Attachments:

1a KBWA Adopted IRWM Implementation Grant Resolution

1b Upper Kings IRWM Joint Powers Agreement

1c Upper Kings IRWM Authority Statement Facts

1d Recent Implementation Grant Award Sub-Agreement

1e 10-17-2012 Kings Basin Water Authority Adopted IRWMP

1f Fresno Area Groundwater Management Plan

1g KRCD Lower Kings Basin Groundwater Management Plan

1h James Irrigation District and the City of San Joaquin GWMP

1i Kings Basin IRWMP Project List (10/17/2012)

1j 10-17-2012 KBWA Board Meeting Minutes

BEFORE THE BOARD OF DIRECTORS
OF THE UPPER KINGS BASIN INTEGRATED REGIONAL
WATER MANAGEMENT AUTHORITY
FRESNO, CALIFORNIA

RESOLUTION NO. 13-01

AUTHORIZATION TO FILE AN APPLICATION FOR A GRANT UNDER ROUND 2 OF THE PROPOSITION 84 INTEGRATED REGIONAL WATER MANAGEMENT IMPLEMENTATION GRANT PROGRAM AND TO ENTER INTO AN AGREEMENT WITH THE CALIFORNIA DEPARTMENT OF WATER RESOURCES

WHEREAS, the Upper Kings Basin Integrated Regional Water Management Authority, a Joint Powers Authority made up of cities, counties and water agencies in the Central San Joaquin Valley, with the responsibility for implementing the Kings Basin Integrated Regional Water Management Plan and;

WHEREAS, the Upper Kings Basin Integrated Regional Water Management Authority desires to make an application for funding under the Proposition 84 Integrated Regional Water Management Implementation Grant Program, Round 2, to implement projects that are consistent with the Kings Basin Integrated Regional Water Management Plan and Proposition 84 standards and;

BE IT RESOLVED BY THE Board of Directors of the Upper Kings Basin Integrated Regional Water Management Authority that application be made to the California Department of Water Resources to obtain an Integrated Regional Water Management Implementation Grant pursuant to all the terms and provisions of the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 (Public Resource Code Section 75001 *et seq.*), and amendments thereto, and;

BE IT FURTHER RESOLVED THAT the Chair of the Water Authority, or his or her designee, is hereby authorized and directed to prepare the necessary data, conduct investigations, file such application, and execute a grant agreement with the California Department of Water Resources.

THE FOREGOING RESOLUTION was passed and adopted at a special meeting of the Board of Directors of the Upper Kings Basin Integrated Regional Water Management Authority on this 14th day of February, 2013, by the following vote:

AYES: Directors Armstrong, Fast, and Worthley. Alternate Directors Uota, Buche, Orth, Moore, Burleson Desatoff, Galvan, and Jimenez

NOES: None

ABSENT: Directors Lopez, Ontiveros, Kapheim, Serrato, Mills, and Reilly

Chair

ATTEST:

Secretary

UPPER KINGS BASIN INTEGRATED REGIONAL WATER MANAGEMENT JOINT POWERS AGREEMENT

THIS AGREEMENT is made and effective as of March 1, 2009 pursuant to the Joint Exercise of Powers Act (Government Code Sections 6500, *et seq.*) by and between the public agencies listed on the attached Exhibit A in order to form the Upper Kings Basin Integrated Regional Water Management Authority. This Agreement is made with reference to the following facts.

A. Each of the parties to this Agreement is a public agency vitally interested in the management of water supplies delivered to those within that agency's boundaries. One of the water supplies of great importance to each of the parties is the Kings River.

B. Because the parties share a common interest in maximizing the beneficial use of Kings River water, they have jointly been pursuing integrated regional water management planning strategies for the Upper Kings Basin (as defined below) through an informal coalition sometimes referred to as the Upper Kings Basin Water Forum. Through the Upper Kings Basin Water Forum, the parties have developed an integrated regional water management plan for the Upper Kings Basin and have undertaken various activities in furtherance of that plan.

C. The parties wish to facilitate continued integrated water resource management on the Upper Kings Basin by forming a joint powers authority to replace the informal Upper Kings Basin Water Forum and to pursue appropriate water resource planning opportunities in accordance with the applicable provisions of California law.

THEREFORE, in consideration of the mutual promises, covenants and conditions hereinafter set forth, it is agreed by and among the parties hereto as follows:

Article I: Definitions

As used in this Agreement, unless the context requires otherwise, the meaning of the terms hereinafter set forth shall be as follows:

(a) "Act" shall mean the Integrated Regional Water Management Planning Act of 2002, codified in Part 2.2 (commencing with Section 10530) of Division 6 of the California Water Code, as it may be amended, revised or superseded from time to time.

(b) "Advisory Committee" shall mean the advisory body of the Authority created by Section 3.02 of this Agreement, consisting of representatives from the Members and the Interested Parties.

(c) "Authority" shall mean the Upper Kings Basin Integrated Regional Water Management Authority, being the separate entity created by this Agreement.

(d) "Board of Directors" or "Board" shall mean the governing body of the Authority as established by Section 3.01 of this Agreement.

(e) "Fiscal Year" shall mean that period of twelve months established as the Fiscal Year of the Authority pursuant to Section 4.01 of this Agreement.

(f) "Interested Parties" shall mean those public and private entities that have (i) either opted not to become Members of the Authority or are legally precluded from becoming Members, (ii) provided a formal expression of interest in the Authority's activities and (iii) been designated by the Board of Directors as Interested Parties. The parties listed on the attached Exhibit B shall be the initial Interested Parties. The Board of Directors may from time to time add additional Interested Parties or remove Interested Parties. Interested Parties need not execute this Agreement, but shall be governed by its provisions. Interested Parties shall be non-voting, but shall be provided with an opportunity to provide input into Authority activities for consideration by the Board of Directors, Advisory Committee and Members.

(g) "IRWMP" shall mean the integrated regional water management plan for the Upper Kings Basin adopted pursuant to the Act by the Upper Kings Basin Water Forum, as it may be modified or amended from time to time.

(h) "Major Decision" shall mean any decision by the Board of Directors that is not a Minor Decision or Supermajority Decision. A Major Decision shall require the affirmative vote of two-thirds of the members of the Board of Directors present and voting at a meeting at which a quorum is present.

(i) "Minor Decision" shall mean a decision by the Board of Directors that does not have a material effect on the long-term activities or policies of the Authority, including (i) setting, amending or approving agendas, (ii) approving or amending minutes, (iii) approving the payment of bills or other amounts due as a result of the routine activities of the Authority, (iv) incurring any expense or series of related expenses totaling not more than $10,000 in any Fiscal Year and (v) purely administrative decisions that do not set policy for the Authority. In the event of a disagreement as to whether a decision is a Minor Decision, the Chairman shall determine whether such decision is a Minor Decision, and such determination shall be final. A Minor Decision shall require the affirmative vote of a majority of the members of the Board of Directors present and voting at a meeting at which a quorum is present.

(j) "Members" shall mean those the parties identified on the attached Exhibit A, and any parties that shall hereafter become Members in accordance with the terms and provisions of this Agreement.

(k) "Participation Percentage" shall mean the percentages described in Section 3.03 as they may be modified from time to time.

(l) "Special Activities" shall mean activities that are consistent with the purpose of this Agreement, but which are undertaken by fewer than all the parties in the name of the Authority pursuant to Section 3.07.

(m) "Supermajority Decision" shall mean any decision by the Board of Directors to (i) initiate litigation in the name of the Authority, (ii) issue bonds or other form of indebtedness obligating the Authority for an amount in excess of $100,000, (iii) adopt or amend the Authority's budget, (iv) change any Participation Percentage, (v) admit any new Member to the Authority or (vi) terminate any Member. A Supermajority Decision shall require the affirmative vote of two-thirds of the members of the Board of Directors.

(n) "Upper Kings Basin" shall mean the area depicted on the attached Exhibit C.

Article II: Creation of Authority

Section 2.01 – Creation.

The parties, pursuant to their joint exercise of powers, hereby create a public entity to be known as the "Upper Kings Basin Integrated Regional Water Management Authority."

Section 2.02 – Term.

This Agreement shall remain in effect until terminated by mutual agreement of all the parties hereto. Notwithstanding any other provision herein, this Agreement shall remain in effect and be binding upon the parties hereto and upon all subsequent parties joined herein for such a period as the Authority desires to engage in any activities under this Agreement. The foregoing provision shall not apply, however, to any party that withdraws or is terminated from its participation in the Authority in accordance with this Agreement.

Section 2.03 – Purpose.

The purpose of this Agreement is to provide for the joint exercise, through the Authority, of powers common to each of the parties in order to (i) engage in integrated regional water management planning and related activities under the Act in the Upper Kings Basin for the benefit of the water users within the boundaries of the Members, including without limitation those activities formerly conducted by the Members through the Upper Kings Basin Forum, (ii) coordinate, manage, maintain, modify, amend and implement the IRWMP under the Act, including without limitation assisting the Members in the development of water management projects and/or grant applications for projects included in or consistent with the IRWMP, (iii) participate through the Authority in water management projects included in or consistent with the IRWMP, and (iv) engage in such other activities related thereto as are incidental, necessary and convenient to the mutual benefit and interest of the Members. Activities unrelated to integrated regional water management planning under the Act in the Upper Kings Basin and/or the IRWMP shall not be undertaken by the Authority.

Section 2.04 – Powers.

The Authority shall have the power to take any action to carry out the purposes of this Agreement. Subject to the applicable voting requirements described in this Agreement, the Authority is authorized, in its own name, to do all acts necessary for the exercise of said powers, including, but not limited to, any and all of the following: to coordinate all activities necessary to maintain, modify, amend and implement the IRWMP in accordance with the Act; to screen and

select projects for grant applications; to prepare and submit grant applications on behalf of the Members; to assist Members in the development of water management projects; to participate in water management projects; to allocate and manage grant funding; to create and appoint committees and sub-committees; to undertake, on behalf of the Members, all actions required by the California Department of Water Resources and the State Water Resources Control Board related to the IRWMP; to make and enter into contracts and agreements; to sue and be sued in its own name; to engage or employ agents, consultants and employees; to acquire, construct, manage, maintain and operate any buildings, works, or improvements; to acquire by eminent domain, or otherwise, and to hold or dispose of any property; to issue bonds and all other forms of indebtedness, to the extent and on the terms provided by law for any of the parties herein or for any separate entity so permitted; and to incur debts, liabilities and obligations as approved by the Board of Directors in accordance with this Agreement. The Authority may levy assessments. Alternatively, in lieu of assessments (either in whole or in part), the Authority may fix and collect charges for any service furnished by the Authority. In accordance with California Government Code Section 6509, the foregoing powers shall be subject to the restrictions upon the manner of exercising such powers pertaining to the ALTA IRRIGATION DISTRICT, as specified in Division 11 of the California Water Code.

Notwithstanding the foregoing, Members of the Authority shall at all times retain control and authority, independent of the Authority, over their own internal matters, including water supplies, facilities, and water supply projects.

Section 2.05 – Adoption of IRWMP.

The Members agree that the IRWMP shall be coordinated and managed by the Authority, and that all modifications or amendments of the IRWMP shall be adopted only by the Authority's Board of Directors and in accordance with this Agreement. Modifications and amendments of the IRWMP shall be a Major Decision.

Article III: Internal Organization

Section 3.01 – Governing Body.

The Authority shall be governed by a Board of Directors which is hereby established and which shall be composed of one representative of each of the Members, and who shall be selected and designated in writing from time to time by the governing body of the respective party from among the elected members of that party's governing body. Each party, in addition to appointing its member to the Board, shall appoint at least one alternate to the Board who shall be a director, officer or employee of that party, but need not be an elected member of that party's respective governing body. The role of each alternate Director shall be to assume the duties of the Director appointed by his/her member entity in case of the absence or unavailability of such Director. The Directors and alternates so named shall continue to serve until their respective successors are appointed.

Interested Parties shall be notified of Board meetings when members of the Board are so notified, and each agenda for Board meetings shall provide an opportunity for participation by representatives of Interested Parties in attendance.

Section 3.02 – Advisory Committee and Other Committees.

The Board of Directors shall establish an advisory body known as the "Upper Kings Basin Integrated Regional Water Management Authority Advisory Committee" that shall consist of representatives of the Members and representatives of the Interested Parties. Each Member and each Interested Party may (but need not) appoint one member to the Advisory Committee. In addition to appointing a member to the Advisory Committee, each Member and each Interested Party may appoint at least one alternate to the Advisory Committee. Members and alternates shall be designated in writing from time to time by the respective governing body of each appointing entity. The Advisory Committee shall provide advice to the Board, but shall have no authority to take action that binds the Authority in any way.

Advisory Committee members and alternates need not be elected representatives of their respective appointing entities. The Advisory Committee shall meet from time to time as required by the Board or as the Advisory Committee establishes. A majority in number of the members of the Advisory Committee shall constitute a quorum for the transaction of the Advisory Committee's business. Each member of the Advisory Committee shall be entitled to one vote. All questions and matters of any nature whatsoever coming before the Advisory Committee shall be determined, provided a quorum is present, by the concurrence of at least a majority of the members of the Advisory Committee.

The Board of Directors may establish other committees as it determines necessary and shall establish membership, quorum, and voting requirements when the committees are established.

Section 3.03 – Participation Percentages.

The Participation Percentages of the Members shall be equal, and shall be automatically adjusted without further action of the parties or the Board of Directors upon the admission, withdrawal or termination of a Member. The Participation Percentages may be otherwise changed only upon a vote of the Board of Directors. Any such change in the Participation Percentages shall be a Supermajority Decision and shall not be deemed an amendment to this Agreement.

Section 3.04 – Seal; Bylaws.

The Board may (but need not) adopt an official seal for the Authority and adopt such bylaws as it may deem necessary to regulate the affairs of the Authority in accordance with this Agreement. The bylaws may be amended from time to time by the Board of Directors as it may deem necessary. Amendment of the Bylaws shall be a Major Decision.

Section 3.05 – Quorum.

A majority in number of the members of the Board of Directors shall constitute a quorum for the transaction of Members' business. Each member of the Board of Directors shall be entitled to one vote. Any member of the Board of Directors abstaining from a vote shall be counted for purposes of determining the existence of a quorum, but shall not be deemed to be voting. Amendment of this Agreement shall be governed by Section 7.01.

Section 3.06 – Meetings.

Meetings of the Board of Directors and Advisory Committee shall be conducted in accordance with the Ralph M. Brown Act, California Government Code Sections 54950, *et seq.*

Section 3.07 - Special Activities.

With the prior approval of the Board of Directors, Members may undertake Special Activities in the name of the Authority. Prior to undertaking a Special Activity, the Members electing to participate in the Special Activity shall enter into an activity agreement. Such activity agreement shall provide that (i) no Special Activity undertaken pursuant to such agreement shall conflict with the terms of this Agreement and (ii) the Members to the activity agreement shall indemnify, defend and hold the other parties to this Agreement and the Authority harmless from and against any liabilities, costs or expenses of any kind arising as a result of the Special Activity described in the activity agreement. All assets, rights, benefits, debts, liabilities and obligations attributable to a Special Activity shall be assets, rights, benefits debts, liabilities and obligations solely of the Members that have entered into the activity agreement for that Special Activity, in accordance with the terms of the activity agreement, and shall not be the assets, rights, benefits, debts, liabilities and obligations of those Members that have not executed the activity agreement. This Section 3.07 shall survive the termination of expiration of this Agreement.

Section 3.08 – Officers.

The officers of the Authority shall include a Chairman, a Vice-Chairman who shall serve in the absence of the Chairman, a Secretary-Treasurer, and such other officers as the Board of Directors may appoint from time to time. Each officer shall serve at the pleasure of the Board of Directors, or for such terms as the Board of Directors may establish, and shall have those powers set forth in this Agreement or delegated to them by the Board of Directors.

Article IV: Financial Provisions

Section 4.01 – Fiscal Year.

The Fiscal Year of the Authority shall be from July 1 through June 30 of each year.

Section 4.02 – Funds; Accounts.

Subject to Section 5.02 of this Agreement, the Secretary-Treasurer shall be responsible for all money of the Authority from whatever source. All funds of the Authority shall be strictly and separately accounted for and regular reports shall be rendered of all receipts and disbursements at least quarterly during the Fiscal Year. The books and records of the Authority shall be open to inspection by the Members and by bondholders as and to the extent provided by resolution or indenture. The Secretary-Treasurer shall contract with a certified public accountant to make an annual audit of the accounts and records of the Authority which shall be conducted in compliance with Section 6505 of the California Government Code.

Section 4.03 – Property; Bonds.

The Board of Directors shall from time to time designate the officers and persons, in addition to those specified in Section 4.02 above, who shall have charge of, handle, or have access

to any property of the Authority. The Authority shall acquire such fidelity bonds or comparable insurance covering such officers and persons in amounts designated by the Board of Directors; provided, that if no bond amount is set by the Board of Directors, no bond shall be required. Such designation shall be subject to ratification by the Members in compliance with California Government Code Section 6505.1.

Section 4.04 – Budget.

By a date set by the Board of Directors each Fiscal Year, the Board of Directors shall adopt an annual budget for the Authority for the ensuing Fiscal Year. Adoption of the annual budget or any amendment thereof shall be a Supermajority Decision.

Section 4.05 – Payments To The Authority.

All fees, costs and expenses incurred by the Authority for Member actions and activities shall be allocated to and paid by the Members in accordance with the Participation Percentages as defined in Section 3.03 on a schedule set by the Board of Directors; provided, that no Member shall be obligated to make any such payment unless and until such Member's governing body has approved and appropriated the funds necessary to make such payment. In the event a payment by a Member is otherwise required but is not made because such Member's governing body has not approved such payment or appropriated the funds necessary to make such payment, such Member shall be subject to termination as a Member pursuant to Section 6.02 but upon any such termination shall not be liable for the amount of such payment.

Article V: Contract Management; Fiscal Agent

Section 5.01 – Management.

In addition to, or in lieu of, hiring employees, the Authority may engage one or more third parties to manage any or all of the business of the Authority on terms and conditions acceptable to the Board of Directors. A third party so engaged may, but need not, be a Member. Any third party so engaged shall have such responsibilities as are set forth in the contract for such third party's services.

Section 5.02 – Fiscal Agent.

Without limiting the breadth of Section 5.01, the Board of Directors may select a Member or a third party to act as the fiscal agent for the Authority pursuant to an agreement with the fiscal agent approved by the Board of Directors. The approval of such agreement shall be a Majority Decision.

Article VI: Relationship of Authority And Its Members

Section 6.01 – Separate Entity; Property.

In accordance with California Government Code Sections 6506 and 6507, the Authority shall be a public entity separate from the parties to this Agreement. To the greatest extent permitted by law, otherwise agreed herein the debts, liabilities and obligations of the Authority shall not be

debts, liabilities or obligations of the member entities. The Authority shall own and hold title to all funds, property and works acquired by it during the term of this Agreement.

Section 6.02 – Admission, Withdrawal and Termination of Members.

Additional qualified parties may join in this Agreement and become Members upon the approval of the Board of Directors. Prior to being admitted as a new Member, a party shall (i) execute an agreement to be bound by the terms of this Agreement as if such party had been an original signatory hereto and (ii) pay an amount set by the Board of Directors to make the contributions to Authority activities by all Members (including the new Member) equitable. The admission of a new Member and determination of such amount shall be a Supermajority Decision.

Notwithstanding anything herein to the contrary, any Member may withdraw from this Agreement by giving 60 days written notice of its election to do so, which notice shall be given to the Board of Directors and to each of the other parties; provided, that such withdrawal does not in any way impair any contracts, resolutions, indentures or other obligations of the Authority then in effect. In the event of a disagreement between the Authority and the withdrawing party as to whether such withdrawal shall cause the impairment of any contracts, resolutions, indentures or other obligations of the Authority, such determination shall be made by the vote of 75% of the directors representing the non-withdrawing Members present and voting. Subject to the foregoing, a Member's withdrawal will be effective as of the date the notice of withdrawal is provided.

A withdrawing Member shall in all events remain liable for its proportionate share of (i) any call for funds or assessment levied by the Authority prior to the date it provides its notice of withdrawal, (ii) any contribution required by Section 6.04 to reflect the Participation Percentages in existence at the time the subject act or omission occurred, and (iii) the amount of any annual budget approved not more than 60 days prior to the date it provides its notice of withdrawal; provided, that a Member not concurring in an amendment of this Agreement that withdraws within the 60-day period described in Section 7.01 shall not be liable for any such amounts except to the extent they are delinquent on the date of withdrawal.

Any Member may be terminated, by a vote of the Board of Directors and upon termination shall no longer be a member of the Authority. Termination of a Member shall be a Supermajority Decision. A Member so terminated shall not be liable for the amounts described in clauses (i), (ii) and (iii) of the immediately preceding paragraph except to the extent they are delinquent on the date of termination.

In the event a Member withdraws from the Authority or is terminated in accordance with the terms and conditions hereof, such Member shall not receive a refund of any amounts advanced to the Authority by such Member prior to the date of its withdrawal or termination.

Section 6.03 – Disposition Of Property Upon Termination Or Determination By Board Of Surplus.

Upon termination of this Agreement or upon determination by the Board of Directors that any surplus money is on hand, such surplus money shall be returned to the then member entities of the Authority which contributed such monies in proportion to their Participation Percentages. The Board of Directors shall first offer any properties, works, rights and interests of the Authority for

sale to the member entities. If no such sale is consummated, then the Board of Directors shall offer the properties, works, rights and interests of the Authority for sale to any governmental agency, private entity or persons for good and adequate consideration. The net proceeds from any sale shall be distributed among the Members in proportion to their Participation Percentages. If no such sale is consummated, then all of the properties, works, rights and interests of the Authority shall be allocated to the Members in the same manner as the allocation of the net proceeds from the sale.

