# CHAPTER EIGHT

# WATER SHORTAGE CONTINGENCY PLAN

# CHAPTER EIGHT – WATER SHORTAGE CONTINGENCY PLAN

## *8.1 Stages of Actions*

**LAW**

*10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplier:*

*10632. (a) Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply and an outline of specific water supply conditions which are applicable to each stage.*

*10632. (d) Additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.*

*10632. (e) Consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have thee ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply.*

*10632. (f) Penalties or charges for excessive use, where applicable.*

### 8.1.1 WATER SHORTAGE STAGES AND REDUCTION OBJECTIVES

Supply capacity must be designed to meet MDD plus standby and thus meet demands through the planning horizon of 2025. The 2025 standby capacity, reserved for emergency conditions such as equipment malfunctions, is estimated at 15 percent (3.17 mgd).

Water agencies relying solely on groundwater, such as the City, are much less likely to experience water shortages than those agencies relying primarily on surface water.

### 8.1.2 WATER REDUCTION STAGE TRIGGERING MECHANISMS

Emergency response actions should take effect when the City Manager declares that the City is unable to provide sufficient water supply to meet ordinary demands, to the extent that insufficient supplies would be available for human consumption, sanitation and fire protection. The declaration would be based on his/her judgment as to the degree of the immediate or future supply deficiency. Table 8.1-1 provides guidelines to assist in declaring water shortage stages.

A combination of voluntary and mandatory water conservation measures would be used to reduce water usage in the event of water shortages.

Table 8.1-2 outlines reduction objectives for each stage.

**Table 8.1-1**
**Guide for Declaring Water Shortage Stages**

| Stage | Condition |
|---|---|
| 1 | ▪ Below average rainfall in the previous 12-24 months<br>▪ 10 percent or more of municipal wells out of service due to noncompliance with drinking water standards or other emergency<br>▪ Warm weather patterns typical of summer months |
| 2 | ▪ Below average rainfall in the previous 24-36 months<br>▪ Prolonged periods of low water pressure<br>▪ 10 percent or more of municipal wells out of service due to noncompliance with drinking water standards or other emergency<br>▪ Warm weather typical of summer months |
| 3 | ▪ Below average rainfall in the previous 36 months<br>▪ Prolonged periods of low water pressure<br>▪ 10 percent or more of municipal wells out of service due to noncompliance with drinking water standards or other emergency<br>▪ Warm weather patterns typical of summer months |

**Table 8.1-2**
**Water Usage Reduction Objectives**

| Stage | Description | Reduction Objective |
|---|---|---|
| 1 | (Minor Shortage Potential) | 10-20% reduction in total water demands from baseline |
| 2 | (Moderate Shortage Potential) | 20-35% reduction in total water demands from baseline |
| 3 | (Critical Shortage Potential) | 35-50% reduction in total water demands from baseline |

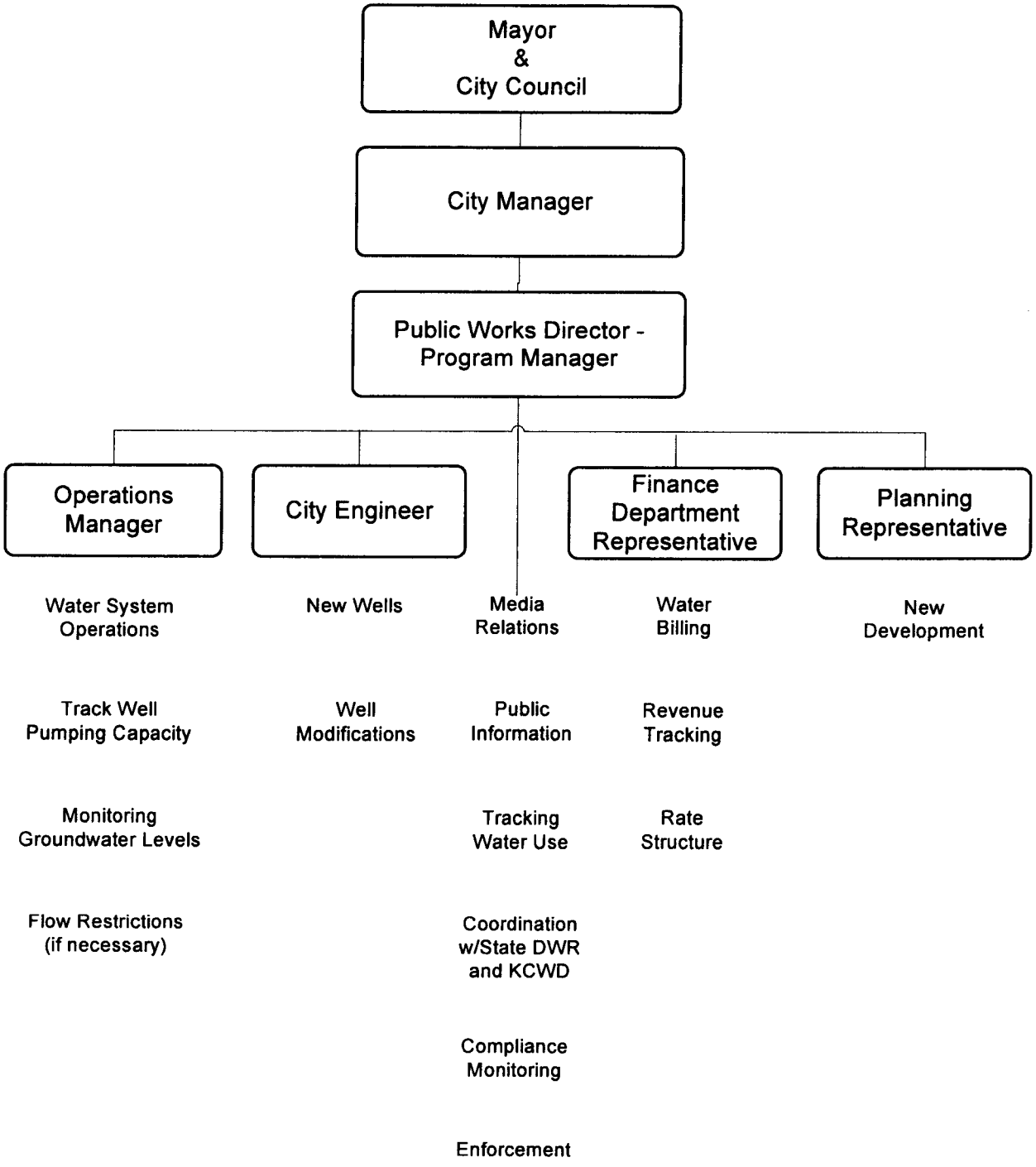
### 8.1.3 ADMINISTRATION OF WATER SHORTAGE PROGRAM

The administration of a water shortage program as described in this section would involve coordination among a number of City departments. It is anticipated that the Public Works Department would have primary responsibility for managing the program, since it is responsible for the City's water system. The Public Works Director would be the Program Manager and thus the primary coordinator of water shortage activities.

An appropriate organizational structure for a water shortage management team would be determined based on the actual situation. Figure 8-1 presents an example of a typical organization structure. Specific individuals would be designated to fill the identified roles. The City would not have to hire additional staff or outside contractors to implement the program.

The major elements to be considered in administering and implementing the program would include:

**Water Shortage Program Organizational Structure**
**Figure 8-1**




Identifying the City staff members to fill the key roles on the water shortage management team.

Intensifying the public information program to provide comprehensive information on necessary actions that must be undertaken by the City and by the public. The scope of the public

information program can be developed by reviewing published references, especially those published by DWR, and researching successful aspects of current programs conducted by neighboring water agencies.

A public information hotline may be advisable to answer any questions regarding the program.

Monitoring program effectiveness: Ongoing monitoring will be needed to track supply availability and actual water user reductions. This procedure will allow the City to continuously re-evaluate the situation and make informal decisions as to whether another reduction level is needed.

Enforcing program requirements: For the 35 to 50 percent reduction program, enforcement of water use prohibitions and water use allocations would be important in achieving the program goals. Inspectors and enforcement personnel could be identified among City staff that are in the community on other business, such as police, park department staff, street maintenance staff, meter readers, etc.

Dealing with equity issues that might arise from the mandatory restrictions or higher water rates: Depending on the level of restriction, there may be a need to address concerns of individual customers who might have special conditions or extenuating circumstances and are unduly affected by the program. A procedure should be identified for dealing with such special requests and/or for reviewing specific accounts.

Coordinating with relevant local entities: Since the Lemoore Canal and Irrigation Company and the Lemoore Irrigation District are the principal water management agencies affecting Lemoore's water supply, it is critical to have ongoing coordination with contact persons at these entities who will be aware of the City's needs.

Adjusting water rates: Revenues from water sales should be reviewed periodically to determine whether an increase in rates might be needed to cover revenue shortfalls due to the decrease in demand.

Addressing new development proposals:. During periods of severe water shortage, it may be necessary to impose additional requirements on new development to reduce new demand or to temporarily curtail new hook-ups.

It is essential that the water shortage contingency plan, as a component of the Urban Water Management Plan, undergoes a formal public review process including a public hearing. A thorough public review process will help minimize future objections when mandatory prohibitions are needed.

## *8.2 Water Shortage Contingency Ordinance or Resolution*

**LAW**

*10632. The plan shall provide an urban water shortage contingency analysis, which includes each of the following elements, which are within the authority of the urban water supplier.*

*10632. (h) A draft water shortage contingency resolution or ordinance.*

The City held a hearing, precedent to adoption of this Plan on December 20, 2005. A copy of the proposed adoption resolution is included in Appendix H. Fourteen days prior to adoption, a notice of the public hearing was published in the local newspaper, notifying interested parties that the 2005 UWMP, including the Urban Water Shortage Contingency Plan (Contingency Plan) was available at various City facilities. The City will, after the hearing, submit the amended draft Plan to the Department of Water Resources for review and recommended corrections. The City Council will thereafter, at a properly noticed meeting, re-adopt the Plan, by resolution, as revised in accord with the recommended corrections.

## 8.3 Mandatory Prohibitions on Water Wasting

Mandatory compliance measures enacted during a water shortage are more severe than voluntary measures, produce greater savings, and are less costly to the utility. The principal drawback to these measures is customer resentment if the measures are not seen as equitable. Therefore, such measures need to be accompanied by a good public relations campaign.

Mandatory measures may include:

- Ordinances making water waste illegal
- Ordinances controlling landscape irrigation
- Ordinances restricting non-irrigation outdoor water uses
- Prohibitions on new connections or the incorporation of new areas
- Rationing

Prohibitions on new development may conflict with other policies and needs. However, if existing customers are called upon to make sacrifices during a drought period, they may feel that water agencies should concentrate on fulfilling current obligations rather than taking on new customers. Such prohibitions may need to be considered in the event of a critical shortage, such as the 50 percent reduction program. If necessary, an offset program might be considered whereby developers demonstrate that they will implement measures to conserve at least as much water in the existing community as their new project will use. In some cases, a two to one offset might be required of the new development.

The City currently enforces Municipal Code Section 7-7A-8, Title 7. The provisions of that Code section are summarized in Section 7.13 of this Plan; the full Code section is contained in Appendix H.

Customers violating the regulations and restrictions on water use set forth in the Code are penalized as follows:

1. *First Violation. A written notice of such violation shall be issued by the Public Works Department personnel or Police Department personnel.*

2. *Second Violation. A written notice of such violation shall be given of a second violation, and a charge of Fifteen and No/100 Dollars ($15.00) shall be added to the water bill of such person as a one-time penalty.*

3. *Third Violation. A written notice of such violation shall be given and a penalty of Twenty-five and No/100 ($25.00) shall be added to the water bill of such person as a one-time penalty.*

4. *Fourth Violation. A written notice of such violation shall be given and a charge of Fifty and No/100 Dollars ($50.00) shall be added to the water bill of such person as a one-time penalty.*

5. *Fifth Violation. A written notice shall be given of a fifth violation and the consumer shall have a flow restrictor placed in their service until such time that they can assure the Public Works Director that no more waste will occur. All costs, including overhead, for this installation shall be billed to the customer.*

## 8.4 Revenue and Expenditure Impacts/Measures to Overcome Impacts

**LAW**

*10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplier:*

*10632. (g) An analysis of the impacts of each of the actions and conditions described in subdivisions (a) to (f), inclusive, on the revenues and expenditures of the urban water supplier...*

*10632 (g) {An analysis of the impacts of each of the proposed measures to overcome those {revenue and expenditure impacts, such as the development of reserves and rate adjustments.*

The majority of operating costs for most water agencies are fixed rather than a function of the amount of water sold. As a result, when significant conservation programs are undertaken, it is frequently necessary to raise water rates because the revenue generated is based on lower total consumption while the costs, and resulting revenue required, are basically fixed. Typically water rates need to be increased by the percentages listed in Table 8.4-1 when the indicated stages are implemented. However, reductions in water demands, especially peak demands, can delay the need to develop costly new water sources in growing communities.

The City does not currently have an emergency fund but will consider establishing such a fund to mitigate the impacts of a water shortage. The fund would then be used to stabilize water rates during periods of water shortage or disasters affecting the water supplies. Excess water revenues collected as a result of shortage rate adjustments would be used to enhance the emergency fund.

**Table 8.4-1**
**Guide for Rate Adjustment**

| Stage | Rate Adjustment |
|---|---|
| 1 | 25 percent increase over pre-shortage rates |
| 2 | 50 percent increase over pre-shortage rates |
| 3 | 100 percent increase over pre-shortage rates |
| End of Water Shortage Emergency | 15 percent increase over pre-shortage rates. (This rate increase is implemented based on historical information from communities that experienced water shortage and found that consumption rate (gpcd) does not return to pre-shortage levels. In anticipation of reduced sales, the City rates would be set for one year at 115 percent of the pre-shortage rates. This rate increase should be re-evaluated every two years.) |

## *8.5 Actions During A Catastrophic Interruption*

**LAW**

*10632. The plan shall provide an urban water shortage contingency analysis, which includes each of the following elements, which are within the authority of the urban water supplier...*

*10632 (c) Actions to be undertaken by the urban supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.*

During declared shortages, or when a shortage declaration appears imminent, the City Manager will activate a water shortage response team. The team includes: public utilities, water, fire, planning, health and emergency services. Other actions and procedures to be followed during catastrophic events will be developed.

## *8.6 Reduction Measuring Mechanism*

*10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplier:*

*10632. (i) A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.*

The City's water system is supplied by groundwater wells. Each well includes a flow-monitoring device that records the amount of water entering the City's distribution system. The City would use these devices to monitor actual citywide reductions in water use.

# CHAPTER NINE

# WATER RECYCLING

# CHAPTER NINE – WATER RECYCLING

**LAW**

*10633. The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplied. To the extent practicable, the preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies and shall include all of the following:*

*10633 (a). A description of the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.*

*10633 (b). A description of the recycled water currently being used in the supplier's service area, including but not limited to, the type, place and quantity of use.*

*10633 (c). A description and quantification of the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse determination with regard to the technical and economic feasibility of serving those uses, groundwater recharge, and other appropriate use...*

*10633 (d). The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years.*

*10633 (e). A description of actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.*

*10633 (f). A plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems and to promote recirculating uses.*

## *9.1 Recycling Programs*

The City of Lemoore, and the industries supplied by the City's water system, employ recycling procedures to minimize City water supply impacts on the groundwater basin. This Plan section describes the existing, and planned, recycling programs.

## *9.2 SK Foods*

This industry, a tomato products processing facility, discharges approximately 75 percent of its total annual water usage directly to agricultural land previously supplied by groundwater, and surface water entitlements, for crop irrigation. The balance of the industry's effluent is discharged to the City's wastewater treatment and recycling facility. Thus essentially 100% of the industry's water usage is recycled.

## 9.3 Existing City Wastewater Treatment and Recycling Facilities

The City of Lemoore provides wastewater services to its residential, commercial, and industrial water users. The Waste Water Treatment Facility operates under Waste Discharge Order No. 96-050, issued by the RWQCB.

The WWTF was completed in 1974 and consisted of four aerated lagoons with diffused air systems, and a fifth pond for emergency storage of effluent. In 1987, the diffused air system was removed and replaced with floating surface aerators. The fifth pond was upgraded to two holding/ treatment ponds used solely by Leprino Foods Inc. in 2003.

The existing facility has a domestic waste/SK Foods waste design capacity of 2.5 mgd. The existing 12-inch and 30-inch diameter outfall lines limit the ability of the WWTF to discharge water to a maximum of 4.5 mgd. The treatment facility includes: a pumping station and four treatment ponds, followed by gas chlorination prior to discharge to receiving waters.

A new headworks facility has been constructed (2004). The new headworks facility has an initial design capacity of 3.9 mgd and can be expanded to a design flow of 9.6 mgd.

Effluent from the combined domestic and SK Foods waste discharges is conveyed via a 6-mile pipeline to the Westlake Canal. The recycled water is then used to supplement irrigation of about 50,000 acres of animal feed grains and cotton on Westlake Farms. Discharge to Westlake Canal in 2004 was approximately 25 percent of the water utilized by domestic consumers and SK Foods.

