



NORTHERN &
CENTRAL
DELTA-
MENDOTA

Final Draft Groundwater Sustainability Plan

For the Northern and Central Delta-Mendota Regions

November 2019



This page intentionally left blank.



NORTHERN &
CENTRAL
DELTA-
MENDOTA

Northern and Central Delta-Mendota Regions

Final Draft Groundwater Sustainability Plan

Prepared by:



November 2019

This page intentionally left blank.

Difficulty Accessing Material

If you have difficulty accessing any material in this document, please contact us in writing or via telephone and we will work with you to make the information available. You can direct your request to:

*ATTN: Seth Harris
San Luis & Delta-Mendota Water Authority
842 6th Street
Los Banos, CA 93635
Telephone (209) 324-1033
Email: sethharris@sldmwa.org*

This page intentionally left blank.

Table of Contents

EXECUTIVE SUMMARY	1
ES-1. Introduction.....	1
ES-2. Plan Area.....	2
ES-3. Governance and Administration	2
ES-4. Outreach and Communication.....	3
ES-5. Basin Setting	3
Hydrogeologic Conceptual Model.....	4
Groundwater Conditions.....	4
Water Budgets.....	5
Management Areas	6
ES-6. Sustainable Management Criteria	6
ES-7. Sustainability Implementation.....	9
Projects and Management Actions	9
Monitoring 11	
ES-8. Plan Implementation.....	12
ES-9. Technical Studies.....	13
1. INTRODUCTION	1-1
1.1 Purpose of the Groundwater Sustainability Plan	1-1
1.2 Description of the Delta-Mendota Subbasin	1-2
1.3 Groundwater Sustainability Plan Organization	1-2
1.4 References	1-4
2. PLAN AREA	2-1
2.1 Plan Area Description.....	2-1
2.1.1 Plan Area Definition	2-1
2.1.2 Plan Area Setting.....	2-7
2.1.2.1 Watersheds	2-7
2.1.2.2 Major Water-Related Infrastructure	2-10
2.1.2.2.1 CVP Facilities.....	2-10
2.1.2.2.2 SWP Facilities	2-11
2.1.2.3 Groundwater Use	2-12
2.1.2.4 Flood Management.....	2-19
2.1.2.5 Major Land Use Divisions.....	2-19
2.1.2.6 Regional Economic Issues and Trends	2-24
2.1.3 Plan Area Jurisdictional Boundaries	2-29
2.2 Land Use Elements	2-37
2.2.1 General Plans in Plan Area	2-42
2.2.1.1 Fresno County General Plan	2-44
2.2.1.2 Merced County General Plan	2-48
2.2.1.3 San Joaquin County General Plan	2-51
2.2.1.4 San Benito County General Plan.....	2-54
2.2.1.5 Stanislaus County General Plan.....	2-60
2.2.1.6 City of Patterson General Plan.....	2-61
2.2.1.7 Santa Nella Community Specific Plan	2-64
2.2.1.8 City of Modesto Urban Area General Plan as applicable to Grayson.....	2-65
2.2.1.9 Crows Landing Community Plan	2-66
2.2.1.10 Westley Community Plan	2-66

2.2.2	Existing Land Use Plans and Impacts to Sustainable Groundwater Management	2-66
2.3	Existing Water Resources Monitoring and Management Programs	2-67
2.3.1	Water Resources Management Programs.....	2-67
2.3.1.1	Irrigated Lands Regulatory Program (ILRP)	2-67
2.3.1.2	CV-SALTS.....	2-68
2.3.1.3	Integrated Regional Water Management Program	2-68
2.3.1.3.1	Westside-San Joaquin 2019 Integrated Regional Water Management Plan	2-68
2.3.1.3.2	2018 East Stanislaus Integrated Regional Water Management Plan....	2-71
2.3.1.3.3	2014 Madera Integrated Regional Water Management Plan	2-75
2.3.2	County Well Construction/Destruction Standards and Permitting	2-77
2.3.3	Water Resources Monitoring Programs.....	2-83
2.3.3.1	Delta-Mendota Canal Groundwater Pump-in Program Water Quality Monitoring Plan	2-83
2.3.3.2	Irrigated Lands Regulatory Program (ILRP)	2-84
2.3.3.3	Department of Water Resources Water Data Library (WDL).....	2-90
2.3.3.4	GeoTracker Groundwater Ambient Monitoring and Assessment Program (GAMA) 2-90	
2.3.3.5	GeoTracker	2-90
2.3.3.6	National Water Information System (NWIS)	2-90
2.3.3.7	State Water Resources Control Board Division of Drinking Water	2-90
2.3.3.8	CASGEM.....	2-91
2.3.3.9	Department of Water Resources Groundwater Information Center Interactive Map	2-91
2.3.3.10	Subsidence Monitoring	2-94
2.3.3.10.1	DWR Surveying/Spirit Leveling	2-94
2.3.3.10.2	USGS Extensometers (NWIS)	2-94
2.3.3.10.3	USGS InSAR.....	2-94
2.3.3.10.4	University NAVSTAR Consortium (UNAVCO) CGPS	2-95
2.3.3.10.5	NASA UAVSAR and InSAR	2-95
2.3.3.10.6	NASA GRACE.....	2-95
2.3.3.10.7	SJRRP Geodetic Network.....	2-95
2.3.4	Implications of Existing Monitoring and Management Programs in this GSP	2-95
2.4	Existing and Planned Conjunctive Use Programs	2-96
2.5	Plan Elements from CWC Section 10727.4.....	2-98
2.5.1	Control of Saline Water Intrusion	2-98
2.5.2	Wellhead Protection Areas and Recharge Areas	2-98
2.5.3	Migration of Contaminated Groundwater	2-98
2.5.4	Well Abandonment and Well Destruction Programs	2-99
2.5.5	Activities Implementing, Opportunities for, and Removing Impediments to Conjunctive Use or Underground Storage	2-99
2.5.6	Measures Addressing Groundwater Contamination Cleanup, Groundwater Recharge, In-Lieu Use, Diversions to Storage, Conservation, Water Recycling, Conveyance, and Extraction Projects	2-100
2.5.7	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.....	2-101
2.5.8	Efforts to Develop Relationships with State and Federal Regulatory Agencies.....	2-102
2.5.9	Processes to Review Land Use Plans and Efforts to Coordinate with Land Use Planning Agencies to Assess Activities that Potentially Create Risk to Groundwater Quality or Quantity	2-104
2.5.10	Impacts on Groundwater Dependent Ecosystems.....	2-104