Section 6.04 – Agreed Upon Share Of Liability Or Judgment For Damages.

The parties to this Agreement do not intend hereby to be obligated either jointly or severally for the debts, liabilities or obligations of the Authority, except as may be specifically provided for in California Government Code Section 895.2 as amended or supplemented. Provided, however, if the Members of the Authority are, under such applicable law, held liable for the acts or omissions of the Authority caused in the performance of this Agreement, caused by negligent or wrongful act or omission occurring in the performance of this Agreement, such Members shall be entitled to contribution from each of the other Members so that after said contribution each party shall bear a share equal to its Participation Percentage in existence at the time the subject act or omission occurred. The right of contribution shall include any and all loss, liability, fines, penalties, forfeitures, costs and damages whether in contract, tort or strict liability, including but not limited to personal injury, death at any time and property damage, and for any and all claims, demands and actions in law or equity, including attorney's fees and litigation expenses (hereinafter collectively referred to as "judgment" for purposes of this section.) The right of contribution is limited to the amount paid in satisfaction of the judgment in excess of the Participation Percentage of the Members so paying. No Member may be compelled to make contribution beyond its share based upon its Participation Percentage of the entire judgment in existence as of the date of the subject act or omission.

Section 6.05 – Insurance.

The Board of Directors shall, from time to time and at least annually, review the general liability, automobile, directors and officers, and other insurance coverage maintained by the Authority for adequacy and determine the nature, extent and limits of insurance to be maintained by the Authority. The Authority shall purchase and maintain such insurance as the Board determines to be appropriate after such review.

Article VII: Miscellaneous Provisions

Section 7.01 – Amendment.

This Agreement may be amended from time to time by the concurrence of 75% of all of the Members. To provide non-concurring parties an opportunity to withdraw from the Authority as provided herein, an amendment shall be binding on all parties hereto 60 days after the required concurrence has been obtained.

Section 7.02 – Severability And Validity Of Agreement.

Should the participation of any party to this Agreement, or any part, term or provision of this Agreement be decided by the courts or the legislature to be illegal, in excess of that party's

authority, in conflict with any law of the State of California, or otherwise rendered unenforceable or ineffectual, the validity of the remaining portions, terms or provisions of this Agreement shall not be affected thereby and each party hereby agrees it would have entered into this Agreement upon the same terms as provided herein if that party had not been a participant in this Agreement.

Section 7.03 – Assignment.

Except as otherwise provided in this Agreement, the rights and duties of the parties to this Agreement may not be assigned or delegated without the approval of the Board of Directors, which approval shall be a Supermajority Decision. Any attempt to assign or delegate such rights or duties in contravention of this section shall be null and void. Any assignment or delegation permitted under the terms of this Agreement shall be consistent with the terms of any contracts, resolutions or indentures of the Authority then in effect. This Agreement shall inure to the benefit of and be binding upon the successors and assigns of the parties hereto. This section does not prohibit a party from entering into an independent agreement with another agency regarding the financing of that party's contributions to the Authority or the disposition of proceeds which that party receives under this Agreement so long as such independent agreement does not affect, or purport to affect, the rights and duties of the Authority or the parties under this Agreement.

Section 7.04 – Execution In Parts Or Counterparts.

This Agreement may be executed in parts or counterparts, each part or counterpart being an exact duplicate of all other parts or counterparts, and all parts or counterparts shall be considered as constituting one complete original and may be attached together when executed by the parties hereto. Facsimile signatures shall be binding.

Section 7.05 – Notices.

Notices authorized or required to be given pursuant to this Agreement shall be in writing and shall be deemed to have been given when mailed, postage prepaid, or delivered during working hours to the addresses set forth for each of the parties beneath their signatures on this Agreement, or to such other changed addresses communicated to the Authority and the member entities in writing.

Section 7.06 – Governing Law and Venue.

This Agreement shall be governed by, construed, and enforced in accordance with the laws of the State of California, excluding any conflict of laws rule which would apply the law of another jurisdiction. Venue for purposes of the filing of any action regarding the enforcement or interpretation of this Agreement and any rights and duties hereunder shall be Fresno County, California. The parties to this Agreement hereby expressly waive any right to remove any action to a county other than Fresno County as permitted pursuant to California Code of Civil Procedure Section 394.

Section 7.07 – Attorney's Fees.

If any party commences any proceeding or legal action to enforce or interpret any term, covenant or condition of this Agreement, the prevailing party in such proceeding or action shall be entitled to recover from the other party its reasonable attorney's fees and legal expenses.

IN WITNESS WHEREOF, the parties hereto, pursuant to resolutions duly and regularly adopted by their respective governing boards, have caused their names to be affixed by their proper and respective officers as of the day and year first above-written.

NAME OF MEMBER: ALTA I.D.

By: Norman Waldner
Its: President

By: Chris M. Fogherm
Its: Secretary

Member's Address:
Alta Irrigation District
289 North "L" Street
Dinuba, CA 93618

Dated: Feb. 9, 2009

IN WITNESS WHEREOF, the parties hereto, pursuant to resolutions duly and regularly adopted by their respective governing boards, have caused their names to be affixed by their proper and respective officers as of the day and year first above-written.

NAME OF MEMBER: Kings River Conservation District

By: _____
Its: President, Board of Directors

By: _____
Its: General Manager

Member's Address:
Kings River Conservation District
4886 E. Jensen Avenue
Fresno, CA 93725

Dated: 2/10/2009

IN WITNESS WHEREOF, the parties hereto, pursuant to resolutions duly and regularly adopted by their respective governing boards, have caused their names to be affixed by their proper and respective officers as of the day and year first above-written.

NAME OF MEMBER: _____

By: _____

Its: General Manager

By: _____

Its: President

Member's Address:
Fresno Irrigation District
2907 S Maple Avenue
Fresno, CA 93725

Dated: February 11, 2009

IN WITNESS WHEREOF, the parties hereto, pursuant to resolutions duly and regularly adopted by their respective governing boards, have caused their names to be affixed by their proper and respective officers as of the day and year first above-written.

NAME OF MEMBER: Consolidated Irrigattion District

By: Robert Nielsen Jr.
Its: Robert Nielsen Jr. President

By: Phillip G. Desatoff
Its: Phillip G. Desatoff, General Manager

Member's Address:
P O Box 209
Selma, CA 93662

Dated: February 11, 2009

IN WITNESS WHEREOF, the parties hereto, pursuant to resolutions duly and regularly adopted by their respective governing boards, have caused their names to be affixed by their proper and respective officers as of the day and year first above-written.

NAME OF MEMBER: Trinidad M. Rodriguez

By: Ron Manfredi

Ron Manfredi

Its: City Manager

Member's Address:

City of Kerman
850 S. Madera Ave
Kerman, CA 93630

Dated: February 18, 2009

IN WITNESS WHEREOF, the parties hereto, pursuant to resolutions duly and regularly adopted by their respective governing boards, have caused their names to be affixed by their proper and respective officers as of the day and year first above-written.

NAME OF MEMBER:

By: _____
Its: Director

By: _____
Its: Alternate

Member's Address:
City of Parlier
1100 Parlier Avenue
Parlier, CA. 93648

Dated: 2/19/2009

a county other than Fresno County as permitted pursuant to California Code of Civil Procedure Section 394.

Section 7.07 – Attorney's Fees.

If any party commences any proceeding or legal action to enforce or interpret any term, covenant or condition of this Agreement, the prevailing party in such proceeding or action shall be entitled to recover from the other party its reasonable attorney's fees and legal expenses.

IN WITNESS WHEREOF, the parties hereto, pursuant to resolutions duly and regularly adopted by their respective governing boards, have caused their names to be affixed by their proper and respective officers as of the day and year first above-written.

NAME OF MEMBER: City of Reedley

By: Mary L. Fast Mary L. Fast
Its: Mayor

By: _____
Its: _____

Member's Address:
City of Reedley
1717 - 9th Street
Reedley, CA 93654

Dated: March 10, 2009

IN WITNESS WHEREOF, the parties hereto, pursuant to resolutions duly and regularly adopted by their respective governing boards, have caused their names to be affixed by their proper and respective officers as of the day and year first above-written.

NAME OF MEMBER: CITY OF CLOVIS

By: Chad Fitzgerald
Its: Interim City Clerk

By: Kathy Millison
Its: City Manager

Member's Address:
1033 Fifth Street
Clovis CA 93612

Dated: March 20, 2009

IN WITNESS WHEREOF, the parties hereto, pursuant to resolutions duly and regularly adopted by their respective governing boards, have caused their names to be affixed by their proper and respective officers as of the day and year first above-written.

NAME OF MEMBER: City of Selma

By: , D-B Heusser
Its: City Manager

By:
Its:

Member's Address:
City of Selma
1710 Tucker Street
Selma, CA 93662

Dated: April 6, 2009

IN WITNESS WHEREOF, the parties hereto, pursuant to resolutions duly and regularly adopted by their respective governing boards, have caused their names to be affixed by their proper and respective officers as of the day and year first above-written.

NAME OF MEMBER: City of Kingsburg

By:
Its: Mayor

By:
Its: City Manager

Member's Address:
1401 Draper St.
Kingsburg CA 93631

Dated: 07/09/09

Section 7.04 – Execution In Parts Or Counterparts.

This Agreement may be executed in parts or counterparts, each part or counterpart being an exact duplicate of all other parts or counterparts, and all parts or counterparts shall be considered as constituting one complete original and may be attached together when executed by the parties hereto. Facsimile signatures shall be binding.

Section 7.05 – Notices.

Notices authorized or required to be given pursuant to this Agreement shall be in writing and shall be deemed to have been given when mailed, postage prepaid, or delivered during working hours to the addresses set forth for each of the parties beneath their signatures on this Agreement, or to such other changed addresses communicated to the Authority and the member entities in writing.

Section 7.06 – Governing Law and Venue.

This Agreement shall be governed by, construed, and enforced in accordance with the laws of the State of California, excluding any conflict of laws rule which would apply the law of another jurisdiction. Venue for purposes of the filing of any action regarding the enforcement or interpretation of this Agreement and any rights and duties hereunder shall be Fresno County, California. The parties to this Agreement hereby expressly waive any right to remove any action to a county other than Fresno County as permitted pursuant to California Code of Civil Procedure Section 394.

Section 7.07 – Attorney's Fees.

If any party commences any proceeding or legal action to enforce or interpret any term, covenant or condition of this Agreement, the prevailing party in such proceeding or action shall be entitled to recover from the other party its reasonable attorney's fees and legal expenses.

IN WITNESS WHEREOF, the parties hereto, pursuant to resolutions duly and regularly adopted by their respective governing boards, have caused their names to be affixed by their proper and respective officers as of the day and year first above-written.

NAME OF MEMBER: Kings County Water District

By: Don Mills
Its: General Manager

By: _____
Its: _____

Member's Address:
200 North Campus Drive
Hanford, CA 93230

Dated: 9/1/09

a county other than Fresno County as permitted pursuant to California Code of Civil Procedure Section 394.

Section 7.07 – Attorney's Fees.

If any party commences any proceeding or legal action to enforce or interpret any term, covenant or condition of this Agreement, the prevailing party in such proceeding or action shall be entitled to recover from the other party its reasonable attorney's fees and legal expenses.

IN WITNESS WHEREOF, the parties hereto, pursuant to resolutions duly and regularly adopted by their respective governing boards, have caused their names to be affixed by their proper and respective officers as of the day and year first above-written.

City of Fresno:

By: _____
Rene A. Ramirez, Director
for Department of Public Utilities

Dated: 9/1/09

ATTEST:
REBECCA E. KLISCH
City Clerk

By: _____ 9/1/09
Deputy Date

APPROVED AS TO FORM:
James C. Sanchez
City Attorney

By: _____
Tei Yukimoto Date
Senior Deputy

Member's Address:
City of Fresno Department of Public Utilities
2600 Fresno Street
Fresno, CA 93721

IN WITNESS WHEREOF, the parties hereto, pursuant to resolutions duly and regularly adopted by their respective governing boards, have caused their names to be affixed by their proper and respective officers as of the day and year first above-written.

NAME OF MEMBER: City of Sanger

By: Jose R. Villarreal
Its: Mayor

By: John A. Wall
Its: Interim City Manager

Member's Address:
1700 7th Street
Sanger, CA 93657

Dated: October 1, 2009

COUNTY OF FRESNO, a Political

Subdivision of that State of California

("County")

By: _____ 4/13/10

Judith G. Case, Chairman

Board of Supervisors

By: _____

Alan Weaver, Director

Department of Public Works and Planning

APPROVED AS TO LEGAL FORM:

Kevin Briggs, County Counsel

By: _____
Sr. Deputy

ATTEST:

BERNICE E. SEIDEL, Clerk
Board of Supervisors

By _____
Deputy

APPROVED AS TO ACCOUNTING FORM:

Auditor-Controller/Treasurer-Tax Collector

By: _____

Org: 4360/0200
Acct: 7250

IN WITNESS WHEREOF, the parties hereto, pursuant to resolutions duly and regularly adopted by their respective governing boards, have caused their names to be affixed by their proper and respective officers as of the day and year first above-written.

NAME OF MEMBER: County of Tulare

By: [signature]

Its: Chairman

By: _____

Its: _____

Member's Address:
2800 W. Burrel Ave.
Visalia, CA. 93291

Dated: May 18, 2010

APPROVED AS TO FORM:
COUNTY COUNSEL
By [signature]
4/2/10 Deputy 2010557

IN WITNESS WHEREOF, the parties hereto, pursuant to resolutions duly and regularly adopted by their respective governing boards, have caused their names to be affixed by their proper and respective officers as of the day and year first above-written

NAME OF MEMBER: CITY OF DINUBA

By: _____

Its: CITY MANAGER

By: _____

Its: _____

Member's Address:

City of Dinuba
405 E El Monte Way
Dinuba CA 93618

Dated: JULY 1, 2010

IN WITNESS WHEREOF, the parties hereto, pursuant to resolutions duly and regularly adopted by their respective governing boards, have caused their names to be affixed by their proper and respective officers as of the day and year first above-written.

NAME OF MEMBER: Raisin City Water District

By: [illegible]
Its: President, Board of Director

By: _____
Its: _____

Member's Address:
Raisin City Water District
10129 S Jameson Ave.
Fresno, CA 93706

Dated: 7-16-2010

EXHIBIT A

Members

Alta Irrigation District

Kings River Conservation District

Consolidated Irrigation District

Fresno Irrigation District

City of Kerman

City of Parlier

City of Dinuba

City of Clovis

City of Reedley

Raisin City Water District

Kings County Water District

City of Selma

City of Kingsburg

City of Fresno

City of Sanger

County of Fresno

County of Tulare

EXHIBIT B
Interested Parties

Bakman Water Company

Biola Community Services District

California Native Plant Society, Sequoia Chapter

Community Water Center

County of Kings

Crescent Canal Company

Cutler Public Utilities District

El Rio Reyes Conservation Trust

James Irrigation District

Kings River Conservancy

Kings River Water Association

Laguna Irrigation District

Laton Community Service District

Liberty Canal Company

Liberty Water District

Mid-Valley Water District

Orange Cove Irrigation District

Orosi Public Utilities District

Reed Ditch Company

Riverdale Irrigation District

Riverdale Public Utility District

Self-Help Enterprises

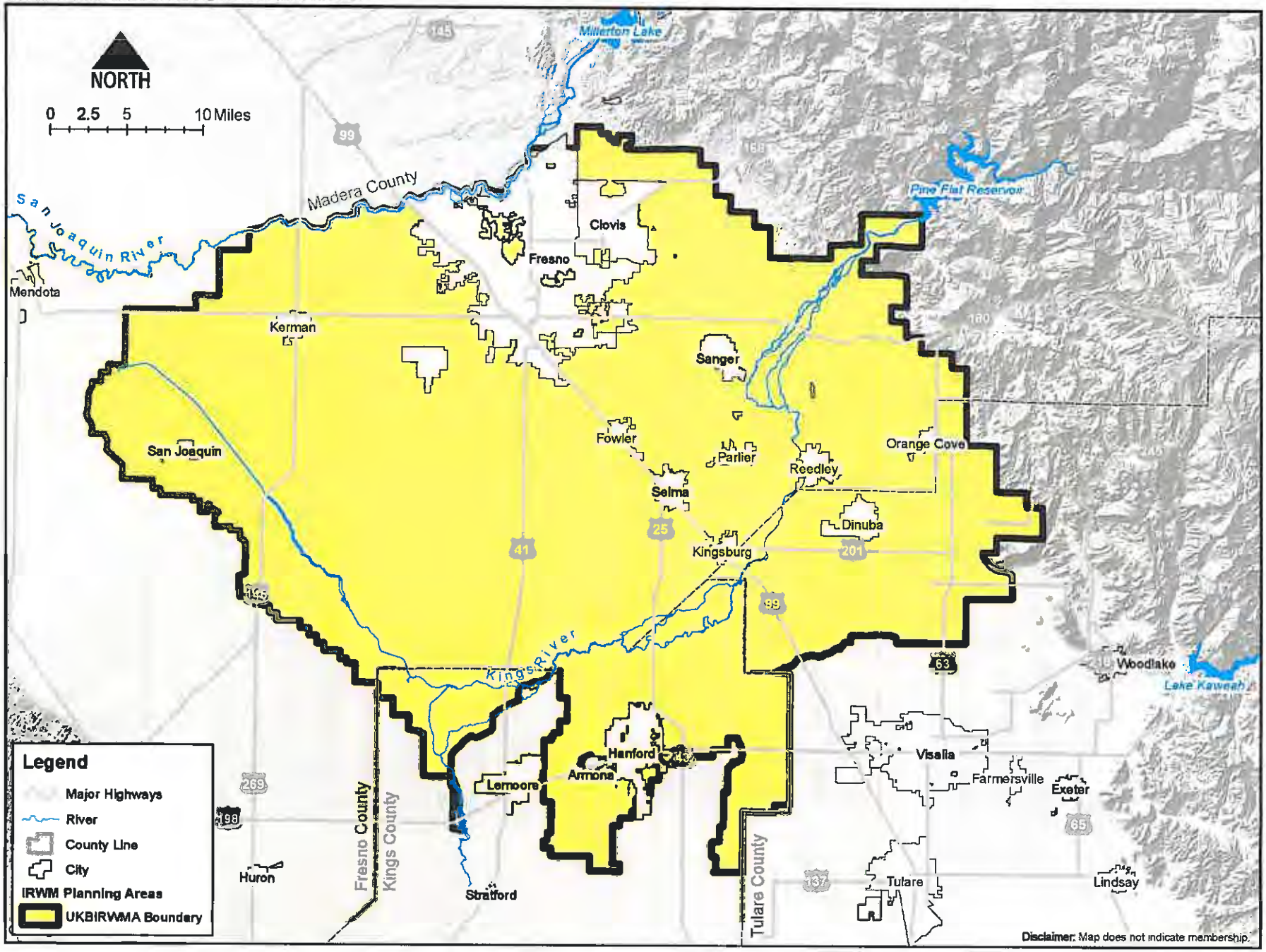
Sierra Club, Tehipite Chapter

Sierra Resource Conservation District

Terranova Ranch, Inc.

Tulare Basin Wildlife Partners

Z:\PROJECTS\AgWaiver\MXDs\Monitoring\UKIRWMA JPA Exhibit C.mxd



Upper Kings Basin Integrated Regional Water Management Authority

Exhibit C

Upper Kings Basin
Integrated Regional Water Management Authority
c/o Kings River Conservation District
4886 East Jensen Avenue
Fresno, CA 93725
(559) 237-5567
(559) 237-5560 Fax

July 23, 2010

Secretary of State
State of California
P. O. Box 942877
Sacramento, CA 94277-0001

Subject: Statement of Facts - Roster of Public Agencies Filing – Upper Kings Basin Integrated Regional Water Management Authority – File Number 2136 (April 22, 2010)

Ladies and Gentlemen:

Enclosed is the subject Statement for your records. The Statement is filed pursuant to Government Code 53051. The Statement has also been filed with the Fresno County Clerk.

Should you have questions or need additional information, please contact me at (559) 237-5567.

Sincerely,

David Orth
Secretary, Upper Kings Basin IRWM Authority

Enclosure: As Stated

DO/DC/dp

UKB-L10-0004
File: UKB 100.03

State of California
Secretary of State

FILED
In the office of the Secretary of State
of the State of California
AUG 1 [illegible]
(Office Use Only)

STATEMENT OF FACTS
ROSTER OF PUBLIC AGENCIES FILING
(Government Code Section 53051)

Instructions:

1. Complete and mail to: Secretary of State, P.O. Box 942877, Sacramento, CA 94277-0001 (916) 653-3984
2. A street address must be given as the official mailing address or as the address of the presiding officer.
3. Complete addresses as required.
4. If you need additional space, please include information on an 8½ X 11 page.