## 9.4 Leprino Foods

This industry pre-treats its process wastes before discharge to the downstream end of the City's wastewater treatment facilities. That waste, approximately 2 million gallons per day, is transported through the City's 30-inch outfall line to the Westlake Farms' irrigated agriculture. In excess of 50% of the industry's water usage is recycled, the balance being evaporated in the cheese production process.

## 9.5 Projected Recycling Usage

It is anticipated that the effluent recycled by SK Foods and Leprino Foods will remain constant during the planning horizon. The City's recycled domestic effluent will increase proportionate to anticipated population growth, essentially doubling during the planning period (through 2025).

The effectiveness of the existing and projected agricultural irrigation recycling program precludes the necessity of evaluating other recycling programs such as dual distribution systems. The two major industries, as cost-saving measures, fully recycle and multi-use water within their plants prior to discharge.

# APPENDICES

# Appendix A

## California Water Code, Sections 10610 et seq; The Urban Water Management Planning Act

# California Water Code, Sections 10610 et seq; The Urban Water Management Planning Act

## WATER CODE SECTION 10610-10610.4

10610. This part shall be known and may be cited as the "Urban Water Management Planning Act."

10610.2. The Legislature finds and declares all of the following:
(a) The waters of the state are a limited and renewable resource subject to ever-increasing demands.
(b) The conservation and efficient use of urban water supplies are of statewide concern; however, the planning for that use and the implementation of those plans can best be accomplished at the local level.
(c) A long-term, reliable supply of water is essential to protect the productivity of California's businesses and economic climate.
(d) As part of its long-range planning activities, every urban water supplier should make every effort to ensure the appropriate level of reliability in its water service sufficient to meet the needs of its various categories of customers during normal, dry, and multiple dry water years.
(e) Public health issues have been raised over a number of contaminants that have been identified in certain local and imported water supplies.
(f) Implementing effective water management strategies, including groundwater storage projects and recycled water projects, may require specific water quality and salinity targets for meeting groundwater basins water quality objectives and promoting beneficial use of recycled water.
(g) Water quality regulations are becoming an increasingly important factor in water agencies' selection of raw water sources, treatment alternatives, and modifications to existing treatment facilities.
(h) Changes in drinking water quality standards may also impact the usefulness of water supplies and may ultimately impact supply reliability.
(i) The quality of source supplies can have a significant impact on water management strategies and supply reliability.
(2) This part is intended to provide assistance to water agencies in carrying out their long-term resource planning responsibilities to ensure adequate water supplies to meet existing and future demands for water.

10610.4. The Legislature finds and declares that it is the policy of the state as follows:
(a) The management of urban water demands and efficient use of water shall be actively pursued to protect both the people of the state and their water resources.
(b) The management of urban water demands and efficient use of urban water supplies shall be a guiding criterion in public decisions.
(c) Urban water suppliers shall be required to develop water

management plans to actively pursue the efficient use of available supplies.

# WATER CODE SECTION 10611-10617

10611. Unless the context otherwise requires, the definitions of this chapter govern the construction of this part.

10611.5. "Demand management" means those water conservation measures, programs, and incentives that prevent the waste of water and promote the reasonable and efficient use and reuse of available supplies.

10612. "Customer" means a purchaser of water from a water supplier who uses the water for municipal purposes, including residential, commercial, governmental, and industrial uses.

10613. "Efficient use" means those management measures that result in the most effective use of water so as to prevent its waste or unreasonable use or unreasonable method of use.

10614. "Person" means any individual, firm, association, organization, partnership, business, trust, corporation, company, public agency, or any agency of such an entity.

10615. "Plan" means an urban water management plan prepared pursuant to this part. A plan shall describe and evaluate sources of supply, reasonable and practical efficient uses, reclamation and demand management activities. The components of the plan may vary according to an individual community or area's characteristics and its capabilities to efficiently use and conserve water. The plan shall address measures for residential, commercial, governmental, and industrial water demand management as set forth in Article 2 (commencing with Section 10630) of Chapter 3. In addition, a strategy and time schedule for implementation shall be included in the plan.

10616. "Public agency" means any board, commission, county, city and county, city, regional agency, district, or other public entity.

10616.5. "Recycled water" means the reclamation and reuse of wastewater for beneficial use.

10617. "Urban water supplier" means a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually. An urban water supplier includes a supplier or contractor for water, regardless of the basis of right, which distributes or sells for ultimate resale to customers. This part applies only to water supplied from public water systems subject to Chapter 4 (commencing with Section 116275) of Part 12 of Division 104 of the Health and Safety Code.

# WATER CODE
# SECTION 10620-10621

10620. (a) Every urban water supplier shall prepare and adopt an urban water management plan in the manner set forth in Article 3 (commencing with Section 10640).

(b) Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.

(c) An urban water supplier indirectly providing water shall not include planning elements in its water management plan as provided in Article 2 (commencing with Section 10630) that would be applicable to urban water suppliers or public agencies directly providing water, or to their customers, without the consent of those suppliers or public agencies.

(d) (1) An urban water supplier may satisfy the requirements of this part by participation in areawide, regional, watershed, or basinwide urban water management planning where those plans will reduce preparation costs and contribute to the achievement of conservation and efficient water use.

(2) Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.

(e) The urban water supplier may prepare the plan with its own staff, by contract, or in cooperation with other governmental agencies.

(f) An urban water supplier shall describe in the plan water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions.

10621. (a) Each urban water supplier shall update its plan at least once every five years on or before December 31, in years ending in five and zero.

(b) Every urban water supplier required to prepare a plan pursuant to this part shall notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. The urban water supplier may consult with, and obtain comments from, any city or county that receives notice pursuant to this subdivision.

(c) The amendments to, or changes in, the plan shall be adopted and filed in the manner set forth in Article 3 (commencing with Section 10640).

# WATER CODE
# SECTION 10630-10634

10630. It is the intention of the Legislature, in enacting this part, to permit levels of water management planning commensurate with the numbers of customers served and the volume of water supplied.

10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:

(a) Describe the service area of the supplier, including current and projected population, climate, and other demographic factors affecting the supplier's water management planning. The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available.

(b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a). If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan:

(1) A copy of any groundwater management plan adopted by the urban water supplier, including plans adopted pursuant to Part 2.75 (commencing with Section 10750), or any other specific authorization for groundwater management.

(2) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater. For those basins for which a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree. For basins that have not been adjudicated, information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition.

(3) A detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(4) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(c) Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following:

(1) An average water year.

(2) A single dry water year.

(3) Multiple dry water years.

For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable.

(d) Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.

(e) (1) Quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors including, but not necessarily limited to, all of the following uses:

(A) Single-family residential.

(B) Multifamily.

(C) Commercial.

(D) Industrial.

(E) Institutional and governmental.

(F) Landscape.

(G) Sales to other agencies.

(H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof.

(I) Agricultural.

(2) The water use projections shall be in the same five-year increments described in subdivision (a).

(f) Provide a description of the supplier's water demand management measures. This description shall include all of the following:

(1) A description of each water demand management measure that is currently being implemented, or scheduled for implementation, including the steps necessary to implement any proposed measures, including, but not limited to, all of the following:

(A) Water survey programs for single-family residential and multifamily residential customers.

(B) Residential plumbing retrofit.

(C) System water audits, leak detection, and repair.

(D) Metering with commodity rates for all new connections and retrofit of existing connections.

(E) Large landscape conservation programs and incentives.

(F) High-efficiency washing machine rebate programs.

(G) Public information programs.

(H) School education programs.

(I) Conservation programs for commercial, industrial, and institutional accounts.

(J) Wholesale agency programs.

(K) Conservation pricing.

(L) Water conservation coordinator.

(M) Water waste prohibition.

(N) Residential ultra-low-flush toilet replacement programs.

(2) A schedule of implementation for all water demand management measures proposed or described in the plan.

(3) A description of the methods, if any, that the supplier will use to evaluate the effectiveness of water demand management measures implemented or described under the plan.

(4) An estimate, if available, of existing conservation savings on water use within the supplier's service area, and the effect of the savings on the supplier's ability to further reduce demand.

(g) An evaluation of each water demand management measure listed in paragraph (1) of subdivision (f) that is not currently being implemented or scheduled for implementation. In the course of the evaluation, first consideration shall be given to water demand management measures, or combination of measures, that offer lower incremental costs than expanded or additional water supplies. This evaluation shall do all of the following:

(1) Take into account economic and noneconomic factors, including

environmental, social, health, customer impact, and technological factors.

(2) Include a cost-benefit analysis, identifying total benefits and total costs.

(3) Include a description of funding available to implement any planned water supply project that would provide water at a higher unit cost.

(4) Include a description of the water supplier's legal authority to implement the measure and efforts to work with other relevant agencies to ensure the implementation of the measure and to share the cost of implementation.

(h) Include a description of all water supply projects and water supply programs that may be undertaken by the urban water supplier to meet the total projected water use as established pursuant to subdivision (a) of Section 10635. The urban water supplier shall include a detailed description of expected future projects and programs, other than the demand management programs identified pursuant to paragraph (1) of subdivision (f), that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in average, single-dry, and multiple-dry water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program.

(i) Urban water suppliers that are members of the California Urban Water Conservation Council and submit annual reports to that council in accordance with the "Memorandum of Understanding Regarding Urban Water Conservation in California," dated September 1991, may submit the annual reports identifying water demand management measures currently being implemented, or scheduled for implementation, to satisfy the requirements of subdivisions (f) and (g).

10632. The plan shall provide an urban water shortage contingency analysis which includes each of the following elements which are within the authority of the urban water supplier:

(a) Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions which are applicable to each stage.

(b) An estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply.

(c) Actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.

(d) Additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.

(e) Consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply.

(f) Penalties or charges for excessive use, where applicable.

(g) An analysis of the impacts of each of the actions and conditions described in subdivisions (a) to (f), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.

(h) A draft water shortage contingency resolution or ordinance.

(i) A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.

10633. The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. To the extent practicable, the preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies and shall include all of the following:

(a) A description of the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.

(b) A description of the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.

(c) A description and quantification of the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.

(d) The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years.

(e) A description of actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.

(f) A plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems and to promote recirculating uses.

10634. The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments as described in subdivision (a) of Section 10631, and the manner in which water quality affects water management strategies and supply reliability.

# WATER CODE SECTION 10635

10635. (a) Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with

the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.

(b) The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.

(c) Nothing in this article is intended to create a right or entitlement to water service or any specific level of water service.

(d) Nothing in this article is intended to change existing law concerning an urban water supplier's obligation to provide water service to its existing customers or to any potential future customers.

# WATER CODE SECTION 10640-10645

10640. Every urban water supplier required to prepare a plan pursuant to this part shall prepare its plan pursuant to Article 2 (commencing with Section 10630).

The supplier shall likewise periodically review the plan as required by Section 10621, and any amendments or changes required as a result of that review shall be adopted pursuant to this article.

10641. An urban water supplier required to prepare a plan may consult with, and obtain comments from, any public agency or state agency or any person who has special expertise with respect to water demand management methods and techniques.

10642. Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan. Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection and shall hold a public hearing thereon. Prior to the hearing, notice of the time and place of hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code. The urban water supplier shall provide notice of the time and place of hearing to any city or county within which the supplier provides water supplies. A privately owned water supplier shall provide an equivalent notice within its service area. After the hearing, the plan shall be adopted as prepared or as modified after the hearing.

10643. An urban water supplier shall implement its plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan.

10644. (a) An urban water supplier shall file with the department and any city or county within which the supplier provides water

supplies a copy of its plan no later than 30 days after adoption. Copies of amendments or changes to the plans shall be filed with the department and any city or county within which the supplier provides water supplies within 30 days after adoption.

(b) The department shall prepare and submit to the Legislature, on or before December 31, in the years ending in six and one, a report summarizing the status of the plans adopted pursuant to this part. The report prepared by the department shall identify the outstanding elements of the individual plans. The department shall provide a copy of the report to each urban water supplier that has filed its plan with the department. The department shall also prepare reports and provide data for any legislative hearings designed to consider the effectiveness of plans submitted pursuant to this part.

10645. Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

# WATER CODE SECTION 10650-10657

10650. Any actions or proceedings to attack, review, set aside, void, or annul the acts or decisions of an urban water supplier on the grounds of noncompliance with this part shall be commenced as follows:

(a) An action or proceeding alleging failure to adopt a plan shall be commenced within 18 months after that adoption is required by this part.

(b) Any action or proceeding alleging that a plan, or action taken pursuant to the plan, does not comply with this part shall be commenced within 90 days after filing of the plan or amendment thereto pursuant to Section 10644 or the taking of that action.

10651. In any action or proceeding to attack, review, set aside, void, or annul a plan, or an action taken pursuant to the plan by an urban water supplier on the grounds of noncompliance with this part, the inquiry shall extend only to whether there was a prejudicial abuse of discretion. Abuse of discretion is established if the supplier has not proceeded in a manner required by law or if the action by the water supplier is not supported by substantial evidence.

10652. The California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) does not apply to the preparation and adoption of plans pursuant to this part or to the implementation of actions taken pursuant to Section 10632. Nothing in this part shall be interpreted as exempting from the California Environmental Quality Act any project that would significantly affect water supplies for fish and wildlife, or any project for implementation of the plan, other than projects implementing Section 10632, or any project for expanded or additional water supplies.

10653. The adoption of a plan shall satisfy any requirements of

state law, regulation, or order, including those of the State Water Resources Control Board and the Public Utilities Commission, for the preparation of water management plans or conservation plans; provided, that if the State Water Resources Control Board or the Public Utilities Commission requires additional information concerning water conservation to implement its existing authority, nothing in this part shall be deemed to limit the board or the commission in obtaining that information. The requirements of this part shall be satisfied by any urban water demand management plan prepared to meet federal laws or regulations after the effective date of this part, and which substantially meets the requirements of this part, or by any existing urban water management plan which includes the contents of a plan required under this part.

10654. An urban water supplier may recover in its rates the costs incurred in preparing its plan and implementing the reasonable water conservation measures included in the plan. Any best water management practice that is included in the plan that is identified in the "Memorandum of Understanding Regarding Urban Water Conservation in California" is deemed to be reasonable for the purposes of this section.

10655. If any provision of this part or the application thereof to any person or circumstances is held invalid, that invalidity shall not affect other provisions or applications of this part which can be given effect without the invalid provision or application thereof, and to this end the provisions of this part are severable.

10656. An urban water supplier that does not prepare, adopt, and submit its urban water management plan to the department in accordance with this part, is ineligible to receive funding pursuant to Division 24 (commencing with Section 78500) or Division 26 (commencing with Section 79000), or receive drought assistance from the state until the urban water management plan is submitted pursuant to this article.

10657. (a) The department shall take into consideration whether the urban water supplier has submitted an updated urban water management plan that is consistent with Section 10631, as amended by the act that adds this section, in determining whether the urban water supplier is eligible for funds made available pursuant to any program administered by the department.
(b) This section shall remain in effect only until January 1, 2006, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2006, deletes or extends that date.

# WATER CODE SECTION 10910-10915

10910. (a) Any city or county that determines that a project, as defined in Section 10912, is subject to the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) under Section 21080 of the Public Resources

Code shall comply with this part.

(b) The city or county, at the time that it determines whether an environmental impact report, a negative declaration, or a mitigated negative declaration is required for any project subject to the California Environmental Quality Act pursuant to Section 21080.1 of the Public Resources Code, shall identify any water system that is, or may become as a result of supplying water to the project identified pursuant to this subdivision, a public water system, as defined in Section 10912, that may supply water for the project. If the city or county is not able to identify any public water system that may supply water for the project, the city or county shall prepare the water assessment required by this part after consulting with any entity serving domestic water supplies whose service area includes the project site, the local agency formation commission, and any public water system adjacent to the project site.

(c) (1) The city or county, at the time it makes the determination required under Section 21080.1 of the Public Resources Code, shall request each public water system identified pursuant to subdivision (b) to determine whether the projected water demand associated with a proposed project was included as part of the most recently adopted urban water management plan adopted pursuant to Part 2.6 (commencing with Section 10610).

(2) If the projected water demand associated with the proposed project was accounted for in the most recently adopted urban water management plan, the public water system may incorporate the requested information from the urban water management plan in preparing the elements of the assessment required to comply with subdivisions (d), (e), (f), and (g).

(3) If the projected water demand associated with the proposed project was not accounted for in the most recently adopted urban water management plan, or the public water system has no urban water management plan, the water supply assessment for the project shall include a discussion with regard to whether the public water system's total projected water supplies available during normal, single dry, and multiple dry water years during a 20-year projection will meet the projected water demand associated with the proposed project, in addition to the public water system's existing and planned future uses, including agricultural and manufacturing uses.

(4) If the city or county is required to comply with this part pursuant to subdivision (b), the water supply assessment for the project shall include a discussion with regard to whether the total projected water supplies, determined to be available by the city or county for the project during normal, single dry, and multiple dry water years during a 20-year projection, will meet the projected water demand associated with the proposed project, in addition to existing and planned future uses, including agricultural and manufacturing uses.

(d) (1) The assessment required by this section shall include an identification of any existing water supply entitlements, water rights, or water service contracts relevant to the identified water supply for the proposed project, and a description of the quantities of water received in prior years by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), under the existing water supply entitlements, water rights, or water service contracts.