2.6	References	2-105
3.	GOVERNANCE & ADMINISTRATION	3-1
3.1	Agency Contact Information	3-1
3.2	Northern and Central Delta-Mendota Regions Groundwater Sustainability Agencies	3-4
3.2.1	Central Delta-Mendota GSA	3-4
3.2.2	City of Patterson GSA	3-5
3.2.3	DM-II GSA	3-5
3.2.4	Northwestern Delta-Mendota GSA	3-6
3.2.5	Oro Loma Water District GSA	3-6
3.2.6	Patterson Irrigation District GSA	3-7
3.2.7	West Stanislaus Irrigation District GSA	3-7
3.2.8	Widren Water District GSA	3-7
3.3	GSA Coordination and Governance	3-16
3.3.1	Northern Delta-Mendota SGMA Services Activity Agreement	3-16
3.3.2	Central Delta-Mendota SGMA Services Activity Agreement	3-18
3.3.3	Delta-Mendota Subbasin	3-20
3.3.3.1	Intra-Basin Coordination	3-20
3.3.3.2	Inter-basin Agreements	3-25
3.3.4	Governance Structure	3-25
3.3.4.1	Northern & Central Delta-Mendota Region GSP Governance Structure	3-25
3.3.4.2	Delta-Mendota Subbasin SGMA Governance Structure	3-26
4.	OUTREACH AND COMMUNICATION	4-1
4.1	Description of Beneficial Uses and Users in Plan Area	4-1
4.2	Plan Development	4-5
4.2.1	Decision-making Process	4-5
4.2.2	Comments Received Regarding the Plan	4-5
4.3	Outreach	4-6
4.3.1	Noticing	4-6
4.3.1.1	GSP Stakeholder List	4-6
4.3.2	Opportunities for Public Engagement	4-6
4.3.2.1	Public Workshops	4-7
4.3.2.2	Special Environmental Considerations	4-7
4.3.2.3	Other Opportunities for Public Engagement	4-8
4.3.3	Outreach to Diverse Social, Cultural, and Economic Areas of the Population	4-8
4.3.4	Methods for Disseminating Information	4-9
4.3.4.1	Informational Documents	4-9
4.3.4.2	Website	4-9
4.3.4.3	Email List	4-9
4.3.4.4	Newsletters	4-9
4.3.4.5	Public Workshops	4-9
4.3.4.6	Other Outreach Efforts	4-10
5.	BASIN SETTING	5-1
5.1	Overview	5-1
5.2	Hydrogeologic Conceptual Model	5-1
5.2.1	Regional Geologic and Structural Setting	5-1
5.2.2	Geologic History	5-4
5.2.3	Geologic Formations and Stratigraphy	5-8
5.2.4	Faults and Structural Features	5-9

5.2.5	Basin Boundaries.....	5-9
5.2.5.1	Lateral Boundaries	5-9
5.2.5.2	Definable Bottom of Basin.....	5-12
5.2.6	Principal Aquifers and Aquitards.....	5-12
5.2.6.1	Principal Aquifers.....	5-12
5.2.6.2	Aquifer Properties.....	5-14
5.2.6.2.1	Hydraulic Conductivity.....	5-14
5.2.6.2.2	Transmissivity	5-15
5.2.6.2.3	Specific Yield.....	5-15
5.2.6.2.4	Specific Storage.....	5-15
5.2.7	Structural Properties and Restricted Groundwater Flow.....	5-32
5.2.8	Water Quality.....	5-32
5.2.8.1	Historic Water Quality.....	5-33
5.2.8.2	Recent Groundwater Quality	5-34
5.2.8.2.1	Nitrate Concentrations	5-34
5.2.8.2.2	TDS Concentrations.....	5-46
5.2.8.2.3	Pesticides.....	5-58
5.2.8.2.4	Selenium and Boron.....	5-63
5.2.8.3	Aquifer Use.....	5-80
5.2.9	Topography, Surface Water, Recharge, and Imported Supplies	5-80
5.2.9.1	Topography	5-80
5.2.9.2	Surface Water Bodies.....	5-80
5.2.9.3	Soils.....	5-83
5.2.9.4	Areas of Recharge, Potential Recharge, and Groundwater Discharge Areas	5-83
5.2.9.5	Imported Supplies.....	5-84
5.3	Groundwater Conditions.....	5-89
5.3.1	Useful Terminology.....	5-89
5.3.2	Groundwater Elevations	5-90
5.3.2.1	Available Data	5-90
5.3.2.2	Historic Conditions.....	5-91
5.3.2.3	Current Conditions.....	5-92
5.3.2.4	Groundwater Trends.....	5-92
5.3.3	Groundwater Storage	5-119
5.3.4	Seawater Intrusion.....	5-121
5.3.5	Groundwater Quality.....	5-121
5.3.5.1	Available Data	5-122
5.3.5.2	Historic and Current Conditions and Trends.....	5-124
5.3.6	Land Subsidence	5-154
5.3.6.1	Available Data	5-154
5.3.6.2	Historic Conditions.....	5-155
5.3.6.3	Current Conditions.....	5-156
5.3.6.4	Groundwater Trends.....	5-158
5.3.7	Interconnected Surface Water Systems	5-173
5.3.7.1	Available Data	5-173
5.3.7.2	Identification of Interconnected Surface Water Systems	5-173
5.3.7.3	Historic Conditions.....	5-174
5.3.7.4	Current Conditions.....	5-175
5.3.7.5	Estimates of Timing and Quantity of Gains/Depletions	5-175
5.3.7.6	Groundwater Dependent Ecosystems.....	5-175
5.3.8	Data Gaps.....	5-183
5.4	Water Budgets.....	5-184

5.4.1	Useful Terms	5-184
5.4.2	Water Budget Purpose and Information.....	5-186
5.4.3	Key Coordinated Water Budget Decisions.....	5-188
5.4.4	Methodology Selected and Spreadsheet Model Development	5-192
5.4.5	Water Budget Definitions and Assumptions.....	5-193
5.4.6	Water Budget Estimates	5-200
5.4.7	Historic and Current Water Budgets	5-221
5.4.8	Projected Baseline Water Budget	5-226
5.4.9	Projected Water Budget with Climate Change.....	5-229
5.4.10	Projected Water Budget with Climate Change and Projects & Management Actions.....	5-233
5.4.11	Sustainable Yield Estimates	5-237
5.5	Management Areas	5-238
5.5.1	Chronic Lowering of Groundwater Levels	5-239
5.5.2	Reduction of Groundwater Storage	5-239
5.5.3	Seawater Intrusion	5-239
5.5.4	Degraded Water Quality	5-239
5.5.5	Land Subsidence	5-239
5.5.5.1	Reason for Management Areas.....	5-239
5.5.5.2	Minimum Thresholds and Measurable Objectives.....	5-240
5.5.5.3	Monitoring and Analysis	5-245
5.5.5.4	Operation and Outside Impacts.....	5-245
5.5.6	Depletion of Interconnected Surface Water	5-246
5.6	References	5-247
6.	SUSTAINABLE MANAGEMENT CRITERIA.....	6-1
6.1	Useful Terms	6-1
6.2	Sustainability Goal.....	6-2
6.3	Sustainability Thresholds.....	6-3
6.3.1	Chronic Lowering of Groundwater Levels	6-3
6.3.1.1	Undesirable Results	6-3
6.3.1.1.1	Description of Undesirable Results	6-3
6.3.1.1.2	Identification of Undesirable Results	6-4
6.3.1.1.3	Potential Causes of Undesirable Results	6-4
6.3.1.1.4	Potential Effects of Undesirable Results	6-4
6.3.1.2	Minimum Thresholds	6-4
6.3.1.3	Measurable Objectives and Interim Milestones	6-10
6.3.2	Reduction of Groundwater Storage	6-12
6.3.2.1	Undesirable Results	6-12
6.3.2.1.1	Description of Undesirable Results	6-12
6.3.2.1.2	Identification of Undesirable Results	6-13
6.3.2.1.3	Potential Causes of Undesirable Results	6-13
6.3.2.1.4	Potential Effects of Undesirable Results	6-13
6.3.2.2	Minimum Thresholds	6-14
6.3.2.3	Measurable Objectives and Interim Milestones	6-14
6.3.3	Degraded Water Quality	6-14
6.3.3.1	Undesirable Results	6-14
6.3.3.1.1	Description of Undesirable Results	6-14
6.3.3.1.2	Identification of Undesirable Results	6-15
6.3.3.1.3	Potential Causes of Undesirable Results	6-15
6.3.3.1.4	Potential Effects of Undesirable Results	6-15
6.3.3.2	Minimum Thresholds	6-16