New Filing ☑ Update ☐

Legal name of Public Agency: Upper Kings Basin Integrated Regional Water Management Authority

Nature of Update: File names of members of the Authority

County: Fresno, Kings, and Tulare Counties

Official Mailing Address: 4886 East Jensen Avenue, Fresno, CA 93725

Name and Address of each member of the governing board:

Chairman, President or other Presiding Officer (Indicate Title): Chairman

Name: Harry Armstrong Address: 1033 Fifth Street, Clovis, CA 93612

Secretary or Clerk (Indicate Title): Secretary

Name: David Orth Address: 4886 East Jensen Avenue, Fresno, CA 93725

Members:

Name: See attached sheets. Address:

Name: Address:

Name: Address:

Name: Address:

Name: Address:

Date: July 23, 2010

Signature

David Orth, Secretary

Typed Name and Title

SECSTATE NPOF 405 (REV 03/2005)

Upper Kings Basin
Integrated Regional Water Management Authority
4886 East Jensen Avenue
Fresno, CA 93725
(559) 237-5567
(559) 237-5560 Fax

Governing Board

Board Members (Directors)	**General Member Represented**
Norman Waldner c/o Alta Irrigation District P. O. Box 715 Dinuba, CA 93618	Alta Irrigation District
Mark McKean c/o Kings River Conservation District 4886 East Jensen Avenue Fresno, CA 93725	Kings River Conservation District
Robert Nielsen, Jr. c/o Consolidated Irrigation District P. O. Box 209 Selma, CA 93662	Consolidated Irrigation District
Jeffrey Boswell c/o Fresno Irrigation District 2907 South Maple Fresno, CA 93725	Fresno Irrigation District
Trinidad M. Rodriquez c/o City of Kerman 850 S. Madera Kerman, CA 93638	City of Kerman
Armando Lopez c/o City of Parlier 1100 E. Parlier Ave. Parlier, CA 93648	City of Parlier
Mark Wallace c/o City of Dinuba 1710 E. Gerald Dinuba, CA 93618	City of Dinuba

Harry Armstrong
c/o City of Clovis
1033 Fifth St.
Clovis, CA 93612

City of Clovis

Steven Rapada
c/o City of Reedley
1717 9th Street
Reedley, CA 93654

City of Reedley

Jerry K. Boren
c/o Raisin City Water District
P. O. Box 174
Raisin City, CA 93652

Raisin City Water District

Barry McCutcheon
c/o Kings County Water District
200 North Campus Drive
Hanford CA 93230

Kings County Water District

Dennis Lujan
c/o City of Selma
1710 Tucker St.
Selma, CA 93662

City of Selma

Bruce Blayney
c/o City of Kingsburg
1401 Draper St.
Kingsburg, CA 93631

City of Kingsburg

Andreas Borgeas
c/o City of Fresno
2600 Fresno St., 2nd Floor
Fresno, CA 93721

City of Fresno

Victor Ruiz
c/o City of Sanger
1700 7th St.
Sanger, CA 93657

City of Sanger

Steve Worthley
c/o County of Tulare
2800 West Burrel Avenue
Visalia, CA 93291

County of Tulare

Judy Case
c/o County of Fresno
2281 Tulare St., Room 300
Fresno, CA 93721

County of Fresno

PROPOSITION 84 SUB-GRANTEE AGREEMENT

THIS AGREEMENT is made effective as of October 17, 2012 by and between (i) the Upper Kings Basin Integrated Regional Water Management Authority (the "Authority"), and (ii) Consolidated Irrigation District ("Sub-Grantee"), with respect to the following facts and circumstances:

A. The Authority has obtained or will obtain Proposition 84 grant funding from the California Department of Water Resources ("DWR") in the maximum amount of $8,496,000 under the terms of that certain Grant Agreement by and between the Authority and DWR, as it may be amended from time to time, a copy of which is attached hereto as Exhibit A (the "Grant Agreement"). Sub-Grantee is thoroughly familiar with the Grant Agreement, including without limitation all exhibits thereto.

B. The funds provided under the Grant Agreement are for the purpose of implementing components of the Upper Kings Basin Integrated Regional Water Management Plan (the "IRWMP").

C. One component of the IRWMP is the Sub-Grantee's South and Highland Basin Project, which is described on Exhibit A to the Grant Agreement (the "Project). The Grant Agreement contemplates that approximately $3,804,300 of the available grant funds (the "Grant Funds") will be disbursed to or for the benefit of Sub-Grantee as a "Local Project Sponsor" for implementation of the Project.

D. Prior to initiation of construction, Sub-Grantee will evaluate the environmental impacts of the Project under the California Environmental Quality Act

E. Because Sub-Grantee is not a party to the Grant Agreement, the parties desire to establish terms and conditions for Sub-Grantee's use of the Grant Funds and its role as a Local Project Sponsor for the Project under the Grant Agreement.

THEREFORE, in consideration of the mutual terms and conditions contained herein, the parties agree as follows:

1. Grant Funds. Sub-Grantee hereby agrees to be the Local Project Sponsor (as defined in the Grant Agreement) for the Project, and the Authority shall so designate Sub-Grantee to DWR. The Authority shall make the Grant Funds available to Sub-Grantee, as such funds are made available to the Authority from DWR, under the terms and subject to the conditions of the Grant Agreement and this Agreement.

2. Sub-Grantee to Perform Certain Obligations.

(a) The terms of the Grant Agreement are hereby incorporated within this Agreement. The parties acknowledge that the Authority's role is solely to consolidate items for review, reporting and invoicing, as well as to coordinate with the DWR pursuant to the Grant Agreement and that Sub-Grantee is to be responsible for all other aspects of performance of and compliance with the Grant Agreement in connection with the Project. Sub-Grantee shall further

perform all obligations of the Local Project Sponsor for the Project under the Grant Agreement.

(b) Any term or provision of the Grant Agreement that imposes any duty or obligation on the Authority as "Grantee" in connection with the Project shall be deemed to apply to, and be an obligation of, Sub-Grantee (the "Project Obligations"). Except as expressly provided in this Agreement, Sub-Grantee hereby agrees to be bound by, perform and be solely responsible for compliance with all the Project Obligations. Any provisions of the Grant Agreement that do not apply to the Project shall not be considered the Project Obligations.

(c) Sub-Grantee shall be responsible to develop and submit to the Authority all necessary information and documents described in the Grant Agreement at least 15 days prior to the time that the Authority is required to submit such items to DWR. Sub-Grantee shall also be responsible for any compliance requirements relating to the Project. If Sub-Grantee fails to timely submit any such information and documents, (i) it shall be deemed a material breach of this Agreement that shall allow the Authority to suspend its performance hereunder and to otherwise invoke Section 11 of this Agreement and (ii) Sub-Grantee shall submit such information and documents within five days of a written demand therefor from the Authority.

(d) Subject to Section 2(c) of this Agreement, and without limiting the breadth of the Project Obligations to be undertaken by Sub-Grantee, Sub-Grantee shall be responsible to perform the various tasks more particularly described in Exhibit A to the Grant Agreement insofar as they relate to the Project within the time frames specified in Exhibit B to the Grant Agreement and in accordance with the applicable Budget set forth in Exhibit C to the Grant Agreement..

(e) Sub-Grantee shall comply with all applicable labor requirements with respect to the Project. The parties acknowledge that, as of the date of this Agreement, neither the Authority nor Sub-Grantee has an approved in-house Labor Code 1771.5 Labor Compliance Program. Accordingly, this Agreement and parties' obligations hereunder shall be contingent upon (i) utilization at Sub-Grantee's expense of a third party Labor Compliance Program meeting all applicable requirements, established and/or contracted for by the Authority or Sub-Grantee, in accordance with the requirements of Labor Code Section 1771.5(b), on terms acceptable to the Authority and Sub-Grantee, (ii) Sub-Grantee's contracting with a third party that has been approved by the Director of Industrial Relations to operate a Labor Compliance Program in accordance with the requirements of Labor Code Section 1771.5(b), (iii) the entry by the Authority into a contract for a single third party Labor Compliance Program meeting all applicable requirements covering all sub-grantees receiving funds under the Grant Agreement who must implement or participate in such a program, in accordance with the requirements of Labor Code Section 1771.5(b), on terms acceptable to the Authority and all such sub-grantees, or (iv) a determination by the DWR/Director of Industrial Relations that the requirements of Labor Code Section 1771.5 do not apply to this Agreement. Any and all such costs incurred for the Project labor compliance shall be paid by Sub-Grantee, subject to annually allocated and available Sub-Grantee funding, and payable from Grant Funds in the Sub-Grantee's discretion to the extent eligible.

(f) The Authority's obligations under this Agreement are conditioned on Sub-

Grantee's adoption of, and agreement to be bound by and comply with, any amendments of the IRWMP duly adopted by the Authority subsequent to the date of this Agreement. Without limiting the foregoing, Sub-Grantee understands that as of the date of this Agreement the Authority is in the process of amending the IRWMP to be compliant with the IRWM Program Guidelines dated August 2010 adopted by DWR in order for the IRWMP to comply with Proposition 84 and recent changes to California Water Code. The failure by Sub-Grantee to timely adopt the amended IRWMP shall be deemed a material breach of this Agreement by Sub-Grantee that shall permit the Authority to suspend its performance hereunder and to otherwise invoke Section 11 of this Agreement.

3. Communication with DWR by Sub-Grantee. Notwithstanding any other provision of this Agreement, all materials or other deliverables, and all communications, relating to the Project, Grant Agreement or Grant Funds to be provided by Sub-Grantee to DWR shall be provided by Sub-Grantee to the Authority, which will in turn provide them to DWR.

4. Land Acquisition Requirements. Sub-Grantee's acquisition of any real property for the Project is subject to the applicable requirements set forth in the Grant Agreement.

5. Disbursement of Grant Funds.

(a) In order to receive disbursement of Grant Funds, Sub-Grantee shall submit to the Authority invoices for eligible expenses in a form required by the Authority. Supporting documentation as described in the Grant Agreement shall accompany each invoice. Such documentation required by this Section 5 shall be sent to:

c/o Kings River Conservation District
4886 East Jensen Ave
Fresno, CA 93725
Attn: Mr. Eric Osterling
Facsimile No.: 559-237-5560
Email Address: eosterling@krcd.org

or such other address as the Authority may provide.

(b) Sub-Grantee shall not request disbursement for any cost until such cost has been incurred and has been (i) paid by or (ii) is due and payable by Sub-Grantee. All Grant Fund disbursements received by Sub-Grantee shall be paid to applicable contractors and vendors within 30 days from receipt of the funds by Sub-Grantee from the Authority subject to resolving any dispute or issue of contention between Sub-Grantee and affected contractors, subcontractors or vendors. In the event that Sub-Grantee fails to disburse Grant Funds to contractors or vendors within such 30 day period or as modified or set forth above, Sub-Grantee shall immediately return such funds to the Authority. In such event, interest shall accrue on such funds from the date of disbursement from the DWR to the Authority through the date of mailing of such funds to the DWR by the Authority, which the Authority shall do as soon as it feasibly can after the Authority receives such funds from Sub-Grantee. In addition, if Sub-Grantee held such funds in

interest-bearing accounts, any and all interest earned on the funds shall be due and payable to the Authority. Sub-Grantee shall indemnify, defend and hold harmless the Authority and the Authority's officers, directors, agents, and employees (each, an "Indemnified Person") from and against any and all judgments, losses, claims, damages or liabilities, joint or several, to which any Indemnified Person may become subject which relate to or arise out of Sub-Grantee's failure to immediately return any funds as required by this Section 5.

(c) Notwithstanding any other provision of this Agreement, no disbursement shall be required to be made by the Authority at any time or in any manner which is in violation of, or in conflict with, federal or state laws, rules, or regulations, or which may require any rebates to the Federal or State government, or any loss of tax-free status on state bonds, pursuant to any Federal or State statute or regulation.

6. Budget Detail and Reporting. Sub-Grantee shall be responsible to comply with all budget detail and reporting provisions of the Grant Agreement, to the extent such provisions constitute the Project Obligations. All such information shall be in the form required by and shall include such supporting documentation as may be required by DWR.

7. Grantee Costs. The reasonable costs of the Project are estimated to be $3,995,300. Sub-Grantee agrees to fund the difference between the estimate of the Project cost and the Grant Funds from available funds. Sub-Grantee's cost share is estimated to be $191,000. If match funds are required for the Project, Sub-Grantee shall provide the Authority evidence that match funds have been expended prior to submittal of a request for Grant Fund reimbursement. Sub-Grantee agrees that it will provide for payment of its full share of the Project costs and that all costs connected with the Project will be paid on a timely basis.

8. Authority Costs. The Authority shall delivery a monthly invoice to Sub-Grantee for the Authority's reasonable costs for time and materials expended by the Authority or its agents in connection with the administration of this Agreement and the Grant Agreement insofar as it relates to the Project. Such costs shall include without limitation the Authority's reasonable costs of developing and complying with this Agreement. Sub-Grantee shall pay all such invoices within 30 days of receipt. Sub-Grantee may, at its election, either (i) submit those invoices to DWR (through the Authority) as expenses to be reimbursed with Grant Funds or (ii) treat amounts paid on those invoices as a portion of Sub-Grantee's cost share for the Project.

9. General Conditions. Sub-Grantee shall comply with all standard conditions and requirements set forth at Exhibits D and E of the Grant Agreement to the extent they apply to the Project, and shall not fail to take any action that would result in a breach of such standard conditions or requirements.

10. Indemnification. The parties agree that review or approval of the Project applications, documents, permits, plans and specifications, or other the Project information by DWR and/or the Authority is for administrative purposes only and does not relieve Sub-Grantee of its responsibility to properly plan, design, construct, operate, maintain, implement, or otherwise carry out the Project. To the fullest extent permitted by law, Sub-Grantee agrees to indemnify, defend and hold harmless each Indemnified Person against any loss or liability

arising out of any claim or action brought against the Indemnified Person from and against any and all losses, claims, damages, liabilities or expenses, of every conceivable kind, character and nature whatsoever arising out of, resulting from, or in any way connected with (i) the Project or the conditions, occupancy, use, possession, conduct or management of, work done in or about, or the planning, design, acquisition, installation or construction, of the Project, any component or any part thereof, (ii) the carrying out of any of the transactions contemplated by this Agreement or any related document, (iii) any violation of any applicable law, rule or regulation, any environmental law (including, without limitation, the Federal Comprehensive Environmental Response, Compensation and Liability Act, the Resource Conservation and Recovery Act, the California Hazardous Substance Account Act, the Federal Water Pollution Control Act, the Clean Air Act, the California Hazardous Waste Control Law and California Water Code § 13304, and any successors to said laws), rule or regulation or the release of any toxic substance on or near any component site, (iv) services, if any, provided by the Authority to Sub-Grantee, except to the extent caused by the Authority's gross negligence or willful misconduct, (v) Sub-Grantee's failure to comply with this Agreement in any way, (vi) any untrue statement or alleged untrue statement of any material fact or omission or alleged omission to state a material fact necessary to make the statements required to be stated therein, in light of the circumstances under which they were made, not misleading with respect to any information provided by Sub-Grantee for use in any disclosure document utilized in connection with any of the transactions contemplated by this Agreement. To the fullest extent permitted by law, Sub-Grantee agrees to pay and discharge any judgment or award entered or made against an Indemnified Person with respect to any such claim or action, and any settlement, compromise, or other voluntary resolution. The provisions of this Section 10 shall survive the term of this Agreement.

11. Defaults by Sub-Grantee. In the event of a default by Sub-Grantee under this Agreement, the Authority may suspend performance of any or all of its obligations under this Agreement. If such default is not cured within five days of written notice of default provided by the Authority to Sub-Grantee, the Authority may terminate this Agreement and Sub-Grantee's access to Grant Funds without any liability whatsoever to the Authority.

12. Representations and Warranties. Sub-Grantee hereby makes all of the representations and warranties contained in the Grant Agreement, for the benefit of the Authority.

13. Required State Disclosure. Funding for the Project has been provided in full or in part through an agreement with the DWR. The contents of this document do not necessarily reflect the views and policies of the DWR, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

14. Further Assurances. From time to time and at any time after the execution and delivery hereof, each of the parties, at its own expense, shall execute, acknowledge and deliver any further instruments, documents and other assurances reasonably requested by the other party, and shall take any other action consistent with the terms of this Agreement that may reasonably be requested by the other party, to evidence or carry out the intent of this Agreement.

15. Compliance with Grant Agreement.

(a) Notwithstanding any other provision of this Agreement, Sub-Grantee shall not take any action or fail to take any action that would result in a breach by the Authority under the Grant Agreement. Sub-Grantee shall be solely responsible for all costs incurred by the Authority of any kind as a result of a breach of the Grant Agreement to the extent such breach resulted from the action or in action of Sub-Grantee.

(b) The parties understand that amendments to the Grant Agreement may be proposed from time to time by either the DWR or the Authority, and nothing in this Agreement shall be interpreted to prohibit such amendments. However, any proposed amendment to the Grant Agreement shall be provided to Sub-Grantee for comment not less than 15 days before it is executed by the Authority. If a proposed amendment would impose no additional obligations on Sub-Grantee if it became a part of the Grant Agreement, or if the Authority is required to execute such amendment in order to maintain the Grant Agreement in full effect, after such 15-day period it may be executed by the Authority and upon such amendment becoming effective it shall be deemed to be a part of the Grant Agreement for all purposes under this Agreement. If a proposed amendment would impose additional obligations on Sub-Grantee if it became a part of the Grant Agreement, unless the Authority is required to execute such amendment in order to maintain the Grant Agreement in full effect, the Authority shall not execute it if Sub-Grantee reasonably objects to such execution during the 15-day comment period. If Sub-Grantee does not so reasonably object, or if Sub-Grantee subsequently confirms in writing that it consents to the amendment, the Authority may thereafter execute such amendment and upon such amendment becoming effective it shall be deemed to be a part of the Grant Agreement for all purposes under this Agreement.

16. Time and Computation of Time. Time is of the essence of this Agreement and each and all of its provisions. The parties agree that the time for performance of any action permitted or required under this Agreement shall be computed as if such action were "an act provided by law" within the meaning of California Civil Code Section 10, which provides: "The time in which any act provided by law to be done is computed by excluding the first day and including the last, unless the last day is a holiday, and then it is also excluded."

17. Effect of Headings. The subject headings of the paragraphs and subparagraphs of this Agreement are included for purposes of convenience only and shall not affect the construction or interpretation of any of its provisions.

18. Entire Agreement. This Agreement constitutes the entire agreement between the parties pertaining to the subject matter contained in it and supersedes all prior and contemporaneous agreements, representations, and understandings of the parties. No supplement, modification, or amendment of this Agreement shall be binding unless executed in writing by all of the parties hereto.

19. Waiver. Waiver of any breach of this Agreement by any party hereto shall not constitute a continuing waiver or a waiver of any breach of the same or another provision of this Agreement.

20. Counterparts; Fax and Email Signatures. This Agreement may be executed in any

number of counterparts and each such counterpart shall be deemed to be an original instrument, all of which together shall constitute one and the same instrument. Facsimile and electronic mail signature pages shall constitute originals.

21. Assignment; Binding Effect. Neither party shall assign any interest in this Agreement without the express written consent of the other party. This Agreement shall be binding upon and inure to the benefit of the heirs, executors, administrators, assigns, and successors of the parties hereto.

22. Interpretation. It is agreed and acknowledged by the parties that this Agreement has been arrived at through negotiation, and that each party has had a full and fair opportunity to revise the terms of this Agreement. Consequently, the normal rule of construction that any ambiguities are to be resolved against the drafting party shall not apply in construing or interpreting this Agreement.

23. Professionals' Fees. Should any action or proceeding be commenced between the parties hereto concerning this Agreement, or the rights and duties of any party in relation thereto, the party prevailing in such action or proceeding shall be entitled, in addition to such other relief as may be granted, to recover from the losing party a reasonable sum for its attorneys', paralegals', accountants', and other professional fees and costs incurred in connection with such action or proceeding.

24. Governing Law. This Agreement shall be governed by the laws of the State of California.

25. Construction. All words used in this Agreement shall be construed to include the plural as well as the singular number and vice versa. Words used herein in the present tense shall include the future as well as the present, and words used in the masculine gender shall include the feminine and neuter genders.

26. Parties in Interest. Nothing in this Agreement, whether expressed or implied, is intended to confer any rights or remedies on any persons other than the parties hereto and their respective successors and assigns, nor is anything in this Agreement intended to relieve or discharge the obligation or liability of any third person to any party to this Agreement, nor shall any provision give any third person any right of subrogation or action over and against any party to this Agreement.

27. Survival. Each of the terms, provisions, representations, warranties, and covenants of the parties shall be continuous and shall survive the closing or other consummation of the transactions contemplated in this Agreement.

28. Notices. All notices and other communications required under this Agreement shall be in writing and shall be deemed to have been duly given (i) on the date of service, if served personally on the person to whom notice is to be given, (ii) on the date of service if sent by facsimile or email transmission, provided the original is concurrently sent by first class mail, and provided that notices received by facsimile or email transmission after 5:00 p.m. shall be

deemed given on the next business day, (iii) on the next business day after deposit with a recognized overnight delivery service, or (iv) or on the third (3rd) day after mailing, if mailed to the party to whom notice is to be given by first class mail, registered or certified, postage-prepaid, and properly addressed as follows:

To the Authority: c/o Kings River Conservation District
4886 East Jensen Ave
Fresno, CA 93725
Attn: Mr. Eric Osterling
Facsimile No.: 559-237-5560
Email Address: eosterling@krcd.org

To Sub-Grantee: Consolidated Irrigation District
P.O. Box 209
Selma, CA 93662
Attn: Mr. Phillip Desatoff
Facsimile No.: 559-896-8488
Email Address: pdesatoff@cidwater.com

A party may change its address for notices by providing notice to the other parties as provided above.

IN WITNESS WHEREOF, the parties have executed this Agreement to be effective as of the date first above written.

