefit commission shall meet at the district office. At the time of such initial meeting and thereafter as requested by the independent benefit commission the board shall furnish or make available to the independent benefit commission all data and information possessed by the district and which in the judgment of the independent benefit commission is relevant to the determinations to be made by it.
(h) After its initial meeting the independent benefit commission within the next succeeding

120 days shall determine which parcels within the partial tax areas are receiving a substantial benefit by the operations of the district and shall prepare a preliminary report of its findings. Upon its completion the preliminary report of the independent benefit commission shall be delivered to the secretary in writing. Such preliminary report shall list and identify each parcel which the independent benefit commission has determined is receiving a substantial benefit from district operations by the current description of such parcel as such description is then disclosed by the applicable current records of the assessor, and accordingly should be transferred from the partial tax area to the full tax area, Upon receipt of such preliminary report of the independent benefit commission the secretary shall publish pursuant to Section 6061 of the Government Code a notice of the receipt of such preliminary report. Such notice shall fix a date for a public hearing to be held on the report. Such publication shall be by a display advertisement in a newspaper of general circulation printed and published within the district, at least 20 days prior to the date at which the public hearing is to be held. The notice, among other information, shall contain an invitation to all interested persons to call at the office of the district and to examine said report of the independent benefit commission. At the time appointed in the notice, the independent benefit commission shall meet in the district office and hold a public hearing on its preliminary report. At the hearing any person interested in the district, including the board and members of the board, may, in person or by representative, appear and submit evidence concerning the matters contained in the preliminary report and the matters pending before the independent benefit commission. Within 30 days of the conclusion of its public hearing the independent benefit commission shall deliver its final report to the secretary.

(i) Upon receipt of the final report of the independent benefit commission the secretary shall publish a notice that such final report has been received and that the same is available for inspection by all interested persons at the office of the district. The notice shall be published pursuant to Section 6061 of the Government Code by display advertisement in a newspaper of general circulation printed and published within the district, and shall advise interested persons of their right to request review pursuant to this paragraph. Within 30 days of the publication of the notice required by this paragraph any person interested in a parcel affected by the final report of the independent benefit commission who is dissatisfied with the action of the independent benefit commission in connection with such parcel may file a request for review in writing on forms provided by the secretary requesting review by the board of the action of the independent benefit commission as to the parcel in which such person is interested. Upon the filing of a request for review the secretary shall set the matter for hearing by the board. At least 20 days prior to the hearing the secretary shall mail notice of such hearing to the person or persons requesting review. At the hearing the board shall hear evidence concerning the subject parcel and whether it is receiving a substantial benefit by the operations of the district. At the conclusion of the hearing the board may modify the report of the independent benefit commission by excluding one or more parcels from the list of parcels to be transferred from the partial tax area to the full tax area, but the board shall have no power to include any parcel within the full tax area which was not initially so included by the final report of the independent benefit commission. A final report of the independent benefit commission shall be final and shall take effect for all purposes upon either the expiration of 30 days after the publication of the notice provided for in this subdivision or upon the final action of the board in modifying the final report or determining not to modify the final report following the public hearing of the board in the event of the filing of a request for review pursuant to this subdivision.

(j) After the initial hearing of the independent benefit commission so long as any portion of the district is not within the full tax area the independent benefit commission shall again hold an initial meeting as provided in subdivision (i) of this section during the fifth year next succeeding the year of the final adoption of the last final report of the independent benefit commission or at more frequent intervals upon written request of the board, and after such initial meeting shall proceed to the adoption of a new final report of the independent benefit commission in the manner set forth in subdivisions (g) to (i), inclusive, of this section.

SECTION 29

Failure of the district at any time to take action to collect any delinquent replenishment assessment or charge shall not be a waiver of the right of the district to collect such account at any time in the future by the utilization of such procedures and remedies as are granted to the district by this act.

SECTION 30

Whenever the district is required to mail any bill or notice to any owner the requirement of mailing shall be satisfied by deposit of such bill or notice in any postal facility regularly maintained by the government of the United States, with postage paid, addressed to the owner at his address as disclosed by the most recent record of the district. If the records of the district do not contain an address for such owner, such mailing shall be to his address as disclosed by the most recent equalized tax roll of the county. Any owner may, from time to time, file notices of change of address with the district.

SECTION 31

Notwithstanding Section 74223 of the Water Code and any other provisions of law in conflict with this section, the board shall hold regular meetings on the third Tuesday of each month. The board may by resolution change the frequency of, and the day for, holding regular meetings. Notice of any such change shall be published once a week for at least two consecutive weeks before the time for a regular meeting on the new meeting date in a newspaper of general circulation circulated in the district.

SECTION 32

Notwithstanding Section 74091 of the Water Code and any other provisions of law in conflict with this section, one director, who shall be an elector of the division in which such director resides, shall be elected for such division, by vote of the electors of the entire district, This section shall be applicable to voting at any district election held after January 1, 1972.

SECTION 33

The boundaries of the divisions of the district are relocated as follows:

<u>Division No. 1</u>

Beginning at a point on the Stockton and East San Joaquin Water Conservation District boundary, said point being the Southwest corner of the Northeast ¼ of Section 25, Township 2 North, Range 8 East, Mount Diablo Base and Meridian, said Stockton and East San Joaquin

Water Conservation District boundary being described in notice of election for the organization of the Stockton and East San Joaquin Water Conservation District, held June 1, 1948; thence along said Stockton and East San Joaquin Water Conservation District boundary the following thirty-five (35) courses, (1) East 1.0 mile, more or less, along the South line of the Northeast ¼ of said Section 25 and along the South line of the Northwest ¼ of Section 30, Township 2 North, Range 9 East to the center of said Section 30, (2) North 2½ miles, more or less, along the half section line running North and South through Sections 30, 19, and 18, Township 2 North, Range 9 East to the Southwest corner of the Southeast ¼ of Section 7, Township 2 North, Range 9 East, (3) East ½ mile, more or less, along the South line, of said Section 7 to the Southeast corner thereof, (4) North ¼ mile, more or less, along the East line of said Section 7 to the Southwest corner of the Northwest ¼ of the Southwest ¼ of Section 8, Township 2 North, Range 9 East, (5) East ¼ mile, more or less, along the South line of said Northwest ¼ of the Southwest ¼ of said Section 8 to the centerline of the Escalon-Bellota Road, (6) North ¼ mile, more or less, along said centerline of the Escalon-Bellota Road to its intersection with the South line of the North one-half of said Section 8, (7) East ¾ mile, more or less, along the South line of the North ½ of said Section 8 to the Southeast corner of the North ½ of said Section 8, (8) North ¼ mile, more or less, along the East line of Section 8 to the Southwest corner of the Northwest ¼ of the Northwest ¼ of Section 9, Township 2 North, Range 9 East, (9) East ¼ mile, more or less, along the South line of the Northwest ¼ of the Northwest ¼ of Section 9 to the Southeast corner thereof in the center of the Gilmore Road No.616, (10) North along the ¼, ¼ section line and along the center of said Gilmore Road No. 616 to a point 300.0 feet Southerly from the South line of Section 4, Township 2 North, Range 9 East, Mount Diablo Base and Meridian, (11) East 750.0 feet, (12) North 300.0 feet to a point on said South line of Section 4, (13) East along the South line of Section 4 to the Southeast corner of the Southwest ¼ of said Section 4, (14) North ½ mile, more or less, along the East line of the Southwest ¼ of Section 4 to the center of said Section 4, (15) East ½ mile, more or less, along the South line of the Northeast ¼ Section 4 to the Southeast corner of the Northeast ¼ of said Section 4, (16) North ½ mile, more or less, along the East line of said Northeast ¼ of Section 4 to the Southwest corner of Section 34, Township 3 North, Range 9 East, (17) East 1.0 mile, more or less, along the South line of Section 34 to the Southeast corner thereof, (18) South, along the West line of Section 2, Township 2 North, Range 9 East, to the center of the Bellota River Road, (19) Northeasterly along the center of said road to the East line of the Northwest ¼ of said Section 2, (20) North along said East line of the Northwest ¼ of said Section 2 to the Southwest corner of the Southeast ¼ of Section 35, Township 3 North, Range 9 East, (21) East ⁵⁄₁₆ mile, more or less, along the South line of Section 35 to the center of the Bellota River Road, (22) Northeasterly ¾ mile, more or less, along the center of said road to a point on the South line of the North ½ of Section 36, Township 3 North, Range 9 East, Mount Diablo Base and Meridian, (23) East ⅝ mile, more or less, along the South line of said North ½ of Section 36 to the County line between San Joaquin and Stanislaus Counties, (24) North ½ mile, more or less, along said County line to the corner common to San Joaquin, Stanislaus and Calaveras Counties, (25) Northwesterly ½ mile, more or less, along County Line between San Joaquin and Calaveras Counties to its intersection with the North line of the South ½ of Section 25, Township 3 North, Range 9 East, (26) West, along said North line to the Northwest corner of the Southwest ¼ of said Section 25, (27) South ½ mile, more or less, to the Southwest corner of said Section 25, (28) West ½ mile, more or less, to the Northwest corner of the Northeast,

¼ of Section 35 of Township 3 North, Range 9 East, (29) South ¼ mile, more or less, to the Northeast corner of the South ½ of the Northwest ¼ of said Section 35, (30) West ½ mile, more or less, to the Northwest corner of said South ½ of the Northwest ¼ of said Section 35, (31) South ¼ mile, more or less, to the Northeast corner of the South ½ of Section 34, Township 3 North, Range 9 East, (32) West 1½ miles, more or less, to a point in the center of the Linden Road at the center of Section 33, (33) Westerly ½ mile, more or less, along the center of said Linden Road to its intersection with the West line of Section 33, Township 3 North, Range 9 East, (34) South ½ mile, more or less, along the West line of Section 33 to the Northeast corner of Section 5, Township 2 North, Range 9 East, (35) West 3¼ miles, more or less, along the North line of Sections 5 and 6 of Township 2 North, Range 9 East, and the North line of Sections 1 and 2 of Township 2 North, Range 8 East to the Southwest corner of the East ½ of the East ½ of Section 35, Township 3 North, Range 8 East to a point on the boundary of that certain petition dated May 14, 1953, for inclusion in the Stockton and East San Joaquin Water Conservation District; thence along the boundary described in said petition, dated May 14, 1953 the following eighteen (18) courses, (1) Northerly ¾ mile, more or less, along the Westerly line of said East ½ of the East ½ of said Section 35 to the Northeast corner of the Southwest ¼ of the Northeast ¼ of said Section 35, (2) Westerly 418.3 feet along the North line of the Southwest ¼ of the Northeast ¼ of said Section 35, (3) Northerly ¼ mile, more or less, along a line parallel with, 418.3 feet Westerly of, measured at right angles to the West line of the Northeast ¼ of the Northeast ¼ of said Section 35 to intersection with the North line of said Section 35, (4) Westerly 1072.5 feet, more or less, along the North line of said Section 35 to the Northwest corner of the East 5 acres of the Northeast ¼ of the Northwest ¼ of said Section 35, (5) Southerly along the West line of said 5 acre tract to intersection with the North line of the Southeast ¼ of the Northwest ¼ of said Section 35, (6) Westerly along said North line to the Northwest corner of the Southeast ¼ of the Northwest ¼ of said Section 35, (7) Southerly 2645 feet, more or less, along the West line of the East ½ of the West ½ of said Section 35 to the Northeast corner of the Southwest ¼ of the Southwest ¼ of said Section 35, (8) Westerly 1324.5 feet, more or less, along the North line of the Southwest ¼ of the Southwest ¼ of said Section 35 to the Northwest corner of said Southwest ¼ of the Southwest ¼ of said Section 35, (9) Northerly 1 ¼ miles, more or less, along the East line of Sections 34 and 27, Township 3 North, Range 8 East, Mount Diablo Base and Meridian, to the Northeast corner of the Southeast ¼ of said Section 27, (10) Westerly ¼ mile, more or less along the North line of said Southeast ¼ to the Northwest corner of the Northeast ¼ of said Southeast ¼, (11) Southerly ⅛ mile, more or less, along the West line of the Northeast ¼ of the Southeast ¼ of said Section to the Southeast corner of the Northeast ¼ of the Northwest ¼ of the Southeast ¼ of said Section 27, (12) Westerly $^{1}/_{16}$ mile, more or less, along the South line of the Northeast ¼ of the Northwest ¼ of the Southeast ¼ of said Section to the Northwest corner of the East ½ of the Southwest ¼ , of the Northwest ¼ of the Southeast ¼ of said Section 27, (13) Southerly ⅓ mile, more or less, along the West line of the East ½ of the Southeast ¼ of the Northwest ¼ of the Southeast ¼ of said Section to the Southwest corner thereof, (14) Westerly $^{1}/_{16}$ mile, more or less, along the North line of the East ½ of the Southwest ¼ of the Southeast ¼ of said Section 27 to the Northwest corner thereof, (15) Southerly ¼ mile, more or less, along the West line of the East ½ of the Southwest ¼ of the Southeast ¼ to the Southwest corner thereof, (16) Westerly ⅞ mile, more or less, along the North line of Sections 34 and 33, Township 3 North, Range 8 East, Mount Diablo Base and Meridian to the Northwest corner of the Northeast ¼ of the

Northeast ¼ of said Section 33, (17) Southerly ¼ mile, more or less, along the West line of the Northeast ¼ of the Northeast ¼ of said Section to the Southwest corner thereof, and (18) Westerly ¼ mile, more or less, along the South line of the Northwest ¼ of the Northeast ¼ of said Section to the Southwest corner thereof being a point on said Stockton and East San Joaquin Water Conservation District boundary; thence along last said boundary the following four (4) courses; (1) Northerly ¼ mile, more or less, along the East line of the Northwest ¼ of said Section 33 to the Northeast corner of said Northwest ¼ , (2) Westerly ½ mile, more or less, along the North line of said Northwest ¼ to the Northwest corner thereof, (3) Northerly ½ mile, more or less, along the East line of the Southeast ¼ of Section 29, Township 3 North, Range 8 East to the Northeast corner of said Southeast ¼, and (4) Westerly ½ mile, more or less, along the North line of said Southeast ¼ to the Northwest corner thereof being a point on the centerline of Tully Road; thence leaving said Stockton and East San Joaquin Water Conservation District boundary the following seven (7) courses, (1) Southerly 2½ miles, more or less, along said centerline of Tully Road to intersection with the centerline of Comstock Road, said intersection being at the Southeast corner of the West ½ of Section 5, Township 2 North, Range 8 East, Mount Diablo Base and Meridian, (2) Westerly ¼ mile, more or less, along said centerline of Comstock Road to intersection with Tully Road at the Northeast corner of the West ½ of the West ½ of Section 8, Township 2 North, Range 8 East, Mount Diablo Base and Meridian, (3) Southerly 1.0 mile, more or less, along said centerline of Tully Road to intersection with the centerline of Baker Road at the Southeast corner of said West ½ of the West ½ of Section 8, (4) Easterly 3.0 miles, more or less, along said centerline of Baker Road and the ½ mile extension thereof to intersection with the centerline of Wall Road and being at the Southeast corner of the West ½ of the West ½ of Section 11, Township 2 North, Range 8 East, Mount Diablo Base and Meridian, (5) Southerly ½ mile, more or less, along said centerline of Wall Road to intersection with the centerline of Linden Road, (6) Northeasterly 1.3 miles, more or less, along said centerline of Linden Road to intersection with the centerline of Fine Road and (7) Southerly 2½ miles, more or less, along said centerline of Fine Road to the point of beginning.

<u>Division No. 2</u>

Beginning at a point on the Stockton and East San Joaquin Water Conservation District boundary, said point being the Southwest corner of fractional Section 1, Township 1 North, Range 7 East, Mount Diablo Base and Meridian, and being a point on the Easterly boundary of C. M. Weber Grant, said Stockton and East San Joaquin Water Conservation District boundary being described in notice of election for the organization of the Stockton and East San Joaquin Water Conservation District, held June 1, 1948; thence along said Stockton and East San Joaquin Water Conservation District boundary the following seven (7) courses, (1) Easterly ½ mile, more or less, along the Southerly line of said fractional Section 1 to the Southeast corner thereof, said corner being on the centerline of Jack Tone Road, (2) Easterly 4.0 miles, more or less, along the South lines of Sections 6, 5, 4, and 3, Township l North, Range 8 East, to the Southeast corner of said Section 3, (3) Northerly 1.0 mile, more or less, along the East line of said Section 3 to the Southwest corner of Section 35, Township 2 North, Range 8 East, being a point on the centerline of Copperopolis Road, (4) Easterly 1.0 mile, more or less, along the South line of said Section 35 and being along said centerline of Copperopolis Road to the Southeast corner of said Section 35 (5) Northerly ½ mile, more or less, along the East line of said Section 35 to the Southwest corner of the Northwest ¼ of Section 36, Township 2 North, Range 8 East, (6) Easterly ½ mile, more or less, along the South line of said Northwest ¼ to the center of said Section 36 and being a point on the centerline of Fine Road, and (7) Northerly 1.0 mile, more or less, along the ¼ section line of Sections 36 and 25, Township 2 North, Range 8 East and along said centerline of Fine Road to the center of Section 25, Township 2 North, Range 8 East; thence leaving said Stockton and East San Joaquin Water Conservation District boundary the following nine (9) courses, (1) Northerly 2½ miles, more or less, along the said centerline of Fine Road to intersection with the centerline of Linden Road, (2) Southwesterly 1.3 miles, more or less, along said centerline of Linden Road to intersection with the centerline of Wall Road, (3) Northerly ½ mile, more or less, along said centerline of Wall Road to intersection with the Easterly projection of the centerline of Baker Road at a point being the Northeast corner of the West ½ of the Northwest ¼ of Section 14, Township 2 North, Range S East, (4) Westerly 3¼ miles, more or less, along said Easterly projection and said centerline of Baker Road to the Northwest corner of Section 17, Township 2 North, Range 8 East, said projection and said centerline of Baker Road being along the North lines of Sections 14, 15, 16, and 17, Township 2 North, Range 8 East, (5) Southerly 1.7 miles, more or less, along the West lines of Sections 17 and 20 to a point on the said centerline of Linden Road, (6) Southwesterly 3.7 miles, more or less, along said centerline of Linden Road to intersection with the centerline of Alpine Road, (7) Southeasterly 0.8 mile, more or less, along said centerline, of Alpine Road to intersection with the centerline of the Southern Pacific Railroad Company property, (8) Easterly 1¾ miles, more or less, along said centerline of the Southern Pacific Railroad Company property to a point on the Northerly projection of said Westerly line of fractional Section 1, Township I North, Range 7 East, and (9) Southerly 1½ miles, more or less, along said Northerly projection and said Easterly line of fractional Section 1 to the point of beginning.

<u>Division No. 3</u>

Beginning at a point on the Stockton and East San Joaquin Water Conservation District boundary, said point being the Northeast corner of the Southwest ¼ of Section 29, Township 3 North, Range 8 East, Mount Diablo Base and Meridian, said Stockton and East San Joaquin Water Conservation District boundary being described in notice of election for the organization of the Stockton and East San Joaquin Water Conservation District, held June 1, 1948; thence along said Stockton and East San Joaquin Water Conservation District boundary the following four (4) courses, (1) Westerly 1½ mile, more or less, along the ½ Section lines of Sections 29 and 30, Township 3 North, Range 8 East to the Northeast corner of the Southeast ¼ of Section 25, Township 3 North, Range 7 East, Mount Diablo Base and Meridian, (2) Westerly 3½ miles, more or less, along the ½ Section lines of Sections 25, 26, 27, and 28, Township 3 North, Range 7 East to intersection with the centerline of Alpine Road, (3) Southerly 1½ miles, more or less, along said centerline of Alpine Road to intersection with the North line of Section 4, Township 2 North, Range 7 East, Mount Diablo Base and Meridian, and being on the centerline of Eight Mile Road, (4) Westerly 0.9 mile, more or less, along the North line of Sections 4 and 5, Township 2 North, Range 7 East and being along said centerline of Eight Mile Road to intersection with the centerline of Hildreth Road; thence Southerly 1¼ mile, more or less, along said centerline of Hildreth Road to intersection with centerline of Ashley Road; thence Southeasterly 1¼ mile, more or less, along said centerline of Ashley Road to intersection with centerline of the Calaveras River; thence Northeasterly 1.1 mile, more or less, along said centerline of the Calaveras River to intersection with centerline of Alpine Road; thence Southeasterly 3.7 miles, more or less, along said centerline of Alpine Road to intersection with the centerline of Linden Road; thence Northeasterly 3.7 miles, more or less, along said centerline of Linden Road to intersection with the West line of Section 20, Township 2 North, Range 8 East, Mount Diablo Base and Meridian; thence Northerly 1.7 miles, more or less, along said West line of Section 20 and along the West line of Section 17, Township 2 North, Range 8 East, Mount Diablo Base and Meridian to the Northwest corner thereof, being a point on the centerline of Baker Road; thence Easterly ¼ mile, more or less, along the North line of said Section 17 and the centerline of Baker Road to intersection with the centerline of Tully Road at the Southeast corner of the West ½ of the West ½ of Section 8, Township 2 North, Range 8 East, Mount Diablo Base and Meridian; thence Northerly 1.0 mile, more or less, along said centerline of Tully Road to intersection with the centerline of Comstock Road at the Northeast corner of said West ½ of West ½ of Section 8; thence Easterly ¼ mile, more or less, along said centerline of Comstock Road being along the South line of Section 5, Township 2 North, Range 8 East, Mount Diablo Base and Meridian to intersection with centerline of Tully Road at the Southeast corner of the West ½ of said Section 5; thence Northerly 2½ miles, more or less, along said centerline of Tully Road and the ½ Section line of said Section 5 and the ½ Section lines of Sections 32 and 29, Township 3 North, Range 8 East, Mount Diablo Base and Meridian to the point of beginning.

<u>Division No. 4</u>

Beginning at a point on the Stockton and East San Joaquin Water Conservation District boundary, said point being on the intersection of the centerline of Hildreth Road and the North line of Section 5, Township 2 North, Range 7 East, Mount Diablo Base and Meridian, said Stockton and East San Joaquin Water Conservation District boundary being described in notice of election for the organization of the Stockton and East San Joaquin Water Conservation District, said election being held June 1, 1948; thence leaving said District boundary Southerly 1¼ mile, more or less, along said centerline of Hildreth Road to intersection with the centerline of Ashley Road; thence Southeasterly 1¼ mile, more or less, along said centerline of Ashley Road to intersection with the centerline of the Calaveras River; thence Southwesterly 6.0 miles, more or less, along said centerline of the Calaveras River to intersection with the centerline of Pacific Avenue; thence Northerly 1.2 mile, more or less, along said centerline of Pacific Avenue to intersection with the centerline of Robinhood Drive; thence Westerly 0.6 mile, more or less, along said centerline of Robinhood Drive to intersection with the centerline of Pershing Avenue; thence Northerly 0.2 mile, more or less, along said centerline of Pershing Avenue to intersection with the South line of Swain Oaks Manor; thence South 69° 40’ West 1652.20 feet along said South line of Swain Oaks Manor to the Southwest corner thereof; thence North 02° 35’ West 112.62 feet along the West line of said Swain Oaks Manor to the North line of Section 29, Township 2 North, Range 6 East, Mount Diablo Base and Meridian; thence Westerly 1.0 mile, more or less, along said North line of Section 29 to the Northwest corner thereof; thence Southerly ⅛ mile, more or less, along the West line of said Section 29 to intersection with the centerline of Fourteen Mile

Slough (formerly called Twelve Mile Slough); thence Southerly and Westerly ½ mile, more or less, along said centerline of Fourteen Mile Slough to a point on the City Limits line; thence Westerly, Northwesterly, Northerly and Northeasterly 1.3 miles, more or less, along said centerline of Fourteen Mile Slough and said City Limits line to intersection with the West line of Section 19, Township 2 North, Range 6 East, Mount Diablo Base and Meridian; thence Northerly 0.5 mile, more or less, along said West line of Section 19 and said City Limits line to the Southeasterly corner of Mitchell Slough-Wright Tract Annexation—A-7-67; thence Westerly, Northerly, and Easterly 1.3 miles, more or less, along the City Limits line established by said Annexation—A-7-67 and by the Wright Tract Annexation—A-1-62 to the Northwest corner of said Section 19; thence Easterly 1900 feet, more or less, along the North line of said Section 19 and said City Limits line to the Southeast corner of the Shima Tract; thence leaving said City Limits line Northerly 6600 feet, more or less, along the Easterly boundary of said Shima Tract to a corner thereof; thence Westerly 1500 feet, more or less, along the Northerly boundary of said Shima Tract to the Southeast corner of the Atlas Tract; thence Northerly 3800 feet, more or less, along the Easterly boundary of said Atlas Tract to the Southwest corner of Section 6, Township 2 North, Range 6 East, Mount Diablo Base and Meridian; thence Northerly 1.0 mile, more or less, along the West line of said Section 6 to the Northwest corner thereof; thence Easterly 7⅞ miles, more or less, along the North line of said Township and Range and along the North line of Township 2 North, Range 7 East, Mount Diablo Base and Meridian, to the point of beginning.

Division No. 5

Beginning at a point on the Stockton and East San Joaquin Water Conservation District boundary, said point being the Southwest corner of fractional Section 1, Township 1 North, Range 7 East, Mount Diablo Base and Meridian, and being a point on the Easterly boundary of C. M. Weber Grant, said Stockton and East San Joaquin Water Conservation District boundary being described in notice of election for the organization of the Stockton and East San Joaquin Water Conservation District, held June 1, 1948; thence Northerly 1½ mile, more or less, along the Westerly line of said fractional Section 1 and the Northerly projection thereof to intersection with the centerline of the Southern Pacific Railroad Company property; thence Westerly 1¾ miles, more or less, along said centerline of the Southern Pacific Railroad Company property to intersection with the centerline of Alpine Road; thence Northwesterly 4½ miles, more or less, along said centerline of Alpine Road to intersection with the centerline of the Calaveras River; thence Westerly 5.1 miles, more or less, along said centerline of the Calaveras River to intersection with the centerline of the Stockton Diverting Canal; thence Southeasterly ¾ mile, more or less, along said centerline of the Stockton Diverting Canal to intersection with the centerline of North Wilson Way; thence Southerly 4⅝ miles, more or less, along the centerline of North Wilson Way and South Wilson Way to intersection with the centerline of Charter Way; thence Easterly 1¾ miles, more or less, along said centerline of Charter Way to intersection with the centerline of State Highway 99; thence Northerly 0.6 mile, more or less, along said centerline to the centerline of Washington Street; thence Easterly 1.4 miles, more or less, along said centerline of Washington Street to intersection with the centerline of the Stockton Diverting Canal; thence Southeasterly 0.8 mile, more or less, along said centerline of the Stockton Diverting Canal to intersection with the centerline of Copperopolis Road; thence Southwesterly 0.1 mile, more or less, along said centerline of Copperopolis Road to intersection with Gillis Road; thence Southerly ⅞ mile, more or less, along said centerline of Gillis Road to a point on the boundary of said Stockton and East San Joaquin Water Conservation District, on the South line of State Highway Route 4 (Farmington Road); thence Easterly 1¼ mile, more or less, along said South line to intersection with the North line of fractional Section 11, Township 1 North, Range 7 East, Mount Diablo Base and Meridian and being also the Southerly boundary of C. M. Weber Grant; thence Easterly 1¼ mile, more or less, along said Southerly boundary of C. M. Weber Grant to a point where the Farmington Road turns Southeasterly; thence North 80.0 feet to a point on the Northerly line of a private roadway 80.0 feet in width; thence Easterly ¼ mile, more or less, along the Northerly line of said roadway to a point on the Westerly line of the Northeast ¼ of Section 12, Township 1 North, Range 7 East, Mount Diablo Base and Meridian, said point being on the Easterly line of the C. M. Weber Grant and distant 80.0 feet Northerly from the center of said Section 12; thence Northerly ½ mile, more or less, along said Easterly boundary of C. M. Weber Grant to the point of beginning.

<u>Division No. 6</u>

Beginning at the Northeast corner of Section 58, C. M. Weber Grant, said corner being a point on the boundary of the Central San Joaquin Water Conservation District; thence along said Central San Joaquin Water Conservation District boundary the following four (4) courses, (1) Southerly along the West line of Sections 68, 69, and 70 of said C. M. Weber Grant to the Southerly line of said Grant being also the North line of Section 28, Township 1 North, Range 7 East, Mount Diablo Base and Meridian; (2) Westerly along said Weber Grant line and along said North line of Section 28 to the Northwest corner of said Section 28; (3) Southerly along the West line of said Section 28 to intersection with the South line of Section 59, C. M. Weber Grant, and (4) Westerly along the said South line of Section 59 to a point on the Easterly right-of-way line of Highway 99; thence Southerly 3.4 miles, more or less, along said Easterly right-of-way line of Highway 99 to the intersection of said Easterly right-of-way with the Southwesterly boundary of French Camp Road, also known as French Camp Toll Road or Turnpike; thence Northwesterly 3 miles, more or less, along said Southwesterly boundary of French Camp Road to the Westerly right-of-way line of the Western Pacific Railroad Company property; thence Southerly 1.8 miles, more or less, along said Westerly right-of-way to a point on the Southerly line of Section P of C. M. Weber Grant; thence Westerly 1.2 miles, more or less, along the South line, of said C. M. Weber Grant to the Northeast corner of the Northwest ¼ of the Northwest ¼ of Section 14, Township 1 South, Range 6 East, Mount Diablo Base and Meridian, said corner being a point in the boundary of Reclamation District No. 17; thence Westerly 0.75 mile, more or less, along the boundary of said Reclamation District No. 17 to the Southeast corner of fractional Section 10 of said Township and Range and being the Southwest corner of the C. M. Weber Grant; thence along the boundary of said Reclamation District No. 17 and the boundary of said C. M. Weber Grant the following, four (4) courses, (1) Northerly 232.41 chains, more or less, along the Easterly boundary of fractional Sections 10 and 3 of said Township and Range and along the Easterly boundary of fractional Section 34, Township 1 North, Range 6 East, Mount Diablo Base and Meridian to the Northeast corner of said fractional Section 34, (2) East 20 chains, (3) North 40 chains, and (4) East 1076 feet; thence leaving said C. M. Weber Grant boundary and continuing along the boundary of said Reclamation District No. 17 the following five (5) courses, (1) North 255.64 feet, (2) North 89° 15’ East 364.98 feet, (3) North 66° 30’ East 1246.34 feet to a point on the West line of said French Camp Road, (4) Northerly 1850 feet, more or less, along said West line of French Camp Road to the South bank of French Camp Slough, and (5) Westerly 1.75 mile, more or less, continuing along said boundary of Reclamation District No. 17 to the right or Easterly bank of the San Joaquin River; thence Northwesterly 1.1 mile, more or less, downstream along said right or Easterly bank of the San Joaquin River to intersection with the centerline of State Highway 4; thence Easterly 1¾ miles, more or less, along said centerline of Highway 4 to intersection with the centerline of Charter Way; thence Easterly 3½ miles, more or less, along said centerline of Charter Way to intersection with centerline of State Highway 99; thence Northerly 0.6 mile, more or less, along said centerline of State Highway 99 to intersection with centerline of Washington Street; thence Easterly 1.4 miles, more or less, along said, centerline of Washington Street to intersection with the centerline of the Stockton Diverting Canal; thence Southeasterly 0.8 mile, more or less, along said centerline of the Stockton Diverting Canal to intersection with the centerline of Copperopolis Road; thence Southwesterly 0.1 mile, more or less, along said centerline of Copperopolis Road to intersection with Gillis Road; thence Southerly ⅞ mile, more or less, along said centerline of Gillis Road to a point on the Stockton and East San Joaquin Water Conservation District boundary on the South line of Farmington Road, said Stockton and East San Joaquin Water Conservation District boundary being described in notice of election for the organization of the Stockton and East San Joaquin Water Conservation District, said election being held on June 1, 1948; thence along said Stockton and East San Joaquin Water Conservation District boundary the following three (3) courses, (1) Westerly ¼ mile, more or less, along said South line of Farmington Road to intersection with the Easterly line of Section 67, C. M. Weber Grant, (2) Southerly 0.4 mile, more or less, along said Easterly line of Section 67 to the Southeast corner thereof, and (3) Westerly 0.9 mile, more or less, along the Southerly line of said Section 67 to the point of beginning.

Division No. 7

Beginning at the point of intersection of the centerline of the Calaveras River with the centerline of Pacific Avenue, said point being on the Stockton and East San Joaquin Water Conservation District boundary, said Stockton and East San Joaquin Water Conservation District boundary being described in notice of election for the organization of the Stockton and East San Joaquin Water Conservation District, said election being held June 1, 1948; thence Easterly 2.0 miles, more or less, meandering the centerline of the Calaveras River upstream to intersection with centerline of the Stockton Diverting Canal; thence Southeasterly ¾ mile, more or less, along said centerline of Stockton Diverting Canal to intersection with the centerline of North Wilson Way; thence Southerly 4⅝ miles, more or less, along the said centerline of North Wilson Way and the centerline of South Wilson Way to intersection with the centerline of State Highway 4; thence Westerly 3.5 miles, more or less, along said centerline of State Highway 4 to the intersection with the right or Easterly bank of the San Joaquin River; thence Southerly 0.1 mile, more or less, along said right or Easterly bank of the San Joaquin River to a point bearing East 500 feet, more or less, from the Southeast corner of the 3.55 acre parcel of Oxidation Pond Annexation No. 3—A-1-66; thence West 500 feet, more or less, to said Southeast corner; thence Westerly 1.6 miles, more or less, along the Stockton City Limits line to the Easterly line of Dagget Road; thence Northerly 1.0 mile, more or less, along said Easterly line of Dagget Road and along the Stockton City Limits line to a point on the centerline of Burns Cutoff; thence in a general Westerly, Northerly, and Northeasterly direction 3.09 miles, more or less, along said centerline of Burns Cutoff to intersection with the centerline of the Stockton Deep Water Channel; thence Northwesterly 0.9 mile, more or less, along said centerline of the Stockton Deep Water Channel to centerline Station 286+00, said Station 286+00 bearing Southwesterly 375 feet at right angles to said centerline from U.S.E.D., B.M. 4008; thence Northeasterly 300 feet, more or less, at right angles to said centerline to a point on the Southerly boundary of the Elmwood Tract; thence Easterly and Northerly 1.9 mile, more or less, along the Southerly and Easterly boundary of said Elmwood Tract to the point of intersection of said Easterly boundary with the Southerly levee of Fourteen Mile Slough (formerly called Twelve Mile Slough); thence North 500 feet, more or less, to the Stockton City Limits line, said City Limits line being along the centerline of said Fourteen Mile Slough; thence Easterly 1.2 mile, more or less, along said centerline of Fourteen Mile Slough to intersection with the West line of Section 29, Township 2 North, Range 6 East, Mount Diablo Base and Meridian; thence Northerly ⅛ mile, more or less, along said West line to the Northwest corner of said Section 29; thence Easterly 1.0 mile, more or less, along the North line of said Section 29 to intersection with the West line of Swain Oaks Manor; thence South 02° 35’ East 112.62 feet along the West line of said Swain Oaks Manor to the Southwest corner thereof; thence North, 69° 40’ East 1652.20 feet along the South line of said Swain Oaks Manor to the centerline of Pershing Avenue; thence Southerly 0.2 mile, more or less, along said centerline of Pershing Avenue to intersection with the centerline of Robinhood Drive; thence Easterly 0.6 mile, more or less, along said centerline of Robinhood Drive to intersection with the centerline of Pacific Avenue; thence Southerly 1.2 miles, more or less, along said centerline of Pacific Avenue to the point of beginning.

After the effective date of this section the division boundaries may be further relocated pursuant to the procedures set forth in Chapter 3 (commencing at Section 74430) of Part 4 of Division 21 of the Water Code, but no such relocation of division boundaries shall occur until four years after the effective date of this section, except that the board shall be authorized pursuant to the provisions of Section 74433 of the Water Code to relocate the boundaries of the division’s established by this section to the extent of any exclusion of land, including, but not limited to, any exclusion as a result of an election held pursuant to Section 24 of this act, and any inclusion of land or annexation of land to the district. This section shall not take effect until the adoption, pursuant to Section 26, of a resolution including one or more planning areas into the district.

SECTION 34

Notwithstanding the provisions of Sections 74019 and 74202 of the Water Code and Sections 23506 and 23509 of the Elections Code and any other provisions of law in conflict with this section, directors shall be elected as provided in this section. In all other respects the election of directors and the holding of office by directors and the expiration of their terms of office shall be governed by Division 21 (commencing at Section 74000) of the Water Code and the Uniform District Election Law. The general district election shall be held on the date of the general municipal election for the City of Stockton.

SECTION 35

Upon the annexation of any territory to the City of Stockton not within the district, such territory shall automatically be included within the district and such inclusion shall take effect upon the effective date of the annexation of such territory to the City of Stockton. Upon the inclusion of any territory pursuant to this section, such territory shall be an additional planning area and shall be in the partial tax area, subject to the provisions of Section 27 as to inclusion in the full tax area. It shall not be necessary to undertake a benefit review procedure solely for the purpose of reviewing an area included within the district as an additional planning area pursuant to this section, but such additional planning area shall be reviewed at the time of subsequent benefit review procedures.

SECTION 36
Parcels of land within any planning area shall be excluded from paying all ad valorem taxes assessed by the district during any fiscal year (July 1 to June 30) following a preceding period extending from November 1 of any year to the next succeeding October 31 during which there was utilized on such a parcel for irrigated agricultural crops water taken from any watercourse which is located within the boundaries of the Delta Water Agency as the boundaries of the Delta Water Agency are presently defined by Section 10.1 of the Delta Water Agency Act of 1968 (Chapter 419 of the Statutes of 1968, as amended by Chapter 285 of the Statutes of 1969) or from the distribution system of the Woodbridge Irrigation District or from any watercourse entirely outside the boundaries of the district prior to the effective date of this act, if less than 50 percent of such a parcels water supply during such a subject period is extracted from the underground. This section shall be implemented by rule adopted by the board and any owner of a parcel desiring to take advantage of this section shall file such reports with the board as the board may require by rule. It shall be the duty of the secretary to annually file a statement as to all parcels to which this section is applicable, as provided by Chapter 8 (commencing at Section 54900) of Part 1 of Division 2 of Title 5 of the Government Code.

SECTION 37
The provisions of this act, insofar as they are substantially the same as existing law, are restatements and continuations of existing law and not new enactments.

SECTION 38
This act is an urgency statute necessary for the immediate preservation of the public peace, health or safety within the meaning of Article IV of the Constitution and shall go into immediate effect. The facts constituting such necessity are:
There is an urgent need to provide treated water within the Stockton-East Water District and facilities for such purpose cannot be adequately planned and initiated until such time as the extent of the jurisdiction of the district is determined, in order, therefore, to permit the provision of urgently needed water within the district at the earliest possible time, it is necessary that this act go into immediate effect.

ATTACHMENT Q

Items to Address DWR Agricultural Water Management Plan Requirements

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DWR ATTACHMENT Q.1.