6.3.3.3	Measurable Objectives and Interim Milestones	6-19
6.3.4	Seawater Intrusion	6-25
6.3.5	Land Subsidence	6-25
6.3.5.1	Undesirable Results	6-25
6.3.5.1.1	Description of Undesirable Results	6-25
6.3.5.1.2	Identification of Undesirable Results	6-25
6.3.5.1.3	Potential Causes of Undesirable Results	6-26
6.3.5.1.4	Potential Effects of Undesirable Results	6-26
6.3.5.2	Minimum Thresholds	6-26
6.3.5.3	Measurable Objectives and Interim Milestones	6-28
6.3.6	Depletions of Interconnected Surface Water	6-34
6.3.6.1	Undesirable Results	6-34
6.3.6.1.1	Description of Undesirable Results	6-34
6.3.6.1.2	Identification of Undesirable Results	6-34
6.3.6.1.3	Potential Causes of Undesirable Results	6-34
6.3.6.1.4	Potential Effects of Undesirable Results	6-34
6.3.6.2	Minimum Thresholds	6-35
6.3.6.3	Measurable Objectives and Interim Milestones	6-35
6.4	References	6-39

7. SUSTAINABILITY IMPLEMENTATION 7-1

7.1	Projects and Management Actions	7-1
7.1.1	Description of Projects and Management Actions	7-9
7.1.1.1	Tier 1 Projects	7-9
7.1.1.1.1	Los Banos Creek Recharge and Recovery Project	7-9
7.1.1.1.2	Orestimba Creek Recharge and Recovery Project	7-9
7.1.1.1.3	North Valley Regional Recycled Water Program (NVRWP) – Modesto and Early Turlock Years.....	7-10
7.1.1.1.4	City of Patterson Percolation Ponds for Stormwater Capture and Recharge.....	7-11
7.1.1.1.5	Kaljjan Drainwater Reuse Project.....	7-11
7.1.1.1.6	West Stanislaus Irrigation District Lateral 4-North Recapture and Recirculation Reservoir	7-11
7.1.1.1.7	Revision to Tranquillity Irrigation District Lower Aquifer Pumping	7-12
7.1.1.2	Tier 1 Management Actions.....	7-12
7.1.1.2.1	Lower Aquifer Pumping Rules for Minimizing Subsidence	7-12
7.1.1.2.2	Maximizing Use of Other Water Supplies.....	7-12
7.1.1.2.3	Increasing GSA Access to and Input on Well Permits.....	7-13
7.1.1.2.4	Drought Contingency Planning in Urban Areas.....	7-13
7.1.1.2.5	Fill Data Gaps	7-13
7.1.1.3	Tier 2 Projects	7-13
7.1.1.3.1	Del Puerto Canyon Reservoir Project	7-13
7.1.1.3.2	Little Salado Creek Groundwater Recharge and Flood Control Basin ..	7-14
7.1.1.3.3	Patterson Irrigation District Groundwater Bank and/or Flood-Managed Aquifer Recharge (MAR)-type Project.....	7-14
7.1.1.3.4	West Stanislaus Irrigation District Lateral 4-South Recapture and Recirculation Reservoir	7-14
7.1.1.3.5	Ortigalita Creek Groundwater Recharge and Recovery Project.....	7-15
7.1.1.4	Tier 2 Management Actions.....	7-15
7.1.1.4.1	Develop Program to Incentivize Use of Surface Water and Reduce Groundwater Demand.....	7-15

7.1.1.5	Tier 3 Projects	7-15
7.1.1.5.1	Pacheco Reservoir Expansion	7-16
7.1.1.5.2	Raising San Luis Reservoir	7-16
7.1.1.5.3	Sites Reservoir	7-16
7.1.1.5.4	Los Vaqueros Expansion Phase 2	7-17
7.1.1.6	Tier 3 Management Actions	7-17
7.1.1.6.1	Groundwater Extraction Fee with Land Use Modifications	7-17
7.1.1.6.2	City of Patterson Reduced Groundwater Use Portfolio	7-17
7.1.1.6.3	Rotational Fallowing of Crop Lands	7-17
7.1.2	Legal Authority	7-18
7.1.3	Costs	7-18
7.1.4	Public Noticing	7-21
7.1.5	Permitting	7-21
7.1.6	Benefits and Evaluation of Benefits	7-22
7.2	Monitoring	7-24
7.2.1	Useful Terms	7-24
7.2.2	Monitoring Network Objectives	7-27
7.2.2.1	Conditions Relevant to Monitoring Network Development	7-28
7.2.3	Representative Monitoring	7-28
7.2.4	Scientific Rationale for Monitoring Site Selection	7-28
7.2.4.1	Monitoring Site Selection Criteria	7-29
7.2.4.2	Monitoring Network Subregions	7-29
7.2.4.3	Existing Monitoring Programs	7-29
7.2.4.4	Data and Reporting Standards	7-29
7.2.5	Monitoring Networks	7-35
7.2.5.1	Groundwater Level Monitoring Network	7-35
7.2.5.1.1	Selected Monitoring Sites	7-35
7.2.5.1.2	Monitoring Protocols and Data Reporting Requirements	7-41
7.2.5.1.3	Frequency and Timing of Monitoring	7-43
7.2.5.1.4	Spatial Density	7-44
7.2.5.1.5	Data Gaps	7-44
7.2.5.1.6	Plan to Fill Data Gaps	7-45
7.2.5.2	Groundwater Storage Monitoring Network	7-49
7.2.5.3	Seawater Intrusion Monitoring Network	7-49
7.2.5.4	Degraded Water Quality Monitoring Network	7-49
7.2.5.4.1	Selected Monitoring Sites	7-49
7.2.5.4.2	Monitoring Protocols and Data Reporting Requirements	7-57
7.2.5.4.3	Frequency and Timing of Monitoring	7-59
7.2.5.4.4	Spatial Density	7-60
7.2.5.4.5	Data Gaps	7-60
7.2.5.4.6	Plan to Fill Data Gaps	7-60
7.2.5.5	Land Subsidence Monitoring Network	7-60
7.2.5.5.1	Management Areas	7-61
7.2.5.5.2	Selected Monitoring Sites	7-61
7.2.5.5.3	Monitoring Protocols and Data Reporting Requirements	7-67
7.2.5.5.4	Frequency and Timing of Monitoring	7-68
7.2.5.5.5	Spatial Density	7-68
7.2.5.5.6	Data Gaps	7-68
7.2.5.5.7	Plan to Fill Data Gaps	7-69
7.2.5.6	Depletions of Interconnected Surface Water Monitoring Network	7-69
7.2.5.6.1	Selected Monitoring Sites	7-69