(2) An identification of existing water supply entitlements, water rights, or water service contracts held by the public water system,

or the city or county if either is required to comply with this part pursuant to subdivision (b), shall be demonstrated by providing information related to all of the following:

(A) Written contracts or other proof of entitlement to an identified water supply.

(B) Copies of a capital outlay program for financing the delivery of a water supply that has been adopted by the public water system.

(C) Federal, state, and local permits for construction of necessary infrastructure associated with delivering the water supply.

(D) Any necessary regulatory approvals that are required in order to be able to convey or deliver the water supply.

(e) If no water has been received in prior years by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), under the existing water supply entitlements, water rights, or water service contracts, the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), shall also include in its water supply assessment pursuant to subdivision (c), an identification of the other public water systems or water service contract holders that receive a water supply or have existing water supply entitlements, water rights, or water service contracts, to the same source of water as the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), has identified as a source of water supply within its water supply assessments.

(f) If a water supply for a proposed project includes groundwater, the following additional information shall be included in the water supply assessment:

(1) A review of any information contained in the urban water management plan relevant to the identified water supply for the proposed project.

(2) A description of any groundwater basin or basins from which the proposed project will be supplied. For those basins for which a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), has the legal right to pump under the order or decree. For basins that have not been adjudicated, information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current bulletin of the department that characterizes the condition of the groundwater basin, and a detailed description by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), of the efforts being undertaken in the basin or basins to eliminate the long-term overdraft condition.

(3) A detailed description and analysis of the amount and location of groundwater pumped by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), for the past five years from any groundwater basin from which the proposed project will be supplied. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(4) A detailed description and analysis of the amount and location

of groundwater that is projected to be pumped by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), from any basin from which the proposed project will be supplied. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(5) An analysis of the sufficiency of the groundwater from the basin or basins from which the proposed project will be supplied to meet the projected water demand associated with the proposed project.

A water supply assessment shall not be required to include the information required by this paragraph if the public water system determines, as part of the review required by paragraph (1), that the sufficiency of groundwater necessary to meet the initial and projected water demand associated with the project was addressed in the description and analysis required by paragraph (4) of subdivision (b) of Section 10631.

(g) (1) Subject to paragraph (2), the governing body of each public water system shall submit the assessment to the city or county not later than 90 days from the date on which the request was received. The governing body of each public water system, or the city or county if either is required to comply with this act pursuant to subdivision (b), shall approve the assessment prepared pursuant to this section at a regular or special meeting.

(2) Prior to the expiration of the 90-day period, if the public water system intends to request an extension of time to prepare and adopt the assessment, the public water system shall meet with the city or county to request an extension of time, which shall not exceed 30 days, to prepare and adopt the assessment.

(3) If the public water system fails to request an extension of time, or fails to submit the assessment notwithstanding the extension of time granted pursuant to paragraph (2), the city or county may seek a writ of mandamus to compel the governing body of the public water system to comply with the requirements of this part relating to the submission of the water supply assessment.

(h) Notwithstanding any other provision of this part, if a project has been the subject of a water supply assessment that complies with the requirements of this part, no additional water supply assessment shall be required for subsequent projects that were part of a larger project for which a water supply assessment was completed and that has complied with the requirements of this part and for which the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), has concluded that its water supplies are sufficient to meet the projected water demand associated with the proposed project, in addition to the existing and planned future uses, including, but not limited to, agricultural and industrial uses, unless one or more of the following changes occurs:

(1) Changes in the project that result in a substantial increase in water demand for the project.

(2) Changes in the circumstances or conditions substantially affecting the ability of the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), to provide a sufficient supply of water for the project.

(3) Significant new information becomes available which was not known and could not have been known at the time when the assessment was prepared.

10911. (a) If, as a result of its assessment, the public water system concludes that its water supplies are, or will be, insufficient, the public water system shall provide to the city or county its plans for acquiring additional water supplies, setting forth the measures that are being undertaken to acquire and develop those water supplies. If the city or county, if either is required to comply with this part pursuant to subdivision (b), concludes as a result of its assessment, that water supplies are, or will be, insufficient, the city or county shall include in its water supply assessment its plans for acquiring additional water supplies, setting forth the measures that are being undertaken to acquire and develop those water supplies. Those plans may include, but are not limited to, information concerning all of the following:

(1) The estimated total costs, and the proposed method of financing the costs, associated with acquiring the additional water supplies.

(2) All federal, state, and local permits, approvals, or entitlements that are anticipated to be required in order to acquire and develop the additional water supplies.

(3) Based on the considerations set forth in paragraphs (1) and (2), the estimated timeframes within which the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), expects to be able to acquire additional water supplies.

(b) The city or county shall include the water supply assessment provided pursuant to Section 10910, and any information provided pursuant to subdivision (a), in any environmental document prepared for the project pursuant to Division 13 (commencing with Section 21000) of the Public Resources Code.

(c) The city or county may include in any environmental document an evaluation of any information included in that environmental document provided pursuant to subdivision (b). The city or county shall determine, based on the entire record, whether projected water supplies will be sufficient to satisfy the demands of the project, in addition to existing and planned future uses. If the city or county determines that water supplies will not be sufficient, the city or county shall include that determination in its findings for the project.

10912. For the purposes of this part, the following terms have the following meanings:

(a) "Project" means any of the following:

(1) A proposed residential development of more than 500 dwelling units.

(2) A proposed shopping center or business establishment employing more than 1,000 persons or having more than 500,000 square feet of floor space.

(3) A proposed commercial office building employing more than 1,000 persons or having more than 250,000 square feet of floor space.

(4) A proposed hotel or motel, or both, having more than 500 rooms.

(5) A proposed industrial, manufacturing, or processing plant, or industrial park planned to house more than 1,000 persons, occupying more than 40 acres of land, or having more than 650,000 square feet of floor area.

(6) A mixed-use project that includes one or more of the projects specified in this subdivision.
(7) A project that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500 dwelling unit project.
(b) If a public water system has fewer than 5,000 service connections, then "project" means any proposed residential, business, commercial, hotel or motel, or industrial development that would account for an increase of 10 percent or more in the number of the public water system's existing service connections, or a mixed-use project that would demand an amount of water equivalent to, or greater than, the amount of water required by residential development that would represent an increase of 10 percent or more in the number of the public water system's existing service connections.
(c) "Public water system" means a system for the provision of piped water to the public for human consumption that has 3000 or more service connections. A public water system includes all of the following:
(1) Any collection, treatment, storage, and distribution facility under control of the operator of the system which is used primarily in connection with the system.
(2) Any collection or pretreatment storage facility not under the control of the operator that is used primarily in connection with the system.
(3) Any person who treats water on behalf of one or more public water systems for the purpose of rendering it safe for human consumption.

10914. (a) Nothing in this part is intended to create a right or entitlement to water service or any specific level of water service.

(b) Nothing in this part is intended to either impose, expand, or limit any duty concerning the obligation of a public water system to provide certain service to its existing customers or to any future potential customers.
(c) Nothing in this part is intended to modify or otherwise change existing law with respect to projects which are not subject to this part.
(d) This part applies only to a project for which a notice of preparation is submitted on or after January 1, 1996.

10915. The County of San Diego is deemed to comply with this part if the Office of Planning and Research determines that all of the following conditions have been met:
(a) Proposition C, as approved by the voters of the County of San Diego in November 1988, requires the development of a regional growth management plan and directs the establishment of a regional planning and growth management review board.
(b) The County of San Diego and the cities in the county, by agreement, designate the San Diego Association of Governments as that review board.
(c) A regional growth management strategy that provides for a comprehensive regional strategy and a coordinated economic development and growth management program has been developed pursuant to Proposition C.
(d) The regional growth management strategy includes a water element to coordinate planning for water that is consistent with the

requirements of this part.

(e) The San Diego County Water Authority, by agreement with the San Diego Association of Governments in its capacity as the review board, uses the association's most recent regional growth forecasts for planning purposes and to implement the water element of the strategy.

(f) The procedures established by the review board for the development and approval of the regional growth management strategy, including the water element and any certification process established to ensure that a project is consistent with that element, comply with the requirements of this part.

(g) The environmental documents for a project located in the County of San Diego include information that accomplishes the same purposes as a water supply assessment that is prepared pursuant to Section 10910.

# Appendix B

# Kings River Water Association
# Groundwater Management


November 2003

*The coordinated use of surface and groundwater supplies, known as conjunctive use and practiced for decades in the area, is a key strategy for groundwater management in the Kings River region.*

Since the early recharge basins in the 1930s, groundwater management has been regularly practiced in the Kings River service area. From those early beginnings, the effort has expanded to numerous programs in water storage, recharge and quality through the coordinated effort of the thirty-five agencies that have a role in the Kings River's groundwater resources.

The goal of this comprehensive effort is to provide a balanced and high quality groundwater supply to the over 850,000 residents and water users within the 1.2 million acre Kings River region. This is accomplished by the Kings River water agencies working individually and together with local city and county governments on programs that address groundwater supply and quality with an emphasis on regional coordination.

# Groundwater Supply

Groundwater resources for the Kings River region are supplied by the area's aquifer. The region's groundwater supply meets the demands of domestic and agricultural uses resulting in significant groundwater extractions in certain areas and during drought periods.

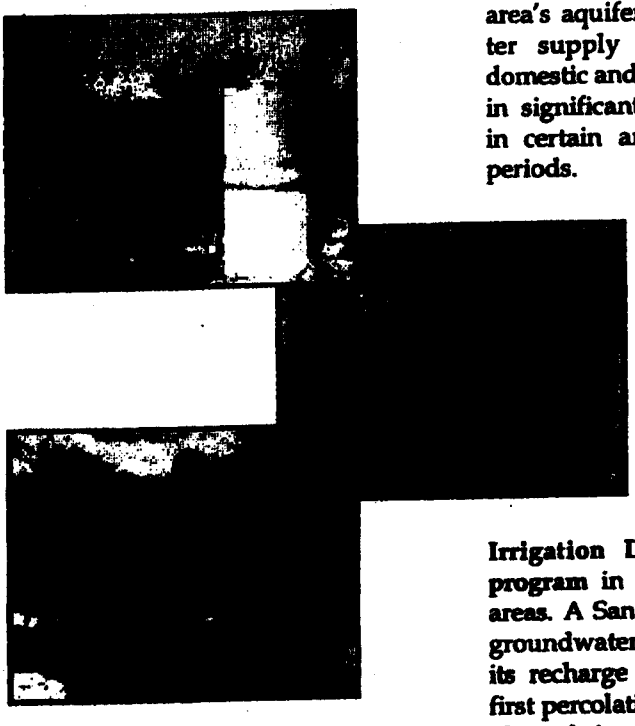
These extractions are replenished by in lieu and direct recharge programs. As a conjunctive use basin, in lieu recharge is the most broadly used method in the region.

One of the oldest direct recharge programs is **Consolidated Irrigation District's (CID) recharge program** in the Selma and Kingsburg areas. A San Joaquin Valley pioneer in groundwater management, CID began its recharge program by acquiring its first percolation basin in 1932. An initial plan of sixteen ponds eventually grew to forty-six basins covering 1,300 acres located in the sandy soils of the Kings River's alluvial plain.

In nearby Kings County, the **Kings County Water District** is working on a project to bank off-peak sources of water to help mitigate the imbalanced water supply in certain areas of Kings County. The banked water from the **Apex Conjunctive Use Project** would be used in the summer when it is most needed.

In addition to **Fresno Irrigation District's** numerous recharge basins, the Waldron Pond is the first groundwater banking facility to be constructed within the District. Lands currently committed to the project just west of Fresno will provide percolation over roughly 220 acres with an average annual recovery estimated to be 10,000 acre-feet per year putting to beneficial use storm and flood waters.

Within the Kings River region, there are over 3,800 acres of recharge ponds with the capacity of recharging 87,000 acre feet of water annually, along with several thousands of miles of unlined canals that have direct recharge benefits.



*Direct recharge, where surface water is intentionally percolated into the aquifer for later use, and in lieu recharge, where groundwater wells are shut off and local and imported surface water is utilized, are tools used by Kings River water agencies to manage water supplies.*

# Groundwater Quality

Since nearly all of the domestic, municipal, industrial, and portions of agricultural water for the Kings River service area are obtained by pumping groundwater, maintenance of a quality groundwater supply is essential. Local agencies continue to work on the best ways to manage and protect this resource including long-term water quality monitoring and improvement projects.

One of these projects is in an 126,000 acre area southwest of Fresno designated as **Groundwater Management Area A.** The monitoring program, part of the Kings River Conservation District's implementation of Area A's groundwater management plan, has been on-going since 1997 and includes field measurements of electrical conductivity, pH and temperature taken at predetermined pumping wells. Groundwater levels are also monitored. The program will allow for a consistent baseline for groundwater quality monitoring.

# Regional Coordination

In the Kings River region, local governments and water agencies are working together to develop comprehensive groundwater management strategies designed to take better advantage of the natural relationship between surface and groundwater. Coordinated management efforts of local and imported surface supplies along with groundwater are ongoing within the Kings River region and adjoining areas.

The Cities of Fresno and Clovis, the Fresno Metropolitan Flood Control District and the Fresno Irrigation District are involved in the cooperative implementation of a comprehensive surface and groundwater management effort. The main thrust of the long-standing Fresno/Clovis Area Recharge Program involves the use of flood control basins for recharge during the summer when they are not needed to control urban storm runoff. The program recharges an average of 60,000 acre-feet of surface water per year. The regional groundwater table also benefits from the intentional use of Fresno Irrigation District's unlined canals for an additional recharge of up to 80,000 acre-feet per year.

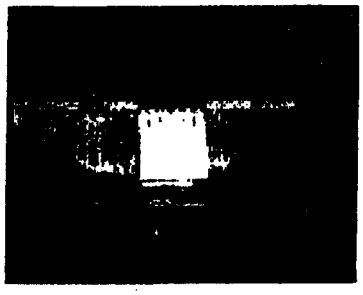
The McMullin Recharge Group was formed in 1999 to address the long-term water supply imbalance in the Raisin City area caused by the lack of surface water available for irrigation. Studies are being conducted to locate the best sites for recharge basins in the 148,000-acre project area. Members of the group include James Irrigation District, Mid-Valley Water District, Raisin City Water District, Tranquillity Irrigation District, Kings River Conservation District (KRCD), and Teranova Ranch, Inc.

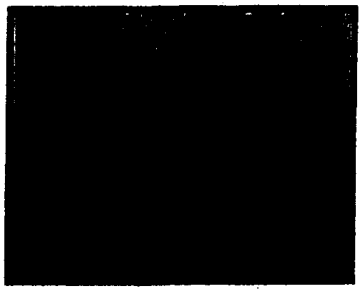
Water agencies from western Fresno and Kings counties have formed the North Fork Conjunctive Water Management Group to monitor potential projects and studies that can provide further benefits for the valley's water supply. Members include Murphy Slough Association, Crescent Canal Company, Stinson Canal and Irrigation Company, KRCD, Burrel Ditch Company, Liberty Canal Company and California Department of Water Resources.

The KRCD, Alta, Consolidated and Fresno irrigation districts are participants in a Integrated Storage Investigations Project to study varying water management options to help plan for the future water needs of California. Efforts specifically focus on development of facilities to capture and recharge floodwaters from the Kings River.

The Tulare Lake Basin Coordinated Groundwater Management Plan was developed and adopted in May 1995. The Plan encompasses over 250,000 acres and includes about 246,000 acres of productive agricultural farmland and approximately 4,500 acres of municipal and industrial land. Currently, Plan participants include seven public water districts, the City of Corcoran, and several private landowners. The Plan documents the local groundwater management practices, encourages the importation of surface water from the State Water Project, promotes efficient water practices and conservation programs and acts to preserve local groundwater management.

*Recognizing that the geography in the region is complex, groundwater strategies are focused on projects that address the unique hydrological conditions for specific areas. Most direct recharge projects are in the northern part of the region where the soils are best suited for percolation, while in lieu projects are predominantly in the southern part.*





# Environmental Benefits

Coordinating water supplies in the region through conjunctive use practices has environmental benefits such as reducing energy usage and enhancing water quality. As the groundwater table's downward trend is reversed, usage of energy for pumping is reduced. The region's air quality also benefits from reduced usage of diesel pumps.

A further example of the commitment to the environment can be seen in the Kings River Fisheries Management Program, a project to enhance the fisheries in the Kings River. Participants in the program include the 28 member agencies of the Kings River Water Association, the California Department of Fish & Game, and the Kings River Conservation District.