Legal Certification and Apportionment Required for Water Measurement

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Legal Certification and Apportionment Required for Water Measurement

SEWD can measure water at the farm-gate for all customers and therefore does not need to submit legal certification and apportionment required for water measurement. This DWR Attachment A requirement is not applicable to SEWD.

A recent field investigation conducted by SEWD determined that the seven unmetered customer delivery points can be metered, and two of those meters have already been installed. Therefore, there are no legal constraints to installing or operating water meters for any of the District's customers.

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DWR ATTACHMENT Q.2.

Engineer Certification and Apportionment Required for Water Measurement

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Engineer Certification and Apportionment Required for Water Measurement

SEWD can measure water at the farm-gate for all customers and does not measure at the lateral (upstream of multiple customers). Therefore, SEWD does not need to submit engineer certification and apportionment required for water measurement. This DWR Attachment B requirement is not applicable to SEWD.

A recent field investigation conducted by SEWD determined that the seven previously unmetered customer delivery points can be metered, and two of those meters have already been installed. Therefore, there are no physical constraints at the farm-gate that prevent the installation or operation of water meters for any of the District's customers.

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DWR ATTACHMENT Q.3.

Water Measurement Best Professional Practices

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Water Measurement Best Professional Practices

Water Measurement Data Collection

Water measurement data are collected via manual readings. SEWD uses a certified pump tester to calibrate their meters. An SEWD engineer reviews and approves the pump tests.

Measurement Frequency

Meter readings are collected monthly during use.

Method for Determining Irrigated Acres

SEWD requests that each of their agricultural customers reports on their agricultural irrigation use for the previous year. Customers are sent an *Owner's Water Use Statement for Calendar Year (the upcoming calendar year)*, and must return it to SEWD by mid-January. Customers are asked to report the following data and information:

1. crops grown,
2. method of irrigation,
3. acres fallow/not irrigated,
4. acres being irrigated with well water, and
5. acres being irrigated with surface water.

The customers are also asked to report non-agricultural irrigation use. The Owner's Water Use Statement requires acknowledgement that the information submitted is truthful under penalty of perjury. If the form is not turned in by the requested date, a 5 percent penalty is added to the customer's water bill.

Quality Control and Quality Assurance Procedures

Information provided by the customers on the *Owner's Water Use Statement for Calendar Year (the upcoming calendar year)* form sent out annually by SEWD is cross-checked by the District using water meter readings. SEWD first compares customer current water use with historical use to identify potential metering inaccuracies or errors. For any suspected inaccuracies or errors, SEWD then conducts a further investigation with the customer, including conducting a detailed meter inspection or testing.

SEWD conducts water audits for the DJWWTP. SEWD measures their diversions, the amount treated at the DJWWTP, and the amount delivered to its urban customers. Any discrepancies are immediately investigated, and repairs made as necessary.

As part of the preparation of the USBR Water Management Plan and the DWR Agricultural Water Management Plan, SEWD has improved two significant water management practices. In 2012, SEWD investigated seven customer delivery points that had previously been determined to be unmeasurable due to physical limitations of the turnouts. This recent field investigation determined that all of these delivery points can be metered, and 2 meters have already been installed. Secondly, it was determined that the PG&E or hour meters used for 18 customers have an accuracy well above +/- 6 percent. SEWD has begun replacing these meters, and has scheduled replacement by the end of 2015.

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DWR ATTACHMENT Q.4

Description of Water Measurement Conversion to Volume

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Description of Water Measurement Conversion to Volume

For SEWD water measurement devices that are not measuring water volume, the water measurements are obtained from flow meters by taking the gallons per minute rating of the pump and the run time reading from each pump system to calculate usage through the following formula:

(pump flow in gallons per minute) X (1 ft^3/7.481 gal) X (1 acre/43,560ft^2) X total minutes pump is operating = total acre-feet (volume)

A similar water measurement conversion to volume procedure is used for the PG&E or hour meters; however, all pumps measured by pump test, run time or PG&E readings will be replaced over the next three years (by 2015) in order to obtain more accurate volume reading measurements.

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DWR ATTACHMENT Q.5.

Device Corrective Action Plan Required for Water Measurement

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Device Corrective Action Plan Required for Water Measurement

Prior to preparation of the USBR Water Management Plan and the DWR Agricultural Water Management Plan, SEWD had seven unmeasured customer delivery points and two customers that shared one unmeasured turnout. It had previously been determined that these seven delivery points were unmeasurable due to physical limitations of the turnouts. A 2012 field investigation determined that all of these delivery points can be metered. Individual meters have already been installed for the customers who shared a turnout. Only five unmeasured delivery points remain.

It was also recently determined that the PG&E or hour meters used for 18 customers have an accuracy above +/- 6 percent. SEWD has begun replacing these meters, and expects to have them replaced within the next three years (by 2015).

The implementation schedule, finance plan, and budget allotment to install meters at the five remaining unmeasured delivery points, and to replace the 18 meters that are not accurate to +/- 6 percent is presented in Table E-1, below.

Table E-1. (DWR Table VII.A.3) Schedule to Implement EWMPs

EWMP	Implementation Schedule	Finance Plan	Budget Allotment
Critical EWMP 1: Water Measurement	5 meters will be installed at the unmeasured turnouts by the end of 2013.	Monies will be transferred to the water meter maintenance category from the Ag Division Fund 67 budget to cover planned meter installations.	$8,000 in 2013[a]
Critical EWMP 1: Water Measurement	9 PG&E or hour meters will be replaced each year in 2014 and 2015, resulting in the replacement of all 18 by 2015.	Monies will be transferred to the water meter maintenance category from the Ag Division Fund 67 budget to cover planned meter replacements.	$13,000/year for 2014 and 2015[a]
Critical EWMP 1: Water Measurement	10 percent of the district's existing water meters will be tested each year.	Monies will be transferred to the water meter maintenance category from the Ag Division Fund 67 budget to cover planned meter calibrations.	$5,000/year

[a] These monies include budget to cover unplanned but needed meter replacements.

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DWR ATTACHMENT Q.6. DWR

Notice of AWMP Preparation

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NOTICE OF PUBLIC HEARING

Stockton East Water District will be holding a public hearing on their 2012 Agricultural Water Management Plan, prepared for the California State Department of Water Resources, on December 18, 2012, at 12:00 PM, at Stockton East Water District, 6767 East Main Street, Stockton, California, 95215. A copy of the 2012 Agricultural Water Management Plan will be available for review prior to the hearing at SEWD offices at 6767 Main Street. Please call Ed Morley, 209/948-0537, with any questions.

#943211 12/4, 11, 2012

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ATTACHMENT R

Water Conservation Coordinator Position Description

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SEWD WATER CONSERVATION COORDINATOR

CONTACT INFORMATION

Water Conservation Coordinator: Kristin Coon

Kristin Coon Consulting
501 Pine Valley Court
Valley Springs, CA 95252
Business Phone: 209-304-1734
Business Email: **water7996@gmail.com**
SAWS WEP Email: **kcoon@sewd.net**
Online Brochure: **http://www.sewd.net/docs/SAWS-Ed-Brochure2.pdf**

POSITION DESCRIPTION

Kristin Coon is the Water Conservation Coordinator for the Stockton Area Water Suppliers (SAWS), an alliance of water providers in Stockton, California that includes the Stockton East Water District, the City of Stockton MUD, San Joaquin County, and the California Water Service Company. Ms. Coon, as Kristin Coon Consulting, is an independent contractor with the Stockton East Water District on behalf of the Stockton Area Water Suppliers. In this capacity, Ms. Coon has managed and implemented the Stockton Area Water Suppliers Water Education Program (SAWS WEP) since 2004. The SAWS WEP provides comprehensive water education outreach for Stockton area schools and the general public, offering seven standards based, grade level specific in-classroom water education presentations for K-6 in all schools in the Stockton metropolitan area, as well as after school presentations, school wide assembly programs and outreach at Stockton youth-oriented events. The contract between Kristin Coon Consulting and SEWD has been renewed annually since 2004 and is currently in effect through July 31, 2020.

EXAMPLES OF DUTIES

Kristin Coon Consulting, on behalf of the SAWS WEP, employs two water education instructors. The water education instructors are each assigned approximately nine in-class K-6 or after school presentations per week. Each presentation runs 70-120 minutes. Using informative lecture, illustrations, demonstrations and hands-on activities, each presentation ties water education, water conservation and awareness to grade level Common Core and NGSS standards. Kristin Coon's duties include comprehensive program management, including curriculum preparation, presentation scheduling, and administrative duties, as well as back up for the in-class water education presenters. In the 2018/2019 school year, the SAWS WEP reached over 25,000 Stockton area students and residents through in-class and after school presentations, school-wide assembly programs and youth-oriented events.

EMPLOYMENT STANDARDS

Kristin Coon Consulting is a sole proprietorship. All California employment standards are observed.

REQUIRED KNOWLEDGE AND ABILITIES

Kristin Coon has been employed in various capacities in the water industry since 1996, including grant writing, customer service, public relations/outreach and public information dissemination.

REQUIRED TRAINING AND EDUCATION

Kristin Coon holds a bachelor's in management from St. Mary's College of California and a Specialized Studies Certificate in Public Relations from UC Davis.

ATTACHMENT S

Irrigation Training & Research Center Draft Technical Memorandum: Crop Water Use for SEWD

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ITRC

moving water in new directions

IRRIGATION TRAINING & RESEARCH CENTER
California Polytechnic State University
San Luis Obispo, CA 93407-0730
Phone: (805) 756-2434 FAX: (805) 756-2433 www.itrc.org

DRAFT - TECHNICAL MEMORANDUM

Date: July 17, 2013

To: Jeanette Thomas - Stockton East Water District
Ed Morley - Stockton East Water District

From: Dr. Stuart Styles, P.E, D.WRE., ITRC Director
Darren Roan, ITRC Irrigation Technician

Subject: Crop Water Use for SWED

The Irrigation Training & Research Center (ITRC), working under a technical services agreement with the United States Bureau of Reclamation (USBR) Mid-Pacific Region, has undertaken this review of the procedure and materials used to create estimates for Irrigation Allowance Index evaluations and Crop Water Requirements for the growers in Stockton East Water District (SEWD). These values will be used to create ***a real-time irrigation scheduling tool*** for the growers as well as a simple evaluation of total water use at the end of the irrigation season.

Disclaimer

The ET and Crop Water Requirement values are best estimates based on specific information such as published ETc and ETo values, planting and harvesting dates, and precipitation. These values are not exact and are dependent on Distribution Uniformity, plant vigor, growing season and irrigation method. Canopy cover and cover crop health are important factors in ET, which is then reflected in Crop Water Requirements.

Persons involved in irrigation scheduling should use a variety of reality checks. In particular, weather-based ET estimates should always be accompanied by in-field soil moisture verifications.

Irrigation Allowance Index

The Irrigation Allowance Index (IAI) is calculated by comparing two values:

1. The estimated amount of water that should be applied to a certain crop (called the "Irrigation Allowance"), which is based on:
   a. Crop Evapotranspiration (ETc)
   b. Effective Precipitation for a typical precipitation year
   c. An assumed Distribution Uniformity (DU) of 0.80
2. How much water was actually applied

Table 1 contains a list of Irrigation Allowance values for crops in the SEWD region in AF/A for a typical year.

Table 1. Irrigation Allowance values for SEWD Crops

Irrigation Allowance Index		Typical year
ID #'s	SEWD Crop Category	Total AF/A
1	Walnuts	4.1
2	Walnuts w/ cover crop	5.1
3	Apple, Pear, Cherry, Plum, Prune, Olives	3.8
4	Apples, Plums, Cherries, etc. w/cover crop	5.4
5	Vineyards and Grapes	2.6
6	Vineyards and Grapes w/ cover crop	3.7
7	Vineyards and Grapes (Immature)	1.6
8	Tomatoes and Peppers	2.2
9	Chestnuts, Orchard, Pecans, Persimmons	3.6
10	Chestnuts, Orchard, etc. w/ cover crop	5.3
11	Barley, Grain, Hay, Oats, Wheat	1.5
12	Corn	2.7
13	Peach, Nectarine and Apricots	3.6
14	Peach, Nectarine, etc. w/ cover crop	5.2
15	Peach, Nectarine and Apricots (Immature)	2.1
16	Beans	2.3
17	Alfalfa	4.4
18	Melons, Squash, and Cucumbers	1.3
19	Lilac	3.6
20	Asparagus	1.4
21	Pumpkin, Eggplant, Carrots, Row or Field Crops	2.3
22	Onions	1.6
23	Almonds	3.9
24	Almonds w/cover crop	4.9
25	Immature Almonds	2.3
26	Strawberries, Blueberries, Berries	2.3
27	Pistachio	3.4
28	Pistachio w/ cover crop	4.7
29	Immature Pistachio	2.0
30	Citrus (no ground cover)	3.4
31	Immature Citrus	2.0
32	Potatoes, Sugar Beets, Turnip, etc.	3.2
33	Cotton	3.0
34	Avocado	3.6
35	Misc. Subtropical	3.6

These index values are compared to actual water use for each field, and a decimal value is calculated to determine the Irrigation Allowance Index (IAI) for that field. The IAI value for each field is then compared to 1.0, which is the critical point. If the IAI is greater than 1.0 then the grower is most likely over-irrigating. If the IAI is less than 1.0 then the grower is either under-irrigating or using deficit irrigation practices. Note: The index does *not* account for special exceptions to the allowance values such as water quality issues, frost control and/or the extra water necessary to overcome a Distribution Uniformity less than the assumed 0.80.

A sample Irrigation Allowance Index form that would be filled out by growers in order to determine their fields' IAI value is included in *Appendix A*.

Crop Evapotranspiration Information for SEWD

A list of crops and Crop Evapotranspiration (ETc) values was complied specifically for Stockton East Water District in order to provide SEWD growers with a resource for irrigation management. ETc data was taken from published data available from the Irrigation Training and Research Center (ITRC) of California Polytechnic State University, San Luis Obispo, California. The data is available on the ITRC website (www.itrc.org/etdata/etmain.htm). ETc data is available for specific climate "Zones" throughout California and for different precipitation years (typical, wet, and dry years), as well as for different irrigation methods (surface, sprinkler, drip/micro irrigation). The ETc data for Stockton East Water District was compiled for a typical precipitation year in Zone 12, using a list of crops grown in the Stockton East Water District. This table is included in *Appendix B*.

To determine a typical precipitation year for Stockton East Water District, a ten-year average was taken from data collected at CIMIS Station #70, Manteca. The average precipitation per year was found to be 12 inches per year. A wet year was determined to be a year with more than 15 inches of precipitation, and a dry year was a year with less than 9 inches of precipitation.

Determining the Crop Coefficient, Kc (Typical Year)

A table was created with monthly and annual Crop Coefficients (Kc). These Kc values are used to create current year ETc values. The Kc values for the listed crops were computed by using the equation below.

$$ET_C = ET_O \times Kc$$

Where, ETc is the Crop Evapotranspiration
ETo is the Grass Reference Crop Evapotranspiration
Kc is the Crop Coefficient

The ETo and ETc are provided in the published ITRC Evapotranspiration data mentioned above. A table with the Kc values for a typical year for Stockton East Water District is attached in *Appendix B*.

Crop Water Requirement (Typical Year)

The Crop Water Requirement is an estimate of how much water the crop needs to provide full yield. This estimate takes into account the ETc, the Effective Precipitation and the extra water needed to be applied to overcome Distribution Uniformity (for SEWD the DU was assumed to be 0.8).

The Effective Precipitation is the amount of precipitation that contributes to the ETc; all precipitation that is not "effective" (used by plants) is considered lost to deep percolation. For example, there may be 3 inches of total precipitation in a month, but the crop only uses 1 inch of water for ETc (Note: the ETc includes the water used by the plant for Transpiration plus the water that is lost to Evaporation). Therefore, the effective precipitation for that month would be 1 inch, while 2 inches of precipitation is lost to deep percolation. As another example, if there is only 0.5 inches of precipitation in a month but the crop uses 3 inches for ETc, then none of the precipitation is lost, and all of the precipitation (0.5 inches) is considered "effective".

The Distribution Uniformity was assumed to be 0.8, but this could be either high or low depending on the management of the fields and the current irrigation system in place.

To determine the Crop Water Requirement, the Effective Precipitation is subtracted from the ETc and then is divided by the Distribution Uniformity. This is the amount of water that would need to be provided by the grower for the crop to produce full yield. The equation is:

$$Crop\ Water\ Requirement = \frac{ETc - Effective\ Precipitation}{Distribution\ Uniformity\ (DU)}$$

Once the Crop Water Requirement *per month* was determined, the total Crop Water Requirement for the *year* (acre-in) was calculated and then converted to acre-ft by dividing by 12 inches per foot. A table with the Crop Water Requirements for SEWD is included in *Appendix B*.

Weighted Average Crop Water Requirement

To provide an idea of how much water should be applied per acre for the Stockton East Water District, the weighted average was taken of the Crop Water Requirement and the total acres per crop in the Stockton East Water District. This factor came out to be 4.6 acre-ft of water per acre. This factor is affected heavily by the amount of walnuts with cover crops that are grown in the district, as walnuts with cover crops are almost half of the total crop acreage and use about 5.1 acre-ft of water in a typical year.

ETo (Current Year)

The ETo data for the current year is available using a new method provided by CIMIS called spatial data. Spatial data provides daily representative ETo and solar radiation values within 2 km of any position chosen in California. To check the accuracy of the spatial data, two years' worth of ETo data was compared against the two closest CIMIS stations to Stockton East Water District: Station 70 (Manteca), and Station 166 (Lodi West). The spatial data was found to be within 5% of the ETo data calculated at the stations. The data and results are listed in Table 2.

In order to provide CIMIS spatial data representative of the entire District, a central location in Stockton East Water District was chosen to use as the point for the CIMIS spatial data. The coordinates for the location chosen are 38.01°N, 121.17°W. This location is shown along with the district boundaries in Figure 1.

Table 2. CIMIS Station ETo Data vs. CIMIS Spatial ETo Data (2011-2012)

		Manteca Station		*Lodi West Station*	
Year	Month	CIMIS 70	Spatial	CIMIS 166	Spatial
2011	Jan	0.82	0.89	0.80	0.91
	Feb	2.08	1.98	2.03	2.02
	Mar	2.80	2.77	2.45	2.64
	Apr	4.69	4.59	4.69	4.62
	May	5.72	5.82	5.75	5.67
	Jun	6.66	6.75	6.53	6.58
	Jul	7.54	7.4	7.43	7.33
	Aug	6.81	6.8	6.61	6.81
	Sep	5.24	5.57	5.23	5.53
	Oct	3.29	3.24	3.18	3.19
	Nov	1.75	1.66	1.58	1.62
	Dec	1.50	1.43	1.43	1.51
Total (in)		48.9	48.9	47.7	48.4
Percent Difference		Standard	0%	Standard	2%
2012	Jan	1.61	1.47	1.48	1.48
	Feb	2.47	2.38	2.21	2.34
	Mar	2.94	2.84	2.80	2.80
	Apr	4.67	4.49	4.65	4.44
	May	7.15	7.09	7.11	6.98
	Jun	7.79	7.75	7.66	7.70
	Jul	7.71	7.76	7.53	7.78
	Aug	7.02	7.21	6.96	7.29
	Sep	5.30	5.57	5.31	5.52
	Oct	3.29	3.44	3.22	3.37
	Nov	1.91	1.57	0.67	1.51
	Dec	1.09	1.03	0.00	1.01
Total (in)		53.0	52.6	49.6	52.2
Percent Difference		Standard	-1%	Standard	5%

NOTE: The Penman-Monteith equation, which is recommended by ITRC, was used to calculate the CIMIS station data instead of the reference CIMIS equation.
Percent Difference (%) = 100% * ((Spatial - CIMIS Station)/(CIMIS Station))

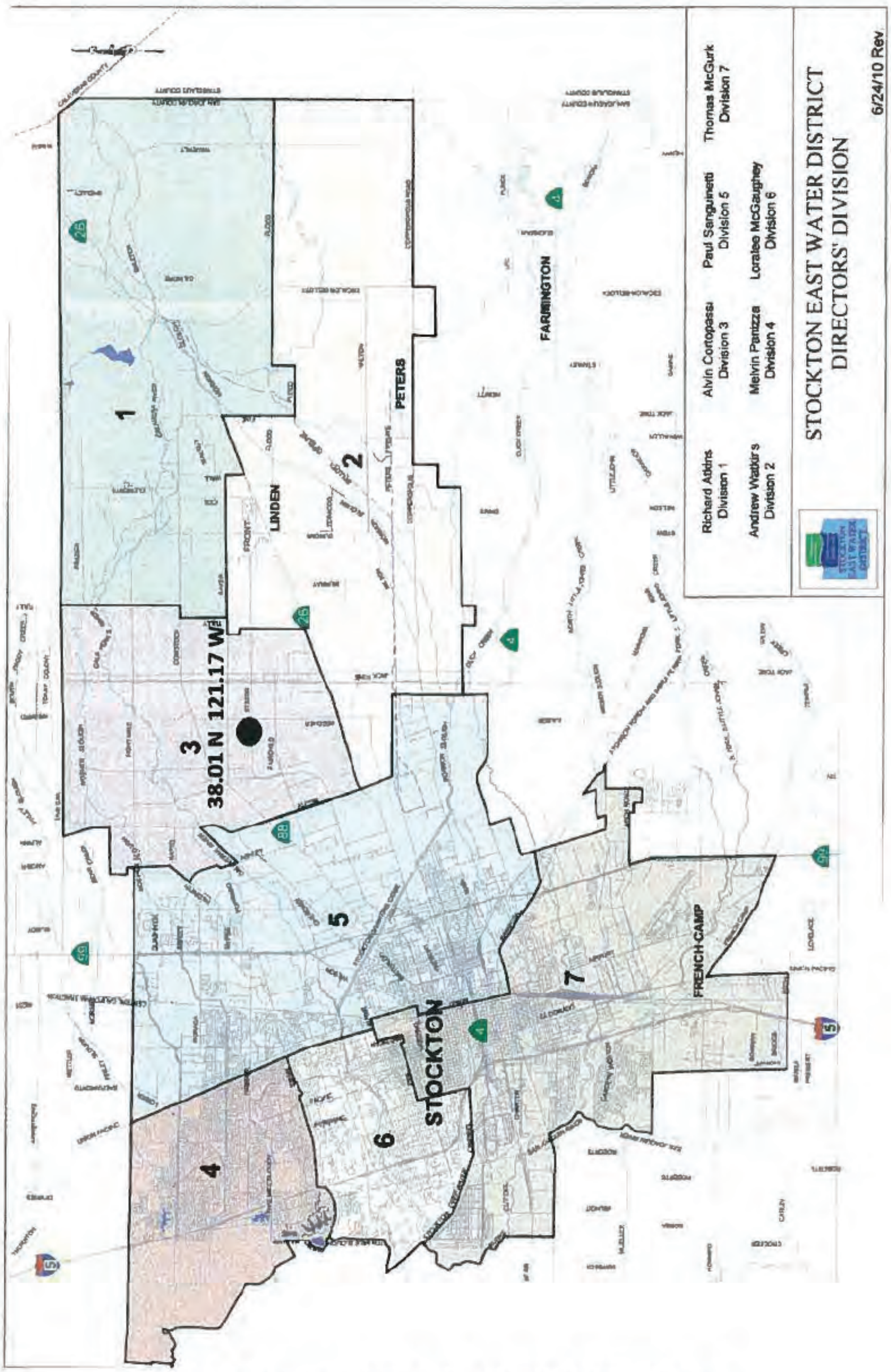

Figure 1. Central position in Stockton East Water District
38.01° N, 121.17° W

Accessing CIMIS Spatial ETo Data

1. Go to the CIMIS website (wwwcimis.water.ca.gov/cimis/myCimis.jsp) and log on. If you do not have a CIMIS account, register for an account. A username and password is required to login; it is free to create an account.
2. Select the "Spatial CIMIS" tab in the main navigational menu at the top of the window.
3. In the left-hand navigational menu, select "Map Reports".
4. Find the location on the map in either of three ways:
    a. Enter the address of the field under "Map" and click "Address Search".
    b. Enter the latitude and longitude of the field (in decimal degrees) and click "Address Search".
    c. Navigate the map using the arrows and zoom slider; place the first pin by clicking on the field.
5. Multiple coordinate points can be requested, allowing the user to request information for multiple fields.
6. Scroll down the page and select English units.
7. Set the date range that is needed.
8. Under "Reporting Method," select "CSV with Headers" if you wish to use Microsoft Excel to view and input the data or select "Web Report" to view the information in a web browser.
9. Click "Submit". Depending on the reporting method you selected, the file will either downloaded to your computer where you can view or save it, or the report will be displayed in your web browser.

Once the ETo data is collected, the monthly ETo can be calculated by adding up the total amount of ETo in each month. These monthly ETo values can be used to create monthly ETc values.

Calculating ETc (Current Year)

To determine the monthly ETc for the current year, multiply the ETo per month by the Crop Coefficient (Kc) using the equation below.

$$ETc = Kc \times ETo$$

The ETo can be taken from the typical year values or other precipitation years depending on which precipitation year the Crop Coefficient is needed for.

Accessing *Monthly* CIMIS Station Data

1. Return to the CIMIS website and log on (wwwcimis.water.ca.gov/cimis/myCimis.jsp).
2. Select the "CIMIS Data" tab.
3. Scroll down the main page until you find a list of options for sensor data reports listed in blue (e.g., Hourly, Daily, Daily ETo Variance, Monthly, etc.). Click on the blue "Monthly" link.
4. From the Station List select the station that is closest to the field, which should be either:

70 – Manteca
166 – Lodi West

5. Scroll down the page and select English units
6. Select the date range to be from January 1, of the current year to the last day of the previous month.
7. Select the appropriate reporting method, and click "Submit".

This station report will provide various data for each month such as average maximum temperature and average low temperature, but the only information needed for the Crop Water Requirement is the total precipitation, which is listed as a monthly value.

A table containing the ETo and ETc for the current year (2013) is located in *Appendix C.*

Calculated Crop Water Requirement (Current Year)

Using the ETc for the current year, the Crop Water Requirement for the current year is calculated by subtracting the Effective Precipitation from the ETc and then dividing by the Distribution Uniformity. Again, the formula is:

$$Crop\ Water\ Requirement = \frac{ETc - Effective\ Precipitation}{Distribution\ Uniformity\ (DU)}$$

This current year's Crop Water Requirement can be compared to the amount of water applied to the field to date, to gauge if the field is being over- or under-irrigated. A table with the current year's (2013) Crop Water Requirements for Stockton East Water District is located in *Appendix C.*

Real-Time Scheduling Tool

In order to provide the SEWD growers with a *real-time irrigation scheduling tool*, the Projected Weekly ETc and Crop Water Requirements are estimated and listed in the current year's tables located in *Appendix C.* With this information the SEWD growers can schedule their irrigations to meet the Projected Crop Water Requirement.

Projected Weekly ETo and Effective Precipitation

The previous calculations for ETc and Crop Water Requirements were monthly values. To properly calculate the Projected Weekly ETc and Crop Water Requirement, the Projected Weekly ETo and Effective Precipitation need to be calculated. This is achieved by summing the daily values from the previous year, for each week to be projected. The same process described above that is used to access CIMIS spatial data can be used since the CIMIS spatial data retrieved is a daily value. The process to access *Daily* Effective Precipitation values from a local CIMIS Station is listed below:

Accessing *Daily* CIMIS Station Data

1. Return to the CIMIS website and log on (wwwcimis.water.ca.gov/cimis/myCimis.jsp).
2. Select the "CIMIS Data" tab.

3. Scroll down the main page until you find a list of options for sensor data reports listed in blue (e.g., Hourly, Daily, Daily ETo Variance, Monthly, etc.). Click on the blue "Daily" link.
4. From the Station List select the station that is closest to the field, which should be either:
   70 – Manteca
   166 – Lodi West
5. Scroll down the page and select English units
6. Set the date range to the days to be projected from the previous year.
7. Select the appropriate reporting method, and click "Submit".

Projected Weekly ETc

The Projected Weekly ETc is then calculated by multiplying the Projected Weekly ETo, by the Kc factor using the equation below:

$$Projected\ Weekly\ ET_C = Projected\ Weekly\ ET_O * K_C$$

The Kc value for this calculation is the Kc value for the month that is being projected, found on the Typical Year – Kc tab of the spreadsheet.

Projected Weekly Crop Water Requirements

Using the Projected Weekly ETc the Projected Weekly Crop Water Requirement is calculated by subtracting the Projected Weekly Effective Precipitation from the Projected Weekly ETc and then dividing by the Distribution Uniformity. The equation is:

$$Projected\ Weekly\ Crop\ Water\ Requirement = \frac{Projected\ Weekly\ Etc - Projected\ Weekly\ Precipitation}{Distribution\ Uniformity}$$

Note that the Projected Weekly ETc and Crop Water Requirements are only an estimate and should be used with current weather data, along with crop and soil monitoring practices to provide accurate irrigation scheduling information.

Appendix A:
Irrigation Allowance Index Evaluation Form

Stockton East Water District
Irrigation Allowance Index

Name

Please fill out the white cells in the tables below to compute your **Irrigation Allowance Index** *value.*

Water Sources

GROUNDWATER

	Groundwater Wells (List ALL State Well #'s)	Extractions (in Acre-feet) January - June		July - December		Yearly Total
1		0	+	0	=	0
2		0	+	0	=	0
3		0	+	0	=	0
4		0	+	0	=	0
5		0	+	0	=	0
				Total Volume for Wells	=	0

SEWD DELIVERIES

Deliveries from SEWD (in Acre-feet) January - June		July - December		Yearly Total
0	+	0	=	0
		Total Volume from SEWD	=	0

OTHER SOURCES (Neighbor's well, etc.)

	Source	Volume (in Acre-feet) January - June		July - December		Yearly Total
1		0	+	0	=	0
2		0	+	0	=	0
				Total Volume from Other Sources	=	0

Total Volume for All Sources = 0

Crop Water Use

Please see Page 2 for a list of Irrigation Allowance values by crop type.

	ID# and Crop Category (from list)		# of Acres		Irrigation Allowance *per crop type*
1	Please choose a crop category	×	0	=	0
2	Please choose a crop category	×	0	=	0
3	Please choose a crop category	×	0	=	0
4	Please choose a crop category	×	0	=	0
			Total Irrigation Allowance	=	0

$$\text{Irrigation Allowance Index} = \frac{\text{Total Volume from All Sources}}{\text{Total Irrigation Allowance}} = \frac{0}{0} = $$

Clear Form **Calculate!**

	Irrigation Allowance Index	Typical year
ID #'s	SEWD Crop Category	Total AF/A
1	Walnuts	4.1
2	Walnuts w/ cover crop	5.1
3	Apple, Pear, Cherry, Plum, Prune, Olives	3.8
4	Apples, Plums, Cherries, etc. w/cover crop	5.4
5	Vineyards and Grapes	2.6
6	Vineyards and Grapes w/ cover crop	3.7
7	Vineyards and Grapes (Immature)	1.6
8	Tomatoes and Peppers	2.2
9	Chestnuts, Orchard, Pecans, Persimmons	3.6
10	Chestnuts, Orchard, etc. w/ cover crop	5.3
11	Barley, Grain, Hay, Oats, Wheat	1.5
12	Corn	2.7
13	Peach, Nectarine and Apricots	3.6
14	Peach, Nectarine, etc. w/ cover crop	5.2
15	Peach, Nectarine and Apricots (Immature)	2.1
16	Beans	2.3
17	Alfalfa	4.4
18	Melons, Squash, and Cucumbers	1.3
19	Lilac	3.6
20	Asparagus	1.4
21	Pumpkin, Eggplant, Carrots, Row or Field Crops	2.3
22	Onions	1.6
23	Almonds	3.9
24	Almonds w/cover crop	4.9
25	Immature Almonds	2.3
26	Strawberries, Blueberries, Berries	2.3
27	Pistachio	3.4
28	Pistachio w/ cover crop	4.7
29	Immature Pistachio	2.0
30	Citrus (no ground cover)	3.4
31	Immature Citrus	2.0
32	Potatoes, Sugar Beets, Turnip, etc.	3.2
33	Cotton	3.0
34	Avocado	3.6
35	Misc. Subtropical	3.6

Appendix B:
ETc, Kc and Crop Water Requirement Tables for Typical Year

ETc Table for Irrigation Scheduling and Design

ETo Zone 12 Monthly Evapotranspiration

Typical Year

IRRIGATION TRAINING AND RESEARCH CENTER, California Polytechnic State University, San Luis Obispo (PUBLISHED DATA)

Table does not include adjustments for bare spots and reduced vigor

Total Crop Evapotranspiration for SEWD

ITRC Crops	SEWD Crops	Acreage	Typical Year Jan inch	Feb inch	Mar inch	Apr inch	May inch	Jun inch	Jul inch	Aug inch	Sep inch	Oct inch	Nov inch	Dec inch	Annual inches	Annual (AF)
Precipitation			6.8	0.3	1.3	0.2	0.2	0.2	0.1	0.3	0.1	0.6	4.2	2.1	16.5	
Effective Precipitation			0.7	0.3	1.3	0.2	0.2	0.2	0.1	0.3	0.1	0.6	1.1	1.0	6.2	
Grass Reference ETo			0.7	2.1	4.0	5.6	7.3	7.6	8.0	6.8	5.4	3.5	1.1	1.0	53.0	
Walnuts	Walnuts	0.0	0.8	0.9	1.7	1.8	5.8	8.3	8.7	7.4	5.2	2.6	0.5	1.0	44.7	3.7
Walnuts w/ cover crop	Walnuts w/ cover crop	22,743.4	0.8	2.1	3.4	3.7	6.9	9.4	9.8	8.4	6.0	2.7	1.0	1.2	55.5	4.6
Apple, Pear, Cherry, Plum and Prune	Apple, Pear, Cherry, Plum, Prune, Olives	0.0	0.8	0.9	1.6	2.3	6.5	7.3	7.6	6.5	4.9	2.3	0.5	1.0	42.1	3.5
Apples, Plums, Cherries etc w/cover crop	Apples, Plums, Cherries etc w/cover crop	11,937.0	0.8	2.4	4.1	4.9	7.9	9.0	9.5	8.0	6.1	3.5	0.9	1.2	58.2	4.8
Grape Vines with 80% canopy	Vineyards and Grapes	0.0	0.8	0.9	1.3	1.1	3.5	6.0	6.4	5.1	2.8	0.6	0.5	1.0	30.0	2.5
Grape Vines with cover crop (80% canopy)	Vineyards and Grapes w/ cover crop	4,242.6	0.9	2.0	3.2	3.1	5.2	6.8	7.2	5.8	3.4	2.1	0.7	1.2	41.5	3.5
Immature Grapes Vines with 50% canopy	Vineyards and Grapes (Immature)	0.0	0.9	0.9	1.2	0.8	2.3	3.7	3.9	3.2	1.7	0.6	0.5	1.0	20.7	1.7
Tomatoes and Peppers	Tomatoes and Peppers	2,270.0	0.9	0.9	1.7	0.8	3.7	8.0	7.3	1.2	0.1	0.6	0.5	1.0	26.4	2.2
Misc. Deciduous	Chestnuts, Orchard, Pecans, Persimmons	0.0	0.8	0.9	1.6	2.3	6.2	6.8	7.2	6.3	4.7	2.2	0.5	1.0	40.4	3.4
Misc. Deciduous w/ cover crop	Chestnuts, Orchard, etc. w/ cover crop	1,494.0	0.8	2.4	4.1	4.8	7.6	8.6	9.1	7.8	6.0	3.3	0.9	1.2	56.5	4.7
Grain and Grain Hay*	Barley, Grain, Hay, Oats, Wheat	1,253.3	0.9	2.3	4.4	6.1	3.9	0.2	0.2	0.3	0.1	0.6	0.5	1.0	20.5	1.7
Corn and Grain Sorghum*	Corn	921.8	0.9	0.9	2.2	1.4	2.6	7.0	8.1	5.5	0.5	0.6	0.5	1.0	31.0	2.6
Peach, Nectarine and Apricots	Peach, Nectarine and Apricots	0.0	0.8	0.9	1.6	2.2	6.0	6.8	7.2	6.2	4.6	2.2	0.5	1.0	40.1	3.3
Peach, Nectarine, etc. w/ cover crop	Peach, Nectarine, etc. w/ cover crop	784.2	0.8	2.4	4.1	4.7	7.4	8.6	9.1	7.8	5.9	3.3	0.9	1.2	56.1	4.7
Immature Peaches, Nectarines, etc	Peach, Nectarine and Apricots (Immature)	0.0	0.8	0.9	1.3	1.2	3.5	4.0	4.2	3.7	2.6	1.6	0.5	1.0	25.3	2.1
Beans **	Beans	767.5	0.9	0.9	2.2	1.2	2.6	7.1	7.7	3.0	0.1	0.6	0.5	1.0	27.7	2.3
Alfalfa Hay and Clover*	Alfalfa	619.2	0.9	2.3	4.2	5.2	6.7	7.0	7.2	6.0	4.9	2.2	0.9	1.2	48.5	4.0
Melons, Squash, and Cucumbers	Melons, Squash, and Cucumbers	550.4	0.9	0.9	1.1	0.2	1.0	1.0	4.2	4.9	1.5	0.6	0.5	1.0	17.8	1.5
Flowers, Nursery and Christmas Tree	Lilac	373.0	0.8	0.9	1.6	2.3	6.2	6.8	7.2	6.3	4.7	2.2	0.5	1.0	40.4	3.4
Small Vegetables	Asparagus	345.7	0.9	1.5	3.6	5.5	1.6	0.2	0.2	1.4	1.3	1.3	0.8	1.2	19.5	1.6
Misc. field crops	Pumpkin, Eggplant, Carrots, Row or Field crops	332.1	0.9	0.9	2.2	1.4	2.6	7.1	7.7	3.1	0.1	0.6	0.5	1.0	28.0	2.3
Onions and Garlic	Onions	234.8	0.9	2.1	3.7	4.8	5.2	1.3	0.2	0.3	0.1	0.6	1.0	1.0	21.2	1.8
Almonds	Almonds	0.0	0.8	1.0	1.8	3.0	6.5	7.0	7.3	6.2	4.7	3.1	0.5	1.0	42.7	3.6
Almonds w/cover crop	Almonds w/cover crop	197.3	0.8	2.1	3.5	4.9	7.6	8.1	8.4	7.3	5.5	3.2	0.9	1.2	53.5	4.5
Immature Almonds	Immature Almonds	0.0	0.8	1.0	1.6	2.0	4.0	4.2	4.3	3.9	2.8	2.0	0.5	1.0	27.9	2.3
Strawberries	Strawberries, Blueberries, Berries	71.2	0.9	0.9	2.2	1.4	2.6	7.1	7.7	3.1	0.1	0.6	0.5	1.0	28.0	2.3
Pistachio	Pistachio	0.0	0.8	0.9	1.1	1.1	2.7	6.0	8.5	7.4	5.4	2.8	0.5	1.0	38.2	3.2
Pistachio w/ cover crop	Pistachio w/ cover crop	17.0	0.8	2.1	3.4	3.7	5.3	7.3	9.0	7.7	5.9	3.6	0.9	1.2	50.8	4.2
Immature Pistachio	Immature Pistachio	0.0	0.8	0.9	1.1	0.7	1.5	3.7	5.1	4.6	3.3	1.8	0.5	1.0	25.0	2.1
Citrus (no ground cover)	Citrus (no ground cover)	0.0	0.8	2.2	3.5	3.9	4.8	5.1	5.2	4.6	3.5	2.8	0.9	1.2	38.4	3.2
Immature Citrus	Immature Citrus	0.0	0.9	1.6	2.5	2.2	3.0	3.1	3.2	2.9	2.1	1.9	0.7	1.1	25.1	2.1
Potatoes, Sugar beets, Turnip etc..	Potatoes, Sugar beets, Turnip etc..	0.0	0.9	1.2	2.6	5.6	7.8	8.1	7.2	0.4	0.1	0.6	0.5	1.0	35.9	3.0
Cotton	Cotton	0.0	0.9	0.9	1.1	1.0	1.7	4.7	8.4	7.4	5.0	1.4	0.5	1.0	33.9	2.8
Avocado	Avocado	0.0	0.8	0.9	1.6	2.3	6.2	6.8	7.2	6.3	4.7	2.2	0.5	1.0	40.4	3.4
Misc Subtropical	Misc Subtropical	0.0	0.8	0.9	1.6	2.3	6.2	6.8	7.2	6.3	4.7	2.2	0.5	1.0	40.4	3.4
	Total Acreage	49,154.3								Weighted Average ETc per acre					50.6	4.2