	7.2.5.6.2	Monitoring Protocols and Data Reporting Requirements	7-70
	7.2.5.6.3	Frequency and Timing of Monitoring	7-75
	7.2.5.6.4	Spatial Density	7-75
	7.2.5.6.5	Data Gaps	7-76
	7.2.5.6.6	Plan to Fill Data Gaps	7-76
7.3	References		7-79
8.	PLAN IMPLEMENTATION		8-1
8.1	Plan Implementation		8-1
	8.1.1	Implementation Schedule	8-1
8.2	Implementation Costs and Funding Sources		8-1
	8.2.1	GSP Implementation and Funding	8-7
	8.2.2	Projects and Management Actions	8-10
8.3	Annual Reports		8-11
	8.3.1	General Information	8-11
	8.3.2	Subbasin Conditions	8-11
	8.3.3	Plan Implementation Progress	8-11
	8.3.4	Data Handling and Coordinated Data Management System	8-12
	8.3.4.1	DMS Development and Functionality	8-12
8.4	Five-Year Assessment Report		8-17
	8.4.1	Sustainability Evaluation	8-17
	8.4.2	Plan Implementation Progress	8-17
	8.4.3	Reconsideration of GSP Elements	8-17
	8.4.4	Monitoring Network Description	8-17
	8.4.5	New Information	8-18
	8.4.6	Regulations or Ordinances	8-18
	8.4.7	Legal or Enforcement Actions	8-18
	8.4.8	Plan Amendments	8-18
	8.4.9	Coordination	8-18
	8.4.10	Reporting to Stakeholders and the Public	8-18
9.	TECHNICAL STUDIES		9-1

Tables

Table 2-1.	DACs as a Percentage of the Delta-Mendota Subbasin	2-24
Table 2-2.	DAC and SDAC Census Designated Places in Delta-Mendota Subbasin	2-25
Table 2-3.	EDAs as a Percentage of the Delta-Mendota Subbasin	2-27
Table 2-4.	Jurisdictional Areas in the Northern Delta-Mendota Region	2-32
Table 2-5.	Jurisdictional Areas in the Central Delta-Mendota Region	2-33
Table 2-6.	2014 State Crop Mapping Acreage by Crop Category	2-39
Table 2-7.	Summary of Applicable Well Construction/Destruction Standards in the Northern and Central Delta-Mendota Regions	2-78
Table 2-8.	Summary of Subsidence Monitoring in the Central Valley	2-92
Table 3-1.	Delta-Mendota Subbasin Coordination Committee Members	3-27
Table 3-2.	Northern Delta-Mendota Region Management Committee Contact Information	3-30
Table 3-3.	Central Delta-Mendota Region Management Committee Contact Information	3-31
Table 4-1.	Beneficial Uses and User Stakeholder Groups	4-2
Table 4-2.	Delta-Mendota Subbasin Public Workshops	4-6
Table 5-1.	Summary of Pesticide Detections and Exceedances	5-61
Table 5-2.	State and Federal Primary and Secondary MCLs for Drinking Water, Constituents of Concern	5-122

Table 5-3. Water Quality Objectives for Irrigation	5-122
Table 5-4. Nitrate (as N) Trend Significance	5-125
Table 5-5. TDS Trend Significance	5-139
Table 5-6. Boron Trend Significance.....	5-150
Table 5-7. Subsidence Monitoring Trends,	5-154
Table 5-8. Subsidence Rates Along the Delta-Mendota Canal.....	5-156
Table 5-9. Estimated Quantity of Gains/Depletions for Interconnected Stream Reaches, Northern and Central Delta-Mendota Regions	5-172
Table 5-10. List of Potential Freshwater Species, Northern and Central Delta-Mendota Regions.....	5-176
Table 5-11. Representative Water Years for Climate Change Factors, Precipitation, and Evapotranspiration.....	5-187
Table 5-12. Modeled Water Year by Water Year Type	5-188
Table 5-13. Land Surface Budget Category Definitions	5-190
Table 5-14. Groundwater Budget Category Definitions.....	5-191
Table 5-15. Historic and Current Land Surface Budget Assumptions.....	5-192
Table 5-16. Historic and Current Groundwater Budget Assumptions.....	5-193
Table 5-17. Projected Land Surface Budget Assumptions.....	5-194
Table 5-18. Projected Groundwater Budget Assumptions	5-195
Table 5-19. Differences in Sources and Assumptions Between Projected Water Budgets.....	5-196
Table 5-20. Land Surface Budget, Historic Water Budget (AFY)	5-199
Table 5-21. Groundwater Budget, Historic Water Budget (AFY).....	5-199
Table 5-22. Change in Storage, Historic Water Budget (AFY).....	5-200
Table 5-23. Land Surface Budget, Current Water Budget (AFY)	5-200
Table 5-24. Groundwater Budget, Current Water Budget (AFY).....	5-200
Table 5-25. Change in Storage, Current Water Budget (AFY).....	5-200
Table 5-26. Land Surface Budget, Baseline Projected Water Budget (AFY)	5-201
Table 5-27. Groundwater Budget, Baseline Projected Water Budget (AFY).....	5-203
Table 5-28. Change in Storage, Baseline Projected Water Budget (AFY)	5-205
Table 5-29. Land Surface Budget, Projected Water Budget with Climate Change (AFY).....	5-207
Table 5-30. Groundwater Surface Budget, Projected Water Budget with Climate Change (AFY)	5-209
Table 5-31. Change in Storage, Projected Water Budget with Climate Change (AFY).....	5-211
Table 5-32. Land Surface Budget, Projected Water Budget with Climate Change and Projects & Management Actions (AFY)	5-213
Table 5-33. Groundwater Budget, Projected Water Budget with Climate Change and Projects & Management Actions (AFY)	5-215
Table 5-34. Change in Storage, Projected Water Budget with Climate Change and Projects & Management Actions (AFY)	5-217
Table 5-35. Minimum Thresholds and Measurable Objectives for Subsidence Management Areas	5-240
Table 6-1. Minimum Thresholds for Chronic Lowering of Groundwater Levels, Upper Aquifer.....	6-9
Table 6-2. Minimum Threshold for Chronic Lowering of Groundwater Levels, Lower Aquifer	6-10
Table 6-3. Measurable Objective for Chronic Lowering of Groundwater Levels, Upper Aquifer	6-11
Table 6-4. Measurable Objective for Chronic Lowering of Groundwater Levels, Lower Aquifer	6-12
Table 6-5. Minimum Thresholds for Degraded Water Quality, Upper Aquifer	6-18
Table 6-6. Minimum Thresholds for Degraded Water Quality, Lower Aquifer	6-19
Table 6-7. Measurable Objective for Degraded Water Quality, Upper Aquifer.....	6-20
Table 6-8. Measurable Objective for Degraded Water Quality, Lower Aquifer.....	6-21
Table 6-9. Minimum Thresholds for Land Subsidence.....	6-29
Table 6-10. Measurable Objective for Land Subsidence	6-30
Table 6-11. Interim Milestones for Land Subsidence	6-31
Table 7-1. Northern & Central Delta-Mendota Region GSP Projects and Management Actions	7-3
Table 7-2. Summary of How Northern & Central Delta-Mendota Region GSP Projects and Management Actions Address Sustainability Indicators.....	7-5

