TABLE OF CONTENTS

Executive Summary

	ES 1. Introduction	ES-1
	ES 1.1 GSP Revisions	ES-2
	ES 2. Summary of Plan Area	ES-3
	ES 2.1. Basin Setting and Hydrogeologic Conceptual Model	ES-3
	ES 2.2 Water Budget	ES-4
	ES 3. Sustainable Management Criteria	ES-6
	ES 3.1. Chronic Lowering of Groundwater Elevations	ES-10
	ES 3.2. Reduction of Groundwater Storage	ES-10
	ES 3.3. Subsidence	ES-10
	ES 3.4. Degraded Water Quality	ES-10
	ES 3.5. Seawater Intrusion	ES-11
	ES 3.6. Depletion of Interconnected Surface Waters	ES-11
	ES 3.7. Monitoring Network	ES-11
	ES 4. Overview of Projects and Management Actions	ES-13
	ES 4.1. PMAs Planned for Implementation	ES-13
	ES 4.1.8. Demand Management	ES-14
	ES 4.1.9. Well Mitigation Program	ES-14
	ES 4.2. Proposed Potential PMAs	ES-14
	ES 5. Plan Implementation	ES-16
	ES 6. Overview of Governance	ES-19
C	Chapter 1. Introduction	
	1. INTRODUCTION	1-1
	1.1. Purpose of Groundwater Sustainability Plan	1-1
	1.1.1. Justification for Management Area	1-3
	1.2. Sustainability Goal	1-5
	1.3. Agency Information	1-6
	1.3.1. Organization and Management Structure of the GSA	1-6
	1.3.2. Legal Authority of the GSA	1-8
	1.3.3. Estimated Cost of Implementing the GSP	
	1.4. GSP Organization	1-10

Chapter 2A. Plan Area

2. Subbasin Plan Area and Basin Setting (Reg. § 354.8)	2A-1
2.1. Description of Plan Area	2A-1
2.1.1. Summary of Jurisdictional Areas and Other Features	2A-1
2.1.2. Water Resource Monitoring Entities, Management Programs, and Data Source	es 2A-13
2.1.3. Land Use Elements or Topic Categories of Applicable General Plans	2A-27
2.1.4. Additional GSP Elements	2A-33
2.1.5. Notice and Communication	2A-37
2.2. References	2A-54
Chapter 2B. Basin Setting	
2. Subbasin Plan Area and Basin Setting (Reg. § 354.8)	2B-1
2.1. Description of Plan Area	2B-1
2.2. Basin Setting	2B-1
2.2.1. Hydrogeologic Conceptual Model	2B-1
2.2.2. Current and Historical Groundwater Conditions	2B-44
2.2.3. Basin Setting Summary	2B-78
2.3. References	2B-80
Chapter 2C. Water Budget	
2. SUBBASIN PLAN AREA AND BASIN SETTING (REG. § 354.8)	2C-1
2.1. Description of Plan Area	2C-1
2.2. Basin Setting	2C-1
2.3. Water Budget (Reg. § 354.18)	2C-1
2.3.1. Water Budget Conceptual Model	2C-2
2.3.2. Water Budget Analysis Periods	2C-6
2.3.3. Surface Water System (SWS) Water Budget Description	2C-8
2.3.4. Groundwater System (GWS) Water Budget Description	2C-15
2.3.5. Historical Water Budget	2C-18
2.3.6. Current Water Budget	2C-30
2.3.7. Projected Water Budgets	2C-33
2.3.8. Projected (Future Land Use) Water Budget Summary	2C-43
2.3.9. Projected Water Budgets with Climate Change	2C-55
2.3.10. Projected Groundwater Storage Change by Aquifer	2C-57
2.3.11. Uncertainty in Water Budget Estimates	2C-59