* ETc data from Surface Irrigation Calculation

** ETc data from Sprinkler Irrigation Calculation

kc Table for Irrigation Scheduling and Design
Zone 12 Monthly Evapotranspiration
Typical Year
IRRIGATION TRAINING AND RESEARCH CENTER, California Polytechnic State University, San Luis Obispo (PUBLISHED DATA)
Table does not include adjustments for bare spots and reduced vigor

Kc- Crop Coefficient for SEWD

ITRC Crops	SEWD Crops	Acreage	Jan inch	Feb inch	Mar inch	Apr inch	May inch	Jun inch	Jul inch	Aug inch	Sep inch	Oct inch	Nov inch	Dec inch	Annual inches
Precipitation			6.8	0.3	1.3	0.2	0.2	0.2	0.1	0.3	0.1	0.6	4.2	2.1	16.5
Effective Precipitation			0.7	0.3	1.3	0.2	0.2	0.2	0.1	0.3	0.1	0.6	1.1	1.0	6.2
Grass Reference ETo			**0.7**	**2.1**	**4.0**	**5.6**	**7.3**	**7.6**	**8.0**	**6.8**	**5.4**	**3.5**	**1.1**	**1.0**	**53.0**
Walnuts	**Walnuts**	0.0	1.1	0.4	0.4	0.3	0.8	1.1	1.1	1.1	1.0	0.8	0.5	1.0	0.8
Walnuts w/ cover crop	Walnuts w/ cover crop	22,743.4	1.1	1.0	0.9	0.7	0.9	1.2	1.2	1.2	1.1	0.8	0.9	1.2	1.0
Apple, Pear, Cherry, Plum and Prune	**Apple, Pear, Cherry, Plum, Prune, Olives**	0.0	1.2	0.4	0.4	0.4	0.9	1.0	1.0	1.0	0.9	0.7	0.4	1.0	0.8
Apples, Plums, Cherries etc w/cover crop	Apples, Plums, Cherries etc w/cover crop	11,937.0	1.2	1.1	1.0	0.9	1.1	1.2	1.2	1.2	1.1	1.0	0.8	1.2	1.1
Grape Vines with 80% canopy	**Vineyards and Grapes**	0.0	1.2	0.4	0.3	0.2	0.5	0.8	0.8	0.8	0.5	0.2	0.4	1.0	0.6
Grape Vines with cover crop (80% canopy)	Vineyards and Grapes w/ cover crop	4,242.6	1.2	0.9	0.8	0.6	0.7	0.9	0.9	0.9	0.6	0.6	0.6	1.2	0.8
Immature Grapes Vines with 50% canopy	**Vineyards and Grapes (Immature)**	0.0	1.2	0.4	0.3	0.1	0.3	0.5	0.5	0.5	0.3	0.2	0.4	1.0	0.4
Tomatoes and Peppers	Tomatoes and Peppers	2,270.0	1.2	0.4	0.4	0.1	0.5	1.1	0.9	0.2	0.0	0.2	0.5	1.0	0.5
Misc. Deciduous	**Chestnuts, Orchard, Pecans, Persimmons**	0.0	1.2	0.4	0.4	0.4	0.9	0.9	0.9	0.9	0.9	0.6	0.4	1.0	0.8
Misc. Deciduous w/ cover crop	Chestnuts, Orchard, etc. w/ cover crop	1,494.0	1.2	1.1	1.0	0.9	1.0	1.1	1.1	1.2	1.1	1.0	0.8	1.2	1.1
Grain and Grain Hay*	**Barley, Grain, Hay, Oats, Wheat**	1,253.3	1.2	1.1	1.1	1.1	0.5	0.0	0.0	0.1	0.0	0.2	0.5	1.0	0.4
Corn and Grain Sorghum*	Corn	921.8	1.2	0.4	0.5	0.3	0.4	0.9	1.0	0.8	0.1	0.2	0.5	1.0	0.6
Peach, Nectarine and Apricots	**Peach, Nectarine and Apricots**	0.0	1.2	0.4	0.4	0.4	0.8	0.9	0.9	0.9	0.9	0.6	0.4	1.0	0.8
Peach, Nectarine, etc. w/ cover crop	Peach, Nectarine, etc. w/ cover crop	784.2	1.2	1.1	1.0	0.8	1.0	1.1	1.1	1.1	1.1	1.0	0.8	1.2	1.1
Immature Peaches, Nectarines, etc	**Peach, Nectarine and Apricots (Immature)**	0.0	1.2	0.4	0.3	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.4	1.0	0.5
Beans **	Beans	767.5	1.2	0.4	0.5	0.2	0.4	0.9	1.0	0.4	0.0	0.2	0.5	1.0	0.5
Alfalfa Hay and Clover*	**Alfalfa**	619.2	1.2	1.1	1.1	0.9	0.9	0.9	0.9	0.9	0.9	0.6	0.8	1.2	0.9
Melons, Squash, and Cucumbers	Melons, Squash, and Cucumbers	550.4	1.2	0.4	0.3	0.0	0.1	0.1	0.5	0.7	0.3	0.2	0.5	1.0	0.3
Flowers, Nursery and Christmas Tree	**Lilac**	373.0	1.2	0.4	0.4	0.4	0.9	0.9	0.9	0.9	0.9	0.6	0.4	1.0	0.8
Small Vegetables	Asparagus	345.7	1.2	0.7	0.9	1.0	0.2	0.0	0.0	0.2	0.2	0.4	0.7	1.2	0.4
Misc. field crops	**Pumpkin, Eggplant, Carrots, Row or Field crops**	332.1	1.2	0.4	0.5	0.2	0.4	0.9	1.0	0.5	0.0	0.2	0.5	1.0	0.5
Onions and Garlic	Onions	234.8	1.2	1.0	0.9	0.9	0.7	0.2	0.0	0.1	0.0	0.2	1.0	1.0	0.4
Almonds	**Almonds**	0.0	1.2	0.5	0.5	0.5	0.9	0.9	0.9	0.9	0.9	0.9	0.5	1.0	0.8
Almonds w/cover crop	Almonds w/cover crop	197.3	1.2	1.0	0.9	0.9	1.0	1.1	1.1	1.1	1.0	0.9	0.9	1.2	1.0
Immature Almonds	**Immature Almonds**	0.0	1.2	0.5	0.4	0.4	0.5	0.5	0.5	0.6	0.5	0.6	0.5	1.0	0.5
Strawberries	Strawberries, Blueberries, Berries	71.2	1.2	0.4	0.5	0.2	0.4	0.9	1.0	0.5	0.0	0.2	0.5	1.0	0.5
Pistachio	**Pistachio**	0.0	1.2	0.4	0.3	0.2	0.4	0.8	1.1	1.1	1.0	0.8	0.5	1.0	0.7
Pistachio w/ cover crop	Pistachio w/ cover crop	17.0	1.2	1.0	0.8	0.7	0.7	1.0	1.1	1.1	1.1	1.0	0.8	1.2	1.0
Immature Pistachio	**Immature Pistachio**	0.0	1.2	0.4	0.3	0.1	0.2	0.5	0.6	0.7	0.6	0.5	0.5	1.0	0.5
Citrus (no ground cover)	Citrus (no ground cover)	0.0	1.2	1.0	0.9	0.7	0.7	0.7	0.6	0.7	0.6	0.8	0.8	1.2	0.7
Immature Citrus	**Immature Citrus**	0.0	1.2	0.7	0.6	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.7	1.1	0.5
Potatoes, Sugar beets, Turnip etc..	Potatoes, Sugar beets, Turnip etc..	0.0	1.2	0.6	0.6	1.0	1.1	1.1	0.9	0.1	0.0	0.2	0.5	1.0	0.7
Cotton	**Cotton**	0.0	1.2	0.4	0.3	0.2	0.2	0.6	1.1	1.1	0.9	0.4	0.5	1.0	0.6
Avocado	Avocado	0.0	1.2	0.4	0.4	0.4	0.9	0.9	0.9	0.9	0.9	0.6	0.4	1.0	0.8
Misc Subtropical	**Misc Subtropical**	0.0	1.2	0.4	0.4	0.4	0.9	0.9	0.9	0.9	0.9	0.6	0.4	1.0	0.8
	Total Acreage	49,154.3													

* ETc data from Surface Irrigation Calculation
** ETc data from Sprinkler Irrigation Calculation

Formula: Kc = ETc/ETo

Estimated Applied Water Table for Irrigation Scheduling and Design
ETo Zone 12 Monthly Evapotranspiration
Typical Year

Estimated Total Crop Water Requirement for SEWD (for Typical year)

IRRIGATION TRAINING AND RESEARCH CENTER, California Polytechnic State University, San Luis Obispo (PUBLISHED DATA)
Table does not include adjustments for bare spots and reduced vigor

ITRC Crops	SEWD Crops	Acreage	Typical Year Jan inch	Feb inch	Mar inch	Apr inch	May inch	Jun inch	Jul inch	Aug inch	Sep inch	Oct inch	Nov inch	Dec inch	Annual Inches	Annual (AF)
Precipitation			6.8	0.3	1.3	0.2	0.2	0.2	0.1	0.3	0.1	0.6	4.2	2.1	16.5	
Effective Precipitation			0.7	0.3	1.3	0.2	0.2	0.2	0.1	0.3	0.1	0.6	1.1	1.0	6.2	
Grass Reference ETo			0.7	2.1	4.0	5.6	7.3	7.6	8.0	6.8	5.4	3.5	1.1	1.0	53.0	
Walnuts	Walnuts	0.0	0.1	0.8	0.5	2.0	7.0	10.1	10.7	8.8	6.4	2.5	0.0	0.0	48.8	4.1
Walnuts w/ cover crop	Walnuts w/ cover crop	22,743.4	0.1	2.3	2.6	4.3	8.4	11.6	12.1	10.1	7.4	2.6	0.0	0.2	61.7	5.1
Apple, Pear, Cherry, Plum and Prune	Apple, Pear, Cherry, Plum, Prune, Olives	0.0	0.1	0.8	0.3	2.7	7.9	8.8	9.4	7.7	6.0	2.1	0.0	0.0	45.7	3.8
Apples, Plums, Cherries etc w/cover crop	Apples, Plums, Cherries etc w/cover crop	11,937.0	0.1	2.6	3.4	5.8	9.6	11.0	11.7	9.6	7.6	3.5	0.0	0.3	65.2	5.4
Grape Vines with 80% canopy	Vineyards and Grapes	0.0	0.1	0.8	0.0	1.2	4.1	7.3	7.8	5.9	3.4	0.0	0.0	0.0	30.7	2.6
Grape Vines with cover crop (80% canopy)	Vineyards and Grapes w/ cover crop	4,242.6	0.2	2.1	2.3	3.6	6.3	8.3	8.8	6.9	4.2	1.8	0.0	0.2	44.6	3.7
Immature Grapes Vines with 50% canopy	Vineyards and Grapes (Immature)	0.0	0.2	0.8	0.0	0.8	2.6	4.4	4.8	3.6	2.0	0.0	0.0	0.0	19.1	1.6
Tomatoes and Peppers	Tomatoes and Peppers	2,270.0	0.2	0.8	0.4	0.7	4.4	9.7	8.9	1.0	0.0	0.0	0.0	0.0	26.0	2.2
Misc. Deciduous	Chestnuts, Orchard, Pecans, Persimmons	0.0	0.1	0.8	0.3	2.6	7.5	8.3	8.9	7.4	5.8	2.0	0.0	0.0	43.6	3.6
Misc. Deciduous w/ cover crop	Chestnuts, Orchard, etc. w/ cover crop	1,494.0	0.1	2.6	3.4	5.7	9.2	10.5	11.2	9.3	7.4	3.4	0.0	0.3	63.1	5.3
Grain and Grain Hay*	Barley, Grain, Hay, Oats, Wheat	1,253.3	0.2	2.5	3.9	7.4	4.6	0.0	0.0	0.0	0.0	0.0	0.0	0.1	18.6	1.5
Corn and Grain Sorghum*	Corn	921.8	0.2	0.8	1.0	1.5	3.0	8.5	10.0	6.5	0.5	0.0	0.0	0.0	31.8	2.7
Peach, Nectarine and Apricots	Peach, Nectarine and Apricots	0.0	0.1	0.8	0.3	2.4	7.3	8.3	8.9	7.4	5.7	2.0	0.0	0.0	43.1	3.6
Peach, Nectarine, etc. w/ cover crop	Peach, Nectarine, etc. w/ cover crop	784.2	0.1	2.6	3.4	5.6	9.0	10.5	11.2	9.3	7.3	3.3	0.0	0.3	62.6	5.2
Immature Peaches, Nectarines, etc	Peach, Nectarine and Apricots (Immature)	0.0	0.1	0.8	0.0	1.3	4.1	4.8	5.1	4.1	3.2	1.2	0.0	0.0	24.6	2.1
Beans **	Beans	767.5	0.2	0.8	1.0	1.2	3.0	8.7	9.4	3.4	0.0	0.0	0.0	0.0	27.6	2.3
Alfalfa Hay and Clover*	Alfalfa	619.2	0.2	2.5	3.6	6.2	8.1	8.5	8.8	7.0	6.1	1.9	0.0	0.2	53.1	4.4
Melons, Squash, and Cucumbers	Melons, Squash, and Cucumbers	550.4	0.2	0.8	0.0	0.0	1.0	1.0	5.0	5.7	1.8	0.0	0.0	0.0	15.5	1.3
Flowers, Nursery and Christmas Tree	Lilac	373.0	0.1	0.8	0.3	2.6	7.5	8.3	8.9	7.4	5.8	2.0	0.0	0.0	43.6	3.6
Small Vegetables	Asparagus	345.7	0.2	1.5	2.9	6.7	1.8	0.0	0.0	1.4	1.6	0.8	0.0	0.2	16.9	1.4
Misc. field crops	Pumpkin, Eggplant, Carrots, Row or Field crops	332.1	0.2	0.8	1.0	1.5	3.0	8.6	9.5	3.4	0.0	0.0	0.0	0.0	28.0	2.3
Onions and Garlic	Onions	234.8	0.2	2.2	2.9	5.7	6.2	1.4	0.0	0.0	0.0	0.0	0.0	0.1	18.8	1.6
Almonds	Almonds	0.0	0.1	0.9	0.6	3.5	7.8	8.4	8.9	7.3	5.8	3.0	0.0	0.0	46.4	3.9
Almonds w/cover crop	Almonds w/cover crop	197.3	0.1	2.3	2.7	5.8	9.3	9.9	10.3	8.6	6.7	3.2	0.0	0.2	59.3	4.9
Immature Almonds	Immature Almonds	0.0	0.1	0.9	0.3	2.2	4.7	5.0	5.3	4.5	3.4	1.7	0.0	0.0	27.9	2.3
Strawberries	Strawberries, Blueberries, Berries	71.2	0.2	0.8	1.0	1.5	3.0	8.6	9.5	3.4	0.0	0.0	0.0	0.0	28.0	2.3
Pistachio	Pistachio	0.0	0.1	0.8	0.0	1.2	3.1	7.3	10.5	8.8	6.7	2.7	0.0	0.0	41.0	3.4
Pistachio w/ cover crop	Pistachio w/ cover crop	17.0	0.1	2.3	2.5	4.4	6.3	8.9	11.1	9.2	7.3	3.7	0.0	0.2	56.0	4.7
Immature Pistachio	Immature Pistachio	0.0	0.1	0.8	0.0	0.6	1.7	4.4	6.2	5.4	4.0	1.4	0.0	0.0	24.6	2.0
Citrus (no ground cover)	Citrus (no ground cover)	0.0	0.1	2.4	2.8	4.6	5.8	6.1	6.3	5.3	4.3	2.7	0.0	0.2	40.6	3.4
Immature Citrus	Immature Citrus	0.0	0.2	1.6	1.5	2.5	3.5	3.6	3.8	3.2	2.5	1.6	0.0	0.1	24.0	2.0
Potatoes, Sugar beets, Turnip etc..	Potatoes, Sugar beets, Turnip etc..	0.0	0.2	1.2	1.6	6.7	9.5	9.9	8.8	0.1	0.0	0.0	0.0	0.0	37.8	3.2
Cotton	Cotton	0.0	0.2	0.8	0.0	1.0	1.9	5.6	10.4	8.8	6.2	0.9	0.0	0.0	35.7	3.0
Avocado	Avocado	0.0	0.1	0.8	0.3	2.6	7.5	8.3	8.9	7.4	5.8	2.0	0.0	0.0	43.6	3.6
Misc Subtropical	Misc Subtropical	0.0	0.1	0.8	0.3	2.6	7.5	8.3	8.9	7.4	5.8	2.0	0.0	0.0	43.6	3.6
	Total Acreage	49,154.3					Weighted Average Crop Water Requirement per acre								55.7	4.6

Note: Assumes 0.8 Distribution Uniformity

These values do not take into account extra water required for salinity or frost protection.

* ETc data from Surface Irrigation Calculation

** ETc data from Sprinkler Irrigation Calculation

Formula: Crop Water Required = (ETc - Effective Precipitation)/ DU

Appendix C:
Current Year ETc and Crop Water Requirement for Real-Time Irrigation Scheduling

ETo Zone 12 Monthly Evapotranspiration
Current Year
IRRIGATION TRAINING AND RESEARCH CENTER, California Polytechnic State University, San Luis Obispo (PUBLISHED DATA)
Table does not include adjustments for bare spots and reduced vigor

ITRC Crops	SEWD Crops	Acreage	Current Year (August 2013) Jan inch	Feb inch	Mar inch	Apr inch	May inch	Jun inch	Jul inch	Aug inch	Projected Crop Water Requirement for September**** Week 1 Sun 9/1-Sat 9/7 inch	Week 2 Sun 9/8-Sat 9/14 inch	Week 3 Sun 9/15-Sat 9/21 inch	Week 4 Sun 9/22-Sat 9/27 inch	Oct inch	Nov inch	Dec inch	To Date*** inches	To Date(AF)***
Precipitation			1.1	0.2	1.4	0.4	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0				3.1	
Effective Precipitation			1.1	0.2	1.4	0.4	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0				3.1	
Grass Reference ETo			1.3	2.2	3.6	5.9	7.0	7.8	8.4	7.24	1.4	1.5	1.4	1.2				48.9	
Walnuts	Walnuts	0.0	0.3	0.8	0.2	1.5	5.5	8.4	9.2	7.9	1.7	1.8	1.6	1.4				33.9	2.8
Walnuts w/ cover crop	Walnuts w/ cover crop	22,743.4	0.3	2.0	1.7	3.5	6.6	9.6	10.4	9.0	1.9	2.1	1.9	2.6				43.2	3.6
Apple, Pear, Cherry, Plum and Prune	Apple, Pear, Cherry, Plum, Prune, Olives	0.0	0.3	0.8	0.1	2.1	6.2	7.4	8.1	6.9	1.6	1.7	1.5	1.3				31.8	2.7
Apples, Plums, Cherries etc w/cover crop	Apples, Plums, Cherries etc w/cover crop	11,937.0	0.3	2.3	2.3	4.8	7.5	9.2	10.1	8.6	2.0	2.1	1.9	1.7				45.0	3.8
Grape Vines with 80% canopy	Vineyards and Grapes	0.0	0.3	0.8	0.0	0.8	3.3	6.1	6.8	5.5	0.9	1.0	0.9	0.8				23.6	2.0
Grape Vines with cover crop (80% canopy)	Vineyards and Grapes w/ cover crop	4,242.6	0.4	1.9	1.5	2.9	5.0	6.9	7.6	6.2	1.1	1.2	1.1	0.9				32.4	2.7
Immature Grapes Vines with 50% canopy	Vineyards and Grapes (Immature)	0.0	0.4	0.8	0.0	0.5	2.2	3.7	4.2	3.4	0.5	0.6	0.5	0.5				15.1	1.3
Tomatoes and Peppers	Tomatoes and Peppers	2,270.0	0.4	0.8	0.2	0.4	3.5	8.1	7.7	1.2	0.0	0.0	0.0	0.0				22.2	1.9
Misc. Deciduous	Chestnuts, Orchard, Pecans, Persimmons	0.0	0.3	0.8	0.1	2.0	5.9	6.9	7.6	6.7	1.5	1.6	1.5	1.3				30.4	2.5
Misc. Deciduous w/ cover crop	Chestnuts, Orchard, etc. w/ cover crop	1,494.0	0.3	2.3	2.3	4.7	7.2	8.7	9.6	8.4	1.9	2.1	1.9	1.6				43.6	3.6
Grain and Grain Hay*	Barley, Grain, Hay, Oats, Wheat	1,253.3	0.4	2.2	2.7	6.1	3.7	0.2	0.2	0.4	0.0	0.0	0.0	0.0				15.7	1.3
Corn and Grain Sorghum*	Corn	921.8	0.4	0.8	0.6	1.1	2.4	7.1	8.6	5.9	0.2	0.2	0.2	0.1				26.8	2.2
Peach, Nectarine and Apricots	Peach, Nectarine and Apricots	0.0	0.3	0.8	0.1	1.9	5.7	6.9	7.6	6.7	1.5	1.6	1.4	1.3				30.1	2.5
Peach, Nectarine, etc. w/ cover crop	Peach, Nectarine, etc. w/ cover crop	784.2	0.3	2.3	2.3	4.6	7.0	8.7	9.6	8.3	1.9	2.0	1.9	1.6				43.3	3.6
Immature Peaches, Nectarines, etc	Peach, Nectarine and Apricots (Immature)	0.0	0.3	0.8	0.0	0.9	3.3	4.1	4.4	3.9	0.9	0.9	0.8	0.7				17.7	1.5
Beans **	Beans	767.5	0.4	0.8	0.6	0.9	2.5	7.2	8.1	3.2	0.0	0.0	0.0	0.0				23.7	2.0
Alfalfa Hay and Clover*	Alfalfa	619.2	0.4	2.2	2.5	5.1	6.3	7.1	7.6	6.4	1.6	1.7	1.5	1.4				37.6	3.1
Melons, Squash, and Cucumbers	Melons, Squash, and Cucumbers	550.4	0.4	0.8	0.0	0.0	0.9	1.0	4.4	5.2	0.5	0.5	0.5	0.4				12.7	1.1
Flowers, Nursery and Christmas Tree	Lilac	373.0	0.3	0.8	0.1	2.0	5.9	6.9	7.6	6.7	1.5	1.6	1.5	1.3				30.4	2.5
Small Vegetables	Asparagus	345.7	0.4	1.4	1.9	5.5	1.5	0.2	0.2	1.5	0.4	0.5	0.4	0.4				12.6	1.0
Misc. field crops	Pumpkin, Eggplant, Carrots, Row or Field crops	332.1	0.4	0.8	0.6	1.1	2.5	7.2	8.1	3.3	0.0	0.0	0.0	0.0				24.0	2.0
Onions and Garlic	Onions	234.8	0.4	2.0	2.0	4.7	4.9	1.3	0.2	0.4	0.0	0.0	0.0	0.0				15.8	1.3
Almonds	Almonds	0.0	0.3	0.8	0.3	2.8	6.2	7.0	7.7	6.6	1.5	1.6	1.5	1.3				31.8	2.6
Almonds w/cover crop	Almonds w/cover crop	197.3	0.3	2.1	1.8	4.8	7.2	8.2	8.9	7.8	1.8	1.9	1.7	1.5				41.2	3.4
Immature Almonds	Immature Almonds	0.0	0.3	0.8	0.1	1.7	3.8	4.2	4.6	4.2	0.9	1.0	0.9	0.8				19.7	1.6
Strawberries	Strawberries, Blueberries, Berries	71.2	0.4	0.8	0.6	1.1	2.5	7.2	8.1	3.3	0.0	0.0	0.0	0.0				24.0	2.0
Pistachio	Pistachio	0.0	0.3	0.8	0.0	0.8	2.5	6.1	9.0	7.9	1.8	1.9	1.7	1.5				27.5	2.3
Pistachio w/ cover crop	Pistachio w/ cover crop	17.0	0.3	2.1	1.7	3.5	5.0	7.4	9.5	8.3	1.9	2.0	1.8	1.6				37.8	3.1
Immature Pistachio	Immature Pistachio	0.0	0.3	0.8	0.0	0.4	1.4	3.7	5.4	4.9	1.1	1.1	1.0	0.9				17.0	1.4
Citrus (no ground cover)	Citrus (no ground cover)	0.0	0.3	2.1	1.9	3.8	4.6	5.2	5.5	4.5	1.1	1.2	1.1	1.0				28.2	2.3
Immature Citrus	Immature Citrus	0.0	0.4	1.5	0.9	2.0	2.8	3.1	3.4	3.1	0.7	0.7	0.7	0.6				17.1	1.4
Potatoes, Sugar beets, Turnip etc..	Potatoes, Sugar beets, Turnip etc..	0.0	0.4	1.1	1.0	5.6	7.4	8.2	7.6	0.5	0.0	0.0	0.0	0.0				31.6	2.6
Cotton	Cotton	0.0	0.4	0.8	0.0	0.7	1.6	4.7	8.9	7.9	1.6	1.7	1.6	1.4				25.0	2.1
Avocado	Avocado	0.0	0.3	0.8	0.1	2.0	5.9	6.9	7.6	6.7	1.5	1.6	1.5	1.3				30.4	2.5
Misc Subtropical	Misc Subtropical	0.0	0.3	0.8	0.1	2.0	5.9	6.9	7.6	6.7	1.5	1.6	1.5	1.3				30.4	2.5
	Total Acreage	49,154.3																	

Note: Assumes 0.8 Distribution Uniformity

These values do not take into account extra water required for salinity or frost protection.

* ETc data from Surface Irrigation Calculation

** ETc data from Sprinkler Irrigation Calculation

*** To Date does not include Projected Values

Formula: Crop Water Required = (ETc - Effective Precipitation)/ DU

****Projected Crop Water Requirement is an Estimate and should be checked against the actual conditions in the field

Formula: Projected Weekly Crop Water Required = (Projected Weekly ETc - Projected Weekly Effective Precipitation)/ DU

ETc Table for Irrigation Scheduling and Design
Zone 12 Monthly Evapotranspiration

Current Crop Evapotranspiration for SEWD

Current Year

IRRIGATION TRAINING AND RESEARCH CENTER, California Polytechnic State University, San Luis Obispo (PUBLISHED DATA)

Table does not include adjustments for bare spots and reduced vigor

ITRC Crops	SEWD Crops	Acreage	Current Year (June) Jan Inch	Feb Inch	Mar Inch	Apr Inch	May Inch	Jun Inch	Jul Inch	Aug Inch	Projected Crop Water Requirement for September: Week 1 Sun 9/1-Sat 9/7 Inch	Week 2 Sun 9/8-Sat 9/14 Inch	Week 3 Sun 9/15-Sat 9/21 Inch	Week 4 Sun 9/22-Sat 9/27 Inch	Oct Inch	Nov Inch	Dec Inch	To Date*** Inches	To Date***(AF)
Precipitation			1.1	0.2	1.4	0.4	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0				3.1	
Effective Precipitation			1.1	0.2	1.4	0.4	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0				3.1	
Grass Reference ETo			1.5	2.2	5.6	5.9	7.0	7.8	8.4	7.2	1.4	1.5	1.4	1.2				48.9	
Walnuts	Walnuts	0.0	1.4	1.0	1.5	1.9	5.5	8.5	9.2	7.9	1.3	1.4	1.3	1.1				37.0	3.1
Walnuts w/ cover crop	Walnuts w/ cover crop	22,743.4	1.4	2.2	3.1	3.9	6.6	9.7	10.4	9.0	1.5	1.6	1.5	1.3				46.1	3.9
Apple, Pear, Cherry, Plum and Prune	Apple, Pear, Cherry, Plum, Prune, Olives	0.0	1.4	1.0	1.4	2.5	6.2	7.4	8.1	6.9	1.3	1.3	1.2	1.1				35.0	2.9
Apples, Plums, Cherries etc w/cover crop	Apples, Plums, Cherries etc w/cover crop	11,937.0	1.4	2.5	3.7	5.2	7.5	9.2	10.1	8.6	1.6	1.5	1.1	1.4				48.1	4.0
Grape Vines with 80% canopy	Vineyards and Grapes	0.0	1.4	1.0	1.1	1.2	3.4	6.2	6.8	5.5	0.7	0.8	0.7	0.6				26.5	2.2
Grape Vines with cover crop (80% canopy)	Vineyards and Grapes w/ cover crop	4,242.6	1.5	2.1	2.9	3.3	5.0	7.0	7.6	6.2	0.9	0.9	0.9	0.8				35.5	3.0
Immature Grapes Vines with 50% canopy	Vineyards and Grapes (Immature)	0.0	1.5	1.0	1.1	0.9	2.2	3.8	4.2	3.4	0.4	0.3	0.6	1.1				18.0	1.5
Tomatoes and Peppers	Tomatoes and Peppers	2,270.0	1.5	1.0	1.5	0.8	3.5	8.1	7.7	1.2	0.0	0.0	0.0	0.0				25.3	2.1
Misc. Deciduous	Chestnuts, Orchard, Pecans, Persimmons	0.0	1.4	1.0	1.4	2.4	5.9	7.0	7.6	6.7	1.2	1.0	0.6	1.1				33.5	2.8
Misc. Deciduous w/ cover crop	Chestnuts, Orchard, etc. w/ cover crop	1,494.0	1.4	2.5	3.7	5.1	7.2	8.8	9.6	8.4	1.5	1.6	1.5	1.3				46.7	3.9
Grain and Grain Hay*	Barley, Grain, Hay, Oats, Wheat	1,253.3	1.5	2.4	4.0	6.5	3.7	0.2	0.2	0.4	0.0	0.3	0.6	1.2				18.8	1.6
Corn and Grain Sorghum*	Corn	921.8	1.5	1.0	1.9	1.5	2.5	7.1	8.6	5.9	0.1	0.1	0.1	0.1				29.9	2.5
Peach, Nectarine and Apricots	Peach, Nectarine and Apricots	0.0	1.4	1.0	1.4	2.3	5.8	7.0	7.6	6.7	1.2	1.3	1.2	1.0				33.2	2.8
Peach, Nectarine, etc. w/ cover crop	Peach, Nectarine, etc. w/ cover crop	784.2	1.4	2.5	3.7	5.0	7.0	8.8	9.6	8.3	1.5	1.6	1.5	1.3				46.4	3.9
Immature Peaches, Nectarines, etc	Peach, Nectarine and Apricots (Immature)	0.0	1.4	1.0	1.2	1.3	3.3	4.1	4.4	3.9	0.7	0.7	0.7	0.6				20.7	1.7
Beans **	Beans	767.5	1.5	1.0	1.9	1.5	2.5	7.3	8.1	3.2	0.0	0.0	0.0	0.0				26.8	2.2
Alfalfa Hay and Clover*	Alfalfa	619.2	1.5	2.4	3.8	5.5	6.4	7.2	7.6	6.4	1.3	1.4	1.2	1.1				40.7	3.4
Melons, Squash, and Cucumbers	Melons, Squash, and Cucumbers	550.4	1.5	1.0	1.0	0.2	1.0	1.0	4.4	3.2	0.4	0.4	0.4	0.3				15.3	1.3
Flowers, Nursery and Christmas Tree	Lilac	373.0	1.4	1.0	1.4	2.4	5.9	7.0	7.6	6.7	1.2	1.3	1.2	1.0				33.5	2.8
Small Vegetables	Asparagus	345.7	1.5	1.5	3.3	5.9	1.5	0.2	0.2	1.5	0.3	0.4	0.3	0.3				15.7	1.3
Misc. field crops	Pumpkin, Eggplant, Carrots, Row or Field crops	332.1	1.5	1.0	1.9	1.5	2.5	7.3	8.1	3.3	0.0	0.0	0.0	0.0				27.1	2.3
Onions and Garlic	Onions	234.8	1.5	2.2	3.3	5.1	4.9	1.4	0.2	0.4	0.0	0.0	0.0	0.0				18.9	1.6
Almonds	Almonds	0.0	1.4	1.0	1.6	3.2	6.2	7.1	7.7	6.6	1.2	1.3	1.2	1.0				34.9	2.9
Almonds w/cover crop	Almonds w/cover crop	197.3	1.4	2.3	3.2	5.2	7.3	8.3	8.9	7.8	1.4	1.5	1.4	1.2				44.3	3.7
Immature Almonds	Immature Almonds	0.0	1.4	1.0	1.4	2.1	3.8	4.9	4.6	4.2	0.7	0.8	0.7	0.6				22.8	1.9
Strawberries	Strawberries, Blueberries, Berries	71.2	1.5	1.0	1.9	1.5	2.5	7.3	8.1	3.3	0.0	0.0	0.0	0.0				27.1	2.3
Pistachio	Pistachio	0.0	1.4	1.0	1.0	1.2	2.5	8.2	9.0	7.9	1.4	1.5	1.4	1.2				30.2	2.5
Pistachio w/ cover crop	Pistachio w/ cover crop	17.0	1.4	2.3	3.0	3.9	5.0	7.5	9.5	8.3	1.5	1.6	1.5	1.3				40.9	3.4
Immature Pistachio	Immature Pistachio	0.0	1.4	1.0	1.0	0.7	1.5	3.8	5.4	4.9	0.8	0.9	0.8	0.7				19.7	1.6
Citrus (no ground cover)	Citrus (no ground cover)	0.0	1.4	2.3	3.2	4.1	4.6	5.2	5.5	4.9	0.9	1.0	0.9	0.8				31.3	2.6
Immature Citrus	Immature Citrus	0.0	1.5	1.6	2.3	2.4	2.9	3.1	3.4	3.1	0.5	0.6	0.5	0.5				20.2	1.7
Potatoes, Sugar beets, Turnip etc..	Potatoes, Sugar beets, Turnip etc..	0.0	1.5	1.3	2.3	5.9	7.4	8.3	7.6	0.5	0.0	0.0	0.0	0.0				34.8	2.9
Cotton	Cotton	0.0	1.5	1.0	1.0	1.1	1.6	4.8	8.9	7.9	1.3	1.4	1.3	1.1				27.8	2.3
Avocado	Avocado	0.0	1.4	1.0	1.4	2.4	5.9	7.0	7.6	6.7	1.2	1.3	1.2	1.0				33.5	2.8
Misc Subtropical	Misc Subtropical	0.0	1.4	1.0	1.4	2.4	5.9	7.0	7.6	6.7	1.2	1.3	1.2	1.0				33.5	2.8
	Total Acreage	49,154.3																	

Note: ETo for Cimis Spatial Data taken at 38.01 N 121.17 N. Precipitation data taken from CIMIS Station 70, Manteca, CA

* ETc data from Surface Irrigation Calculation

** ETc data from Sprinkler Irrigation Calculation

*** To Date does not include Projected Values

Projected Weekly ETc = (ETo from the selected dates of the previous year * Kc for Specific Month)

ATTACHMENT T

District Pump Efficiency Test Results, 2019

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Power Services, Inc.

6301 Bearden Lane
Modesto, CA 95357
209.527.2908 / 800.808.9283
209.527.2921 fax
www.powerhydrodynamics.com

Tuesday, June 25, 2019

Justin Hopkins
Stockton East Water District
PO Box 5157
Stockton, CA 952055157

Dear Justin Hopkins:

Enclosed are the results of your pump test. The results are based on conditions during the time of the test. If these conditions vary from the normal operation of your pump, the results shown may not describe the pump's normal performance.

Some of the factors, which influence pump performance, are:

- Changes in discharge pressures
- Changes in water table level and well yield
- Pump wear
- Proper pump design for application

We offer the following services to help our customers save time and money. Pump testing, irrigation system analysis, irrigation water management, and electric rate management. Visit our website at www.powerhydrodynamics.com for more information or to use our water cost calculator.

Please feel free to call 209-527-2908 if you have questions about this test or on the other services that Power Services has to offer.

Regards,

William Thomas Power, III

Enclosures

Power Services, Inc.

6301 Bearden Lane
Modesto, CA 95357
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209.527.2921 fax
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CONFIDENTIAL/PROPRIETARY INFORMATION

Justin Hopkins
Stockton East Water District
PO Box 5157
Stockton, CA 952055157

Tuesday, June 25, 2019

SUBJECT: PUMPING COST ANALYSIS
HP: 30.00 Plant: 4000 Lift Pump
PUMP TEST REFERENCE NUMBER: PT-22922
PUMP TEST RUN: Run 1

The following Pumping Cost Analysis is presented as an aid to your cost accounting. This analysis is an estimate prepared from operating criteria supplied from the pump test performed Jun 24th 2019 and information provided by you during the pump test.

It is recommended and assumed that:

1. **Overall plant efficiency can be improved to: 61%**
2. **Water requirements will be the same as for the past year.**
3. **All operating conditions (annual hours of operation, discharge head, and water pumping level) will remain the same as they were at the time of the pump test.**

	EXISTING PLANT EFFICIENCY	IMPROVED PLANT EFFICIENCY	SAVINGS
kWh/AF	35.1	26.8	8.3
Estimated Total kWh	26,411	20,159	6,252
Average Cost per kWh	$0.18	$0.18	
Average Cost per hour	$4.88	$5.05	*
Cost Per Acre Ft.	$6.48	$4.95	$1.53
Estimated Acre Ft. Per Year	752.37	752.37	
Run Hours	1,000.00	1,000.00	
Overall Plant Efficiency	46.6%	61%	
Estimated Total Annual Cost	$4,875.95	$3,721.72	$1,154.23

It is sincerely hoped that this information will prove helpful to you, and that your concerns over maintaining optimum pumping efficiency will be continued.
If you have any questions, please contact Bill Power at (209) 527-2908.

