THE BOARD OF SUPERVISORS OF THE COUNTY OF STANISLAUS
ACTION AGENDA SUMMARY

DEPT: Environmental Resources **BOARD AGENDA #** *B-7

Urgent ☐ **Routine** ☑ **AGENDA DATE** December 18, 2007

CEO Concurs with Recommendation YES ☑ **NO** ☐ **4/5 Vote Required YES** ☐ **NO** ☒
(Information Attached)

SUBJECT:

Acceptance of the Triennial Update on the Status of Groundwater Conditions, Management, and Protection in Stanislaus County

STAFF RECOMMENDATIONS:

1. Accept the triennial update on the status of groundwater conditions, management, and protection in Stanislaus County.

FISCAL IMPACT:

There is no fiscal impact associated with this item.

BOARD ACTION AS FOLLOWS:

No. 2007-999

On motion of Supervisor Mayfield , **Seconded by Supervisor** Grover
and approved by the following vote,
Ayes: Supervisors: Mayfield, Grover, Monteith, DeMartini, and Chairman O'Brien
Noes: Supervisors: None
Excused or Absent: Supervisors: None
Abstaining: Supervisor: None

1) X **Approved as recommended**
2) _____ **Denied**
3) _____ **Approved as amended**
4) _____ **Other:**
MOTION:

Christine Ferraro

ATTEST: **CHRISTINE FERRARO TALLMAN, Clerk** **File No.**

DISCUSSION:

On August 24, 1999, the Board of Supervisors (Board) created the Stanislaus County Groundwater Coordination Advisory Committee (Advisory Committee). The Advisory Committee was tasked with evaluating the level to which current groundwater management practices in Stanislaus County protect groundwater. A report was prepared detailing the results of the evaluation titled, "*Recommendations for Improving Groundwater Management and Protection in Stanislaus County*" (Report). The Board accepted the Report in November 2001.

In the Report it was noted that groundwater conditions are dynamic and subject to change. Due to the dynamic conditions, it was recommended that County staff conduct a review of groundwater activities and conditions and prepare a report for review by the Board on the status of groundwater conditions, management, and protection within Stanislaus County every three years. The first triennial update was presented to the Board on November 30, 2004; this report serves as the second update.

Department of Environmental Resources (DER) staff represent the County at regular groundwater basin association meetings in order to evaluate the current status of groundwater conditions and management practices. For purposes of the triennial update, DER staff contacted the agencies associated with the four groundwater basins within Stanislaus County and requested written updates on the status of groundwater conditions and basin activities over the past three years. Elements included within the written updates are: 1) activities of the groundwater basin association over the past three years; 2) areas of concern within the basin and recommendations for improving groundwater conditions; and 3) future activities planned within each basin. The updates from each of these four basins are attached for your reference (Attachment A).

California's groundwater largely resides in alluvial groundwater basins within hydrologic regions. Stanislaus County is within the San Joaquin River Hydrologic Region and the San Joaquin Valley Groundwater basin, which is divided into 15 sub-basins (Attachment B). There are four sub-basins within the boundaries of Stanislaus County as follows: the Modesto, the Turlock, the Delta – Mendota, and the Eastern San Joaquin.

Agencies involved in the management and use of groundwater within each of the four sub-basins have formed associations or authorities (associations). These associations promote the collection, organization, and sharing of information related to groundwater quality, quantity, and management. Each of the associations representing the four sub-basins have formed regional management groups and have adopted regional plans for groundwater management known as Integrated Groundwater Management Plans. These associations meet regularly to determine courses of action related to pertinent groundwater issues such as grant application for funds related to groundwater projects, groundwater model development, and groundwater management.

Stanislaus County currently has memoranda of understanding with the Stanislaus and Tuolumne Rivers Groundwater Basin Association (Modesto Sub-Basin) and the Turlock Groundwater Basin Association (Turlock Sub-basin) for membership with each of those

associations. Additionally, funding is contributed for the development of several groundwater models in the Modesto Sub-basin and a study to determine impacts of water-use changes within the Turlock Sub-basin.

Passed by the California voters in November 2006 was Proposition 84 which earmarked approximately $1 billion for projects that assist local public agencies in meeting the long term water needs of the State, including the delivery of safe drinking water and the protection of water quality. Funding under Proposition 84 was allocated to each hydrologic region as identified in the California Water Plan. Stanislaus County is part of the San Joaquin River region, which has been allocated $57 million dollars.

Part of the criteria for funding under Proposition 84 would be the development of an Integrated Regional Water Management Plan (IRWMP), which would tie in groundwater, surface water, and storm water management on a regional basis. Funding under Proposition 84 has been delayed due to the Governor's veto of SB 1002, which contained the appropriations for the IRWMP program the current fiscal year.

At this time in Stanislaus County, only the Eastern San Joaquin Sub-basin association has completed an IRWMP. Agencies within the Eastern San Joaquin and Delta Mendota sub-basins have expressed intent to apply for funds under Proposition 84, although neither have specific projects to date. The Turlock Groundwater Basin Association may consider exploring potential funding sources in the future, although no specific projects or potential funding sources have been identified. The association for the Modesto Sub-basin does not intend to pursue funding under Proposition 84 at this time. A complete report of activities within each sub-basin is included in Attachments 2 through 5.

The Board of Supervisors has historically recognized the important role that groundwater serves in sustaining economic viability in Stanislaus County. As part of the Board Priority to strive for a well planned infrastructure system, Goal 1 states the importance of implementing strategies to ensure reliable water sources in both quality and quantity. Outcomes of this goal such as the identification of urban sources of pollution and the closing of 2% of existing identified contaminated sites have a positive effect on the quality of groundwater in Stanislaus County.

As part of its commitment to the Board Priority to ensure effective partnerships, the County hosts a Water Summit quarterly to discuss pertinent issues related to water. The Summit provides a forum for discussion between local and regional purveyors and public agencies related to groundwater and surface water.

Currently, documentation and data related to groundwater within the County is divided according to the agencies or districts that provide water, gathers groundwater data, and by what type of water application is being permitted. The Stanislaus County Public Works Department is developing a "Water Atlas" (Atlas) that will compile pertinent documents related to groundwater within the County and provide consumers with a directory that details which agency or district would be appropriate to contact depending on the information desired. The Atlas is still in the early stages of development, but

long-range goals include compiling data from various sources and producing maps to illustrate groundwater depths and quality across Stanislaus County.

Groundwater resources are essential to the economic viability and prosperity of the County. These resources play a vital role in the economy by meeting the needs of agriculture, industrial, environmental, municipal, domestic and recreational users. The Department of Environmental Resources will continue to represent the County at groundwater basin association meetings and will bring future requests for County participation in agency programs to the Board for consideration.

POLICY ISSUE:

The Board of Supervisors should determine if accepting the report is consistent with the Board's priorities of a strong local economy, well-planned infrastructure system, and effective partnerships.

STAFFING IMPACT:

There is no staffing impact associated with this item.

Groundwater Basin Update to the Stanislaus County Board of Supervisors
Modesto Groundwater Basin
Fall 2007

1. Overview of Basin

The Modesto Groundwater Sub-Basin, as defined by the California Department of Water Resources (DWR), extends from the Stanislaus River on the north, the Sierra Nevada foothills on the east, the Tuolumne River on the south and the San Joaquin River on the west.

Groundwater Recharge occurs in the basin primarily as deep percolation of surface water applied for flood irrigation purposes and, to a lesser extent, from the retention and detention of storm water in wet years on the surrounding lands within the basin. The basin is not in over-draft.

The six member agencies of the Stanislaus & Tuolumne Rivers Groundwater Basin Association (Association) are made up of the cities of Modesto, Oakdale and Riverbank, the Oakdale Irrigation District, the Modesto Irrigation District and Stanislaus County. These agencies represent the entire geographic governmental jurisdiction of the basin.

2. Basin Management Objectives (BMO's)

Two sets of BMO's have been developed for the Modesto Subbasin reflecting the integrated and regional nature of the groundwater management plan: (1) the broad BMO's are designed to have basin-wide and regional perspectives, and (2) more specific BMO's have been developed for each management area.

Maintain Groundwater Levels

Except for some localized areas, groundwater levels in the basin are generally stable. However, an increase in urban development and reliance of urban areas on groundwater may cause the groundwater table to lower. The Association's objective is to ensure that the overall groundwater levels in the basin are maintained over time to provide long-term reliable sources of water for the economic well-being of the area. Specific actions to achieve this objective include:

- Identification and mapping of the basin's natural recharge areas.
- Protection of groundwater recharge areas. This may include communication, coordination, and cooperation with land use planning agencies to encourage them to take actions that would limit incompatible land use development practices in the recharge area.
- Development of a water budget to determine if the basin is in overdraft and, if so, to determine the amount of overdraft.
- Feasibility evaluation of artificial recharge projects.
- Identification and feasibility evaluation of conjunctive use projects.

- Support and encourage water conservation programs.

- In-lieu recharge through the importation of a surface water supply to areas currently relying on groundwater.

Control Degradation of Groundwater Quality

Water quality in the basin is adequate for agricultural use. North of the basin, the Cities of Oakdale and Riverbank enjoy excellent water quality. However, the City of Modesto has lost some of its production wells because of the migration of pollutants into its management area. Specific water quality actions for the basin include:

- Maintaining groundwater levels to control the movement of poor quality water into and within the basin. Groundwater pumping that results in the lowering of groundwater levels in part of the basin could alter the natural groundwater flow direction in the basin. In the area with groundwater contamination, this change could result in the movement of poor quality water in the basin. The City of Modesto has reduced groundwater pumping in some parts of the basin, augmenting its groundwater with surface water deliveries to its customers. Other actions may include implementing the actions summarized for the groundwater level BMO's listed above.

- Conducting a detailed geologic assessment of the basin, focusing on the areas with poor water quality, to identify the sources of contaminants and poor quality water. Developing actions and projects to mitigate the migration of poor quality water into the basin where practical. Continuing to support the development of in-lieu recharge projects in urban areas with poor quality water (i.e., continuing the delivery of additional surface water to the City of Modesto to reduce its reliance on groundwater).

- The Association will coordinate and communicate with land use planning. The agencies will work together to discourage land use practices within the recharge areas that may contribute to groundwater degradation. Agencies within the basin, particularly urban water agencies, are concerned about protecting natural recharge areas from pollutants and about the quality of water used for potential future groundwater recharge projects. Such projects within the basin will be developed in a coordinated fashion and through the Association to ensure that the groundwater quality concerns of all management areas are considered.

- Evaluating the impact of annexation practices on groundwater levels and groundwater quality.

