NORTHERN & CENTRAL DELTA-MENDOTA

Executive Summary - Final Draft
Groundwater Sustainability Plan

For the Northern and Central Delta-Mendota Regions

November 2019

DEPARTMENT OF WATER RESOURCES · STATE OF CALIFORNIA ·

PROP 1
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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 Delta-Mendota Subbasin (Subbasin) is one of 21 alluvial basins and subbasins identified by the California Department of Water Resources (DWR) as being in a state of critical overdraft. SGMA requires the preparation of a Groundwater Sustainability Plan (GSP) to address measures necessary to attain sustainable conditions in the Subbasin by 2040. Within the framework of SGMA, sustainability is generally defined as the long-term reliability of groundwater supply to meet the needs of uses and users of groundwater in the Subbasin with the absence of undesirable results.

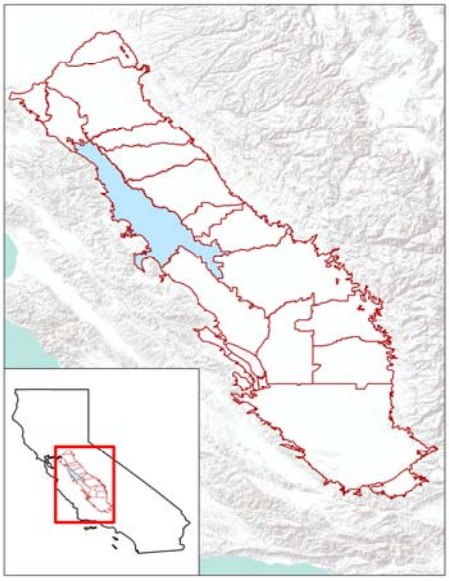
Critical Dates for the Delta-Mendota Subbasin

- 2020 By January 31: Submit GSPs to DWR
- 2025 Review and update GSPs
- 2030 Review and update GSPs
- 2035 Review and update GSPs
- 2040 Achieve sustainability for the Subbasin

Within the Delta-Mendota Subbasin, six (6) GSPs have been developed in a coordinated fashion with the goal of achieving sustainability for the Subbasin as a whole. The GSP Groups preparing the coordinated GSPs include: the Aliso Water District GSP Group, Farmers Water District GSP Group, Fresno County GSP Group, Grassland GSP Group, Northern & Central Delta-Mendota Region GSP Group, and San Joaquin River Exchange Contractors GSP Group. This GSP has been developed for the Northern and Central Delta-Mendota Regions, which are comprised of the following eight Groundwater Sustainability Agencies (GSAs): Central Delta-Mendota, City of Patterson, DM-II, Northwestern Delta-Mendota, Oro Loma Water District, Patterson Irrigation District, West Stanislaus Irrigation District, and Widren Water District. The Northern & Central Delta-Mendota Region GSP has been developed by these GSAs to meet SGMA regulatory requirements while reflecting local needs and preserving local control over water resources. This GSP provides a path to achieve and document sustainable groundwater management within 20 years following adoption, promoting the long-term sustainability of locally-managed groundwater resources now and into the future.

SGMA requires development of a GSP that achieves groundwater sustainability in the Plan area and Subbasin as a whole by 2040. This GSP outlines the need to address overdraft and related conditions and has identified projects and management actions for implementation to offset increasing reliance on groundwater and to meet current and future groundwater demands in a sustainable fashion. While no regulatory actions are anticipated to occur during the first five years of GSP implementation, additional efforts will be taken during this period to fill data gaps, to confirm benefits provided by projects and management actions implemented in the first five years, and to assess the need to modify the projects or management actions, or identify additional projects and management actions required, to achieve sustainability.

Figure ES-1. Delta-Mendota Subbasin within the San Joaquin Valley

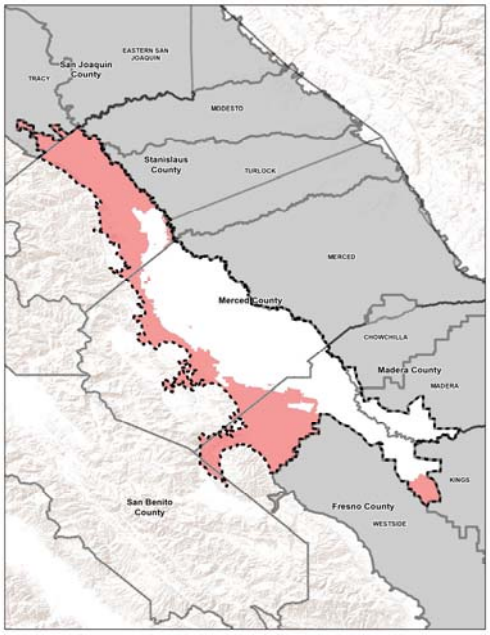


As previously stated, the Northern & Central Delta-Mendota Region GSP is one of six GSPs developed for implementation in the Delta-Mendota Subbasin under SGMA. Coordinated efforts required under SGMA regulations in basins and subbasins developing more than one GSP are documented in the *Delta-Mendota Subbasin Groundwater Sustainability Plan Common Chapter*, which is included as a supplemental document to this GSP (Appendix B).