UPPER KINGS BASIN INTEGRATED REGIONAL WATER MANAGEMENT AUTHORITY	CONSOLIDATED IRRIGATION DISTRICT
By:	By:

Exhibit A
Grant Agreement

RESOLUTION NO. 2012 - 03

RESOLUTION OF THE BOARD OF DIRECTORS OF THE CONSOLIDATED IRRIGATION DISTRICT

FOR A GRANT FROM THE LOCAL GROUNDWATER ASSISTANCE FUND

Resolved by the Consolidated Irrigation District that application shall be made to the California Department of Water Resources for a Local Groundwater Assistance Grant pursuant to the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 (Public Resource Code (PRC) Section 75001 *et seq.*), and to enter into an agreement to receive a grant for the Consolidated Irrigation District Groundwater Monitoring Improvement Project. The Consolidated Irrigation District considers groundwater monitoring an essential component of groundwater management and supports the effort to seek funding to improve groundwater monitoring in the District and the region. Phillip Desatoff, General Manager of Consolidated Irrigation District, is hereby directed to prepare the necessary data, conduct investigations, file such application, and execute a grant agreement with California Department of Water Resources.

Passed and adopted at a meeting of the Consolidated Irrigation District on July 11, 2012.

Authorized Original Signature: Phillip G. Desatoff

Printed Name: **Phillip G. Desatoff**

Title: **General Manager**

Clerk/Secretary: Margaret Mauro

STATE OF CALIFORNIA – CALIFORNIA NATURAL RESOURCES AGENCY

EDMUND G. BROWN JR., *Governor*

DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

RECEIVED K.R.C.D.

JUL 30 2012

File No. UKB 301.02.02

July 25, 2012

Eric Osterling
Upper Kings Basin IRWM Authority
Upper Kings River Conservation District
488 East Jensen Avenue
Fresno, CA 93725

Proposition 84 - Round 1- Integrated Regional Water Management (IRWM) Implementation Grant; Agreement No. 4600009713

Dear Mr. Osterling:

Enclosed is an original executed copy of Agreement No. 4600009713.

If you have any questions, please contact Simar Dhanota, Project Manager at (916) 651-9250 or sdhanota@water.ca.gov.

Sincerely,

Elise King

Elise King
Contract Analyst
Implementation Grants Section
Financial Assistance Branch
Division of Integrated Regional Water Management

Enclosures

cc: Simar Dhanota, Project Manager

GRANT AGREEMENT BETWEEN THE STATE OF CALIFORNIA (DEPARTMENT OF WATER RESOURCES) AND UPPER KINGS BASIN INTEGRATED REGIONAL WATER MANAGEMENT AUTHORITY
AGREEMENT NUMBER 4600009713
INTEGRATED REGIONAL WATER MANAGEMENT (IRWM) IMPLEMENTATION GRANTS
CALIFORNIA PUBLIC RESOURCES CODE §75026 *ET SEQ.*

THIS AGREEMENT is entered into by and between the Department of Water Resources of the State of California, herein referred to as the "State" and the Upper Kings Basin Integrated Regional Water Management Authority, a joint powers authority, in the Counties of Fresno, Kings, and Tulare, State of California, duly organized, existing, and acting pursuant to the laws thereof, herein referred to as the "Grantee", which parties do hereby agree as follows:

1. PURPOSE. State shall provide a grant from the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 to Grantee to assist in financing projects associated with the Upper Kings Basin Integrated Regional Water Management (IRWM) Plan pursuant to Chapter 8 (commencing with Section 79560) of Division 26.5 of the California Water Code (CWC), hereinafter collectively referred to as "IRWM Program."

2. TERM OF GRANT AGREEMENT. The term of this Grant Agreement begins on the date this Grant Agreement is executed by State, and terminates on March 31, 2015 or when all of the Parties' obligations under this Grant Agreement are fully satisfied, whichever occurs earlier. Execution date is the date the State signs this Grant Agreement indicated on page 8.

3. GRANT AMOUNT. The maximum amount payable by State under this Grant Agreement shall not exceed $8,496,000. Of this grant amount, not less than $256,090 shall be expended to projects that benefit the critical water supply or water quality needs of disadvantaged communities (DAC) in the IRWM effort funded by this Grant Agreement. Of the total grant amount, not less than $1,435,610 shall be expended to urban and agricultural water conservation projects in the IRWM effort funded by this Grant Agreement.

4. GRANTEE COST SHARE. The reasonable costs for this Agreement are estimated to be $15,316,390. Grantee shall provide a Grantee Cost Share (Funding Match) in the amount of at least 25% (unless a Disadvantaged Community project waiver is granted) of the total project cost. Grantee's Funding Match is estimated to be $6,820,390. Grantee's Funding Match may include cost share performed after September 30, 2008.

5. GRANTEE'S RESPONSIBILITY. Grantee shall faithfully and expeditiously perform or cause to be performed all project work as described in Exhibit A (Work Plan) and in accordance with Project Exhibit B (Schedule) and Exhibit C (Budget). Grantee shall comply with all of the terms and conditions of this Grant Agreement and applicable California Public Resources Code (PRC) requirements.

6. LOCAL PROJECT SPONSOR'S RESPONSIBILITY. Grantee shall assign Local Project Sponsors to act on behalf of Grantee for the purposes of individual project management, oversight, compliance, and operations and maintenance. Local Project Sponsors shall be assigned in accordance with the participating agencies identified in the Upper Kings Basin IRWM Authority IRWM Implementation grant application. Exhibit F identifies Local Project Sponsors. Local Project Sponsors shall also act on behalf of Grantee in the fulfillment of Grantee responsibilities where specifically specified in this Grant Agreement.

7. BASIC CONDITIONS. State shall have no obligation to disburse money for a project under this Grant Agreement unless and until Grantee has satisfied the following conditions in accordance with the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006.
   a) By signing this Grant Agreement, Grantee demonstrates the designated Local Project Sponsors for each project are aware of and comply with the provisions of the Grant Agreement between State and Grantee.
   b) Grantee demonstrates the availability of sufficient funds to complete the project, as stated in the Grant Award/Commitment Letter, by submitting the most recent 3 years of audited financial statements.
   c) Grantee complies with PRC §75102 to notify the California Native American tribe (which is on the contact list maintained by the Native American Heritage Commission) of Project Construction if that tribe has traditional lands located within the area of the Project.

d) For groundwater management and recharge projects and for projects with potential groundwater impacts, the Grantee must demonstrate compliance with the groundwater compliance options set forth on page 15 of the IRWM Program Guidelines, dated August 2010.
e) For the term of this Grant Agreement, Grantee submits timely Quarterly Progress Reports as required by Paragraph 17, "Submission of Reports."
f) Grantee submits all deliverables as specified in this Paragraph of this Grant Agreement and Work Plan in Exhibit A.
g) Since the Grantee's IRWM region (region) receives water supplied from the Sacramento-San Joaquin Delta (Delta), then the region's IRWM Plan (existing or any future update) must help reduce dependence on the Delta for water supply.
h) For each project, prior to the commencement of construction or implementation activities, Grantee shall submit to the State the following:
   1) Final plans and specifications certified by a California Registered Civil Engineer as to compliance for each approved project as listed in Exhibit A of this Grant Agreement.
   2) Work that is subject to the California Environmental Quality Act (CEQA) and or environmental permitting shall not proceed under this Grant Agreement until the following actions are performed:
      i. Grantee submits all applicable environmental permits as indicated on the Environmental Information Form to the State,
      ii. Documents that satisfy the CEQA process are received by the State,
      iii. State has completed its CEQA compliance review as a Responsible Agency, and
      iv. Grantee receives written concurrence from the State of Lead Agency's CEQA document(s) and State notice of verification of environmental permit submittal.

      State's concurrence of Lead Agency's CEQA documents is fully discretionary and shall constitute a condition precedent to any work (ex. construction or implementation activities) for which it is required. Therefore, the Grantee should get concurrence from DWR on CEQA before beginning any of the work that is subject to CEQA. Once CEQA documentation has been completed, State will consider the environmental documents and decide whether to continue to fund the project or to require changes, alterations or other mitigation. Grantee must also demonstrate that it has complied with all applicable requirements of the National Environmental Policy Act by submitting copies of any environmental documents, including environmental impact statements, Finding of No Significant Impact, mitigation monitoring programs, and environmental permits as may be required prior to beginning construction/implementation.
   3) For each project included in this Grant Agreement a monitoring plan as required by Paragraph 22, "Project Monitoring Plan Requirements."

8. DISBURSEMENT OF GRANT FUNDS. Following the review of each invoice, State will disburse to Grantee the amount approved, subject to the availability of funds through normal State processes. Notwithstanding any other provision of this Grant Agreement, no disbursement shall be required at any time or in any manner which is in violation of, or in conflict with, federal or state laws, rules, or regulations, or which may require any rebates to the federal government, or any loss of tax-free status on state bonds, pursuant to any federal statute or regulation. For each project, funds will be disbursed by State in response to each approved invoice in accordance with the Exhibit C. Any and all money disbursed to Grantee under this Grant Agreement and any and all interest earned by Grantee on such money shall be used solely to pay Eligible Costs.

9. ELIGIBLE PROJECT COST. Grantee shall apply State funds received only to eligible Project Costs in accordance with applicable provisions of the law and Exhibit C. Eligible project costs include the reasonable costs of studies, engineering, design, land and easement acquisition, legal fees, preparation of environmental documentation, environmental mitigations, monitoring, and project construction. Work performed after the date of grant award, August 16, 2011, shall be eligible for reimbursement. Reasonable administrative expenses may be included as Project Costs and will depend on the complexity of the project preparation, planning, coordination, construction, acquisitions, implementation, and maintenance. Reimbursable administrative expenses are the necessary costs incidentally but directly related to the project including the portion of overhead and administrative expenses that are directly related to the projects included in this Agreement in accordance with the standard accounting practices of the Grantee.

Advanced funds will not be provided. Costs that are not reimbursable with grant funds cannot be counted as cost share. Costs that are not eligible for reimbursement include but are not limited to:

a) Costs, other than those noted above, incurred prior to the award date of the Grant.
b) Operation and maintenance costs, including post construction performance and monitoring costs.
c) Purchase of equipment not an integral part of a project.
d) Establishing a reserve fund.
e) Purchase of water supply.
f) Monitoring and assessment costs for efforts required after project construction is complete.
g) Replacement of existing funding sources for ongoing programs.
h) Travel and per diem costs.
i) Support of existing agency requirements and mandates (e.g. punitive regulatory agency requirements).
j) Purchase of land in excess of the minimum required acreage necessary to operate as an integral part of a project, as set forth and detailed by engineering and feasibility studies, or land purchased prior to the effective date of the grant award with the State.
k) Payment of principal or interest of existing indebtedness or any interest payments unless the debt is incurred after execution of this Grant Agreement, the State agrees in writing to the eligibility of the costs for reimbursement before the debt is incurred, and the purposes for which the debt is incurred are otherwise eligible costs. However, this will only be allowed as Grantee cost share (i.e. Funding Match)
l) Overhead not directly related to project costs.

10. METHOD OF PAYMENT. After the disbursement requirements in Paragraph 7 "Basic Conditions" are met, State will disburse the whole or portions of the Grant Amount to Grantee, following receipt from Grantee of an invoice for costs incurred, and timely Quarterly Progress Reports as required by Paragraph 17, "Submission of Reports."

Invoices submitted by Grantee shall include the following information:

a) Costs incurred for work performed in implementing the IRWM Program or program contracts during the period identified in the particular invoice.
b) Costs incurred for any interests in real property (land or easements) that have been necessarily acquired for a project during the period identified in the particular invoice for the construction, operation, or maintenance of a project.
c) Appropriate receipts and reports for all costs incurred.
d) Invoices shall be submitted on forms provided by State and shall meet the following format requirements:
    1) Invoices must contain the date of the invoice, the time period covered by the invoice, and the total amount due.
    2) Invoices must be itemized based on the categories specified in the Exhibit C. The amount claimed for salaries/wages/consultant fees must include a calculation formula (i.e., hours or days worked times the hourly or daily rate = the total amount claimed).
    3) Sufficient evidence (i.e., receipts, copies of checks, time sheets) must be provided for all costs included in the invoice.
    4) Each invoice shall clearly delineate those costs claimed for reimbursement from the State's grant amount, as depicted in Paragraph 3, "Grant Amount" and those costs that represent Grantee's and Local Project Sponsors' costs, as applicable, in Paragraph 4, "Grantee Cost Share."
    5) Original signature and date (in ink) of Grantee's Project Manager.

Payment will be made no more than monthly, in arrears, upon receipt of an invoice bearing the Grant Agreement number. Submit the original and three (3) copies of the invoice form to the following address:

Department of Water Resources
Simarjit Dhanota
PO Box 942836
Sacramento, CA 94236-0001
Phone: (916)651-9250
Fax: (916) 651-9292
e-mail: sdhanota@water.ca.gov

11. WITHHOLDING OF GRANT DISBURSEMENT BY STATE. If State determines that a project is not being implemented in accordance with the provisions of this Grant Agreement, or that Grantee has failed in any other respect to comply with the provisions of this Grant Agreement, and if Grantee does not remedy any such failure to State's satisfaction, State may withhold from Grantee all or any portion of the Grant Amount and take any other action that it deems necessary to protect its interests. State may require the Grantee to immediately repay all or any portion of the disbursed grant amount with interest, consistent with its determination. State may consider Grantee's refusal to repay the requested disbursed grant amount a contract breach subject to the default provisions in Paragraph 13, "Default Provisions."

    If State notifies Grantee of its decision to withhold the entire grant amount from Grantee pursuant to this Paragraph, this Grant Agreement shall terminate upon receipt of such notice by Grantee and shall no longer be binding on either party.

12. CONTINUING ELIGIBILITY. Grantee must meet the following ongoing requirements to remain eligible to receive State grant funds:
    a) Timely adoption of an IRWM Plan that meets the requirements contained in Part 2.2 of Division 6 of the CWC, commencing with Section 10530.
    b) An urban water supplier that receives grant funds governed by this Grant Agreement shall maintain compliance with the Urban Water Management Planning Act (CWC§10610 *et. seq.*)
    c) For groundwater management and recharge projects and for projects with potential groundwater impacts, the Grantee must demonstrate compliance with the groundwater compliance options set forth on page 15 of the IRWM Program Guidelines, dated August 2010.
    d) Reporting of status of IRWM Plan Update as described in Exhibit E under the heading "Quarterly Progress Report."

13. DEFAULT PROVISIONS. Grantee will be in default under this Grant Agreement if any of the following occur:
    a) Breach of this Grant Agreement, or any supplement or amendment to it, or any other agreement between Grantee and State evidencing or securing Grantee's obligations.
    b) Making any false warranty, representation, or statement with respect to this Grant Agreement.
    c) Failure to operate or maintain projects in accordance with this Grant Agreement.
    d) Failure to make any remittance required by this Grant Agreement.
    e) Failure of Grantee or a Local Project Sponsor receiving grant funding through this Grant Agreement to adopt, no later than 2 years after the State executes the Grant Agreement, an IRWM Plan that meets the requirements contained in Part 2.2 of Division 6 of the CWC, commencing with Section 10530.
    f) Failure to undertake all reasonable and feasible efforts to take into account the water-related needs of disadvantaged communities in the area within the boundaries of the IRWM Plan.
    g) Failure to comply with Labor Compliance Program (LCP) requirements.
    h) Failure to meet any of the requirements set forth in Paragraph 12, "Continuing Eligibility."

    Should an event of default occur, State may do any or all of the following:
    i) Declare the Grant be immediately repaid, with interest, which shall be equal to State of California general obligation bond interest rate in effect at the time of the default.
    j) Terminate any obligation to make future payments to Grantee.
    k) Terminate the Grant Agreement.
    l) Take any other action that it deems necessary to protect its interests.

14. PERMITS, LICENSES, APPROVALS, AND LEGAL OBLIGATIONS. Grantee and Local Project Sponsors shall be responsible for ensuring any and all permits, licenses, and approvals required for performing their obligations under this Grant Agreement are obtained, and shall comply with CEQA (PRC Section 21000 *et seq.*) and other applicable federal, State and local laws, rules, and regulations, guidelines, and requirements for each project described in Exhibit A.

15. RELATIONSHIP OF PARTIES. Grantee and Local Project Sponsors are solely responsible for design, construction, and operation and maintenance of Projects within the Upper Kings Basin IRWM Authority IRWM Program. Review or approval of plans, specifications, bid documents, or other construction

documents by State is solely for the purpose of proper administration of grant funds by State and shall not be deemed to relieve or restrict responsibilities of Grantee and Local Project Sponsors under this Grant Agreement.

16. GRANTEE REPRESENTATIONS. Grantee accepts and agrees to comply with all terms, provisions, conditions, and written commitments of this Grant Agreement, including all incorporated documents, and to fulfill all assurances, declarations, representations, and statements made by Grantee in the application, documents, amendments, and communications filed in support of its request for Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 financing. Grantee warrants that all Local Project Sponsors will be contractually required to comply with this Grant Agreement for their respective project or projects.

17. SUBMISSION OF REPORTS. The submittal and approval of all reports is a requirement for the successful completion of this Grant Agreement. Reports shall meet generally accepted professional standards for technical reporting and shall be proofread for content, numerical accuracy, spelling, and grammar prior to submittal to State. All reports shall be submitted to the State's Project Manager, and shall be submitted in both electronic and hard copy forms. If requested, Grantee shall promptly provide any additional information deemed necessary by State for the approval of reports. Reports shall be presented in the formats described in the applicable portion of Exhibit E. The timely submittal of reports is a requirement for initial and continued disbursement of State funds. Submittal and subsequent approval by the State, of a Project Completion Report for each project listed on Exhibit A is a requirement for the release of any funds retained for such project.

    - Quarterly Progress Reports: Grantee shall submit Quarterly Progress Reports on a regular and consistent basis to meet the State's requirement for disbursement of funds. Quarterly Progress Reports shall be sent via e-mail, to the State's Project Manager as specified in Exhibit B. Quarterly Progress Reports shall provide a brief description of the work performed, Grantees activities, milestones achieved, any accomplishments and any problems encountered in the performance of the work under this Grant Agreement during the reporting period.
    - Project Completion Reports: Grantee shall prepare and submit to State a separate Project Completion Report for each project included in Exhibit A. Grantee shall submit a Project Completion Report within ninety (90) calendar days of project completion. Each Project Completion Report shall include a description of actual work done, any changes or amendments to each project, and a final schedule showing actual progress versus planned progress, and copies of any final documents or reports generated or utilized during a project. The Project Completion Report shall also include, if applicable, certification of final project by a registered civil engineer, consistent Standard Condition D-15,"Final Inspections and Certification of Registered Civil Engineer." A DWR "Certification of Project Completion" form will be provided by the State.
    - Grant Completion Report: Upon completion of all projects included in Exhibit A, Grantee shall submit to State a Grant Completion Report. The Grant Completion Report shall be submitted within ninety (90) calendar days of submitting the Project Completion Report for the final project to be completed under the Grant Agreement. The Grant Completion Report shall include reimbursement status, a brief description of each project completed, and how those projects will further the goals of the IRWM Plan and identify any changes to the IRWM Plan, as a result of project implementation. Retention for the last project to be completed as part of this Grant Agreement will not be disbursed until the Grant Completion Report is submitted to and approved by the State.
    - Post-Performance Reports: Grantee shall submit a Post-Performance Report for each project. Post-Performance Reports shall be submitted to State within ninety (90) calendar days after the first operational year of a project has elapsed. This record keeping and reporting process shall be repeated, for each project, annually for a total of 10 years after the completed project begins operation.

18. IRWM PROGRAM PERFORMANCE AND ASSURANCES. Grantee agrees to faithfully and expeditiously perform or cause to be performed all IRWM Program work as described in the final plans and specifications for each project under this Grant Agreement and implement the project in accordance with applicable provisions of the law. In the event State finds it necessary to enforce this provision of this Grant Agreement in the

manner provided by law, Grantee agrees to pay all costs incurred by State including, but not limited to, reasonable attorneys' fees, legal expenses, and costs.

20. 19. LABOR COMPLIANCE. Grantee will be required to keep informed of and take all measures necessary to ensure compliance with applicable California Labor Code requirements, including, but not limited to, Section 1720 et seq. of the California Labor Code regarding public works, limitations on use of volunteer labor (California Labor Code Section 1720.4), labor compliance programs (California Labor Code Section 1771.5) and payment of prevailing wages for work done and funded pursuant to these *Guidelines*, including any payments to the Department of Industrial Relations under California Labor Code Section 1771.3.

21. OPERATION AND MAINTENANCE OF PROJECT. For the useful life of construction and implementation projects and in consideration of the Grant made by State, Grantee agrees to ensure or cause to be performed the commencement and continued operation of the projects, and shall ensure or cause the projects to be operated in an efficient and economical manner; shall ensure all repairs, renewals, and replacements necessary to the efficient operation of the same are provided; and shall ensure or cause the same to be maintained in as good and efficient condition as upon its construction, ordinary and reasonable wear and depreciation excepted. The Grantee shall ensure that all operations and maintenance costs of the facilities and structures are contractually assumed by the appropriate Local Project Sponsors for their respective projects; State shall not be liable for any cost of such maintenance, management, or operation. Grantee or Local Project Sponsors may be excused from operations and maintenance only upon the written approval of the State's Project Manager. For purposes of this Grant Agreement, "useful life" means period during which an asset, property, or activity is expected to be usable for the purpose it was acquired or implemented; "operation costs" include direct costs incurred for material and labor needed for operations, utilities, insurance, and similar expenses, and "maintenance costs" include ordinary repairs and replacements of a recurring nature necessary for capital assets and basic structures and the expenditure of funds necessary to replace or reconstruct capital assets or basic structures. Refusal of Grantee to ensure operation and maintenance of the projects in accordance with this provision may, at the option of State, be considered a breach of this Grant Agreement and may be treated as default under Paragraph 13, "Default Provisions."