Agencies involved in Kings River groundwater management efforts include:

Alta Irrigation District
Burrel Ditch Company
Clovis Fork Reclamation District #769
Consolidated Irrigation District
Corcoran Irrigation Company
Crescent Canal Company
Fresno Irrigation District
Gravelly Ford Water District
Kings County Water District
Kings River Conservation District
Kingsburg Water Association
Kings River Water District
Liberty Canal Company
Lone Star Irrigation District
Murphy Slough Association
Orange Cove Irrigation District
Reed Ditch Company
Riverdale Irrigation District
Stinson Canal and Irrigation Company
Tranquillity Irrigation District
Tulare Lake Basin Water Storage District
Tulare Lake Canal Company
Tulare Lake Reclamation District #761
Upper San Jose Water Company

For more information on programs discussed in this brochure, please contact the following agencies:

**Consolidated Irrigation District Recharge Program**

Consolidated Irrigation District, 559-896-1661

**Apex Conjunctive Use Project**

Kings County Water District, 559-584-6412

**Waldron Pond**

Fresno Irrigation District, 559-237-7161

**Area A Groundwater Monitoring**

Kings River Conservation District, 559-237-5567
Mid-Valley Water District, 559-449-2700
Raisin City Water District, 559-498-8323

**Fresno/Clovis Area Recharge Program**

Fresno Irrigation District, 559-233-7161, Gary Serrato
City of Fresno, 559-261-8610, Martin McIntyre
City of Clovis, 559-324-2613, Alan Weaver
Fresno Metropolitan Flood Control District, 559-456-3194, Jerry Lakeman

**McMullin Recharge Group**

James Irrigation District, 559-693-4356
Kings River Conservation District, 559-237-5567
Mid-Valley Water District, 559-449-2700
Raisin City Water District, 559-498-8323
Tranquillity Irrigation District, 559-698-7225

**North Fork Conjunctive Water Management Group**

Burrel Ditch Company, 559-867-4457
California Department of Water Resources,
Crescent Canal Company, 559-866-5671
Kings River Conservation District, 559-237-5567
Liberty Canal Company, 559-867-3123
Murphy Slough Association, 559-866-8600, Mark McKean
Stinson Canal and Irrigation Company, 559-229-4740

**Integrated Storage Investigations Project**

Alta Irrigation District, 559-591-0800
Consolidated Irrigation District, 559-896-1661
Fresno Irrigation District, 559-233-7161
Kings River Conservation District, 559-237-5567
North Fork Conjunctive Water Management Group (see above)

**Tulare Lake Basin Coordinated Groundwater Management Plan - 992-4127**

Alpaugh Irrigation District
Angiola Water District
Atwell Island Water District
City of Corcoran
Corcoran Irrigation District
Lovelace Reclamation District No. 738
Melga Water District
Tulare Lake Basin Water Storage District
Private Landowners

**Kings River Fisheries Management Program**

Kings River Water Association, 559-266-0767
Kings River Conservation District, 559-237-5567
California Department of Fish and Game, 559-

# Appendix C

## Groundwater Management Program, Kings River Conservation District, Groundwater Management, Area "C"

# GROUNDWATER MANAGEMENT PLAN

# FOR

# KINGS RIVER CONSERVATION DISTRICT AREA "C"

**Prepared by the**

## KINGS RIVER CONSERVATION DISTRICT

**Adopted August 11, 1998**

**June 1998**

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| | |
|---|---|
| AB 3030 | California Assembly Bill 3030 |
| AF | Acre-Feet |
| Area "C" | Kings River Conservation District Groundwater Management Area "C" |
| CEQA | California Environmental Quality Act |
| CFRD | Clarks Fork Reclamation District |
| DWR | California Department of Water Resources |
| ET | Evapotranspiration |
| JHMWC | John Heinlen Mutual Water Company |
| JRWC | Jacob Rancho Water Company |
| KRCD | Kings River Conservation District |
| LCIC | Lemoore Canal and Irrigation Company |
| MOU | Memorandum of Understanding |
| MSL | Mean Sea Level |
| SAR | Sodium Absorption Ratio |
| TDS | Total Dissolved Solids |
| USBR | United States Bureau of Reclamation |
| USJWC | Upper San Jose Water Company |

# I. INTRODUCTION

## 1. General

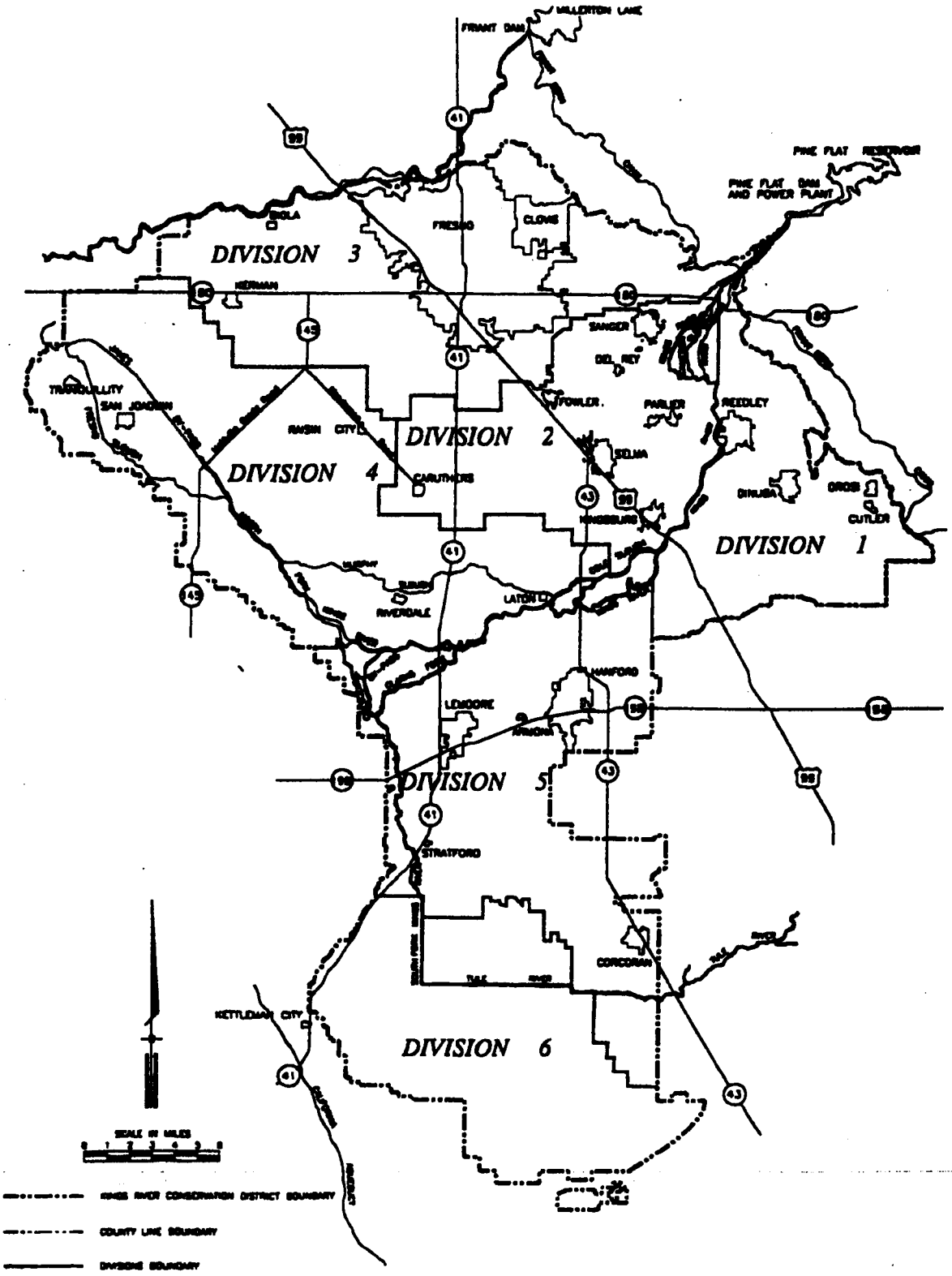
The Kings River Conservation District (KRCD) is a political subdivision of the State of California, covering an area of approximately 1,240,000 acres in Fresno, Kings and Tulare Counties in the Central San Joaquin Valley. KRCD was formed by the California Legislature in 1951 with the passage of the "Kings River Conservation District Act." The boundaries of KRCD and its six divisions are shown in Figure 1. KRCD's boundaries encompass the entire service area of the Kings River, which is the primary source of surface water for the area.

Subsequent to the implementation of California Assembly Bill No. 3030 (AB 3030) (Chapter 947 of the Statutes of 1992) which became law on January 1, 1993, KRCD's board of directors adopted Resolution of Intention No. 97-3 on March 11, 1997 to draft a groundwater management plan for KRCD Groundwater Management Area "C" (Area "C"). The management plan was adopted by the KRCD Board of Directors by Ordinance No. 99-1 on August 11, 1998. A legal description of Area "C" is included in Appendix A, a copy of Resolution 97-3 is included in Appendix B, and Ordinance No. 99-1 is included in Appendix C. Area "C" lies in the north central portion of Kings County, California, surrounding the City of Lemoore, encompassing approximately 53,000 acres.

In conjunction with the process of developing a draft plan for Area "C", KRCD shall include participation by such other local water entities within Area "C" that exist and may desire to participate. These local entities include Clark's Fork Reclamation District (CFRD), Jacob Rancho Water Company (JRWC), John Heinlen Mutual Water Company (JHMWC), Lemoore Canal and Irrigation Company (LCIC), and Upper San Jose Water Company (USJWC).

Figure 1

Kings River Conservation District Boundary and Divisions

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## 2. Purpose

The purpose of this groundwater management plan is to develop a coordinated approach to the evaluation and management of groundwater in Area "C". Effective groundwater management is important to Area "C" even though there is a good surface water supply available.

## 3. Goals

The goals of this groundwater management plan are to manage the groundwater within Area "C" in order to maintain current groundwater conditions related to quality and quantity. It is desirable to formulate and implement a plan at the local level rather than having management imposed by the state or federal government.

Upon its adoption, the goals of this plan will be carried out through the implementation of specific programs listed within the plan. The initial program will include the monitoring of: groundwater elevations, changes in storage, water quality, and conditions that may lead to groundwater contamination. If evaluation of data collected indicates a need, implementation of additional programs will be considered.

## 4. Authority

AB 3030, which became law on January 1, 1993 (California Water Code, Sections 10750 et seq.), authorized local public agencies that are within groundwater basins, as defined in California Department of Water Resources (DWR) Bulletin 118-80, and that meet certain other criteria, to prepare and adopt groundwater management plans. KRCD qualifies under the law. Area

"C" lies within portions of the Kings Groundwater Basin and the Tulare Lake Groundwater Basin as defined in Bulletin 118-80.

# II. EXISTING CONDITIONS

## 1. Description of Study Area

### A. Location

Area "C" contains approximately 53,000 acres that is adjacent to, but excludes, the City of Lemoore at its current and future city limits. Most of the area lies south of the Clark's Fork of the Kings River and east of the South Fork of the Kings River (Figure 2). The area is surrounded by the following water agencies: Westlands Water District, Stratford Irrigation District, Tulare Lake Basin Water Storage District, Last Chance Water Ditch Company, Kings County Water District, and Laguna Irrigation District.

### B. Topography

The topography is relatively flat with a slight trough centered along the Crescent by-pass and the South Fork of the Kings River. The entire trough is sloped downward from northwest to southeast (Figure 3). Ground surface elevations range from 190 feet in the southwest to 240 feet above mean seal level (MSL) in the northeast.

### C. Climate

The climate in this area is seasonal with mild winters and long, hot summers. Summer has an average daily high of 95°F and a low of 59°F. Winter has an average daily high of 57°F and an average daily low of 36°F. The growing season ranges from 225 to 275 days depending on location (SCS, 1986). These numbers reflect the trend in the San Joaquin Valley. Historical annual

Figure 2

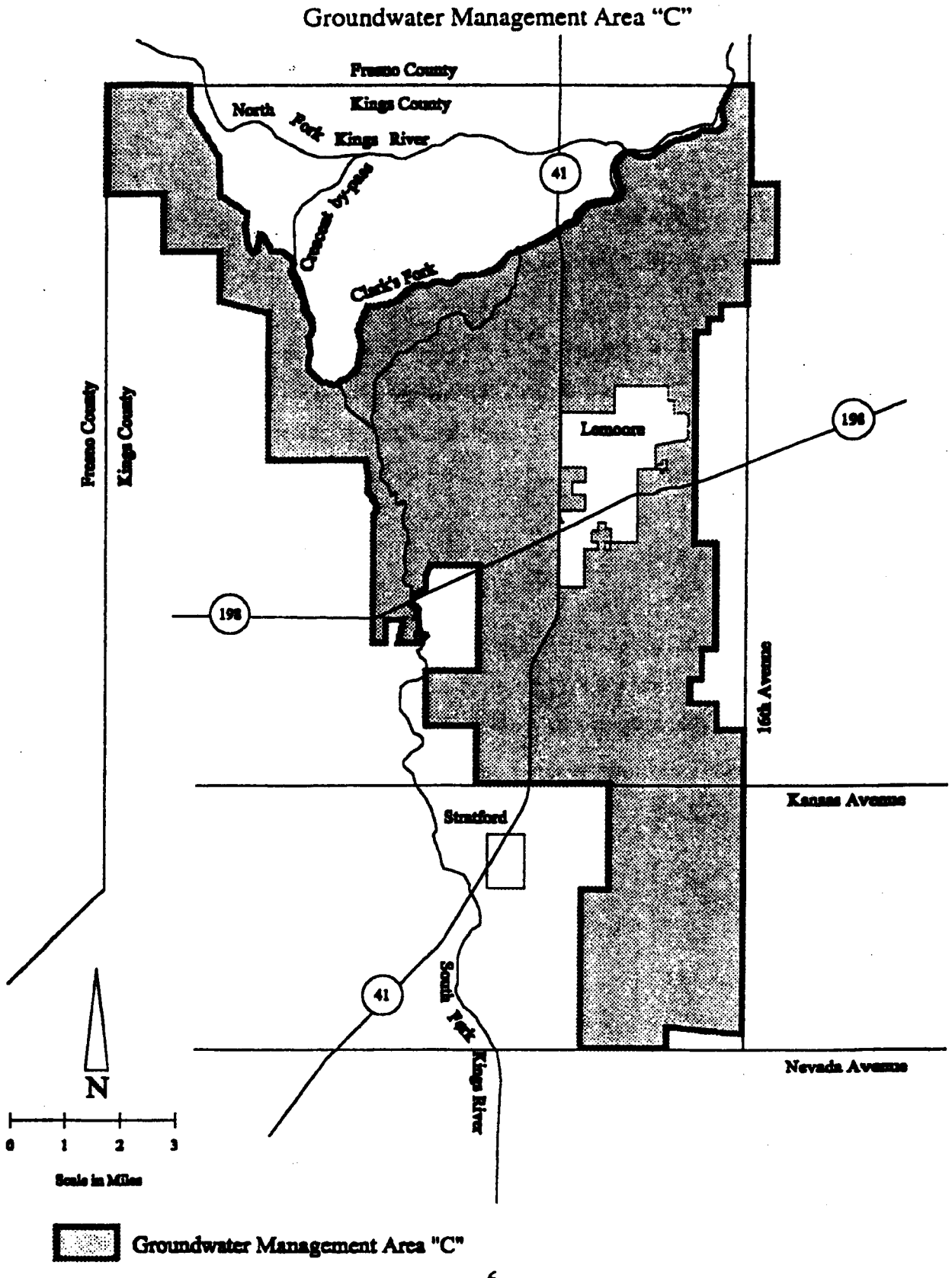


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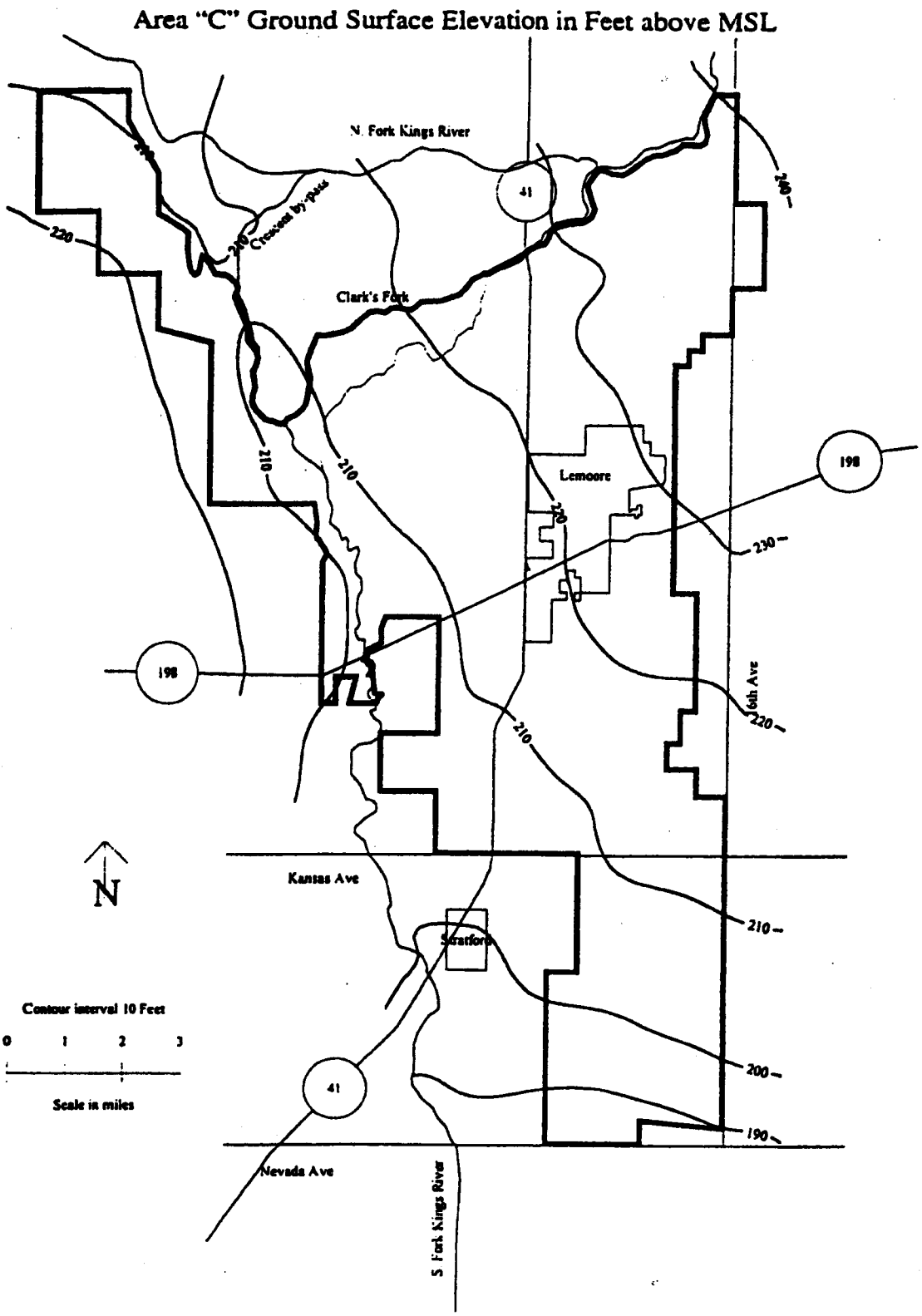
Figure 3


Area "C" Ground Surface Elevation in Feet above MSL
N. Fork Kings River
Clark's Fork
Crossed by pipe
Lemoore
Kansas Ave
Stratford
Nevada Ave
S Fork Kings River
16th Ave
198
41
220
210
200
190
230
N
Contour interval 10 Feet
0 1 2 3
Scale in miles

precipitation for this area has been low, averaging only 7.8 inches between 1958 and 1996, but has ranged from 3.4 inches in 1984 to 15.8 inches in 1978.