ES-2. Plan Area

The Delta-Mendota Subbasin is defined by DWR's 2003 Bulletin 118 and subsequently updated in 2016 and 2018. The Delta-Mendota Subbasin is one of 19 subbasins that comprise the San Joaquin Valley Groundwater Basin and neighbors the following subbasins: Tracy, Eastern San Joaquin, Modesto, Turlock, Merced, Chowchilla, Madera, Kings and Westside (Figure ES-1). The Northern & Central Delta-Mendota Region GSP generally encompasses the area along the western boundary of the Delta-Mendota Subbasin and lies within five counties: San Joaquin, Stanislaus, Merced, Fresno, and San Benito (Figure ES-2).

Figure ES-2. Plan Area within the Delta-Mendota Subbasin



Agriculture is the primary land use type within the Northern and Central Delta-Mendota Regions, with the City of Patterson and several communities (including Grayson, Westley, Crows Landing, Santa Nella, and Volta) comprising the urban sector of the Plan area. The predominant land use planning entities in the Plan area include the overlying counties, the City of Patterson, the City of Modesto (serving Community of Grayson), and the larger communities of Santa Nella, Crows Landing, and Westley. Changes to land use have the potential to change water demands or impact sustainable groundwater management in the Plan area.

The Delta-Mendota Canal (DMC) and California Aqueduct extend nearly the entire length of the Plan area and provide water from the Central Valley Project and State Water Project, respectively, to water districts, irrigation districts, and private land owners south of the Sacramento-San Joaquin Delta and throughout the Delta-Mendota Subbasin. The San Joaquin River is the primary feature defining the eastern boundary of the Delta-Mendota Subbasin and serves as a water supply source for Patterson Irrigation District, West Stanislaus Irrigation District, and private landowners in the Northern and Central Delta-Mendota Regions. The Kings River, located south of the Subbasin, serves as a water supply for entities in the southern portion of the Subbasin. Groundwater is used as a supplemental water supply source by water purveyors throughout the Delta-Mendota Subbasin, with several entities reliant in whole or in part on groundwater as their primary water supply. Existing water resources monitoring and management plans are currently in place throughout the Delta-Mendota Subbasin and include the California Statewide Groundwater Elevation Monitoring (CASGEM) program and Irrigated Lands Regulatory Program (ILRP), in addition to county well standards and permitting. These existing programs can help inform SGMA activities by coordinating with monitoring and management entities on overlapping activities and goals.

ES-3. Governance and Administration

As previously noted, the Northern & Central Delta-Mendota Region GSP was developed in a coordinated fashion by the eight GSAs comprising the Regions. All eight of these GSAs each have their own organization and management structure as well as legal authority under which they operate in order to enforce SGMA and the contents of this GSP. The Northern Delta-Mendota Region and Central Delta-Mendota Region coordinate with the San Luis & Delta-Mendota Water Authority (SLDMWA) as Plan Manager to prepare and implement a single GSP for their portion of the Delta-Mendota Subbasin.

The Northern Delta-Mendota Region is comprised of the following GSAs: DM-II, Patterson Irrigation District, West Stanislaus Irrigation District, City of Patterson, and Northwestern Delta-Mendota. The Central Delta-Mendota Region is comprised of the following GSAs: Central Delta-Mendota, San Benito County (under a Memorandum of Understanding with the Central Delta-Mendota GSA), Oro Loma Water District, and Widren Water District. The Northern Delta-Mendota Management Committee and Central Delta-Mendota Management Committee coordinate on

all aspects of GSP development and implementation through joint management committee meetings. At the Subbasin-level, representatives from the Northern & Central Delta-Mendota Region GSP Group participate as members on the Delta-Mendota Subbasin Coordination Committee during regular meetings, where all SGMA-required coordination efforts regarding GSP development and implementation occurs.

ES-4. Outreach and Communication

Figure ES 3. Public Workshop Events

A stakeholder engagement strategy was developed to solicit and discuss the interests of all beneficial users of groundwater in the Plan area and Subbasin. The strategy incorporated monthly meetings of the Northern and Central Delta-Mendota Management Committees and the Northern and Central Delta-Mendota Technical Advisory Committee; monthly meetings of the Delta-Mendota Subbasin Coordination Committee, Subbasin Technical Working Group, and Subbasin Communications Working Group; bi-annual public workshops (including outreach presentations on GSP development progress to solicit feedback); a monthly newsletter distributed to targeted stakeholders; a website where all meeting and public workshop materials, as well as supplemental resources, are posted; and information distributed to property owners and residents in the Subbasin. Figure ES-3 shows attendees at one of the public workshop events conducted during development of the GSP.