- The Association will coordinate and facilitate implementation of groundwater protection measures. '

Protect Against Potential Inelastic Land Surface Subsidence

Historically land surface subsidence within the basin has not been significant. Given the balanced nature of groundwater storage in the basin, potential future land subsidence is remote. However, the agencies will document and investigate any changes in land surface elevations and take appropriate actions if inelastic subsidence is observed.

Groundwater Monitoring and Assessment

The agencies in the Modesto Groundwater Subbasin understand the value of groundwater monitoring and assessment in the management of the basin. Groundwater monitoring is needed to track and assess the potential effects from the water-related activities and the implementation of management objectives in order to protect the quality and quantity of the basin's groundwater. The Association, therefore, is evaluating its groundwater monitoring needs and has developed (and periodically updated) its groundwater monitoring plan. A database is being developed to facilitate the storage, retrieval, and archiving of the basin groundwater data. The Association will also develop a groundwater model for the basin that can be used to evaluate the effects of the various proposed projects and management actions on groundwater levels and quality in the basin.

Evaluate Feasible Water Conservation Measures

Certain water conservation practices may be evaluated to determine their ability to improve water levels and water quality in the basin. Typical water conservation practices may include:

- Blending: Currently, MID pumps water from the shallow aquifer and blends it with surface water before delivering it to its agricultural water users. The agencies within the basin could evaluate an expansion of the blending program in order to lower the high groundwater table and improve water quality.

- Reuse of poor quality water: Groundwater in areas with a high level of nitrates can be pumped for agricultural uses in order to improve water supply availability and groundwater quality.

- Water conservation: Water conservation in the form of incentive programs, water audits, water metering, sewage fees, and other measures can be a tool to reduce demand on the basin.

Coordination and Cooperation

- Provide and expand existing forum for coordination and cooperation between all water entities to manage the Modesto Subbasin. Assist in formulating regional projects and programs for protection and use of subbasin water resources.

- Provide a framework for coordination and cooperation with the state and federal agencies and neighboring water entities such as TID, Stockton East Water District, and SSJID.

- A number of industrial plants in the Modesto Subbasin use groundwater. Production wells in these plants frequently affect groundwater levels in neighboring municipal and industrial wells during peak demands in summers. The Association will provide for an education and outreach program to bring industrial water users to the table and to work with them to develop conjunctive use projects to reduce well interference.

Groundwater Management Areas Objectives

This section addresses the specific objectives for each management area. Although specific to each management area, these objectives may limit or constrain activities within other management areas. Therefore, the participation and cooperation of agencies within the basin will be needed for the successful implementation of these objectives.

City of Modesto Management Area

Until 1995, the City of Modesto relied solely on groundwater for its service area. Groundwater degradation and more stringent drinking water quality standards resulted in the abandonment of a number of wells within the City's service area. Currently, the City is augmenting its groundwater supplies in its contingency service area with surface water received from MID. Groundwater quality issues, including elevated levels of uranium and arsenic, are threatening the City's groundwater supply. To protect its groundwater and maintain groundwater as a viable drinking water source, the City of Modesto has formulated the following BMOs for its management area:

Groundwater Quality Protection:
The City proposes to protect groundwater quality by developing and implementing specific actions to identify potential sources of contamination and to develop a management plan to control and curtail movement of contaminants into and within the basin. The specific actions may include the following:

- Develop a database and populate it with water quality data. Using the database information, develop tools to map contaminated areas as well as historic movement of the contaminants.

- Formulate and implement a geologic assessment to better understand the basin's aquifer characteristics and water movement and to evaluate and understand the sources of contaminants. Detect potential changes in water quality that could affect the long-term quality and quantity of the drinking water supply.

- Develop a well field management plan that will manage groundwater pumping to reduce or eliminate contaminant movement into and within the basin.

Develop well design criteria, including proper spacing and screening of wells to manage groundwater pumping and the movement of contaminants.

Groundwater Levels:
Groundwater levels, historically, were declining in this management area. Since 1995 and with the importation of surface water to augment the groundwater supply, groundwater levels have recovered. However, future population growth in and around the management area will increase groundwater use. To maintain groundwater levels in the management area, the City of Modesto formulated the following management objectives:

- Work with other entities in the subbasin to identify and protect the groundwater recharge area.

- Evaluate feasibility of groundwater recharge and conjunctive use projects including the development of artificial recharge areas, conjunctive use projects, and storage tanks with transmission mains for added reliability to the system.

- Work with MID to evaluate the feasibility of developing a cooperative in-lieu recharge and/or water exchange programs including the following:

    - Increase water treatment capacity and use of surface water to augment the groundwater supply.

    - Develop an exchange program to mix the groundwater of marginal quality (for drinking water) with surface water and deliver it for agricultural use, golf courses, parks, and other open space areas in exchange for a surface water supply for the City of Modesto.

Water Conservation and System Improvement:
The City of Modesto, under its Urban Water Management Planning function, will continue to evaluate water conservation and metering opportunities to reduce water demands in the service area. The City also plans to undertake a conveyance system interconnection improvement project to connect isolated delivery systems to its water delivery network. These actions will add flexibility to the system and enable the City to reduce pumping from the areas of poor water quality and reduce movement of contaminants in the basin.

Modesto Irrigation District Management Area

MID plays a major role in the groundwater management of the Modesto Groundwater Subbasin. MID and TID operate Don Pedro Reservoir and divert surface water for agricultural and urban uses to the basin. To manage groundwater levels and protect the basin groundwater quality, MID plans to implement the following BMO's:

- Develop a systemwide wellfield optimization program to actively manage MID's groundwater production and to manage its surface and groundwater resources

conjunctively, in real time, to meet its water supply and energy management objectives.

- Manage MID's surface water and groundwater conjunctively in an integrated fashion. This would include importation and treatment of additional surface water supplies from MID to the City of Modesto to reduce pumping groundwater.

- Continue working with the City of Modesto to protect the management area from potential overdraft and movement of contaminants to the basin. In cooperation with the City of Modesto, develop a water exchange program to mix the groundwater of marginal quality (as potable water) pumped by the City with surface water and deliver it for agricultural use, golf courses, parks, cemeteries, and other open space areas in exchange for surface water delivery to the City of Modesto.

- Evaluate the feasibility of an expanded blending program and the use of shallow water acquired for delivery to agricultural water users.

City of Oakdale Management Area

The City of Oakdale relies solely on groundwater for its water supply. The City's goal is to protect its groundwater levels and quality for a sustainable water supply for its citizens.

Groundwater Levels:
The City operates nine wells, two of which were recently constructed. Water levels in some wells are impacted by operations of production wells at the Hunts and Hershey industrial plants. To protect its groundwater levels, the City can:

- Conduct a system-wide optimization study to determine how its wells can be operated to maximize production while minimizing the impact from the other wells.

- Work with plant managers to minimize operation impacts during the City's peak water demand. Promote and encourage an industrial water conservation program.

- Work cooperatively with other water entities in the basin to promote and implement conjunctive management programs. Specifically, investigate the potential of treatment facilities for surface water that could be supplied by OID.

- Work cooperatively with other agencies to identify and develop groundwater recharge projects when possible.

Groundwater Quality Protection:

- Construct a sanitary seal on all new wells and work with other groundwater users within the management area to ensure proper well construction methods are used for all new wells.

- Abandon wells within the management area in accordance with the Stanislaus County well abandonment ordinance.

- Regularly monitor wells adjacent to industrial areas to detect any potential water quality degradation. If degradation is detected, consult with the Regional Water Quality Control Board to encourage the implementation of necessary steps to control the migration of poor quality water.

City of Riverbank Management Area

Groundwater is the only source of water for the City of Riverbank. Currently, groundwater levels and water quality are stable within this management area. Groundwater quality protection is the only BMO designated for this management area. To protect the groundwater quality of the management area, the City can take the following actions:

- Monitor groundwater quality to ensure that it is not compromised by the operation of industrial facilities such as the wood treatment plant. If water quality degradation is detected, consult with the Regional Water Quality Control Board to encourage the implementation of actions to control the migration of poor quality water in the basin.

- The City is concerned about the operation of a future recharge project and the quality of water used for recharge. The City will work with other water agencies within the basin to ensure that the future recharge project operation will not compromise groundwater quality in the Riverbank management area.

Oakdale Irrigation District Management Area

The OID management area is divided between the Modesto Groundwater Subbasin and the East San Joaquin Groundwater Subbasin. About 60 percent of the OID management area is within the Modesto Subbasin. However, the issues of the management area north and south of the Stanislaus River are similar and the BMOs listed below will be applicable for the entire management area. Urbanization within and around the management area has increased groundwater production and the potential for future overdraft. OID plans to implement the following BMOs:

- Develop a systemwide well field optimization program to actively manage groundwater production and to manage surface and groundwater resources conjunctively, in real time, to meet OID's water supply and energy management objectives.

- Manage OID's surface water and groundwater resources conjunctively. This would include:

    - Investigating the feasibility of developing conjunctive use and groundwater recharge projects. Determine if groundwater recharge is a viable option to reduce the falling water table within the management area.

    - Promoting programs and actions that protect recharge areas within the management area.

    - Investigating the feasibility of annexing areas currently on groundwater in order to bring surface water to the area for in-lieu recharge programs. Evaluating the potential benefits of the annexation of adjacent farmland on falling groundwater table within the management area, which is reliant on groundwater, and converting it to surface water.

    - Investigate impacts of upstream development (urban or agriculture) on the water quality and groundwater level within the OID service area.

Stanislaus County Management Area

The County of Stanislaus is represented by the DER at Association meetings. Partnering with the Association in basin-wide groundwater management is consistent with the Board of Supervisors' priority of ensuring a safe and healthy community, facilitating economic development, and achieving multijurisdictional cooperation. To meet these priorities, the County promotes and participates in Association programs that:

- Preserve and protect the groundwater resource

- Enhance the understanding of groundwater resources through the gathering and sharing of information

- Provides factual information that may serve as a basis for land use decisions in the groundwater basin

3. Activities of the Basin Within the Last Three Years

The Association has prepared a single, integrated, basin-wide groundwater management plan in 2005. The update incorporated two legislative mandates. SB 1672 (Costa) and SB 1938 (Machado). The Association conducted this work as a Regional Planning Group consistent with the legal requirements of the legislation. Another legislative change requires that groundwater management plans be updated prior to any local agency qualifying for state financial support in the area of groundwater management. The integrated, basin-wide water management plan was prepared to meet all conditions of both SB 1672 and SB 1938. The updated basin-wide plan will be adopted by each of the member agencies.

