

Executive Summary

Introduction

The Modesto Groundwater Subbasin lies between the Stanislaus River on the north and the Tuolumne River on the south and between the San Joaquin River on the west and crystalline basement rock of the Sierra Nevada foothills on the east. The surface area of the subbasin is 247,000 acres.

The northern, western, and southern boundaries are shared with the Eastern San Joaquin, Delta-Mendota, and Turlock Groundwater Subbasins, respectively. The major water purveyors in the planning area include the Modesto Irrigation District (MID), the Oakdale Irrigation District (OID), and the Cities of Modesto, Riverbank, and Oakdale.

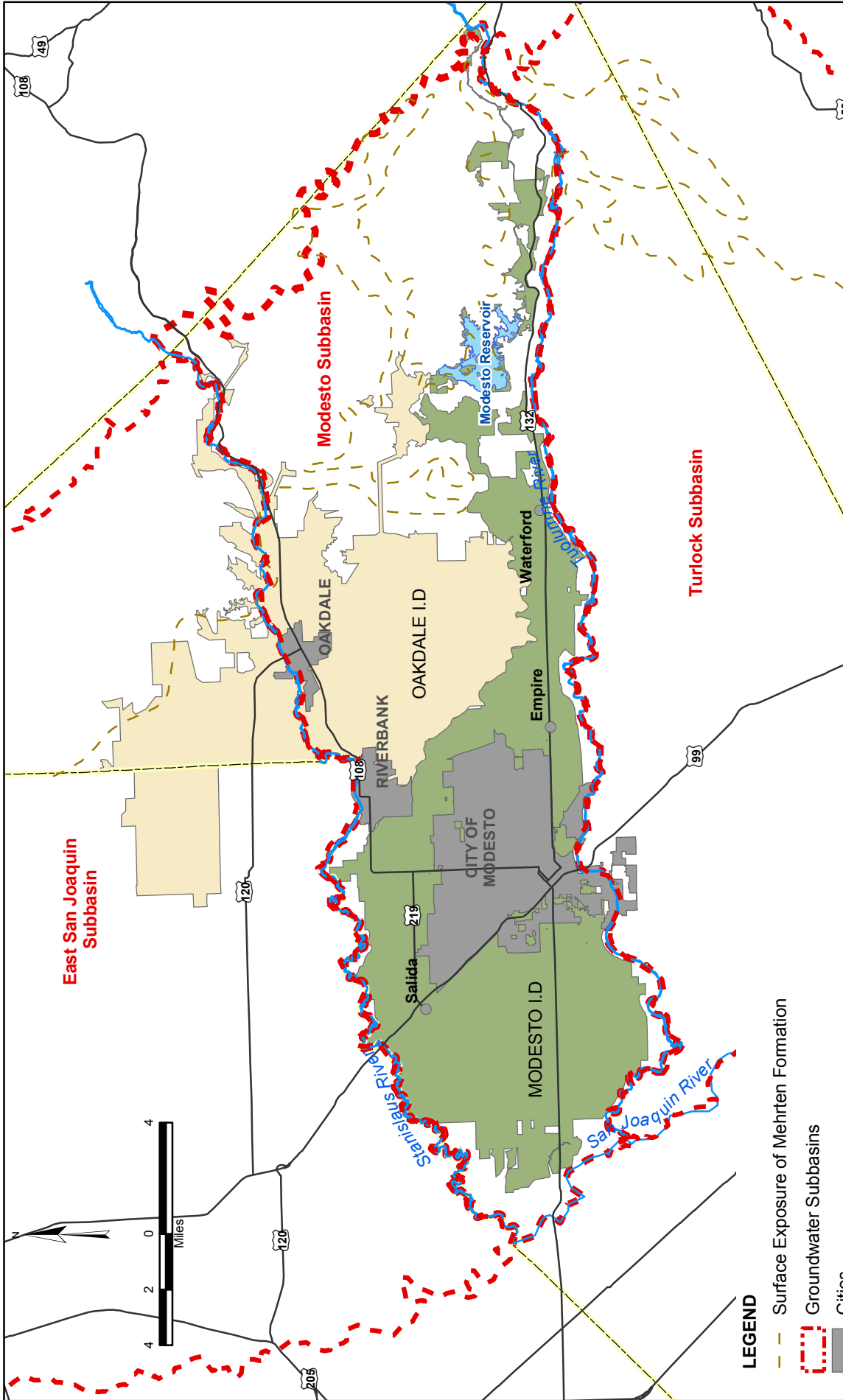
In April 1994, the five water purveyors were joined by a sixth agency, Stanislaus County, to form the Stanislaus and Tuolumne Rivers Groundwater Basin Association (Association). The Association provides a forum for the coordinated planning and management of the Modesto Groundwater Subbasin and encourages the development of projects and programs that will improve water supply reliability and water quality within the subbasin. Figure ES-1, a map of the subbasin, shows the boundaries of the six agencies.