22. STATEWIDE MONITORING REQUIREMENTS. Grantee shall ensure that all groundwater projects and projects that include groundwater monitoring requirements are consistent with the Groundwater Quality Monitoring Act of 2001 (Part 2.76 (commencing with Section 10780) of Division 6 of CWC) and, where applicable, that projects that affect water quality shall include a monitoring component that allows the integration of data into statewide monitoring efforts, including where applicable, the Surface Water Ambient Monitoring Program carried out by the State Water Resources Control Board.

23. PROJECT MONITORING PLAN REQUIREMENTS. The Grant Agreement work plan should contain activities to develop and submit to State a monitoring plan for each project contained in this Grant Agreement. Monitoring plan can be for the entire Proposal or on a per project basis. Along with the Attachment 6 Project Performance Measures Tables requirements outlined on page 21 of the Proposition 84 Round 1 Implementation Proposal Solicitation Package, the Project Monitoring Plan should also include:
    a) Baseline conditions.
    b) Brief discussion of monitoring systems to be utilized.
    c) Methodology of monitoring.
    d) Frequency of monitoring.
    e) Location of monitoring points.

    A monitoring plan shall be submitted to the State prior to disbursement of grant funds for construction or monitoring activities for each project in this Grant Agreement. See Exhibit G ("Requirements for Data Submittal") for web links and information regarding other State monitoring and data reporting requirements.

24. NOTIFICATION OF STATE. For each project, Grantee shall promptly notify State , in writing, of the following items:
    a) Events or proposed changes that could affect the scope, budget, or work performed under this Grant Agreement. Grantee agrees that no substantial change in the scope of a project will be undertaken

until written notice of the proposed change has been provided to State and State has given written approval for such change. Substantial changes generally include changes to the wording/scope of work, schedule or term, and budget. See Exhibit H for guidance on Agreement Amendment requirements.

b) Any public or media event publicizing the accomplishments and/or results of this Grant Agreement and provide the opportunity for attendance and participation by State's representatives. Grantee shall make such notification at least fourteen (14) calendar days prior to the event.

c) Completion of work on a project shall include final inspection of a project by a Registered Civil Engineer, as determined and required by State, and in accordance with Standard Condition D-15 (Final Inspections and Certification of Registered Civil Engineer). Furthermore, the Grantee shall provide the State the opportunity to participate in the inspection. Grantee shall make such notification at least fourteen (14) calendar days prior to the final inspection.

24. NOTICES. Any notice, demand, request, consent, or approval that either party desires or is required to give to the other party under this Grant Agreement shall be in writing. Notices may be transmitted by any of the following means: (i) by delivery in person; (ii) by certified U.S. mail, return receipt requested, postage prepaid; (iii) by "overnight" delivery service; provided that next-business-day delivery is requested by the sender; or (iv) by electronic means. Notices delivered in person will be deemed effective immediately on receipt (or refusal of delivery or receipt). Notices sent by certified mail will be deemed effective given ten (10) calendar days after the date deposited with the U. S. Postal Service. Notices sent by overnight delivery service will be deemed effective one business day after the date deposited with the delivery service. Notices sent electronically will be effective on the date of transmission, which is documented in writing. Notices shall be sent to the below addresses. Either party may, by written notice to the other, designate a different address that shall be substituted for the one below.

25. PERFORMANCE EVALUATION. Upon completion of this Grant Agreement, Grantee's performance will be evaluated by the State and a copy of the evaluation will be placed in the State file and a copy sent to the Grantee.

26. PROJECT REPRESENTATIVES. The Grantee has acknowledged authorization to enter into a cost sharing partnership agreement as documented in Exhibit I. The Project Representatives during the term of this Grant Agreement is as follows.

Department of Water Resources Paula Landis Chief, Division of IRWM P.O. Box 942836 Sacramento CA 94236-0001 Phone: (916) 651-9220 e-mail: plandis@water.ca.gov	Upper Kings Basin IRWM Authority Harry Armstrong Chairman of the Board 4886 East Jensen Ave Fresno, CA 93725 Phone: (559) 237-5567 e-mail: jacquiep@cityofclovis.com

Direct all inquiries to the Project Manager:

Department of Water Resources Simarjit Dhanota Division of Integrated Regional Water Management PO Box 942836 Sacramento, CA 94236-001 Phone: (916)651-9250 e-mail: sdhanota@water.ca.gov	Upper Kings Basin IRWM Authority Eric Osterling Kings River Conservation District 4886 East Jensen Ave Fresno, CA 93725 Phone: (559) 237-5567 ext.135 e-mail: eosterling@krcd.org

Either party may change its Project Representative or Project Manager upon written notice to the other party.

27. STANDARD PROVISIONS. The following Exhibits are attached and made a part of this Grant Agreement by this reference:

Exhibit A – Work Plan
Exhibit B – Schedule
Exhibit C – Budget
Exhibit D – Standard Conditions
Exhibit E – Report Formats and Requirements
Exhibit F – Local Project Sponsors
Exhibit G – Requirements for Data Submittal
Exhibit H – Guidelines for Grantees
Exhibit I – Grantee Resolution

IN WITNESS WHEREOF, the parties hereto have executed this Grant Agreement.

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

Paula J. Landis, P.E., Chief
Division of Integrated Regional Water Management
Date 7-16-12

UPPER KINGS BASIN IRWM AUTHORITY

Harry Armstrong
Chairman of the Board
Date 6/26/12

Approved as to Legal Form and Sufficiency

Spencer Kenner, Assistant Chief Counsel
Office of Chief Counsel
Date 7/10/12

EXHIBIT A
WORK PLAN

PROJECT 1: CONSOLIDATED IRRIGATION DISTRICT SOUTH AND HIGHLAND BASIN

PROJECT DESCRIPTION

Consolidated Irrigation District (CID) will construct a new groundwater banking facility for recharge and recovery. The facility will include the construction of two recharge ponds on a 75-acre site, along with two recovery wells, two monitoring wells, and two diversion structures. CID will deliver excess and available surface water to the basin for recharge during winter and spring months when water is available. Then during summer months, CID will pump the banked water using recovery wells into existing CID canals for delivery to meet downstream irrigation demands. It is anticipated that this project will provide as much as 7,000 acre-feet of additional recharge capacity during a wet year.

TASKS

TASK 1: ADMINISTRATION AND REPORTING

This task covers the project administration work involved in the development of the project including meetings, grant administration, coordination with stakeholders, invoice preparation and all reporting obligations in accordance with the grant agreement. All reports shall follow the requirements listed in Exhibit E.

Upon execution of the grant agreement, Progress Reports shall be submitted to DWR on a Quarterly basis.

This task also includes modification to the Monitoring, Assessment and Performance Measures (MAPM). Upon completion of any needed revisions to the MAPM, it will be implemented and the efforts described within the MAPM will be documented. The MAPM will serve as the Project Monitoring Plan.

Deliverables:

- Quarterly Progress Reports
- Monitoring, Assessment and Performance Measures
- Invoices for Reimbursement
- Final Project Completion Report

TASK 2: LABOR COMPLIANCE PROGRAM

Grantee shall adopt and enforce a Labor Compliance Program (LCP) pursuant to California Labor Code §1771.5(b) and applicable laws. At DWR's request, written evidence of compliance with the LCP will be submitted.

Deliverable:

- Evidence of LCP compliance

TASK 3: LAND PURCHASE/EASEMENT

The objective of this task is to continue to pay the "option to purchase" agreement fees and ultimately purchase the subject property.

Option to Purchase Agreement

Work to acquire the property (Fresno County Assessor's Number 345-020-52) has been initiated with an Option to Purchase Agreement dated April 1, 2010 between the landowner and CID. The agreement requires CID to pay a monthly fee while the Option to Purchase Agreement is in effect. This agreement was in effect until September 2011 (18 months).

Land Purchase/Acquisition

Included in this task is fee title acquisition of approximately 75 acres (APN 345-020-52) for development as the recharge basin area. Final purchase of the property was completed in September 2011, in accordance with the terms of the option agreement.

Deliverables:

- Property appraisal or other proof of fair market value
- Purchase agreement
- Proof of completion of acquisition in the form of title and agreement

TASK 4: ASSESSMENT AND EVALUATION

The objective of this task is to assess the feasibility of the banking project.

Feasibility Study

A feasibility study was completed in November 2010 to evaluate water supplies, facility economics, and conceptual project design. The study identified specific water supplies for banking, and included a hydrologic simulation and detailed cost estimates for construction fees.

As part of the feasibility study, a hydrogeologic study was completed for the proposed project. The study evaluated the geologic and hydrogeologic conditions, and concluded that a groundwater bank is technically feasible at the proposed site. The study included a preliminary geotechnical investigation, development of geologic cross sections utilizing DWR well completion reports, an on-site percolation and groundwater mounding test, and development of a monitoring well canvass to aid in the design and monitoring of the groundwater.

Environmental Site Assessment and Reconnaissance Level Biological Survey Report

To aid in the feasibility determination of the project a Phase 1 Environmental Site Assessment and a Reconnaissance Level Biological Survey Report were prepared.

The results of the studies conclude that the project site is feasible for use as a banking facility, with minor to no anticipated environmental impacts.

Deliverables:

- Final Feasibility Study and Hydrogeologic Study
- Environmental Site Assessment and Reconnaissance Level Biological Survey Report

TASK 5: FINAL DESIGN

This task includes a detailed topographic survey of subject property, and development of the preliminary and final designs for the project.

Topographic surveying will be done along adjacent CID canals, within the project property, along adjacent roadways, and in other areas needed to complete the final design. A boundary survey is not anticipated at this point, but will be added if required.

Design drawings, specifications and a cost estimate will be prepared for the recharge basin earthwork and levee construction, project basin turnout structures along the Kirby Ditch, and monitoring and recovery wells. Basin design will include a full geotechnical investigation to determine the recommended levee design. Structure design will include basin turnout box and pipeline design. Well design will include initial siting, determination of dimensions, materials, and perforated intervals, pump design, and electrical interconnection design.

Deliverables:

- Geotechnical investigation results
- Project plans and specifications at the final level
- Engineer's cost estimate

TASK 6: ENVIRONMENTAL DOCUMENTATION

This task includes the environmental planning efforts required to complete project development in the form of environmental processing and documentation.

The environmental process will consist of

1. Preparation of initial studies to identify potential project impacts.
2. Scientific and biological reviews to identify the existing conditions and potential impacts from construction and/or operations of the proposed project.
3. Public input through meetings and public hearings.
4. Formalized process of publication, circulation and adoption.

Environmental documentation will include preparation of a CEQA Initial Study using necessary plant and animal biological surveys, identification of potential endangered species, a cultural resources investigation and other studies as needed.

Deliverable:

- Approved and adopted CEQA documentation

TASK 7: PERMITTING

Permitting for this project will require the involvement of numerous State and local agencies. Each of the identified agencies have jurisdiction over portions of the project. The permits identified herein are grouped into two areas. The first are permits that are required during the planning, regulatory and design phase. The other group consists of permits that are required for construction.

Planning, Regulatory, and Design Phase Permits and/or Reviews:

- Fresno County
  CEQA review, conformance with General Plan
- Mosquito Abatement District
  Review and planning for mosquito control

Construction Phase Permits and/or Reviews:

- Well Drilling Permit and Encroachment Permit from Fresno County
  Fresno County will also conduct an electrical review.
- Permit from San Joaquin Valley Air Board
  Required for emissions from equipment and dust control
- Storm Water Pollution Prevention Plan (SWPPP) from Regional Water Quality Control Board
- Permit for Electrical Service from Fresno County

Deliverables:
Copies of permits or review from each of the following:

- Fresno County CEQA review
- Mosquito Abatement review
- Fresno County Well Drilling Permit
- Fresno County Encroachment Permit

- San Joaquin Valley Air Board Permit
- Storm Water Pollution Prevention Plan review
- Fresno County Electrical Permit

TASK 8: CONSTRUCTION CONTRACTING

This task includes preparation of bid packages, public bid advertisements, pre-bid meetings, QA during the bidding process, and evaluation of submitted bids.

Four separate bid packages will be prepared for

1. Earthwork and Structures
2. Recovery Well Construction
3. Recovery Well Equipping
4. Monitoring Well Construction

Deliverable:

- (4) Bid Summary Reports

TASK 9: CONSTRUCTION

The objective of this task is to construct the project facilities. Facility construction is broken down into mobilization/earthwork, structures, wells, site improvements and testing/inspection.

Mobilization/Earthwork

This includes all earthwork activities to excavate and construct two recharge basins and earthen levees. Includes contractor mobilization, any required clearing and grubbing of the existing fields, and demolition and removal of the existing home site and workshop are also part of this task.

Soil compaction, backfilling, and other geotechnical activities shall be reviewed and monitored by a geotechnical engineer to ensure compliance with the geotechnical report recommendations, design plans and specifications.

Structures

Two concrete basin turnout structures are needed to regulate and convey water from Kirby Ditch into the recharge basins using water control gates. Turnout structures, associated pipeline, valves and appurtenances shall be constructed according to the plans and specifications for each of the project's recharge basins.

Wells

Two recovery wells and as many as two shallow monitoring wells shall be constructed for this project.

Recovery well construction includes discharge piping, flow meters, check valves and appurtenances for each of the two recovery wells. Initial stages of the well construction include pilot borings, E-logging, depth discrete water quality sampling, and aquifer tests to aid in selecting the final design details of the wells.

The shallow monitoring wells to monitor and manage the groundwater bank shall be constructed according to the plans and specifications as part of this task.

Site Improvements

These activities include perimeter fence construction, crushed rock drive surfaces, and project electrical improvements for the wells and electrically controlled water control gates.

Testing/Inspection

A final inspection of the banking facility shall be performed to ensure the project was constructed in compliance with the plans and specifications. Recovery wells will be tested after construction to ensure their performance capabilities comply with that of the design.

Summary of work products for **Task 9 Construction**:

- Site preparation and demolition
- Construction of Recharge Basins and Levees
- Construction of Turnout Structures
- Construction of Recovery Wells
- Construction of Monitoring Wells
- Perimeter fencing around banking facility
- Crushed rock drive surfaces
- Site electrical improvements
- Final inspection of the facility
- Recovery well performance tests

Deliverables:

- Construction Photographs
- Final Inspection Report
- Recovery and Monitoring well Completion Report(s)
- Well performance test results

TASK 10: ENVIRONMENTAL COMPLIANCE/MITIGATION/ENHANCEMENT

This task has been developed to mitigate any potential disturbance or impacts to protected species or communities. This task covers mitigation measures as required by the CEQA documentation.

Deliverable:

- Summary and implementation plan of mitigation measures required by CEQA.

TASK 11: CONSTRUCTION ADMINISTRATION

This task includes construction administration and observation efforts. CID construction management staff will perform construction observation duties with assistance from an experienced consultant familiar with this type of project.

Roles of the engineering consultant include: periodic site visits during project construction, organize and attend kickoff meetings, attend weekly meetings with contractors, review submittals, process monthly payment requests, and review contract change order requests. The engineering consultant shall provide a field engineer, geotechnical engineer, or geologist, as appropriate, to monitor construction of the recharge basins and levees, concrete structures, wells, pumps, and pipelines. During construction of the wells, geologic logs will be prepared by a geologist.

Upon completion of construction, the design drawings shall be modified to reflect construction conditions using information provided by the contractor. These drawings shall be signed by a professional engineer. Additionally, upon completion of construction a notice of completion shall be submitted to the county.

This task also includes the preparation of an Operations and Maintenance (O&M) Manual and Monitoring Plan. The Monitoring Plan will establish the procedures for monitoring the banking project's influence on groundwater conditions and will be used to minimize negative effects on nearby wells and septic systems, in conjunction with the MAPM.

Summary of work products for **Task 11 Construction Administration**:

- Review of submittals
- Daily construction observation and reporting
- Contractor progress payment approval and change order review
- Preparation of final record drawings
- O&M Manual
- Monitoring Plan

Deliverables:

- Final record (as-built) drawings based on changes during construction
- Final O&M Manual
- Final Monitoring Plan
- Copy of County Notice of Completion

PROJECT 2: CITY OF CLOVIS SWTP EXPANSION

PROJECT DESCRIPTION

The Surface Water Treatment Plant Expansion (Expansion) will add a total of 7,711 ac-ft per year to the output capacity of City of Clovis' existing plant that was built in 2004. The added capacity will allow the City to rely less on their existing groundwater wells, allowing for groundwater basin recharge and providing greater flexibility during dry years.

TASKS

TASK 1: ADMINISTRATION AND REPORTING

This task includes preparation of all reporting obligations in accordance with the grant agreement, including invoices and Progress Reports. All reports shall follow the requirements listed in Exhibit E.

Upon execution of the grant agreement, Progress Reports shall be submitted to DWR on a Quarterly basis.

This task will also include meetings, conference calls, engineering consultant management and overall project coordination.

This task also includes modification to the Monitoring, Assessment and Performance Measures (MAPM). Upon completion of any needed revisions to the MAPM, it will be implemented and the efforts described within the MAPM will be documented. The MAPM will serve as the Project Monitoring Plan.

Deliverables:

- Quarterly Progress Reports
- Invoices for Reimbursement
- Monitoring, Assessment and Performance Measures
- Final Project Completion Report

TASK 2: LABOR COMPLIANCE PROGRAM

Grantee shall adopt and enforce a LCP pursuant to California Labor Code §1771.5(b) and applicable laws. At DWR's request, written evidence of compliance with the LCP will be submitted.

Deliverable:

- Evidence of LCP compliance

TASK 3: FINAL DESIGN

This task includes the design of the membrane feed pumps and strainers, membrane rack arrangements, plate settler, pipelines and preparation of plans, specifications and cost estimates. City design engineers will prepare the required design plans and specifications with assistance from design consultants as required. Design will include plans for sewer pipeline connection from the Plant to the existing sewer pipeline in DeWolf Avenue. This task also includes acquisition of the required easement for that pipeline.

Deliverables:

- Project plans and specifications at the final level
- Engineer's cost estimate

TASK 4: ENVIRONMENTAL DOCUMENTATION

CEQA documents are not a contractual obligation because CEQA was completed with the original Surface Water Treatment Plant planning, design and construction. A Notice of Exemption has been filed for the sewer line construction. The final documents will be made available to DWR as it is the responsible agency.

Deliverables:

- Notice of Exemption
- Final Mitigated Negative Declaration

TASK 5: PERMITTING

Permitting for this project will require the involvement of State and local agencies. Each of the identified agencies will be contacted and have jurisdiction over portions of the project. The permits identified herein are grouped into two areas. The first are permits that are required during the planning, regulatory and design phase. The other group consists of permits that are required for construction.

During the Planning, Regulatory and Design Phase:

- Operating Permit from California Department of Public Health
  Upon initiation of design, the City shall request from CDPH permission to increase the operation flow through SWTP.

During the Construction Phase:

- Construction General Permit from State Water Resources Control Board
  Contractor shall obtain a permit required for control of drainage from property.
- Building Permit from City of Clovis
  Contractor shall obtain.

Deliverables:

Copies of permits from each of the following:

- California Department of Public Health Operating Permit
- State Water Resources Control Board Construction Permit
- City of Clovis Building Permit

TASK 6: CONSTRUCTION CONTRACTING

Bidding documents will be prepared for all construction work. The Grantee will conduct a public bid process in accordance with City and State requirements to secure a licensed contractor experienced with the required construction. This task also includes public bid advertisements, pre-bid meetings, QA during the bidding process, and evaluation of submitted bids.

Deliverables:

- Bid Summary Report

TASK 7: CONSTRUCTION

This task includes the construction activities of the facilities. All construction will meet applicable local, state and federal codes and regulations and shall consist of the following activities.

- Project site clearing, construction equipment and material lay-down and staging area preparations
- Purchase and install the membrane feed pump and strainer, a plate settler and new membrane racks, including all required pipes and fittings to connect the existing system to the new expansion system.
- Construction of the pipeline connecting the Plant to an existing City owned sewer pipeline in DeWolf Avenue.
- Testing of all equipment shall meet the specifications of the construction documents and manufacturer recommendations. Testing will comply with local, state and federal regulations.
- Post-construction close-out walkthrough between the contractor, City and engineer
- Project site cleanup of construction areas, and the construction equipment and material lay-down and staging areas

Deliverable:

- Construction Photographs

TASK 8: CONSTRUCTION ADMINISTRATION

This task includes construction administration and observation efforts. City of Clovis construction management staff will perform construction observation duties with assistance from an experienced consultant familiar with this type of project.

The engineering consultant will provide a field engineer or construction inspector to monitor construction of the membrane feed pumps and strainers, membrane rack arrangements, plate settler, and pipelines. The consultant will make periodic visits to the project site during construction. Other roles of the engineering consultant will include: organize and attend kickoff meetings, attend weekly meetings with contractors, review submittals, process monthly payment requests, and review contract change orders requests.

Upon completion of construction, the design drawings will be modified to reflect construction conditions using information provided by the contractor. The drawings will be signed by a professional engineer.