The Association continues to fund the research activity of the USGS, which continues to develop the MODFLOW Groundwater Model of the Modesto Subbasin. In addition, the Association executed an MOU with the DWR agreeing to work cooperatively to improve surface and groundwater management and to promote conjunctive use projects and programs in the basin. The outcome of this cooperation was the completion of the recharge mapping of the Modesto Subbasin by WRIME, Inc., under contract with the DWR. The association also applied for grant funds pertaining to the wellfield optimization project. The outcome of this effort was the issuance of a $250,000 state grant under AB 303 and the successful completion of the project.

- USGS Reports:
    - Scientific Investigations Report 2004-5232 entitled "Hydrogeologic Characterization of the Modesto Area, San Joaquin Valley, California."
    - Scientific Investigations Report 2007-5009 entitled "Simulation of Multiscale Ground-Water Flow in Part of the Northeastern San Joaquin Valley, California."
- Integrated Regional Groundwater Management Plan for the Modesto Subbasin (GEI Consultants, April 2005)
- Recharge Characterization for Stanislaus and Tuolumne Rivers Groundwater Basin (WRIME, May 2007)
- Well Field Optimization Project Final Report (GEI Consultants, May 2007) [Prepared for the Stanislaus and Tuolumne Rivers Groundwater Basin Assocation.]
- Three-Dimensional, Calibrated Flow Model Development (ongoing work with the USGS)

4. Areas of Concern and Recommendations for Improvement

Urbanization and loss of primary recharge areas.

5. Future Projects for the Basin

The implementation plan is included in the integrated, basin-wide groundwater management plan completed by the Association in 2005. The implementation plan identifies near-term, mid-term and long-term activities, many of which have already been completed or are in preparation.

Groundwater Protection Measures

The specific groundwater protection measures are explained in more detail in Chapter 6 of the integrated, basin-wide groundwater management plan update previously described. These measures include, but are not limited to, programs and projects related to the:

1. Control of saline water movement
2. Identification and management of wellhead protection areas for public supply wells
3. Regulation of the migration of contaminated groundwater
4. Administration of a well abandonment and well destruction program
5. Construction and operation of recharge, storage, conservation, water recycling and water extraction projects.

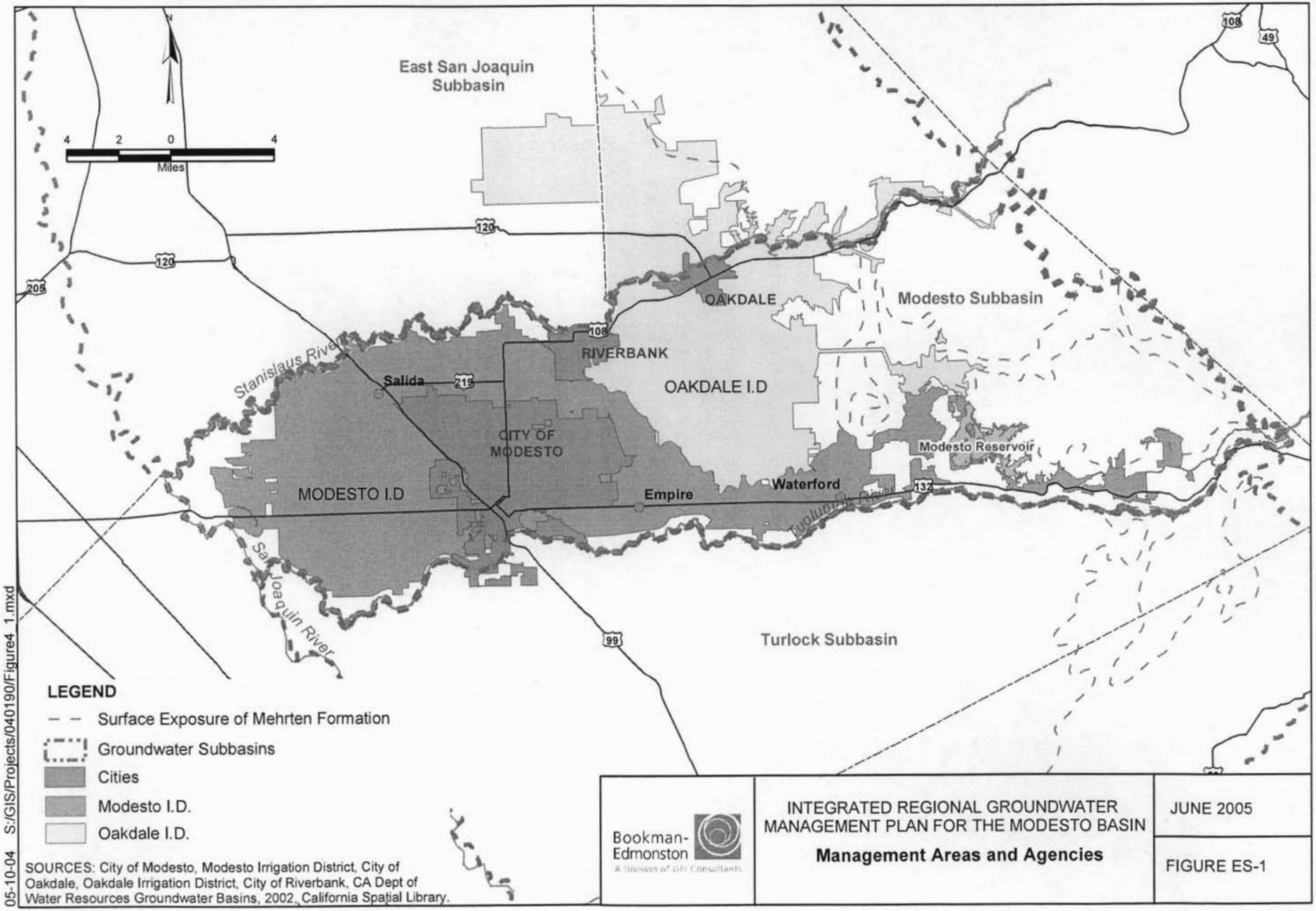
Other water management actions may continue throughout the planning horizon including:

- Association monthly meetings.
- Preparation of annual progress reports.
- Groundwater monitoring and data sharing.
- Coordination with neighboring basins and state and federal agencies.
- Periodic review of groundwater monitoring and groundwater management

There are no plans at this time for the Association to pursue any funding under Proposition 84.

MAP

See attached map of the Modesto Subbasin.


East San Joaquin Subbasin
Modesto Subbasin
Turlock Subbasin
OAKDALE
RIVERBANK
OAKDALE I.D
CITY OF MODESTO
MODESTO I.D
Salida
Empire
Waterford
Modesto Reservoir
Stanislaus River
San Joaquin River
Tuolumne River
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Miles
120
205
108
49
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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.
Bookman-Edmonston
A Division of GEI Consultants
INTEGRATED REGIONAL GROUNDWATER MANAGEMENT PLAN FOR THE MODESTO BASIN
Management Areas and Agencies
JUNE 2005
FIGURE ES-1
05-10-04 S:/GIS/Projects/040190/Figure4 1.mxd

Groundwater Basin Update to the Stanislaus County Board of Supervisors
Turlock Groundwater Basin
Fall 2007

1. Overview of Basin

A. Description of Basin/Service Area

The Turlock Groundwater Basin ("Basin" or "Subbasin") lies on the eastern side of California's San Joaquin Valley, and encompasses portions of both Stanislaus and Merced counties. The groundwater system is bounded by the Tuolumne River on the north, the Merced River on the south, and the San Joaquin River on the west. The eastern boundary of the system is the western extent of the outcrop of crystalline basement rock in the foothills of the Sierra Nevada. The Subbasin is a subunit of the larger San Joaquin Valley Groundwater Basin. Overlying the Subbasin is a variety of local public agencies including municipalities, unincorporated communities, and water districts that utilize surface water and/or groundwater for supply.

B. Agencies within the Groundwater Basin

The Turlock Groundwater Basin Association was established to coordinate the common interests of local public agencies in the utilization and protection of groundwater within the Turlock Basin. The members include:

- City of Ceres
- City of Hughson
- City of Modesto
- City of Turlock
- Denair Community Services District
- Hilmar County Water District
- Ballico-Cortez Water District
- Eastside Water District
- Merced Irrigation District
- Turlock Irrigation District
- Stanislaus County
- Merced County

Other agencies in the Basin include:

- Delhi County Water District
- Keyes Community Services District
- Ballico Community Services District

These agencies participate in some Association activities, but are not members of the Association.

The Association meets regularly to cooperatively manage the groundwater resources of the Basin. The Association operates under the Brown Act. Members of the public are afforded the opportunity participate in decisions regarding Association business. The Association also coordinates with activities in the Merced and Modesto groundwater subbasins through the agencies that have lands in two of the subbasins (i.e., the counties, City of Modesto, and Merced ID).

C. Basin Water Balance

A water balance study of the Turlock Subbasin was prepared in 2003 and updated in 2007 to estimate the inflows and outflows from the Subbasin between 1952 and 2006. Outflows from the Subbasin result from municipal, domestic, and agricultural supply and drainage well pumping, discharge to the Tuolumne, Merced, and San Joaquin rivers, discharges from subsurface agricultural drains, and consumption by riparian vegetation. Total outflow from the Basin for the 1997-2006 period is estimated to average 541,000 AF/yr. The majority of outflow comes from agricultural, municipal and rural residential, and drainage well pumping, which collectively averaged an estimated 452,000 AF/yr for the 1997-2006 period. Inflows to the Subbasin result primarily from deep percolation of agricultural and landscape irrigation water and infiltration of precipitation. Total inflow to the Turlock Subbasin for the 1997-2006 period is estimated to average 519,000 AF/yr. More than 70 percent of this quantity is attributed to deep percolation on irrigated agricultural lands.

For the 1997-2006 period, average net outflow exceeded the estimated net inflow to the Basin. As a result, groundwater levels have declined slightly in the eastern part of the Basin, primarily in the past four years. In any groundwater basin, groundwater storage will fluctuate both seasonally and annually, depending upon the water year classification, distribution of rainfall, and numerous other physical and biological factors. Alternating periods of decline and recovery in groundwater levels are a response to this natural variation. Long-term declines in storage without recovery could be a concern. Continued monitoring by the local public agencies will be important for tracking changes in groundwater conditions and evaluating whether additional management actions should be considered.

Increases in land use types that rely on groundwater for supply have increased the net outflow from the Basin. Groundwater storage is likely to continue to decline if additional urban development occurs or if additional irrigated acreage is developed in areas dependent upon groundwater. The Turlock Groundwater Basin Association initiated a study in late 2006 to evaluate future land use change scenarios and the potential impacts to groundwater resources. The results of this study will help the local public agencies understand how groundwater storage may change in the future, and will be utilized to evaluate what management actions would be appropriate if groundwater storage continues to decline.