	2.3.12. Estimate of Sustainable Yield	2C-62
	2.4. References	2C-72
C	hapter 3. Sustainable Management Criteria	
	3 SUSTAINABLE MANAGEMENT CRITERIA	3-1
	3.1. Sustainability Goal (Reg §354.24)	3-10
	3.1.1. Goal Description	3-10
	3.1.2. Description of Measures	3-11
	3.1.3. Description of Measures and Explanation of How the Goal Will Be Achieved in 20 Years	3-11
	3.2. Measurable Objectives and Interim Milestones (Reg. § 354.30)	3-12
	3.2.1. Measurable Objectives for Chronic Lowering of Water Levels	3-13
	3.2.2. Measurable Objectives for Reduction in Groundwater Storage	3-17
	3.2.3. Measurable Objectives for Subsidence	3-18
	3.2.4. Measurable Objectives for Degraded Water Quality	3-20
	3.2.5. Measurable Objectives for Interconnected Surface Waters	3-22
	3.3. Minimum Thresholds (Reg. § 354.28)	3-25
	3.3.1. Minimum Thresholds for Chronic Lowering of Groundwater Elevations	3-25
	3.3.2. Minimum Thresholds for Reduction in Groundwater Storage	3-34
	3.3.3. Minimum Thresholds for Subsidence	3-36
	3.3.4. Minimum Thresholds for Groundwater Quality	3-38
	3.3.5. Minimum Thresholds for Interconnected Surface Water Depletions	3-39
	3.3.6. Relationship Between the Established Minimum Threshold and Sustainability Indicator(s)	3-41
	3.3.7. Minimum Thresholds Impacts to Adjacent Basins	3-42
	3.3.8. Minimum Thresholds Impacts on Beneficial Users	3-42
	3.4. Undesirable Results (Reg. § 354.26)	3-42
	3.4.2. Potential Effects on the Beneficial Users of Groundwater	3-45
	3.5. Management Areas	3-45
	3.6. Monitoring Network	3-46
	3.6.1. Description of Monitoring Network (Reg. § 354.34)	3-46
	3.6.2. Groundwater Elevation Monitoring Network	3-50
	3.6.3. Groundwater Storage Monitoring Network	3-53
	3.6.4. Subsidence Monitoring Network	3-55
	3.6.5. Groundwater Quality Monitoring Network	3-57
	3.6.6. Interconnected Surface Water Monitoring Network	3-59

GSP TEAM

	3.7. Description of Monitoring Protocols (Reg. § 354.34)	.3-61
	3.7.1. Protocols for Monitoring Sites	.3-61
	3.7.2. Groundwater Level Elevation	.3-61
	3.7.3. Groundwater Storage Measurements	.3-63
	3.7.4. Groundwater Quality Measurements	.3-63
	3.7.5. Subsidence Measurements	.3-65
	3.7.6. Interconnected Surface Water Measurements	.3-65
	3.7.7. Representative Monitoring (Reg. § 354.36)	.3-65
	3.7.8. Assessment and Improvement of Monitoring Network ((Reg. § 354.38)	.3-65
C	hapter 4. Projects and Management Actions	
	4. Groundwater Management: Projects and Management Actions (§ 354.44)	4-1
	4.1. Introduction	4-1
	4.1.1. Development Approach	4-1
	4.2. Summary of Projects and Management Actions	4-6
	4.2.1. Overview of All Proposed Projects and Management Actions	4-6
	4.2.2. Sustainability Indicators Benefitted by Projects and Management Actions	.4-19
	4.2.3. Achieving and Maintaining Sustainability	.4-20
	4.3. Overview of Concepts Explored	.4-20
	4.3.1. Well Permit Revision	. 4-20
	4.3.2. Demand Management	.4-20
	4.3.3. Multi-Benefit Recharge Project	.4-21
	4.3.4. Flood Managed Aquifer Recharge (Flood-MAR)	.4-22
	4.3.5. Rainfall Managed Aquifer Recharge (Rain-MAR) to Capture Runoff from Fields	.4-23
	4.3.6. Other Groundwater Management Strategies (Projects and Management Actions and Feasibility)	
	4.3.7. Ongoing Evaluation of Groundwater Management Efforts (LSCE)	.4-23
	4.4. Projects and Management Actions Developed for Implementation	.4-23
	4.4.1. Multi-Benefit Recharge Project	.4-24
	4.4.2. Grower Education Relating to On-Farm Practices for Sustainable Groundwater Managemen 30	t4-
	4.4.3. Thomes Creek and Elder Creek Diversion for Direct or In-Lieu Groundwater Recharge	.4-35
	4.4.4. Expanded Use of CVP Contract Supplies in Proberta Water District and Thomes Creek V	
	4.4.5. Fl Camino Restoration Project	.4-50