Regards,

William Thomas Power, III

Enclosures

Power Services, Inc.

6301 Bearden Lane
Modesto, CA 95357
209.527.2908 / 800.808.9283
209.527.2921 fax
www.powerhydrodynamics.com

Report ID: PT-22922

Agricultural and Domestic Pump Test Report
Stockton East Water District - 4000 Lift Pump - Run 1

Latitude: 38.4079W	Longitude: -121.2780N	Elevation: 101 ft
Test Date: Jun 24th 2019	Tester: Bill Power	Nameplate HP: 30.00 hp

Customer Information

Stockton East Water District

PO Box 5157
Stockton, CA 952055157

Contact: Justin Hopkins
Phone: 209-948-0333
Cell: 209-444-3150

Power Company Data

PG&E

Meter #: 1010088982
Rate Schedule: AG5B
Average Cost: $0.18

Equipment Data

Motor Make: General Electric
Volts/Amps: 460V/39.5A
Serial#: AJJ151484
Pump Make: Johnston
Pump Type: Propeller
Drive Type: Electric Motor
Gearhead Make:

Hydraulic Data

Standing Water Level (SWL): 0.00 ft
Recovered Water Level (RWL): 0.00 ft
Pumping Water Level (PWL): 10.20 ft
Drawdown: 0 ft
Discharge Pressure: 2.50 lb/sqft
Discharge Level: 5.775 ft
Total Lift: 15.975 ft
Well Yield: 0 gpm/ft
Water Source: River

Flow Data

Run Number: 1 of 1
Measured Flow: 4086 gpm
Customer Flow: 0 gpm
Flow Velocity: 8.75 ft/sec
Acre Feet per 24 Hr: 18.08
Cubic Feet Per Second (CFS): 9.1 ft
Discharge Pressure: 2.5 psi

Power Data

Horsepower Input to Motor: 35.4 hp
Brake Horsepower: 31.86 hp
Kilowatt Input to Motor: 26.41 kW
Energy Cost: $4.88/hr
Name Plate RPM: 1170 rpm

Percent of Rated Motor Load: 106%
Kilowatt Hours per Acre Foot: 35.1
Cost to Pump an Acre Foot: $6.48
Overall Plant Efficiency: 46.56%
Water Horsepower: 16.48 hp
Run Hours: 1000

Remarks

All results are based on conditions during the time of the test. If these conditions vary from the normal operation of your pump, the results shown may not describe the pump's normal performance.

Overall efficiency of this plant is considered to be low assuming this run represents plant's normal operating condition.

This pump has an adequate test section.

This pump did not have a flow meter.

HPI measured with direct read KWI.

Based on information obtained at the time the test was performed, this test represents the pumps standard operating conditions.

Vibration Analysis was performed on this pump.

Power Services, Inc.

Vibration Analysis

Customer Name: Stockton East Water District

Location: 4000 Lift Pump

Date: 6/24/2019

Run Number	PSI	GPM	RPM	Hertz	VFD	Highest Vibration level	Measurement Location
1	2.5	4086	1170	60	No	0.1125	Motor Top Horizontal

Notes:

1. This pump is in the OK stage of the vibration standards set forth in HI 9.6.4
2. This Pump Passed the Vibration Test

Horizontal = inline with discharge
Vertical = 90° off discharge
Axial = Down shaft

HI 9.6.4	> .129	in/s rms	OK
For Design Point	0.13	in/s rms	Warning
	0.2	in/s rms	Alert
	0.3	in/s rms	Danger

Overall Vibration Report

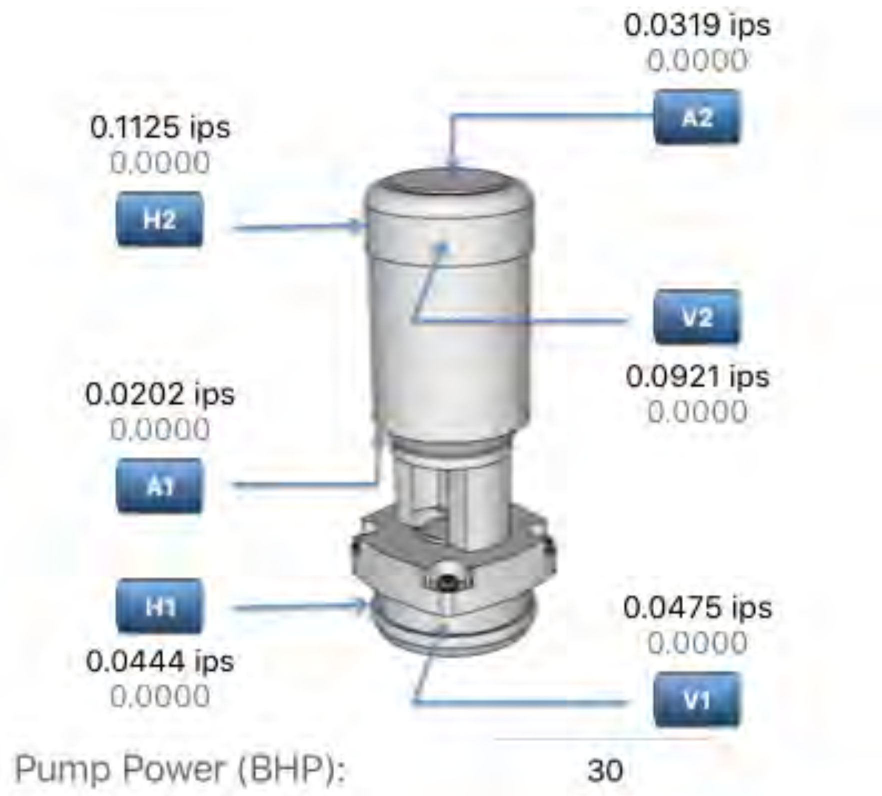
Date / Time: Jun 24, 2019 14:59:59 PM

Staff Name: Bill Power

Location: SEWD

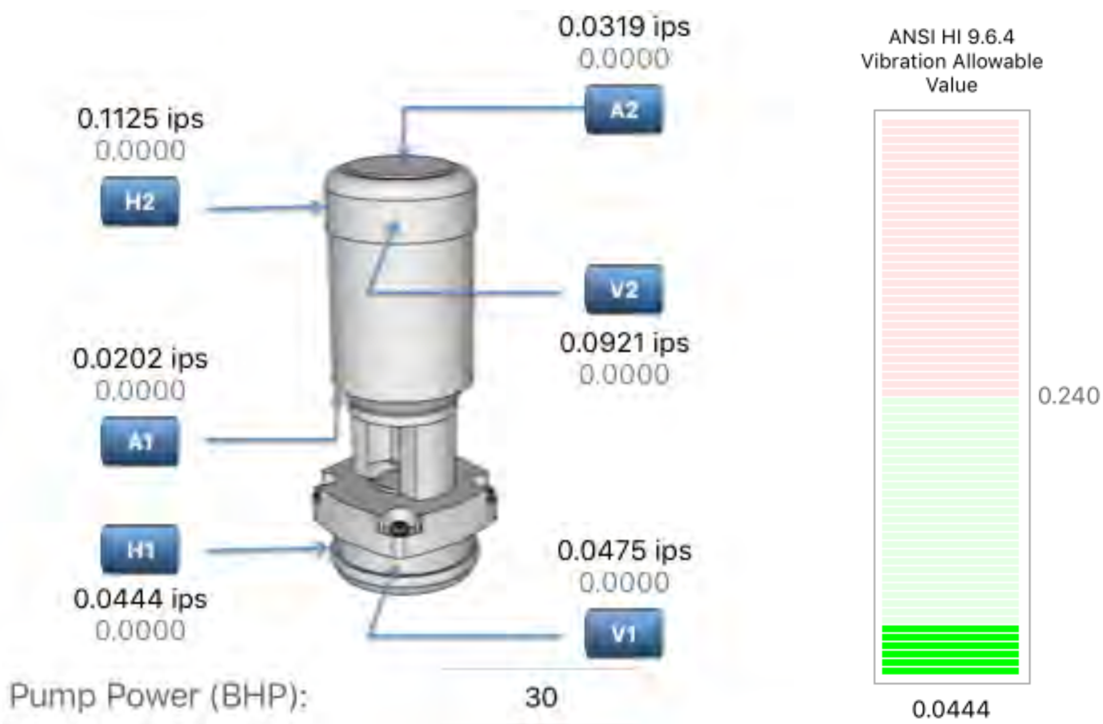
Machine ID: 4000

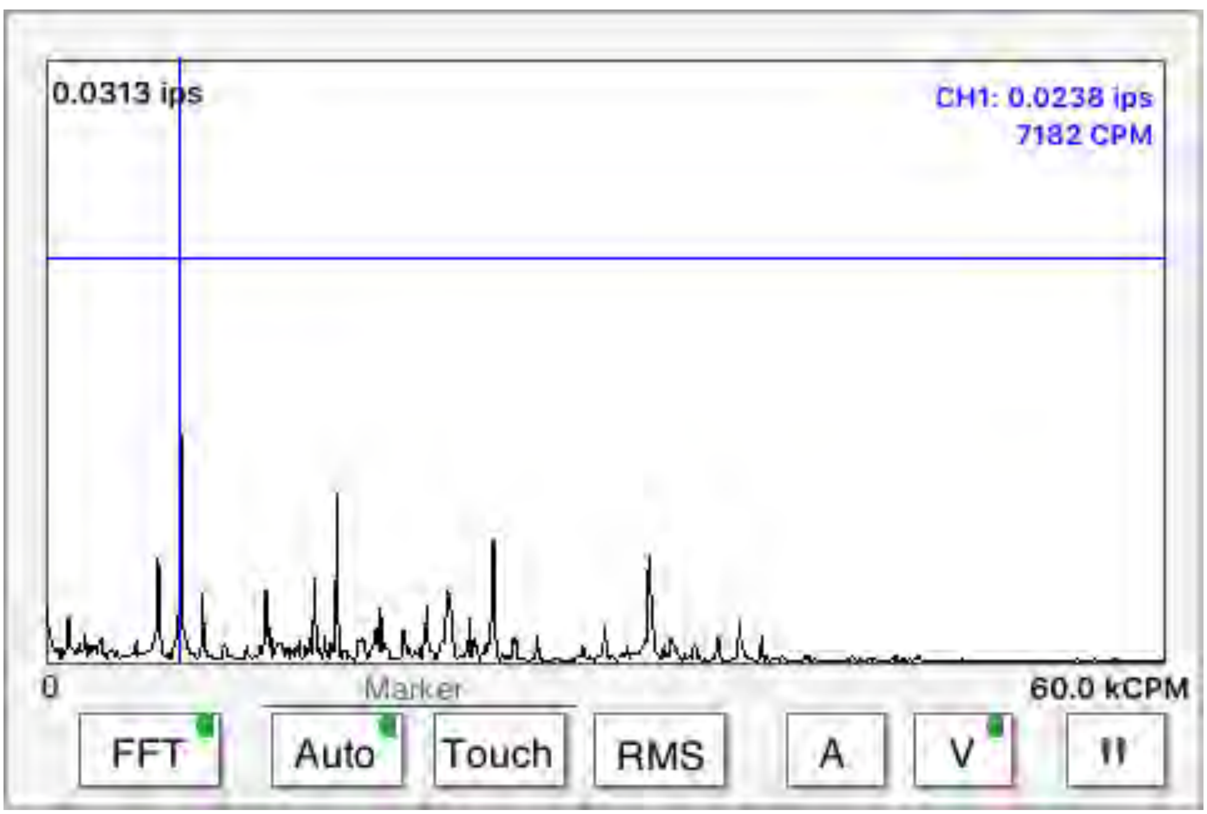
Vibration units in: ips



Notes

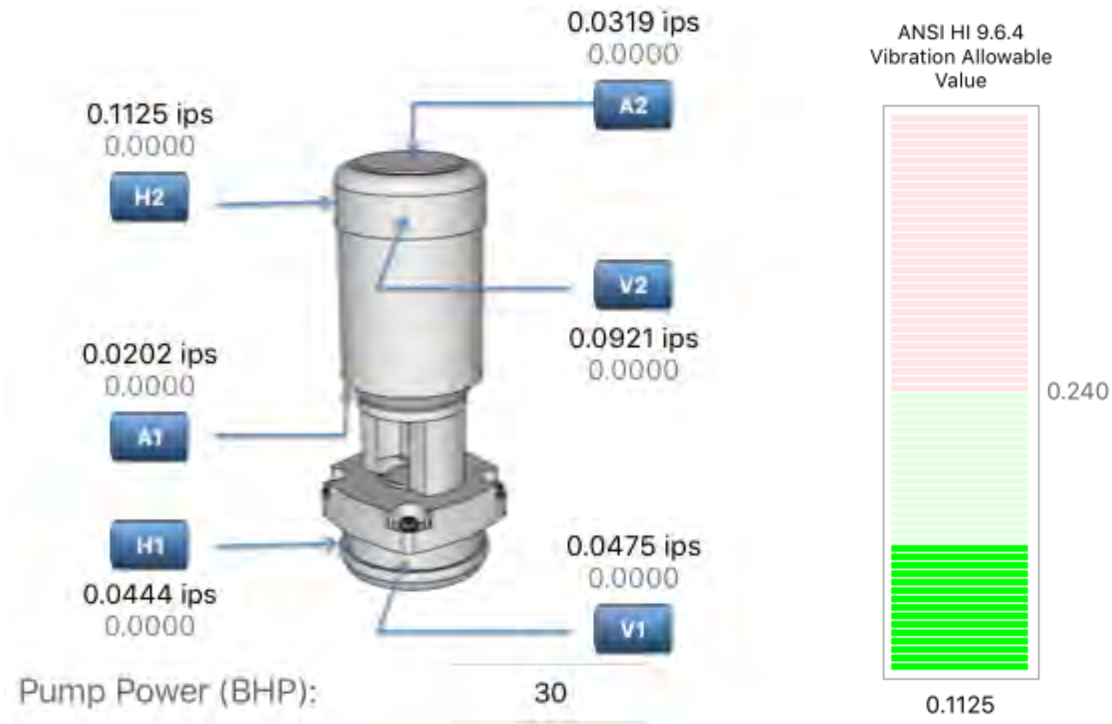
Point H1

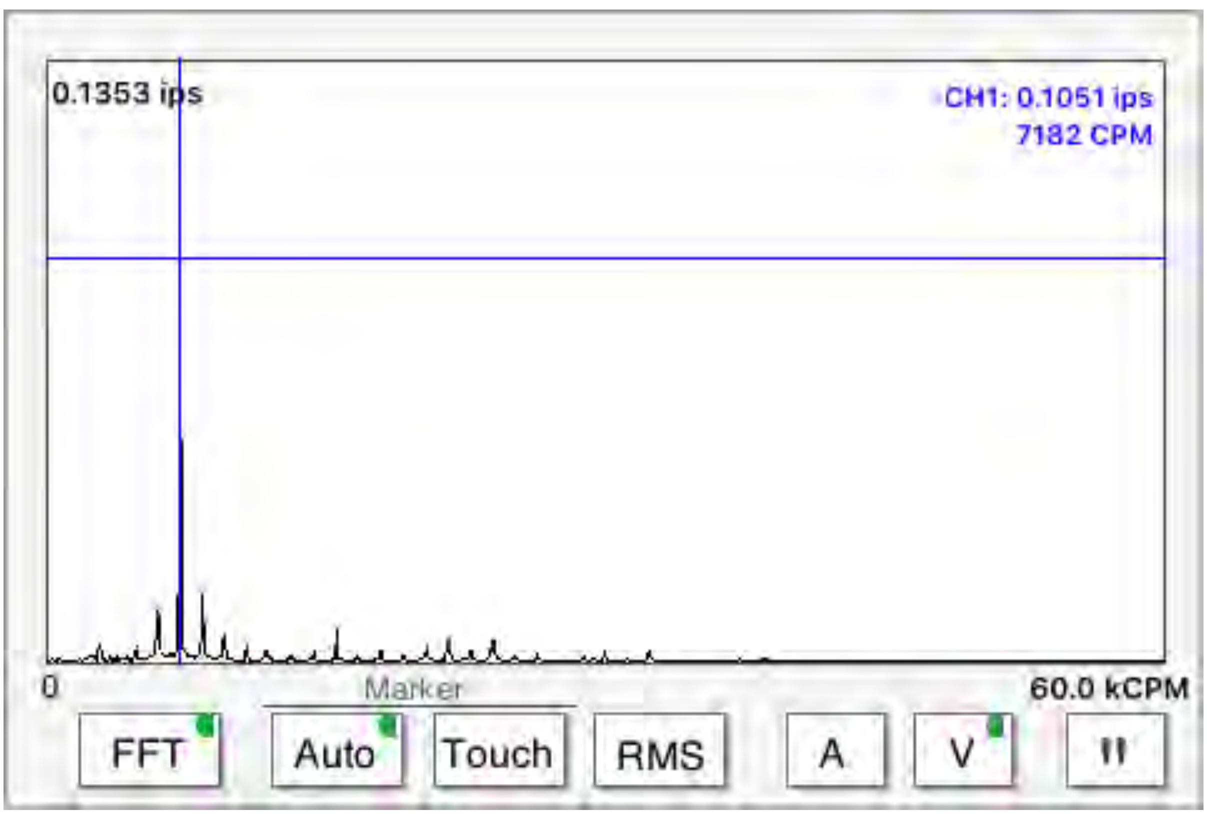




Vibration Spectrum/Time-Waveform for point H1

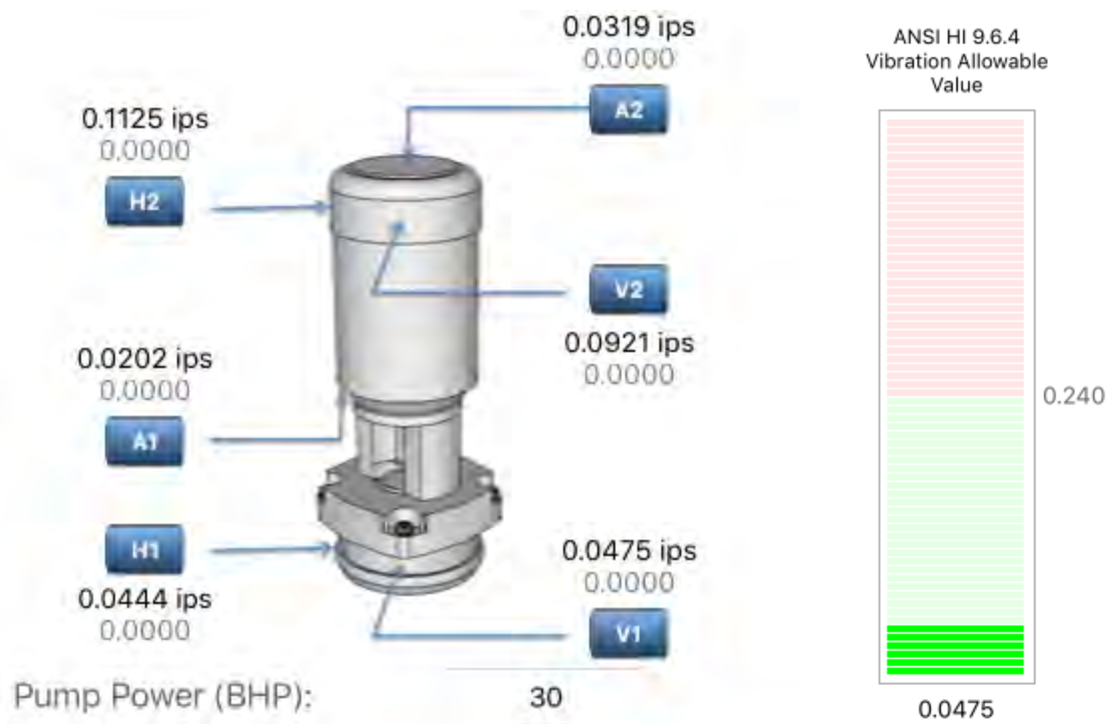
Point H2

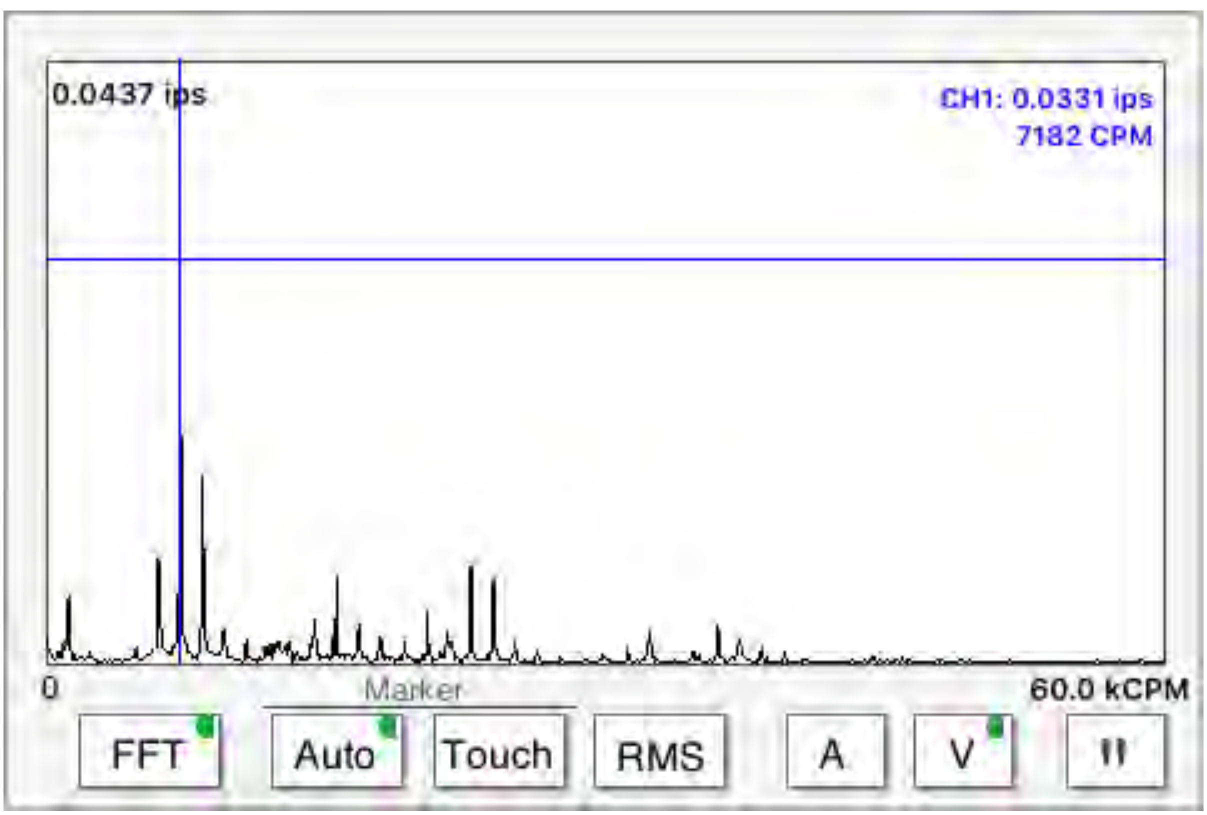




Vibration Spectrum/Time-Waveform for point H2

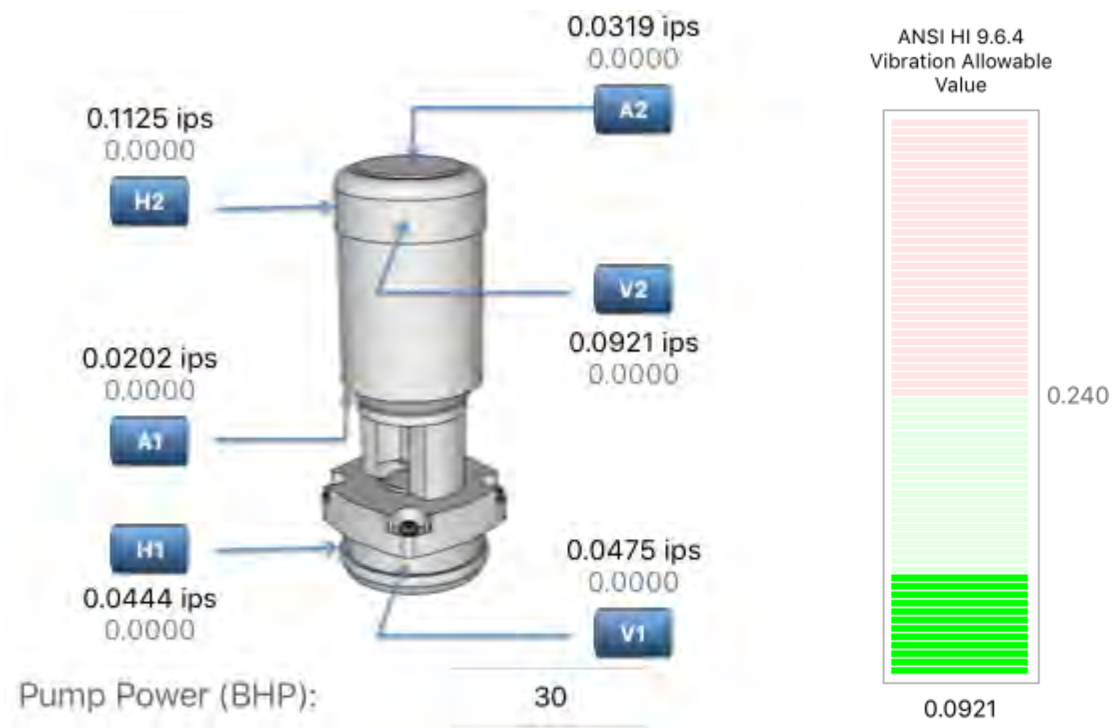
Point V1

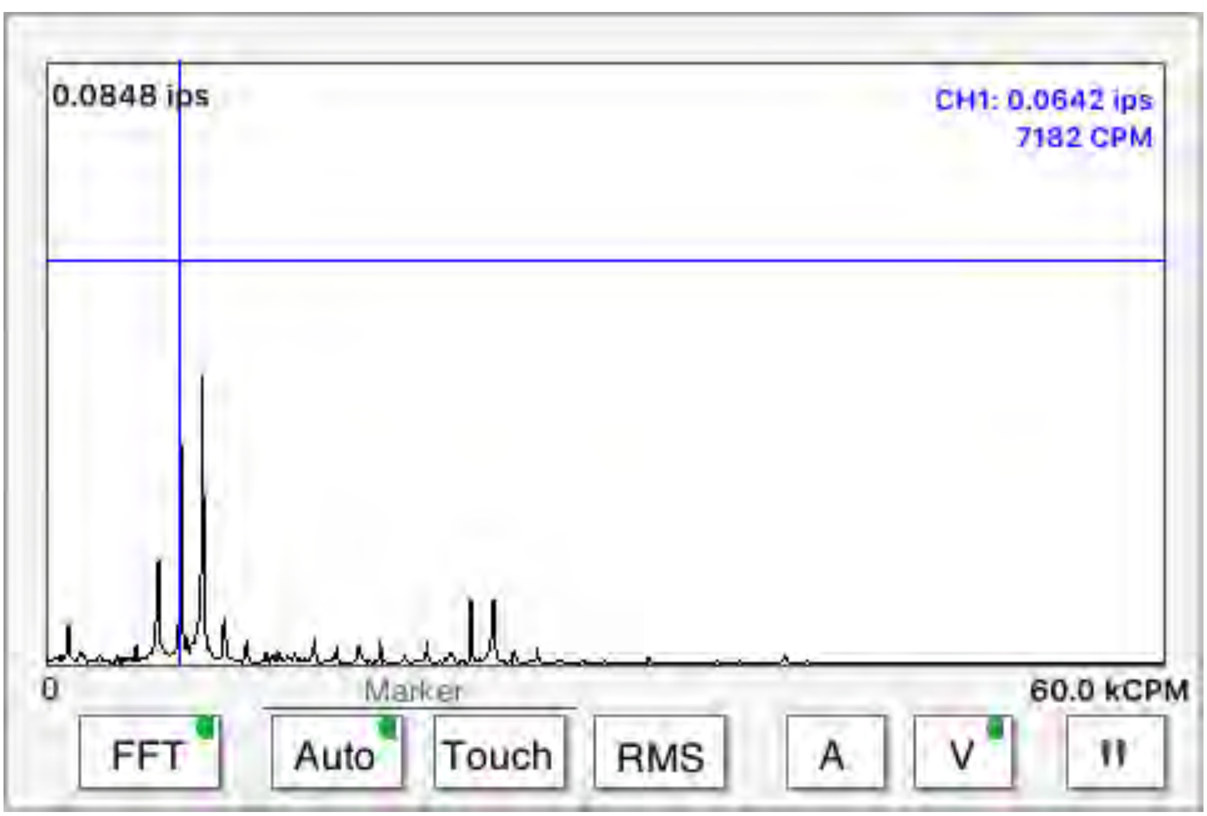




Vibration Spectrum/Time-Waveform for point V1

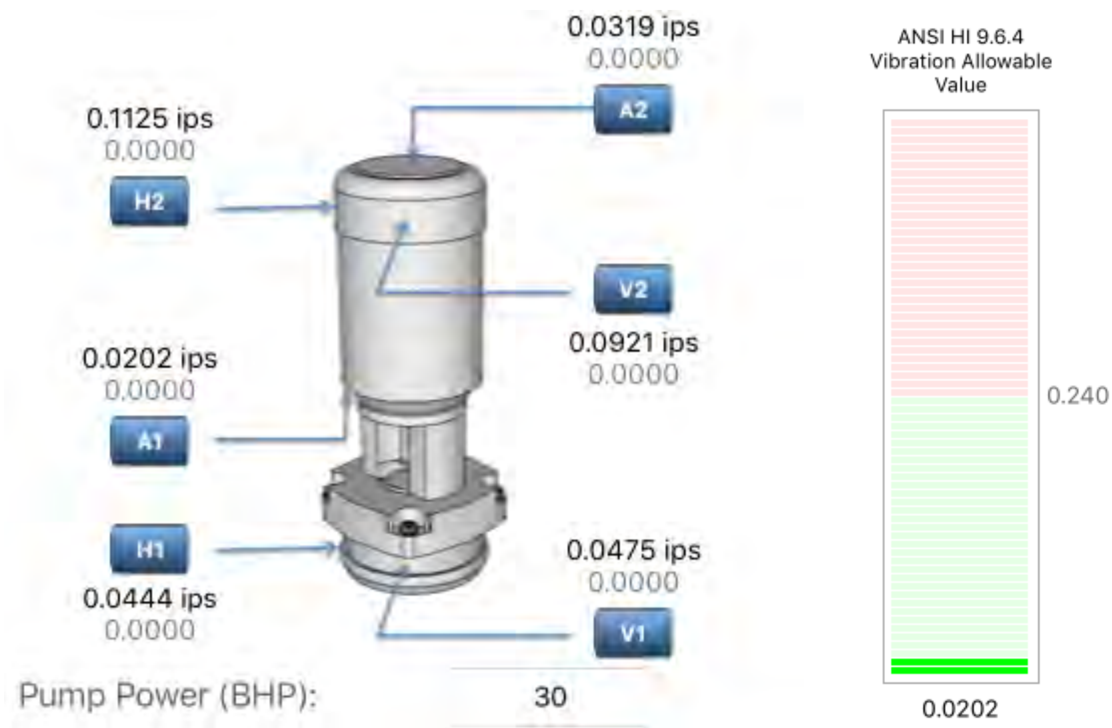
Point V2

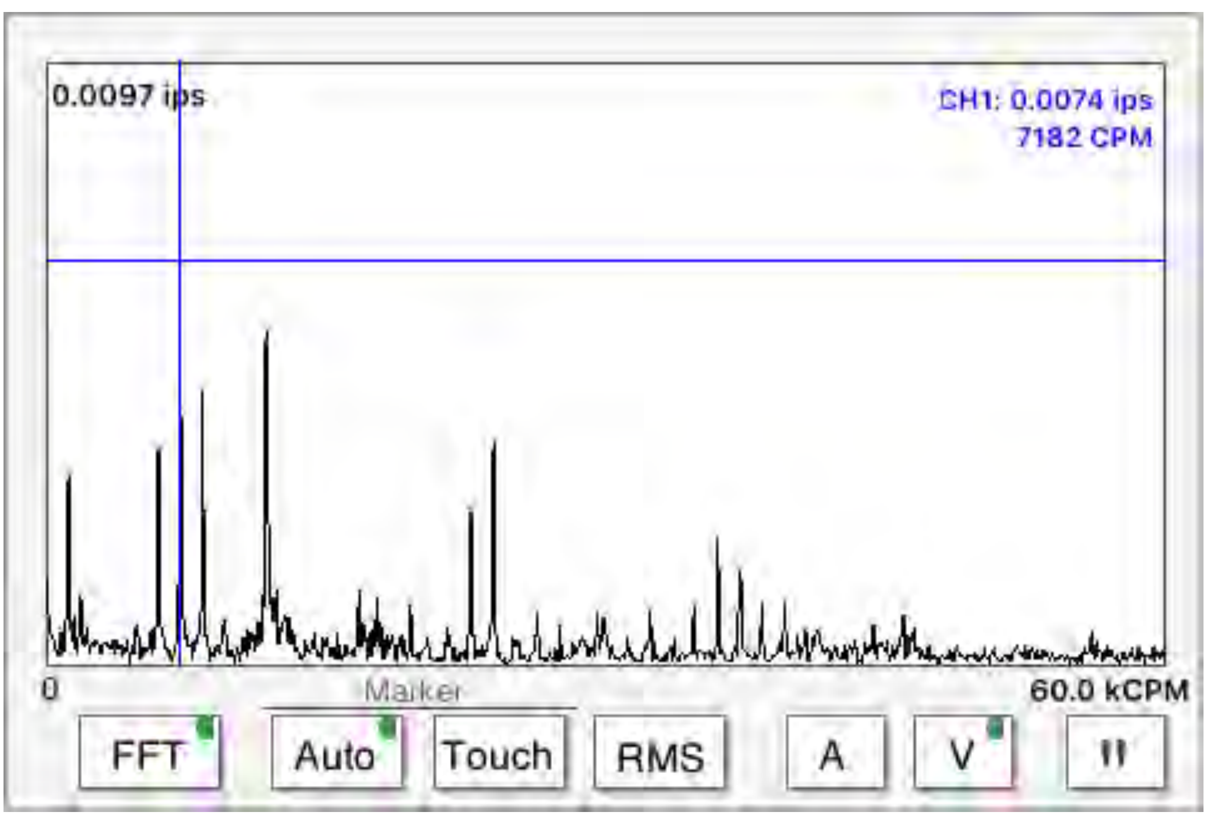




Vibration Spectrum/Time-Waveform for point V2

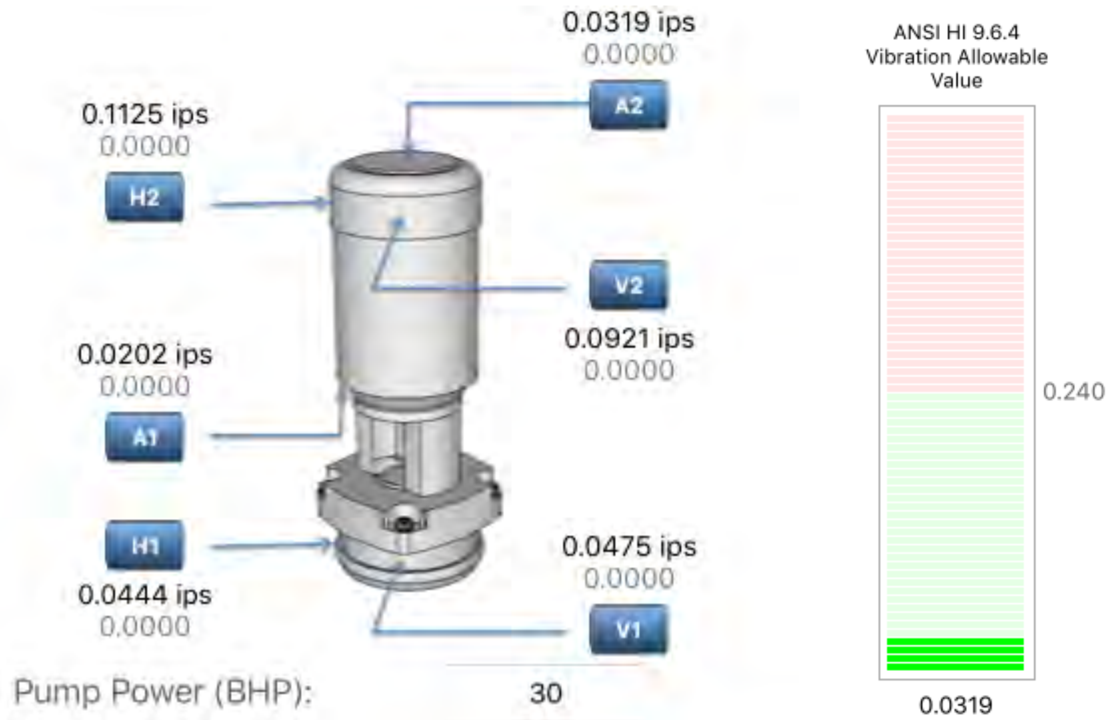
Point A1

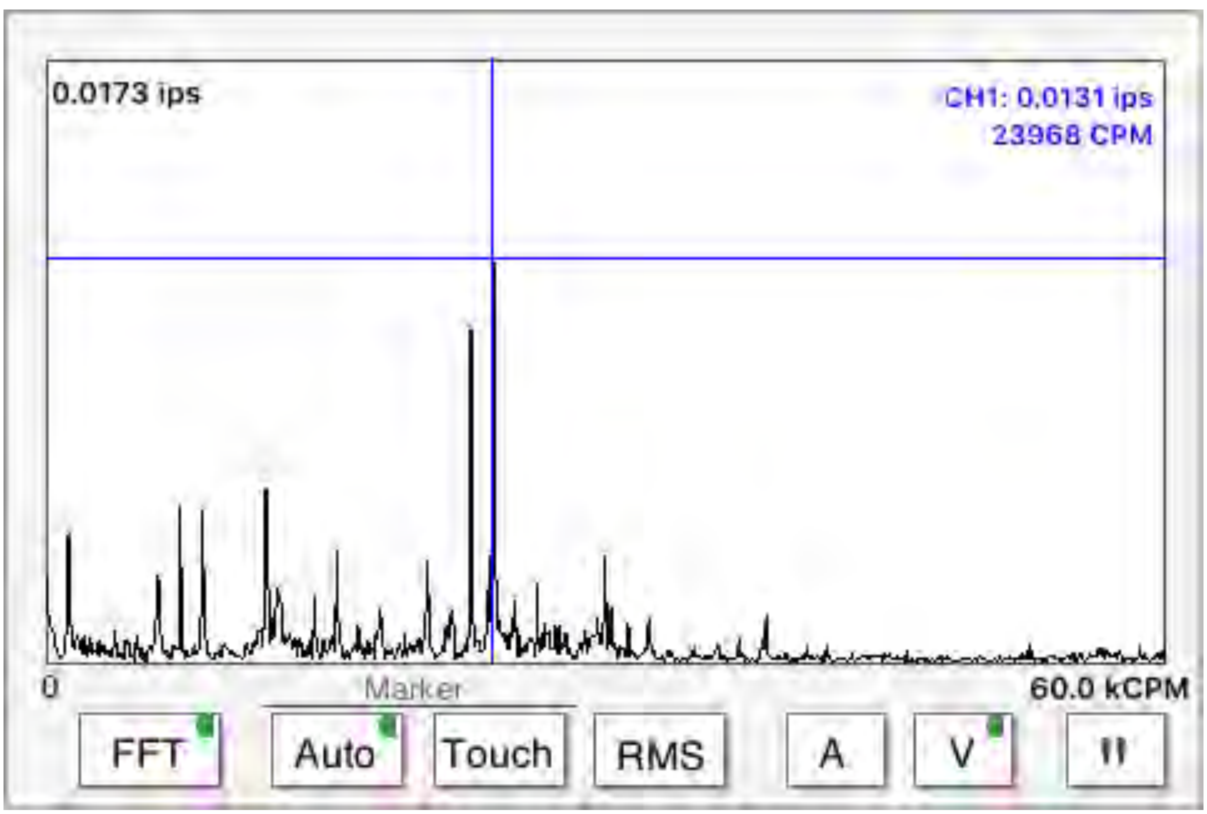




Vibration Spectrum/Time-Waveform for point A1

Point A2





Vibration Spectrum/Time-Waveform for point A2

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Power Services, Inc.