Deep percolation of irrigation water is the largest inflow to the Basin and plays an important role in maintaining groundwater levels. Surface water from the Turlock Irrigation District, and to a lesser extent, the Merced Irrigation District is used to supply more than 50% of the total irrigation water applied within the Basin. Hence, continued use of surface water for agricultural irrigation is vital for sustaining recharge in the Subbasin. Future changes to inflows or outflows resulting from shifts in land use patterns and/or changes in irrigation practices have the potential to disrupt this balance.

D. Status of Water Quality

The Basin generally has good quality groundwater. As a result, the municipalities are not currently required to provide significant water treatment. In most cases, treatment is limited to chlorination. However, there are some areas of water quality concern. There are elevated levels of salts on the western side of the Basin, some of which are naturally occurring. In addition, constituents such as PCE, DBCP, EDB, arsenic, uranium, nitrates, manganese and iron have been found in a few water supply wells within the Basin. In a few cases, these constituents have impacted the municipalities' ability to utilize the wells for potable supply and have resulted in the wells being abandoned, or requiring some form of treatment.

In the future, more municipalities within the Basin may be required to investigate various options, such as wellhead treatment, to meet increasingly stringent water quality requirements. In some instances where municipal providers experience difficulty meeting water quality standards it is because the actual concentrations increase, but in other instances it is because of changing standards. For example, in January 2006 the arsenic water quality standard was reduced from 50 ppb to 10 ppb. A number of communities in the Basin have wells that supply water at or near this new standard. To meet this standard, municipalities are considering options including blending, treatment, or well abandonment.

E. Key Reference Document - Turlock Groundwater Basin Groundwater Management Plan

The Turlock Groundwater Basin Association is working to develop an updated Groundwater Management Plan. It is expected that the Plan will be complete and ready for approval by the Association in December 2007. After the Association approves the Plan, member agencies will be able to take the Plan to their governing bodies for adoption. Until this time, the 1997 Turlock Groundwater Basin Groundwater Management Plan will remain the active management document for the Basin.

A majority of the water agencies within the Basin have adopted the 1997 Plan, including the cities of Ceres, Hughson, and Turlock, the Denair Community Services District, the Hilmar and Delhi county water districts, the Ballico-Cortez and Eastside water districts, the Merced and Turlock irrigation districts, and Merced County. There are areas outside of management agencies where groundwater is being pumped. The recent water balance study shows there is increasing agricultural development in these areas. In Merced County these areas are represented by Merced County. In Stanislaus County, they are not represented.

The City of Modesto did not adopt the 1997 Groundwater Management Plan, but intends to adopt the updated Plan. Similarly, Stanislaus County chose not to adopt the 1997 Groundwater Management Plan, but has provided funding for, and has indicated its intent to adopt the updated Plan. In addition, there are two small urban water agencies within the Basin that did not adopt the 1997 Groundwater Management Plan, the Ballico Community Services District in Merced County and the Keyes Community Services District in Stanislaus County.

F. Desired Level of involvement by Stanislaus County

The Association welcomes the continued support by Stanislaus County as it manages groundwater within the Basin and encourages the County to adopt the 2007 Groundwater Management Plan on behalf of those areas within the Basin that lie outside the other agencies' boundaries.

2. Basin Management Objectives (BMO's)

The update of the Groundwater Management Plan is close to completion and will be approved by the Association by December 2007. The Basin Management Objectives described in this section are part of the updated Plan.

It is the goal of the Association that groundwater will continue to be a reliable, safe, efficient, and cost-effective water supply. The agencies, individually and collectively, are pursuing and will continue to pursue water management strategies to maintain viable local sources of water supply.

The following Basin Management Objectives (BMOs) have been developed by the Association for the purpose of meeting this goal:

1. Maintain an adequate water level in the groundwater basin.
2. Protect groundwater quality and implement measures, where feasible, to reduce the potential movement of existing contaminants.
3. Monitor groundwater extraction to reduce the potential for land subsidence.
4. Promote conjunctive use of groundwater and surface waters.
5. Support and encourage water conservation.
6. Develop and support alternate water supplies. Educate users on the benefits of water recycling.
7. Continue coordination and cooperation between the TGBA members and customers.

The local water agencies, individually and collectively, are pursuing water management strategies under each of the BMOs to ensure that groundwater continues to be a reliable, safe, efficient, and cost-effective water supply.

3. Activities of the Basin Within the Last Three Years

In September 2003, the Denair Community Services District (CSD) was awarded a grant from the AB 303 fund for $200,000. Denair CSD constructed a nested monitoring well with the funds from this grant. The well construction and water testing report was completed in May 2006. Information from this test well and other existing wells will be used to support advancement of a hydrogeologic model of the producing groundwater system and to monitor the quality and quantity of groundwater produced from the alluvial aquifer sequences underlying Denair CSD. This project supports the BMOs of maintaining groundwater levels and protecting groundwater quality in the Basin.

In late 2006, the Association commissioned a study to simulate the effect of expected land-use changes on the Basin. Many water use patterns within the Basin are changing. Changes are occurring due to urbanization, agricultural cropping patterns, expansion of agriculture in areas east of Turlock ID that are dependent upon groundwater for their supplies, and the expansion of efficient irrigation practices. These changes may affect groundwater levels in the Basin. The study involves an update of the Turlock Irrigation District groundwater model to include data through 2006 and the simulation of land- and water-use changes into the future. The results of this study are expected to be available in early 2008. The results of the study will support most of the BMOs and will help shape the direction of groundwater management as land uses in the Basin continue to change.

The EWD, in conjunction with the Turlock ID, conducted an initial groundwater recharge study from 1998 through 2000. These districts are currently working on a potential expanded study, in which several larger basins could be installed and operated to further evaluate the potential recharge opportunities within the Subbasin. Testing of a new recharge site began in May 2007. This project supports the BMOs related to maintaining groundwater levels and supporting conjunctive use.

A number of urban agencies within the Basin are evaluating the potential for utilizing TID surface water to supply a portion of their potable water needs. The use of surface water for municipal supply will reduce groundwater extraction by municipal suppliers. This shift in use creates in lieu recharge that helps maintain adequate groundwater levels. The Turlock ID Board of Directors approved the project and certified the environmental review in December 2006. The municipal agencies are currently in the process of studying the costs of project implementation. If the

municipal agencies commit to project funding, it is expected that surface water supplies will be available sometime in 2011.

Ongoing activities in the Basin include the update of the Groundwater Management Plan, coordinated groundwater level monitoring during fall and spring, and monthly meetings of the Turlock Groundwater Basin Association to coordinate on local groundwater issues.

4. Areas of Concern and Recommendations for Improvement

The 2003 Water Budget study commissioned by the Turlock Groundwater Basin Association revealed that water levels within the Turlock Groundwater Basin were at a state of equilibrium from 1993-2002. The recent update of the groundwater model indicates that groundwater levels have declined slightly in the eastern part of the Basin between 2002 and 2006. Continued monitoring will be important for tracking further changes in the Basin and determining whether these declines are part of the normal variability in groundwater levels. The water use study that will be completed in 2008 will also illustrate potential future changes in groundwater levels and will be used to identify additional actions that may be needed.

The recent update of the groundwater model illustrates that consistent groundwater level monitoring data are needed. Groundwater data have become less available due to funding constraints and subsequent reductions in the CA Department of Water Resources groundwater level monitoring program. These data were an important supplement to the Association's monitoring program and are needed to track changes in groundwater levels over time. The Association will be reassessing its monitoring network and identify ways to ensure that consistent data are gathered, which will enable the agencies to better manage the Basin.

The local water agencies are working to address historical overdraft issues in the Basin. The Eastside Water District is continuing to evaluate the potential options to address this concern including, in cooperation with Turlock Irrigation District, constructing and operating a new Pilot Recharge Basin.

5. Future Projects for the Basin

The Groundwater Management Plan is intended to provide a flexible, adaptive plan for achieving the overall goal that groundwater will continue to be a reliable, safe, efficient, and cost-effective water supply. The Plan presents numerous potential actions that can be undertaken by local water agencies and coordinated through the TGBA to meet the Basin Management Objectives. Potential future projects will be implemented based on changes in groundwater conditions, and could include the following actions identified in the Groundwater Management Plan:

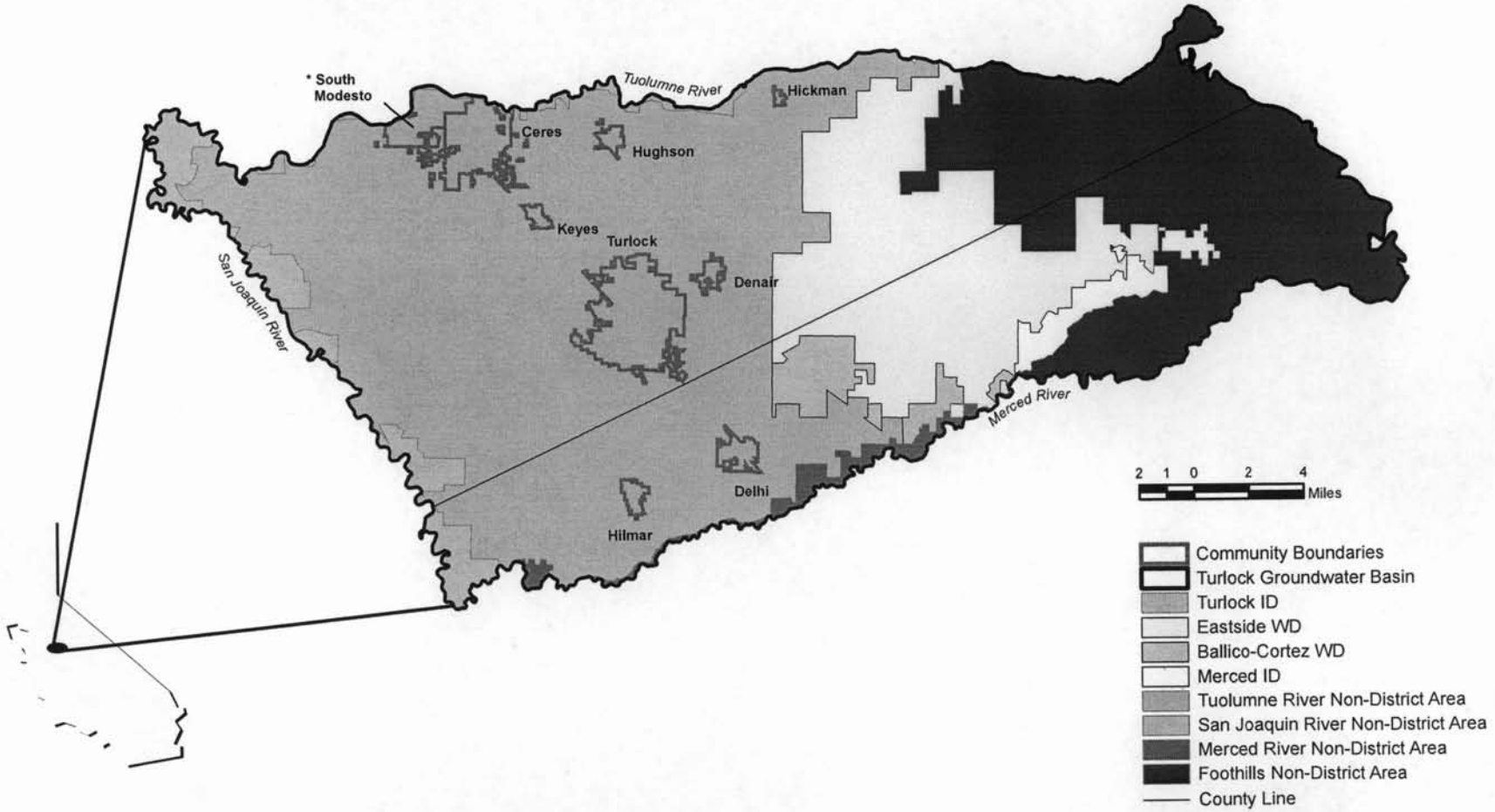
1. **Protection of natural recharge areas** through mapping and identification, education of the public and planning entities, and encouraging the maintenance of land use practices that promote groundwater recharge.
2. **Feasibility evaluation of artificial recharge projects,** by building upon mapping efforts to protect natural recharge and investigating additional water supplies for percolation, and promoting in-lieu recharge.
3. **Management and optimization of well field operations** to reduce well interference, control the migration of contaminant plumes, and optimize supply blending programs.
4. **Support of public health programs** to protect water quality through proper well construction and destruction.