## 2. Water Supply

### A. Historical and Projected Water Supply

Area "C" is a conjunctive use area in that the water used in Area "C" comes from three sources; 1) surface supplies, 2) groundwater and 3) precipitation. An estimate of the amounts of inflow from surface supplies (the Kings River) and precipitation since the year 1958 are shown in Table 2 on page 26. An estimate of the outflow from the area is also shown in the table, expressed as evapotranspiration. In years with normal or greater precipitation, the primary source of irrigation water has been surface supplies. In dry years, the volume of groundwater pumped may have exceeded the surface supplies. In most years, water from all three sources has been used.

In the foreseeable future, the amounts of water that will be available to the area is expected to remain the same as the historical amounts.

### B. Additional Water for Groundwater Management

Kings River flood releases to the San Joaquin River average 198,000 AF annually (Kings River Water Association, 1997). During flood years, a portion of this is surplus water that could be delivered to groundwater recharge basins in the northern edge of Area "C" if they were available. It is not anticipated that other significant sources of water will be available in the near future.

## 3. Water Demand

### A. Land Use and History

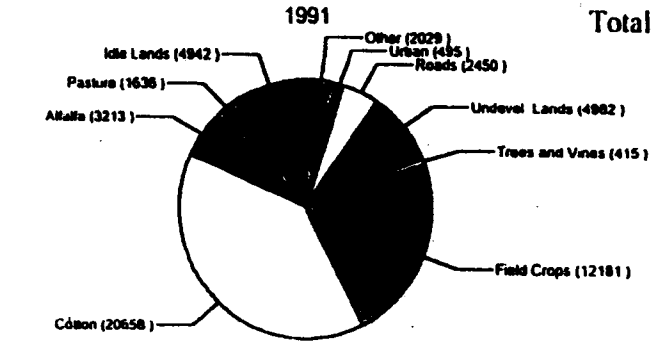
In 1958, 80 percent of the 53,000 acres in Area "C" were developed. Field crops (not including cotton) were the most widely grown crop, occupying approximately 40 percent of the total acreage. Field crops grown in Area "C" include cereal grains, rice, safflower, sugar beets, corn, and grain sorghum. Cotton is treated as an independent crop due to its significance in Area "C". By 1988 cotton consumed about 50 percent of the developed acres. Alfalfa, cotton, and field crops together comprised more than 70 percent of the total acreage from 1958 - 1991. During this same time period, developed land increased from 80 to 90 percent. The pie charts in Figure 4 show the land use distribution of Area "C" during five time steps from 1958 to 1991. Land use surveys conducted by DWR (1958, 1973, 1981, 1988, 1991) were used to determine these crop acreages.

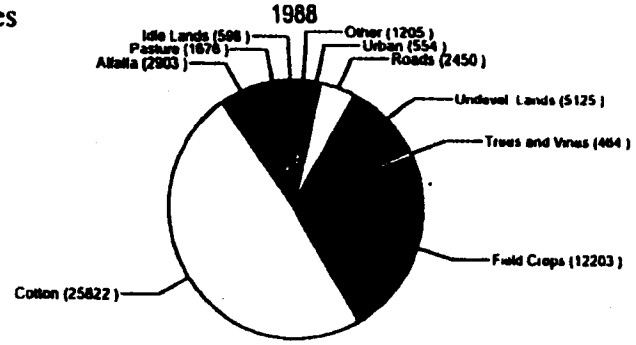
### B. Historical Water Demand

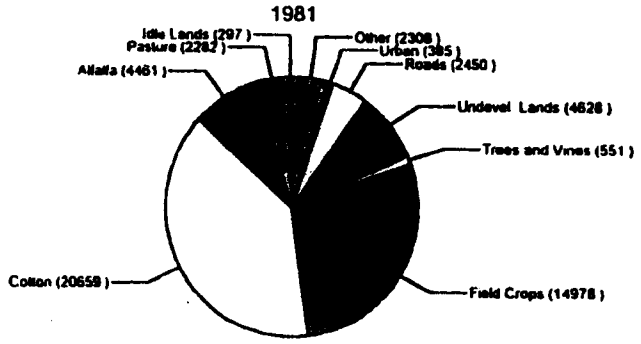
#### i. Municipal, Industrial and Domestic Water Demand

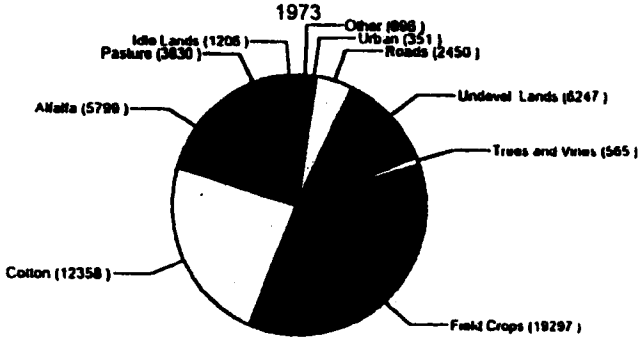
The combined municipal, industrial, and domestic water requirement for Area "C" has been insignificant, and was estimated to be approximately 176 AF in 1958 and 554 AF in 1988 calculated from DWR Land Use Surveys and evapotranspiration (ET) rates from KRCD (1994). This is less than 1 percent of the total water demand. Domestic water demand has not changed significantly from the late 1950's, consisting primarily of scattered single family units using wells for potable water. Water use within the city limits of Lemoore is not included in this plan.

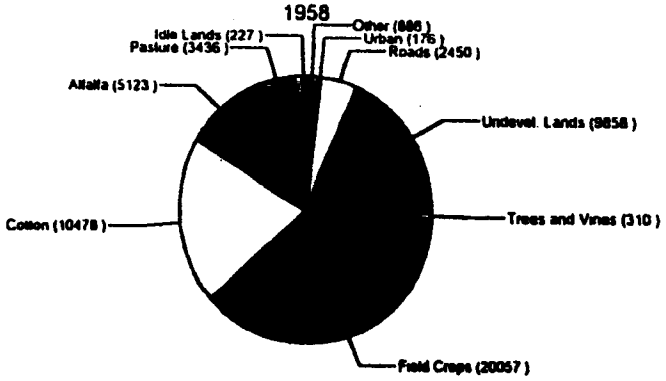
# Figure 4
## Land Use in Area "C"
### Total Area of 53,000 Acres



### ii. Agricultural Water Demand

As Figure 5 shows, agricultural water demand has increased since the 1950's. In 1958, the total water demand for Area "C" was 80,218 AF, calculated from DWR Land Use Surveys and evapotranspiration (ET) rates from KRCD (1994). By 1981 water demand had climbed to a peak of 7,027 AF. The increase of water demand is largely due to the conversion of undeveloped land into cropped land. In 1988 water demand dropped to 92,233 AF. This is due to a change in the cropping pattern from alfalfa to cotton. Annual crop ET for alfalfa is 4.1 AF/acre where cotton is only 2.2 AF/acre. In 1991 water demand continued to drop to 85,714 AF. This is due to the increase in idle land as a result of a drought reduced surface water supply and changes in the cropping pattern.

### iii. Other Demand

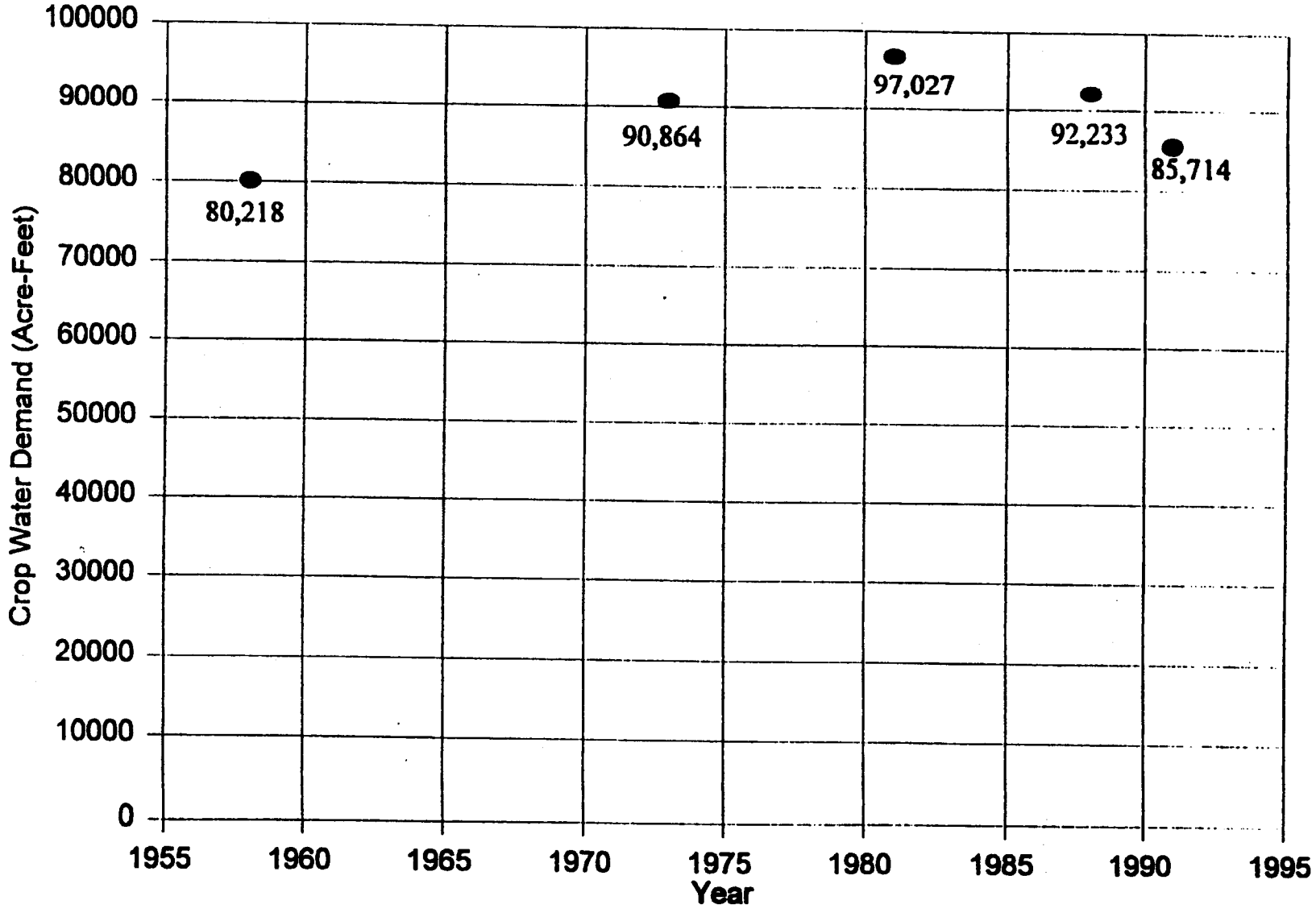
There is no known historical or current exportation of groundwater from Area "C".

## C. Projected Water Demand

### i. Municipal, Industrial and Domestic Water Demand

Municipal, industrial and domestic water requirements are expected to follow the trend set during the period from 1958 to 1991. This combined water demand is expected to remain less than one percent of the total water demand for Area "C".

Figure 5
Water Demand in Area "C"



### ii. Agricultural Water Demand

The expected average annual water demand is approximately 91,500 AF (Figure 5) for the foreseeable future. Water demand is expected to remain constant unless their is a major change in cropping pattern to crops of different water use, or an increase in cropped acreage.

### iii. Other Demand

There is not expected to be any significant change to the current distribution of water demand in the foreseeable future.

## 4. Water Quality

### A. Historical Quality

There is very little information on the water quality for the aquifers above the A and C clay in this area. Above the E clay the water is a sodium bicarbonate water averaging 300 ppm Total Dissolved Solids (TDS). Below the E clay, the water is a sodium sulfate type averaging 800 ppm TDS (Water Supply Paper 1999-H). According to a personal conversation with Alan Fultan, former Kings County Farm Advisor, the water being pumped in the northern half of Area "C" probably has a salinity level of 260 to 460 ppm TDS with a Sodium Adsorption Ratio (SAR) of 7 to 10. The water being pumped in the southern half of Area "C" probably has a TDS of 460 to 860 ppm with a SAR of 10 to 20. As TDS levels approach 900 ppm waters begin to approach the yield reducing threshold for the irrigation of some crops. The relationship between SAR and TDS indicated how poorly water will infiltrate the soil. Poor water infiltration requires additional farm management practices.

## B. Agricultural Water Quality Requirements

One of the issues that should be addressed in a groundwater management plan is the quality of water within the management area. A reduction in the quality of water beyond certain limits is equivalent to a loss in the useable water supply. Poor quality water can be treated but the costs are generally much higher than the cost of maintaining a high quality groundwater supply. Although considerable amounts of the salts in geological formations have dissolved, much remains and continues to contribute to the salt loading of the groundwater.

The threshold values of TDS where crop yields will be reduced are given in Table 1.

Table 1
Salinity Threshold for Yield Reduction

| Crop | TDS (ppm) |
|---|---|
| Barley | 5,120 |
| Cotton | 4,930 |
| Wheat | 3,840 |
| Tomatoes | 1,600 |
| Alfalfa | 1,280 |
| Corn | 1,090 |
| Peaches | 1,090 |
| Almonds | 960 |
| Vines | 960 |

To maintain optimum crop yield with the crops currently farmed in Area "C" it is essential that groundwater TDS levels be maintained well below the threshold levels. Specific ion levels can also limit crop yields even when TDS is not a factor (i.e. sodium).

## 5. Water Facilities in Study Area

### A. Water Supply, Storage, Distribution and Recharge Facilities

Water supplies for Area "C" vary from year to year and are dependent upon annual run-off of the Kings River. How this run-off is divided is based upon the complex set of agreements between the water rights holders. The volume of surface water available to Area "C" has historically fluctuated from a minimum of 28,715 AF in 1991 to a maximum of 109,021 AF in 1959.

The only general use water facility in the vicinity of Area "C" is the Kings River. There are a number of privately owned canals and ditches which deliver surface water from the Kings River to water users in Area "C".

Currently there are no designated recharge facilities within Area "C".

### B. Wastewater Treatment and Disposal/Reclamation Facilities

The City of Lemoore has a wastewater treatment facility within its city limits. Over half of the water from this facility is utilized by an area farm for irrigation purposes. The remaining communities within Area "C" are small and unincorporated and are not known to have wastewater treatment or reclamation facilities. Rural residential areas and farmsteads generally use septic systems.

### C. Groundwater Wells

#### i. Municipal

The City of Lemoore, which is excluded from this plan, acquires its municipal water supply entirely from wells, which are located within the

city limits. A portion of these wells are located in a well field approximately six miles north of the main city. Other rural residential areas have individual wells providing domestic water use for single family homes. A review of well logs submitted to DWR show the majority of the individual domestic water wells in Area "C" are completed in the aquifer between the A and C clay layers (Figure 6). The exceptions are the domestic wells in the southern most portion of the area which are completed at deeper depths.

### ii. Industrial

There is some industrial development in Area "C". The number of industrial wells is significantly less than the number of agricultural wells. There are three industrial wells which are shown by DWR well logs to be completed between the A and C clay layers.