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CONFIDENTIAL/PROPRIETARY INFORMATION

Justin Hopkins
Stockton East Water District
PO Box 5157
Stockton, CA 952055157

Tuesday, June 25, 2019

SUBJECT: PUMPING COST ANALYSIS
HP: 60.00 Plant: 8000 Lift Pump
PUMP TEST REFERENCE NUMBER: PT-22923
PUMP TEST RUN: Run 1

The following Pumping Cost Analysis is presented as an aid to your cost accounting. This analysis is an estimate prepared from operating criteria supplied from the pump test performed Jun 24th 2019 and information provided by you during the pump test.

It is recommended and assumed that:

1. **Overall plant efficiency can be improved to: 64%**
2. **Water requirements will be the same as for the past year.**
3. **All operating conditions (annual hours of operation, discharge head, and water pumping level) will remain the same as they were at the time of the pump test.**

	EXISTING PLANT EFFICIENCY	IMPROVED PLANT EFFICIENCY	SAVINGS
kWh/AF	26.3	25.8	0.5
Estimated Total kWh	43,231	42,419	812
Average Cost per kWh	$0.18	$0.18	
Average Cost per hour	$7.98	$9.99	*
Cost Per Acre Ft.	$4.86	$4.77	$0.09
Estimated Acre Ft. Per Year	1,643.02	1,643.02	
Run Hours	1,000.00	1,000.00	
Overall Plant Efficiency	62.8%	64%	
Estimated Total Annual Cost	$7,981.34	$7,831.37	$149.97

It is sincerely hoped that this information will prove helpful to you, and that your concerns over maintaining optimum pumping efficiency will be continued.
If you have any questions, please contact Bill Power at (209) 527-2908.

Regards,

William Thomas Power, III

Enclosures

Power Services, Inc.

6301 Bearden Lane
Modesto, CA 95357
209.527.2908 / 800.808.9283
209.527.2921 fax
www.powerhydrodynamics.com

Report ID: PT-22923

Agricultural and Domestic Pump Test Report
Stockton East Water District - 8000 Lift Pump - Run 1

Latitude: 38.4088W | Longitude: -121.2758N | Elevation: 106 ft
Test Date: Jun 24th 2019 | Tester: Bill Power | Nameplate HP: 60.00 hp

Customer Information

Stockton East Water District

PO Box 5157
Stockton, CA 952055157

Contact: Justin Hopkins
Phone: 209-948-0333
Cell: 209-444-3150

Power Company Data

PG&E

Meter #: 1010088982
Rate Schedule: AG5B
Average Cost: $0.18

Equipment Data

Motor Make: U.S.
Volts/Amps: 460V/69A
Serial#:
Pump Make: Johnston
Pump Type: Propeller
Drive Type: Electric Motor
Gearhead Make:

Hydraulic Data

Standing Water Level (SWL): 0.00 ft
Recovered Water Level (RWL): 0.00 ft
Pumping Water Level (PWL): 4.60 ft
Drawdown: 0 ft
Discharge Pressure: 5.00 lb/sqft
Discharge Level: 11.55 ft
Total Lift: 16.15 ft
Well Yield: 0 gpm/ft
Water Source: River

Flow Data

Run Number: 1 of 1
Measured Flow: 8923 gpm
Customer Flow: 0 gpm
Flow Velocity: 9.52 ft/sec
Acre Feet per 24 Hr: 39.48
Cubic Feet Per Second (CFS): 19.87 ft
Discharge Pressure: 5 psi

Power Data

Horsepower Input to Motor: 57.95 hp
Brake Horsepower: 52.73 hp
Kilowatt Input to Motor: 43.23 kW
Energy Cost: $7.98/hr
Name Plate RPM: 880 rpm
Measured RPM: 886 rpm

Percent of Rated Motor Load: 88%
Kilowatt Hours per Acre Foot: 26.31
Cost to Pump an Acre Foot: $4.86
Overall Plant Efficiency: 62.8%
Water Horsepower: 36.39 hp
Run Hours: 1000

Remarks

All results are based on conditions during the time of the test. If these conditions vary from the normal operation of your pump, the results shown may not describe the pump's normal performance.

Overall efficiency of this plant is considered to be good assuming this run represents plant's normal operating condition.

This pump has an adequate test section.

This pump did not have a flow meter.

HPI measured with direct read KWI.

Cost Analysis page is based on 1000 run time hours. Your savings may differ based on pumps actual usage.

Based on information obtained at the time the test was performed, this test represents the pumps standard operating conditions.

Vibration Analysis was performed on this pump.

Power Services, Inc.

Vibration Analysis

Customer Name: Stockton East Water District

Location: 8000 Lift Pump

Date: 6/24/2019

Run Number	PSI	GPM	RPM	Hertz	VFD	Highest Vibration level	Measurement Location
1	4.6	8923	880	60	No	0.1455	Motor Top Axial

Notes:

1. This pump is in the Warning stage of the vibration standards set forth in HI 9.6.4
2. This Pump Failed the Vibration Test

Horizontal = inline with discharge
Vertical = 90° off discharge
Axial = Down shaft

HI 9.6.4	> .129	in/s rms	OK
For Design Point	0.13	in/s rms	Warning
	0.2	in/s rms	Alert
	0.3	in/s rms	Danger

Power Services, Inc.

Overall Vibration Report

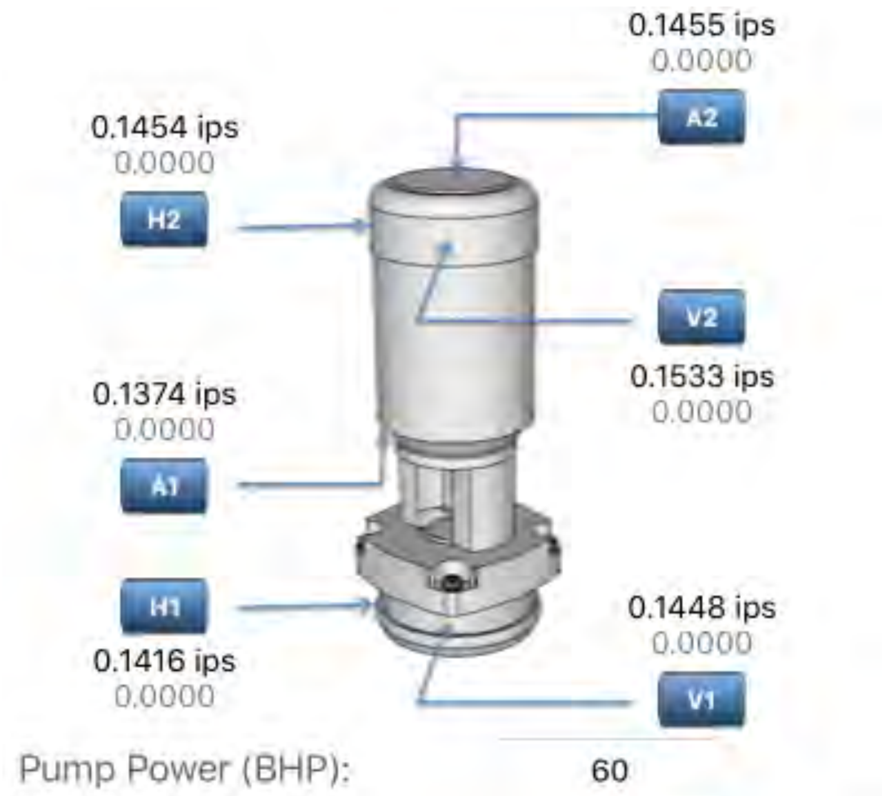
Date / Time: Jun 24, 2019 15:29:58 PM

Staff Name: Bill Power

Location: SEWD

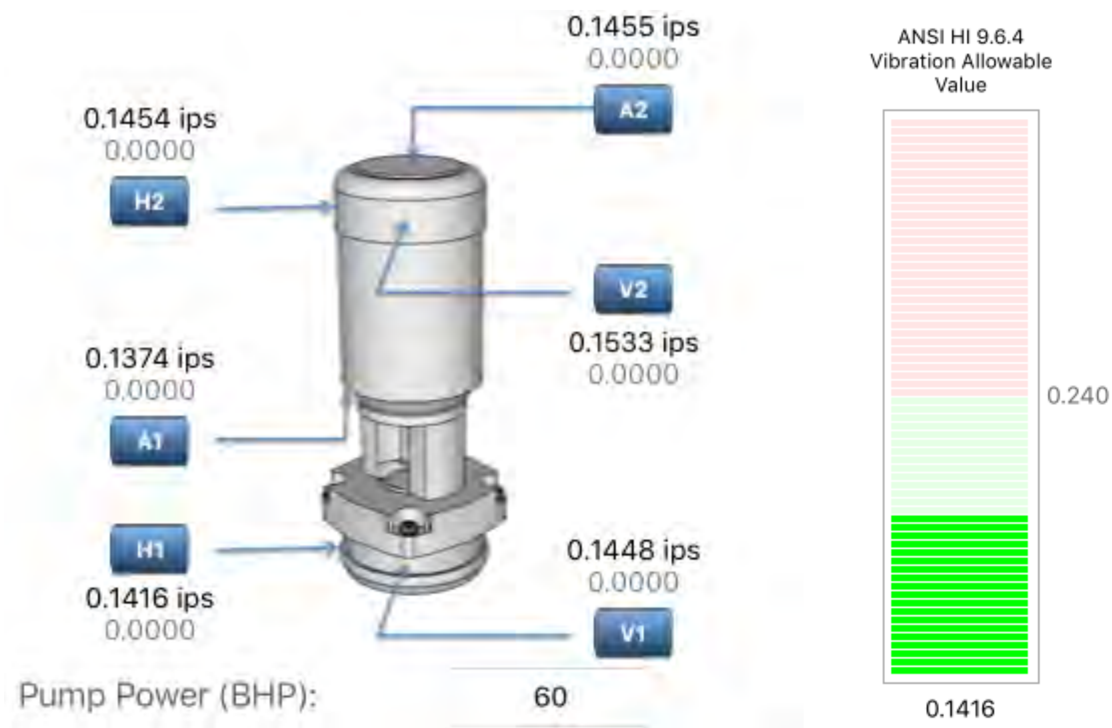
Machine ID: 8000 LIFT

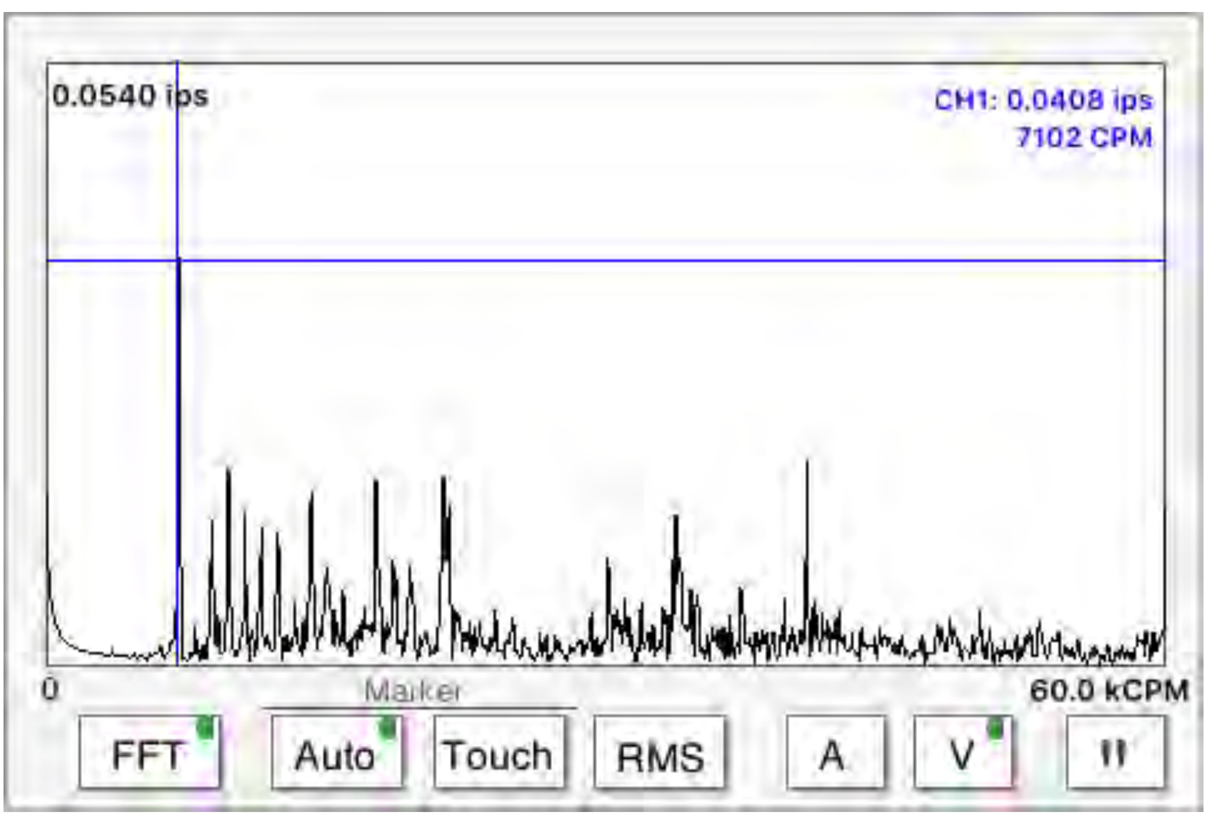
Vibration units in: ips



Notes

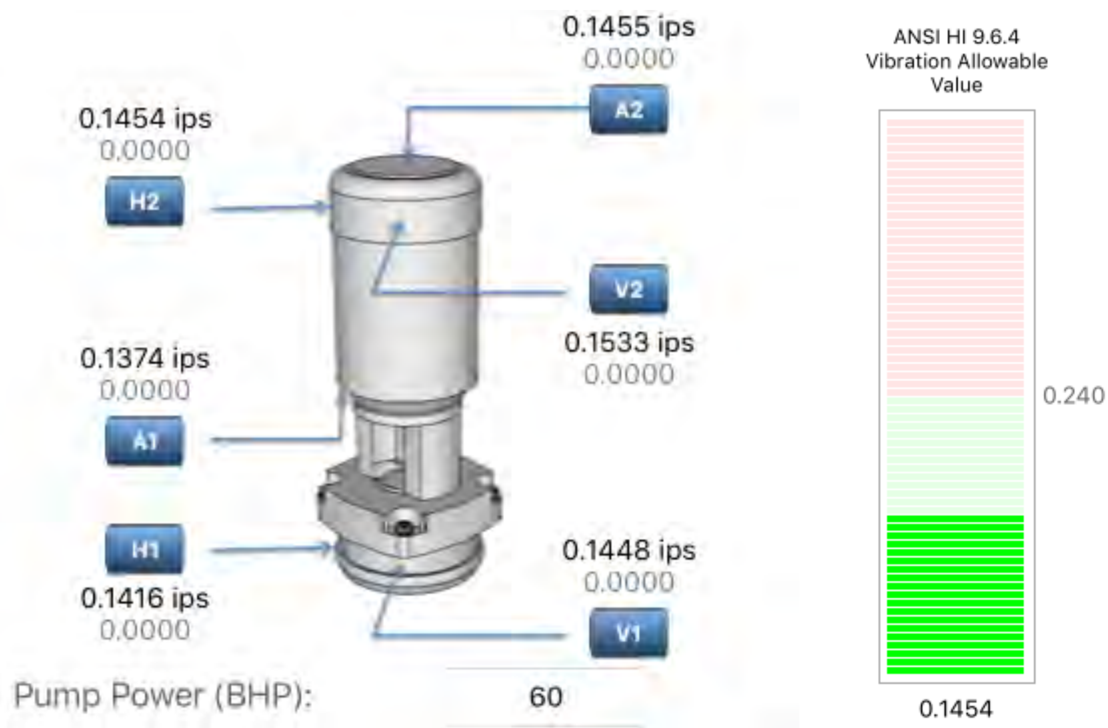
Point H1

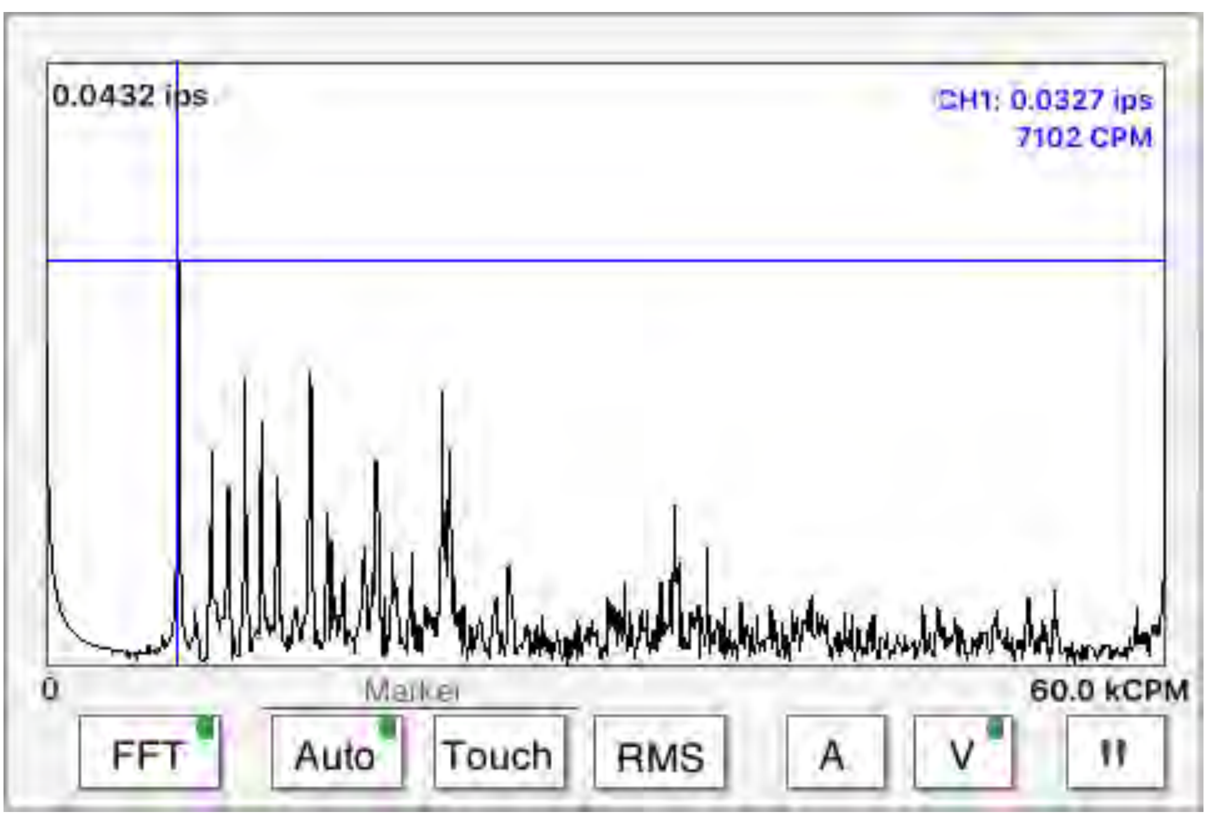




Vibration Spectrum/Time-Waveform for point H1

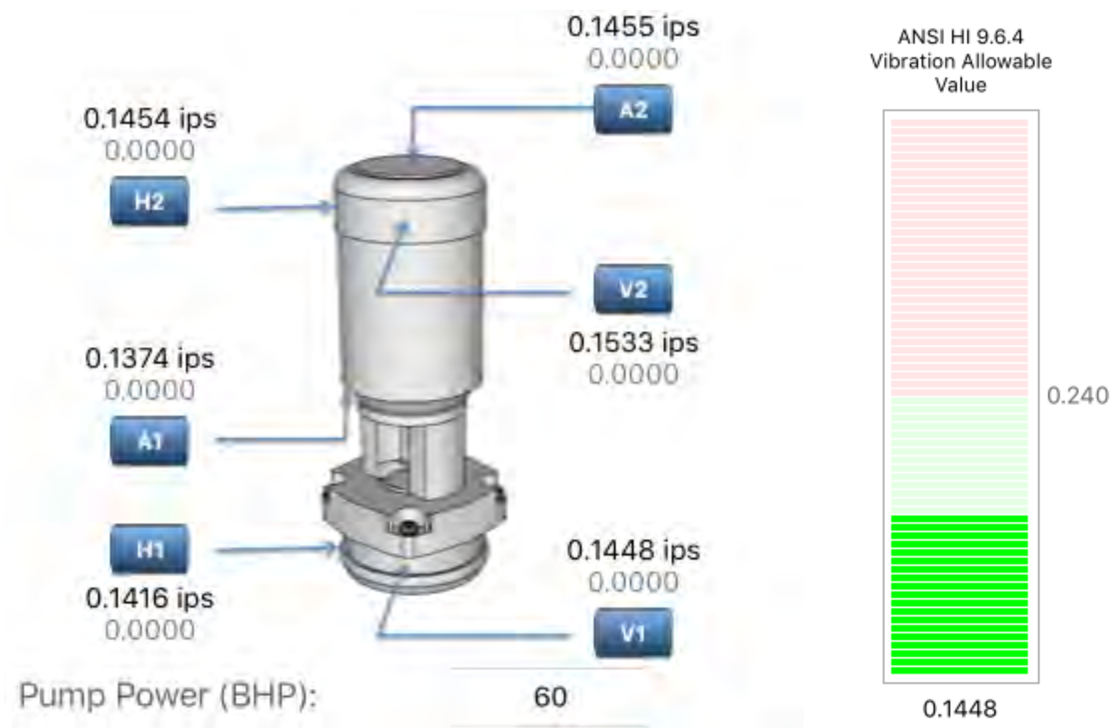
Point H2

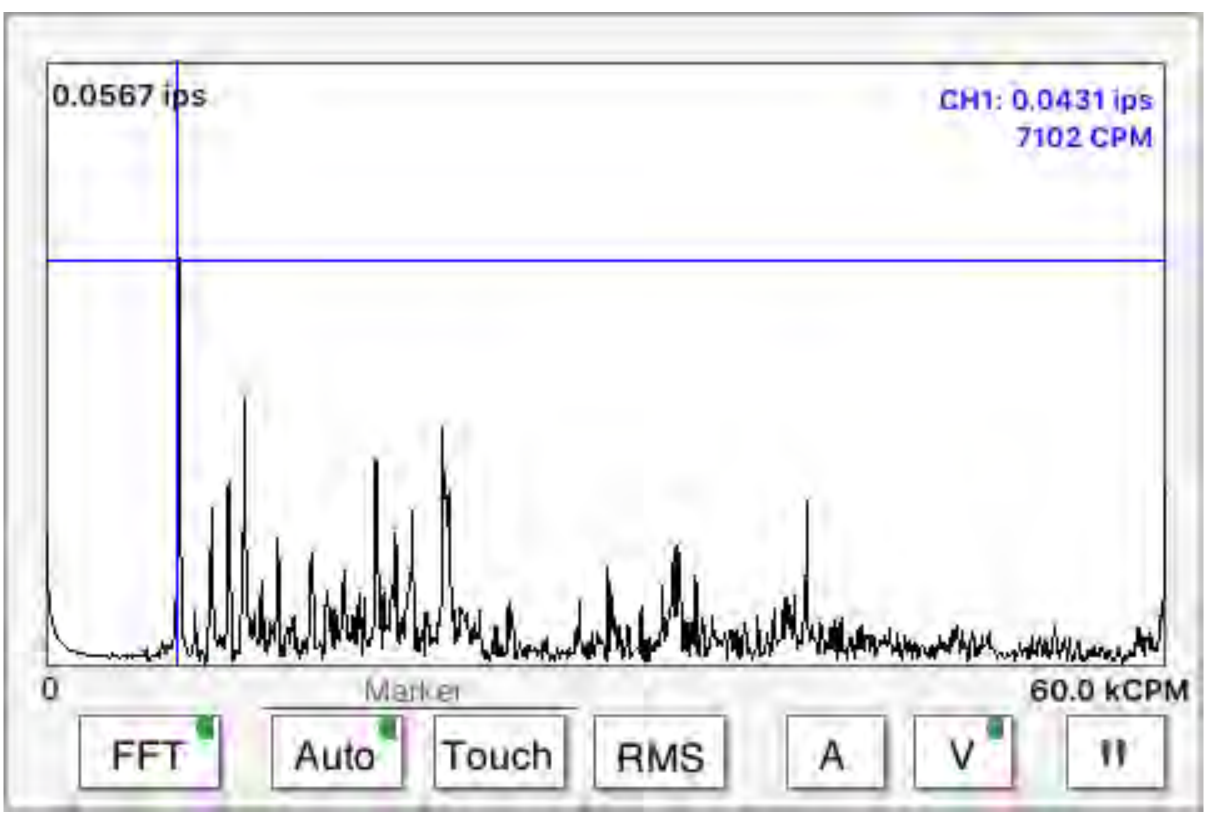




Vibration Spectrum/Time-Waveform for point H2

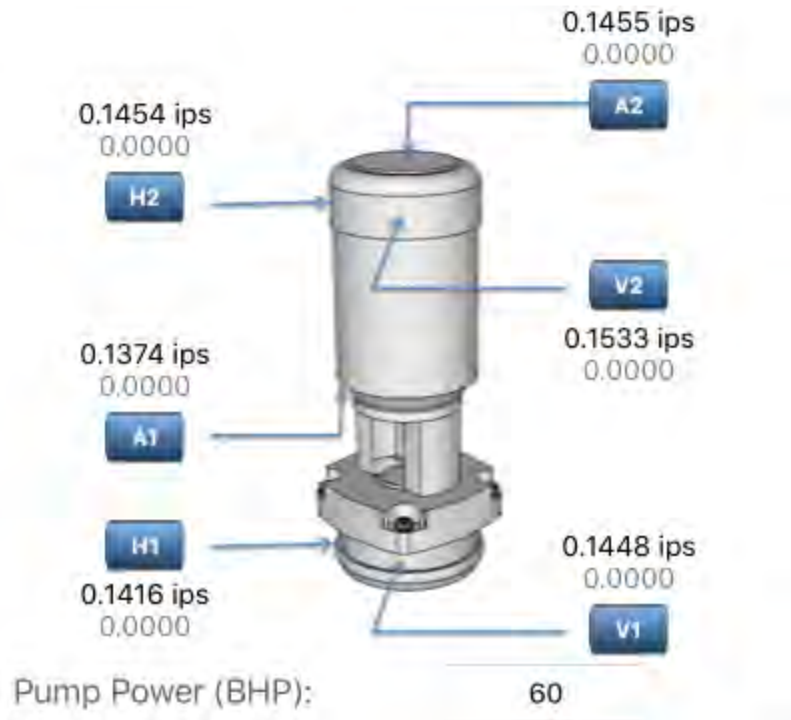
Point V1

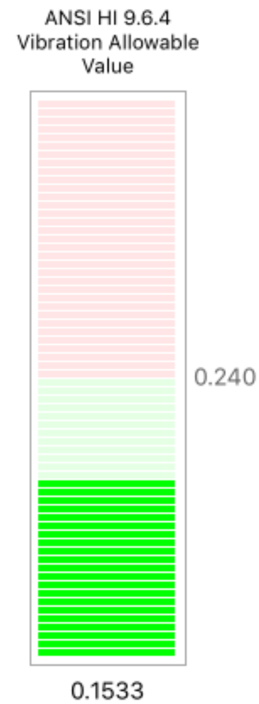


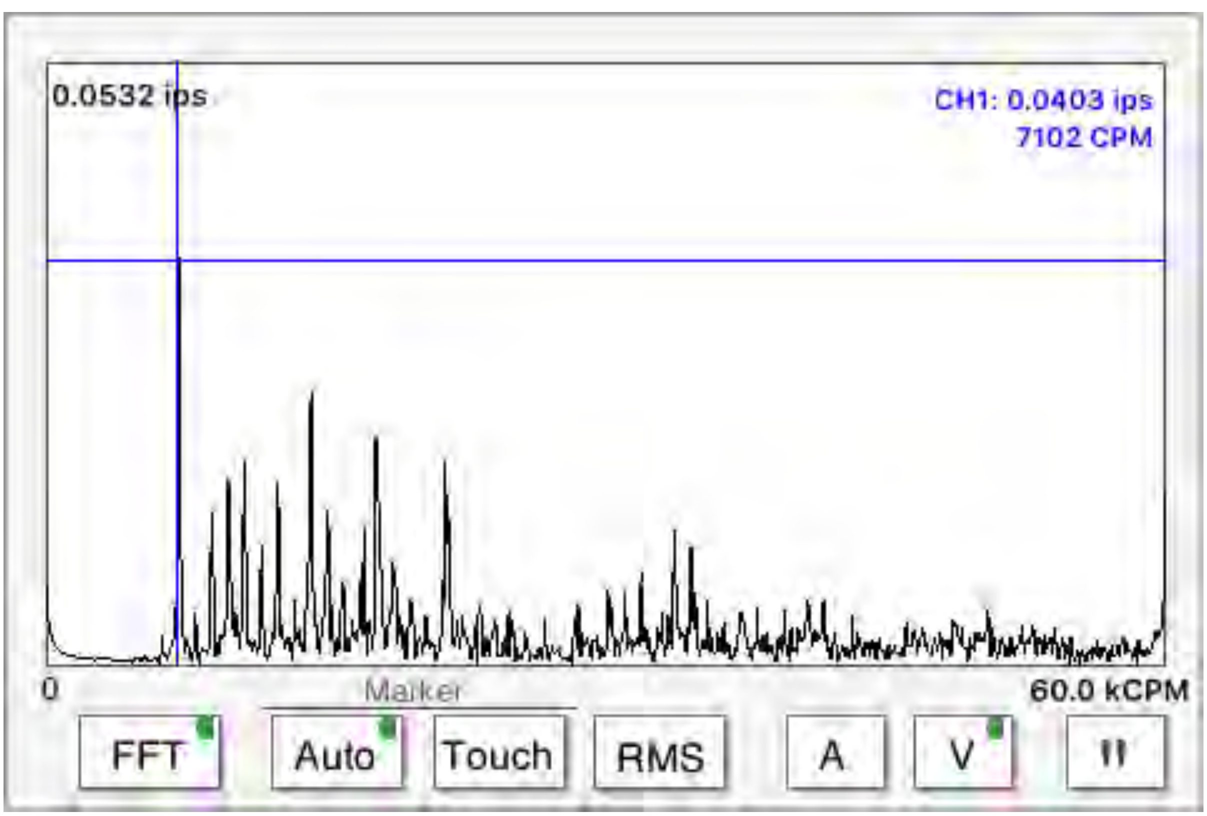


Vibration Spectrum/Time-Waveform for point V1

Point V2

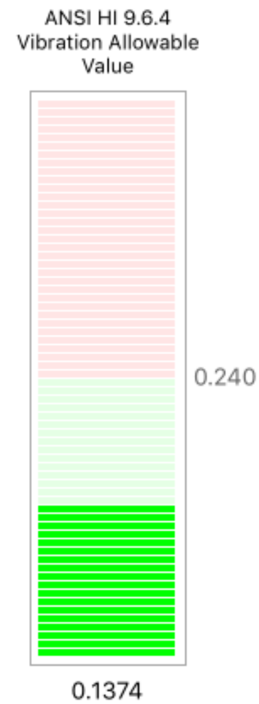


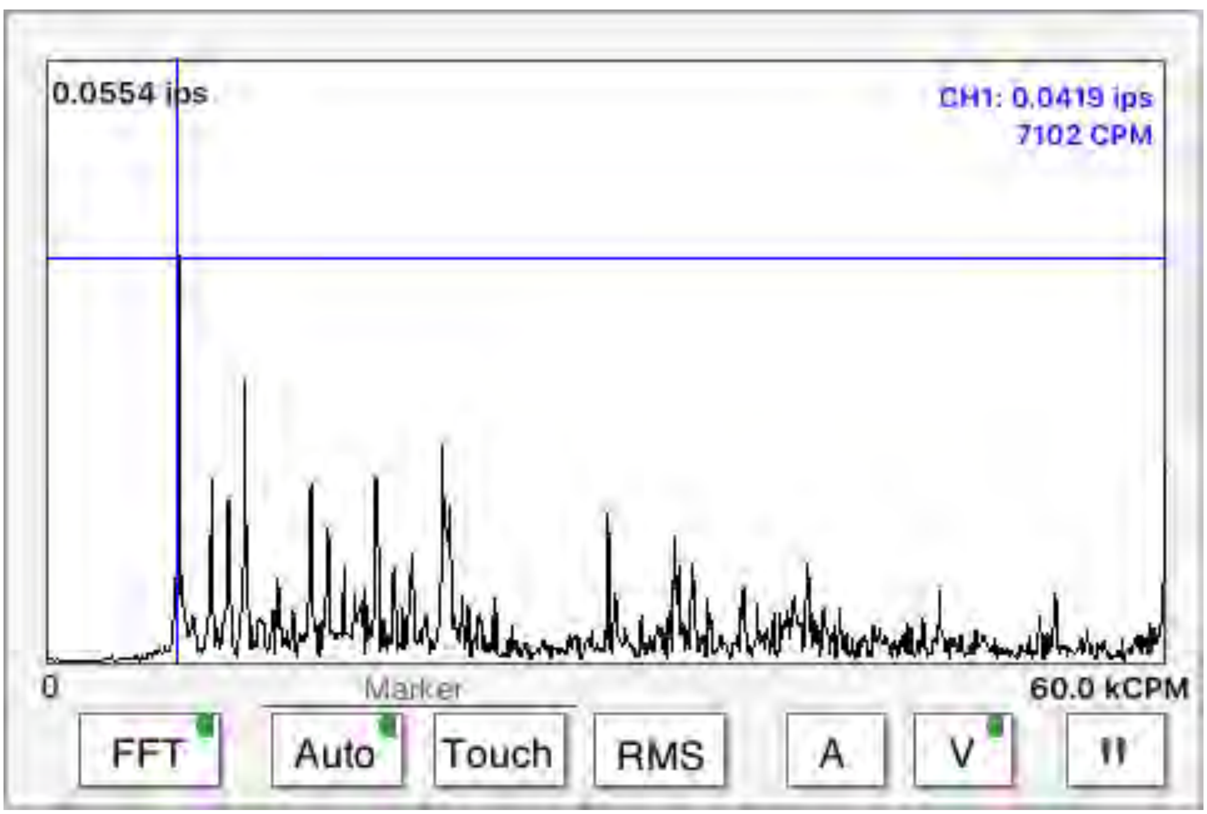




Vibration Spectrum/Time-Waveform for point V2

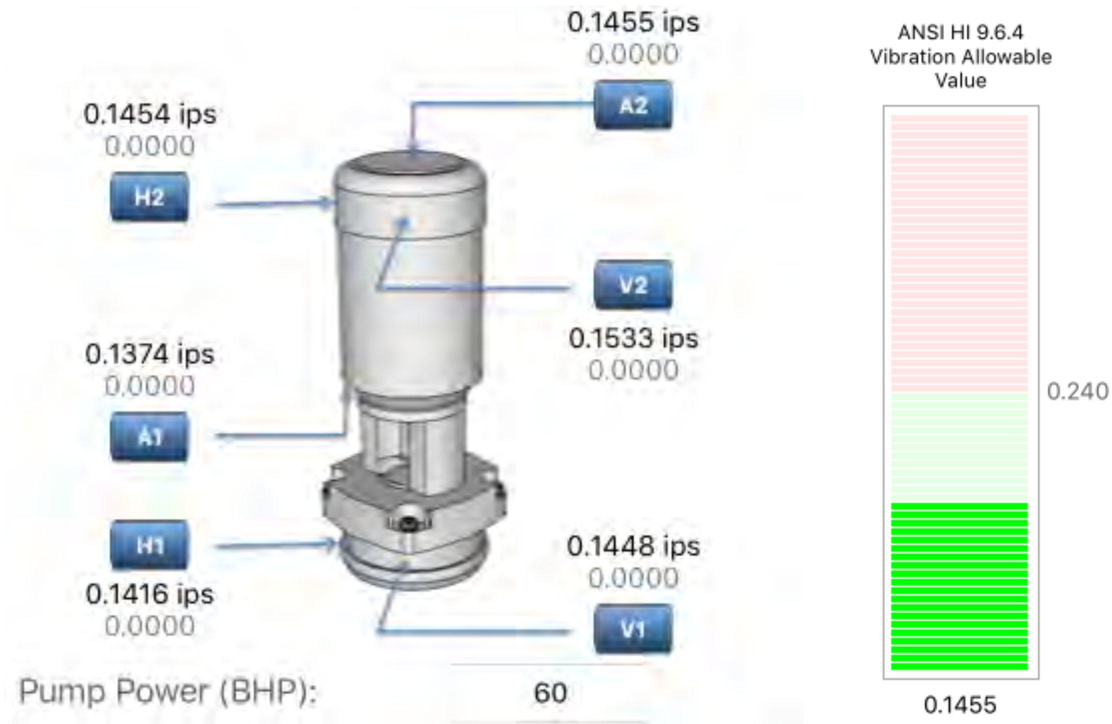
Point A1

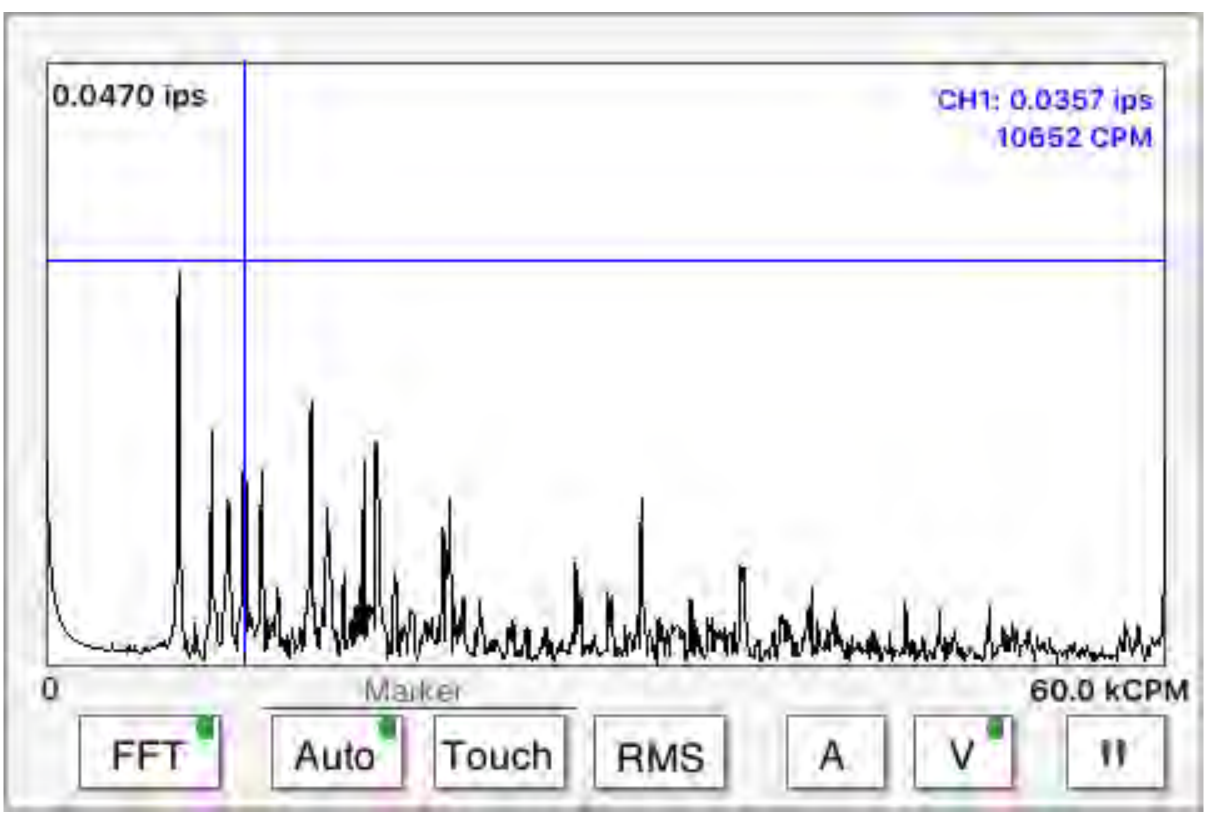




Vibration Spectrum/Time-Waveform for point A1

Point A2





Vibration Spectrum/Time-Waveform for point A2

ATTACHMENT U

Efficient Water Management Practices (EWMPs) Report

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Efficient Water Management Practices (EWMPs) Report

As part of the preparation of the USBR Water Management Plan and the DWR Agricultural Water Management Plan, SEWD has improved two significant water management practices. In 2012, SEWD investigated seven customer delivery points that had previously been determined to be unmeasurable due to physical limitations of the turnouts. This recent field investigation determined that all of these delivery points can be metered, and two meters have already been installed. It was also determined that the PG&E hour meters used for 18 customers have an accuracy above +/- 6 percent. SEWD has begun replacing these meters, and plans to replace all of them by 2015. See Table E-1 in DWR Attachment E for the implementation schedule for meter installation, replacement, and testing.