GSP TEAM

4.4.6. Elder Creek Non-Native, Invasive Species (NIS) Plant Control	4-53
4.4.7. Tehama West Non-Native, Invasive Species (NIS) Plant Control	4-55
4.4.8. Demand Management	4-58
4.4.9. Well Mitigation Program	4-60
4.4.10. County Well Permitting Ordinance	4-62
4.5. Portfolio of Other Potential Projects and Management Actions	4-64
4.5.1. Potential Projects	4-64
4.5.2. Potential Management Actions	4-78
4.5.3. Potential Other Activities	4-87
4.6. Project Financing	4-98
4.7. GSA Coordination	4-98
4.7.1. Goals, Policies, and Ordinances	4-98
4.7.2. Well Owner Outreach and Education	4-99
4.7.3. Participation in IRWMPs/GMPs/SNMPs/etc	4-99
4.8. Subbasin Water Available for Projects	4-99
4.8.1. Thomes Creek	4-101
4.8.2. Water Right Permits	4-102
4.8.3. Potential Water Available from Elder Creek for Groundwater Recharge	4-103
4.8.4. Potential Water Available from Thomes Creek for Groundwater Recharge	4-106
4.8.5. Sacramento River	4-109
Chapter 5. Plan Implementation	
5. PLAN IMPLEMENTATION (REG. § 354.6)	5-1
5.1. Estimate of GSP Implementation Costs	5-1
5.1.1. GSA Administration, Management, Operations, and Other Costs	5-1
5.1.2. Monitoring	5-2
5.1.3. GSP Implementation and Updates	5-3
5.1.4. Project and Management Actions Development and Implementation Costs	5-4
5.1.5. Total Costs	5-4
5.1.6. Funding Sources	5-6
5.2. Schedule for Implementation	
5.3. Annual Reporting	5-7
5.3.1. General Information (§356.4(a))	
5.3.2. Subbasin Conditions (§356.4(b))	

Table 2-5

Table 2-6

Table 2-7

Table 2-8

Table 2-9

Table 2-10

Table 2-11

Table 2-12

Table 2-13

Table 2-14 Table 2-15

TABLE OF CONTENTS RED BLUFF S		RED BLUFF SUBBASII
5.3.3. Plan	Implementation Progress (§356.4(c))	5-8
5.4. Period	dic Evaluations and Reporting	5-8
5.4.1. Sust	ainability Evaluation (§356.4(a) - §356.4(b))	5-8
5.4.2. Mor	nitoring Network (§356.4(e))	5-9
5.4.3. New	v Information (§356.4(f))	5-9
5.4.4. GSA	Actions (§356.4(g))	5-9
5.4.5. Plan	Amendments, Coordination, and Other Information (§356.4(i) - (§356.4(k))5-9
Chapter 6. R	eferences	
LIST OF TA	ABLES	
Table ES-1	Summary of Undesirable Results Applicable to the Plan Area	
Table ES-2	Summary of MT, MO, and Undesirable Results	
Table ES-3	Estimated GSP Implementation Costs through 2042	
Table 1-1	Sustainability Goal Development and Associated GSP Sections	
Table 1-2	GSA formation Timeline	
Table 1-3	Cross Reference of GSP Regulations and Associated GSP Sections	
Table 2-1	Red Bluff Subbasin Land Use (Acres)	
Table 2-2	Red Bluff Subbasin Agricultural Land Use (Acres)	
Table 2-3	Well Density	
Table 2-4	Surface Water Monitoring Stations	

Tehama County General Plan Relevant Goals, Policies, and Implementation Measures

Details of the Stream Gage and Well with Overlapping Historical Record Periods

Water Budget Components by Accounting Center and Associated GSP Regulations

Sacramento Valley Water Year Type Classification during the Historical Water Budget

Sacramento Valley Water Year Type Classification Over the Projected Water Budget

Beneficial Uses and Users of Groundwater

Stratigraphic Summary with Hydrogeologic Properties

Sacramento Valley Water Year Types since 1980

Land Surface System Water Budget Components

Canal System Water Budget Components

Opportunities for Public Engagement

Period (1990-2018)

Period (2022-2072)