5. **Water quality management**, beginning with conducting a hydrogeologic assessment to identify contaminant sources and develop strategies to control the migration and movement of poor quality water into or within the Basin.
6. Continue the **groundwater monitoring and subsidence monitoring program** and evaluate the effectiveness of the groundwater level and quality monitoring programs as well as the database used to store and manipulate the data.
7. Provide a forum for **policy assessment** and coordination of regional programs with policy implications or requirements.
8. Continue **promoting coordination and cooperation between water agencies** on regional issues, outreach programs, and actions to implement the BMOs.
9. **Identification and feasibility study of conjunctive use projects** to increase supply flexibility and promote recharge in years when water is available.

Development of an Integrated Regional Water Management Plan under Proposition 84 is not addressed in the Groundwater Management Plan update. The Turlock Groundwater Basin Association may wish to consider exploring potential funding sources in the future, although no specific projects or potential funding sources have been identified at this time.

6. Map of Basin

See attached map of the Turlock Subbasin.



* South Modesto represents the City of Modesto Service Area South of the Tuolumne River

Turlock Groundwater Basin Location and Boundaries

Groundwater Basin Update to the Stanislaus County Board of Supervisors
Delta Mendota Basin
Fall 2007

1. Background/Overview of Basin

The Groundwater Management Act, Assembly Bill 3030 (AB 3030), signed into law in 1992, establishes provisions to allow local water agencies to develop and implement groundwater management plans. The Act provides a systematic procedure for existing local agencies to develop these plans. Amendments to the Water Code Section 10750 et seq., made in 2002, enacted through the passage of Senate Bill 1938 (SB 1938) (Stats 2002, Ch 603), require AB 3030 groundwater management plans to contain specific plan components in order to receive state funding for water projects.

The Groundwater Management Plan for the Northern Agencies in the Delta-Mendota Canal Service Area and a Portion of San Joaquin County (GMP) is part of the ongoing efforts by the San Luis and Delta-Mendota Water Authority (SLDMWA) and their Participating Agencies (PAs) to manage their limited water resources in the region. It will benefit the residents of the Groundwater Management Area (GMA) that rely on the groundwater resource as a part of their water supply. This GMP provides a mechanism to bridge gaps and interface in local PAs' programs to support comprehensive regional water resources management in the GMA.

The PAs of the SLDMWA, located in the northern Delta-Mendota Canal (DMC) service area, entered into an agreement under the SLDMWA umbrella to jointly fund the preparation of a coordinated regional plan. The area in the southwestern portion of San Joaquin County is being represented by the San Joaquin County Flood Control and Water Conservation District (SJCFCWCD), which entered into a memorandum of understanding with the SLDMWA such that the GMP could cover this portion of San Joaquin County.

The water needed is obtained from three sources for agricultural, municipal, and industrial uses within the GMA. The first source is imported surface water diverted from the DMC under the Central Valley Project (CVP). The DMC provides water for urban use in the City of Tracy (Tracy) and for agricultural production. During drought conditions, supplies from the CVP surface water are limited, which requires many water users to pump groundwater to meet water demand. Surface water supplies diverted south of the Sacramento-San Joaquin Delta are further limited by restrictions in water export set in place to protect endangered species that depend on adequate water conditions within the Delta.

The second source is local surface water supply diverted from the San Joaquin River for agricultural use. Several of the PAs possess water rights to divert water from the river.

The third source is groundwater, which is used for municipal and industrial purposes, for rural domestic needs, and for agricultural production where the surface water supplies are either not available or are insufficient to meet the crop demand. Communities that rely on groundwater for their water supply have experienced water quality deterioration over time, while regulations governing domestic water quality become stricter. This combination has made it increasingly difficult for these communities to find viable

groundwater supplies and has raised serious concerns about the sustainability of groundwater resources to meet domestic demands without expensive treatment. As an example, Tracy uses treated surface water to blend with high salinity groundwater to provide potable domestic water for the community.

Description of the Groundwater Basin

Geographical Description of the Groundwater Basin
The area included in this GMP is part of the Tracy and Delta-Mendota Basins of the San Joaquin HAS and covers portions of Merced, Stanislaus, and San Joaquin Counties. The northern boundary of the groundwater management area is the north boundary of the DMC service area in San Joaquin County, and the southern boundary is the southern boundary of the Del Puerto Water District in Merced County. The Groundwater Management Area (GMA) is bounded by the Coast Ranges on the west and by the San Joaquin River on the east. The portion of this area included within Stanislaus County lies wholly within the Delta-Mendota Basin.

Geologic Description of the Groundwater Basin
The aquifers of the GMA consist of unconsolidated sediments derived from the Diablo Range and the Sierra Nevada Mountains. The area is underlain by the Pleistocene Corcoran Clay Member of the Tulare Formation, which is a deposit that divides the aquifer system vertically into an upper semiconfined zone and a lower confined zone. The unconsolidated sediments taper towards the Diablo Range and the Corcoran Clay crops out sporadically on the west margin of the valley.

The semiconfined zone is made up of sediments derived from the Diablo Range on the west that interfinger eastward with sediments derived from the Sierra Nevada. The Diablo Range and Sierra Nevada sediments differ in their hydrogeologic characteristics. The Diablo Range sediments consist of beds, lenses and tongues of clay, sand, and gravel, and form most of the sedimentary material deposited west of the San Joaquin River. Although there are no distinct continuous aquifers or aquitards within the Diablo Range alluvium, the term "semiconfined" is used to emphasize the cumulative effect of the vertically distributed fine-grained materials. The Sierran sediment that interfingers with the Diablo Range alluvium is well sorted, medium to coarse-grained micaceous sand derived from the Sierra Nevada. The uppermost expression of the interface between the Diablo range and Sierran deposits is close to the eastern boundary of the GMA.

The confined zone underlies the confining Corcoran Clay stratum and is similar to the semiconfined zone in texture and composition. It extends downward from the base of the Corcoran Clay to the base of fresh water. Sierran sand and Diablo Range alluvium interfingers in a similar fashion as those of the semiconfined zone, except that Sierra Nevada sediments extend farther to the west.

The horizontal groundwater flow direction in the semiconfined zone is toward the San Joaquin River, typically causing subsurface outflow laterally along the eastern boundary of the study area. The hydraulic gradients west of the San Joaquin River are generally steeper than those east of the river. The water table west of the river can be thought of as a subdued replica of the topography, sloping gently toward the river from the Coast Ranges.

Key Documents for Reference

Key documents include:

Groundwater Management Plan for the Northern Agencies in the Delta-Mendota Canal Service Area and a Portion of San Joaquin County, dated October 1995 and revised April 1996.

Regional Groundwater Monitoring Program for the Northern Subbasin Groundwater Management Area, 2000

Draft Update to Groundwater Management Plan for the Northern Agencies in the Delta-Mendota Canal Service Area and a Portion of San Joaquin County, dated March 2007.

2006 Westside Integrated Resources Plan

Agencies Within the Groundwater Basin

The Groundwater Management Area includes the following agricultural water supply districts:

San Joaquin County
- Banta Carbona Irrigation District
- Del Puerto Water District (portion)
- Plain View Water District
- Westside Irrigation District
- West Stanislaus Irrigation District (portion)

Stanislaus County
- Del Puerto Water District (portion)
- Patterson Water District
- West Stanislaus Irrigation District (portion)

Merced County
- Del Puerto Water District (portion)

Non-district lands within San Joaquin County are included in the plan and are represented by the San Joaquin Flood Control and Water Conservation District. A portion of land within Stanislaus County and outside the GMA boundary was included in the development of the water resource balance, but is not part of the groundwater management area. The GMA encompasses ±173,000 acres. The City of Tracy is the only city participating at this time.

2. Basin Management Objectives

Proper management of groundwater requires knowledge of the storage, distribution, depletion, and replenishment of the groundwater resource as well as various other local and regional geologic and hydrologic factors. Without such knowledge, the effect of current and future activities on groundwater resources cannot be adequately predicted.

The general objectives for management of groundwater resources within the GMA are as follows:

- Assure an affordable groundwater supply for the long term needs of the users.
- Prevent long-term depletion of groundwater resources, and maintain adequate groundwater supplies for all users.
- Maintain groundwater quality to meet the long-term needs of users.
- Attempt to reduce or prevent inelastic land subsidence due to groundwater overdraft.

3. Activities of the Basin Within the Last Three Years

During recent years, there have been several groundwater management activities undertaken by various agencies and individuals in the GMA to protect the groundwater resources. The following activities can be mentioned as examples of the PAs actions:

The passage of SB 1938 requires a GMP to include components relating to the management of groundwater levels, groundwater quality, inelastic land surface subsidence and changes in surface flow and water quality that directly affect groundwater levels or quality, or are caused by groundwater pumping. The GMP is currently in the final draft of being updated.