Table 7-3. Project Costs.....	7-19
Table 7-4. Project Type and Benefits.....	7-21
Table 7-5. Project Types.....	7-22
Table 7-6. Groundwater Level Monitoring Network, Upper Aquifer.....	7-37
Table 7-7. Groundwater Level Monitoring Network, Lower Aquifer.....	7-38
Table 7-8. Groundwater Quality Monitoring Network, Upper Aquifer.....	7-51
Table 7-9. Groundwater Quality Monitoring Network, Lower Aquifer.....	7-52
Table 7-10. Land Subsidence Monitoring Network.....	7-63
Table 7-11. Depletions of Interconnected Surface Water Monitoring Network.....	7-69
Table 7-12. Selected Stream Gauges.....	7-69
Table 8-1. Northern & Central Delta-Mendota Region GSP Estimated Implementation Costs.....	8-4
Table 8-2. Potential Funding Sources for GSP Implementation.....	8-7

Figures

Figure 1-1. Delta-Mendota Subbasin Groundwater Sustainability Plan Groups.....	1-3
Figure 2-1. Plan Area Covered by the Northern & Central Delta-Mendota Region Groundwater Sustainability Plan	2-2
Figure 2-2. Plan Area Covered by the Northern & Central Delta-Mendota Region Groundwater Sustainability Plan in San Joaquin County.....	2-3
Figure 2-3. Plan Area Covered by the Northern & Central Delta-Mendota Region Groundwater Sustainability Plan in Stanislaus County.....	2-4
Figure 2-4. Plan Area Covered by the Northern & Central Delta-Mendota Region Groundwater Sustainability Plan in Merced County.....	2-5
Figure 2-5. Plan Area Covered by the Northern & Central Delta-Mendota Region Groundwater Sustainability Plan in Fresno and San Benito Counties.....	2-6
Figure 2-6. Watersheds in the Delta-Mendota Subbasin.....	2-8
Figure 2-7. Wildlife Refuges and Areas in the Delta-Mendota Subbasin.....	2-9
Figure 2-8. Communities Dependent on Groundwater in the Northern and Central Delta-Mendota Regions.....	2-14
Figure 2-9. De Minimis Groundwater Extractors in the Northern and Central Delta-Mendota Regions.....	2-15
Figure 2-10. Estimated Domestic Well Density in the Delta-Mendota Subbasin.....	2-16
Figure 2-11. Estimated Production Well Density in the Delta-Mendota Subbasin.....	2-17
Figure 2-12. Estimated Public Well Density in the Delta-Mendota Subbasin.....	2-18
Figure 2-13. 100-Year Floodplain, Delta-Mendota Subbasin.....	2-21
Figure 2-14. Land Cover, Delta-Mendota Subbasin.....	2-22
Figure 2-15. Land Use Planning Entities, Northern and Central Delta-Mendota Regions.....	2-23
Figure 2-16. Disadvantaged and Severely Disadvantaged Communities in the Delta-Mendota Subbasin.....	2-26
Figure 2-17. Economically Distressed Areas in the Delta-Mendota Subbasin.....	2-28
Figure 2-18. Northern & Central Delta-Mendota Region GSP GSAs.....	2-30
Figure 2-19. Other GSAs in the Delta-Mendota Subbasin.....	2-31
Figure 2-20. Federal and State Lands in the Northern and Central Delta-Mendota Regions.....	2-34
Figure 2-21. Cities and Counties in the Northern and Central Delta-Mendota Regions.....	2-35
Figure 2-22. Agencies with Water Management Responsibilities in the Northern and Central Delta-Mendota Regions	2-36
Figure 2-23. Existing Land Use Designations in the Delta-Mendota Subbasin.....	2-38
Figure 2-24. Land Use by Water Source in the Northern and Central Delta-Mendota Regions.....	2-40
Figure 2-25. Land Use by Water Use Sector in the Northern and Central Delta-Mendota Regions.....	2-41
Figure 2-26. Relevant General Plans in the Northern and Central Delta-Mendota Regions.....	2-43
Figure 2-27. Delta-Mendota Subbasin underlying the Westside-San Joaquin IRWM Region.....	2-70
Figure 2-28. Delta-Mendota Subbasin underlying the East Stanislaus IRWM Region.....	2-74
Figure 2-29. Delta-Mendota Subbasin underlying the Madera IRWM Region.....	2-76
Figure 2-30. High Vulnerability Areas, Western San Joaquin River Watershed Coalition.....	2-85