GSP TEAM νi

Table 2-16	Rivers, Streams, and Small Watersheds System Water Budget Components
Table 2-17	Subbasin Boundary Surface Water System Water Budget Components
Table 2-18	Subbasin Boundary Groundwater System Water Budget Components
Table 2-19	Red Bluff Subbasin Land Use Areas, by Water Use Sector
Table 2-20	Red Bluff Subbasin Agricultural Land Use Areas (acres)
Table 2-21	Red Bluff Subbasin Surface Water System Historical Water Budget, 1990-2018 (acre-feet)
Table 2-22	Red Bluff Subbasin Historical Water Budget Summary (acre-feet)
Table 2-23	Comparison of Recent SWS Water Budget Periods (acre-feet)
Table 2-24	Comparison of Recent GWS Water Budget Periods (acre-feet)
Table 2-25	Red Bluff Subbasin Surface Water System Projected (Current Land Use) Water Budget, 2022-2072 (acre-feet)
Table 2-26	Red Bluff Subbasin Projected (Current Land Use) Water Budget Summary (acre-feet)
Table 2-27	Red Bluff Subbasin Future Land Use Areas, by Water Use Sector (acres)
Table 2-28	Red Bluff Subbasin Projected Agricultural Land Use Areas (acres)
Table 2-29	Red Bluff Subbasin Surface Water System Projected (Future Land Use) Water Budget, 2022-2072 (acre-feet)
Table 2-30	Red Bluff Subbasin Projected (Future Land Use) Water Budget Summary (acre-feet)
Table 2-31	Comparison of Annual Projected (Current Land Use) GWS Water Budgets with Climate Change Adjustments (acre-feet)
Table 2-32	Comparison of Projected (Future Land Use) GWS Water Budgets with Climate Change Adjustments (acre-feet)
Table 2-33	Comparison of Annual Projected (Current Land Use) Aquifer-specific GWS Water Budgets with Climate Change Adjustments
Table 2-34	Comparison of Projected (Future Land Use) Aquifer-specific GWS Water Budgets with Climate Change Adjustments
Table 2-35	Estimated Uncertainty of Major Water Budget Components
Table 2-36	Summary Comparison of Annual Historical and Projected Water Budgets (acre-feet)
Table 2-37	Sacramento River Streamflow Gains through the Red Bluff Subbasin as Percent of Total Streamflow
Table 3-1	Summary of Undesirable Results Applicable to the Plan Area
Table 3-2	Measurable Objectives and Interim Milestones for the Chronic Lowering of Water Elevations – Upper Aquifer
Table 3-3	Measurable Objectives and Interim Milestones for the Chronic Lowering of Water Elevations – Lower Aquifer
Table 3-4	Measurable Objectives and Interim Milestones for Subsidence

GSP TEAM vii

Table 3-5	Measurable Objectives and Interim Milestone for Groundwater Quality
Table 3-6	Interim Measurable Objectives and Interim Milestones for Interconnected Surface Water
Table 3-7	Minimum Thresholds and Interim Milestones for the Chronic Lowering of Water Elevations – Upper Aquifer
Table 3-8	Minimum Thresholds and Interim Milestones for the Chronic Lowering of Water Elevations – Lower Aquifer
Table 3-9	Measurable Thresholds and Interim Milestones for Subsidence
Table 3-10	Minimum Thresholds Measurable Objectives and Interim Milestones for Groundwater Quality
Table 3-11	Interim Minimum Thresholds and Interim Milestones for Interconnected Surface Water Depletions
Table 3-12	Summary of Minimum Thresholds, Measurable Objectives, and Undesirable Results
Table 3-13	Proposed Monitoring Network
Table 3-14	Groundwater Level Monitoring Well Network – Upper Aquifer
Table 3-15	Groundwater Level Monitoring Well Network – Lower Aquifer
Table 3-16	Summary of Rationale for Selection for Wells Using Groundwater Levels
Table 3-17	Groundwater Storage Monitoring Network – Upper Aquifer
Table 3-18	Groundwater Storage Monitoring Network – Lower Aquifer
Table 3-19	Summary of Rationale for Selection for Wells Used for Storage
Table 3-20	Land Subsidence Monitoring Network
Table 3-21	Summary of Rationale for Selection of Subsidence Monitoring Sites
Table 3-22	Groundwater Quality Monitoring Network
Table 3-23	Summary of Rationale for Selection for Wells Used Groundwater Quality
Table 3-24	Interconnected Surface Water Monitoring Network
Table 3-25	Summary of Rationale for Selection for Wells for Interconnected Surface Water
Table 3-26	Summary of Groundwater Quality Monitoring Constituents and Measurement Frequency for Representative Monitoring Test
Table 4-1	Summary of Key Groundwater System Water Budget Parameters Influencing Formulation of Projects and Management Actions in the Red Bluff Subbasin (average annual volumes in acre-feet per year, rounded).
Table 4-2	Summary of Key Groundwater System Water Budget Parameters to Evaluate the Potential Effects of Projects and Management Actions on the Red Bluff Subbasin (average annual volumes in acre-feet per year, rounded).
Table 4-3	Summary of Projects and Management Actions Proposed for the Red Bluff Subbasin.
Table 4-4	Benefits and Costs of Projects and Management Actions Developed for Implementation