Since its formation, the Association has been actively engaged in the management of the subbasin. The Association provides its members a vehicle for coordinated planning to make the best use of groundwater and to satisfy the mutual interests of the member agencies.






Specific purposes of the Association are to:

- Determine and evaluate the subbasin's groundwater supply
- Promote the coordination of groundwater management planning
- Develop a hydrologic groundwater model of the groundwater basin
- Determine the subbasin's need for additional or improved water extraction, storage, delivery, conservation, and recharge facilities
- Provide information and guidance for the management, preservation, protection, and enhancement of groundwater quality and quantity in the subbasin

In late 2003, the Association began developing an Integrated Regional Groundwater Management Plan (IRGMP) in compliance with the Groundwater Management Planning Act of 2002 (SB 1938) and the Integrated Regional Water Management Planning Act of 2002



LEGEND

-  Surface Exposure of Mehrten Formation
-  Groundwater Subbasins
-  Cities
-  Modesto I.D.
-  Oakdale I.D.

SOURCES: City of Modesto, Modesto Irrigation District, City of Oakdale, Oakdale Irrigation District, City of Riverbank, CA Dept of Water Resources Groundwater Basins, 2002, California Spatial Library.



**INTEGRATED REGIONAL GROUNDWATER
MANAGEMENT PLAN FOR THE MODESTO BASIN
Management Areas and Agencies**

JUNE 2005

FIGURE ES-1

(SB 1672). Throughout the planning process, other interested parties within the subbasin as well as state agencies have been encouraged to participate in the plan's development.

Planning Area

Developed land uses within the Modesto Groundwater Subbasin are concentrated in two major categories: irrigated agricultural and urban land uses. The largest jurisdiction within the subbasin is MID with a service area of 101,700 acres and an irrigated area of approximately 62,000 acres. Nested within MID are the communities of Waterford, Empire, and Salida and parts of Del Rio and Riverbank. Also lying largely within MID is the city of Modesto, which occupies approximately 40 square miles or 25,600 acres. Modesto is in the southwestern portion of the subbasin, and a portion of the city is located south of the Tuolumne River in the Turlock Groundwater Subbasin.

The cities of Oakdale and Riverbank lie in the north-central portion of the subbasin. The southern 60 percent of OID is in the Modesto Groundwater Subbasin and the remaining 40 percent is in the Eastern San Joaquin Groundwater Subbasin.

The Modesto Groundwater Subbasin underlies all of MID, the City of Oakdale, and the City of Riverbank. However, a portion of OID overlies the Eastern San Joaquin Groundwater Subbasin, and a portion of the City of Modesto service area overlies the Turlock Groundwater Subbasin.

Because OID's jurisdictional boundaries reach beyond the boundaries of the Modesto Groundwater Subbasin, the study area has been extended to include OID's complete jurisdiction. A similar water planning effort is under way in the Turlock Groundwater Subbasin, and the portion of the City of Modesto service area within the Turlock Subbasin is covered in the Turlock groundwater planning process.

The entire subbasin and planning area lies within Stanislaus County.

Description of the IRGMP

This IRGMP has been prepared in accordance with requirements of SB 1672 (California Water Code Section 10540 *et seq.*) and SB 1938 (California Water Code Section 10750 *et seq.*). As such, the plan includes components of AB 3030, SB 1938, and SB 1672.