Figure 2-31. High Vulnerability Areas, Grassland Drainage Area	2-86
Figure 2-32. Groundwater Quality Trend Monitoring Program Wells, Western San Joaquin River Watershed Coalition	2-87
Figure 2-33. Delta-Mendota Subbasin CASGEM Groundwater Monitoring Network	2-90
Figure 2-34. Voluntary Monitoring Wells in the Delta-Mendota Subbasin	2-91
Figure 3-1. Northern and Central Delta-Mendota Regions GSA Boundaries	3-2
Figure 3-2. Delta-Mendota Subbasin GSP Regions.....	3-3
Figure 3-3. Central Delta-Mendota GSA Boundary, Central Delta-Mendota Region	3-8
Figure 3-4. City of Patterson GSA Boundary, Northern Delta-Mendota Region.....	3-9
Figure 3-5. DM-II GSA Boundary, Northern Delta-Mendota Region	3-10
Figure 3-6. Northwestern Delta-Mendota GSA Boundary, Northern Delta-Mendota Region	3-11
Figure 3-7. Oro Loma Water District GSA Boundary, Central Delta-Mendota Region	3-12
Figure 3-8. Patterson Irrigation District GSA Boundary, Northern Delta-Mendota Region.....	3-13
Figure 3-9. West Stanislaus Irrigation District GSA Boundary, Northern Delta-Mendota Region.....	3-14
Figure 3-10. Widren Water District GSA Boundary, Central Delta-Mendota Region.....	3-15
Figure 3-11. Governance Structure of the Northern & Central Delta-Mendota Region GSP	3-32
Figure 3-12. Governance Structure of the Delta-Mendota Subbasin	3-33
Figure 5-1. Regional Geologic Setting, Delta-Mendota Subbasin.....	5-3
Figure 5-2. Geologic Map, Delta-Mendota Subbasin	5-5
Figure 5-3. Generalized Geology, Delta-Mendota Subbasin.....	5-7
Figure 5-4. Faults, Delta-Mendota Subbasin.....	5-10
Figure 5-5. Neighboring Subbasins, San Joaquin Valley Groundwater Basin	5-11
Figure 5-6. Representative Cross-Sections, Northern & Central Delta-Mendota Region GSP	5-16
Figure 5-7. Cross-Section A-A' (RMC/W&C and Schmidt, 2014).....	5-17
Figure 5-8. Cross-Section B-B' (Hotchkiss, 1972).....	5-19
Figure 5-9. Cross-Section C-C' (Tranquillity ID, 1994 and 2000 and LSCE, 2011).....	5-20
Figure 5-10. Cross-Section D-D' (Hotchkiss, 1972)	5-21
Figure 5-11. Cross-Section E-E' (RMC/W&C and Schmidt, 2014).....	5-22
Figure 5-12. Cross-Section F-F' (Hotchkiss, 1972)	5-22
Figure 5-13. Cross-Section G-G' (Hotchkiss & Balding, 1971)	5-23
Figure 5-14. Cross-Section H-H' (Schmidt, 2018).....	5-25
Figure 5-15. Cross-Section I-I' (Hotchkiss & Balding, 1971)	5-27
Figure 5-16. Cross-Section J-J' (Hotchkiss, 1972).....	5-27
Figure 5-17. Depth to Corcoran Clay, Delta-Mendota Subbasin.....	5-28
Figure 5-18. Thickness of Corcoran Clay, Delta-Mendota Subbasin	5-29
Figure 5-19. Non-Corcoran Clay Layers, Delta-Mendota Subbasin	5-30
Figure 5-20. Soil Hydraulic Conductivity, Delta-Mendota Subbasin	5-31
Figure 5-21. Maximum Nitrate Concentrations, All Wells.....	5-36
Figure 5-22. Most Recent (2000-2014) Nitrate Concentrations, All Wells.....	5-37
Figure 5-23. Maximum Nitrate Concentrations, Above Corcoran Clay.....	5-38
Figure 5-24. Most Recent (2000-2014) Nitrate Concentrations, Above Corcoran Clay	5-39
Figure 5-25. Maximum Nitrate Concentrations, Below Corcoran Clay.....	5-40
Figure 5-26. Most Recent (2000-2014) Nitrate Concentrations, Below Corcoran Clay.....	5-41
Figure 5-27. Maximum Nitrate Concentrations, Composite Wells.....	5-42
Figure 5-28. Most Recent (2000-2014) Nitrate Concentrations, Composite Wells.....	5-43
Figure 5-29. Maximum Nitrate Concentrations, Wells of Unknown Depth	5-44
Figure 5-30. Most Recent (2000-2014) Nitrate Concentrations, Wells of Unknown Depth	5-45
Figure 5-31. Maximum TDS Concentrations, All Wells	5-47
Figure 5-32. Most Recent (2000-2014) TDS Concentrations, All Wells	5-48
Figure 5-33. Maximum TDS Concentrations, Above Corcoran Clay.....	5-49
Figure 5-34. Most Recent (2000-2014) TDS Concentrations, Above Corcoran Clay.....	5-50

Figure 5-35. Maximum TDS Concentrations, Below Corcoran Clay	5-52
Figure 5-36. Most Recent (2000-2014) TDS Concentrations, Below Corcoran Clay	5-53
Figure 5-37. Maximum TDS Concentrations, Composite Wells	5-54
Figure 5-38. Most Recent (2000-2014) TDS Concentrations, Composite Wells	5-55
Figure 5-39. Maximum TDS Concentrations, Wells of Unknown Depth	5-56
Figure 5-40. Most Recent (2000-2014) TDS Concentrations, Wells of Unknown Depth	5-57
Figure 5-41. Pesticide Detections and Exceedances by Section	5-59
Figure 5-42. Maximum Selenium Concentrations, All Wells	5-64
Figure 5-43. Most Recent (2000-2014) Selenium Concentrations, All Wells	5-65
Figure 5-44. Maximum Selenium Concentrations, Above Corcoran Clay	5-66
Figure 5-45. Most Recent (2000-2014) Selenium Concentrations, Above Corcoran Clay	5-67
Figure 5-46. Maximum Selenium Concentrations, Below Corcoran Clay	5-68
Figure 5-47. Most Recent (2000-2014) Selenium Concentrations, Below Corcoran Clay	5-69
Figure 5-48. Maximum Selenium Concentrations, Wells of Unknown Depth	5-70
Figure 5-49. Most Recent (2000-2014) Selenium Concentrations, Wells of Unknown Depth	5-71
Figure 5-50. Maximum Boron Concentrations, All Wells	5-72
Figure 5-51. Most Recent (2000-2014) Boron Concentrations, All Wells	5-73
Figure 5-52. Maximum Boron Concentrations, Above Corcoran Clay	5-74
Figure 5-53. Most Recent (2000-2014) Boron Concentrations, Above Corcoran Clay	5-75
Figure 5-54. Maximum Boron Concentrations, Below Corcoran Clay	5-76
Figure 5-55. Most Recent (2000-2014) Boron Concentrations, Below Corcoran Clay	5-77
Figure 5-56. Maximum Boron Concentrations, Wells of Unknown Depth	5-78
Figure 5-57. Most Recent (2000-2014) Boron Concentrations, Wells of Unknown Depth	5-79
Figure 5-58. Ground Surface Elevation, Delta-Mendota Subbasin	5-81
Figure 5-59. Surface Water Features, Delta-Mendota Subbasin	5-82
Figure 5-60. Hydrologic Soil Groups, Delta-Mendota Subbasin	5-85
Figure 5-61. Tile Drains, Delta-Mendota Subbasin	5-86
Figure 5-62. Recharge Areas, Seeps and Springs, Delta-Mendota Subbasin	5-87
Figure 5-63. Imported Supplies, Delta-Mendota Subbasin	5-88
Figure 5-64. Wells with Known Screened Interval Depths, Delta-Mendota Subbasin	5-96
Figure 5-65. Representative Hydrographs with Post-Drought Measurements, Upper Aquifer	5-97
Figure 5-66. Representative Hydrographs with Post-Drought Measurements, Lower Aquifer	5-98
Figure 5-67. Select Graphs of Groundwater Elevations, Very Shallow Groundwater	5-99
Figure 5-68. Select Graphs of Groundwater Elevations, Upper Aquifer	5-100
Figure 5-69. Select Graphs of Groundwater Elevations, Various Depths	5-101
Figure 5-70. Map of Spring Groundwater Elevation (2000-2016 Average), Very Shallow Groundwater	5-102
Figure 5-71. Map of Fall Groundwater Elevation (2000-2016 Average), Very Shallow Groundwater	5-103
Figure 5-72. Map of Spring Groundwater Elevation (2000-2016 Average), Upper Aquifer	5-104
Figure 5-73. Map of Fall Groundwater Elevation (2000-2016 Average), Upper Aquifer	5-105
Figure 5-74. Map of Spring Groundwater Elevation (2000-2016 Average), Shallow Groundwater	5-106
Figure 5-75. Map of Spring Groundwater Elevation (2000-2016 Average), Upper Aquifer	5-107
Figure 5-76. Select Graphs of Groundwater Elevations, Lower Aquifer	5-109
Figure 5-77. Map of Spring Groundwater Elevation (2000-2016 Average), Lower Aquifer	5-111
Figure 5-78. Map of Fall Groundwater Elevation (2000-2016 Average), Lower Aquifer	5-112
Figure 5-79. Map of Spring Groundwater Elevation (2000-2016 Average), Lower Aquifer	5-113
Figure 5-80. Spring 2013 Upper Aquifer Groundwater Contour Map, Delta-Mendota Subbasin	5-115
Figure 5-81. Fall 2013 Upper Aquifer Groundwater Contour Map, Delta-Mendota Subbasin	5-116
Figure 5-82. Spring 2013 Lower Aquifer Groundwater Elevation Measurements, Delta-Mendota Subbasin	5-117
Figure 5-83. Fall 2013 Lower Aquifer Groundwater Elevation Measurements, Delta-Mendota Subbasin	5-118
Figure 5-84. Calculated Upper Aquifer Change in Storage, Annual and Cumulative	5-120
Figure 5-85. Calculated Lower Aquifer Change in Storage, Annual and Cumulative	5-120