Deliverables:

- Record construction drawings
- Copy of Notice of Completion

PROJECT 3: FRESNO COUNTY DRUMMOND JENSEN AVE SEWER CONNECTION STUDY

PROJECT DESCRIPTION

This project is a feasibility study that consists of the development and preparation of a design for a new sanitary sewer system for the disadvantaged community of Drummond Jensen Avenue Neighborhood. Currently, individual septic systems and seepage pits provide for onsite disposal of domestic sewage. Many of these systems are failing and contaminating the groundwater due to age and unsuitability of local soils.

TASKS

TASK 1: ADMINISTRATION AND REPORTING

This task includes preparation of all reporting obligations in accordance with the grant agreement, including invoices and Progress Reports. All reports shall follow the requirements listed in Exhibit E.

Upon execution of the grant agreement, Progress Reports shall be submitted to DWR on a Quarterly basis.

This task will also include overall project coordination.

Deliverables:

- Quarterly Progress Reports
- Invoices for Reimbursement
- Final Project Completion Report

TASK 2: LABOR COMPLIANCE PROGRAM

Grantee shall adopt and enforce a LCP pursuant to California Labor Code §1771.5(b) and applicable laws. At DWR's request, written evidence of compliance with the LCP will be submitted.

Deliverable:

- Evidence of LCP compliance

TASK 3: ASSESSMENT AND EVALUATION

The proposed feasibility study will assess viable options to extend sewer service from the City of Fresno to Drummond Jensen Avenue Neighborhood. Each option will be assessed and evaluated to determine the most cost effective and environmentally sound solution to solving the on-site wastewater disposal system failures in the area. A preliminary engineering report that details these options and the recommended solution shall be produced.

Deliverable:

- Preliminary Engineering Report

TASK 4: FINAL DESIGN

This task includes development of the project design through the preliminary and final phases and a detailed topographic survey of the project area.

Surveying

A topographic survey of the project area along the neighborhood's streets, within residential property (as required), along adjacent roadways, and in other areas, as needed, will be conducted to complete the final design. A boundary survey is not anticipated at this point, but will be included if required.

Design

Once the recommended design option developed in assessment and evaluation task is agreed upon, project design shall commence. Design drawings and specifications and a construction cost estimate will be prepared for the proposed sewer collection system.

Deliverables:

- Topographic Survey
- Final Project Plans and Specifications
- Construction Cost Estimate

TASK 5: ENVIRONMENTAL DOCUMENTATION

This task includes the required planning and environmental efforts to complete project development and design. Therefore a CEQA Notice of Exemption is expected to be sufficient. The full project may require a full CEQA document but that is not part of this grant agreement.

Deliverable:

- CEQA Notice of Exemption

PROJECT 4: EAST OROSI CSD WATER WELL REHABILITATION PROJECT

PROJECT DESCRIPTION

The East Orosi Community Services District (EOCSD) is a publicly owned utility that provides water service to the disadvantaged community of East Orosi. Water is provided from two active wells which were drilled in the early 1980's. The water quality and amount of water produced in these wells has diminished over the past 25 to 30 years. The wells have produced water that has periodically exceeded the Maximum Contaminant Level (MCL) for nitrate, resulting in Notices of Violation from the Tulare County Health Department for failure to meet the drinking water quality standard.

The primary objective of this project is to perform modifications on one of the wells (the East Well) in order to reduce the nitrate concentration. This will be accomplished through cleaning the well, performing vertical flow and concentration profiling, and performing a feasibility test of the modification that appears best based upon the profile data. If the feasibility test is successful, the modification may be left in-place as the final solution.

TASKS

TASK 1: ADMINISTRATION AND REPORTING

This task includes preparation of all reporting obligations in accordance with the grant agreement, including invoices and Progress Reports. All reports shall follow the requirements listed in Exhibit E.

Upon execution of the grant agreement, Progress Reports shall be submitted to DWR on a Quarterly basis.

This task will also include overall project coordination.

Deliverables:

- Quarterly Progress Reports
- Invoices for Reimbursement
- Final Project Completion Report

TASK 2: LABOR COMPLIANCE PROGRAM

Grantee shall adopt and enforce a LCP pursuant to California Labor Code §1771.5(b) and applicable laws. At DWR's request, written evidence of compliance with the LCP will be submitted.

Deliverable:

- Evidence of LCP compliance

TASK 3: ENVIRONMENTAL PROCESS AND PERMITTING

A CEQA Notice of Exemption was adopted and was filed with the Tulare County Clerk and State Clearinghouse in February 2011.

Tulare County Environmental Health requires a well recondition permit for the proposed work.

Deliverables:

- CEQA Notice of Exemption
- Copy of Well Recondition Permit

TASK 4: CONSTRUCTION CONTRACTING

Bidding documents will be prepared for the cleaning and testing well screen modification (depending upon the profiling results) on the East Well. This task includes public bid advertisements, pre-bid meetings, QA during the bidding process, and evaluation of submitted bids.

Deliverable:

- Bid Summary Report

TASK 5: PROJECT CONSTRUCTION

The East Well will be cleaned by a contractor. After profiling is performed and the data is evaluated by the consulting hydrogeologist, a well modification will be tested (assuming that the profiling data are favorable) with the assistance of the contractor. Well modifications will be completed to under the supervision of a Certified Hydrogeologist.

Deliverable:

- Construction Photos

TASK 6: CONSTRUCTION ADMINISTRATION, ASSESSMENT AND EVALUATION

The consulting hydrogeologist will prepare the specifications for the well cleaning, conduct the well profiling and data analysis, develop specifications for testing the well modification, analyze the modification test data, and prepare a summary report. The report will document work performed on the well, the increase in specific capacity resulting from the cleaning, the profiling results, and changes in water quality and production as a result of the well modification.

Deliverables:

- Water Quality Test Results
- Hydrogeologist Letter Report- Summary of Findings
- Copy of EOCSD Notice of Completion

PROJECT 5: CITY OF FRESNO RESIDENTIAL WATER METER PROJECT (AREA VI & VII)

PROJECT DESCRIPTION

This project represents a portion of the City's plan to transition all customers to metered service by January 1, 2013. This portion is to install 17,820 of the 110,000 residential water meters in the City of Fresno, specifically in Area VI & VII. Installation of approximately 92,000 water meters is not included in this project.

TASKS

TASK 1: PROJECT ADMINISTRATION AND REPORTING

This task includes preparation of all reporting obligations in accordance with the grant agreement, including invoices and Progress Reports. All reports shall follow the requirements listed in Exhibit E.

Upon execution of the grant agreement, Progress Reports shall be submitted to DWR on a Quarterly basis.

This task will also include other deliverables as required and overall project coordination.

This task also includes modification to the Monitoring, Assessment and Performance Measures (MAPM). Upon completion of any needed revisions to the MAPM, it will be implemented and the efforts described within the MAPM will be documented. The MAPM will serve as the Project Monitoring Plan.

Deliverables:

- Plat Numbers and units per plat for Areas VI & VII
- Quarterly Progress Reports
- Invoices for Reimbursement
- Monitoring, Assessment and Performance Measures
- Final Project Completion Report

TASK 2: CONSTRUCTION

Mobilization

Once the contractor has received Notice to Proceed (NTP) for work within the designated contract area(s), contractor mobilization and site preparation will include:

1. Several days prior to construction, all residential properties within the work area will be notified of the proposed work schedule and timelines of any anticipated affects to water service.
2. Logging water service lines to each property and proposed meter box locations

Installation

This grant will cover installation of 17,820 of each of the following:

1. Water meter boxes with lids
2. Water meters
3. Automated Meter Reading (AMR) devices

These components will then be integrated with the citywide monitoring systems for customer billing.

Activation and Testing

Each residential meter and AMR will be field tested and activated to perform a 'forced read' to ensure: it is functioning properly and an automated signal can be generated and received by the citywide system.

TASK 3: CONSTRUCTION ADMINISTRATION

This task includes construction administration and observation efforts, to be performed by a qualified inspector.

A qualified inspector shall provide construction observation to monitor the installation of the meter through periodic visits to the project site during construction. The inspector will also organize and attend kickoff meetings, attend weekly meetings with contractors, review submittals, process monthly payment requests, and review contract change orders requests.

Upon completion of construction, the final design drawings will be provided by the contractor. The drawings will be signed by a professional engineer.

This task also includes enforcing a LCP pursuant to California Labor Code §1771.5(b) and applicable laws. At DWR's request, written evidence of compliance with the LCP will be submitted.

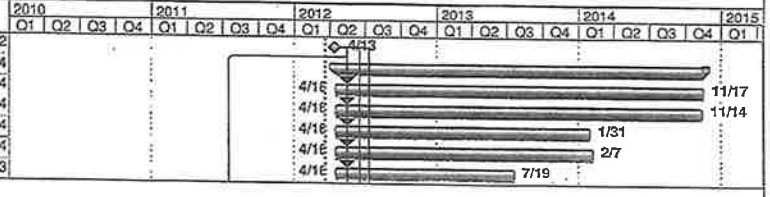
Deliverable:

- Final record (as-built) drawings
- Evidence of LCP compliance

EXHIBIT B
SCHEDULE

Upper Kings IRWM Authority Groundwater Overdraft Reduction and Disadvantaged Community Water Supply Reliability Projects

ID	Task Name	Duration	Start	Finish
1	Assumed DWR Signed Contract Date	1 day	Fri 4/13/12	Fri 4/13/12
2	PROJECT ROLL-UP OVERALL SCHEDULE	676 days	Mon 4/16/12	Mon 11/17/14
3	PROJECT 1 - CID - SOUTH AND HIGHLAND BASIN	676 days	Mon 4/16/12	Mon 11/17/14
4	PROJECT 2 - CITY OF CLOVIS - SWTP EXPANSION SCHEDULE	675 days	Mon 4/16/12	Fri 11/14/14
5	PROJECT 3 - COUNTY OF FRESNO - DRUMMOND JENSEN SEWER STUDY	470 days	Mon 4/16/12	Fri 1/31/14
6	PROJECT 4 - EAST OROSI CSD - WATER WELL REHABILITATION	475 days	Mon 4/16/12	Fri 2/7/14
7	PROJECT 5 - CITY OF FRESNO - METER SCHEDULE	330 days	Mon 4/16/12	Fri 7/19/13

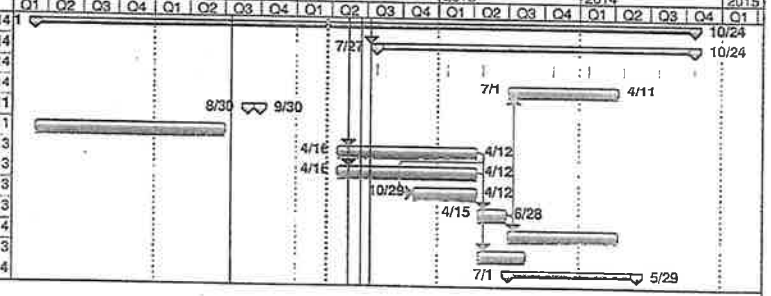


Project: Schedule revised 3-16-12
Date: Mon 3/19/12

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

Upper Kings IRWM Authority Groundwater Overdraft Reduction and Disadvantaged Community Water Supply Reliability Projects

ID	Task Name	Duration	Start	Finish
8	PROJECT 1 - CID - SOUTH AND HIGHLAND BASIN	1215 days	Mon 3/1/10	Fri 10/24/14
9	Task 1 Administration and Reporting	586 days	Fri 7/27/12	Fri 10/24/14
10	Quarterly Progress Reports	586 days	Fri 7/27/12	Fri 10/24/14
21	Task 2 Labor Compliance Program (during construction)	205 days	Mon 7/1/13	Fri 4/11/14
22	Task 3 Land Purchase/Easement	24 days	Tue 8/30/11	Fri 9/30/11
25	Task 4 Assessment and Evaluation	350 days	Mon 3/1/10	Fri 7/1/11
26	Task 5 Final Design	260 days	Mon 4/16/12	Fri 4/12/13
27	Task 6 Environmental Documentation	260 days	Mon 4/16/12	Fri 4/12/13
28	Task 7 Permitting	120 days	Mon 10/29/12	Fri 4/12/13
29	Task 8 Construction Contracting	55 days	Mon 4/15/13	Fri 6/28/13
30	Task 9 Construction	205 days	Mon 7/1/13	Fri 4/11/14
31	Task 10 Environmental Compliance/ Mitigation/Enhancement	90 days	Mon 4/15/13	Fri 8/16/13
32	Task 11 Construction Administration	239 days	Mon 7/1/13	Thu 5/29/14

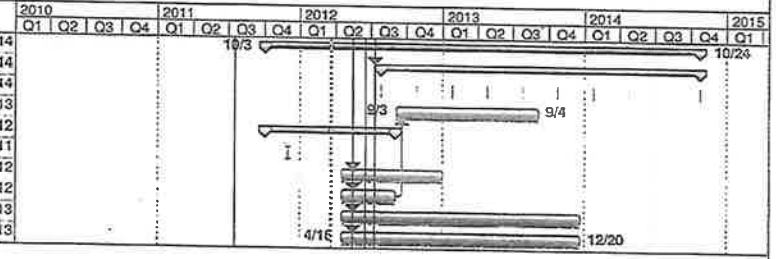


Project: Schedule revised 3-16-12
Date: Mon 3/19/12

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

Upper Kings IRWM Authority Groundwater Overdraft Reduction and Disadvantaged Community Water Supply Reliability Projects

ID	Task Name	Duration	Start	Finish
35	PROJECT 2 - CITY OF CLOVIS - SWTP EXPANSION	800 days	Mon 10/3/11	Fri 10/24/14
36	Task 1 Administration and Reporting	585 days	Fri 7/27/12	Fri 10/24/14
37	Quarterly Progress Reports	585 days	Fri 7/27/12	Fri 10/24/14
48	Task 2 Labor Compliance	263 days	Mon 9/3/12	Wed 9/4/13
49	Task 3 Final Design	240 days	Mon 10/3/11	Fri 8/31/12
54	Task 4 Environmental Documentation	3 days	Tue 11/29/11	Thu 12/1/11
55	Task 5 Permitting	186 days	Mon 4/16/12	Mon 12/31/12
56	Task 6 Construction Contracting	100 days	Mon 4/16/12	Fri 8/31/12
57	Task 7 Construction	440 days	Mon 4/16/12	Fri 12/20/13
58	Task 8 Construction Administration	440 days	Mon 4/16/12	Fri 12/20/13

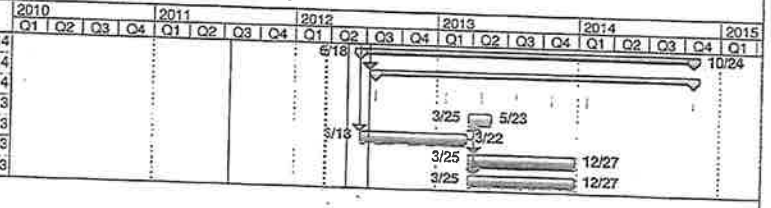


Project: Schedule revised 3-16-12
Date: Mon 3/19/12

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

Upper Kings IRWM Authority Groundwater Overdraft Reduction and Disadvantaged Community Water Supply Reliability Projects

ID	Task Name	Duration	Start	Finish
59	PROJECT 3 - COUNTY OF FRESNO - DRUMMOND JENSEN SEWER	615 days	Mon 6/18/12	Fri 10/24/14
60	Task 1 Administration and Reporting	586 days	Fri 7/27/12	Fri 10/24/14
61	Quarterly Progress Reports	586 days	Fri 7/27/12	Fri 10/24/14
72	Task 2 Labor Compliance	44 days	Mon 3/25/13	Thu 5/23/13
73	Task 3 Assessment and Evaluation	200 days	Mon 6/18/12	Fri 3/22/13
74	Task 4 Design	200 days	Mon 3/25/13	Fri 12/27/13
75	Task 5 Environmental Documentation	200 days	Mon 3/25/13	Fri 12/27/13

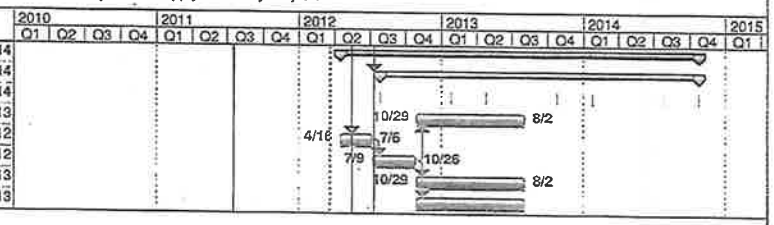


Project: Schedule revised 3-16-12
Date: Mon 3/19/12

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

Upper Kings IRWM Authority Groundwater Overdraft Reduction and Disadvantaged Community Water Supply Reliability Projects

ID	Task Name	Duration	Start	Finish
76	PROJECT 4 - EAST OROSI CSD - WATER WELL REHABILITATION	660 days	Mon 4/16/12	Fri 10/24/14
77	Task 1 Adminstration and Reporting	586 days	Fri 7/27/12	Fri 10/24/14
78	Quarterly Progress Reports	586 days	Fri 7/27/12	Fri 10/24/14
89	Task 2 Labor Compliance Program	200 days	Mon 10/29/12	Fri 8/2/13
90	Task 3 Environmental Process and Permitting	60 days	Mon 4/16/12	Fri 7/6/12
91	Task 4 Construction Contracting	80 days	Mon 7/9/12	Fri 10/26/12
92	Task 5 Project Construction	200 days	Mon 10/29/12	Fri 8/2/13
93	Task 6 Construction Administration, Assessment, Evaluation	200 days	Mon 10/29/12	Fri 8/2/13

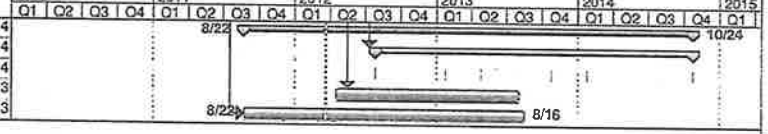


Project: Schedule revised 3-16-12
Date: Mon 3/19/12

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

Upper Kings IRWM Authority Groundwater Overdraft Reduction and Disadvantaged Community Water Supply Reliability Projects

ID	Task Name	Duration	Start	Finish
94	PROJECT 5 - CITY OF FRESNO - WATER METER	830 days	Mon 8/22/11	Fri 10/24/14
95	Task 1 Administration and Reporting	586 days	Fri 7/27/12	Fri 10/24/14
96	Quarterly Progress Reports	586 days	Fri 7/27/12	Fri 10/24/14
107	Task 2 Construction	340 days	Mon 4/16/12	Fri 8/2/13
108	Task 3 Construction Administration	520 days	Mon 8/22/11	Fri 8/16/13



Project: Schedule revised 3-16-12
Date: Mon 3/19/12

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

EXHIBIT C
BUDGET

The method of disbursement shall be Task by Task; therefore cost share must be spent on a per task basis before grant funds will be paid.