GSP TEAM viii

Table 4-5	Sustainability Indicators Expected to Benefit from Projects and Management Action Types Proposed for the Red Bluff Subbasin.
Table 4-6	Expected Annual Implementation Timeline for the Red Bluff Subbasin Multi-benefit Groundwater Recharge Project.
Table 4-7	Estimated Average Recharge Volume and Temporary Wetland Babitat Formation for the Multi-benefit Groundwater Recharge Project.
Table 4-8	Estimated Capital Cost and Average Annual Operating Cost per Site for the Multi- benefit Groundwater Recharge Project.
Table 4-9	Sustainability Indicators Benefitted by On-Farm Management Actions.
Table 4-10	Grower Education Program Implementation Schedule.
Table 4-11	Potential Thomes Creek and Elder Creek Diversion Projects.
Table 4-12	Potential Annual Implementation Timeline for the Westside Streams Stormwater Capture Project.
Table 4-13	Estimated Average Recharge Volume and Temporary Wetland Habitat Formation for the Thomes Creek and Elder Creek Groundwater Recharge Project (2022-2072).
Table 4-14	Estimated Capital Costs and Average Annual Operations and Maintenance Costs Per Site for the Thomes Creek and Elder Creek Groundwater Recharge Project.
Table 4-15	Estimated Costs per Diversion Site for Construction of New Diversion and Conveyance Infrastructure for the Thomes Creek and Elder Creek Groundwater Recharge Project.
Table 4-16	Project Implementation Schedule
Table 4-17	Summary of Annual Allocations and Estimated Unused Allocations of CVP Supply4-50
Table 4-18	Estimated Average Reduction in Groundwater Pumping Resulting from the Expanded Use of CVP Contract Supplies in Proberta Water District and Thomes Creek Water District (2022-2072).
Table 4-19	List of Potential Projects Proposed for the Red Bluff Subbasin
Table 4-20	Direct Groundwater Recharge of Stormwater and Flood Water: Summary (23 CCR §354.44(b)).
Table 4-21	Stormwater Management Improvements: Summary (23 CCR §354.44(b)).
Table 4-22	Levee Setback and Stream Channel Restoration: Summary (23 CCR §354.44(b)).
Table 4-23	Rain-MAR: Summary (23 CCR §354.44(b)).
Table 4-24	Recycled Water Projects: Summary (23 CCR §354.44(b)).
Table 4-25	Invasive Plant Removal: Summary (23 CCR §354.44(b)).
Table 4-26	Inter-Basin Surface Water Transfers or Exchanges: Summary (23 CCR §354.44(b)).
Table 4-28	Enhanced Boundary Flow Measurement: Summary (23 CCR §354.44(b)). 4-78
Table 4-27	Water Supply Reservoir Construction, Renovation, or Conversion: Summary (23 CCR §354.44(b)).

GSP TEAM ix

Table 4-29	Well Metering: Summary (23 CCR §354.44(b)).
Table 4-30	List of Potential Management Actions Proposed for the Red Bluff Subbasin.
Table 4-31	Assistance and Incentives for On-Farm Irrigation Infrastructure Improvements: Summary (23 CCR §354.44(b)).
Table 4-32	Incentives for Residential and Municipal Water Use Efficiency Improvements: Summary (23 CCR §354.44(b)).
Table 4-33	Incentives for Use of Available Surface Water and Recycled Water: Summary (23 CCR §354.44(b)).
Table 4-34	Water Market for Surface Water and Groundwater Exchange: Summary (23 CCR §354.44(b)).
Table 4-35	Tehama County Domestic Well Tracking and Outreach Program: Summary (23 CCR §354.44(b)).
Table 4-36	List of Potential Other Activities Proposed for the Red Bluff Subbasin
Table 4-37	Coordination and Development of Public Data Portals: Summary (23 CCR §354.44(b)).
Table 4-38	Additional Studies of GDEs and Groundwater - Surface Water Interactions: Summary (23 CCR §354.44(b)).
Table 4-39	Expanded Subbasin Monitoring and Aquifer Testing: Summary (23 CCR §354.44(b)).
Table 4-40	Install Additional Agroclimate Stations: Summary (23 CCR §354.44(b)).
Table 4-41	Maintain and Expand Groundwater Level Monitoring Network: Summary (23 CCR §354.44(b)).
Table 4-42	One-Time Groundwater Quality Snapshot and Evaluation: Summary (23 CCR §354.44(b)).
Table 4-43	Tehama County Well Inventory and Registration Program: Summary (23 CCR §354.44(b)).
Table 4-44	Water Year Classification Defined in Sacramento Valley Water Year Hydrologic Classification
Table 4-45	Annual Water Available and Estimated Unused Water for CVP Water Service Contracts
Table 5-1	Estimated GSA Administration, Management, and Operations Costs
Table 5-2	Estimated Annual Monitoring Costs
Table 5-3	Estimated Plan Update Costs
Table 5-4	Estimated GSP Implementation Costs through 2042