The Northern and Central Delta-Mendota Management Committees, as well as the Delta-Mendota Subbasin Coordination Committee, were established to encourage active involvement from diverse social, cultural, and economic elements of the population of the Plan area and Subbasin, in addition to meeting SGMA requirements for intrabasin coordination. Members of these committees include representatives from water and irrigation districts, representing large and small landowners and growers, and municipal water providers. Environmental interest groups, state agencies, and disadvantage community representatives were also consulted during regular meetings, special meetings, and workshops early on in the GSP development process to consider the interest of all users of groundwater in the Plan area and Subbasin as a whole. Participating stakeholders were invited to provide comments during these meetings (subject to the Brown Act) as well as provide comments and feedback during public workshops hosted throughout the Subbasin during GSP development. Spanish translation was provided at the public workshops and associated materials were provided in Spanish and English, along with other SGMA-related informational materials, at the meetings and on the Subbasin website (http://deltamendota.org/), creating an opportunity for local Spanish-speaking individuals to engage in the GSP development process.

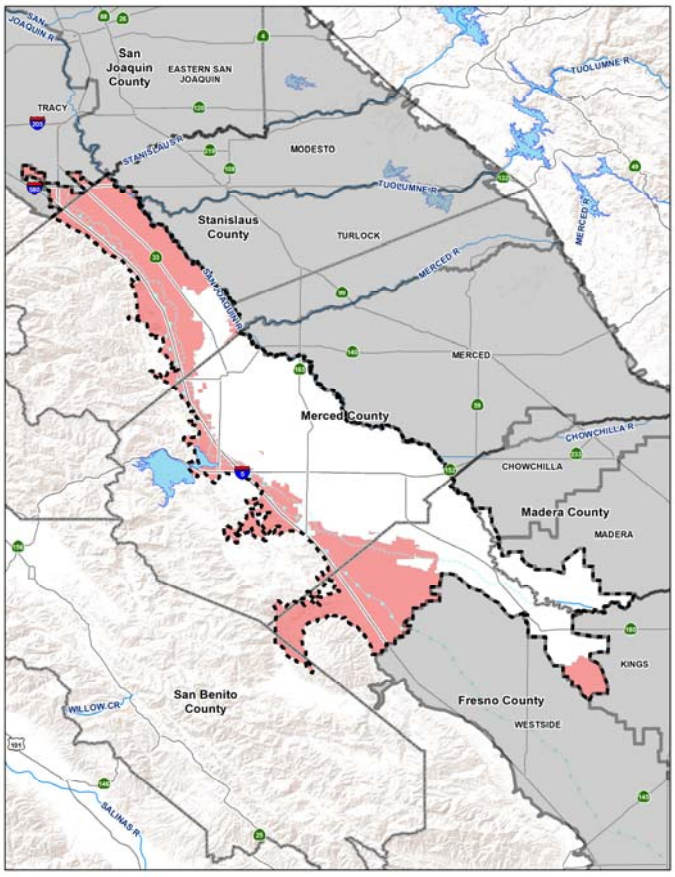
ES-5. Basin Setting

The Northern & Central Delta-Mendota Region GSP contains the required sections for establishing the Basin Setting. These sections contain descriptions of the Regions' physical setting, characteristics, and current conditions, and include the Hydrogeologic Conceptual Model, Groundwater Conditions, Water Budgets, and Management Areas sections. Combined, these sections serve as a basis for defining and assessing reasonable sustainable management criteria and projects and management actions.

Hydrogeologic Conceptual Model

The Delta-Mendota Subbasin is located in the northwestern portion of the San Joaquin Valley Groundwater Basin within the southern portion of the Central Valley. The Subbasin is bounded on the west by the Tertiary and older marine sediments of the Coast Range, on the north generally by the San Joaquin-Stanislaus County line, on the east generally by the San Joaquin River and Fresno Slough, and on the south by the Tranquillity Irrigation District boundary near the community of San Joaquin. Surface waters culminate from the Fresno, Merced, Tuolumne, and Stanislaus rivers into the San Joaquin River, which drains toward the Sacramento-San Joaquin Delta. The location of the Subbasin and Plan area are shown in Figure ES-4.

Figure ES-4. Basin Setting



A two-aquifer system is created by the Corcoran Clay layer and is generally pervasive throughout the Subbasin, creating a semi-confined aquifer above the Corcoran Clay layer (Upper Aquifer) and confined aquifer below the Corcoran Clay (Lower Aquifer). The Corcoran Clay layer largely inhibits vertical flow between aquifers, except in areas where the Corcoran Clay layer is thin or wells perforated in both principal aquifers provides a conduit for vertical flow.

Prevailing horizontal groundwater flow within the Upper Aquifer and Lower Aquifer systems is predominantly in the general northeasterly direction from the Coast Range towards and parallel to the San Joaquin River. While local pumping depressions are present, the prevailing northeasterly flow direction for groundwater in the Subbasin has remained.

Groundwater Conditions

Groundwater levels in some portions of the Northern and Central Delta-Mendota Regions have been declining for many years, while groundwater levels in other areas of the Subbasin have remained stable or increased in recent years. Groundwater levels have varied over time within the Delta-Mendota Subbasin where historically, groundwater levels decreased with increased groundwater pumping and the expansion of irrigated agriculture. As large-scale water projects, such as the Central Valley Project and State Water Project, began making imported surface water deliveries south of the Sacramento-San Joaquin Delta, groundwater levels increased as imported water was conjunctively used with groundwater and diverted San Joaquin River waters. During prolonged periods of drought, groundwater levels are observed to decline as groundwater extractions increase to offset loss of imported surface water, with groundwater levels rebounding following increased surface water deliveries during wet conditions.