Table 1 below lists the non-implemented EWMP, Supplier Spill and Tailwater Systems. This EWMP is not locally cost effective, as documented in the cost-benefit analysis provided in Table 2. The assumptions used in the cost-benefit analysis are provided in Table 3.

Table 1. (DWR Table VII.B) Non-Implemented EWMP Documentation

EWMP #	Description	Technically Infeasible	Non Locally Cost-Effective	Justification/Documentation
7	Supplier Spill and Tailwater Systems		X	See Table 2

Table 2. Economic Analysis Worksheet
Stockton East Water District
EWMP 7: Supplier Spill and Tailwater Systems

Calendar Year	Annual Water Savings (ac-ft/yr)	Avoided Costs	Total Undiscounted Benefits	Total Discounted Benefits	Costs ($)				Net Present Value ($)
					Capital Costs	Operating Expenses	Total Undiscounted Costs	Total Discounted Costs	
2011	3000	1,200,000	1,200,000	1,153,846	26,030,308	749,375	26,779,684	25,749,696	-24,595,850
2012	3000	1,200,000	1,200,000	1,109,467		749,375	749,375	692,840	416,628
2013	3000	1,200,000	1,200,000	1,066,796		749,375	749,375	666,192	400,604
2014	3000	1,200,000	1,200,000	1,025,765		749,375	749,375	640,569	385,196
2015	3000	1,200,000	1,200,000	986,313		749,375	749,375	615,932	370,381
2016	3000	1,200,000	1,200,000	948,377		749,375	749,375	592,242	356,135
2017	3000	1,200,000	1,200,000	911,901		749,375	749,375	569,464	342,438
2018	3000	1,200,000	1,200,000	876,828		749,375	749,375	547,561	329,267
2019	3000	1,200,000	1,200,000	843,104		749,375	749,375	526,501	316,603
2020	3000	1,200,000	1,200,000	810,677		749,375	749,375	506,251	304,426
2021	3000	1,200,000	1,200,000	779,497		749,375	749,375	486,780	292,717
2022	3000	1,200,000	1,200,000	749,516		749,375	749,375	468,058	281,459
2023	3000	1,200,000	1,200,000	720,689		749,375	749,375	450,055	270,633
2024	3000	1,200,000	1,200,000	692,970		749,375	749,375	432,746	260,224
2025	3000	1,200,000	1,200,000	666,317		749,375	749,375	416,102	250,216
2026	3000	1,200,000	1,200,000	640,690		749,375	749,375	400,098	240,592
2027	3000	1,200,000	1,200,000	616,048		749,375	749,375	384,709	231,339
2028	3000	1,200,000	1,200,000	592,354		749,375	749,375	369,913	222,441
2029	3000	1,200,000	1,200,000	569,571		749,375	749,375	355,685	213,886
2030	3000	1,200,000	1,200,000	547,664		749,375	749,375	342,005	205,659
Totals:	60000	24,000,000	24,000,000	16,308,392	26,030,308	14,987,509	41,017,817	35,213,399	-18,905,008

Assumptions

Value of conserved water ($/AF) =	400
Discount rate (real) =	4.00%

Cost Effectiveness Summary

Total Costs	$35,213,399
Total Benefits	$16,308,392
B/C ratio	0.5
Cost of Saved Water ($ per AF)	$684
Water Savings (AFY)	3,000

Table 3. Economic Analysis Assumptions
Stockton East Water District
EWMP 7: Spill Supplier Spill and Tailwater Systems

Assumptions			
Annual volume of pump back	3,000	ac-ft	
Pumping duration	6	months	
Change in elevation (pump station to head of system)	135	feet	
Pipeline length (pump station to head of system)	137,280	feet	
Pumping efficiency	70	%	
Electricty Cost	0.20	$/kWh	
New pipeline cost	10	$/in-dia/ft	
New pump station cost	350	$/gpm	
O&M labor rate	80	$/hour	
Annual interest rate	4	%	
System life	20	years	
Conversions			
Average flow rate	3,771	gpm	(3,000 ac-ft pumped over 6 months)
Annual operaton time	4,320	hours	
Calculations			
Pipeline size	18	inches	4-feet headloss/1000-feet of pipeline
Pipeline headloss	496	feet	Hazen-williams (C=140)
Total dynamic head (TDH)	631	feet	Headloss + elevation change
Required pump Hp	858	hp	(gpm*TDH)/(3960*efficiency)
Annual Energy usage	3,708,477	kWh	(746 W/Hp * hours of operation)
Capital Costs			
Pipeline	$24,710,400		
Pump station	$1,319,908		
Total	**$26,030,308**		
O&M Costs			
Electricity	$741,695		
Labor	$7,680	16 hours/month for 6-months	
Total	**$749,375**		

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ATTACHMENT V

USBR Exemption Letter

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O-9

United States Department of the Interior

BUREAU OF RECLAMATION
Central California Area Office
7794 Folsom Dam Road
Folsom, California 95630-1799

IN REPLY REFER TO:
CC-414
RES-3.10

JUN 05 1997

Mr. John W. Stovall
Neumiller & Beardslee
PO Box 20
Stockton, California 95201-3020

Subject: Stockton East Water District's Request for Exemptions for Best Management Practices--New Melones Dam and Power Plant--Central Valley Project, California

Dear Mr. Stovall:

After review by our Regional Solicitor of the information you provided, we concluded that the Stockton East Water District (District) is exempt from requiring the California Water Service Company, the City of Stockton, the Lincoln Village Maintenance District, and the Colonial Heights Maintenance District to implement certain municipal and industrial Best Management Practices (BMPs). A list of the exempted and non-exempt municipal and industrial BMPs is enclosed. This exemption is in place as long as the existing contract among the parties is not amended or renegotiated. In addition, if any other legal issue that is tied to this contract is executed, the District will be required to implement all exempted BMPs.

Although the District is not required to implement these BMPs with their contractors at this time, the District is encouraged to continue assisting their contractors with implementation. The District's Resolution 95-96-08 committed the District to implementing all the urban BMPs by either requiring the retailers to implement or by implementing regionally. Reclamation's Water Conservation Field Service Program is available to assist the District and its contractors in implementing these BMPs and promoting the best management of water.

If you have any questions, please contact Mr. Pete Vonich (Water Conservation Specialist) at (916) 989-7265 (TDD 989-7285).

Sincerely,

Thomas J. Aiken
Area Manager

Enclosure

Exempted BMPs 1993 Criteria

B-3 Tiered block or similar water pricing

Exempted BMPs 1996 Criteria

A- 1 Distribution system water audits, leak detection and repair
A-2 Metering with commodity rates for all new and existing conditions
A-3 Landscape efficiency requirements for new/existing commercial, industrial, institutional governmental and multi-residential developments
A-5 School education
A-7 Conservation pricing - water and sewer
A-8 Water waste prohibition

B-1 Interior and exterior water audits and incentive programs for single family residential, multi family residential and governmental/institutional customers
B-2 Plumbing, new and retrofit
B-3 Large landscape audits and incentives
B-4 Commercial, industrial and institutional conservation
B-5 Landscape water conservation for new and existing single family homes
B-6 Ultra low flush toilet installation

Non-exempted BMPs 1996 Criteria

A-4 Public Information
A-6 New commercial, industrial and institutional water use review
A-9 Demand management staff
A-10 Financial incentives

ATTACHMENT W

Urban Water Management Plans, City of Stockton and California Water Service Company

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ATTACHMENT W.1.

California Water Company Urban Water Management Plan: Demand Management Measures

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Chapter 9
Demand Management Measures

This chapter provides a summary of past and planned demand management measure (DMM) implementation in the Stockton District, as well as an overview of the expected water savings and projected compliance with the Water Conservation Act of 2009 (SB X7-7).

This chapter contains the following sections:

9.1 Demand Management Measures for Wholesale Agencies

Because the Stockton District is a retail water supplier, this section does not apply.

9.2 Demand Management Measures for Retail Agencies

Cal Water centrally administers its conservation programs for its 24 districts. For purposes of this section, these programs have been grouped in accordance with the DMM categories in Section 10631(f) of the UWMP Act. These categories are:

(i) Water waste prevention ordinances
(ii) Metering
(iii) Conservation pricing
(iv) Public education and outreach
(v) Distribution system water loss management
(vi) Water conservation program coordination and staffing support, and
(vii) Other demand management measures

Following are descriptions of the conservation programs Cal Water operates within each of these DMM categories.

9.2.1 Water Waste Prevention Ordinances

Because of its investor owned status Cal Water enforcement of water use restrictions is authorized by the CPUC through Rule 14.1 or Schedule 14.1. Restrictions may also be regulated by ordinances passed by the local governments in each community served. Cal Water has worked with municipalities to pass ordinances and coordinate activities. Cal Water will continue this effort on an ongoing basis. In the Stockton District the City of Stockton passed a water conservation ordinance, which is included in Appendix J.

Due to worsening drought conditions, Cal Water filed Schedule 14.1 with the CPUC in the spring of 2015 which went into effect on June 1, 2015. Cal Water's Schedule 14.1 filing, which applies to both residential and non-residential customers, is responsive to Governor Brown's emergency drought declaration and executive order requiring a statewide 25% reduction in urban potable water use. It also complies with regulations adopted by the State Water Resources Control Board (State Board) and the CPUC to achieve that reduction by the end of February 2016. Schedule 14.1 puts measures in place to enable Cal Water to enforce the water-use prohibitions set by the State Board, including:

- Applying water to outdoor landscapes that causes runoff onto adjacent property, non-irrigated areas, private and public walkways, roadways, parking lots, or structures
- Using a hose to wash motor vehicles unless the hose is fitted with a shut-off nozzle or device that causes it to cease dispensing water immediately when not in use
- Applying water to driveways and sidewalks
- Using water in a fountain or other decorative water feature, except where the water is part of a recirculating system
- Applying water to outdoor landscapes during and within 48 hours after measurable rainfall
- Using potable water to irrigate outside of new construction without drip or microspray systems
- Using potable water on street medians
- Filling or refilling ornamental lakes or ponds except to sustain existing aquatic life

Additionally, Schedule 14.1 requires that:

- Customers must fix leaks within their control within five business days of notification
- Hotel/motel operators must provide option to not have towels or linens laundered daily during a guest's stay, and must provide clear notice of this option in easy-to-understand language

- Restaurants and other eating and drinking establishments may only serve drinking water upon request

With the approval of the Schedule 14.1 filing, beginning June 1, 2015, individual customers in each Cal Water district were provided water budgets based upon their water use each month in 2013 minus the state-mandated reduction for the Stockton District of 20%. If a customer used less than his or her water budget, the unused water was carried forward, similar to rollover minutes on a cell phone plan. Water used in excess of the monthly budget was subject to a drought surcharge. The surcharge was discounted for customers on Cal Water's Low-Income Rate Assistance (LIRA) program. To help with compliance, the customer's monthly bill showed his or her water budget for the following month. Customers' water use history back to 2011 and their water budgets were also available online beginning in June of 2015.

Cal Water's Schedule 14.1 filing is included as Appendix J of this UWMP.

9.2.2 Metering

All service connections within the Stockton District are metered. Meters are read monthly and routinely maintained and calibrated. Customers are billed monthly based on their metered water use.

Cal Water is also piloting automatic meter reading (AMR) and advanced metering infrastructure (AMI) in several of its districts. AMI may be used by Cal Water in the future to detect and alert households of leaks and other possible problems as well as to provide customers with tailored water use information to help them use water more efficiently.

9.2.3 Conservation pricing

As an investor owned utility, Cal Water rates and charges are reviewed and authorized by the CPUC every three years. Starting in 2008 Cal Water adopted tiered rate designs for single family residential service. Uniform volumetric rate designs are employed by Cal Water for other water service classes. Current volumetric rates by class of service within Stockton District are provided in Table 9-1.

Table 9-1: Volumetric Water Rates by Class of Service ($/CCF)

Class of Service	Tier 1 (1-9 ccf)	Tier 2 (10-20 ccf)	Tier 3 (21+ ccf)	All units of water
Single Family	$2.34	$2.54	$2.98	
Non Residential				$2.41

Per the Memorandum of Understanding Regarding Urban Water Conservation in

California (MOU), conservation pricing provides economic incentives to customers to use water efficiently via a volumetric water rate. The MOU considers uniform, seasonal, tiered (block), and allocation-based rate designs as each being potentially consistent with conservation pricing, provided that either (1) 70% or more of total annual revenue is derived from the volumetric component of the rate design or (2) the proportion of total revenue from the volumetric component of the rate design equals or exceeds the long-run incremental cost of providing water service, or (3) the utility's metering technology, rate structure, and customer communication programs satisfy various requirements specified by the MOU.

The Stockton District's rate structure, metering, and customer communication programs comply with Option 3 of the Urban MOU's definition of conservation pricing. Urban MOU BMP compliance reports are provided in Appendix L.

9.2.4 Public Education and Outreach

Cal Water's public outreach program is divided into four components, as follows:

Residential Customer Assistance – This category provides tailored assistance to residential customers through home water surveys and monthly water use reports. It provides assistance to residential customers wanting to reduce their indoor and outdoor water uses. While available to all residential customers, marketing of home water surveys is generally focused on high use residential customers.

Non-Residential Customer Assistance – This category provides tailored assistance to commercial customers through commercial water surveys, monthly landscape reports to large landscape customers, and large landscape water use surveys. It provides assistance to commercial customers wanting to reduce their use of water for sanitation, hygiene, process, and landscape purposes.

Public Information and School Education – Cal Water's public information program provides general information on the need for and value and methods of water conservation through multiple media outlets, including its website, direct mail, external print media, and radio. Cal Water's school education program includes the Cal Water H2O Challenge, a project-based learning competition for grades 4-6, Cal Water Town, an interactive online learning tool, and general information and learning materials for students and teachers.

Rebate Program Information and Marketing – Through its website, bill inserts, newsletters, and radio and print media, Cal Water advertises and markets a variety of conservation rebate programs, including rebate programs for high-efficiency toilets, urinals, and clothes washers, and irrigation equipment and landscape efficiency improvements.

9.2.5 Programs to Assess and Manage Distribution System Real Loss

Per the MOU, Cal Water annually quantifies the district's volume of apparent and real water loss. Cal Water's conservation staff have received training in the AWWA water audit method and component analysis process and have completed water balances for each Cal Water district using AWWA's water audit software. For the five-year period 2011-2015, apparent and real water loss in the Stockton District averaged 1,892 AF, or approximately 7 percent of total production.

In addition to its routine and planned system maintenance and water loss reporting, Cal Water is planning to implement a lift-and-shift sonic data logger leak detection program in the District starting in 2017. The lift-and-shift program will survey up to one-third of main miles annually in three shifts. Each leak detection shift will last approximately 80 days. Lift-and-shift sonic data logging technology will enable Cal Water to quickly and efficiently locate leaks in one part of the water distribution network and then redeploy the equipment to another part of the network. Staff will review sound files from the loggers for potential leak warnings and discuss this information with District management, who can then assign work orders for repair crews to investigate and repair leaks. Cal Water conservatively estimates the lift-and-shift program will reduce real water loss in the District by up to 333 AFY – enough water for about 1,000 households. Additional potential benefits of the program include reduced excavation of streets, less staff overtime spent responding to and repairing catastrophic main breaks, and improvement to the best management practices of the valve maintenance program. This program was submitted as part of Cal Water's 2015 General Rate Case with the CPUC and is subject to CPUC approval prior to implementing.

9.2.6 Water Conservation Program Coordination and Staffing Support

Because of its status as an investor owned utility, conservation program staffing positions must be approved by the CPUC through its General Rate Case every three years. Currently authorized conservation program staffing consists of five full-time positions, which include:

- One Conservation Program Manager
- One Conservation Program Analyst
- One Landscape Program Analyst
- Two Conservation Program Coordinators

These five staff positions manage all aspects of Cal Water's conservation programs deployed across 24 separate districts serving a combined population of about 2 million through 470,000 service connections. Staffing constraints have been one of the primary challenges Cal Water has faced in expanding the scope and reach of its conservation programs throughout its service districts. To ensure adequate management and oversight of the expansion and utilization of its conservation programs, Cal Water is proposing in its current General Rate Case to add three additional Conservation Program Coordinator positions. Proposed staffing is summarized in Table 9-2. If approved, total staffing level would increase from 5 to 8 FTE positions. While this would still be below the average for conservation programs of similar size and scope operated by other water utilities, it would be a substantial improvement over Cal Water's current conservation program staffing levels.

Table 9-2: Planned Conservation Program Staffing

Staff Position	Responsibilities	Position Status
Conservation Program Manager	Long-term program planning and implementation; program budgeting and oversight; staff oversight and management; contracting and oversight of outside services	Existing
Conservation Program Coordinator	Management and oversight of conservation programs in Cal Water districts	2 Existing 3 Proposed
Conservation Program Analyst	Program analysis and reporting, including but not limited to preparation of reports related to CPUC requirements, urban water management plans, BMP compliance reports, and SB X7-7 compliance reports	Existing
Landscape Program Analyst	Analysis and tracking of landscape program implementation and performance; coordination of landscape program rollouts; GIS/GPS management; assist regional conservation program coordinators with management/oversight of landscape programs	Existing

9.2.7 Other Demand Management Measures

In addition to the DMM programs described above, Cal Water operates rebate, give-away, and direct installation programs aimed at plumbing fixture replacement and irrigation equipment and landscape efficiency improvements. Following are brief descriptions of each of these DMMs.

MaP Premium and Non-Premium Toilet Replacement – This program replaces old toilets with MaP certified high-efficiency toilets. Financial rebates, direct installation, and direct distribution are used to deliver toilets to customers. For residential customers, MaP premium certified toilets which have greater water savings potential are eligible for a $100 rebate while the rebate for MaP non-premium toilets is $50. For commercial customers, a rebate of $100 is available for valve-type toilets flushing 1.28 gallons or less and EPA WaterSense labeled tank-type toilets. Cal Water centrally administers the program. This program is available to all residential and non-residential customers. Cal Water markets the program through direct mail, print media, bill stuffers, and its website. Where advantageous, Cal Water partners with local or regional agencies and community organizations to offer the program.

Urinal Valve and Bowl Replacement – This program replaces old urinals with high-efficiency urinals meeting the new 0.125 gallon per flush water use standard adopted by the California Energy Commission in April 2015. Financial rebates of up to $150 are available to customers. The program targets offices and public buildings receiving significant foot traffic. Cal Water centrally administers the program. While this program is available to all non-residential customers, marketing focuses on prime targets, such as restaurants and high-density office buildings. Cal Water markets the program through direct mail, print media, bill stuffers, and its website.

Clothes Washer Replacement – This program provides customer rebates up to $150 for residential and up to $200 for non-residential high-efficiency clothes washers. The program targets single-family households, multi-family units, multi-family common laundry areas, and commercial coin-op laundries. Cal Water centrally administers the program, and markets the program through direct mail, print media, bill stuffers, and its website. This program is available to all residential and non-residential customers. Where advantageous, Cal Water partners with local or regional agencies to offer the program.

Residential Conservation Kit Distribution – This program offers Cal Water residential customers conservation kits featuring a range of water-saving plumbing retrofit fixtures. Kits are available at no charge to customers, who can request them via Cal Water's website, via mail, or by contacting or visiting their district. Each kit includes the following items: high-efficiency showerheads, kitchen faucet aerator, bathroom faucet aerators, full-stop hose nozzle, and toilet leak detection tablets. Cal Water centrally administers this program as part of a company-wide program operated in each of its districts. This program is available to all residential customers. Cal Water markets the program through direct mail, print media, bill stuffers, and through its website.

Smart Controllers Rebates/Vouchers – This program targets residential and non-residential customers with high landscape water use. The program offers financial incentives up to $125 for residential controllers and up to $25 per station for commercial-grade controllers to either the customer or contractor for proper installation of the Smart Controller at customer sites. The landscape contractor has the direct relationship with customers and is typically the entity customers listen to when making landscape and irrigation decisions. The program educates contractors about the customer benefits of Smart Controllers along with proper installation of the devices. This program is offered to all residential and non-residential customers. Cal Water markets the program through direct mail, print media, bill stuffers, and its website.

High Efficiency Irrigation Nozzle Web Vouchers/Rebates – Water efficient sprinkler nozzles (popup and rotating) and integrated pressure-regulated spray bodies use significantly less water than a standard sprinkler head by distributing water more slowly and uniformly to the landscape. In addition to reducing water use, water directed from these nozzles reduces run-off onto streets and sidewalks with a more directed flow. Customers are able to obtain the nozzles and spray bodies either directly through Cal Water or via a web-voucher program. Restrictions on the number of nozzles individual customers may receive vary by customer class and/or landscape size. Cal Water centrally administers this program as part of a company-wide program operated in most of its districts.

Turf Buy-Back – This program offers customers a $1 per square foot rebate to replace turf with qualified drought-tolerant landscaping. Customer applications are screened to ensure program requirements are met, including before and after photos of the retrofitted landscape area. Turf replacement rebates were offered in a subset of Cal Water districts starting in 2014 and offered across all districts starting in 2015 as a drought response measure. Governor Brown’s Executive Order B-29-15 calls on the Department of Water Resources to lead a statewide initiative, in partnership with local agencies, to replace 50 million square feet of lawns and ornamental turf with drought tolerant landscapes.

Table 9-3 summarizes the DMMs currently available to Stockton District customers.

Table 9-3: Cal Water DMMs Available to Stockton District Customers			
1. Plumbing Fixture Replacement	Customer Class Eligibility		
Rebates	SFR	MFR	COM
MaP Premium Toilet	✓	✓	✓
MaP Non-Premium Toilet	✓	✓	✓
Urinal Bowl & Valve (< 0.125 gal)			✓
Clothes Washer (In Unit)	✓	✓	
Clothes Washer (Commercial)		✓	✓
Direct Install			
MaP Premium Toilet	✓	✓	
MaP Non-Premium Toilet			
Urinal Valve (< 0.125 gal)			
Direct Distribution			
MaP Premium Toilet	✓	✓	
Conservation Kits (showerheads, aerators)	✓		✓
2. Irrigation Equipment/Landscape Upgrades			
Rebates/Vouchers			
Smart Irrigation Controller	✓	✓	✓
High Efficiency Irrigation Popup Nozzle	✓	✓	✓
High Efficiency Irrigation Rotating Nozzle	✓	✓	✓
High Efficiency Irrigation Spray Body		✓	✓
Turf Buy-Back	✓	✓	✓
Direct Distribution			
Smart Irrigation Controller		✓	✓
3. Residential Customer Assistance			
Residential Water Survey	✓	✓	
4. Non-Residential Customer Assistance			
Commercial Water Use Surveys			✓
Monthly Water Use Report			✓
Large Landscape Water Use Survey			✓
Note: MaP Premium toilets: flush vol <= 1.1 gallons; MaP Non-Premium: flush vol <= 1.28 gallons.			

9.3 Implementation over the Past Five Years

Implementation of customer DMMs over the past five years is summarized in Table 9-4. Estimated annual and cumulative water savings from customer DMM implementation is shown in the last row of the table. The water savings estimates are only for the customer DMMs listed in Table 9-3. They do not include water savings from water waste prevention ordinances, conservation pricing, general public information, or distribution system water loss management DMMs. Estimated water savings shown in Table 9-4 were calculated with the Alliance for Water Efficiency's Water Conservation Tracking Model.

Significant additional reductions in water demand were achieved in 2015 in response to the District's drought response measures, including its public information campaigns to save water and its Schedule 14.1 water use restrictions, water budgets, and drought surcharges that went into effect June 1, 2015. Relative to its 2013 reference year under the State Board's Emergency Regulation for Statewide Urban Water Conservation, water demand between June and December 2015 decreased by 23.8 percent. Per capita potable water use in 2015 was 116 GPCD compared to the District's SB X7-7 2015 interim water use target of 174 GPCD.

Table 9-4: Implementation of Customer DMMs: 2011-2015		
1. Plumbing Fixture Replacement	2011 – 2015 Total	Average Annual
Toilets & Urinals (number distributed)	3,369	674
Clothes Washers (number distributed)	304	61
Conservation Kits (number distributed)	5,933	1,187
2. Irrigation Equipment/Landscape Upgrades		
Smart Controllers (number distributed)	19	4
Nozzles & Spray Bodies (number distributed)	7,441	1,488
Turf Buy-Back (sq ft removed)	7,156	1,431
3. Residential Customer Assistance		
Surveys/Audits (homes receiving)	352	70
4. Non-Residential Customer Assistance		
Surveys/Audits (sites receiving)	11	2
Large Landscape Reports (sites receiving)	446	89
Estimated Water Savings (AF)	**616**	**123**
Note: Estimated water savings shown in the table are only for the 2011-2015 period. Water savings from customer DMMs implemented between 2011 and 2015 will continue after 2015 and last for the useful life of each DMM.		

Annual expenditure for implementation of customer DMMs over the past five years is summarized in Table 9-5. The table highlights expenditures from 2011 through 2015 for administrative, research, planning, program, and public information and school education.

Table 9-5: Annual DMM Expenditure: 2011-2015		
Expenditure Category	2011 – 2015 Total	Average Annual
Admin, R&D, planning	$339,457	$67,891
Program expenditures & incentives	$1,781,390	$356,278
Public information & school education	$278,354	$55,671
Total	**$2,399,201**	**$479,840**

9.4 Planned Implementation to Achieve Water Use Targets

Planned implementation of customer and water loss management DMMs for the period 2016 to 2020 are summarized in Table 9-6. Estimated annual and cumulative water savings from customer and water loss management DMM implementation is shown in the last two rows of the table. The water savings estimates are only for the customer DMMs listed in Table 9-3 plus the leak detection program Cal Water has proposed to start in 2017. They do not include potential water savings from water waste prevention ordinances, conservation pricing, or general public information and school education DMMs. Estimated water savings shown in Table 9-6 were calculated with the Alliance for Water Efficiency's Water Conservation Tracking Model.

In addition to the DMMs shown in Table 9-6, Cal Water will continue to fully implement the water loss ordinance, metering, conservation pricing, public outreach, and conservation program coordination and staffing support DMMs described previously.

Annual expenditure for DMM implementation in the Stockton District, including pro-rated staffing costs, is expected to average $0.53 million. Cumulative expenditure for DMM implementation for the period 2016-2020 is expected to total $2.64 million. Of this total, approximately 35% is earmarked for plumbing fixture, irrigation equipment, and landscape efficiency upgrades; 21% is earmarked for public information and school education programs; 15% is earmarked for distribution system water loss management; 12% is earmarked for site surveys/audits and customer water use reports; and 18% is earmarked for administrative and labor costs.

Because Cal Water is an investor-owned utility, the planned programs and corresponding expenditures for the next five years are subject to CPUC review and approval. The amount of program implementation for 2016 shown in Table 9-6 is what was approved in Cal Water's last General Rate Case. The amounts of program implementation for 2017-2019 are what Cal Water has proposed in its current General Rate Case. Conservation programs and budgets for 2020 will be determined by the subsequent General Rate Case. However, the amounts shown for 2020 in Table 9-6 are consistent with the amounts recommended in Cal Water's current Conservation Master Plan (see Appendix L).

Table 9-6: Planned Implementation of Customer and Water Loss Management DMMs: 2016-2020

1. Plumbing Fixture Replacement	2016	2017	2018	2019	2020
Toilets & Urinals (number distributed)	298	318	318	318	318
Clothes Washers (number distributed)	45	10	10	10	10
Conservation Kits (number distributed)	8	400	400	400	400
2. Irrigation Equipment/Landscape Upgrades					
Smart Controllers (number distributed)	15	7	7	7	7
Nozzles & Spray Bodies (number distributed)	16,765	5,000	5,000	5,000	5,000
Turf Buy-Back (sq ft removed)	50,000	50,000	50,000	50,000	50,000
3. Residential Customer Assistance					
Monthly home water reports (homes receiving)	9,433	9,433	9,433	9,433	9,433
Surveys/Audits (homes receiving)	275	150	150	150	150
4. Non-Residential Customer Assistance					
Surveys/Audits (sites receiving)	2	2	2	2	2
Large Landscape Reports (sites receiving)	18	18	18	18	18
5. Water Loss Management					
Leak Detection (miles of main)	0	91	137	183	183
Estimated Annual Water Savings (AFY)	**216**	**413**	**526**	**637**	**664**
Cumulative Water Savings (AF)	**216**	**629**	**1,155**	**1,792**	**2,456**

Cal Water puts all proposed conservation programs through a rigorous benefit-cost analysis as part of a comprehensive program review and assessment process. The benefit-cost analysis yields information on expected water savings over the useful life of each DMM, cost of water savings, and avoided water supply cost of water savings. Results are used to rank programs in terms of cost-effectiveness, calculate the overall program unit cost of saved water and program benefit-cost ratio for each district, and develop district conservation budgets. The proposed DMMs for the Stockton District have an overall program unit cost of saved water of $454/AF (in 2015 dollars) and a benefit-cost ratio of 0.5. The low benefit-cost ratio is due to the fact that Stockton District can supply new customer demand with groundwater wells that have low marginal pumping costs. However, because of declining groundwater levels in the region and future implementation of the Sustainable Groundwater Management Act, Cal Water is pursuing strategies, including investment in conservation, to reduce dependence on regional groundwater resources.

Projected SB X7-7 compliance water use for Stockton District in 2020 under planned levels of DMM implementation is 152 GPCD compared to its target water use of 165 GPCD. Therefore, the District is projected to be in compliance with SB X7-7 in 2020.

9.5 Members of the California Urban Water Conservation Council

Cal Water is a member of the California Urban Water Conservation Council (CUWCC). CUWCC members have the option of submitting their 2013–2014 Best Management Practice (BMP) annual reports in lieu of, or in addition to, describing the DMMs in their UWMP (CWC 10631). The BMP annual reports for the Stockton District are provided in Appendix L.

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ATTACHMENT W.2.

City of Stockton Urban Water Management Plan: Demand Management Measures

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Section 8

Demand Management Measures

The City conducts an ongoing water conservation program. The City is committed to implementing water conservation measures for all customer sectors. This section provides narrative descriptions addressing the nature and extent of each demand management measure (DMM) implemented over the past five years, from 2010 through 2015, as well as the City's planned implementation of each conservation measure. The City is a signatory to the California Urban Water Conservation Council (CUWCC) Memorandum of Understanding.

8.1 Water Waste Prohibition

The City's Municipal Code, Chapter 13.28 (Appendix G) is dedicated for water conservation and restricts certain uses of water, as described in Section 7. The restrictions are enforceable per the Municipal Code 13.28.090 and are enforced by the COSMUD.

Planned Implementation: The implementation of this DMM is ongoing. The City will continue to enforce this regulation. The City routinely reviews and updates its water conservation ordinance.

Method to Estimate Expected Water Savings: Water savings from this program cannot be directly quantified. Water waste complaints and violations are received and investigated by COSMUD staff and addressed via door hangers and/or direct contact in person or via telephone with tenants and property owners. Complaints and violations are opened, tracked, and closed in the COSMUD Monthly Operations and Maintenance Report.

8.2 Metering

The entire City water service area is fully metered and all connections are billed based on the volume of water used. The City became fully metered in 1954. In addition, customers are classified by meter type including single-family residential, multi-family residential, commercial, institutional, industrial, and landscape irrigation accounts.

Planned Implementation: This DMM is fully implemented and the City will continue to install and read meters on all new services.

Methods to Estimate Expected Water Savings: Meters allow the City to track customer water use and compare current use to historic data. Since the City is fully metered no additional water savings will be realized.

8.3 Conservation Pricing

The City has a uniform rate structure. The City's Water Fee Schedule is provided in Appendix H. The City's water conservation ordinance allows the City to raise water prices during declared water emergencies. The City is in the process of developing a drought rate structure.

Planned Implementation: The implementation of this DMM is ongoing. The City plans to continue implementing its uniform rate structure. The Water Fee Schedule is in place and effective beginning July 1, 2015 and is adjusted annually July 1 in accordance with the approved rate increases and/or cost of living adjustments.

Methods to Estimate Expected Water Savings: Effectiveness of this DMM is evaluated by comparison of the City's water use prior to and following the implementation of conservation pricing.

8.4 Public Education and Outreach

The City provides water conservation information as part of COSMUD's outreach program. The current 2015/2016 budget for the City's public information programs is $519,080, which includes labor, program, and advertising. The public information program includes print and web-based publications, monthly bill inserts, and public outreach events.

The City includes water conservation tips and information in the City's monthly utility bill newsletter, Stockton Water News, which is mailed to all COSMUD water customers. Water conservation is featured in the May issue of Stockton Water News as part of Water Awareness Month. City staff also provides an update on the City's water supply to the City's Water Advisory Group, Council Water Committee, and City Council. This report provides information regarding anticipated water supplies and provides an overview of the COSMUD water use and conservation programs.

The City is a United States Environmental Protection Agency (USEPA) WATERSense Partner and is able to utilize available promotion materials and actively promotes USEPA's Fix a Leak Week every year.

The City provides water conservation education as part of the community and school outreach program through their participation in SAWS. SAWS water conservation materials are included with teacher packets for classroom presentations and are discussed during classroom programs. The City participates with SAWS to develop and implement a water education program for public and private schools within its service area. The SAWS group believes that providing water education in elementary and secondary schools is highly effective in reaching the public at large because young children are apt to share the lessons they learn in class with their parents, siblings, and extended families.

Educational materials, pamphlets, and guidance to classroom activities are available to schools and the public to highlight the value of water and ways to conserve. SAWS's Water Conservation Program reaches approximately 28,000 K-6 grade students annually and has an outreach budget of $217,000. The program provides outreach in various formats including: a large assembly program, in-class presentations, after-school programs, booths at festivals and community events, and various workshops. Examples of materials used in public education programs are included in Appendix I.

Water conservation outreach literature is also distributed at community events such as Family Day in the Park, Black Family Day, Cinco de Mayo, State of the City, and the annual Earth Day Festival. Water conservation literature is also distributed throughout City departments and to various community centers and libraries. The public can access water conservation information on the COSMUD section of the City's web page at:

http://www.stocktongov.com/government/departments/municipalUtilities/utilWaterCon.html

The City's website offers water wise landscaping resources, tips, and virtual tours and photo galleries of local low-water use gardens. This information can be found at http://www.stockton.watersavingplants.com/.

Planned Implementation: The City's public information and school education program is an ongoing, annual program. The City will continue to provide water conservation materials as part of its community and school outreach programs, as well as continue to work cooperatively with SAWS to develop and distribute water conservation information to K-6 grade students in public and private schools. The City will continue to coordinate and schedule community events and develop hands-on activities for events. The City will continue to promote the water conservation program at events including Family Day, Black Family Day, Cinco de Mayo, Earth Day, Recycling Exposition (REXPO), Senior Day, National Night Out, Stockton Ports Educational Days, and State of the City. The following is a list of additional new or ongoing activities planned for implementation.

- Track and record event attendance and "impressions"
- Maintain current program information on website
- Assist with development and implementation of annual Water Awareness Month Media Campaign
- Coordinate annual activities associated with Fix a Leak Week
- Development of promotional materials
- Create messaging for twelve utility bill insert
- Create public service announcements
- Maintain Water Conservation Hotline
- Maintain current information on "phone tree"
- Retrieve and reply to messages/requests for information
- Participate in market research to refine conservation message
- Maintain four water conservation related updates to website
- Maintain City's Waterwise Landscaping website

The City plans to maintain and create new promotional partner opportunities. They will provide annual reporting for the USEPA WaterSense program.