The purpose of this IRGMP is to provide a framework for coordinating groundwater and surface water management activities into a cohesive set of management objectives and for implementing the actions necessary to meet those objectives.

The goal of the IRGMP is to integrate the use of groundwater and surface water within the Modesto subbasin to ensure the reliability of a long-term water supply that will meet current and future beneficial uses including agricultural, industrial, and municipal water

requirements while protecting the environment. Attaining this goal requires measures that enable the efficient use of groundwater and surface water and measures that protect water quality.

The overriding objective of the IRGMP is to improve the regional and local management of water resources through the formulation and implementation of Basin Management Objectives (BMOs).

Regional Priorities

The IRGMP recognizes that the most effective approach to managing a basin's water resources is enlisting the cooperation of the agencies whose political boundaries match the basin's physical boundaries. For this reason, the IRWMP frames specific water management projects in the context of an integrated regional strategy. Although the plan emphasizes groundwater management, elements of the plan address the use of surface water supplies, water conservation, and water recycling and blending to meet demands that have previously been met with groundwater. This integration of surface water and groundwater resources leads to a more comprehensive management of water supplies and provides a lucid framework for complying with state and federal water quality standards. The primary regional objective is the preservation and protection of the basin's water resources for the benefit of inhabitants of the region. Specific regional objectives include:

- Improve local water supply reliability
- Protect the groundwater resources of the region
- Improve water quality
- Foster prudent stewardship of water resources
- Facilitate compliance with local, state, and federal water quality and public health regulations.

Local Priorities

In addition to the statewide and regional priorities, the IRGMP addresses local issues by presenting BMOs that have been developed to meet the particular management needs of each of the participating agencies. Local BMOs are specific approaches to water management goals including groundwater supply, groundwater quality, and protection against inelastic land surface subsidence. Because they are presented within the context of a basin-wide plan, the local BMOs illustrate the degree to which many BMOs are common to more than one of the participating agencies. This suggests that in certain instances, implementation of local BMOs may best be achieved through cooperation among participating agencies. The most

prominent of the local priorities is protection of groundwater quality through monitoring and control of contaminant plumes.

Statewide Priorities

Implementing the IRGMP will enable the Association and its member agencies to respond to a range of statewide water management initiatives. Key among these is the increasing emphasis placed on developing integrated regional solutions to water management problems and coordinating the conjunctive management of surface water and groundwater to improve water supply reliability and water quality.

In particular, by promoting effective water use in the Modesto Groundwater Subbasin, the implementation of the IRGMP will:

- Increase California's water supply reliability
- Reduce conflicts among water users
- Contribute to meeting Delta water quality objectives
- Assist in the implementation of Regional Water Quality Control Board Watershed Management Initiatives chapters, plans, and policies

Regional BMOs

Specific water management strategies developed during the formulation of the IRGMP are expressed by the regional BMOs agreed upon by all of the participating agencies. The following specific regional BMOs are presented in the IRGMP:

- **Identification of Natural Recharge Areas:** Groundwater recharge has diminished because the expansion of urban areas and trends in agricultural irrigation practices have reduced the deep percolation of applied water. These trends underscore the need to identify and protect remaining natural recharge areas.
- **Development of a Basin-Wide Water Budget:** A basin-wide water budget will describe the pathways by which water enters and leaves the basin. This budget will offer a tool for comparing inflows, outflows, and changes in storage under historical and present conditions with flows and changes in storage that may exist after the implementation of specific BMOs.
- **Feasibility Evaluation of Artificial Recharge Projects:** The basin-wide water balance will reveal whether the basin is in overdraft and will illustrate trends in groundwater recharge and groundwater use. If the water balance demonstrates either that the basin is in overdraft or is likely to fall into overdraft in the near future, artificial recharge basins may be needed to supplement recharge from natural recharge areas.

- **Management and Optimization of Well Field Operation:** A component of improved groundwater management is the optimization of well operations to accomplish specified management objectives. For example, each well in a well field can be instrumented and controlled so that a group of wells can be operated to meet single- or multiple-objective functions.

In addition, well field optimization can support water quality objectives by reducing agricultural outflows to streams and by blending groundwater with surface deliveries. For example, agencies within the basin could evaluate an expansion of the blending program in order to control shallow groundwater and improve downstream water quality.