LIST OF FIGURES

Figure ES-1	Red Bluff Subbasin Location Map
Figure ES-2	Map of all Sustainability Indicator Wells
Figure ES-3	GSP Implementation Schedule

GSP TEAM x

Figure 1-1	Tehama County FCWCD GSP Subbasins
Figure 1-2	Red Bluff Subbasin Vicinity Map
Figure 2-1	Red Bluff Subbasin and Surrounding Groundwater Subbasins
Figure 2-2	Land Status in the Subbasin
Figure 2-3	2018 Land Use
Figure 2-4	Red Bluff Subbasin Land Use
Figure 2-5	Red Bluff Subbasin Agricultural Land Use
Figure 2-6	Domestic Well Density by Section
Figure 2-7	Production Well Density by Section
Figure 2-8	Public Supply Well Density by Section
Figure 2-9	Subsidence Monitoring Stations
Figure 2-10	Surface Water Monitoring Stations
Figure 2-11	Disadvantaged Communities
Figure 2-12	Cleanup Sites
Figure 2-13	Water Sources
Figure 2-14	Public Water Districts
Figure 2-15	Lateral Subbasin Boundary
Figure 2-16	Contours of Equal Groundwater Elevation, Base of Freshwater
Figure 2-17	Contours of Equal Elevation, Base of Post-Eocene Deposits
Figure 2-18	Map of Topographic Slope
Figure 2-19	Map of Ground Surface Elevation
Figure 2-20	Map of Geologic Provinces
Figure 2-21	Geologic Map with Faults
Figure 2-21B	Geologic Map with Faults
Figure 2-22	Map of Cross Section Locations
Figure 2-23	Cross Section A-A'
Figure 2-24	Cross Section C-C'
Figure 2-25	Cross Section E-E'
Figure 2-26	Cross Section F-F'
Figure 2-27	DWR Cross Section a-a'
Figure 2-28	DWR Cross Section d-d'
Figure 2-27B ar	nd 2-28B Description of Map Units for DWR Cross Section a-a' and d-d'
Figure 2-29	Soils – Type by Soil Series

GSP TEAM xi

Figure 2-29B	Soils – Type by Soil Series
Figure 2-30	Soils – Texture
Figure 2-31	Soils – Saturated Hydraulic Conductivity
Figure 2-32	Soils – Drainage Class
Figure 2-33	Soils – Electrical Conductivity
Figure 2-34	Soils – pH
Figure 2-35	Map of Surface Water Features
Figure 2-36	SAGBI Groundwater Recharge Rating
Figure 2-37	Map of Discharge Areas – Wetlands, Springs, Seeps
Figure 2-38	Panel Map of Selected Groundwater Elevation Hydrographs
Figure 2-39	Annual Precipitation and Cumulative Departure at Red Bluff Municipal Airport
Figure 2-40	Contours of Equal Groundwater Elevation Upper Aquifer – Seasonal High of 2019
Figure 2-41	Contours of Equal Groundwater Elevation Upper Aquifer – Seasonal Low of 2019
Figure 2-42	Contours of Equal Groundwater Elevation Upper Aquifer – Seasonal High of 2017
Figure 2-43	Contours of Equal Groundwater Elevation Upper Aquifer – Seasonal Low of 2017
Figure 2-44	Contours of Equal Groundwater Elevation Upper Aquifer – Seasonal High of 2013
Figure 2-45	Contours of Equal Groundwater Elevation Upper Aquifer – Seasonal Low of 2013
Figure 2-46	Contours of Equal Groundwater Elevation Upper Aquifer – Seasonal High of 2015
Figure 2-47	Contours of Equal Groundwater Elevation Upper Aquifer – Seasonal Low of 2015
Figure 2-48	Change of Groundwater Elevation from Spring 1990 to Spring 2018
Figure 2-49	Maximum Historical TDS Concentration by Well
Figure 2-50	Maximum Historical Nitrate Concentration by Well
Figure 2-51	Maximum Historical Arsenic Concentration by Well
Figure 2-52	Map of Oil and Gas Fields and Wells
Figure 2-53	Subsidence Measurements Between 2008 and 2017
Figure 2-54	DWR InSAR Subsidence Map
Figure 2-55	UNAVCO PBO GPS Measurements
Figure 2-56	Surface Water and Shallow Groundwater Monitoring Stations
Figure 2-57	Map of Potential Groundwater Dependent Ecosystems
Figure 2-58	NDVI of GDEs
Figure 2-59.	The Hydrologic Cycle (Source: DWR, 2016a)
Figure 2-60	Water Budget Accounting Structure (Source: DWR, 2016a)
Figure 2-61	Subbasin Water Budget Conceptual Model