### iii. Agricultural

Well driller's logs were obtained from DWR to study the area. All of the wells drilled in the area are not necessarily filed with DWR. The majority of the agricultural wells in the northeast portion of Area "C" pump from above the A clay (Figure 7). Wells pumping between the C and E clay layers are evenly distributed throughout the northern half (Figure 8). There is little pumping south of Kansas Avenue. Most of these wells which pump south of Kansas Avenue do so from below the C or E clay. Figure 9 shows wells completed below the E clay.

Figure 6
Location of Domestic Well Logs
Completed Between the A and C Clay

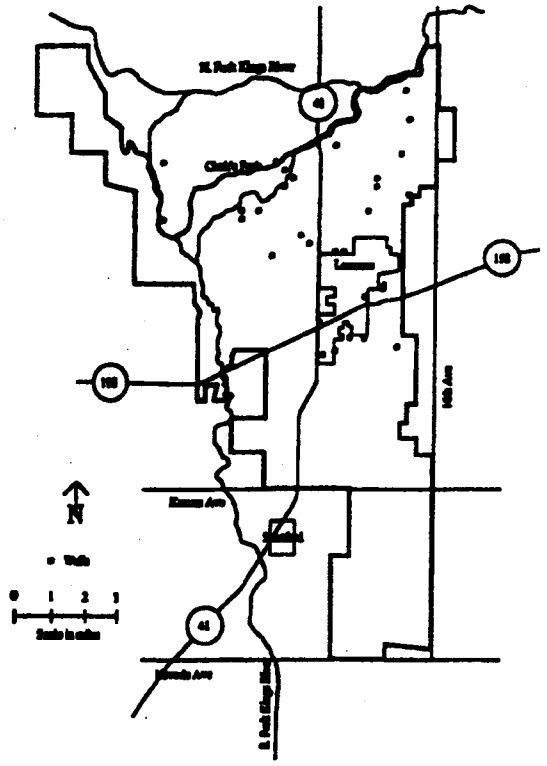


Figure 7
Location of Agricultural Well Logs
Completed Above the A Clay

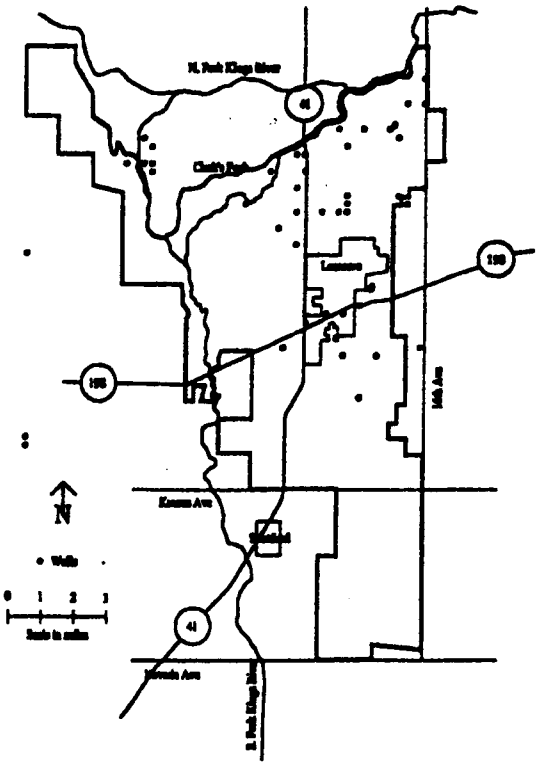


Figure 8
Location of Agricultural Well Logs
Completed Between the C and E Clay

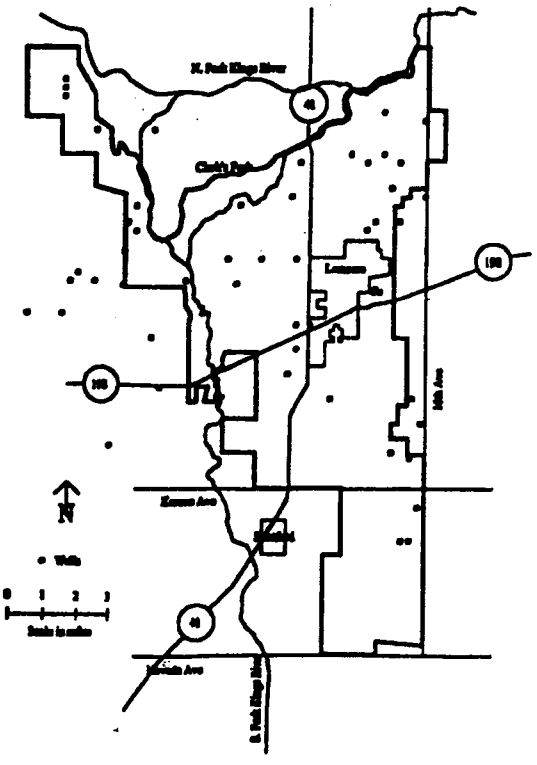
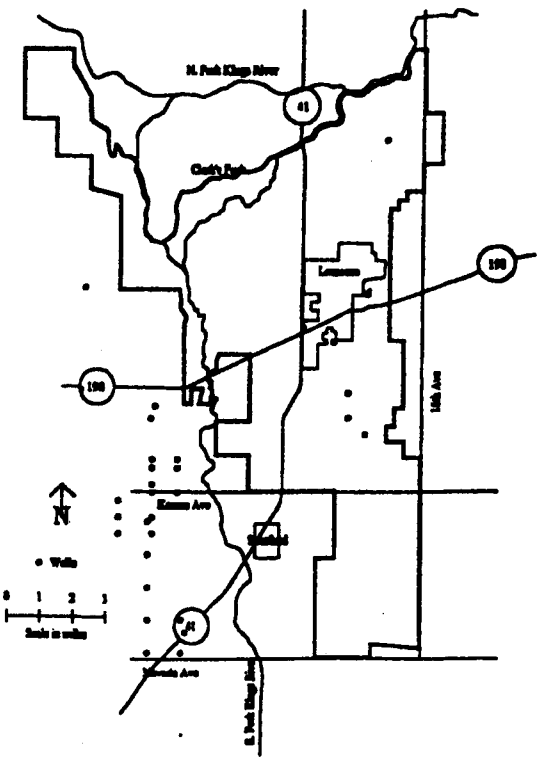


Figure 9
Location of Agricultural Well Logs
Completed Below the E Clay



## 6. Institutional Programs in Study Area

### A. Groundwater Level Monitoring Programs

The United States Bureau of Reclamation (USBR) and DWR both act as clearing houses to distribute well level data collected by local agencies, private water users, etc. Pacific Gas and Electric Company has historically performed pump tests in parts of Area "C" but the results of these tests are confidential.

### B. Groundwater Quality Monitoring Programs

No known routine groundwater quality monitoring program is active in Area "C". Occasional groundwater sampling has taken place on a study-specific basis but this data is typically not area-wide.

# III. EVALUATION OF GROUNDWATER CONDITIONS

## 1. Characteristics of the Aquifer

### A. Geology of the Groundwater Basin

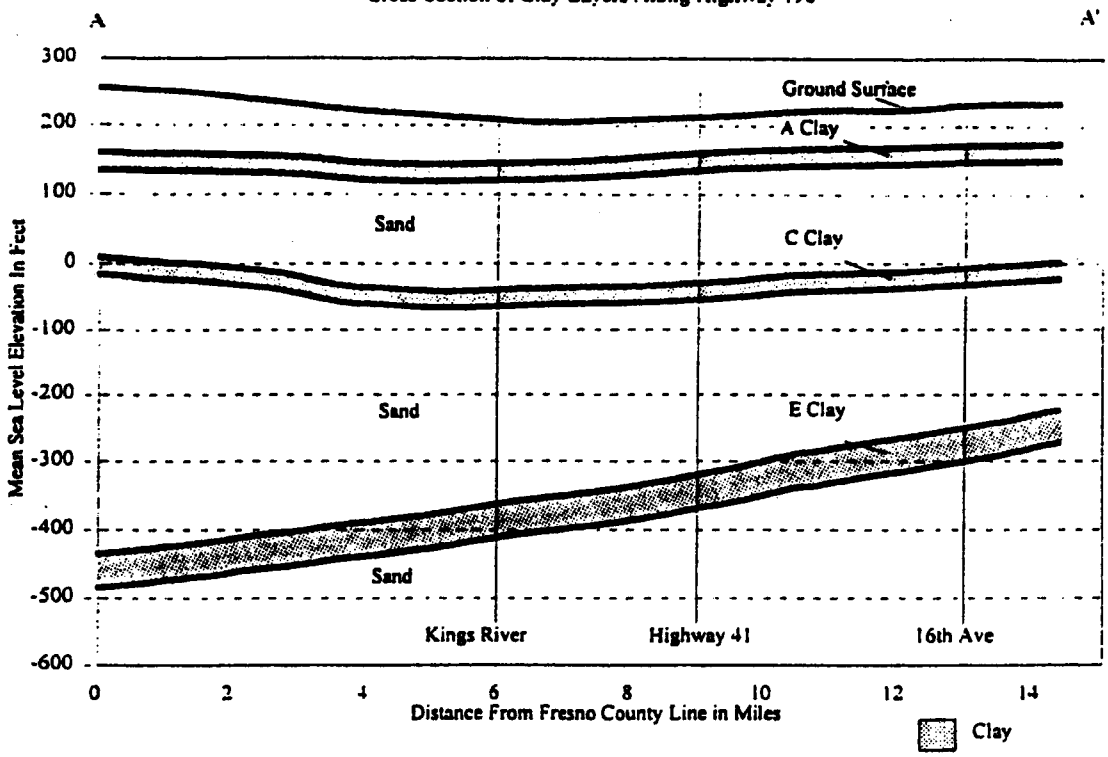
The surface soils in this area consist mainly of excessively drained soils in the northeast to poorly drained soils in the south (SCS 1986). The soils throughout Area "C" are composed mainly of fine to course sands.

There are four primary water bearing strata throughout Area "C". They are vertically bounded by three low permeability clay layers. These are commonly referred to as the A, C, and E (Corcoran) clay layers. There are also B, D, and F clay layers which are thin, inconsistent, and difficult to trace with any consistency. Therefore, their water confining characteristics were disregarded for this report. The southern portion of Area "C" is covered by the old Tulare Lake Basin deposits consisting of a nearly impermeable clay to an approximate depth of 300 feet below ground surface.

Cross-sections of these clay layers have been produced from United States Geologic Survey Studies (USGS, 1972). Figure 10 shows section A-A' along Highway 198 starting at the Fresno County line and extending easterly. Figure 11 shows section B-B' along Highway 41, starting at the Fresno county line and extending southerly along the highway until Kansas Avenue and then continuing directly south.

The A clay layer is an extensive geologic feature underlying Area "C". It is approximately 25 feet thick consisting of a nearly impermeable clay loam. This layer bounds the bottom of a shallow unconfined aquifer of highly permeable

Figure 10
Cross-Section of Clay Layers Along Highway 198



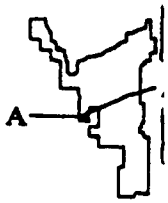
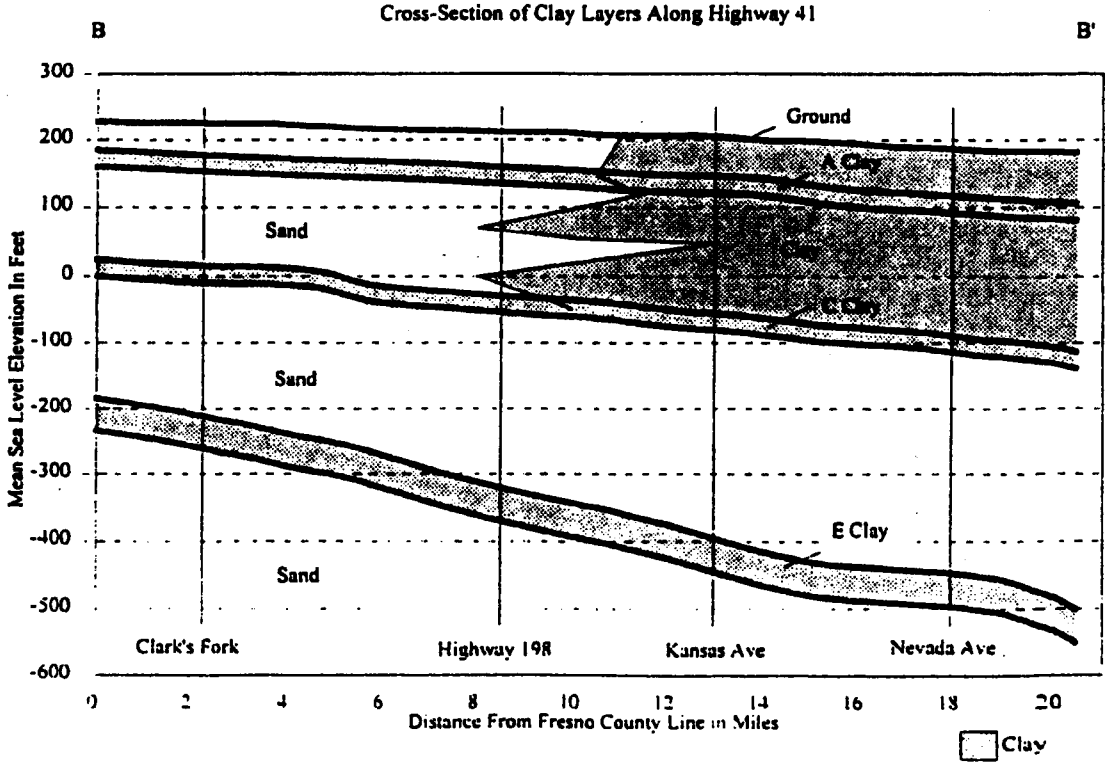
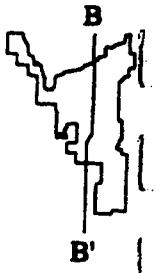




Figure 11
Cross-Section of Clay Layers Along Highway 41



gravel, very fine sand and silt. The bottom of the clay ranges in depth from 60 feet below the ground surface in the north to 90 feet in the south (Figure 12).

The C clay layer is also an extensive geologic feature similar to the A clay in that it is approximately 25 feet thick consisting of a nearly impermeable clay loam. Above this layer and below the A clay is a confined aquifer consisting of a highly permeable gravel, very fine sand, and silt. The bottom of the C clay ranges in depth below the ground surface from 230 feet in the north to 290 feet in the south (Figure 13).

The E clay layer is the third and deepest extensive geologic feature underlying Area "C". It is approximately 50 feet thick consisting of a nearly impermeable clay loam. Above this thick layer is a highly permeable gravel, very fine sand, and silt. The bottom of the clay ranges in depth below the ground surface from 420 feet in the north to 670 feet in the south (USGS, 1972) (Figure 14). Below this layer the soil consists of a highly permeable gravel, very fine sand and silt until approximately 1,100 feet below the ground surface. Around this level the aquifer blends into a finer soil type than above. Well logs indicate the deepest wells in the area reach a depth of approximately 2,200 feet.

## B. Hydraulic Conductivity of the Aquifers

Unpublished data was obtained from DWR (DWR, 1980) to approximate the hydraulic conductivity. Values range from a high of 79 feet per day in the north to a low of 4 feet per day in the south. These values are representative of aquifers comprised of fine to course sands (Driscoll, 1987).