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 Plan area, particularly in the Lower Aquifer (below the Corcoran Clay layer) as there are large volumes of fresh water in storage. Despite periods of wet conditions, with recharge outpacing extractions, an overall declining trend in groundwater storage can be observed in both the Upper Aquifer and Lower Aquifer, with storage typically declining more rapidly in the Upper Aquifer than the Lower Aquifer.

Groundwater quality in the Plan area varies by location. Concerns related to groundwater quality are largely related to non-point sources and/or naturally occurring constituents. Seawater intrusion is not applicable to the Delta-Mendota Subbasin as the Subbasin is located inland from the Pacific Ocean. Primary constituents of concern throughout the Plan area are total dissolved solids (TDS), nitrate as Nitrogen (nitrate as N), and boron, which all have anthropogenic as well as natural sources. In recent years, TDS concentrations in the Upper Aquifer are generally stable near or below the Secondary Maximum Contaminant Level (MCL) of 1,000 milligrams per liter (mg/L). In the Lower Aquifer, TDS concentrations are largely stable though have been found to exceed the Secondary MCL in some locations. Nitrate concentrations are largely below the Primary MCL of 10 mg/L, with elevated concentrations above the Primary MCL found south of Los Banos and northwest toward Patterson in the Upper Aquifer, and at elevated concentrations below the Primary MCL in the Lower Aquifer in locations where the Corcoran Clay is thin or non-existent. While boron does not have a drinking water standard, many crops are sensitive to high boron concentrations. Boron concentrations are greater than the agricultural goal within the Grassland Drainage Area (at about 2 mg/L), where near the City of Patterson, boron concentrations are generally stable and below agricultural objectives at 0.4 mg/L.

Inelastic land subsidence is a prevalent issue throughout the Delta-Mendota Subbasin as it has impacted prominent infrastructure of statewide importance as well as local canals, causing serious operational, maintenance, and construction design issues. Land subsidence monitoring in the Delta-Mendota Subbasin as a result of the most recent drought demonstrated significant inelastic land subsidence as a result of increased groundwater pumping, with effects continuing to the present time (as evidenced by recent surveys). While the impacts appear to have slowed, the temporal and spatial impacts of continued land subsidence have not yet been evaluated.

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 declines as a result of groundwater pumping, the river or stream may “lose” water to the underlying aquifer. Within the Northern & Central Delta-Mendota Region GSP Plan area, the portion of the San Joaquin River adjacent to the Northern Delta-Mendota Region is identified as a gaining stream and will be managed under the GSP to protect against significant and unreasonable stream depletion.

Water Budgets

Groundwater evaluations conducted as part of GSP development have provided estimates of historic, current, and future groundwater budget conditions. Based on these analyses, at projected groundwater pumping levels, overall change in groundwater storage within the Upper Aquifer and Lower Aquifer is estimated to decline at a rate of 43,000 acre-feet per year (AFY) and 7,000 AFY, respectively, indicating long-term decline in groundwater storage. As such, it is anticipated that future groundwater conditions in the Plan area will continue to show decreased groundwater levels and/or storage as projected pumping and land use continue. Projects and management actions that offset projected groundwater pumping and/or increase recharge will help the Plan area reach sustainability.

The projected water budget was evaluated under climate change conditions (e.g., climate change factors were applied), as well as climate change conditions with the addition of future projects and management actions. Under the immediate climate scenario prescribed by DWR, the estimated change in groundwater storage would continue to decline by 42,000 AFY in the Upper Aquifer and 6,000 AFY in the Lower Aquifer. With the addition of projects and management actions, the negative trend in change in groundwater storage is reversed where it is estimated to decline by 4,000 AFY in the Upper Aquifer and increase by 3,000 AFY in the Lower Aquifer. These values are considered to be within a reasonable level of error given the quality of data available for the analyses.

Water Budget Scenario	Upper Aquifer Average Annual Change in Storage (AFY)	Lower Aquifer Average Annual Change in Storage (AFY)
Historic (2003-2012)	-42,000	-8,000
Current (2013)	-73,000	-15,000
Baseline Projected (2014-2070)	-43,000	-7,000
Projected with Climate Change (2014-2070)	-42,000	-6,000
Projected with Climate Change and Projects & Management Actions (2014-2070)	-4,000	+3,000

The water budget analyses were prepared using the best available information in the development of the Northern & Central Delta-Mendota Region GSP spreadsheet model. It is anticipated that, as additional information becomes available, the model can be updated and more refined estimates of the Regions' water budgets can be developed.

Management Areas

Under SGMA, management areas (or MAs) can be identified within a basin or subbasin for which the GSP may identify different numeric sustainable management criteria, monitoring, or projects and management actions based on differences in water use sector, water source type, geology, aquifer characteristics, or other factors. MAs have been established in the Northern & Central Delta-Mendota Region GSP for the purposes of monitoring and managing for the land subsidence sustainability indicator.