GSP TEAM xii

Figure 2-62	Red Bluff Subbasin Land Use Areas, by Water Use Sector
Figure 2-63	Red Bluff Subbasin Agricultural Land Use Areas
Figure 2-64	Red Bluff Subbasin Surface Water System Historical Water Budget, 1990-2018
Figure 2-65	Diagram of the Red Bluff Subbasin Historical Average Annual Water Budget (1990-2018)
Figure 2-66	Red Bluff Subbasin Historical Water Budget Summary
Figure 2-67	Red Bluff Subbasin Surface Water System Projected (Current Land Use) Water Budget, 2022-2072
Figure 2-68	Diagram of the Red Bluff Subbasin Projected (Current Land Use) Average Annual Water Budget, 2022-2072
Figure 2-69	Red Bluff Subbasin Projected (Current Land Use) Water Budget Summary
Figure 2-70	Red Bluff Subbasin Future Land Use Areas, by Water Use Sector
Figure 2-71	Red Bluff Subbasin Projected Agricultural Land Use Areas
Figure 2-72	Red Bluff Subbasin Surface Water System Projected (Future Land Use) Water Budget, 2022-2072
Figure 2-73	Diagram of the Red Bluff Subbasin Projected (Future Land Use) Average Annual Water Budget, 2022-2072
Figure 2-74	Red Bluff Subbasin Projected (Future Land Use) Water Budget Summary
Figure 2-75	Comparison of Gains from Groundwater in the Sacramento River through the Red Bluff Subbasin by Water Year Type and Month
Figure 2-76	Comparison of Gains from Groundwater in the Sacramento River through the Red Bluff Subbasin as Percent of Total Streamflow by Water Year Type and Month
Figure 2-77	Comparison of Monthly Gains from Groundwater in Thomes Creek
Figure 2-78	Comparison of Monthly Gains from Groundwater in Elder Creek
Figure 3-1a	Focus Areas
Figure 3-1b	Polygons with Declining Water Levels
Figure 3-2	Representative Monitoring Sites
Figure 3-3	Groundwater Level Representative Monitoring Sites – Upper Aquifer
Figure 3-4	Groundwater Level Representative Monitoring Sites – Lower Aquifer
Figure 3-5	Subsidence Monitoring Network
Figure 3-6	Groundwater Quality Monitoring Network – Upper Aquifer
Figure 3-7	Interconnected Surface Water Monitoring
Figure 3-8	Example Hydrograph with MO and MT
Figure 3-9	Well Impact Analysis Methodology
Figure 3-10	Example Hydrograph with Estimated Well Impact Analysis
Figure 3-11	Predicted Impacted Wells and Minimum Thresholds

GSP TEAM xiii

Figure 3-12	Identification of Data Gaps (GDE)
Figure 3-13	Identification of Data Gaps (Surface Water Features)
Figure 4 1	Thomes Creek and Elder Creek Diversion Project Locations
Figure 4 2	Potential Demand Management Zones related to RMS Polygons
Figure 4 3	Map of Tehama County with Stream Gages and Groundwater Subbasins
Figure 4 4	Elder Creek Monthy Flow Volume by Water Year Classification
Figure 4 5	Thomes Creek Creek Monthy Flow Volume by Water Year Classification
Figure 4 6	Potential Diversion for Elder Creek in Example Wet Year: Winter 1998 under Streamlined Permit
Figure 4 7	Potential Diversion for Elder Creek under Streamlined Permit by Water Year Classification
Figure 4 8	Potential Diversion Volume for Elder Creek for Water Years 1948-2020
Figure 4 9	Average Annual Potential Diversion for Elder Creek under Streamlined Permit with varying Recharge Capacity
Figure 4- 10	Potential Diversion for Thomes Creek in Example Wet Year: Winter 1998 under Streamlined Permit
Figure 4 11	Potential Diversion for Thomes Creek under Streamlined Permit by Water Year Classification
Figure 4 12	Potential Diversion Volume for Thomes Creek for Water Years 1948-2020
Figure 4 13	Average Annual Potential Diversion for Thomes Creek under Streamlined Permit with varying Recharge Capacity
Figure 4 14	Average Annual Potential Diversion for Thomes and Elder Creeks under Streamlined Permit
Figure 4 15	Location of Water Districts with CVP Contracts for Surface Water
Figure 5-1	GSP Implementation Schedule