Summary Budget					
Project No.	Project Title	Non-State Share (Funding Match)	Grant Funding (DWR)	Total	% Funding Match
1	CID South and Highland Basin Project	$ 191,000	$ 3,804,300	$ 3,995,300	5%
2	City of Clovis SWTP Expansion	$ 1,250,000	$ 3,000,000	$ 4,250,000	29%
3	County of Fresno Drummond Jenson Ave Sewer Connection Study	$ -	$ 119,090	$ 119,090	0%
4	East Orosi CSD Well Rehabilitation Project	$ -	$ 137,000	$ 137,000	0%
5	City of Fresno Residential Water Meter Project (Area VI & VII)	$ 5,379,390	$ 1,435,610	$ 6,815,000	79%
	TOTAL	$ 6,820,390	$ 8,496,000	$ 15,316,390	45%

Budget - Project 1 CID South and Highland Basin Project					
Task No.	Task Description	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
1	Administration and Reporting	$ -	$ 40,000	$ 40,000	0%
2	Labor Compliance Program	$ -	$ 24,000	$ 24,000	0%
3	Land Purchase/Easement	$ 86,000	$ 895,000	$ 981,000	9%
4	Assessment and Evaluation	$ 105,000		$ 105,000	100%
5	Final Design	$ -	$ 205,000	$ 205,000	0%
6	Environmental Documentation	$ -	$ 24,500	$ 24,500	0%
7	Permitting	$ -	$ 7,000	$ 7,000	0%
8	Construction Contracting	$ -	$ 8,800	$ 8,800	0%
9	Construction	$ -	$ 2,405,000	$ 2,405,000	0%
10	Environmental Compliance/ Mitigation/Enhancement	$ -	$ 5,000	$ 5,000	0%
11	Construction Administration	$ -	$ 190,000	$ 190,000	0%
	TOTAL	$ 191,000	$ 3,804,300	$ 3,995,300	5%

Budget - Project 2 City of Clovis SWTP Expansion						
Task No.	Task Description	Other State Funds	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
1	Project Administration and Reporting		$ 50,000.00	$ -	$ 50,000.00	100%
2	Labor Compliance Program		$ 20,000.00		$ 20,000.00	100%
3	Final Design		$ 156,100.00		$ 156,100.00	100%
4	Environmental Documentation		$ 10,000.00	$ -	$ 10,000.00	100%
5	Permitting		$ 20,000.00	$ -	$ 20,000.00	100%
6	Construction Contracting		$ 10,000.00		$ 10,000.00	100%
7	Construction		$ 886,400.00	$ 3,000,000.00	$ 3,886,400.00	23%
8	Construction Administration		$ 97,500.00		$ 97,500.00	100%
	TOTAL	$ -	$ 1,250,000.00	$ 3,000,000.00	$ 4,250,000.00	29%

Budget - Project 3 County of Fresno Drummond Jenson Ave Sewer Connection Study (DAC Project)					
Task No.	Task Description	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
1	Project Administration and Reporting	$ -	$ 10,000	$ 10,000	0%
2	Labor Compliance Program	$ -	$ 5,000	$ 5,000	0%
3	Assessment and Evaluation	$ -	$ 10,000	$ 10,000	0%
4	Final Design	$ -	$ 89,090	$ 89,090	0%
5	Environmental Documentation	$ -	$ 5,000	$ 5,000	0%
	TOTAL	**$ -**	**$ 119,090**	**$ 119,090**	**0%**

Budget - Project 4 East Orosi CSD Well Rehabilitation Project (DAC Project)					
Task No.	Task Description	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
1	Administration and Reporting	$ -	$ 3,600	$ 3,600	0%
2	Labor Compliance Program	$ -	$ 2,000	$ 2,000	0%
3	Environmental Process and Permitting	$ -	$ 1,000	$ 1,000	0%
4	Construction Contracting	$ -	$ 3,400	$ 3,400	0%
5	Project Construction	$ -	$ 65,000	$ 65,000	0%
6	Construction Administration, Assessment, Evaluation	$ -	$ 62,000	$ 62,000	0%
	TOTAL	**$ -**	**$ 137,000**	**$ 137,000**	**$ -**

Budget - Project 5 City of Fresno Residential Water Meter Project (Area VI & VII) (Water Conservation Project)					
Task No.	Task Description	Non-State Share (Funding Match)	Requested Grant Funding	Total	% Funding Match
1	Project Administration and Reporting	$ -	$ -	$ -	0%
2	Construction	$ 4,729,390	$ 1,435,610	$ 6,165,000	77%
3	Construction Administration	$ 650,000	$ -	$ 650,000	100%
	TOTAL	**$ 5,379,390**	**$ 1,435,610**	**$ 6,815,000**	**79%**

EXHIBIT D
STANDARD CONDITIONS

D.1 ACCOUNTING AND DEPOSIT OF GRANT DISBURSEMENT:

a) **SEPARATE ACCOUNTING OF GRANT DISBURSEMENT AND INTEREST RECORDS:** Grantee shall account for the money disbursed pursuant to this Grant Agreement separately from all other Grantee funds. Grantee shall maintain audit and accounting procedures that are in accordance with generally accepted accounting principles and practices, consistently applied. Grantee shall keep complete and accurate records of all receipts, disbursements, and interest earned on expenditures of such funds. Grantee shall require its contractors or subcontractors to maintain books, records, and other documents pertinent to their work in accordance with generally accepted accounting principles and practices. Records are subject to inspection by State at any and all reasonable times.

b) **FISCAL MANAGEMENT SYSTEMS AND ACCOUNTING STANDARDS:** The Grantee agrees that, at a minimum, its fiscal control and accounting procedures will be sufficient to permit tracing of grant funds to a level of expenditure adequate to establish that such funds have not been used in violation of state law or this Grant Agreement.

c) **REMITTANCE OF UNEXPENDED FUNDS:** Grantee, within a period of sixty (60) calendar days from the final disbursement from State to Grantee of grant funds, shall remit to State any unexpended funds that were disbursed to Grantee under this Grant Agreement and were not needed to pay Eligible Project Costs.

D.2 ACKNOWLEDGEMENT OF CREDIT: Grantee shall include appropriate acknowledgement of credit to the State and to all cost-sharing partners for their support when promoting the Project or using any data and/or information developed under this Grant Agreement. During construction of the Project, Grantee shall install a sign at a prominent location which shall include a statement that the Project is financed under the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006, administered by State of California, Department of Water Resources. Grantee shall notify State that the sign has been erected by providing them with a site map with the sign location noted and a photograph of the sign.

D.3 AMENDMENT: No amendment or variation of the terms of this Grant Agreement shall be valid unless made in writing, signed by the parties and approved as required. No oral understanding or agreement not incorporated in the Grant Agreement is binding on any of the parties. For guidance on the Amendment Requirements see Exhibit H.

D.4 AMERICANS WITH DISABILITIES ACT: By signing this Grant Agreement, Grantee assures State that it complies with the Americans with Disabilities Act (ADA) of 1990, (42 U.S.C., 12101 *et seq.*), which prohibits discrimination on the basis of disability, as well as all applicable regulations and guidelines issued pursuant to the ADA.

D.5 AUDITS: State reserves the right to conduct an audit at any time between the execution of this Grant Agreement and the completion of the Project, with the costs of such audit borne by State. After completion of the Project, State may require Grantee to conduct a final audit, at Grantee's expense, such audit to be conducted by and a report prepared by an independent Certified Public Accountant. Failure or refusal by Grantee to comply with this provision shall be considered a breach of this Grant Agreement, and State may take any action it deems necessary to protect its interests.

Pursuant to Government Code Section 8546.7, the parties shall be subject to the examination and audit of State for a period of three years after final payment under this Grant Agreement with respect of all matters connected with this Grant Agreement, including but not limited to, the cost of administering this Grant Agreement. All records of Grantee or subcontractors shall be preserved for this purpose for at least three (3) years after Project completion. See Exhibit H for a listing of documents/records that State Auditors would need to review in the event of a grant being audited.

D.6 BUDGET CONTINGENCY: LIMIT ON STATE FUNDS. Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 is subject to the availability of funds including any

mandates from the Department of Finance, the Pooled Money Investment Board or any other state authority. The State will not make payments of any kind, including advances or reimbursements, until funding is made available by the State Treasurer.

D.7 CHILD SUPPORT COMPLIANCE ACT: For any Grant Agreement in excess of $100,000, the Grantee acknowledges in accordance with Public Contract Code 7110, that:

a) The Grantee recognizes the importance of child and family support obligations and shall fully comply with all applicable state and federal laws relating to child and family support enforcement, including, but not limited to, disclosure of information and compliance with earnings assignment orders, as provided in Chapter 8 (commencing with section 5200) of Part 5 of Division 9 of the Family Code; and

b) The Grantee, to the best of its knowledge is fully complying with the earnings assignment orders of all employees and is providing the names of all new employees to the New Hire Registry maintained by the California Employment Development Department.

D.8 COMPETITIVE BIDDING AND PROCUREMENTS: Grantee shall comply with all applicable laws and regulations regarding securing competitive bids and undertaking competitive negotiations in Grantee's contracts with other entities for acquisition of goods and services and construction of public works with funds provided by State under this Grant Agreement.

D.9 COMPUTER SOFTWARE: The Grantee certifies that it has appropriate systems and controls in place to ensure that state funds will not be used in the performance of this Grant Agreement for the acquisition, operation, or maintenance of computer software in violation of copyright laws.

D.10 CONFLICT OF INTEREST

a) **Current State Employees:** No State officer or employee shall engage in any employment, activity, or enterprise from which the officer or employee receives compensation or has a financial interest and which is sponsored or funded by any State agency, unless the employment, activity, or enterprise is required as a condition of regular State employment. No State officer or employee shall contract on his or her own behalf as an independent contractor with any State agency to provide goods or services.

b) **Former State Employee:** For the two-year period from the date he or she left State employment, no former State officer or employee may enter into a contract in which he or she engaged in any of the negotiations, transactions, planning, arrangements, or any part of the decision-making process relevant to the contract while employed in any capacity by any State agency. For the twelve-month period from the date he or she left State employment, no former State officer or employee may enter into a contract with any State agency if he or she was employed by that State agency in a policy-making position in the same general subject area as the proposed contract within the twelve-month period prior to his or her leaving State service.

D.11 DELIVERY OF INFORMATION, REPORTS, AND DATA: The Grantee agrees to expeditiously provide, during work on the Project and throughout the term of this Grant Agreement, such reports, data, information, and certifications as may be reasonably required by the State.

D.12 DISPOSITION OF EQUIPMENT: Grantee shall provide to State, not less than 30 days prior to submission of the final project invoice, a final inventory list of equipment purchased with grant funds provided by State. Grantee shall consult with State on the scope of the inventory not less than 60 days prior to the submission of the final project invoice. The inventory shall include all items with a current estimated fair market value of more than $5,000 per item. Within 60 days of receipt of such inventory, State shall provide Grantee with a list of the items on the inventory that State will take title to. All other items shall become the property of Grantee. State shall arrange for delivery from Grantee of items that it takes title to. Cost of transportation, if any, shall be borne by State.

D.13 DISPUTES: In the event of an invoice dispute, payment will not be made until the dispute is resolved and a corrected invoice submitted. Failure to use the address exactly as provided may result in return of the invoice to the Grantee. Payment shall be deemed complete upon deposit of the payment, properly addressed, postage prepaid, in the United States mail. Any claim that Grantee may have regarding the performance of this Grant Agreement including, but not limited to claims for additional compensation or

extension of time, shall be submitted to the Director, Department of Water Resources, within thirty (30) calendar days of Grantee's knowledge of the claim. State and Grantee shall then attempt to negotiate a resolution of such claim and process an amendment to the Grant Agreement to implement the terms of any such resolution.

D.14 DRUG-FREE WORKPLACE CERTIFICATION

Certification of Compliance: By signing this Grant Agreement, Grantee, its contractors or subcontractors hereby certify, under penalty of perjury under the laws of State of California, compliance with the requirements of the Drug-Free Workplace Act of 1990 (Government Code 8350 *et seq.*) and have or will provide a drug-free workplace by taking the following actions:

a) Publish a statement notifying employees, contractors, and subcontractors that unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance is prohibited and specifying actions to be taken against employees, contractors, or subcontractors for violations, as required by Government Code Section 8355(a).

b) Establish a Drug-Free Awareness Program, as required by Government Code Section 8355(b) to inform employees, contractors, or subcontractors about all of the following:
   1. The dangers of drug abuse in the workplace,
   2. Grantee's policy of maintaining a drug-free workplace,
   3. Any available counseling, rehabilitation, and employee assistance programs, and
   4. Penalties that may be imposed upon employees, contractors, and subcontractors for drug abuse violations.

c) Provide as required by Government Code Sections 8355(c), that every employee, contractor,and/or subcontractor who works under this Grant Agreement:
   1. Will receive a copy of Grantee's drug-free policy statement, and
   2. Will agree to abide by terms of Grantee's condition of employment, contract or subcontract.

D.15 FINAL INSPECTIONS AND CERTIFICATION OF REGISTERED CIVIL ENGINEER: Upon completion of a construction project and as determined by State, Grantee shall provide for a final inspection and certification by a California Registered Civil Engineer that the project has been completed in accordance with submitted final plans and specifications and any modifications thereto and in accordance with this Grant Agreement and to the State's satisfaction.

D.16 GOVERNING LAW: This Grant Agreement is governed by and shall be interpreted in accordance with the laws of the State of California.

D.17 GRANTEE COMMITMENTS: Grantee accepts and agrees to comply with all terms, provisions, conditions, and commitments of this Funding Agreement, including all incorporated documents, and to fulfill all assurances, declarations, representations, and statements made by Funding Recipient in the application, documents, amendments, and communications filed in support of its request for California Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Act of 2006 financing.

D.18 INCOME RESTRICTIONS: The Grantee agrees that any refunds, rebates, credits, or other amounts (including any interest thereon, accruing to or received by the Grantee under this Grant Agreement shall be paid by the Grantee to the State, to the extent that they are properly allocable to costs for which the Grantee has been reimbursed by the State under this Grant Agreement.

D.19 INDEPENDENT CAPACITY: Grantee, and the agents and employees of Grantee, if any, in the performance of the Grant Agreement, shall act in an independent capacity and not as officers, employees, or agents of the State.

D.20 INSPECTIONS: State shall have the right to inspect the work being performed at any and all reasonable times, providing a minimum of a 24-hour notice, during the term of the Grant Agreement. This right shall extend to any local project sponsor, subagreements, and Grantee shall include provisions ensuring such access in all its contracts or sub-contractors entered into pursuant to its Grant Agreement with State. Grantee acknowledges that Project documents may be subject to the Public Records Act (California Government Code Section 6250 et. seq.). State shall have the right to inspect these documents at any and

all reasonable times after completion of the Project to ensure compliance with the terms and conditions of this Grant Agreement. During regular office hours, State shall have the right to inspect and to make copies of any books, records, or reports of the Grantee relating to this Grant Agreement. Grantee shall maintain and shall make available at all times for such inspection accurate records of its costs, disbursements, and receipts with respect to its activities under this Grant Agreement. Failure or refusal by Grantee to comply with this provision shall be considered a breach of this Grant Agreement, and State may withhold disbursements to Grantee or take any other action it deems necessary to protect its interests.

D.21 NONDISCRIMINATION: During the performance of this Grant Agreement, Grantee and its contractors shall not unlawfully discriminate, harass, or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, physical disability (including HIV and AIDS), mental disability, medical condition (cancer), age (over 40), marital status, and denial of family care leave. Grantee and contractors shall ensure that the evaluation and treatment of their employees and applicants for employment are free from such discrimination and harassment. Grantee and contractors shall comply with the provisions of the Fair Employment and Housing Act (Government Code Section 12990 (a-f) *et seq.*) and the applicable regulations promulgated there under (California Code of Regulations, Title 2, Section 7285 *et seq.*). The applicable regulations of the Fair Employment and Housing Commission implementing Government Code Section 12990 (a-f), set forth in Chapter 5 of Division 4 of Title 2 of the California Code of Regulations, are incorporated into this Grant Agreement by reference and made a part hereof as if set forth in full. Grantee and its contractors shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement. Grantee shall include the nondiscrimination and compliance provisions of this clause in all contracts to perform work under the Grant Agreement.

D.22 NO THIRD PARTY RIGHTS: The parties to this Grant Agreement do not intend to create rights in, or grant remedies to, any third party as a beneficiary of this Grant Agreement, or of any duty, covenant, obligation or undertaking established herein.

D.23 OPINIONS AND DETERMINATIONS: The parties agree that review or approval of any IRWM Program applications, documents, permits, plans and specifications or other program information by the State is for administrative purposes only and does not relieve the Grantee of its responsibility to properly plan, design, construct, operate, maintain, implement, or otherwise carry out the IRWM Program.

D.24 PERMITS, LICENSES, APPROVALS, AND LEGAL OBLIGATIONS. Grantee shall be responsible for obtaining any and all permits, licenses, and approvals required for performing its obligations under this Grant Agreement. Grantee shall comply with the California Environmental Quality Act (PRC Section 21000 *et seq.*) and other applicable federal, State, and local laws, rules, and regulations, guidelines, and requirements prior to disbursement of funds under this Grant Agreement.

Without limiting the foregoing, Funding Recipient shall keep informed of and take all measures necessary to ensure compliance with California Labor Code requirements, including but not limited to Section 1720 *et seq.* of the California Labor Code regarding public works, limitations on use of volunteer labor (California Labor Code Section 1720.4), labor compliance programs (California Labor Code Section 1771.5), and payment of prevailing wages for work done under this Funding Agreement. Pursuant to the provisions of Proposition 84, the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006, Cal. Pub. Res. Code § 75076 *et seq.*, the Funding Recipient must have a labor compliance program that meets the requirements of California Labor Code Section 1771.5.

D.25 PROHIBITION AGAINST DISPOSAL OF PROJECT WITHOUT STATE PERMISSION: Grantee and Local Project Sponsors shall not sell, abandon, lease, transfer, exchange, mortgage, hypothecate, or encumber in any manner whatsoever all or any portion of any real or other property necessarily connected or used in conjunction with the IRWM Program without prior permission of State. Grantee and Local Project Sponsors shall not take any action concerning the performance of this Grant Agreement, including but not limited to actions relating to user fees, charges, and assessments that could adversely affect the ability of Grantee to meet its obligations under this Grant Agreement, without prior written permission of State. State may require

that the proceeds from the disposition of any real or personal property acquired with funds disbursed under this Grant Agreement be remitted to State.

D.26 REMEDIES, COSTS, AND ATTORNEY FEES: The Grantee agrees that any remedy provided in this Grant Agreement is in addition to and not in derogation of any other legal or equitable remedy available to the State as a result of breach of this Grant Agreement by the Grantee, whether such breach occurs before or after completion of the Project, and exercise of any remedy provided by this Grant Agreement by the State shall not preclude the State from pursuing any legal remedy or right which would otherwise be available. In the event of litigation between the parties hereto arising from this Grant Agreement, it is agreed that the prevailing party shall be entitled to such reasonable costs and/or attorney fees as may be ordered by the court entertaining such litigation.

D.27 RETENTION: Notwithstanding any other provision of this Grant Agreement, State shall, for each project, withhold five percent (5.0%) until January 1, 2016 and ten percent (10.0%), thereafter, of the funds requested by Grantee for reimbursement of Eligible Costs. Each project in this Grant Agreement will be eligible to release its respective retention when that project is completed and Grantee has met requirements of Paragraph 17, "Submissions of Reports" as follows. At such time as the "Project Completion Report" required under Paragraph 17 is submitted to and approved by State, State shall disburse the retained funds as to that project to Grantee, except in the case of the last project to be completed under this Grant Agreement, in which case retention for such project will not be disbursed until the "Grant Completion Report" is submitted to and approved by State.

D.28 RIGHTS IN DATA: To the extent permitted by law, the Grantee agrees that all data, plans, drawings, specifications, reports, computer programs, operating manuals, notes, and other written or graphic work produced in the performance of this Grant Agreement shall be in the public domain. The Grantee may disclose, disseminate and use in whole or in part, any final form data and information received, collected, and developed under this Grant Agreement, subject to appropriate acknowledgement of credit to the State for financial support. The Grantee shall not utilize the materials for any profit-making venture or sell or grant rights to a third party who intends to do so.

D.29 SEVERABILITY OF UNENFORCEABLE PROVISION: If any provision of this Grant Agreement is held invalid or unenforceable by a court of final jurisdiction, all other provisions of this Grant Agreement shall be construed to remain fully valid, enforceable, and binding on the parties.

D.30 STATE REVIEWS AND INDEMNIFICATION: The parties agree that review or approval of Project applications, documents, permits, plans and specifications or other Project information by the State is for administrative purposes only and does not relieve the Grantee or Local Project Sponsors of their responsibility to properly plan, design, construct, operate, maintain, implement, or otherwise carry out the Project. To the extent permitted by law, the Grantee and Local Project Sponsors agree to indemnify, defend and hold harmless the State and the State against any loss or liability arising out of any claim or action brought against the State from and against any and all losses, claims, damages, liabilities or expenses, of every conceivable kind, character and nature whatsoever arising out of, resulting from, or in any way connected with:

a) The Project or the conditions, occupancy, use, possession, conduct or management of, work done in or about, or the planning, design, acquisition, installation, or construction, of the Project or any part thereof;
b) Performing any of the terms contained in this Grant Agreement or any related document;
c) Any violation of any applicable law, rule or regulation, any environmental law (including, without limitation, the Federal Comprehensive Environmental Response, Compensation and Liability Act, the Resource Conservation and Recovery Act, the California Hazardous Substance Account Act, the Federal Water Pollution Control Act, the Clean Air Act, the California Hazardous Waste Control Law and CWC Section 13304, and any successors to said laws), rule or regulation or the release of any toxic substance on or near the natural water system; or
d) Any untrue statement or alleged untrue statement of any material fact or omission or alleged omission to state a material fact necessary to make the statements required to be stated therein, in light of the circumstances under which they were made, not misleading with respect to any information provided by the Grantee for use in any disclosure document utilized in connection with any of the transactions

contemplated by this Grant Agreement. Grantee agrees to pay and discharge any judgment or award entered or made against the State with respect to any such claim or action, and any settlement, compromise or other voluntary resolution. The provisions of this section shall survive the term of the Grant Agreement.

D.31 SUCCESSORS AND ASSIGNS: This Grant Agreement and all of its provisions shall apply to and bind the successors and assigns of the parties. No assignment or transfer of this Grant Agreement or any part thereof, rights hereunder, or interest herein by the Grantee shall be valid unless and until it is approved by State and made subject to such reasonable terms and conditions as State may impose.

D.32 TIMELINESS: Time is of the essence in this Grant Agreement.

D.33 TRAVEL: Grantee agrees that travel and per diem costs shall NOT be eligible for reimbursement with State funds, and shall NOT be eligible for computing Grantee cost match. Travel includes the costs of transportation, subsistence, and other associated costs incurred by personnel during the term of this Grant Agreement.

D.34 WAIVER OF RIGHTS: None of the provisions of this Grant Agreement shall be deemed waived unless expressly waived in writing. It is the intention of the parties here to that from time to time either party may waive any of its rights under this Grant Agreement unless contrary to law. Any waiver by either party of rights arising in connection with the Grant Agreement shall not be deemed to be a waiver with respect to any other rights or matters, and such provisions shall continue in full force and effect.

EXHIBIT E
REPORT FORMAT AND REQUIREMENTS

The following reporting formats should be utilized. Please obtain State approval prior to submitting a report in an alternative format.

QUARTERLY PROGRESS REPORT

Grantee shall submit Quarterly Progress Reports on a consistent basis to meet the State's requirement for disbursement of funds. The quarterly progress report should describe the work performed during the reporting period. For each project, describe the work performed including:

CONTINUING ELIGIBILITY

- For Urban Water Suppliers who have not submitted a complete Urban Water Management Plan, the status of the plan development and submittal.
- A brief summary of the status of adoption of an IRWM Plan that complies with Part 2.2 of Division 6 of the CWC commencing with Section 10530.
- Upon adoption of IRWM Plan, submit an electronic copy with progress report.