Land subsidence within the Plan area has the potential to impact water conveyance infrastructure of state-wide and local importance, where such impacts have the potential to cause undesirable results within the Plan area, Subbasin, and outside the Subbasin. MAs have been delineated jointly for the West Stanislaus Irrigation District and Patterson Irrigation District (WSID-PID MA) and for the Tranquillity Irrigation District (TRID MA) service areas to account for their respective unique, localized circumstances and conditions and to help facilitate implementation of the GSP to aid in achieving the sustainability goal for the Subbasin by 2040.

ES-6. Sustainable Management Criteria

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 of groundwater storage
- Seawater intrusion
- Degraded water quality
- Land subsidence
- Depletions 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.

Minimum Thresholds – Minimum thresholds are a numeric value for each sustainability indicator and are used to define when undesirable results occur.

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 monitoring sites.

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 monitoring sites were identified throughout the Northern and Central Delta-Mendota Regions to provide a basis for measuring groundwater conditions throughout the Plan area. Representative monitoring sites were selected based on their potential to effectively represent the groundwater conditions using criteria specific to each sustainability indicator at each location.

A total of 35 representative wells (17 in the Upper Aquifer and 18 in the Lower Aquifer) have been identified for measurement of groundwater levels, change in groundwater storage, and groundwater quality, with two (2) representative wells selected for measurement of depletions of interconnected surface water. A total of 31 representative sites were selected for the measurement of land subsidence. This GSP uses groundwater levels as a basis for evaluating change in groundwater storage as well as depletions of interconnected surface water.

Minimum thresholds and measurable objectives were developed for each of the representative monitoring sites for each sustainability indicator. 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 the hydrologic low for the available hydrograph record, where a 95 percent of the hydrologic low was established for Lower Aquifer wells to avoid undesirable results related to the land subsidence sustainability indicator. Measurable objectives were established based on the historic seasonal high average over the available hydrograph, Spring 2012, or Spring 2017, whichever value is lowest.

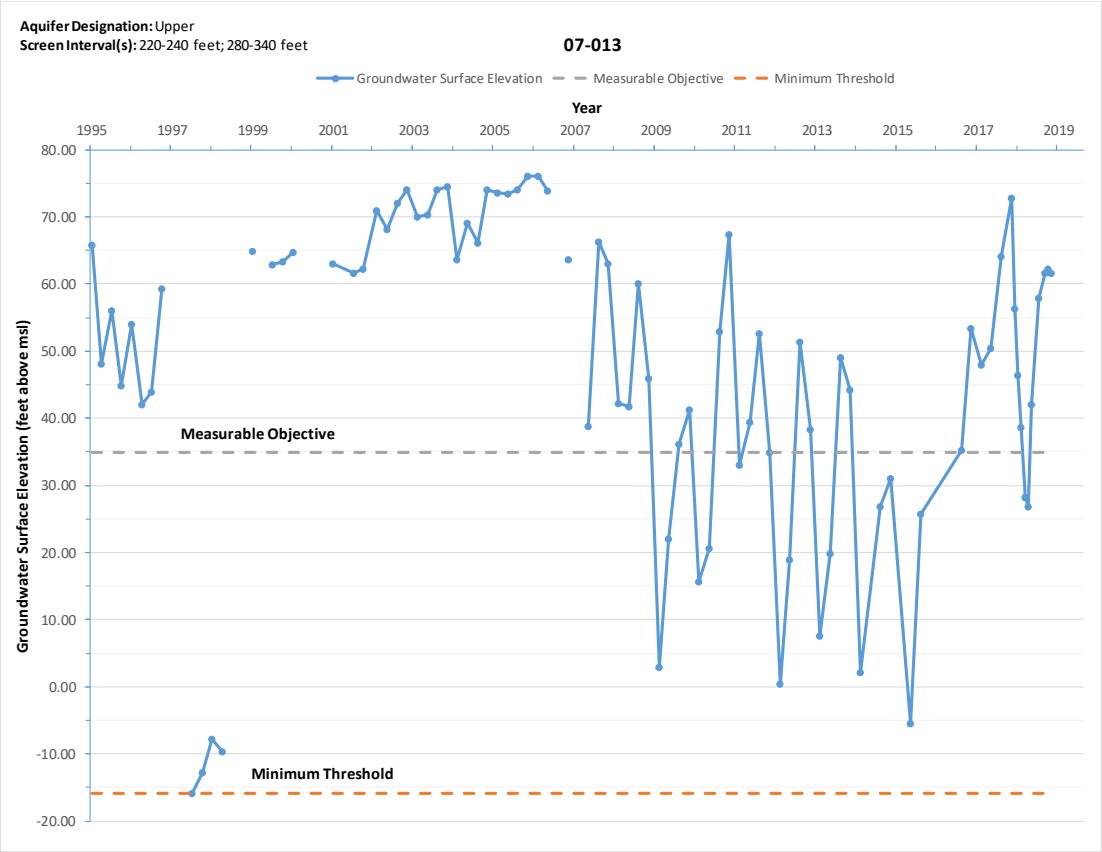
Tables summarizing minimum thresholds and measurable objectives are included in the GSP. Hydrographs showing the minimum threshold and measurable objective for each of the representative wells are contained in an appendix to the GSP (Appendix E).