GSP TEAM xiv

LIST OF APPENDICES

Appendix 1-A	Tehama County Flood Control and Water Conservation District Act of formation
Appendix 1-B	GSA formation Documents
Appendix 1-C	Glossary: SGMA Definitions
Appendix 1-D	Elements Guide
Appendix 1-E	DWR Determination Letter
Appendix 2-A	Domestic Well Inventory Analysis
Appendix 2-B	Communication and Engagement Plan
Appendix 2-C	Northern Sacramento Valley Inter-Basin Coordination Report
Appendix 2-D	GSA Outreach Events and Interested Parties List
Appendix 2-E	Comments on the Plan
Appendix 2-F	Hydrograph Well Locations, Hydrographs, and Groundwater Level Trend Statistics
Appendix 2-G	Water Quality Hydrographs
Appendix 2-H	Freshwater Flora and Fauna
Appendix 2-I	Surface Water Depletion and GDE Methodology and Analysis
Appendix 2-J	Tehama Integrated Hydrologic Model Documentation Report
Appendix 2-K	Detailed Water Budget Results
Appendix 2-L	Crop Land Cover Red Bluff Subbasin
Appendix 3-A	DMS Summary
Appendix 3-B	Groundwater Level Hydrographs, Measurable Objectives (MO) and Minimum Thresholds (MT) of Groundwater Level Sustainability Indicator Wells
Appendix 3-C	InSAR Time Series Data
Appendix 3-D	Baseline Water Quality Sampling Documentation
Appendix 3-E	Well Impact Analysis
Appendix 4-A	Projects and Management Actions Matrix
Appendix 4-B	Demand Management Resolution
Appendix 4-C	Well Mitigation Program Resolution

LIST OF ACRONYMS & ABBREVIATIONS

AB Assembly Bill

bgs Below Ground Surface

BMP Best Management Practices

CalEPA California Environmental Protection Agency

GSP TEAM xv

CalGEM California Geologic Energy Management Division

CASGEM California Statewide Groundwater Elevation Monitoring

CCR California Code of Regulations

CDFW California Department of Fish and Wildlife

CNRA California Natural Resources Agency
CV-SALTS Central Valley Salinity Alternatives

CWA Clean Water Act

CWC California Water Code

DDW Division of Drinking Water

DMS Data Management System

DO Dissolve Oxygen

DPR Department of Pesticide Regulation

DQO Data Quality Objective

DTSC Department of Toxic Substance Control

DTW Depth to Water

DWR California Department of Water Resources

DWR Department of Water Resources

EC Electrical Conductivity

ft/yr feet per year

GAMA Groundwater Ambient Monitoring and Assessment Program

GDE Groundwater Dependent Ecosystem

GMP Groundwater Management Plan

GQTM Groundwater Quality Trend Monitoring

GSA Groundwater Sustainability Agency

GSE Ground Surface Elevation

GSP Groundwater Sustainability Plan

GWE Groundwater Elevation

GWMP Groundwater Management Plan

HCM Hydrogeological Conceptual Model

ILRP Irrigated Lands Regulatory Program

InSAR Interferometric Synthetic Aperture Radar

IRWMP Integrated Regional Water Management Plan

Mas Management Actions

MCL Maximum Contaminant Level

Mg/L Milligrams per Liter

GSP TEAM xvi

MO Measurable Objective MT Minimum Threshold

NAVD88 North American Vertical Datum of 1988

NDVI Normalized Difference Vegetation Index

ORP Oxidation-Reduction Potential
PBO Plate Boundary Observatory

PMAs Projects and Management Actions

QA Quality Assurance
QC Quality Control

RMS Representative Monitoring Sites

RP Reference Point

RPE Reference Point Elevation

RWQCB Regional Water Quality Control Board

SB Senate Bill

SGMA Sustainable Groundwater Management Act

SMC Sustainable Management Criteria

SMCL Secondary Maximum Containment Level

SWP State Water Project

SWRCB State Water Resources Control Board

TAC Technical Advisory Committee

TDS Total Dissolved Solids

Tehama County

FCWCD Tehama County Flood Control and Water Conservation District

UNAVACO University NAVSTAR Consortium
USBLM Bureau of Land Management

USBR United States Bureau of Reclamation

USEPA United States Environmental Protection Agency

USFS United States forest Service

USFWS United States Fish and Wildlife Service

USGS United States Geological Survey

WCR Well Completion Report

WDR Waste Discharge Requirements

GSP TEAM xvii