The following sections discuss certain components that are included in the updated GMP, and briefly describe the related activities within the GMA.

COMPONENTS RELATING TO GROUNDWATER LEVEL MANAGEMENT

Reduction of groundwater use by development of new surface water supplies.
Agencies buy water from out-of-basin sellers to supplement their supplies.

Activities within the GMA: Tracy is participating with the cities of Manteca, Lathrop, Escalon and the South San Joaquin Irrigation District in the South County Surface Water Supply Project (SCSWSP), to bring high quality Sierra Nevada water from the Stanislaus River to cities for their urban use. The intent of the project is to reduce the reliance on groundwater and to satisfy future urban demand increases. A water treatment plant on the Stanislaus River uses water that the irrigation district has conserved from improvements in irrigation practices and water efficiencies. Water is taken from Woodward Reservoir, treated to drinking standards, and conveyed to the cities. Water deliveries commenced in July 2005.

Increased use of available surface water supplies.
There are some in-basin water transfers and purchases from agencies to others with limited water rights overlying areas having more depressed groundwater levels.

Activities within the GMA: Surface water purchases by Tracy from West Side ID and Banta Carbona ID, and the use of Byron-Bethany ID CVP water supply for M & I purposes.

Development of conjunctive use programs and projects.
Conjunctive use of groundwater and surface water typically occurs when the surface water supply varies from year to year and is insufficient at times to meet an area's demand. In some years, the surface water supply is greater than the water demand;

and in other years, the surface water supply cannot meet the entire water demand. In the years when water is plentiful, water available above the demand is utilized to recharge the groundwater aquifer. Recharge can occur either directly by operation of recharge facilities or injection wells, or indirectly, by applying surface water where available to areas to avoid the use of groundwater. In effect, the groundwater basin is utilized as a storage reservoir, and water is placed in the reservoir during wet periods and withdrawn from the reservoir during dry periods.

There are opportunities for conjunctive use in the study area that could increase overall water supply yield; however, each must be evaluated in terms of available water supply, basin geology, available storage capacity, pumping zones, and recharge potential to determine yield, costs, and potential adverse impacts. In the GMA, pumping takes place primarily from the confined zone, while unoccupied aquifer storage is available only in the unconfined zone. Based on the basin characteristics, water supply sources, and current groundwater usage, potential conjunctive use opportunities should focus on the following:

- Identifying areas of local overdraft and evaluating the viability of a recharge program using direct recharge.
- Evaluating the availability of additional surface water supplies, which could be utilized in conjunctive use programs either directly or via exchange of CVP supplies.
- Optimizing the overall groundwater yields during dry periods through sound basin management

In recent history in the GMA, conjunctive use has been practiced in an unmanaged fashion. When full CVP water supplies are being received, relatively little pumping occurs. During the water short periods of 1976-1977 and 1989-1992, water was withdrawn from the aquifer to make up for the deficits in surface water supply.

Activities within the GMA:
Patterson Irrigation District pumps groundwater on an as needed basis. The District has focused its efforts on improving surface water delivery and pumping efficiencies by recycling surface drainage as opposed to limiting canal seepage. Deep percolation of irrigation water and distribution system seepage/losses, enter the groundwater aquifer and is either stored there or is lost as base flow into the San Joaquin River. The stored groundwater supply is available to the District during drought conditions. Such recharge is important to the District to recharge the groundwater supply (Patterson ID, 2005).

Tracy is evaluating the use of the Tracy groundwater basin for water storage, as a way to increase the reliability of the City's water supply during droughts or reduction in surface water imports. This consists of injecting surface water treated to drinking water standards into the aquifer via deep wells during times of surplus water and recovery of that potable water from the aquifer to optimize water quality and meet seasonal peak demands during droughts or when emergency or disaster scenarios preclude the use of imported water supplies. Tracy anticipates that, under this Aquifer Storage and Recovery (ASR) program, approximately 3,000 acre-feet (af) of high-quality groundwater would be available in drought years, thereby increasing the reliability of Tracy's water supply and closing the potential future gap between supply and demand during drought or emergency conditions (EKI, 2005).

Tracy is also studying the possibility of procuring surface water storage to increase water supply reliability. Tracy is evaluating the potential to buy water storage capacity in the Semitropic Water Banking Project (Semitropic) in Kern County. In order to store water in Semitropic, Tracy would not withdraw a portion of its CVP water from the DMC, such that this water would move through the DMC and California Aqueduct systems for delivery to Semitropic. During a drought, Semitropic would pump the stored water into the California Aqueduct and a like amount of water would be made available to Tracy to pump from the DMC. Tracy is currently in negotiations with Semitropic to purchase up to 10,500 af of storage volume. If this storage were secured, it would provide Tracy with up to 3,500 af of water annually for three years during water short periods (EKI, 2005).

Development of agricultural and urban incentive based conservation and demand management programs.
Reduction of demand, either urban or agricultural, should be an important component of the long-term planning and management of water resources. It reduces the need for new water supply projects, often at relatively low cost, and assists in making prudent use of the available supplies.

The experience of active urban water conservation programs in California is that the potential for water savings are initially about 10 to 20 percent of the volume of water used. Such programs typically include distribution system leak-reduction programs, household metering, tiered pricing to discourage high use, education of children and the public and market-enforced transition to water-saving household plumbing devices.

The greatest potential for agricultural water conservation relies mainly on the use of more efficient irrigation technologies. Increasing irrigation efficiency decreases the amount of water that is lost to the system or leaves the site through surface water runoff or deep percolation to groundwater.

From the hydrologic system perspective, the water conservation efforts must be planned locally, taking into account groundwater levels, groundwater quality, and groundwater supply.

Activities within the GMA:
Tracy developed a Water Conservation Plan in 2000. The conservation efforts include implementation of the California Urban Water Conservation Council's (CUWCC) 14 Best Management Practices (BMPs). The BMPs include residential water surveys, system water audits and leak detection, water pricing to encourage conservation, waste prohibitions, public information, landscape guidelines, etc.

An update of the Urban Water Management Plan (UWMP) for Tracy was prepared in 2005 to fulfill the UWMP Act requirements. This UWMP describes how Tracy intends to manage its current and future water resources and demands to continue to provide its customers with an adequate and reliable water supply. This updated UWMP reflects changes to the Tracy's water supply portfolio and water demands since 2000 (EKI, 2005).

Many of the PAs have completed agricultural water conservation plans and periodically update the plans pursuant to the Central Valley Project Improvement Act. In these plans, water conservation practices have been identified and instituted to maximize

beneficial use of the water supply. Practices include better irrigation management, physical improvements, and institutional adjustments. Irrigation management practices include on-farm water management and district water accounting, use of efficient irrigation methods, and on-farm irrigation system evaluations. Physical improvements include lining of canals, replacement of unlined ditches with pipeline conveyance systems, and improvement of on-farm irrigation and drainage technology. Institutional adjustments include improvements in communication and cooperative work among districts, water users, and state and federal agencies, increased conjunctive use of groundwater and surface water, and facilitating the financing of on-farm capital improvements. Other practices that have been instituted include installation of flow measuring devices, modification of distribution facilities to increase the flexibility of water deliveries, and changes in the water fee structure to provide incentive for more efficient use of water.

The water conservation plans have helped the districts identify the opportunities for better irrigation water utilization.

COMPONENTS RELATING TO INELASTIC LAND SURFACE SUBSIDENCE

Reducing the amount of groundwater in storage by pumping could cause the dewatering of fine-grained geological formations, potentially resulting in land subsidence and a reduction in the storage capacity of the aquifer.

The management of the land subsidence would include monitoring and prevention programs. Management of land surface subsidence should contain the following elements:

- Establish a subsidence monitoring program. Benchmarks should be established at well locations, so it would be possible to relate the subsidence to groundwater extraction.
- Identify areas where monitoring suggest land subsidence.
- Identify management measures that may be employed to minimize the subsidence.

Activities within the GMA: Tracy established a subsidence-monitoring program in 2003. Benchmarks were established at each of the City's monitoring wells. An annual benchmark survey is performed in the spring of each year by using the Global Positioning System (GPS). The results of the Monitoring Program are presented in semiannual reports.

4. Areas of Concern and Recommendations for Improvement

Recent and ongoing regulatory restraints on imported surface water supplies force many water users to depend more heavily on groundwater resources. Various arrangements for transfers of water supplies have evolved to match the limited water supply to water demand. Some of these transfers involve pumping of groundwater into the Delta-Mendota Canal for banking and limited conveyance purposes. While the program requires that the water be redelivered to overlying or closely located lands, the increased pumping may result in lowering of groundwater levels and deterioration of water quality.

Utilization of the groundwater basin conjunctively with surface water represents an important source of water supply, but extraction rates and amounts must be limited to preclude exceeding the safe aquifer yield.

Communities within the GMA relay on groundwater for their supplies. Several communities have seen quality deteriorate over time and regulations governing domestic supply are becoming stricter.

Export of local groundwater resources to support development at Diablo Grande or similar projects is an area of concern. Adverse impacts associated with moving limited groundwater resources outside of the aquifer could include both localized overdraft and degradation of groundwater quality.

Anticipated municipal encroachment on agricultural lands in the area will result in reduced recharge and increased groundwater pumping.

Implementation of the Groundwater Management Plan will provide the means for collection of the necessary groundwater monitoring data to assess the impacts of these and other activities that affect the groundwater basin such that sustained use of groundwater can be optimized without adverse impacts to the water quality and yield. This is the basic goal of groundwater management.

5. Future Projects for the Basin

The agencies within the Northern Subbasin meet periodically to discuss groundwater management related issues. These meeting ensure coordination of existing activities provide an opportunity to address areas of concern and develop new, coordinated management related programs.

The agencies within the Basin have developed water level and quality monitoring programs. The water level monitoring program consists of semi-annual monitoring utilizing a grid of agency and privately owned wells throughout the area. The data collected is incorporated into a database and will be utilized to analyze changing groundwater levels and trends.

The water quality monitoring program is in its initial stage. In addition to data provided by municipal agencies, a series of local agricultural wells are being tested. Initial monitoring focuses on electrical conductivity, nitrates, total dissolved solids, selenium and boron. Like the water level monitoring program, this program is designed to analyze trends and identify problem areas.

The San Luis & Delta-Mendota Water Authority has developed a Westside Integrated Resources Plan (Westside IRP) which incorporates the GMP. The Authority plans to apply for funding under Proposition 84. However, no specific project has yet been identified at this time. A copy of the Westside IRP is attached for reference.