Minimum thresholds for groundwater quality are defined by the Secondary MCL for TDS, Primary MCL for nitrate as N, and the water quality objective (WQO) for irrigation for boron, or the current groundwater quality where it exceeds the MCL or WQO as of December 2018. Measurable objectives for groundwater quality are to maintain current ambient groundwater quality conditions in each identified GSP subregion.

The minimum thresholds and measurable objectives for land subsidence vary by established MA and remaining Plan area. Within the WSID-PID MA, the minimum threshold is set as the acceptable loss of distribution capacity as a result of subsidence resulting from groundwater pumping as based on a future capacity study, where the measurable objective is no loss in distribution capacity as a result of subsidence related to groundwater pumping (numeric values to be established during the first GSP update). In the TRID MA, the minimum threshold is established as four (4) feet additional subsidence compared to 2019 benchmark elevation, where the measurable objective is set as two (2) feet additional subsidence compared to 2019 benchmark elevation. Within the remaining Plan area, the minimum threshold is set as the target rate/goal by monitoring subregion based on the average 2014-2016 elevation change from recent DMC surveys, where the measurable objective is the target rate/goal by monitoring subregion based on the average 2016-2018 elevation change from recent DMC surveys.

Minimum thresholds for depletion of interconnection of surface water systems has been set as an X percent increase in surface water depletions along interconnected stretches of surface water as a result of groundwater pumping, where 'X' is the percent increase in depletions to be determined by monitoring data collected prior to the first GSP update and associated analyses of these data. The measurable objective for depletions of interconnected surface water is set as no increased depletions of surface water as a result of groundwater pumping. Numeric values will be included in the first update to this GSP following data collection and associated analysis.

Figure ES-5. Sample Relationship Between Minimum Threshold and Measurable Objective



ES-7. Sustainability Implementation

The Northern & Central Delta-Mendota Region GSP contains the required sections for sustainability implementation, including Projects and Management Actions as well as Monitoring.

Projects and Management Actions

The six Delta-Mendota Subbasin GSP Groups will work together in a coordinated fashion to implement projects and management actions within their respective GSP Plan areas in order to achieve sustainability Subbasin-wide. The Northern & Central Delta-Mendota Region GSP has identified projects that can either replace (offset) or supplement (recharge) groundwater to aid in reaching sustainability by 2040. Currently, no pumping restrictions have been proposed for the Northern and Central Delta-Mendota Regions; however, GSAs maintain the flexibility to implement such demand-side management actions in the future if needed. Management activities identified in the Northern & Central Delta-Mendota Region GSP include a variety of strategies, from implementing rules to limit puming that may result in undesirable results to maximizing the use of other water supplies and incentivizing the use of those supplies over groundwater.

As previously noted, several projects to increase water supply availability in the Subbasin have been identified in the Northern & Central Delta-Mendota Region GSP. The initial set of projects was reviewed by the Northern and Central Delta-Mendota Technical Advisory Committee and recommended for approval by the Northern and Central Delta-Mendota Management Committees. A final list of 25 potential projects and management actions is included in this GSP, representing a variety of project types, including recharge and recovery, demand-side management, recycled water development and use, and reservoir expansion.

Projects and management actions are classified into three tiers, where Tier 1 indicates near-term projects and management actions to be completed and operational within the next five years; Tier 2 includes projects and management actions that currently require further development before implementation can occur and are anticipated to be developed over the next five years and implemented in 2026 or later; and Tier 3 includes long-term projects and management actions that may be implemented in the future as needed and/or are outside of the GSAs' control. The projects and management actions contained in this GSP, along with the projects and management actions implemented by the other five GSP Groups in the Subbasin, are anticipated to bring the Subbasin into sustainability by 2040. These projects and management actions require further analysis and permitting to determine feasibility and cost effectiveness and the project/management action list will be reviewed and revised, as appropriate, during GSP implementation. Projects and management actions are summarized in the table below.