Methods to Estimate Expected Water Savings: The City provides residents with an 866-STOKWTR number where they can call and report water wasters as well as request information. The City works cooperatively with SAWS to develop teacher and student surveys to measure the effectiveness of the outreach campaign. All comments are tracked and programmatic adjustments are made base on the information received. The City has no method to quantify water conservation savings directly as a result of this DMM.

8.5 Programs to Assess and Manage COSMUD Distribution System Real Loss

The COSMUD has a continuous distribution system water audit program in place. Ongoing analysis of water loss is one of the most effective means to achieve conservation by reducing leaks from the system. COSMUD currently documents unmetered consumption in its Monthly Operations and Maintenance Report.

All water meter leaks, service line, main break and manifold leaks are reported to the City by customers calling in or by a system generated work order. All leaks/breaks are documented in the City's Computerized Maintenance Management System (CMMS). Information documented includes: date and time of reported leak, name of person responding to the call, type of leak, work done, customer side or city leak, and time to complete. Also documented is any communication with the customer. All meter leaks and emergency breaks are repaired the same day they are reported. Non-emergency service line and main breaks are usually held until a 48 hour Underground Service Alert is completed. Numbers from main and service line breaks are obtained by taking the line size, duration of the leak, and volume of water leaking to estimate total water loss. Meter leak water loss values are estimated based on the volume of water found and duration of the leak.

Once a year, the City flushes the system through fire hydrants. The time spent flushing is documented in the CMMS. Hard copies of each hydrant flushed and how long it was flushed are kept as records. Water loss numbers are calculated by volume of water being flushed and time flushed multiplied by the number of hydrants flushed. City fire flow tests, commercial and residential construction usage, and equipment testing are sources of water loss that are estimated based on the number of tests performed and number of new construction sites. Street sweeping water usage is documented on hard copies and calculated by size of tank, number of street sweepers, and load counts.

Planned Implementation: This DMM is currently being implemented and will continue to be implemented as part of COSMUD's ongoing operations and maintenance program.

Methods to Estimate Expected Water Savings: The total amount of water conserved over the five-year period by implementing this DMM is directly related to the percentage of unaccounted for water loss leaving the system. The City is committed to maintaining an average of 8 percent or less unaccounted for water during the reporting period.

8.6 Water Conservation Program Coordination and Staffing Support

The City's Water Resources Program Manager currently serves part-time as the City's Water Conservation Coordinator. The Conservation Coordinator establishes an annual program budget based on available funding and resources. Program accomplishments are highlighted and corresponding goals are established for the upcoming year.

Planned Implementation: The implementation of this DMM is ongoing. The City plans on hiring a full time conservation coordinator in the future. The City's water conservation staff updates the monthly operations and maintenance report (MOMR) on a monthly basis, and reports to the CUWCC and USEPA annually.

Methods to Estimate Expected Water Savings: Water savings from this DMM cannot be directly quantified. Effectiveness of this DMM will be evaluated by the success of the City's water conservation program.

8.7 Other Demand Management Measures

The City implements other residential and non-residential demand management measures as described in this section.

8.7.1 Water Survey Programs for Single Family Residential and Multi-Family Residential Customers

Until May 2010, the City offered complimentary water use surveys for single and multi-family residential customers. Surveys were conducted by City staff certified as AWWA Water Use Efficiency Practitioners, covering indoor and outdoor water uses. Due to limited staff resources, the City has developed and implemented a self-performed water use survey modeled after the City of Santa Rosa.

Surveys consist of water use evaluation for appliances, such as dishwashers, washing machines, toilets, and faucets. Landscape and irrigation systems are evaluated as a part of the outdoor water use survey and the customer's water meter is observed to ensure no leaks are occurring. Following completion of the survey, customers are provided a low-flow water use efficiency kit.

The City first implemented water surveys for single and multi-family residential customers in May 2009. This program is still being implemented and will continue to be implemented. The City will continue to serve as a liaison with Water Field Office staff performing in-home surveys. They will track and record water savings from self-certification surveys, coordinate with public on distribution and receipt of self-certification surveys, and track and record the estimated water savings from surveys.

8.7.2 Residential Plumbing Retrofit

The City offers and promotes low-flow water use efficiency kits through distribution at community events, after completion of water surveys, via the City website, through 866-STOKWTR, as well as advertising through utility bill inserts. The low-flow water use efficiency kit includes the following items: (2) 1.5 gallons per minute (gpm) low-flow shower head(s), a 1.5 gpm kitchen aerator, (2) 1.0 gpm bathroom aerators, toilet flapper(s), a metal garden hose nozzle, shower timer, landscape moisture meter, and a 2.5 gallon water bucket.

The City has been distributing low-flow water use efficiency kits, in various forms, for a number of years back to 1990. However, distribution and tracking of the kits described above commenced in 2009 and continues. The City will continue to offer low-flow water use efficiency kits during the reporting period and the City will continue to track number of kits offered and compare the total water usage for customers before and after kits are received.

The City will continue to manage and maintain the device inventory. The City will coordinate with the program manager on purchasing new and replacement items to fit the program needs. The City will continue to track and record the distribution and associated water savings estimated for this program. The City will continue to coordinate with customers and contractors on products and installation, distribute customer satisfaction surveys, and track and record associated estimate water savings. Implementation of this measure is supported by the City's Climate Action Plan (ICF International, 2014), which calls to promote water efficiency for existing development.

8.7.3 Conservation Programs for Commercial, Industrial, and Institutional Accounts

The City promotes water conservation to its CII users by charging users by volume of wastewater discharged from their facility in addition to charging CII users per a uniform water rate structure. Beginning in 2010, the City started offering a high efficiency toilet (HET) Direct Install Program for CII customers. The program covers the cost of the installation and hardware. CII customers may select a pre-approved plumbing contractor for the installation. The approved budget for the HET Direct Install Program is $150,000. To date, 411 HETs have been installed for approximately 64 CII customers.

In addition, the City, as part of SAWS, participates as part of the Greater Stockton Chamber of Commerce's REACON (Recycling, Energy and Conservation) Program and makes periodic visits to CII customers to conduct water use evaluations as a way to assist businesses with reducing their costs of doing business and at the same time, promote environmental stewardship via water conservation practices. The City will continue to attend REACON visits to Stockton service area businesses and conduct water use evaluations. The City will also continue to work with Chamber of Commerce and certified Water Field Office staff to complete water use surveys for Green Business Certifications.

The City will continue to coordinate the completion of permission and release forms with customers, coordinate installs with plumbing contractors, update the approved plumbing contractor list per Directive (advertising, meetings, contracts), distribute customer satisfaction surveys, and track and record associated water savings.

8.7.4 Landscape Conservation Programs and Incentives

The City's landscape conservation program consists of implementing a model water efficient landscape program and a large landscape water use management program.

8.7.4.1 Model Water Efficient Landscape Program

The City will implement a City Water Efficient Landscape Ordinance. This is supported by the City's Climate Action Plan (ICF International, 2014), which lists promotion of the use of water efficient landscaping as a supporting action. City staff will work with other City Departments (Community Development Department and Utility Billing) to obtain and track information received during the permitting process to develop and track water budgets. The City will transmit model water efficient landscape ordinance (MWELO) information obtained during the permit process to Cal Water. The City will also develop a mechanism to establish water budgets for landscape customers before installation of MWELO landscapes.

8.7.4.2 Water Conservation Program for Large Landscape Users

The City will develop and implement a pilot program for Home Owners Associations and other large water users whereby they can track and manage their monthly water use on-line via Landscape Water Use Reports.

8.8 Planned Implementation to Achieve Water Use Targets

The City's active water conservation program should be tailored to enable the City to meet demands at a desired level in conjunction with what is expected to be realized from passive savings. For this UWMP analysis, it is assumed that the City's conservation program is designed at a minimum to enable the City to meet its SB X7-7 per capita target of 165 GPCD (Section 4). Because it is projected that the City will realize an increasing reduction in single family, multi-family and commercial water use from passive saving described in Section 3.3.1, the City's active water conservation program, at a minimum would make up the difference between the City's water demand based on meeting the GPCD target minus what is expected from the projected increasing passive savings. This City's minimum required conservation program savings to meet the GPCD target ranges from approximately 1,300 ac-ft/yr in 2020 down to zero minimum water conservation program savings by 2040. In addition to the DMMs the City plans to implement, described earlier in this section, there are a variety of conservation activities the City can implement to meet this minimum savings goal, described as follows.

- Improve COSMUD operations – Reducing water loss through operational activities is an area where water agencies can conserve water without relying on customer participation. In 2015 the City's water losses (water sales minus water production) were approximately 6.5 percent of total production. This is due in part to the City delaying operational activities such as system flushing and fire flow testing. This is also due in part to a higher response rate to system leak reports. It is not expected that the City would maintain water losses at this low level into the future. Water projections in this UWMP are based on 8 percent water loss in normal years. However, the City may be able to reduce the normal year water loss percentage into the future by further examining the activities implemented during 2015 compared to normal year activities to identify actions that might continue the water losses at a lower level than 8 percent in normal years. Continuing or increasing the City's water distribution leak detection and repair program can help reduce water losses. Some cities like the City of Davis and City of Santa Barbara are currently implementing or considering implementing use of a flushing truck, such as NO-DES, to recapture water main flushing water through the use of a NO-DES truck that utilizes a filtering system, large pump, and hoses. The unit accesses the City's water system through a fire hydrant, circulates water through the filters, and sends the clean water back into the system via a second hydrant. No water is flushed to waste in the street.
- Target large water users – Rather than a blanket conservation program aimed at all customers, the City could target COSMUD's large water users within each customer category. Because the

City is fully metered, high water use customers within each customer category could be targeted. The City could also evaluate customer water usage by customer category compared to water use in the same customer category as for other water agencies. By utilizing available water use information, the City can focus efforts on high water users that will result in higher water savings. Monthly or seasonal (winter/summer) water use for large water users should be reviewed to determine if changes in water use should be due to higher outdoor (summer) or higher indoor(winter) than the average seasonal usage. Pre-drought and drought water usage could be evaluated to determine which customers resulted in a large decrease in water use. These customers should be evaluated to determine the cause of their reduced water usage.

- Target outdoor water use – In normal years outdoor water use is a large percentage of overall water use. Outdoor residential water conservation programs that have proved successful in terms of continuing decreased water use for other water agencies such as City of Roseville include residential irrigation efficiency rebates and residential Smart Timers programs. Higher water savings are likely to result from programs that support implementation of permanent solutions (i.e. turf removal or modification) and depend less on participant behavior. As discussed above, targeting the larger water users for this type of program will result in more water savings. In conjunction with targeting the higher water users, customers could also be potentially targeted based on landscape size.

ATTACHMENT X

SAWS Water Education Program Annual Report, 2017/2018 School Year

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ATTACHMENT X.1.

SAWS Annual Report

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SAWS Water Education Program

ANNUAL REPORT

2017/2018 School Year

SAWS
STOCKTON AREA WATER SUPPLIERS
Stockton East Water District
California Water Service Co.
San Joaquin County
City Of Stockton

WATER EDUCATION PROGRAM

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Report Summary

SAWS

STOCKTON AREA WATER SUPPLIERS

Stockton East Water District
California Water Service Co.
San Joaquin County
City Of Stockton

WATER EDUCATION PROGRAM

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SAWS Water Education Program Annual Report Summary

School Year: 2017/2018

August 1, 2017 through July 31, 2018

This report presents an update on activities related to implementation of the Stockton Area Water Suppliers (SAWS) Water Education Program in the 2017/2018 school year. The report includes a summary of the year's outreach effort, the data and statistics resulting from that outreach effort, a description of the presentations offered to educators by the SAWS Water Education Program, and participant feedback.

In the 2017/2018 school year, the SAWS Water Education Program continued to serve elementary/middle school classrooms and after school programs within the four school districts that serve Stockton. As part of a comprehensive outreach effort, the SAWS Water Education Program also participated in numerous youth-oriented special events in San Joaquin County, including three AgVenture events, school farm days, Stockton's Earth Day Festival and a variety of other local events and gatherings.

In the 2017/2018 school year, the SAWS Water Education Program offered six grade-level specific in-class presentations and an after-school program. This year, the SAWS Water Education Program reached 22,438 students and citizens through a variety of in-class, event and after school programs, and 2,725 students through the Zun Zun school-wide assembly program, for a total of 25,163 participants.

Effectively Promoting Water Awareness and Conservation

Our educators strive to make students aware that while California's drought restrictions have been eased, wise water use is still necessary; a couple of wet winters will not solve California's water dilemma. Through our outreach, we hope to make our future citizens and leaders understand that, due to our dry climate, storage issues and population growth, water will continue to be a very important issue in the state, and we must all be prepared to make water conservation a way of life.

During the extreme drought years, state outreach and media messaging put an emphasis on water conservation in California, and that emphasis provided tangible evidence of the effectiveness of outreach programs like ours. Stockton was one of the most successful cities in the state when it came to implementing conservation measures during the drought, reducing water use by nearly 30 percent. This success may be attributable, at least in part, to the SAWS Water Education Program. For over a decade, the water suppliers have funded multi-faceted outreach in our communities, reaching thousands of students and citizens every year. Since its inception in 2005, the program has reached over 300,000 people through classroom presentations and public, youth-oriented events. Many of the students we have worked with over the years are now adults with a heightened awareness of the importance of our water resources because they participated in our programs when they were forming life-long habits in their youth. These are the people that buckled down and conserved water during the drought.

> **Is Stockton's impressive success in meeting and exceeding water conservation goals evidence of the success the SAWS agencies have had informing the public and changing their water use habits? It's certainly possible! And it seems like a logical way to measure success.**

We have found that the students and teachers we visit are drought aware. When asked "What's going on with California's water?" participants in the Water Education Program are eager to share their knowledge; even Kindergarteners we visit know about the drought, and they are often able to define the meaning of the word and the source of the problem. While media messaging may be responsible for the heightened water awareness in our communities, our presentations take students to the next level, reinforcing the conservation message and providing insight into water as an important and valuable resource. Our programs address the learning standards that relate to water for every grade level: the water cycle, weather, ecosystems, water's three states of matter, the scientific properties of water, current and historic water use in California, water conveyance/distribution systems and environmental awareness. And we enhance learning with a variety of hands-on activities that make the lessons fun and memorable.

A summary of 2017/2018 Program highlights:

- The SAWS Water Education Program visited 66 Stockton area schools/event venues, presenting or staffing a booth in 354 classrooms/events for 22,538 students and citizens.
- On behalf of SAWS, Kristin Coon Consulting contracted with Zun Zun, an environmental education assembly program, to perform nine “Water Beat” assemblies in five Stockton area schools, reaching 2,725 students.
- The SAWS Water Education Program participated in a variety of local, youth-oriented special events and promotional programs, including:
  - San Joaquin County AgVenture Events (Three venues: South County, Stockton & Lodi)
  - Manteca Unified School District’s “Planet Party Day”
  - Manteca Unified School District’s Farm Days
  - Stockton’s Earth Day Festival at Victory Park (SAWS was a principal sponsor)
- Special presentations and/or materials were provided for a variety of organizations and groups, including:
  - Lincoln High School’s “Window on Your Future” career path development event
  - Stockton First Five Parent Club
  - Stockton’s Black Family Day
  - Stockton Rotary Read-In
  - San Joaquin UC Master Gardeners Event
  - Bear Creek Community Church Summer Day Camp: Water Conservation Workshop and H20lympics
- In 2018, the coordinator joined water educators from all over the state of California at DWR’s fall Water Education Committee Meeting, hosted by MWD and Las Virgenes Water District in Calabasas, California. In the spring, the coordinator attended the Water Education Committee Meeting in Santa Cruz, hosted by Soquel Creek Water District and Watsonville Public Works.

The SAWS Booth at the Stockton Earth Day Festival

April 2018

Full Report

SAWS
STOCKTON AREA WATER SUPPLIERS

Stockton East Water District
California Water Service Co.
San Joaquin County
City Of Stockton

WATER EDUCATION PROGRAM

2017/2018 SAWS WATER EDUCATION PROGRAM REPORT

What We Do and How We Do It

The SAWS In-Class Presentation Program is in High Demand

The SAWS in-class presentations continue to be in high demand in Stockton area schools. Invitations to book presentations for the 2017/2018 school year were sent to teachers and administrators via email in early May 2017. The presentation calendar was full and a waiting list was established before the start of next school year.

The SAWS Water Education Program has developed a devoted following among Stockton teachers. Those familiar with the program often design their lesson plans with the SAWS Water Education Program in mind; the colorful visuals and hands-on activities featured in our presentations can bring lessons to life for students. Often, one teacher takes the lead to schedule for an entire grade level so each classroom can experience a “Water Lady” visit. Teachers can coordinate our grade-specific presentations with established curriculum and common core standards, inviting the program to their classrooms in conjunction with units specific or related to water. Some schools even plan field trips that coordinate with our programs; St. Luke, Tully Knoles Elementary, and several other Lincoln and Lodi USD schools coordinate our “California Water” presentation with fourth grade field trips to Columbia State Park. Fifth grades from John Muir Elementary, Primary Years Academy and other schools and teachers coordinate our in-class “Water Cycle: The Incredible Journey” presentation with a field trip/tour of the Dr. Joe Waidhofer Drinking Water Treatment Plant.

In-Class Presentations Meet Grade-Specific Standards

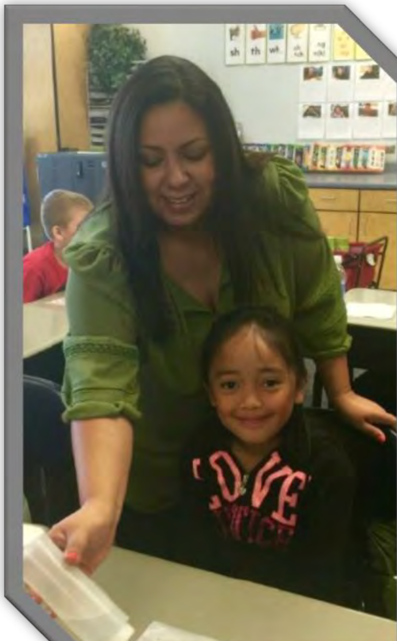
Every presentation offered by the SAWS Water Education Program is designed to meet standards specific to certain grade levels. Teachers know that our presentations can address multiple content/common core standards in 60-90 minutes with little or no teacher prep; we provide an excellent introduction or follow up to standard curriculum involving water for every elementary and middle school grade level.

Kindergarten and Grade 1 teachers can use our popular "Water Cycle Story" presentation to reinforce lessons about weather, states of matter, and forming and testing a hypothesis.

The "H20 to Go!" presentation reinforces second grade standards related to gravity, motion and machines through fun, hands-on activities

Grade 2 teachers often coordinate their lesson plans with our "H20 to Go!" presentation to reinforce standards related to gravity, motion and machines as students track water's journey from source to tap using a variety of fun and exciting hands-on pumping activities.

Teachers of Grades 3, 4, 5 and 6 can use the "Water Matters" and **"Water Cycle: The Incredible Journey"** programs to target physical and life science content standards. The two presentations are similar, but have been adapted for content/common core standards specific to each grade level. Both programs focus on the water cycle and water treatment and distribution, addressing a variety of science standards through fascinating facts and figures and a demonstration of the ratio of fresh to salt water on earth. During the "Water Matters" program, students perform a hands-on "scientific experiment" that demonstrates the properties of surface tension and cohesion, as well as concepts related to food chains and webs and environmental issues in our communities, standards specific to Grades 3 and 4. The "Incredible Journey" program addresses similar science standards for grades 5 and 6; after a refresher on the water cycle, students participate in an active, social game from Project WET, embarking on the "Incredible Journey" of a water



The "Water Matters" presentation features a "scientific experiment" demonstrating water's properties of surface tension and cohesion molecule in the water cycle, evaporating, condensing and precipitating around the room as they make a beaded bracelet, with each bead representing a component and process of the water cycle. Both “Water Matters” and “Incredible Journey” also include a comprehensive “Source to Tap” diagram depicting how water travels from the natural water cycle to the built water cycle to their faucets at home. A scale model sand and gravel water filter demonstration gives students a glimpse of the processes involved in water treatment and distribution and provides information about local water sources and the agencies that sponsor the SAWS Water Education Program. Drought, conservation and water awareness is also discussed.

Students become water molecules moving through the water cycle in the “Incredible Journey” hands-on activity

The “California Water” presentation, which covers the history, use and distribution of water in the State of California, is responsive to both fourth and sixth grade content standards and features a variety of hands-on activities, including map interpretation and a role-playing game designed to introduce students to the concepts of water rights and legislation relating to our natural resources. Students learn how water is distributed throughout the state via the State Water Project and work collaboratively to find water bodies, cities and landmarks on topographical maps.

Every student in every classroom we visit receives a pre-sharpened water-saver pencil and an age-appropriate workbook with information and activities pertaining to water conservation and awareness. As a thank you for inviting us to present, participating teachers receive a variety of gifts, that may include tote bags, magnetic clips, seed packets, water activity guides, sponges, pocket hand sanitizers, white board markers, crayon packs and other items.

The SAWS Water Education Program only distributes promotional items that are practical and useful in the classroom.

There is evidence that as Stockton's educational resources have diminished, our water education presentations have steadily gained favor. Teachers find value in our ability to connect content/common core standards to water resources, the environment, conservation and, recently, current events, such as the drought and water legislation in California. The combination of education and entertainment we provide makes learning exciting and fun for students. We like to remind teachers that, in spite of budget cuts, students can still experience the benefit of community learning because SAWS sponsors in-class programs that "bring the field trip to the classroom."

Our message is reinforced through the use of colorful visuals, songs, physical activity and audience participation

Water Treatment Plant Tours

When the SAWS Water Education Program visits middle/ high school and college classrooms (Grade 5 and up), we encourage teachers to schedule a visit to the Dr. Joe Waidhofer Drinking Water Treatment Plant for a facility tour. When elementary and middle-school classes visit, we ask that the groups include at least one parent/adult chaperon for every five students. While the main purpose for this request is crowd control, we have found that parents touring the plant often learn more than their children do, and invariably leave with a greater appreciation for their community's water resources. College classes and community groups are fascinated by and impressed with our facilities and the treatment process; most citizens never take the time to consider the source and systems that provide them with drinking water. While school districts often lack funding for field trip transportation, some public and private schools are able to visit by using adult/parent chauffeurs and chaperons. Facility tours are valuable in raising public awareness and can provide an enlightening experience for students and community members, as well as those looking for career path possibilities.

Water Operations Manager Jim Wunderlich guides John Muir School's fifth graders through the water treatment process during a tour of the Dr. Joe Waidhofer WTP

<u>After School Program</u>

The "H20lympics" program is offered to any school with a Stockton address and can serve as an after-school program, a booth at school festivals and events, or as a hands-on activity presentation to serve an entire grade level. The program features a series of fun, hands-on water activities or "experiments" that demonstrate scientific properties of water, including cohesion, adhesion and surface tension: How many water drops can you fit on the head of a penny? Can you make a paperclip float? Can you keep a water drop intact while guiding it through a laminated maze? The format of the H20lympics program allows students to have fun while learning in a relaxed, non-classroom atmosphere. As with other SAWS Water Education Programs, we have incorporated a drought/conservation discussion into

Kathy Kirchhof

Tully Knoles 4th Grade H20lympics Event the program format, and, depending on the venue, sometimes include a prize wheel or “water saver” button-making activity.

Benefits of the SAWS H20lympics Programs Include:

- Hands-on activities educate and entertain
- Format holds students’ attention because it provides an alternative to classroom learning structure
- Students are likely to take message home
- Parents often show up at after school programs and may even participate
- Appropriate for multiple grade levels (K-8): maximum contacts in minimum amount of time
- Use of upper elementary and middle school helpers allows older students to work with/teach younger students: excellent learning environment for all
- Provides teachers, facilitators and activities coordinators with free, appropriate educational activities

AgVenture

Every third grader in San Joaquin County is eligible to participate in this dynamic program sponsored by San Joaquin Farm Bureau and Select San Joaquin Foundation. AgVenture participants enjoy a day of fun while learning about the vast diversity of agriculture in San Joaquin County. This event exposes students to important concepts during their “day on the farm,” including nutritional values, agronomics, marketing, farm and crop production, the value of locally grown products and the role that producers, vendors and the purveyors of our natural resources play in bringing these commodities to the community. AgVenture’s unique format offers a meaningful and memorable experience for students and a special opportunity for the agricultural community to reach out to some of our most impressionable citizens. SAWS participation in these events allows us to promote our in-class, after school and assembly programs while sharing our message of water awareness and conservation with thousands of third graders and their teachers. Each of the three San Joaquin County AgVenture events hosts between 3,500 and 4,000 third graders, and the SAWS booth reaches up to 2500 students during each event.

Since 2010, the Stockton Area Water Suppliers alliance, through SEWD, has donated $1,000 annually to AgVenture to help sustain this valuable program.

<u>Zun Zun "Water Beat" Assemblies</u>

Stephen Snyder and Gwynne Snyder Cropsey are "Zun Zun," a performing arts group that celebrates the environment through water-themed, interactive musical assemblies. The Zun Zun program was cut from the budget for the 16/17 school year, but SAWS partially restored funding for the 17/18 school year. Zun Zun performed nine "Water Beat" assemblies in five Stockton area schools this year and has been engaged to visit five schools again in the 18/19 school year. ZunZun's "Water Beat" assembly highlights the connection of the community to its watershed, focusing on water conservation and resource protection. In this 45-minute program, Zun Zun performs a number of skits using musical instruments, song and dance, audience participation and humor for a truly memorable show. Topics covered include drought, water conservation, watershed protection, water reclamation, and water pollution. Students and teachers are encouraged to participate, playing unique "water instruments" from around the world, joining in the Sprinkler, Swimmer, and Washing Machine dances and singing the "Save Some Water" song. Audience members are invited on stage to participate in hilarious activities like the "Toilet Game Show," where students learn that fixing a leaking toilet may be the single greatest way to save water at home. Students do the Drought Limbo and participate in a crazy race that explains the purpose of storm drains and the potential threat of storm water pollution. Participants leave the assembly singing, dancing and chatting about the many facets of water covered in the performance.

Zun Zun

The SAWS "Conservation Cottage" Exhibit at the Children's Museum of Stockton

The SAWS "Conservation Cottage" at the Children's Museum of Stockton was funded by a Department of Water Resources Water Use Efficiency grant in 2005. The Coordinator works with museum personnel on a continuing basis to maintain and improve the exhibit; aging components are being replaced when and if funding becomes available. In 2015, SAWS upgraded the exhibit to include the "Waterburger," a large, vinyl replica of a cheeseburger that can be disassembled to reveal the amount of water needed to grow and process the ingredients necessary to make this popular menu item. In 2019, the Coordinator plans to work with the Department of Water Resources to add another component to the exhibit; current consideration includes a water themed Plinko game modeled after a popular display at the San Luis Reservoir Water Education Center.

The "Waterburger" at the Children's Museum

SAWS Water Education Program and the Community

The SAWS Water Education Program participates in and supplies hand-outs and materials for numerous community gatherings and other special activities and events in Stockton. The following is a list of some of the community events the SAWS Water Education Program staff participated in during the 2017/2018 school year:

- **San Joaquin County AgVentures (South County: November 2017, Stockton: January 2018, Lodi: February 2018)** The SAWS Water Education Program staffed a booth featuring a hands-on activity and prize wheel at each of the three AgVenture events in the 2017/2018 school year. Our participation in AgVenture allows us to promote SAWS sponsored in-class, after school and assembly programs while sharing our message of water awareness and conservation with thousands of third grade students and their teachers. Each AgVenture event hosts between 2,500 and 4,000 San Joaquin County third graders. SAWS/SEWD supports this event with a $1,000 annual donation.
- **Lincoln USD "Window on Your Future" (February 2018):** The Coordinator participated in mock job interviews designed to prepare Lincoln High School students for entry into the job market. This event presents an opportunity for staff to

share career path outreach with potential job seekers. The Coordinator reached approximately 30 Lincoln High School juniors and seniors at this event.

- **Rotary Read In (February 2018):** The Coordinator participates annually in the Stockton Rotary Read-In event.
- **San Joaquin County Science Fair Judging (March 2018):** The Coordinator participates annually in exhibit judging at this county-wide event.
- **MUSD "Planet Party Day" (April 2018):** The SAWS Water Education Program hosts an activity booth annually for this event focusing on science and math.
- **Manteca Unified School District's Farm Days (Spring 2018):** SAWS sponsored H20lympics booths at the MUSD Farm Day events.
- **Stockton's Earth Day Festival (April 2018):** SAWS was a principle sponsor of this popular annual festival at Victory Park in Stockton. The SAWS Water Education Program hosted a booth offering free SAWS tote bags, water conservation materials, pencils and branded rain gauges.
- **Water Treatment Plant Tours:** The SAWS Water Education Program and SEWD staff host tours of the Dr. Joe Waidhofer Drinking Water Treatment Plant for Grade 5 and above.
- **Community Based Programs:** SAWS visited and/or supplied water conservation materials for various community programs in Stockton.
- **DWR Water Education Committee:** The Coordinator attended two meetings of the DWR Water Education Committee in 2018, joining water educators from all over California to share resources and ideas for water conservation education and outreach.

Program Administration

Kristin Coon (Kristin Coon Consulting) is responsible for administration of the SAWS Water Education Program. This includes hiring and supervision of employees, payroll, payroll taxes, worker's compensation and liability insurance, subcontractor negotiations/compensation and all other aspects of program operations. The SAWS Water Education Program budget was approved on April 1, 2018, and the contract between SEWD and Kristin Coon Consulting was renewed in July 2018.

Staffing

In the 2017/2018 school year, under the supervision of Kristin Coon Consulting, the SAWS Water Education Program continued to serve the SAWS alliance, providing comprehensive water education outreach for Stockton area schools and citizens. Kristin Coon, Suzi Kelly and

Kathy Kirchhof share a busy schedule that includes presentations for classrooms, after school programs and local youth-oriented events.

Looking Ahead

In the 2018/2019 school year, Mrs. Kelly and Mrs. Kirchhof will continue to share presentation duties equally. Mrs. Coon will continue to manage the Water Education Program, processing payroll and handling finances, scheduling, and planning, as well as preparing and implementing community outreach and special presentations, working with the community, SEWD and the Urban Contractors, and providing back-up for Mrs. Kelly and Mrs. Kirchhof.

In 2018/2019, the SAWS Water Education Program will continue to serve Stockton area schools in its present form, as it has since 2004. Our in-class presentation schedule will remain static, with updates and enhancements being made using experiential learning curriculums like Project WET, CREEC, Project WILD, AIMS, STEM and Ag in the Classroom. We will also continue to attend youth-oriented community events to promote water awareness and conservation, conduct facility tours for Grade 5 and above, and offer the Zun Zun assembly program to a select group of Stockton area schools.

Conclusion

As we embark upon our 15th year serving the Stockton area, the SAWS Water Education Program staff is proud to say that our outreach programs are well-known and respected in the community. Our presentations reach significant numbers of students and community members with a variety of programs, and we participate in many high-profile youth oriented local events.

In the 2017/2018 school year, the SAWS Water Education Program's in-class, special event, and after school presentations reached over 20,000 students and members of the public. The feedback from teachers and administrators is testament to the fact that we have excellent presenters who are adept at sharing knowledge of and enthusiasm for our water resources; we are invited back to schools and events year after year because the programs we offer are a valuable resource for Stockton area schools and the community. At this writing, the program is already fully booked through June 2019.

The SAWS Water Education Program is endorsed and approved by the Stockton, Lincoln, Lodi and Manteca school districts as well as a variety of charter and private schools in the Stockton metropolitan area. The program is also sanctioned by the San Joaquin County Office of Education. Our success is evidenced by the numbers: teachers participate enthusiastically year after year and demand for presentations has increased steadily. The most effective tool for program sustainability remains teacher-to-teacher recommendations; we continue to visit new teachers and schools each year, and our loyal followers recommend us to their colleagues and often take us along when they move to new schools. Most teachers coordinate our presentations with their lesson plans and many use our outreach programs to enhance field trip experiences. This promotes a progressive learning approach, which is a major component of the overall plan: when we make multiple contacts, seeing students year after year, we are building a comprehensive knowledge base that will make water conservation and awareness second nature for those residing in our communities, ultimately helping us achieve our goal of promoting effective, community-wide water conservation and awareness in Stockton. Evaluations from both teachers and students are always enthusiastic and positive (see Feedback section), and support for the program remains high because it reinforces grade specific content/common core standards, coordinates seamlessly with curriculum, and provides a hands-on, memorable learning experience for students.

Teacher feedback and student comments and illustrations are provided in the Feedback section of this report.

Report Stats

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Stockton East Water District
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WATER EDUCATION PROGRAM

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SAWS Water Education Program
Students Participating: All Outreach Programs, All Providers
Comparison by School Year (SY)

In-Class/Assembly	School Year / # of Students												
	SY 05/06	SY 06/07	SY 07/08*	SY 08/09*	SY 09/10*	SY 10/11*	SY 11/12*	SY 12/13*	SY 13/14*	SY 14/15*	SY 15/16*	SY 16/17*	SY 17/18*
In-Class Program	8044	12357	15344	18293	18838	18915	21345	19748	26320	23538	24350	18670	22438
Assembly Program	3002	11452	9925	13989	4459	4660	6085	4731	5934	4730	5736	0	2725
Totals:	11046	23809	25269	32282	23297	23575	27430	24479	32254	28268	30086	18670	25163

*** See notes on Assembly Program below**

SY 07/08: 46 GWM assemblies performed in the 2007/2008 school year covered under the 2007/2008 agreement with SYRCL. One presenter (KC)

SY 08/09: 54 GWM assemblies performed in the 2008/2009 school year covered under the 2007/2008 agreement with SYRCL. Two Presenters (KC & SW)

SY 09/10 & 10/11: 15 Zun Zun assemblies performed in 09/10 and 10/11 school years covered under agreement with Zun Zun. Three presenters (KC, SW & CT)

SY 11/12: 18 Zun Zun assemblies performed in 11/12 covered under agreement with Zun Zun. Three presenters (KC, SW & MQ)

SY 12/13: 14 Zun Zun assemblies performed in 12/13 covered under agreement with Zun Zun. Two presenters (KC & MQ)

SY 13/14: 15 Zun Zun assemblies performed in 13/14 covered under agreement with Zun Zun. Three presenters (KC, MQ & SK)

SY 14/15: 14 Zun Zun assemblies performed in 14/15 covered under agreement with Zun Zun. Three presenters (KC, MQ & SK)

SY 15/16: 15 Zun Zun assemblies performed in 15/16 covered under agreement with Zun Zun. Three presenters (KC, MQ & SK)

SY 16/17: Zun Zun assembly program was not funded by SAWS. Three presenters through 12/16 (KC,MQ,SK), two presenters Jan-July 2017 (KC, SK)

SY 17/18: Zun Zun assembly program funding partially restored by SAWS. 9 Zun Zun assemblies performend in 17/18 covered under agreement with Zun Zun. Three presenters (KC, SK & KK)

SAWS Water Education Program Presentation/Event Breakdown
School Year: 2017/2018

By Presentation Type

Presentation Type	# of Presentations	# of Students or Attendees	%
Classroom Presentations	342	11463	51%
After School Presentations	4	440	2%
Water Treatment Plant Tours	0	0	0%
Career Workshops	0	0	0%
Children's Festivals	5	6410	28%
Festival Booths	1	4000	18%
Water Conservation Workshops	2	225	1%
Other	0	0	0%
Totals	**354**	**22538**	**100%**

By Grade

Grade	Clsrms	Students	%
K	37	1145	5%
Gr 1	77	2545	11%
Gr 2	68	2280	10%
Gr 3	75	2610	12%
Gr 4	34	1190	5%
Gr 5	46	1610	7%
Middle School	5	83	0%
Aftersch	4	440	2%
Event/Other**	8	10635	47%
	354	**22538**	**100%**

By Presenter

Presenter	Venues/ Classrooms	Students/ Citizens	%
Kristin Coon	37	7848	35%
Suzi Kelly	162	7520	33%
Kathy Kirchhof	155	7170	32%
	354	**22538**	**100%**

By School District

District	Students	%
Stockton USD	4170	19%
Lodi USD	2875	13%
Lincoln USD	2385	11%
Manteca USD	1650	7%
Aspire/Charter	1003	4%
Private	230	1%
All/Other**	10225	45%
	22538	**100%**

By Water Provider

Provider	Students	%
Cal Water	4835	21%
City of Stockton	6218	28%
Unincorporated/SJ County	1260	6%
All **	10225	45%
	22538	**100%**

Total Schools/Venues 16/17
66

**** Students or children reached through city or county wide events: unable to determine district, provider, or grade**

Feedback

SAWS
STOCKTON AREA WATER SUPPLIERS

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WATER EDUCATION PROGRAM

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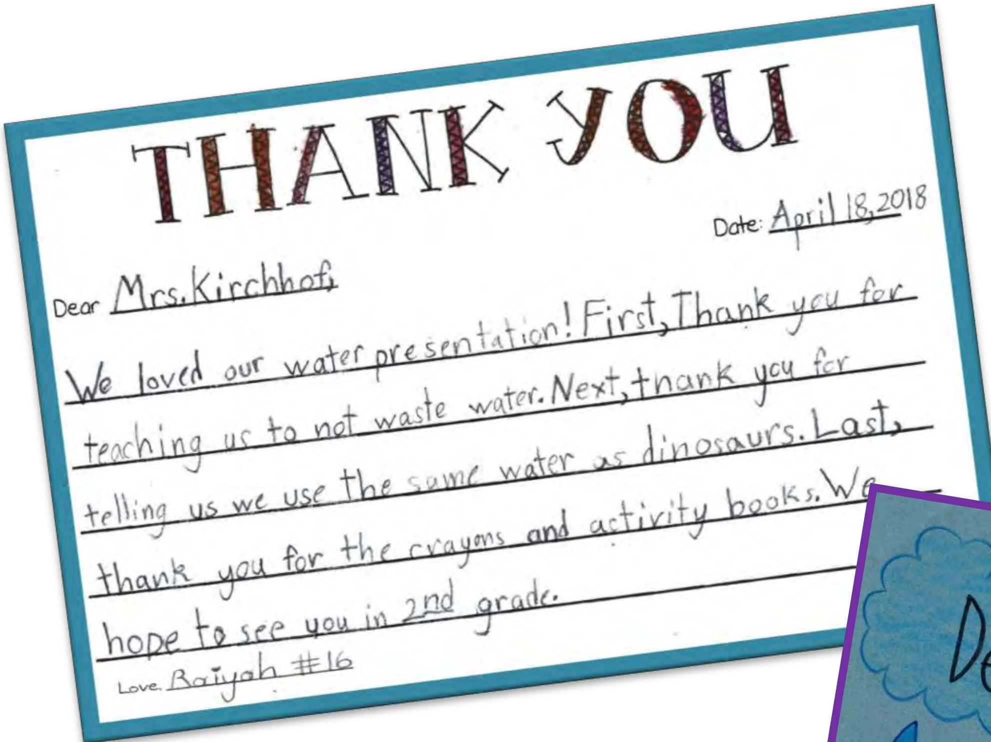
Teacher Feedback is key to enhancing and improving our programs!