Figure 14
Area "C" Depth in Feet to Bottom of E Clay

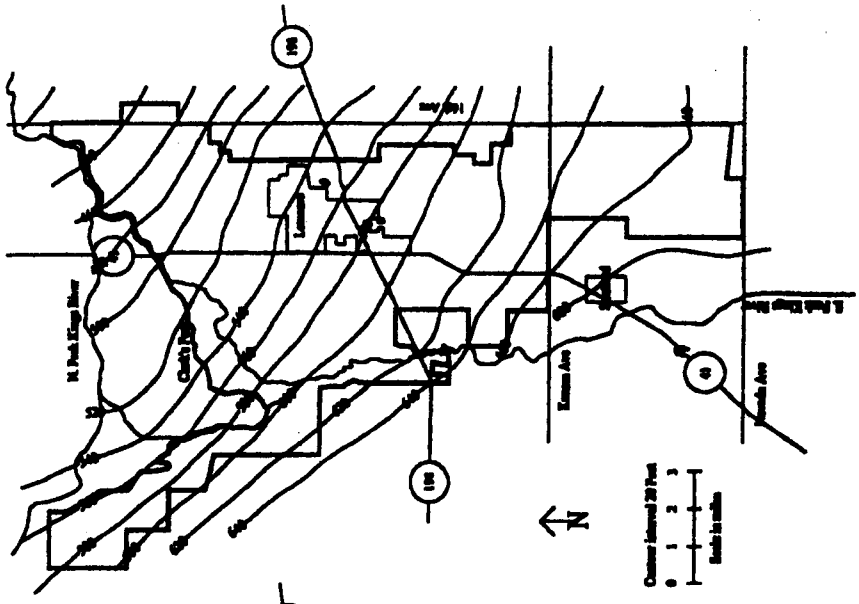


Figure 13
Area "C" Depth in Feet to Bottom of C Clay

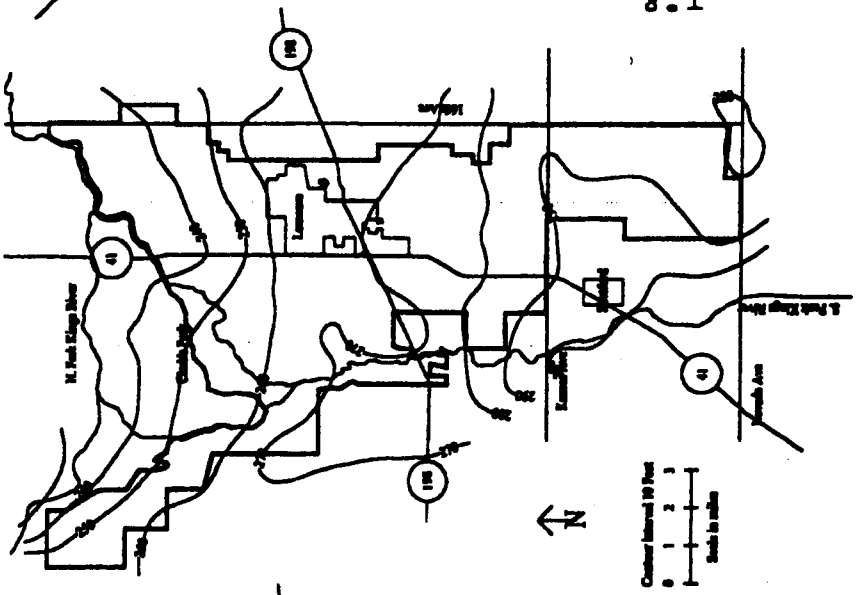
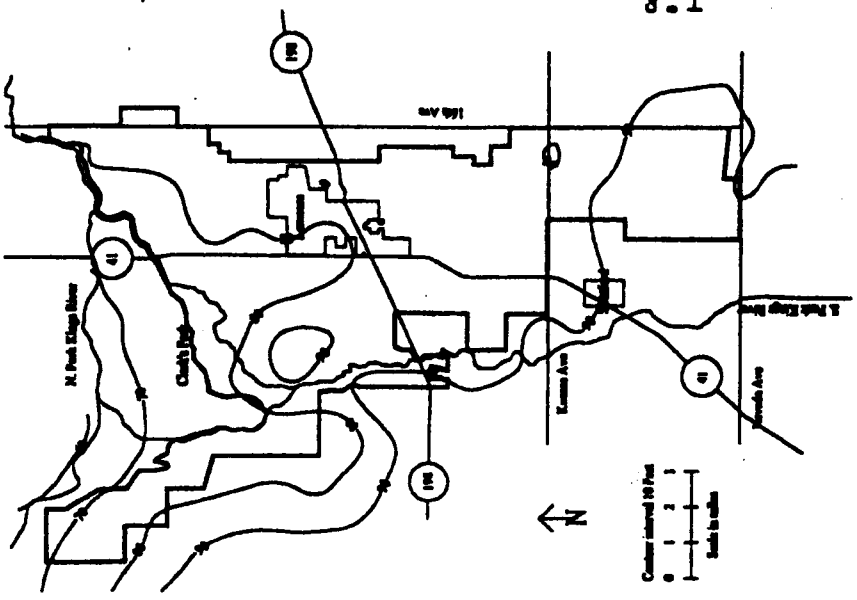


Figure 12
Area "C" Depth in Feet to Bottom of A Clay



## C. Capacity of the Groundwater Basin

The storage capacity of an unconfined aquifer is directly related to its specific yield, i.e. the higher the specific yield, the more water the aquifer holds. Specific yield can also be used with confined aquifers to give a general indication of aquifer capacity per unit depth. Again, unpublished data from DWR (DWR, 1980) was used to determine specific yield data. Values range from a high of 14.4 percent in the north to a low of 4.7 percent in the south.

## D. Recharge Characteristics

Currently all recharge in the north occurs through the Kings River. There are currently no recharge programs or designated artificial recharge facilities in this area. The use of surface water for irrigation has been a significant source of in-lieu recharge for the entire area.

The geology of Area "C" restricts any direct recharge programs for most of the area. Only a thin strip of Area "C" adjacent to the Kings River on the northern boundary has any direct recharge potential. Even before planning any facilities in this small area, detailed geological investigations would be essential to verify the suitability of the area for recharge operations.

Significant portions of Area "C", on the other hand, are well situated to implement indirect recharge programs such as in-lieu recharge. In-lieu recharge works well in areas with confined aquifers and many restricting layers within the aquifer system.

## 2. Groundwater Mapping

### A. Groundwater Monitoring Data

The basis for the groundwater study is data derived from depths to groundwater measurements in wells throughout the San Joaquin Valley. The well measurements are taken by a variety of local, city, state, and federal agencies.

These agencies then provide groundwater level measurements to the USBR and DWR. The agencies taking the actual field measurements in this area include DWR and LCIC. LCIC takes readings of the perched water within the crop root zone in conjunction with the Natural Resources Conservation Service. In order to perform a groundwater study focusing on Area "C", the data was obtained from wells selected from the USBR valley-wide database and LCIC.

Many readings obtained appeared to be measuring from various aquifers. Without having site specific well construction information on the depth the well is screened, it is nearly impossible to group wells pumping from the same aquifer. Therefore it is difficult to determine the existing regional groundwater trends from available data.

### B. Depth to Groundwater

Data obtained from USBR between 1978 and 1995 show the majority of the agricultural groundwater wells appear to be drawing from 3 different aquifers. The first aquifer is above the A clay with water levels ranging from 5 to 25 feet. The second aquifer is between the C and E clay with piezometric water levels ranging from 60 to 180 feet. The third aquifer is below the E clay with piezometric water levels ranging from 60 to 230 feet. All three of the aquifers

responded similarly, decreasing water levels during times of drought and recovering when surface water supplies are plentiful.

### C. Groundwater Storage and Movement

Since there is very little historical information, it was not possible to calculate the changes in storage or movement of groundwater.

## 3. Water Budget

The water budget, tabulated in Table 2, includes inputs from effective precipitation, seepage and riparian pumping, and surface water deliveries. The sole outflow component is crop ET. The balance column is calculated by subtracting the outflows from the inflows. However, the balance column does not account for subsurface groundwater flow into or out of Area "C". Subsurface groundwater flow was not calculated due to insufficient depth to groundwater data for each individual aquifer.

### A. Inflow

#### i. Effective Precipitation

The effective precipitation has provided an average of approximately 17,135 AF annually. Effective precipitation meets approximately 19 percent of the average water demand of Area "C".

#### ii. Kings River Seepage and Riparian Pumping

Area "C" is bordered on its north and west sides by the Kings River. The estimated annual seepage and riparian pumping from the Kings River into Area "C" ranges from a loss from Area "C" of 14,069 AF, to a gain of

## Table 2

## Area "C" Water Budget

| | Inflow | | | | Outflow | Balance* |
|---|---|---|---|---|---|---|
| Year | Effective Precipitation AF | Seepage Into Area "C" From the Kings River & Riparian Pumping AF | Surface Water AF | Subtotal AF | Evapotran-spiration AF | AF |
| 1958 | 26,603 | (2,573) | 80,592 | 104,622 | (80,218) | 24,404 |
| 1959 | 8,196 | (3,887) | 109,021 | 113,330 | (80,928) | 32,403 |
| 1960 | 14,389 | (2,183) | 37,421 | 49,627 | (81,637) | (32,011) |
| 1961 | 10,221 | (26) | 29,846 | 40,041 | (82,347) | (42,306) |
| 1962 | 15,934 | (10,910) | 87,496 | 92,520 | (83,057) | 9,463 |
| 1963 | 19,925 | (8,738) | 74,540 | 85,727 | (83,767) | 1,960 |
| 1964 | 12,746 | (4,556) | 79,251 | 87,441 | (84,476) | 2,965 |
| 1965 | 15,093 | (7,209) | 86,761 | 94,645 | (85,186) | 9,459 |
| 1966 | 11,019 | (4,386) | 85,177 | 91,810 | (85,896) | 5,915 |
| 1967 | 17,561 | (7,085) | 98,640 | 109,116 | (86,605) | 22,511 |
| 1968 | 13,897 | (5,654) | 82,814 | 91,057 | (87,315) | 3,742 |
| 1969 | 31,410 | 7,266 | 77,006 | 115,682 | (88,025) | 27,657 |
| 1970 | 18,146 | (3,074) | 85,791 | 100,863 | (88,735) | 12,129 |
| 1971 | 9,305 | (3,440) | 86,799 | 92,664 | (89,444) | 3,219 |
| 1972 | 8,781 | (5,632) | 71,739 | 74,888 | (90,154) | (15,266) |
| 1973 | 21,456 | (5,844) | 79,550 | 95,162 | (90,864) | 4,298 |
| 1974 | 15,708 | 765 | 95,225 | 111,698 | (91,634) | 20,064 |
| 1975 | 9,226 | 1,867 | 96,815 | 107,908 | (92,405) | 15,503 |
| 1976 | 20,157 | (5,099) | 62,979 | 78,037 | (93,175) | (15,138) |
| 1977 | 11,468 | (4,556) | 37,343 | 44,255 | (93,945) | (49,691) |
| 1978 | 34,890 | (2,533) | 78,247 | 110,604 | (94,716) | 15,888 |
| 1979 | 13,753 | (4,821) | 98,301 | 107,233 | (95,486) | 11,747 |
| 1980 | 17,018 | (4,827) | 99,214 | 111,405 | (96,257) | 15,148 |
| 1981 | 16,420 | (996) | 82,750 | 98,174 | (97,027) | 1,147 |
| 1982 | 23,836 | (2,969) | 96,218 | 117,085 | (96,342) | 20,743 |
| 1983 | 31,428 | 7,876 | 56,254 | 95,558 | (95,657) | (99) |
| 1984 | 7,540 | (579) | 90,963 | 97,924 | (94,972) | 2,952 |
| 1985 | 9,332 | 2,750 | 94,593 | 106,675 | (94,288) | 12,387 |
| 1986 | 15,844 | 7,094 | 75,701 | 98,639 | (93,603) | 5,037 |
| 1987 | 17,017 | (924) | 84,822 | 100,915 | (92,918) | 7,997 |
| 1988 | 15,593 | (3,052) | 65,013 | 77,554 | (92,233) | (14,679) |
| 1989 | 7,806 | (24) | 44,526 | 52,308 | (90,060) | (37,751) |
| 1990 | 10,386 | (12) | 29,639 | 40,013 | (87,887) | (47,874) |
| 1991 | 19,857 | 1,087 | 28,715 | 49,659 | (85,714) | (36,055) |
| 1992 | 19,456 | 6,482 | 32,652 | 58,590 | (85,714) | (27,123) |
| 1993 | 22,344 | (10,644) | 87,006 | 98,706 | (85,714) | 12,992 |
| 1994 | 18,477 | (4,882) | 69,061 | 82,656 | (85,714) | (3,057) |
| 1995 | 28,907 | (4,383) | 83,087 | 107,611 | (85,714) | 21,897 |
| 1996 | 27,118 | (14,069) | 105,459 | 118,508 | (85,714) | 32,795 |
| Sum | 668,263 | (104,380) | 2,947,029 | 3,510,912 | (3,475,541) | 35,371 |
| Min | 7,540 | (14,069) | 28,715 | 40,013 | (97,027) | (49,691) |
| Max | 34,890 | 7,876 | 109,021 | 118,508 | (80,218) | 32,795 |
| Ave | 17,135 | (2,676) | 75,565 | 90,023 | (89,116) | 907 |

* Balance is calculated as in this example: Balance = Inflow - Outflow; () indicate a loss to Area "C"

7,876 AF, averaging a loss of 2,676 AF annually from 1958 to 1996. These values were obtained from the Kings River Water Association's Annual Water Master Reports (KRWA, 1958-1996).

### iii. Surface Water

Surface water is delivered to Area "C" by CFRD, JHMWC, JRWC, LCIC, and USJWC. The average annual surface water delivery to Area "C" between 1958 and 1996 was 75,565 AF.

This number has been adjusted to account for canal bank ET, canal spill, canal evaporation and surface water delivered outside of Area "C" boundaries.

## B. Outflow

### i. Evapotranspiration

Evapotranspiration is the method by which water is lost to the atmosphere by transpiration of a plant and evaporation from the soil surface in the vicinity of the plant. ET values in Table 2 are adjusted to account for the effects of salinity, soil conditions, and perched water table. Since there is no groundwater export, ET is the only component of water demand in Area "C", amounting to over 97,000 AF in 1981. Groundwater pumping is necessary to meet the difference between surface water deliveries and ET during drought.

### ii. Groundwater Export

There is no outflow from Area "C" due to groundwater export at this time.

## C. Balance

The majority of the water demand in Area "C" is met by surface water deliveries from CFRD, JRWC, JHMWC, LCIC, and USJWC. Balance is calculated by what remains after ET is removed from effective precipitation, seepage from the Kings River, and surface water deliveries. For the period between 1958 and 1996, the calculated annual inflow averaged 90,023 AF, 101 percent of the annual average water demand. The result of Table 2 indicates that Area "C" is not in groundwater overdraft.

## IV. MANAGEMENT PLAN COMPONENTS

A successful groundwater management program does not have to include all plan components, but it is important that all components be specified and discussed in the event that they must be used. If funding is required for implementation of a plan item, an election shall be held with the majority of the votes cast determining if the proposition passes or fails. The following list is not intended to be an exhaustive list and can be amended in the future as necessary.

### 1. Control of Saline Water Intrusion

There are no known occurrences of saline water intrusion within Area "C". There are known areas where a shallow perched saline water table exist. These areas occur mainly in the southern portion of Area "C". This is not considered to be saline water intrusion for the purpose of this groundwater management plan. With the establishment of a monitoring program, any intrusion can be identified. If an intrusion is identified, then at that time a plan will be developed to deal with the problem.

### 2. Identification and Management of Wellhead Protection Areas and Recharge Areas

Issues of wellhead protection for Area "C" should be adequately covered by current county, state, and federal laws and regulations. If inadequacies are found, KRCD will work to cooperate with the appropriate agency in correcting the deficiency.

### 3. Regulation of the Migration of Contaminated Groundwater

KRCD's intent is not to take the responsibilities of any regulatory agency such as the State Water Resources Control Board or U.S. Environmental Protection Agency.

KRCD will, however, cooperate with the regulatory agencies to aid in maintaining the best practical quality water supply for Area "C".

**4. Administration of a Well Abandonment and Destruction Program**

Wells that are improperly abandoned could lead to the contamination of the groundwater, and inter-aquifer mixing.

The responsibility for administration and enforcement of a well abandonment and destruction program will be left to Kings County Public Works Department. The county has a program in place that follows rules and regulations explained in DWR bulletins 74-81 and 74-90.

**5. Mitigation of Conditions of Overdraft**

The water budget for Area "C" does not show a history of long term overdraft, or indicate that the area is headed in that direction. If conditions in Area "C" change significantly, leading to overdraft of the groundwater basin, options for mitigating overdraft would be pursued. Some of the options include land fallowing, changing to lower water-use crops, land retirement, and limiting pump extractions. However, the limitation of pump extractions would be a last resort. It is to prevent excessive state or federal actions such as this that KRCD is preparing a local plan.

**6. Replenishment of Extracted Groundwater**

Groundwater replenishment is not currently a high priority in Area "C". The underlying basin appears to be in balance. If groundwater replenishment becomes necessary, three decisions will need to be made; where to get an additional water supply, how to use it, and how to deliver the water. Due to the aforementioned

questions, most replenishment programs would require feasibility studies, design, and construction prior to implementation.

## 7. Monitoring Groundwater Levels and Quality

KRCD plans to investigate the possibility of groundwater monitoring for quantity and quality as soon as possible. USBR, DWR, and local water districts monitor and report well depths but there are a limited number of monitored wells in Area "C". The limited number of wells along with multiple aquifers underlying Area "C" inhibits an accurate assessment of the groundwater conditions. Sporadic water quality monitoring has taken place in the past but no routine monitoring program has been established. It is important to begin such a program to establish whether or not the water supply for this area is in a process of slow degradation or if practices in surrounding areas are affecting local water quantity or quality.

## 8. Facilitating Conjunctive Use

Conjunctive use practices have been and will continue to be an essential part of water management for Area "C", due to fluctuating surface water supplies. Conjunctive use operations currently consist of surface water deliveries from the Kings River to property owners and stockholders when surface water is available. When surface water is not available irrigation demand must be met by groundwater pumping. It is anticipated that no change to this system will occur. If opportunities evolve that will allow greater flexibility of the system, these options will be investigated.

### A. Education

It is foreseen that education efforts would be used to support conjunctive use practices. This information/education effort could be accomplished through the use of newsletters and meetings. A quarterly publication such as the KRCD

Newsletter could be distributed to all the landowners in Area "C". Each issue could feature a different aspect of groundwater management and how it might be implemented for the area. Also, the newsletter could contain updates on groundwater elevations, storage/overdraft, and possibly water management tips.

### B. Water Management Program

KRCD already has a Water Management program in place to review grower's irrigation systems, evaluate irrigation scheduling and power time of use, and offer suggestions for improvement. Although improved irrigation management may not reduce groundwater overdraft or provide additional water, it can prevent groundwater quality degradation, and potentially improve crop yields. Over-irrigation can leach nitrogen, salts, and pesticides through the root zone and eventually into the groundwater table. This program is available in Area "C" for any interested grower.