Tier	Category	Project / Management Action	Project Type	Project Proponent
Tier 1	Projects	Los Banos Creek Recharge and Recovery Project	Recharge and Recovery	San Luis Water District
		Orestimba Creek Recharge and Recovery Project	Recharge and Recovery	Del Puerto Water District
		North Valley Regional Recycled Water Program (NVRRWP) – Modesto and Early Turlock Years	Recycled Water	Del Puerto Water District
		City of Patterson Percolation Ponds for Stormwater Capture and Recharge	Recharge and Recovery	City of Patterson
		Kaljian Drainwater Reuse Project	Recycled Water	San Luis Water District
		West Stanislaus Irrigation District Lateral 4-North Recapture and Recirculation Reservoir	Reservoir Creation/Expansion	West Stanislaus Irrigation District
		Revision to Tranquillity Irrigation District Lower Aquifer Pumping	Demand-side Management	Tranquillity Irrigation District
	Management Actions	Lower Aquifer Pumping Rules for Minimizing Subsidence	Demand-side Management	N/A
		Maximize Use of Other Water Supplies	Demand-side Management	N/A
		Increasing GSA Access to and Input on Well Permits	Demand-side Management	N/A
		Drought Contingency Planning in Urban Areas	Demand-side Management	N/A
		Fill Data Gaps	Various	N/A
Tier 2	Projects	Del Puerto Canyon Reservoir Project	Reservoir Creation/Expansion	Del Puerto Water District
		Little Salado Creek Groundwater Recharge and Flood Control Basin	Recharge and Recovery	Stanislaus County
		Patterson Irrigation District Groundwater Bank and/or Flood-Managed Aquifer Recharge (MAR)-type Project	Recharge and Recovery	Patterson Irrigation District
		West Stanislaus Irrigation District Lateral 4-South Recapture and Recirculation Reservoir	Reservoir Creation/Expansion	West Stanislaus Irrigation District
		Ortigalita Creek Groundwater Recharge and Recovery Project	Recharge and Recovery	San Luis Water District
	Management Action	Develop Program to Incentivize Use of Surface Water and Reduce Groundwater Demand	Demand-side Management	N/A
Tier 3	Projects	Pacheco Reservoir Expansion	Reservoir Creation/Expansion	Santa Clara Valley Water District
		Raising San Luis Reservoir	Reservoir Creation/Expansion	U.S. Bureau of Reclamation (Reclamation)
		Sites Reservoir	Reservoir Creation/Expansion	Sites Project Authority
		Los Vaqueros Expansion Phase 2	Reservoir Creation/Expansion	Contra Costa Water District
	Management Actions	Groundwater Extraction Fee with Land Use Modifications	Pumping Charges	N/A
		City of Patterson Reduced Groundwater Use Portfolio	Demand-side Management	City of Patterson
		Rotational Fallowing of Crop Lands	Demand-side Management	N/A

Monitoring

The Northern & Central Delta-Mendota Region GSP includes monitoring networks for the five sustainability indicators applicable to the Delta-Mendota Subbasin, where seawater intrusion is not applicable to the Delta-Mendota Subbasin. The objective of these monitoring networks is to monitor conditions across the Plan area and to detect trends toward undesirable results. Specifically, the monitoring networks were developed to:

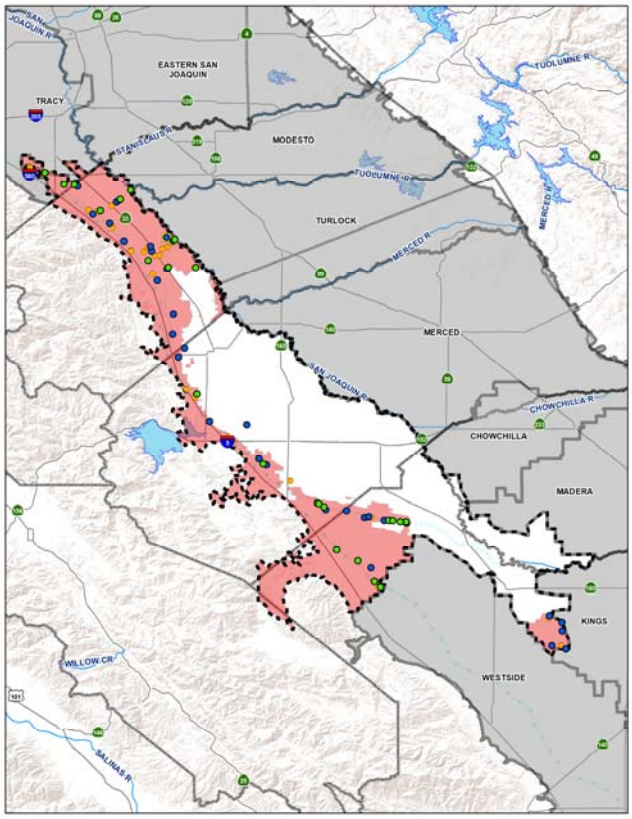
Five Sustainability Indicators Applicable to the Delta-Mendota Subbasin

- Chronic lowering of groundwater levels
- Reduction of groundwater storage
- Degraded water quality
- Land subsidence
- Depletions of interconnected surface water

- Monitor impacts to the beneficial uses or users of groundwater resulting from groundwater use
- Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds
- Demonstrate progress toward achieving measurable objectives described in the GSP

Five monitoring networks were developed for the Northern & Central Delta-Mendota Region GSP: groundwater levels (including both Upper Aquifer and Lower Aquifer wells), groundwater quality (including both Upper Aquifer and Lower Aquifer wells), land subsidence, and interconnected surface water. The same networks for the Upper and Lower Aquifers are used for assessing changes in groundwater elevations, groundwater storage, and groundwater quality. A subset of the montioring wells is used along with stream gauge data for assessing changes to inteconnected surface waters (using groundwater levels as a proxy for those changes). All monitoring networks described in this GSP are representative monitoring networks and are used to determine compliance with the measurable objectives and minimum thresholds established for the individual locations.