Here's what teachers said about last year's classroom presentations:

- **This program does an excellent job of showing how we use and protect a natural resource we can't live without.** *Grade 2 Teacher, Tully Knoles Elementary*
- **We schedule a year ahead because this program is so wonderful and POPULAR! My students thoroughly enjoyed every minute – the songs, the movement, the follow up materials. It is perfect!** *Grade 1 Teacher, Julia Morgan Elementary*
- **Students love the hands on activities with maps and locations of rivers, mountains, aqueducts, etc. The program allows students to understand how important water is to their communities and how it relates to them.** *Grade 4 Teacher, French Camp Elementary*
- **I loved getting to watch my kids learn!** *T-K/Kinder Teacher, Taylor Skills Elementary*
- **The "blue water jar" that demonstrates fresh to salt water ratio was a very effective visual.** *Grade 5 Teacher, Elkhorn Elementary*
- **This program makes students aware of where their water comes from and how it is distributed.** *Grade 4 Teacher, Manlio Silva Elementary*
- **There was a good balance of listening time and activity time. A great program!** *Grade 1 Teacher, Wagner-Holt Elementary*
- **I was impressed with all the interactive activities that were used - students learned how water moves from the water cycle to our homes and they loved the pumping activities. The follow up materials kept students interested long after the presenter had departed.** *Grade 2 Teacher, August Knodt Elementary*
- **The instructor was well informed, had great classroom management and students respected her.** *Grade 3 Teacher, Creekside Elementary*
- **The program explained water in great detail and then had a hands-on experience. Perfect!** *Grade 3 Teacher, Lincoln Elementary*
- **The program is planned just right for fifth grade. Students are aware of what to expect and the content meets my objectives and the standards I must teach. Great materials too!** *Grade 5 Teacher, August Elementary*
- **Interesting, interactive. My sixth-grade class had little knowledge of the water cycle – this was the perfect introduction to my weather and water unit.** *Grade 6 Teacher, Aspire Ben Holt Middle School*
- **Everything was outstanding – covered sorting, vocabulary, and it was science-based.** *Kinder Teacher, Commodore Stockton Skills Elementary*
- **The presentation was perfect – as always! Syncs beautifully with our weather studies and the materials allow us to continue instruction for several weeks. The instructors are wonderful! We've had five different presenters over the years, and all have been terrific. I love this program!** *Grade 1 Teacher, John Muir Elementary*

- **Terrific! You hit our regions and Gold Rush standards right on. It really ties into everything we learned this year.** *Grade 4 Teacher, Manlio Silva Elementary*
- **I like that the program had direct instruction mixed with collaborative activities.** *Grade 4 Teacher, Colonial Heights Elementary*
- **The presentation was interactive. Students were able to be involved as examples and there was even a movement component.** *Grade 1 Teacher, Mable Barron Elementary*
- **The presenter kept the students engaged the entire time. She explained the content and taught it in a way that was easy for second graders to understand. Students loved the materials and activity books!** *Grade 2 Teacher, Wagner-Holt Elementary*
- **The instructor was awesome! Great content and materials, very knowledgeable, totally prepared, excellent classroom management and timing.** *Grade 2 Teacher, Mable Barron Elementary*
- **This presentation was wonderful! It met grade level standards with great hands-on activities and allowed many opportunities for student participation. Keep up the good work! It was wonderful!** *Kinder Teacher, Tully Knoles Elementary*
- **The hands-on activities make the abstract concrete for this age group. The format and content of the lesson are beyond excellent!** *Grade 2 Teacher, John Muir Elementary*
- **Scheduling is always very easy, and we love the follow-up materials. My students were so excited about the water drop experiment – they talked about it for days!** *Grade 3 Teacher, Aspire Port City Academy*
- **The flannel board story is easy for all students to follow. The song generates tons of excitement. Every student was engaged. This program gets better every year.** *Grade 1 Teacher, Julia Morgan Elementary*
- **This was one of the best presentations for primary grades I have ever seen. The students and I LOVED all of it!** *Kinder Teacher, Tully Knoles Elementary*
- **Hands-on, hands-on, hands-on. Students can make real life connections. An Excellent program – kids love it.** *Grade 3 Teacher, Creekside Elementary*
- **The students learned great information that I will refer to when I teach science. They love the activities and they can directly see how it is related to their lives.** *Grade 5 Teacher, Great Valley Elementary*
- **This program is terrific and we look forward to it every year. I am always amazed and love how much info the kids learn about water in such a short time!** *Grade 2 Teacher, John Muir Elementary*



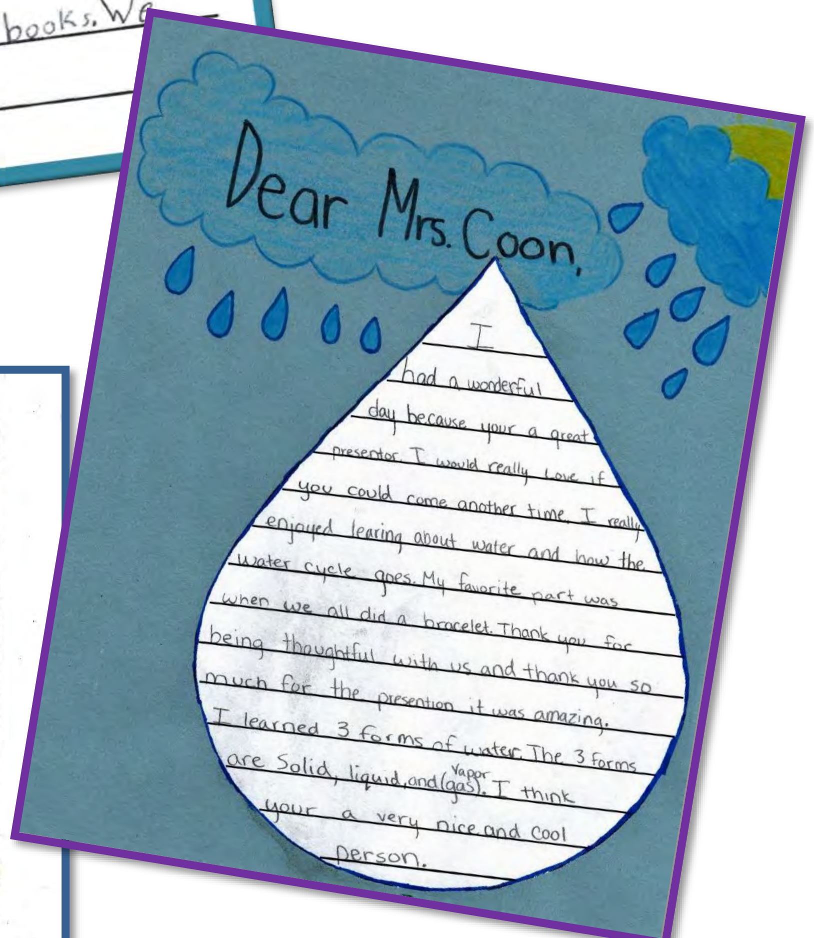
THANK YOU

Date: April 18, 2018

Dear Mrs. Kirchhof,

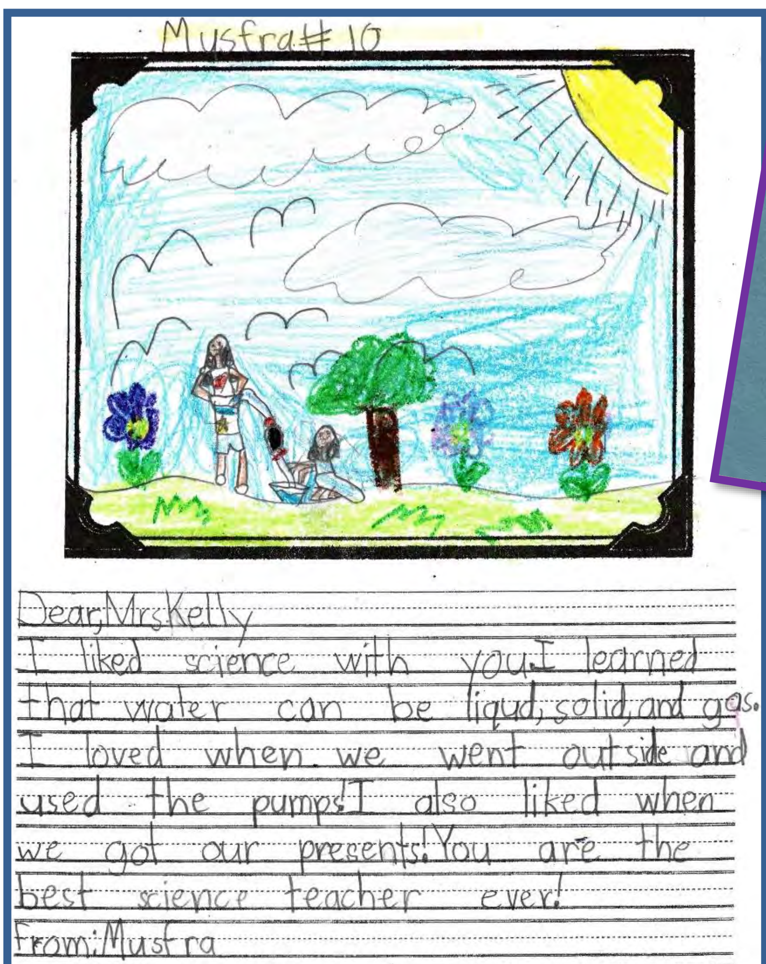
We loved our water presentation! First, Thank you for teaching us to not waste water. Next, thank you for telling us we use the same water as dinosaurs. Last, thank you for the crayons and activity books. We hope to see you in 2nd grade.

Love, Baiyah #16



Dear Mrs. Coon,

I had a wonderful day because your a great presentor. I would really love if you could come another time. I really enjoyed learing about water and how the water cycle goes. My favorite part was when we all did a bracelet. Thank you for being thoughtful with us and thank you so much for the presention it was amazing. I learned 3 forms of water. The 3 forms are Solid, liquid, and (gas) vapor. I think your a very nice and cool person.

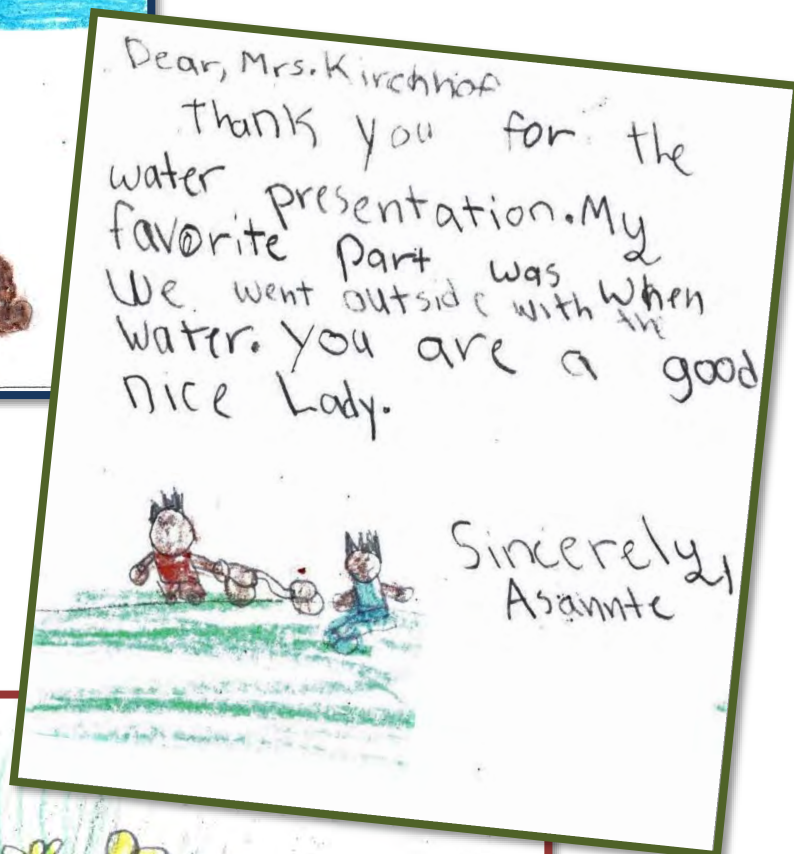


Musfra #10

Dear, Mrs Kelly

I liked science with you. I learned that water can be liqud, solid, and gas. I loved when we went outside and used the pumps! I also liked when we got our presents! You are the best science teacher ever!

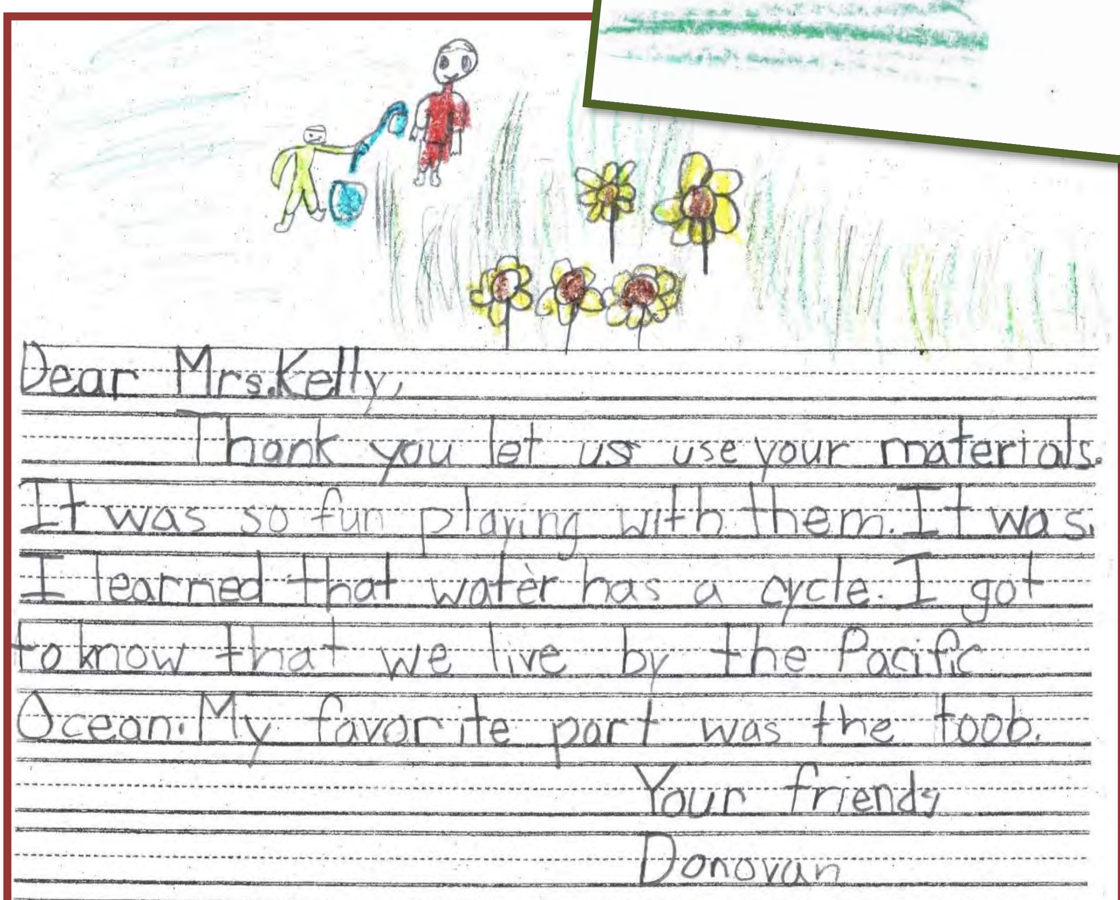
From: Musfra



Dear, Mrs. Kirchhof

Thank you for the water presentation. My favorite part was when We went outside with the water. You are a good nice Lady.

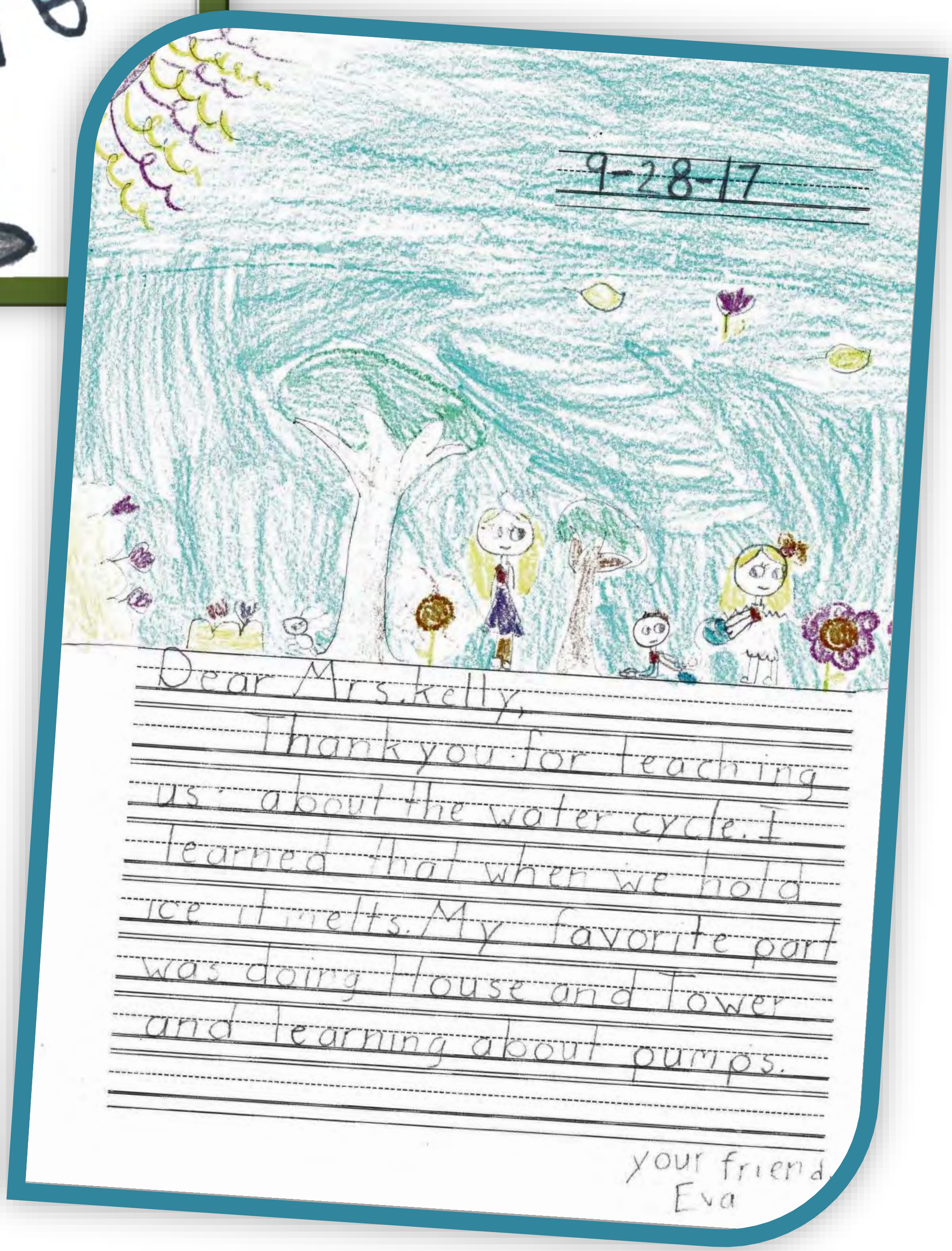
Sincerely,
Asannte



Dear Mrs. Kelly,

Thank you let us use your materials. It was so fun playing with them. It was. I learned that water has a cycle. I got to know that we live by the Pacific Ocean. My favorite part was the foob.

Your friend,
Donovan



9-28-17

Dear Mrs. kelly,

Thank you for teaching us about the water cycle. I learned that when we hold ice it melts. My favorite part was doing House and Tower and learning about pumps.

your friend
Eva

Dear Mrs. Coon,

I thought it was very nice of you to come to our class. I think you are very kind. Thank you for the pencil and books. I learned the three forms of water, a solid, a liquid or a gas. I enjoyed your presentation. I really liked my bracelet that we made. Thank you for teaching me about the water cycle and how you clean the water. My favorite part was the water game and colleted the beads. Thank you for coming and I had a wonderful day.

Your Friend,

Emily

Assembly Program

SAWS

Stockton East Water District
California Water Service Co.
San Joaquin County
City Of Stockton

STOCKTON AREA WATER SUPPLIERS

WATER EDUCATION PROGRAM

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FINAL REPORT 2017-2018 School Year
July 10th, 2018

ZunZun performed assemblies for five schools in the Stockton Area Water Suppliers (SAWS) service area in the 2017-2018 school year. ZunZun performed for approximately 2,725 students and 136 teachers this year. The musical assemblies were a celebration of water and introduced students to the topics of water conservation, clean water, watershed pollution prevention and watershed awareness. The assemblies were in Spanish and English, depending on the language spoken by audience members. All assemblies included California State Education standards in Science, Math, History- Social Science, Language Arts and English Language Development, and Fine Arts so that they easily tied into classroom curriculum. Also, each teacher received a follow up activity "WaterBeat" book with water education, science and conservation activities for use after the assembly to reinforce water conservation and pollution prevention concepts as well as tie into classroom curriculum.

Included in this final report are the following:

- Outreach
- State Standards
- Performances
- "WaterBeat" Post Activity Guide
- Evaluations
- Future Possibilities
- Final Performance Schedule

Enclosed with this report, please find:

- 2017-18 Outreach Flyer sent to schools
- Sample of the newsletter for school newspaper or parent letter

OUTREACH
Kristin Coon, who also made preliminary contact with schools to determine their interest in the assembly program, provided a list of target schools.

Once the assembly coordinator was determined (by Ms. Coon or ZunZun), we phoned or emailed the contact person at each school site to provide them with additional details about the assembly program. ZunZun followed up by phone and email until each school booked or declined the assemblies. All schools booked directly with ZunZun, who provided an updated performance schedule to Kristin Coon monthly.

Prior to each scheduled assembly, we emailed a confirmation letter with assembly details to the contact person at each school. We also emailed pre and post assembly activities to be distributed to the teachers for use before and after the performance. A sample of these activities is included with this report. In addition, we sent a newsletter article that goes in the parent newsletter at every school. The newsletter helps remind kids and parents of ways to save water and prevent watershed pollution and lets parents know about the SAWS sponsored assemblies.

At least one week before the scheduled performance, we called schools to again confirm show times and school location.

STATE CONTENT STANDARDS

This year schools in California are continuing their implementation of Common Core, so we are continuing to update our content to meet common core curriculum goals. Common Core standards are designed to encourage critical thinking and holistic learning, and our water awareness assemblies are a perfect intersection of hands on learning and information, and meet many Common Core standards.

In addition to being an extremely fun water education experience, ZunZun assemblies cover a large number of California State Content Standards for grades K-8. Because we use music and musical instruments, they meet many **Visual and Performing Arts Standards.** As the assemblies are about water issues, they cover **Science Content Standards.** Students are learning new vocabulary and words, so they are meeting many **Language Arts and English Language Development Standards.** We introduce instruments from around the world, which meets many standards in **History- Social Science Standards.** Finally, we use both Spanish and English which meets **English Language Development Standards** and **World Language Content Standards.** Most importantly, the assemblies are designed to help students feel empowered to make changes in their daily lives and the lives of their families that help prevent wasting water and prevent pollution. ***The assemblies encourage proactivity.***

A few specific examples of State Content Standards in **Science, Language Arts, and Visual and Performing Arts** met in our shows are as follows**:**

Science: Water education for all grade levels is included in every assembly. (i.e.: Grade 3 physical science 1.e, 1.f.; Grade 5, earth sciences 3a, 3b, 3c) Education standards regarding water on earth, evaporation, properties of a solid, liquid and a gas, water present in the form of salt and fresh water, etc. are addressed.

Language Arts: Use of rhythm and rhyme to remember a concept. Learning new words such as “runoff” and “drought” and seeing/ hearing a description while repeating a rhyme that reiterates the definition. (See CA Content Standards, Reading Standards- Craft and Structure, Key Ideas and Details Integration and Knowledge of Ideas. Also Speaking and Listening Standards for grades K-6).

Visual and Performing Arts: As students sing and perform with us in the assembly, they are not only hearing music (All grades, Music Standards 1.1-1.5), but performing it (Grade 2, Music Standards, 2.1, 2.2 for example).

Because all students learn differently, ZunZun strives to use as many different types of learning tools as possible in the assemblies, so students are learning *visually, musically, physically, scientifically, mathematically,* and *verbally*. Students are thinking things through, using movements and singing throughout. So many standards are contained in the assemblies it would be a very long list to include them all here.

PERFORMANCES

This year we made sure the program was aligned with as many NGSS standards as possible. Assemblies were about water conservation and watershed pollution prevention. Also, we went beyond simple conservation messages, and included important holistic facts about the many reasons we should save water, such as energy conservation and wildlife habitat preservation. Our recycling messages were sprinkled throughout the entire show, not just in a single segment.

Opening Remarks We thank Stockton Area Water Suppliers for sponsoring the assembly, and give information to get the best results as an audience so students can know to pay attention but also enjoy the show.

Musical Rain Our water access starts with precipitation in California, so we create a musical rain storm. Using Andean instruments such as zampona, kena, bombo, chakchas and charango we create wind, more wind, sounds of birds, thunder rain and then the rain going down a creek and river. 10 students come up front to play the "rain" or chakchas from the Andes. We use this segment to review the water cycle, and review drought, and the fact that we often don't get enough rain and/or snow. We review SAWS water sources. We review how every year our precipitation rate changes, and that is why conservation all year is important.

How Much Water Do We Use This segment shows 60 gallons, and how much water that really is. We review math facts, and how many cups are in a gallon (16). Then we show 15 gallons on a string that are held up by two students. We ask "do you think we use this much per person per day?" Then we say, "the average person uses more!" We add another 15 gallons on a string. We do this all the way up to 60 gallons. We ask "how many cups is that?" Answer: 960, almost 1,000 cups of water a day! Then we say the average in California is actually 100 gallons a day per person, and how if you include outdoor use it is even higher. Usually 60 gallons stretched out takes up so much space we have one student "walk out the door" so we can show 60 gallons in a dramatic way. It consistently stretches all the way across the front of the room, and shows how very much we use!

Drip Drop Has Got to Stop After using the 60 gallons to explain ways we use water (showers, toilets, cooking, cleaning, outdoor use) we ask "how do you think we waste the most water?" We use a cow bell to represent the sound of a drippy faucet or hose. In this segment we show how much a drip can lose over time and have students come up and play the different size containers that would fill up just from a drip. First, we bring 2 "pint size" shaker players who play a recycled plastic water bottle and a reusable water bottle, both with rice inside for a maraca. They represent 5 minutes of dripping. We review "Take it from the tap" and how great reusable water bottles are. Then we show after 2 hours, you could fill a five-gallon container which we then have a student play as a drum. We have the audience then do the math: if we lose 5 gallons in 2 hours, how much would we lose in 6 hours? 15 gallons! We then have a student play a 15-gallon container as a drum. Then we ask how much would we lose in a day, 24 hours. They do the math and say "60 gallons", the same amount they had just seen stretched across the front of the room in "how much water do we use". So, we need to fix the leak, we call a student volunteer who is our "plumber" and they play timbale drums to signify the sounds of a repair. All of this is done to the audience singing the song "drip drop has got to stop, stop the drip drop!"

Water Saving Dances Each class sends up a student who does a water saving review dance: "Wash your hair, five- minute shower, brush your teeth with the faucet off. Wash your hands, turn the drip off, wash your clothes with the washer full!" They get faster and faster then everyone stands up and joins in to do the dance.

Run Off This segment uses berim bao from Brasil and the audience, singing "run run run run run run run run off!" Two students are asked to come up and "run off" the water (a blue stretch of fabric) down the "street" (an aisle in the middle of the room) and in to a storm drain. They are surprised when we tell them "You're not done yet!" and we keep having things that run off: oil from a car, soap from a car wash, paint from washing paint brushes, and of course garbage! We talk about pollution prevention, and what they can do, even choices they make for packaging lunches or team snacks with less disposables and less plastics. We use this segment to also talk about surface tension, and the chemistry of water and why something as simple as soap can damage a watershed. Finally, we celebrate our close connection to the watershed, our creeks, our wetlands, our delta, our San Francisco Bay and our Pacific Ocean.

Water Beat Book
This year we were thrilled to present each class with a SAWS sponsored water beat book that has more than 30 water science and water conservation activities for teachers to use after the assembly. There are also video links on line they can use to do some of the movement-based learning about water. We introduce a poem from the book, and some other activities and thank SAWS for sponsoring the long-awaited activity guides!

Water in 12 Languages “H20 go with the Flow” This segment celebrates our diverse backgrounds, and the science of water is reviewed to tie in with more NGSS standards. We celebrate the diversity of language and our common purpose of protecting our natural resources, with a song which follows the path of water, the water cycle and the properties of water. Whole audience participates. Words are “aqua, vatten, amanzi, su, mizu, apa, wai, pani, shui, tubig, ran, and H2O". Though we have tried to end the show with a new song, everyone requests "H2O Go With the Flow" so we have ended every assembly with this hit!

Closing remarks We thanked SAWS for sponsoring the show, and asked for teacher feedback and reminded them about the follow up activities we sent as well as the evaluations they would receive via email.

PRE and POST ASSEMBLY ACTIVITIES

This year we were thrilled to have handed out "The Waterbeat" activity books to every school. Each school first received a pre-activity sheet before the assembly (see attached "Pre-and Post-activity sheet) and then after the assembly we handed out 15 WaterBeat activity books to each school. The books contain follow up activities that include reading, writing, NGSS, conservation, pollution prevention, musical and movement activities related to water. Many of the activities have an online link to songs and movements teachers can have their students use for science, P.E. and even a quick movement break, all while learning about water. They were enthusiastically received at every school!

EVALUATIONS

This year we used only electronic evaluations, and received responses but not as many as we would have liked. The evaluation feedback was overwhelmingly positive, giving performers and program very high ratings. One hundred percent of respondents said they would like SAWS to continue with this or a similar program in the future. Additionally, performers hear great responses at the school sites.

This year we received our lowest number of evaluation responses in recent history. We think there have been some “spam filter” issues with some districts. Also, we think that the electronic surveys are easy to skip in the busy day of a teacher. If we decide to address the low evaluation numbers, we would love to discuss some initiatives we think would work, or alternatives, such as paper evaluations.

POSSIBILITIES FOR FUTURE COLLABORATIONS

Some ideas for future years are…

Common Core Curriculum/ Next Generation Science Standards: As California begins to adopt the Common Core Standards for classroom curriculum, we will make the use of the standards apparent to teachers and educators while performing the assemblies. We will compare the assembly content to the Common Core/ Next Generation Science Standards guidelines and make the standards we use available to educators.

Paper Evaluations or Electronic? This year we used only electronic evaluations. Although we received fewer back than we had hoped, we are committed to keep trying paper free! If we need to we will return to paper evaluations.

ZunZun FINAL PERFORMANCE SCHEDULE for Stockton Area 2017-2018 School Year:

Date	School	Contact	#	Times	# Students	City
1/11/18	Montezuma	Lori Royce	2	9:15 & 10:15	455	Stockton
1/11/18	August Elementary	Linda Spencer	1	12:50	704	Stockton
5/8/18	Mable Barron	Delia Sanchez	2	8:45 & 9:30	550	Stockton
5/9/18	Clairmont	Jasmine Wells	2	8:30 & 9:30	500	Stockton
5/17/18	Kennedy	Roxanne Pina	2	8:15 & 9:15	516	Stockton

Stockton Newsletter Article 17-18

Did your child come home from school recently and talk about a toilet game show? Or maybe they walked in the door and started singing, "H2O, Go with the Flow" while doing a crazy dance. If so, there's no doubt they just attended ZunZun's latest water awareness assembly.

Each year, Stockton Area Water Suppliers sponsors free water awareness assemblies in local schools. The assemblies, performed by the musical group, ZunZun, teach students about sustainability, watershed protection, conservation, water science and water awareness in a fun and interactive way using musical instruments from all over the world. During the assembly they learned about aquifers, about keeping our watershed clean and what "queremos agua" means! They were also given a water testing activity to do with their class you might ask them to tell you about! See what your child can tell you about what they learned, but don't be surprised if they break into a song and dance routine while telling you how to save water around the house. You can ask them "what is an aquifer" or "what are water instruments?" And if they share some helpful tips on how to conserve and protect water, be sure to take their advice!

ZunZun's water assemblies are sponsored by Stockton Area Water Suppliers. You can contact ZunZun at www.zunzuntunes.com. It is always a pleasure to work with your wonderful school community!

ATTACHMENT X.2.

SAWS Ed Brochure

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What teachers are saying...

"...an excellent presentation...fun and engaging!"

"...very appropriate for my grade level. The students loved the visual demonstrations and hands on activities."

"Meets content standards very well...all information was extremely relevant!"

"This lesson is fun and educational...perfect...like a field trip without the bus!"

What students are saying...

"I learned that there is more salt water than fresh water and I am drinking the same water the dinosaurs drank!" –Maysee, Grade 2

"You showed us how water is used over and over again. I loved the part when you made the dirty water turn clean!" –Vang, Grade 3

"Thank you for coming to teach us about the water cycle. I like the story the best and all of it was fun." –Emma, Grade 1

"At home I am trying my best not to waste water." –Isiah, Grade 3

"I found out that our water comes from melting snow in the mountains, and that it's very old. I loved the water cycle game!" –Krystal, Grade 5

SAWS Water Education Programs

This brochure includes brief descriptions of the stimulating, in-classroom water education programs we offer educators in all schools in the City of Stockton metropolitan area. Each grade specific program is designed to support your classroom curriculum and provide California Content Standards based learning that will inform and educate students about the practical and scientific concepts behind society's need to conserve water.

SAWS, the Stockton Area Water Suppliers, is an association of water professionals from the California Water Service Company, the City of Stockton, Stockton East Water District, and San Joaquin County. We understand that one of the best ways to encourage the wise use of water is to educate our young citizens about the precious nature of water as a necessary resource for society's survival. Please review this brochure and call us with any questions.

To Schedule Your Presentation...

Email or call
Kristin Coon
Water Conservation Coordinator
Stockton East Water District

kcoon@sewd.net
or
(209) 444-3126

Space is limited; presentations will be booked on a first-come, first-served basis

Water Education Programs

Standards Based Learning for Stockton Area Schools

FREE PRESENTATIONS

Sponsored by
Stockton Area Water Suppliers (SAWS)

SAWS
STOCKTON AREA WATER SUPPLIERS
Water Education Program

CLASSROOM PRESENTATIONS

Kinder/Grade 1
“Water Cycle Story”

This presentation provides an introduction to the water cycle and water’s three states of matter. A flannel board story uses colorful pictures and scenarios to discuss how we use water in our lives and how water’s three “costumes” play an important part in the water cycle. The concepts of recycling and conservation are also discussed. Midway, we break for a “cloud stretch” and a song. The program ends with a water themed game.

Program Duration: 70 minutes.

This program is most effective for late-year Kindergarten and Grade 1 students.

Standards: Hist/Soc Sci: K.1.1, K.4.2. Phys Sci: K.1.a, b, c,. 1.1.a,b. Life Sci: 1.2.b, 1.2.e. Earth Sci: K.3.a, b, c. 1.3.b, c. Invest/Exp: K.4.a, K.4.d. 1.4.a, c, g.

Grade 2 “H2O to Go”

The Grade 2 program focuses on water in motion. Students will trace water’s journey from the mountaintops to our faucets and learn about the push/pull forces used to move water in nature and in man-made conveyance systems. Weather permitting, the class will move outdoors for hands-on pumping and siphoning activities (water activities can also be done inside classrooms with a roomy sink area). The program concludes with a question and answer session about water in motion.

Program Duration: 90 minutes

Standards: Phys Science: 2.1.c, d, e. Invest/Exp: 2.4.g

Grade 3 & 4
“Water Matters!”

This presentation takes an in-depth look at the hydrologic cycle and water’s three states of matter. Students will see a demonstration of the ratio of salt water to fresh water on earth and relate this ratio to the water cycle’s amazing ability to provide the earth with a reliable, clean, fresh supply of H20. A hands-on activity helps students discover and understand how liquid water’s cohesive properties relate to every day uses of water and the delicate balance of our natural ecosystems. Stockton’s water sources are discussed. A water filtering demonstration concludes the program.

Program Duration: 90 minutes

Standards: Phys Science: 3.1.e, f, g, h. Life Sc i: 3.3.c, 4.2.b, 4.3.a, b. Invest/Exp: 4.6.c

Grade 4 or 6
“California Water”

Eureka! Liquid Gold! From the gold rush to modern day farming, water affects every aspect of our lives here in California. In this program, students vie for water rights in a game designed to demonstrate how water availability affects growth and progress in our state. This knowledge is linked to the processes used to bring food to our tables and move water to arid southern regions of the state through map interpretation and hands-on activities. Requires some preteaching.

Program Duration: 2 hours

Standards: Hist/Soc Sci: 4.1.3, 4.1.4, 4. 1.5, 4.3.3, 4.4.2, 4.4.7, 4.5.5, 6.2, 6.4

Grade 5
“The Incredible Journey”

Learning is fun as students become water molecules in a fast-paced game that moves them from oceans to rivers, plants, glaciers, lakes and clouds; evaporating, condensing, transpiring, accumulating, and precipitating to demonstrate the endless process of the water cycle. The program also includes an in-depth review of the water cycle and a water filtering demonstration. On-site water treatment plant tours are also available for Grade 5 classrooms.

Program Duration: 90+ minutes

Standards: Phys Sci: 5.1.b, 5.1.g. Life Sci: 5.2.e, 5.3.a, 5.3.b, 5.3.c, 5.3.d, 5.3.3, 5.4.b. Invest/Exp: 5.6.g

Middle School
“Our Watershed”
…we all live downstream

What is a watershed? How do our actions in our environment affect the quality of the water we drink? Why is stormwater management important in maintaining a safe, clean water supply? This interactive presentation defines and demonstrates the concepts of watersheds, point and non-point source pollution and stormwater. Students work together in groups using Enviroscape© Models to demonstrate how activities within a watershed can affect drinking water.

Duration: 90+ minutes

Standards: 5.3, 6.1, 6.2, 6.4, 6.5, 6.6, 6.7, 7. 7

After School/Event
“H2OLYMPICS”

How many water drops will fit on the head of a penny? Can you negotiate the water maze? Make a paper clip float? The SAWS H2Olympics combines water science and fun to make your special event even more special! This program can be structured to serve up to six classes. Great for farm days, after school programs and other organized special events.

Requires volunteer help. For Details:
kcoon@sewd.net or (209) 444-3126