- **Identification and Feasibility Study of Conjunctive Use Projects:** Many of the management actions described above can be viewed as components of a broader conjunctive management program whose goal is an integrated approach that balances surface water and groundwater use. Implementation of a conjunctive management strategy may involve reduced groundwater pumping in some parts of the basin and broad controls on pumping to meet target groundwater levels. An important regional conjunctive use initiative is the Modesto Regional Water Treatment Plan, which has reduced demand for groundwater by storing and treating surface water. Because of its success, this project is being expanded.
- **Support of Public Health Programs:** Well construction and demolition standards are designed specifically to protect groundwater quality. Management actions to assist local agencies in complying with public health standards include the following components:
 - Installation of sanitary well seals on all new wells in accordance with the California Well Standards
 - Abandonment of wells in accordance with the California Well Standards

These actions will be particularly valuable in unincorporated areas not served by a water purveyor.

- **Water Quality Management:** The protection of groundwater quality is of increasing concern because the basin's population is growing. This management action would include a detailed geologic assessment of the basin that would focus on the areas with poor water quality and identify the sources of the contaminants. This assessment would result in coverage on a GIS system for mapping recharge areas and would be used to develop strategies to control the migration and movement of poor quality water into and throughout the basin.

- **Groundwater Monitoring and Subsidence Monitoring Program:** Groundwater monitoring and analysis and the archiving of collected data will be needed to implement several of the recommended management actions (e.g., conjunctive management and optimized operation of well fields) and to meet the reporting requirements of the plan. The Association is developing a database to facilitate the storage, retrieval, and archiving of groundwater data. Monitoring data will be important in the development and calibration of the basin-wide groundwater model that will be used to evaluate the effects of proposed projects and management actions.

The Association plans to monitor and measure the rate of inelastic land surface subsidence within the basin. Given the ongoing efforts by Association members to prevent groundwater overdraft and conditions that might lead to subsidence, it appears unlikely that the insignificant subsidence that has occurred historically within the basin will be accelerated. However, the Association plans to monitor and document any future changes in land surface elevations and, if inelastic subsidence is observed, may recommend necessary actions.

- **Policy Assessment:** Several of the technical management actions introduced above have clear policy requirements and implications. For example, effective protection of natural recharge areas will require coordination and communication with entities responsible for land use policies. Similarly, annexations to expand agencies' service areas as part of an in-lieu recharge program presume clear policies regarding annexation and a process to evaluate the impacts of annexation on groundwater levels and groundwater quality.

The development of consistent policies would be assisted by a regional groundwater forum such as the Association. The Association could promote interagency relationships that would foster coordination and cooperation among participating agencies to manage the Modesto Groundwater Subbasin and would provide a framework for the formulation of regional projects and programs for the protection and use of the subbasin's water resources.

For example, given the mutual concern of agencies within the basin regarding preserving natural recharge areas and protecting these areas from pollutants, local agencies could work together to inform one another about land use practices that may contribute to groundwater degradation and the importance of reducing the occurrence of these land use practices.

- **Promoting Cooperation and Coordination Between Water Entities:** The Association will continue to coordinate water management activities within the basin and to work cooperatively for the implementation of agreed-upon BMOs. It will also develop an outreach and educational program to engage other water interests in the

management of the basin. One example of such outreach will be working cooperatively with industrial water users to improve water levels and water quality in the basin and to reduce localized well interference.

Water Management Strategies

The regional BMOs described above have been developed to support a comprehensive approach to managing water resources in the Modesto Groundwater Basin. In particular, these BMOs provide a framework for developing projects that will advance the following water management strategies:

- **Increase Local and Regional Water Supply Reliability and Water Use Efficiency:** BMOs supporting conjunctive management, policy assessment, and development of a basin-wide water budget will be key to the implementation of this strategy.
- **Promote Groundwater Recharge and Management:** BMOs encouraging the identification of natural recharge areas and the evaluation of artificial recharge areas will be used to implement this strategy.
- **Support Water Conservation:** Development of a basin-wide water budget will be used to identify water conservation opportunities, and the management and optimization of well field operations will be used to reduce spillage from irrigation distribution systems.
- **Implement Watershed Management Programs:** This strategy will be implemented through policy assessment, identification of natural recharge areas and evaluation of artificial recharge projects.
- **Promote Water Recycling:** Management and optimization of well field operations, groundwater monitoring, and development of artificial recharge projects offer opportunities for the management and use of recycled water generated by municipalities and industries in the planning area.
- **Foster Conjunctive Use:** The BMO dedicated to the identification and study of conjunctive use projects focuses on developing conjunctive management in the Modesto Groundwater Subbasin. Other BMOs addressing natural and artificial recharge, groundwater monitoring, well field optimization, and policy assessment will also contribute to planning and implementation of conjunctive use.
- **Improve Water Quality:** The water quality management BMO, groundwater monitoring, and the management and optimization of well field operations will all be important BMOs for improving water quality.

- **Improve Storm Water Capture and Management:** BMOs that support public health programs and that call for capturing storm water in dry wells and in natural and artificial recharge facilities will reduce storm water discharges.

Other regional water management elements such as provisions for recreation and environmental and habitat protection are addressed in other planning documents prepared by the participating agencies.

Public Involvement

The six agencies forming the Association share groundwater and surface water resources and worked together to formulate this management plan. Throughout this planning process, other interested agencies and entities within the subbasin were encouraged to participate. The Association will work with its member agencies and other entities to implement the components of this plan. The County of Stanislaus, as a member of the Association, represented other self-supplied groundwater producers. An extensive public involvement process was also followed during the IRGMP's development to enable stakeholder participation in the planning process.

In addition to public stakeholders, key local, state, and federal government agencies have contributed to the IRGMP. In mid-2004, the Association engaged in discussions with the Department of Water Resources to initiate a cooperative relationship for the conjunctive management of the basin. As a result of these discussions, the Association and the Department of Water Resources signed a Memorandum of Understanding to work together to develop conjunctive use projects.

For the last several years, the Association has been working cooperatively with the U.S. Geological Survey to study the geology and aquifers of the Modesto Groundwater Subbasin. The Association and the U.S. Geological Survey have entered into an agreement, under the National Water-Quality Assessment Program, to map the subsurface geology of the basin and to develop a data network and three-dimensional model of the basin.

The Association's member cities are also working with the Department of Health Services on issues related to compliance with Title 22, Drinking Water Quality Standards.

Plan Implementation

A key feature of the IRGMP implementation is the establishment of linkages among program actions. These linkages transform individual implementation activities into a coherent program where the whole is greater than the sum of the parts with respect to achieving regional water management objectives.

Implementation of the actions recommended in the IRGMP is scheduled in three phases:

- **Phase I—Near Term Projects:** These projects are intended to be implemented within the next three years and include:
 - Management of the well fields: A decision support system to assist the districts to optimize groundwater production from their well fields, based on a set of established objectives
 - Additional water blending projects: To help agencies meet their water quality objectives while increasing the beneficial use of groundwater
 - Water conservation projects, including agricultural and urban water conservation projects
 - Identification of conjunctive use project concepts
 - Increase treatment capacity for the City of Modesto
 - Development of a three-dimensional groundwater model
- **Phase II—Mid-Term Projects:** These projects are planned for implementation in four to seven years:
 - Identification of groundwater recharge areas
 - Rock well monitoring
 - Development of conjunctive use projects
 - Development of the in-lieu recharge projects, including evaluation of annexation options to reduce groundwater pumping
 - Development of a basin-wide database
- **Phase III—Long-Term Projects:** These projects are scheduled for implementation beyond seven years in the future and include:
 - Installation of subsidence monitoring station if needed
 - Water exchange program
 - Update water budget
 - Feasibility evaluation of artificial recharge projects

Other water management actions may continue throughout the planning horizon, including:

- Monthly Association meetings
- Preparation of annual progress reports
- Groundwater monitoring and data sharing
- Coordination and cooperation with water entities, neighboring basins, and state and federal agencies
- Periodic review of groundwater monitoring and groundwater management

Progress toward the implementation of the IRGMP is contingent upon securing funding to complete the program. Two available avenues are grant funding and funds generated internally by the Association members.