6. Map of Basin

See attached.

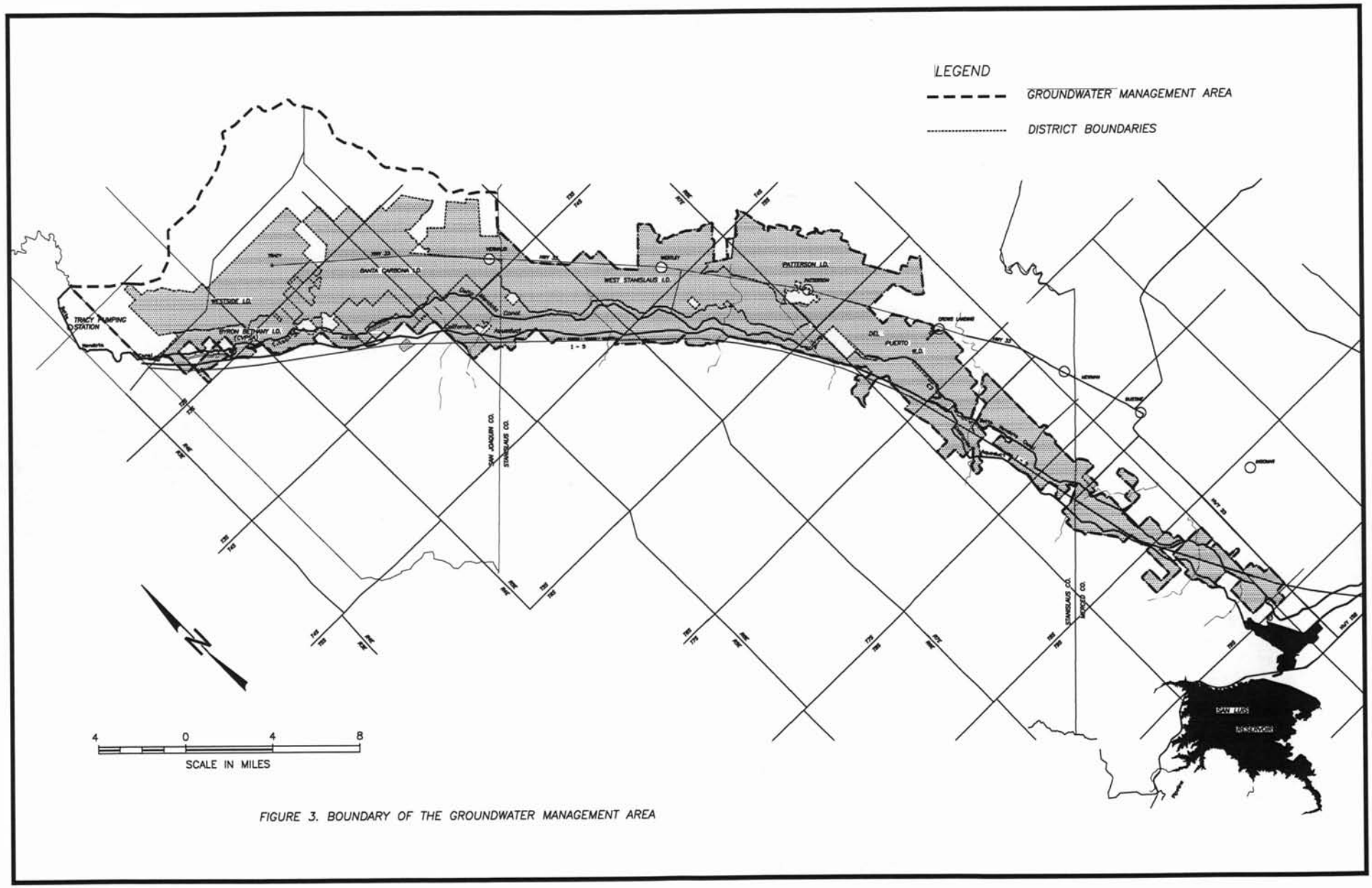


FIGURE 3. BOUNDARY OF THE GROUNDWATER MANAGEMENT AREA

Groundwater Basin Update to the Stanislaus County Board of Supervisors
Eastern San Joaquin Groundwater Basin
Fall 2007

1. Overview of Basin

Independently, agencies in San Joaquin County have found it difficult to wield the political and financial power necessary to mitigate the conditions of overdraft. County interests have come to realize that a regional consensus-based approach to water resources planning and conjunctive water management increases the chance for success.

Since its formation as a Joint Powers Authority in 2001, the 11-member agency Northeastern San Joaquin County Groundwater Banking Authority (GBA) has employed the consensus based approach in its goal to develop "...locally supported conjunctive use projects that improve water supply reliability in San Joaquin County...and provide benefits to project participants as a whole." Collaboration amongst the GBA member agencies has strengthened the potential for broad public support for groundwater management activities as well as the ability to leverage local, State, and federal funds. Table ES-1 lists the member agencies of GBA.

Table 1 Member Agencies of the Northeastern San Joaquin County Groundwater Banking Authority
City of Stockton
California Water Service Company
City of Lodi
Woodbridge Irrigation District
North San Joaquin Water Conservation District
Central San Joaquin Water Conservation District
Stockton East Water District
Central Delta Water Agency
South Delta Water Agency
San Joaquin County Flood Control and Water Conservation District
San Joaquin Farm Bureau Federation*
* Associate Member

The GBA is the regional water management group responsible for the development and implementation of the Eastern San Joaquin Integrated Regional Water Management Plan (IRWM Plan). The Authority together with the San Joaquin County is a Department of Water Resources Conjunctive Water Management Branch MOU partner and has furthered these efforts through this partnership.

2. Basin Management Objectives

The Eastern San Joaquin Basin has developed four basin management objectives as part of its integrated groundwater management plan. The objectives are as follows:

- Maintain or enhance groundwater elevations to meet the long-term needs of groundwater users within the Groundwater Management Area.
- Maintain or enhance groundwater quality underlying the Basin to meet the long-term needs of groundwater users within the Groundwater Management Area.
- Minimize the impacts to surface water quality and flow due to continued Basin overdraft and planned conjunctive use.

- Prevent inelastic subsidence in Eastern San Joaquin County due to continued groundwater overdraft.

3. Activities of the Basin Within the Last Three Years

On July 25, 2007, the GBA adopted the Eastern San Joaquin Integrated Regional Water Management Plan. The IRWMP defines and integrates key water management strategies to establish the protocols and course of action for implementation of the Eastern San Joaquin Integrated Conjunctive Use Program (ICU Program).

The ICU Program will implement a comprehensive and prioritized set of projects and actions that when implemented, will meet adopted Basin Management Objectives and could potentially provide regional benefits to areas beyond the Eastern San Joaquin Region.

The GBA is currently preparing a Programmatic Environmental Impact Report (EIR) pursuant to the California Environmental Quality Act (CEQA) for the Eastern San Joaquin Integrated Conjunctive Use Program. As required by CEQA, a Notice of Preparation has been prepared.

In an effort to localize the data related to groundwater within San Joaquin County the GBA sponsor the San Joaquin County Groundwater Data Center (GDC) on it's website. The GDC is a Countywide centralized groundwater information vehicle that provides access to groundwater data collected and shared by agencies throughout San Joaquin County. Over the internet, water interests including groundwater users, Basin stakeholders, industry professionals, decision makers, and the general public will be able to access historic groundwater data.

4. Future Projects for the Basin

Through past planning efforts, the GBA, its member agencies, and other regional interests have developed numerous projects and programs that integrate multiple strategies and in turn provide multiple benefits to the community. The mission of the GBA is to promote regional collaboration in a consensus-building environment. The Intergraded Regional Water Management (IRWM) planning process is a continuum of this mission and is reflected in the projects and programs described in the ICU Program options discussion below.

This Plan has considered all of the resource management strategies identified in the California Water Plan. These strategies include:

Reduce Water Demand

- Agricultural Water Use Efficiency
- Urban Water Use Efficiency

Improve Operational Efficiency and Transfers

- Conveyance
- System Reoperation

- Water Transfers

Increase Water Supply

- Conjunctive Management and Groundwater Storage
- Desalination
- Precipitation Enhancement
- Recycled Municipal Water
- Surface Storage—CALFED
- Surface Storage—Regional/Local

Improve Water Quality

- Drinking Water Treatment and Distribution
- Groundwater Remediation/Aquifer Remediation
- Matching Water Quality to Water Use
- Pollution Prevention
- Urban Runoff Management

Practice Resources Stewardship

- Agricultural Lands Stewardship
- Economic Incentives (Loans, Grants, and Water Pricing)
- Ecosystem Restoration
- Floodplain Management
- Recharge Areas Protection
- Urban Land Use Management
- Water-Dependent Recreation
- Watershed Management

Other Resource Management Strategies

- Crop idling for water transfers
- Dewvaporation
- Fog collection
- Irrigated land retirement
- Rainfed agriculture
- Waterbag transport/storage technology