Figure ES-6. Representative Monitoring Sites
(including wells and survey benchmarks)



The monitoring networks were designed by evaluating existing monitoring programs within the Subbasin, such as CASGEM, the DMC Pump-in Program, ILRP Groundwater Quality Trend Monitoring Program, United States Bureau of Reclamation DMC subsidence monitoring program, and local agency monitoring programs, and supplementing those monitoring sites with other potential monitoring locations in the Plan area. The monitoring networks consist largely of monitoring sites that are already being used for monitoring in the Subbasin. Additional monitoring sites are being added as data gaps are filled through downhole video surveys to be conducted under DWR's Technical Support Services (TSS) program. The updated monitoring networks will be included in updates to this GSP. Figure ES-6 shows the location of existing and planned monitoring sites (wells and survey benchmarks) for all sustainability indicators.

Monitoring frequencies vary by sustainability indicator and management area. For groundwater levels, measurements will be taken during seasonal high (February through April) and seasonal low (September through October) conditions. Groundwater quality for the identified constituents of concern (TDS, nitrate as N, and boron) will be analyzed annually between May and August, where wells will be

tested for additional water quality constituents every five years. Measurements for interconnected surface waters will be collected concurrently with those for groundwater levels.

Land subsidence will be measured twice during the first five years of GSP implementation in the WSID-PID MA, following a baseline elevation survey to be conducted in 2019. Annual elevation surveys will take place in the TRID MA. Elevation surveys will take place every other year during even years in the remaining Plan area. Publicly-available land subsidence and stream gauge data will be downloaded periodicly for GSP monitoring efforts and combined with data collected via the monitoring networks. Historical measurements have been entered into the Subbasin Data Management System (DMS) and future data will be added to the DMS. A summary of the monitoring sites established for this GSP is shown in the table above.

Summary of GSP Monitoring Networks	
Representative Networks	
Groundwater Level Wells	
Upper Aquifer	17
Lower Aquifer	18
Groundwater Quality Wells	
Upper Aquifer	17
Lower Aquifer	18
Land Subsidence Benchmarks and Continuous GPS Sites	31
Interconnected Surface Water Wells	2

ES-8. Plan Implementation

Implementing the Northern & Central Delta-Mendota Region GSP will require numerous management activities that will be undertaken by the GSAs within the Region and throughout the Subbasin, including:

- Monitoring conditions relative to applicable sustainability indicators at specified frequency and timing
- Entering updated monitoring data into the Subbasin DMS
- Refining Subbasin model and water budget planning estimates
- Preparing annual reports summarizing the conditions of the Subbasin and progress towards sustainability and submitting them to DWR
- Updating the GSP once every five years

A preliminary schedule for GSP implementation and projects and management actions has been developed and agreed upon by the Northern and Central Delta-Mendota Management Committees for the first five years of GSP implementation (2020 through 2025). Implementation of projects and management actions is scheduled to begin in 2020, with full implementation achieved by 2040. The proposed schedule provides time to refine water budget estimates and re-evaluate projects and management actions in terms of benefits, technical feasibility, and cost effectiveness.

Implementation of the Northern & Central Delta-Mendota Region GSP will require both funding by GSAs and external sources. Outside grants will be sought to assist in reducing the cost of implementation to participating agencies, residents, and landowners of the Plan area. Ultimately, it is up to individual GSAs to determine the means by which they will achieve both the Delta-Mendota Subbasin sustainability goal and financial goals for GSP implementation. Costs associated with GSP implementation and Plan Administrator operations include the following:

- GSP-associated administration
- Stakeholder/Board engagement
- Project and management action implementation
- Monitoring
- Data management

GSAs will individually fund implementation of projects and management actions within their boundaries. GSAs will evaluate options for securing the needed funding on an individual basis.

For budgetary purposes, the estimated cost of implementing this GSP is on the order of $1.5 million to $2.5 million per year over the first five years of implementation (2020 to 2025), with an additional $6.6 million to $40 million per year over the 20-year planning horizon for the implementation of projects and management actions. Annual reports and five-year assessment reports (or periodic evaluation assessment reports) will be developed in a manner consistent with the GSP Emergency Regulations and using DWR-provided formats and supplemental resources. Annual reports will be a coordinated effort among the six Delta-Mendota Subbasin GSP Groups with five-year or periodic evaluation assessment reports developed by the Northern and Central Delta-Mendota Regions in coordination with updates to the coordinated Common Chapter by all GSP Groups.

The Delta-Mendota Subbasin DMS, a subbasin-wide coordinated DMS, is a secured web-based application that is designed to support data visualization and aggregation as well as annual report generation. The web application functionality includes an embedded GIS viewer, screens to view tables of time series data, and charting capabilities for hydrographs as well as map layers. The DMS has been developed as part of a coordinated effort among the six Delta-Mendota GSP Groups with each GSP Group and their respective GSA member agencies responsible for conducting their own monitoring programs and associated data collection efforts (including quality control and quality assurance) and ensuring that these data are available at the Subbasin-level for analysis and annual reports. The DMS will be maintained by SLDMWA, while acting as the Plan Manager, with a contract with the software vendor as needed.

ES-9. Technical Studies

Lists of references used to develop this GSP are included following each GSP chapter. Technical studies relied upon in developing the Northern & Central Delta-Mendota Region GSP are included as a chapter to this GSP.