## 9. Well Construction Policies

Kings County Public Works Department currently regulates well construction policies in the county. These duties will be retained and administered by the county under this plan.

## 10. Construction and Operation of Groundwater Management Facilities

Current conditions and knowledge show the groundwater in Area "C" as being in balance. As long as conditions do not undergo a change that results in a deterioration in the balance, the development of groundwater management facilities will be unnecessary. However, if the balance deteriorates, planning and development of some facilities may become necessary. This process would include conducting an economic feasibility study, design engineering, determination of methods of

financing, and adherence to applicable environmental regulations. If financing of the project is to include assessments or fees, a public election must be held at which the majority of the votes cast must be in favor of the assessments of fees in order for them to be collected.

## 11. Relationships with State and Federal Regulatory Agencies

The development of relationships with state and federal regulatory agencies will be an important part of an ongoing groundwater management plan. This plan will be submitted to DWR. Water level and quality monitoring data may be provided to other agencies on a regular basis. Groundwater management activities will be coordinated with other groundwater management agencies within the Kings and Tulare Lake Groundwater Basins.

## 12. Land Use Plans

A program will be implemented for review of land use plans and coordination with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination and depletion.

# V. RECOMMENDED GROUNDWATER MANAGEMENT PROGRAM

## 1. Program

KRCD is recommending the immediate implementation of the following items of the groundwater management plan into a groundwater management program:

- Determine the feasibility of groundwater monitoring programs for Area "C".
- Establishment of an education/information program on groundwater.
- Develop relationships with regulatory agencies and other groundwater management agencies within the Kings and Tulare Lake Basins.

## 2. Memorandums of Understanding

Upon adoption of the groundwater management plan KRCD will begin work with the private water companies and the public district serving Area "C" to develop mutually agreeable memorandums of understanding (MOU) (Appendix D). These MOU's are not required by law. The MOU's should allow each entity sufficient autonomy to direct management activities within their service area while maintaining uniformity of actions within Area "C". Also included within the MOU's should be language addressing the duties of each party and how to deal with financing management activities.

## 3. Fees

If in the event the level of effort in the management programs increases to design and construction of groundwater management facilities the determination of who will pay and how much will be set at that time. If general assessments are required and are

outside the current powers of the district, but within the powers of AB 3030, it will be necessary to hold public elections for the approval of groundwater management assessments.

## 4. Time Lines

Upon adoption of the groundwater management plan the following time line will be put into place:

- Develop relationships with other agencies immediately.
- Begin educational efforts within 6 months.
- Enact MOU's within one year.
- Begin monitoring programs within two years if feasible.

## 5. No Action

If no action is taken towards active groundwater management by local agencies within California it is anticipated that Federal, State or other agencies may resort to more stringent legislation related to groundwater use.

## REFERENCES

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## GLOSSARY OF TERMS

Note: The definitions presented are not all-inclusive but are presented for the benefit of the reader of this report. The terms included may have other broader definitions that do not apply to this report and are not presented here.

***Active Recharge***-- see Recharge, Active

***Acre-Foot (AF)*** -- A unit of water volume equal to 43,560 cubic feet or approximately 325,800 gallons.

***Alluvial Fan***-- A gradually sloping mass of sands and clays which are deposited by slow moving water entering a plane.

***Aquifer***-- A water-bearing formation that is sufficiently permeable to transmit and yield water in usable quantities; usually composed of gravel, sand, or other course-textured particles.

***Confined Aquifer***-- A formation in which the groundwater is isolated from the atmosphere at the point of discharge by impermeable geologic formations. A confined aquifer is usually subject to pressure greater than atmospheric.

***Conjunctive Use***-- The planned joint use of surface and groundwater to improve the reliability, economic and firm yield of the total water resource.

***Crop Water Demand***-- Estimated evapotranspiration of a field or region.

***Effective Precipitation***-- The amount of rain that can actually be used by a crop to meet evapotranspiration requirements.

***Evapotranspiration (ET)***-- The method by which water is lost to the atmosphere by transpiration of a plant and evaporation from the soil surface in the vicinity of the plant.

***Groundwater*** (as defined by AB 3030)-- All water beneath the surface of the earth within the zone below the water table in which the soil is completely saturated with water.

***Groundwater Basin***-- Any basin defined in DWR Bulletin 118-80.

***Groundwater Management Plan***-- A document that describes activities intended to be investigated to stabilize and/or improve groundwater conditions within a defined area.

***Groundwater Management Program***-- Coordinated and on-going activities undertaken for the purpose of implementing the Groundwater Management Plan.

***Hydraulic Conductivity***-- The measure of how effectively groundwater moves through a porous media (soil or aquifer), expressed as feet per day.

***In-Lieu Recharge***-- see Recharge, In-Lieu

***Land Use Plans***-- Refers to city and county land use and zoning ordinances.

***Overdraft***--The volume of water removed from an aquifer or similar holding basin that is greater than the amount entering that aquifer or holding basin..

***Passive Recharge***-- see Recharge, Passive

***Perched Water Table***-- see Water Table, Perched.

***Permanent Crops***--Agricultural plants such as grape vines and fruit or nut trees that are not replanted on an annual or bi-annual basis.

***Piezometric Surface***--An imaginary surface representing the level to which groundwater will rise in a well as a result of the pressure under which it is confined in an aquifer.

***Plan***-- see Groundwater Management Plan

***Program***--see Groundwater Management Program

***Root Zone***-- The strata of soil immediately below the ground surface that contains plant roots; the portion of soil that can hold water for use by crops.

***Recharge, Active***-- Any of various means of intentionally causing surface water to percolate into the groundwater in order to increase the volume of water stored in the groundwater table, such as percolation ponds or basins, flood storage basins, intentional over-irrigation, routing flood and irrigation water through unlined canals, etc.

***Recharge, In Lieu***-- Intentionally using water sources besides groundwater (such as flood water, surface water, or imported water) in order to avoid making extractions from the groundwater.

***Recharge, Passive***-- Any of various means in which surface water, through no effort of man, percolates into the groundwater, such as seepage from rivers, lakes, canals, and rainwater; lateral flow.

***Seepage***-- The process of water flowing through soil pore spaces, primarily due to the force of gravity.

***Specific Yield***--The ratio of the volume of water that a given aquifer will yield by gravity to that aquifer's volume, usually expressed as a percent.

***Static Water Level***-- The level of water in a well that is not being affected by withdrawal of groundwater.

***Subsurface Flow***-- The flow of groundwater through a porous media (aquifer) that exits a defined boundary.

***Unconfined Aquifer***-- An aquifer that is not restricted from above by an impermeable layer or other formation and in which the water contained is under the pressure exerted by the overlying atmosphere and water. The water table in an unconfined aquifer will fluctuate with extraction and recharge.

***Vadose Zone***-- An unsaturated portion of the soil between the ground surface and the water table.

***Water Banking***-- A technique by which an entity, such as a water district, stores water in the groundwater storage space of another entity, to be extracted in the future.

***Water Budget***-- A method of accounting for the quantity of water that enters, exits and is stored within a defined boundary.

***Water Demand***-- The volume of water required to meet the consumptive needs of a crop (i.e. evapotranspiration) or human activity.

***Water Level, Composite***-- The water table measured in a well that penetrates several water bearing formations.

***Water Table***--The surface between the vadose zone and the groundwater; that surface of a body of unconfined groundwater at which the pressure is equal to that of the atmosphere.

***Water Table, Perched***-- Unconfined groundwater separated from an underlying main body of groundwater by unsaturated material.

***Well Field***-- A group of wells used to pump groundwater for delivery to users.

# APPENDIX A

## Legal Description of Groundwater Management Area "C"

Checked & Verified
By
Date 8/14/98

# GROUNDWATER MANAGEMENT AREA "C"
# KINGS RIVER CONSERVATION DISTRICT

## DESCRIPTION

BEGINNING at the northwest corner of Section 6, Township 18 South, Range 19 East, Mount Diablo Base & Meridian, thence easterly along the north line of Sections 6 and 5 to the north quarter corner of Section five; thence south along the north-south center line of Section 5 to the point of intersection of said centerline with the foot of the north bank of the Crescent Canal; thence along the foot of the north bank of the Crescent Canal, S. 56° 00' E., 460 feet; S. 47° 00' E., 1320 feet; S. 78° 10' E., 900, feet; S. 37° 50' E., 170 feet to a point in the centerline of Boggs Slough; thence southerly along the center of Boggs Slough through Sections 5, 8, 9, 16, 21, 22, 27, 34, and 35 to a point in said Section 35 where the said Boggs Slough intersects Clarks Fork of Kings River; thence northeasterly along the north bank of Clarks Fork of Kings River through Sections 35, 26, 25 and 24 to a point in the east line of Section 24; thence in Township 18 South, Range 20 East, continuing along the north bank of Clarks Fork of Kings River through Sections 19 and 20 to a point where said bank intersects the north bank of South Fork of Kings River; thence northeasterly along the north bank of the South Fork of Kings River through Sections 20, 17, 16, 15, and 10 to a point where said bank intersects the north bank of the Kings River; thence northeasterly along the north bank of the Kings River through Sections 10, 11, 2, and 1 to a point in the north line of said Section 1; thence easterly along the north line to the northeast corner of Section 1; thence southerly along the east line of Sections 1 and 12, Township 18 South, Range 20 East, M.D.B.&M.; to the northwest corner of the southwest quarter of the southwest quarter of Section 7, Township 18 South, Range 21 East, M.D.B.&M.; thence east one-half mile to the intersection with the north-south centerline of said Section 7; thence southerly along the north-

south centerline of Sections 7, 18, and 19 to the southeast corner of the northeast quarter of the northwest quarter of section 19; thence west one-half mile to the intersection with the east line of Section 24, Township 18 South, Range 20 East, M.D.B.&M.; thence southerly along the east line of Section 24 to the northeast corner of Section 25; thence westerly to the north quarter corner of Section 25; thence southerly to the southeast corner of the northeast quarter of the northwest quarter of said Section 25; thence westerly to the northwest corner of the southeast quarter of the northwest quarter of said Section 25; thence southerly to the southwest corner of the southeast quarter of the northwest quarter of said Section 25; thence westerly to the east line of Section 26; thence southerly along the east line of Sections 26, and 35, Township 18 South, Range 20 East, M.D.B.&M.; thence southerly along the east line of Sections 2, 11, and 14, Township 19 South, Range 20 East, M.D.B.&M.; to the east-west centerline of said Section 14; thence easterly one-half mile along the east-west centerline to the center of Section 13; thence southerly along the north-south centerline of Sections 13, 24, and 25 to the center of said Section 25; thence westerly to the southwest corner of the southeast quarter of the northwest quarter of said Section 25; thence southerly to the north line of Section 36; thence westerly to the northwest corner of said Section 36; thence southerly along the west line of Section 36 to the west quarter corner of said Section 36; thence easterly along the east-west centerline to the center of said Section 36; thence southerly along the north-south centerline to the intersection with the north line of Section 1, Township 20 South, Range 20 East, M.D.B.&M.; thence easterly to the northeast corner of said Section 1; thence southerly along the east line of Sections 1, 12, 13, 24, 25, and 36 to the foot of the south bank of the Tulare Lake Canal; thence northwesterly along the south foot of the Tulare Lake Canal through Sections 36 and 35 to the northwest corner of Lot 55, recorded in Book 26, Page 35 of Licensed Surveyors Plats, County of Kings, State of

California; thence southerly along the west side of Lot 55 to the south line of Section 35; thence westerly along the south line of Sections 35 and 34 to the southwest corner of Section 34; thence north along the west lines of Sections 34, 27 and 22 to the northwest corner of said Section 22; thence easterly along the south line of Section 15 one-half mile to the south quarter corner of said Section 15; thence north along the north-south centerline through Sections 15 and 10 to the north quarter corner of Section 10; thence west two and one half miles along the north lines of Sections 10, 9, and 8 to the northwest corner of the said Section 8; thence north along the east line of Section 6 one mile to the northeast corner of Section 6; thence west to the northwest corner of the said Section 6 Township 20 South, Range 20 East, M.D.B.&M.; thence north along the east line of Section 36, Township 19 South, Range 19 East, 4740 feet to the base of the reclamation levee on the east bank of the Kings River; thence following the base of the said river levee in a northeasterly direction to a point 4389 feet west of the southeast corner of Section 30, Township 19 South, Range 20 east, M.D.B.&M.; thence easterly along the south line of the said Section 30, 4389 feet to the southeast corner of Section 30; thence northerly along the east line of Sections 30 and 19 to the northeast corner of said Section 19; thence westerly along the north line of the said Section 19, to a point 442 feet east of the northwest corner of said Section 19; thence S. 22° 16' 07" W., 1124.77 feet more or less to a point on the west line of said Section 19, said point being S. 0° 52' 03" E., 1041 feet from the northwest corner of said Section 19, thence south along the west line of said Section 19, S. 0° 52' 03" E., 1325.08 feet more or less to a point N. 0° 52' 03" W., 280.03 feet from the one-quarter common to Sections 19 and 24, said point being also on the Northerly right-of-way line of State Highway 198 Freeway; thence, in Section 24, Township 19 South, Range 19 East, M.D.B.&M.; along said northerly right-of-way line of said State Highway, S. 60° 47' 44" W., 1285.23 feet; thence S. 62° 05' 04" W., 134 feet; thence

leaving said northerly right-of-way line, S. 8° 18' 44" W., 108.42 feet to a point in the centerline of the new State Highway 198 Freeway at Engineers Station 320+00.00; thence S. 0° 28' 29" W., 339 feet to a point on the main Reclamation levee on the east side of the Kings River; thence leaving said levee S. 0° 12' E., 515.52 feet to a point; thence S. 59° 1' W., 73.93 feet to a point on the east side of the Kings River, thence following along said east side of Kings River S. 64° 47' E., 154.42 feet; thence S. 78° 4' E., 282.15 feet; thence S. 32°27' E., 362.68 feet; thence S. 6° 36' W., 204.14 feet; thence S. 26° 3' W., 644.50 feet more or less to a point on the south line of Section 24, Township 19 South, Range 19 East, M.D.B.&M.; thence along said south line, S. 89° 20' E., 256.38 feet; thence into Section 25, S. 11° 25' W., 83.00 feet to a point on the main Reclamation levee on the east side of the Kings River; thence continuing along said levee S. 15° 50' E., 400 feet; thence S. 0° 16' E., 281 feet; thence S. 1° 35' W., 200 feet; thence S. 12° 16' E., 327 feet; thence S. 10° 32' E., 406 feet; thence S. 58° 9' E., 242 feet; thence N. 86° 21' E., 375 feet, thence S. 19° 24' E., 78.19 feet more or less to a point on said main River levee; thence S. 49° 00' W., 385 feet; thence along the line of the main reclamation levee on the east bank of Kings River S.19° 45' W., 522 feet to a point 60 feet west of the quarter corner between Sections 25 and 30; thence westerly along the east-west centerline of Section 25, Township 19 South, Range 19 South, M.D.B.&M.; to a point on the east side of the west levee of Empire Pool #1; thence following the levee N. 15° 51' E., 838.55 feet; thence N. 22° 24' E., 337.80 feet; thence N. 33° 51'. E., 676.40 feet; thence N. 21° 09' W., 578.50 feet; thence N. 3° 20' E., 447.05 feet to the north quarter corner of Section 25, Township 19 South, Range 19 East, M.D.B.&M.; thence west along the north line of Lot 3, of said Section 25 to the northwest corner of said Lot 3 as shown on the map of the Empire Ranch, Recorded in Book 1, Page 91 & 92 of Licensed Surveyors Plats, County of Kings, State of California; thence south along the west line of Lots 3, 4, & 9 of said

Section 25 to the southwest corner of said Lot 9, being also the northeast corner of Lot 13 of said Section 25; thence west along the north line of said Lot 13 to the west quarter corner of Section 25; thence northerly along the east line of Sections 26, 23 and 14 to the southeast corner of Section 11, Township 19 South, Range 19 East, M.D.B.&M.; thence northerly to the south corner of Lot 5 in said Section 11; thence northwesterly along the west line of Lots 5 and 2 to the intersection with the north line of said Section 11; thence westerly along the north line of Sections 11 and 10 to the northwest corner of said Section 10; thence northerly along the east line of Section 4, Township 19 South, Range 19 East, M.D.B.&M.; thence continuing northerly through Sections 33 and 28, Township 18 South, Range 19 East, M.D.B.&M.; about 1 3/4 miles to the intersection with the Government Swamp and Overflow Meander Line in said Section 28; thence northwesterly along said Meander Line to the intersection with the west line of said Section 28; thence northerly along the west line of Sections 28 and 21 to the northeast corner of Section 20; thence westerly along the north line to the northwest corner of said Section 20; thence northerly along the west line of Section 17 to the northwest corner of said Section 17; thence westerly along the north line of Section 18 to the northwest corner of said Section 18; thence northerly along the west line of Sections 7 and 6, Township 18 South, Range 19 East, M.D.B.&M. to the point of beginning.

Excepting therefrom the lands embraced within the boundaries of the City of Lemoore, as such city boundaries exist from time to time.