Strategies Considered by GBA not included in California Water Plan

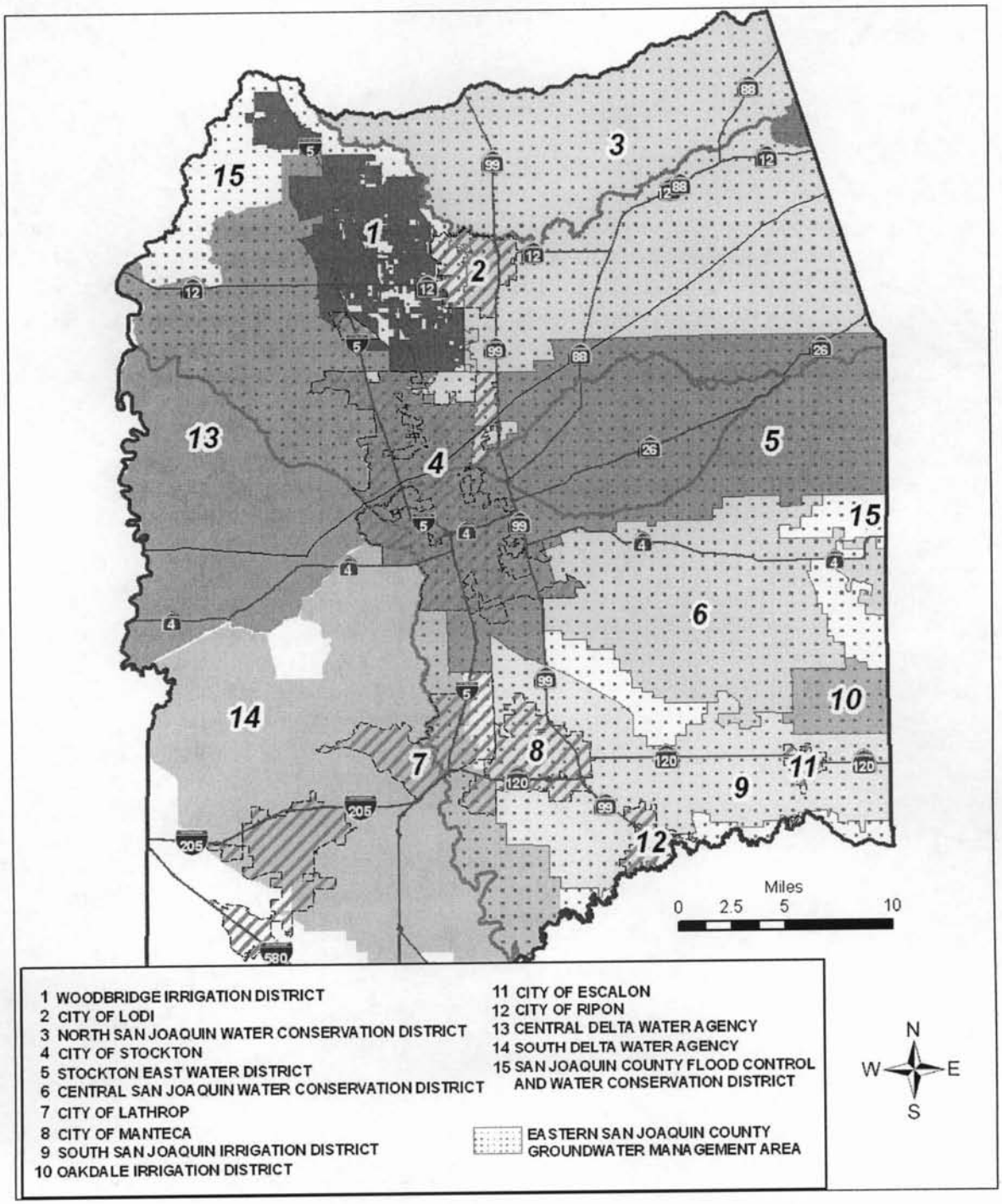
- Water Supply Reliability
- Regional Groundwater Banking Partnerships

- Imported water
- Land use planning
- Flood management
- Climate Change

The GBA is the forum that fosters regional integration amongst member agencies and with other regional participants. The GBA will continue to interact with other agencies and groups throughout the region to increase the social, economic, and environmental viability of the Region and beyond. This integration of these strategies increases the potential for broad-based support by spreading benefits to multiple interests and agencies. Integration also produces synergistic effects and makes additional funding sources available.

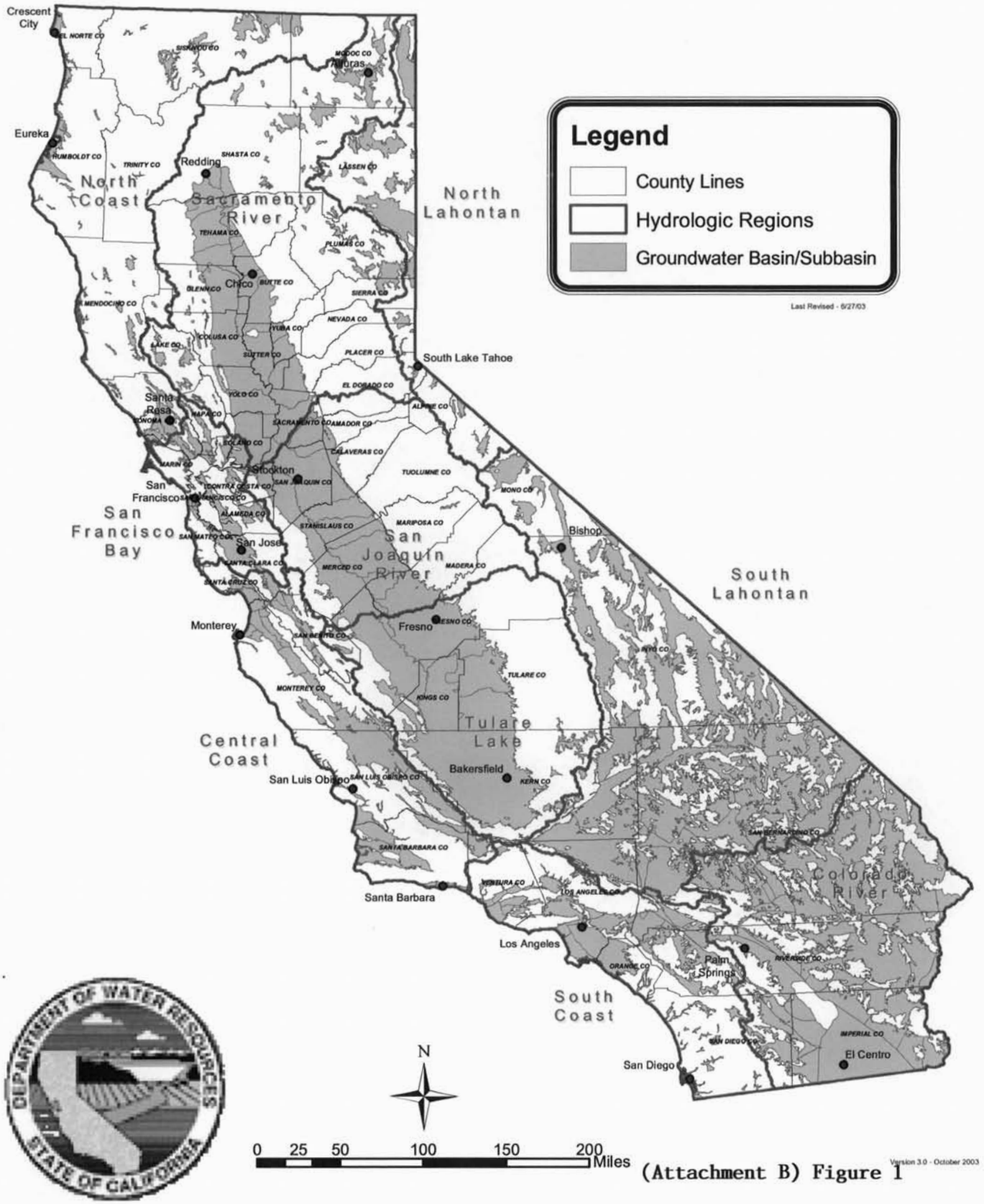
5. Maps

Please see attached map of the Eastern San Joaquin Sub-Basin

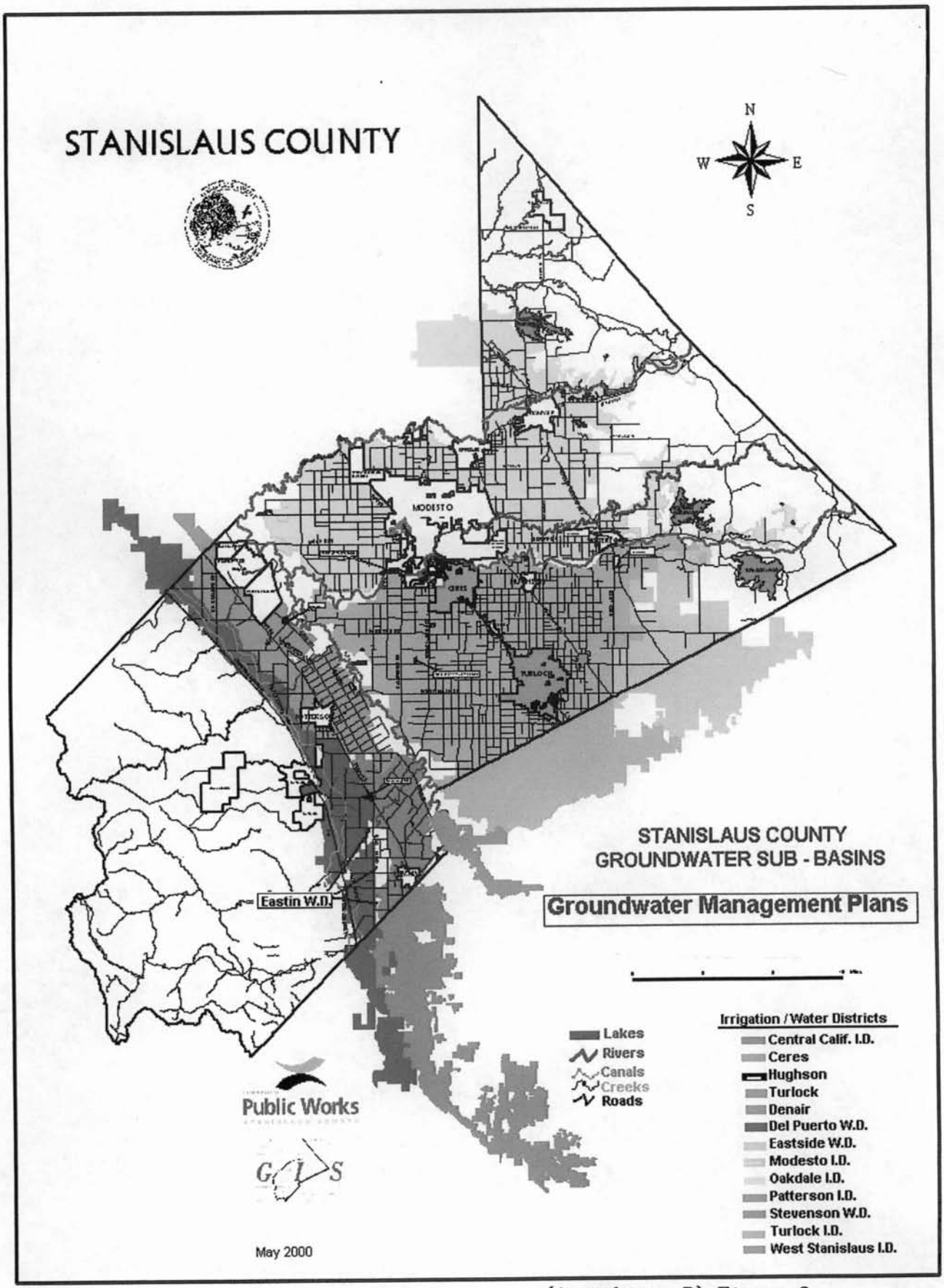


Overlying Agencies within the Groundwater Management Area

Groundwater Basins in California



(Attachment B) Figure 1



(Attachment B) Figure 2