Figure 5-86. Upper Aquifer, Current Groundwater Quality (2000-2018)	5-126
Figure 5-87. Lower Aquifer, Current Groundwater Quality (2000-2018)	5-127
Figure 5-88. Upper Zone Ambient Nitrate as N, Delta-Mendota Subbasin	5-128
Figure 5-89. Production Zone Ambient Nitrate as N, Delta-Mendota Subbasin	5-129
Figure 5-90. Select Graphs of Nitrate Concentrations, Shallow Groundwater	5-131
Figure 5-91. Select Graphs of Nitrate Concentrations, Upper Aquifer	5-132
Figure 5-92. Select Graphs of Nitrate Concentrations, Lower Aquifer	5-133
Figure 5-93. Significant Temporal Trends in Nitrate Concentrations, Upper Aquifer	5-135
Figure 5-94. Significant Temporal Trends in Nitrate Concentrations, Lower Aquifer	5-136
Figure 5-95. Significant Temporal Trends in Nitrate Concentrations, Composite Wells.....	5-137
Figure 5-96. Upper Zone Ambient TDS, Delta-Mendota Subbasin	5-140
Figure 5-97. Production Zone Ambient TDS, Delta-Mendota Subbasin.....	5-141
Figure 5-98. Select Graphs of TDS Concentrations, Shallow Groundwater.....	5-143
Figure 5-99. Select Graphs of TDS Concentrations, Upper Aquifer.....	5-144
Figure 5-100. Select Graphs of TDS Concentrations, Lower Aquifer.....	5-145
Figure 5-101. Significant Temporal Trends in TDS Concentrations, Upper Aquifer.....	5-147
Figure 5-102. Significant Temporal Trends in TDS Concentrations, Lower Aquifer.....	5-148
Figure 5-103. Significant Temporal Trends in TDS Concentrations, Composite Wells.....	5-149
Figure 5-104. Select Graphs of Boron Concentrations, Various Depths.....	5-151
Figure 5-105. Significant Temporal Trends in Boron Concentrations, Lower Aquifer.....	5-152
Figure 5-106. Subsidence Monitoring Locations, Delta-Mendota Subbasin.....	5-158
Figure 5-107. Vertical Elevation Change at UNAVCO CGPS P255, Spring 2007 to 2018.....	5-159
Figure 5-108. Vertical Elevation Change at UNAVCO CGPS P259, Spring 2006 to 2018.....	5-160
Figure 5-109. Vertical Elevation Change at UNAVCO CGPS P252, Spring 2006 to 2018.....	5-161
Figure 5-110. Vertical Elevation Change at UNAVCO CGPS P303, Spring 2006 to 2018.....	5-162
Figure 5-111. Vertical Elevation Change at UNAVCO CGPS P301, Spring 2005 to 2018.....	5-163
Figure 5-112. Vertical Elevation Change at UNAVCO CGPS P304, Spring 2005 to 2018.....	5-164
Figure 5-113. Land Subsidence, December 2011 to December 2014.....	5-165
Figure 5-114. Land Subsidence, July 2012 to December 2016.....	5-166
Figure 5-115. Recent Land Subsidence at Key San Joaquin Valley Locations (Source: <i>Progress Report: Subsidence in California, March 2015 – September 2016</i> , Farr et. al. JPL, 2017).....	5-167
Figure 5-116. Total Land Subsidence in San Joaquin Valley from May 7, 2015 – September 10, 2016 as measured by ESA's Sentinel-1A and processed by JPL (Source: <i>Progress Report: Subsidence in California, March 2015 – September 2016</i> , Farr et. al. JPL, 2017.....	5-168
Figure 5-117. Elevation Change along the Delta-Mendota Canal, 2014 through 2018.....	5-169
Figure 5-118. Groundwater Dependent Ecosystems in the Delta-Mendota Subbasin, Wetlands.....	5-174
Figure 5-119. Groundwater Dependent Ecosystems in the Delta-Mendota Subbasin, Vegetation.....	5-175
Figure 5-120. Generalized Water Budget Diagram.....	5-184
Figure 5-121. Precipitation and Cumulative Departure from Mean, WY2003-2018.....	5-186
Figure 5-122. Average Historic Land Surface Budget (WY2003-2012).....	5-220
Figure 5-123. Current Land Surface Budget (WY2013).....	5-220
Figure 5-124. Annual Land Surface Budget Over Historic and Current Periods.....	5-221
Figure 5-125. Average Historic Groundwater Budget (WY2003-2012).....	5-222
Figure 5-126. Current Groundwater Budget (WY2013).....	5-222
Figure 5-127. Historic and Current Annual Groundwater Budget.....	5-223
Figure 5-128. Projected Baseline Average Annual Land Surface Budget (WY2014-2070).....	5-224
Figure 5-129. Projected Baseline Annual Land Surface Budget (WY2014-2070).....	5-225
Figure 5-130. Projected Baseline Average Annual Groundwater Budget (WY2014-2070).....	5-226
Figure 5-131. Projected Baseline Annual Groundwater Budget (WY2014-2070).....	5-226
Figure 5-132. Projected Average Annual Land Surface Budget with Climate Change (WY2014-2070).....	5-228
Figure 5-133. Projected Annual Land Surface Budget with Climate Change (WY2014-2070).....	5-228

Figure 5-134. Projected Average Annual Groundwater Budget with Climate Change (WY2014-2070).....	5-229
Figure 5-135. Projected Annual Groundwater Budget with Climate Change (WY2014-2070).....	5-230
Figure 5-136. Projected Average Annual Land Surface Budget with Climate Change and Projects & Management Actions (WY2014-2070)	5-232
Figure 5-137. Projected Annual Land Surface Budget with Climate Change and Projects & Management Actions (WY2014-2070)	5-232
Figure 5-138. Projected Average Annual Groundwater Budget with Climate Change and Projects & Management Actions (WY2014-2070)	5-233
Figure 5-139. Projected Annual Groundwater Budget with Climate Change and Projects & Management Actions (WY2014-2070)	5-234
Figure 5-140. Subsidence Management Areas, Northern and Central Delta-Mendota Regions.....	5-239
Figure 6-1. Sustainable Management Criteria Definitions Graphic (Groundwater Elevation Example).....	6-2
Figure 6-2. Location of Representative Monitoring Wells for Groundwater Levels, Upper Aquifer	6-7
Figure 6-3. Location of Representative Monitoring Wells for Groundwater Levels, Lower Aquifer	6-8
Figure 6-4. Locations of Representative Monitoring Wells for Degraded Water Quality, Upper Aquifer	6-22
Figure 6-5. Locations of Representative Monitoring Wells for Degraded Water Quality, Lower Aquifer	6-23
Figure 6-6. Location of Representative Monitoring Sites for Land Subsidence.....	6-28
Figure 6-7. Locations of Representative Monitoring Wells for Depletions of Interconnected Surface Water	6-34
Figure 7-1. Diagram of Key Groundwater Monitoring Well Measurements	7-26
Figure 7-2. Monitoring Network Subregions.....	7-33
Figure 7-3. Groundwater Level Monitoring Network, Upper Aquifer.....	7-39
Figure 7-4. Groundwater Level Monitoring Network, Lower Aquifer.....	7-40
Figure 7-5. Potential Future Groundwater Level Monitoring Sites, Upper Aquifer	7-47
Figure 7-6. Potential Future Groundwater Level Monitoring Sites, Lower Aquifer	7-48
Figure 7-7. Groundwater Quality Monitoring Network, Upper Aquifer	7-54
Figure 7-8. Groundwater Quality Monitoring Network, Lower Aquifer	7-55
Figure 7-9. Land Subsidence Monitoring Network	7-64
Figure 7-10. Depletions of Interconnected Surface Water Monitoring Network	7-70
Figure 7-11. Potential Future Depletions of Interconnected Surface Water Monitoring Sites	7-73
Figure 8-1. Implementation Schedule	8-2
Figure 8-2. Data Flow in Delta-Mendota Subbasin	8-13
Figure 8-3. Delta-Mendota Subbasin Monitoring and Data Management Roles and Responsibilities	8-14

Appendices

Appendix A – Coordination Agreements

Appendix B – Common Chapter for the Delta-Mendota Subbasin Groundwater Sustainability Plan

Appendix C – Outreach Documentation

Appendix D – Water Budgets Model Development Technical Memorandum

Appendix E – Hydrographs for Sustainable Management Criteria

Appendix F – Quality Assurance Program Plan for the Northern & Central Delta-Mendota Region Groundwater
Sustainability Plan Monitoring Protocol

Appendix G – Noticing Documentation

Appendix H – GSP Elements Guide

Acronyms

AB	Assembly Bill
ACS	U.S. Census Bureau's American Community Survey
AF	Acre-foot
AFY	Acre-feet per year
AWMP	Agriculture Water Management Plan
AWS	Amazon Web Services
BMP	Best Management Practice
CASGEM	California Statewide Groundwater Elevation Monitoring
CC	Climate Change
CCF	Climate Change Factors
CDEC	California Data Exchange Center
CDFW	California Department of Fish and Wildlife
CDP	Census Designated Place
CEQA	California Environmental Quality Act
cfs	Cubic feet per second
CGPS	Continuous Global Positioning System
CIMIS	California Irrigation Management Information System
COC	Chain of custody
CVP	Central Valley Project
CV-RWQCB	Central Valley Regional Water Quality Control Board
CV-SALTS	Central Valley Salinity Alternatives for Long-Term Sustainability
CWC	California Water Code
CWSRF	Clean Water State Revolving Fund
DAC	Disadvantaged Community
DACIP	Disadvantaged Community Involvement Program
DDW	Division of Drinking Water, California State Water Resources Control Board
DHS	California Department of Health Services
DMC	Delta-Mendota Canal
DMS	Data Management System
DPR	California Department of Pesticide Regulation
DWR	California Department of Water Resources
EC	Electrical conductivity
EDA	Economically Distressed Area
EIR	Environmental Impact Report
EPA	United States Environmental Protection Agency
ET	Evapotranspiration
ET ₀	Reference Evapotranspiration

Acronyms

FAQ	Frequently Asked Question
GAMA	Groundwater Ambient Monitoring and Assessment
GAR	Groundwater Quality Assessment Report
GDE	Groundwater Dependent Ecosystem
GIS	Geographic Information System
GPS	Global Positioning System
GQTM	Groundwater Quality Trend Monitoring
GSA	Groundwater Sustainability Agency
GSE	Ground Surface Elevation
GSP	Groundwater Sustainability Plan
HCM	Hydrogeologic Conceptual Model
ID	Identification
ILRP	Irrigated Lands Regulatory Program
IRWM	Integrated Regional Water Management
IRWMP	Integrated Regional Water Management Plan
ITRC	Cal Poly Irrigation Training & Research Center
JPA	Joint Powers Authority
LSCE	Luhdorff & Scalmanini Consulting Engineers
MA	Management Area
MAF	Million acre-feet
MCL	Maximum Contaminant Level
mg/L	Milligrams per liter
MHI	Median Household Income
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
msl	Mean Sea Level
NASA JPL	National Aeronautics and Space Administration Jet Propulsions Laboratory
NASA UAVSAR	National Aeronautics and Space Administration Uninhabited Aerial Vehicle Synthetic Aperture Radar
NCCAG	Natural Communities Commonly Associated with Groundwater
NEPA	National Environmental Protection Act
NRCS	National Resource Conservation Service
NVRRWP	North Valley Regional Recycled Water Program
NWIS	USGS National Water Information System
P&MAs	Projects & Management Actions
PID	Patterson Irrigation District
PIP	Delta-Mendota Canal Groundwater Pump-in Program
PLSS	Public Land Survey System

Acronyms

QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Program Plan
RP	Reference point
RWVG	Regional Water Management Group
RWQCB	Regional Water Quality Control Board
SAGBI	Soil Agricultural Groundwater Banking Index
SB	Senate Bill
SCADA	Supervisory control data acquisition
SDAC	Severely Disadvantaged Community
SGMA	Sustainable Groundwater Management Act
SHE	Self-Help Enterprise
SJREC	San Joaquin River Exchange Contractors
SJRECWA	San Joaquin River Exchange Contractors Water Authority
SJRIP	San Joaquin River Improvement Program
SJRRP	San Joaquin River Restoration Program
SLDMWA	San Luis & Delta-Mendota Water Authority
SMC	Sustainable Management Criteria
SMCL	Secondary Maximum Contaminant Level
SNCWD	Santa Nella County Water District
SNMP	Salt and Nutrient Management Plan
SSURGO	Soil Survey Geographic Database
SWP	State Water Project
SWRCB	State Water Resources Control Board
TAC	Technical Advisory Committee
TBD	To be determined
TDS	Total Dissolved Solids
TFCF	Tracy Fish Collection Facility
TNC	The Nature Conservancy
TRID	Tranquillity Irrigation District
TSS	Technical Support Services
UNAVCO	University NAVSTAR Consortium
USBR	U.S. Bureau of Reclamation
USDA	United States Department of Agriculture
USFWS	U.S. Fish & Wildlife Service
USGS	United States Geological Survey
VIC	Variable Infiltration Capacity
WDL	Water Data Library
WIIN	Water Infrastructure Improvements for the Nation

Acronyms

WQO	Water Quality Objective
WRFP	Water Recycling Funding Program
WSID	West Stanislaus Irrigation District
WSIP	Water Storage Investment Program
WWD	Westlands Water District
WY	Water Year

This page intentionally left blank.

Prepared by:



In association with:



📍 1545 River Park Dr., Suite 425
Sacramento, CA 95815
☎ 916.999.8700