PROJECT INFORMATION (INCLUDE ANY OF THE BELOW THAT WERE APPLICABLE DURING THE REPORTING PERIOD)

- Legal matters.
- Engineering matters.
- Environmental matters.
- Status of permits, easements, rights-of-way, and approvals as may be required by other State, federal, and/or local agencies.
- Major accomplishments during the quarter (i.e. tasks completed, milestones met, meetings held or attended, press releases, etc).
- Discussion of data submittal effort(s) for the previous quarter, including a description of the data submitted and date(s) of submittal.
- Issues/concerns that have, will, or could affect the schedule or budget, with a recommendation on how to correct the matter.
- Description of any differences between the work performed and the work outlined in the project work plans.
- Description of any efforts to update IRWM Plan to obligations listed in Paragraph 12, "Continuing Eligibility, if applicable."

COST INFORMATION

- Provide a List showing all costs incurred during the quarter by the grantee, the Local Project Sponsor overseeing the work, and each contractor working on the project. The list should include for all non-construction, or implementation costs, (i.e., design, and admin charges) the hours per task worked on during the quarter for above personnel.
- A discussion on how the actual budget is progressing in comparison to the project budget included in the Work Plan.
- A revised budget, including an explanation of why the revisions were necessary, by task, if changed from latest budget shown in Appendix C, Budget. Note, a revised budget may require an official amendment to the Agreement before it is accepted as final.

SCHEDULE INFORMATION

- A schedule showing actual progress verse planned progress as shown in Exhibit B.
- A discussion on how the actual schedule is progressing in comparison to the schedule in Exhibit B.
- A revised schedule, by task, if changed from latest schedule in Exhibit B. Note, a revised schedule may require an official amendment to the Agreement before it is accepted as final.

ANTICIPATED ACTIVITIES NEXT QUARTER

- Provide a description of anticipated activities for the next quarterly reporting period.

PROJECT COMPLETION REPORT

A Project Completion Report is required for each project identified in the Work Plan, Exhibit A. This report will include the following Sections:

EXECUTIVE SUMMARY

The Executive Summary consists of a maximum of ten (10) pages summarizing project information (see report status section below for topics). The Executive Summary should include the following:

- Brief description of work proposed to be done in the original Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 IRWM Implementation Grant application.
- Description of actual work completed and any deviations from the work plan identified in the Grant Agreement. List any official amendments to the Agreement, with a short description of the amendment
- Describe the mechanism or process that allows for continued performance monitoring of the projects in meeting the objectives of the IRWM Plan.

REPORTS AND/OR PRODUCTS

- Provide a copy of any final technical report or study, produced for this project as described in the Work Plan, if applicable.
- Provide a map and shapefile(s) showing the location of the completed project. A description of the geographic projection and datum used for the shapefile must be submitted with the shapefile (a NAD '83 datum and either a UTM 10 or UTM 11 projection, dependent on the project's location in the state, should be utilized).
- If any wells were constructed as part of the project, provide the following information: well logs; borehole geophysical logs; state well number; site information to include horizontal (NAD '83) and vertical (NAVD '88) datum to be determined within 0.5 feet.
- Provide an electronic copy of any as-built plans (media: CD-ROM; PDF format).
- Provide copies of any data collected along with location maps.
- If applicable, describe the findings of any study and whether the study determined the engineering, hydrologic, hydrogeologic, environmental, economic and financial feasibility of the project.
- If applicable, a discussion of the critical water supply or water quality benefits to DAC as part of this Grant Agreement.

COST & DISPOSITION OF FUNDS INFORMATION

- A list of invoices showing:
  - The date each invoice was submitted to State.
  - The amount of the invoice.
  - The date the check was received.
  - The amount of the check (If a check has not been received for the final invoice, then state this in this section).

- A spreadsheet summary of the original budget costs by task versus the final project costs

- A summary of final funds disbursement including:
  - Labor cost of personnel of agency/ major consultant /sub-consultants (Indicate personnel, hours, rates, type of protession and reason for consultant, i.e., design, CEQA work, etc).
  - Construction cost information, shown by material, equipment, labor costs, and change orders.
  - Any other incurred cost detail.
  - A statement verifying separate accounting of grant disbursements.
- Summary of project cost including:
  - Accounting of the cost of project expenditure.
  - Include all internal and external costs not previously disclosed.
  - A discussion of factors that positively or negatively affected the project cost and any deviation from the original project cost estimate.

ADDITIONAL INFORMATION

- Benefits derived from the project, with quantification of such benefits provided, if applicable.
- A final project schedule showing actual progress verse planned progress.
- Certification from a California Registered Civil Engineer that the project was conducted in accordance with the approved work plan and any approved modifications thereto.
- Submittal schedule for the Post Performance Report and an outline of the proposed reporting format.

GRANT COMPLETION REPORT

The Grant Completion Report shall generally use the following format. This format may be modified as necessary to effectively communicate information on the various projects in the IRWM Program funded by this Grant Agreement, and includes the following:

EXECUTIVE SUMMARY

The Executive Summary consists of a maximum of twenty (20) pages summarizing information for the grant as well as the individual projects.

REPORTS AND/OR PRODUCTS

- Summary of the regional priorities, objectives, and water management strategies of the IRWM Plan.
- Brief comparison of work proposed in the original Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 IRWM Implementation Grant application and actual work done.
- Brief description of the projects completed and how they will further the goals identified in the Agency's final approved IRWM Plan.
- Describe how the implemented projects will meet the regional priorities identified in the final approved IRWM Plan and how the projects contribute to regional integration.
- Identify remaining work and mechanism for their implementation.
- Identify any changes to the IRWM Plan as result of project implementation.
- Short description of the two year IRWM Plan update and the date when the updated Plan was submitted to DWR.
- If applicable, a short discussion on how the IRWM Plan will assist in reducing dependence on Delta water supplies.
- A discussion of the critical water supply or water quality benefits to DAC as part of this Grant Agreement

COST & DISPOSITION OF FUNDS INFORMATION

- A summary of final funds disbursement for each project.

ADDITIONAL INFORMATION

- A final schedule showing individual project's actual progress duration verse planned progress.
- Certification from a California Registered Civil Engineer that the Program was conducted in accordance with the approved work plan and any approved modifications thereto. Discussion of the synergies of the completed projects, including the integration of project benefits and a comparison of actual benefits versus those discussed in the original proposal.
- Submittal schedule for the Post Performance Reports for each of the projects in this Grant Agreement.

POST-PERFORMANCE REPORT

Post Performance Report is required annually for every project for a period of 10 years beginning after the first year of operation, and includes the following:

REPORTS AND/OR PRODUCTS

- Time period of the annual report, i.e., Oct 2014 through September 2015.
- Short project description.
- Brief discussion of the project benefits to water quality, water supply, and the environment.
- An assessment of any explanations for any differences between the expected versus actual project benefits in meeting IRWM priorities as stated in the original IRWM Implementation Grant application. Where applicable, the reporting should include quantitative metrics, i.e., new acre-feet of water produced that year, acres of wildlife habitat added, etc.
- Summary of any additional costs and/or benefits deriving from the project since its completion, if applicable.
- Continued reporting on meeting the Output Indicators and Targets discussed in the Project Monitoring Plan discussed in Paragraph 22 of this Grant Agreement.
- Any additional information relevant to or generated by the continued operation of the project.

ELECTRONIC REPORT FORMATTING

Grantee agrees that work funded under this Grant Agreement will be provided in an electronic format to State. Electronic submittal of final reports, plans, studies, data, and other work performed under this grant shall be as follows:

- Text preferably in MS WORD or text PDF format.
- Files generally less than 10 MB in size.
- Files named so that the public can determine their content. For example, file naming of reports must have the title and, if subdivided into smaller sized files, the chapter number/letter and names in the report Table of Content (TOC); files of maps, figures, and tables by number/letter as referenced in the TOC; well logs files with DWR-required naming convention; and Appendix number/letter and named in the TOC.
- For projects involving a modeling component, grantee shall provide the major input data files, parameters, calibration statistics, output files, and other information requested by State's Project Manager.

EXHIBIT F
LOCAL PROJECT SPONSORS

LOCAL PROJECT SPONSORS

Grantee has assigned, for each project, a Local Project Sponsor according to the roles of the participating agencies identified in the IRWM Plan. Local Project Sponsors may act on behalf of Grantee for the purposes of individual project management, oversight, compliance, and operations and maintenance. Local Project Sponsors are identified for each Sponsored Project below:

Local Sponsor Agency Designations		
Sponsored Project	Sponsor Agency	Agency Address
Project 1 South and Highland Bain	Consolidated Irrigation District	Phil Desatoff General Manager Consolidated Irrigation District P.O. Box 209 Selma, CA 93662 Office: (559) 896-1660 pdesatoff@cidwater.com
Project 2 Surface Water Treatment Plant Expansion	City of Clovis	Lisa Koehn Assistant Public Utilities Director City of Clovis 155 N. Sunnyside Avenue Clovis, CA 93611 Office: (559) 324-2607 lisak@ci.clovis.ca.us
Project 3 Drummond Jensen Avenue Sewer Connection Study	County of Fresno	Joe Prado Principal Staff Analyst C/O Drummond-Jensen Community County of Fresno, Dept. of Public Works and Planning Resources Division, Special Districts 2220 Tulare Street, 6th Floor Fresno, CA 93721 Office: (559) 262-4259 JPrado@co.fresno.ca.us
Project 4 Water Well Rehabilitation Project	East Orosi Community Services District	Lucy Rodriguez District Manager East Orosi Community Services District P.O. Box 213 Orosi, CA 93647 Office: (559) 393-1125 eocsd@aol.com
Project 5 Residential Water Meter Project (Area VI and VII)	City of Fresno	Brock Buche Water Division Engineer City of Fresno Public Utilities Department, Water Division 1910 East University Avenue Fresno, CA 93703-2988 Office: (559) 621-5325 Brock.Buche@fresno.gov

EXHIBIT G
REQUIREMENTS FOR DATA SUBMITTAL

SURFACE AND GROUNDWATER QUALITY DATA:
Groundwater quality and ambient surface water quality monitoring data that include chemical, physical, or biological data shall be submitted to the State as described below, with a narrative description of data submittal activities included in project reports, as described in Exhibit E.

Surface water quality monitoring data shall be prepared for submission to the California Environmental Data Exchange Network (CEDEN). The CEDEN data templates are available on the CEDEN website. Inclusion of additional data elements described on the data templates is desirable. Data ready for submission should be uploaded to your CEDEN Regional Data Center via the CEDEN website. CEDEN website: http://www.ceden.org.

If a project's Work Plan contains a groundwater ambient monitoring element, groundwater quality monitoring data shall be submitted to the State for inclusion in the State Water Resources Control Board's Groundwater Ambient Monitoring and Assessment (GAMA) Program Information on the GAMA Program can be obtained at: http://www.waterboards.ca.gov/water_issues/programs/gama/. If further information is required, the Grantee can contact the State Water Resources Control Board (SWRCB) GAMA Program. A listing of SWRCB staff involved in the GAMA program can be found at:
http://www.swrcb.ca.gov/water_issues/programs/gama/contact.shtml

GROUNDWATER LEVEL DATA
For each project that collects groundwater level data, Grantee will need to submit this data to DWR's Water Data Library (WDL), with a narrative description of data submittal activities included in project reports, as described in Exhibit E. Information regarding the WDL and in what format to submit data in can be found at: http://wdl.water.ca.gov/.

In the near future, DWR's WDL will be replaced by the California Statewide Groundwater Elevation Monitoring program (CASGEM). Once this Program comes online Grantee will then submit groundwater level data to CASGEM. Information regarding the CASGEM program can be found at:
http://www.water.ca.gov/groundwater/casgem/

Exhibit H
State Audit Document Requirements and Guidelines for Grantees
Under DWR Financial Assistance Programs

The following provides a list of documents typically required by State Auditors and general guidelines for Grantees. List of documents pertains to both Grant funding and Grantee's Funding Match and details the documents/records that State Auditors would need to review in the event of this Grant Agreement is audited. Grantees should ensure that such records are maintained for each funded project.

List of Documents for Audit

Internal Controls:
1. Organization chart (e.g., Agency's overall organization chart and organization chart for this Grant Agreement's funded projects.
2. Written internal procedures and flowcharts for the following:
    a. Receipts, deposits and disbursements
    b. State reimbursement requests
    c. Grant expenditure tracking
    d. Guidelines, policy, and procedures on grant funded Program/Project
3. Audit reports of the Agency internal control structure and/or financial statements within the last two years.
4. Prior audit reports on grant funded Program/Project.

Agreements and Contracts:
1. Original signed Grant Agreement, any amendment(s) and budget modification documents.
2. A listing of all bond-funded grants received from the State.
3. A listing of all other funding sources for each project.
4. All subcontractor and consultant contracts and related or partners documents, if applicable.
5. Contracts between the Agency and member agencies as related to this grant agreement.

Invoices:
1. Invoices from vendors and subcontractors for expenditures submitted to the State for payments under this Grant Agreement.
2. Documentation linking subcontractor invoices to State reimbursement, requests and related budget line items under this Grant Agreement.
3. Reimbursement requests submitted to the State for this Grant Agreement.

Cash Documents:
1. Receipts (copies of warrants) showing payments received from the State.
2. Deposit slips (or bank statements) showing deposit of the payments received from the State.
3. Cancelled checks or disbursement documents showing payments made to vendors, subcontractors, consultants, and/or agents under this Grant Agreement.
4. Bank statements showing the deposit of the receipts.

Accounting Records:
1. Ledgers showing entries for receipts and cash disbursements.
2. Ledgers showing receipts and cash disbursement entries of other funding sources.
3. Bridging documents that tie the general ledger to requests for grant reimbursement.

Administration Costs: Supporting documents showing the calculation of administration costs.

Personnel:
1. List of all contractors and Agency staff that worked on this grant funded Program/Project.
2. Payroll records including timesheets for contractor staff and the Agency personnel who provided services charged to this Grant Agreement.

Project Files:
1. All supporting documentation maintained in the project files.
2. All correspondence related to this Grant Agreement.

General Grant Agreement Guidelines

Amendment Requirements:
Amendments to the Work Plan, Budget, and/or Schedule of this Grant Agreement are triggered when the proposed changes are deemed by the State to be substantial. Substantial changes generally include changes to the wording/scope of work, schedule or term, and budget. For example, a formal budget change to an Agreement is required when the cumulative total since the execution of agreement of proposed Grant amount budget change(s) for a Task is greater than 10% of the original Grant amount budget for that particular Task or the Task to be exchanged with.

Funding Match Contribution
Funding Match (often referred to as Grantee Cost Share) is the amount defined in Paragraph 4 of this Agreement. Funding Match consists of non-State funds including in-kind services. In-kind services are defined as work performed (i.e., dollar value of non-cash contributions) by the Grantee (and potentially other parties involved) directly related to the execution of the scope of work (*examples*: volunteer services, equipment use, and facilities). The cost of which in-kind service is valued can counted as funding match in-lieu of actual funds (or revenue) provided by the Grantee. Other funding match and in-kind service eligibility conditions apply (see paragraph 9). Provided below is guidance for claiming funding match with and without in-kind services.

1. Adequate documentation supporting value of in-kind service (or volunteer service) as funding match claimed shall be maintained. Although tracked separately, in-kind services shall be documented and, to the extent feasible, supported by the same methods used by the Grantee for its own employees. Provide formal (on official letterhead) and substantial documentation of in-kind service by including the following:
   - Describe contributed item(s) or service(s)
   - Purpose for which contribution was made (tie to scope of work)
   - Name of contributing organization and date of contribution
   - Real or approximate value of contribution. Who valued the contribution and how was the value determined? (e.g., actual, appraisal, fair market value, etc.). Justification of rate. (see item #4, below)
   - Person's name and function of the contributing person
   - Hours of contribution
   - If multiple sources exist, summarize these on a table with summed charges
   - Was contribution provided by, obtained with, or supported by government funds? If so, indicate source.

2. Funding match contribution (including in kind services) shall be for costs and services directly attributed to activities included in this Grant Agreement Work Plan. These services, furnished by professional and technical personnel, consultants, and other skilled and unskilled labor may be counted as in-kind if the activities are an integral and necessary part of this Grant Agreement. Evaluate eligibility with DWR Project Manager in advance of submittal.

3. Do not track cash contributions made to a project as an expenditure as you would for an in-kind service. When providing funding match, track cash contributions to the Project (i.e. revenues) and expenditures (typically in-kind contribution) separately in an accounting system.

4. Rates for volunteer or in-kind services shall be consistent with those paid for similar work in the Grantee organization. For example, volunteer service of clearing vegetation performed by an attorney shall be valued at a fair market value for this service, not the rate for professional legal services. In those instances in which the required skills are not found in the recipient organization, rates shall be consistent with those paid for similar work in the labor market. In either case, paid fringe benefits that are reasonable, allowable, and allocable may be included in the valuation.

EXHIBIT I
GRANTEE RESOLUTION

**BEFORE THE BOARD OF DIRECTORS
OF THE UPPER KINGS BASIN INTEGRATED REGIONAL
WATER MANAGEMENT AUTHORITY
FRESNO, CALIFORNIA**

RESOLUTION NO. 10-03

AUTHORIZATION TO FILE AN APPLICATION FOR A GRANT UNDER ROUND 1 OF THE PROPOSITION 84 INTEGRATED REGIONAL WATER MANAGEMENT GRANT PROGRAM AND TO ENTER INTO AN AGREEMENT WITH THE CALIFORNIA DEPARTMENT OF WATER RESOURCES

WHEREAS, the Upper Kings Basin Integrated Regional Water Management Authority, a Joint Powers Authority made up of cities, counties and water agencies in the Central San Joaquin Valley, with the responsibility for implementing the Upper Kings Basin Integrated Regional Water Management Plan and;

WHEREAS, the Upper Kings Basin Integrated Regional Water Management Authority desires to make an application for funding under the Proposition 84 Integrated Regional Water Management Grant Program, Round 1, to implement projects that are consistent with the Upper Kings Basin Integrated Regional Water Management Plan and Proposition 84 standards and;

WHEREAS, a requirement of applying for Round 1 Implementation grant funds is submittal of a signed Consent Form, which states that the applicant acknowledges an understanding that they will be required to enter into a binding agreement with California Department of Water Resources to fully update, within two years of the execution date of an agreement, the integrated regional water management plan to meet Proposition 84 Plan Standards contained in the Grant Program Guidelines, now:

BE IT RESOLVED BY THE Board of Directors of the Upper Kings Basin Integrated Regional Water Management Authority that application be made to the California Department of Water Resources to obtain an Integrated Regional Water Management Implementation Grant pursuant to all the terms and provisions of the Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006, and amendments thereto, and;

BE IT FURTHER RESOLVED THAT the Chair of the Water Authority, or his designee, is hereby authorized and directed to prepare the necessary data, conduct investigations, file such application, and execute a grant agreement with the California Department of Water Resources.

THE FOREGOING RESOLUTION was passed and adopted at a special meeting of the Board of Directors of the Upper Kings Basin Integrated Regional Water Management Authority on this 15th day of December, 2010, by the following vote:

AYES: Directors Armstrong, Uota, Blayney, Nielsen, Jr., Serrato, Orth, Mills, Gorman, Moore, Waldner, Martinez, Ramirez, and Worthley

NOES: None

ABSENT: Directors Rapada, Lujan, Mitchell, and Doren

Chair

ATTEST:

Secretary

SECRETARY'S CERTIFICATE

I, David L. Orth, Secretary of Upper Kings Basin Integrated Regional Water Management Authority, hereby certify that the foregoing is a full, true and correct copy of a Resolution duly adopted at the Special Meeting of the Board of Directors of said Authority duly noticed and held on the 15th day of December 2010, of which meeting all of the members of said Board of Directors had due notice and at which a majority thereof were present.

WITNESS my hand this 15th day of December 2010.

Secretary

Kings Basin

Integrated Regional Water Management Plan

KINGS BASIN
Water Authority

Adopted October 17, 2012

This Page is Intentionally Blank

The Kings Basin Integrated Regional Water Management Plan was adopted by the Kings Basin Water Authority on October 17, 2012:

Members	Interested Parties
Alta Irrigation District	Bakman Water Company
City of Clovis	Biola Community Services District
City of Dinuba	California State University, Fresno
City of Fresno	California Native Plant Society
City of Kerman	City of San Joaquin
City of Kingsburg	Community Water Center
City of Parlier	County of Kings
City of Reedley	Crescent Canal Company
City of Sanger	Cutler Public Utility District
City of Selma	East Orosi Community Services District
County of Fresno	Easton Community Services District
County of Tulare	El Rio Reyes Conservation Trust
Consolidated Irrigation District	Fresno County Farm Bureau
Fresno Irrigation District	Hardwick Water Company
Fresno Metropolitan Flood Control District	James Irrigation District
Kings County Water District	Kings River Conservancy
Kings River Conservation District	Kings River Water Association
	Laguna Irrigation District
	Laton Community Services District
	Liberty Canal Company
	Liberty Water District
	London Community Services District
	Mid-Valley Water District
	Orange Cove Irrigation District
	Orosi Public Utility District
	Raisin City Water District
	Reed Ditch Company
	Riverdale Irrigation District
	Riverdale Public Utility District
	Sanger Environmental Fund
	Self-Help Enterprises
	Sierra Club, Tehipite Chapter
	Sierra Resource Conservation District
	Sultana Community Services District
	Terranova Ranch, Inc.
	Tulare Basin Wildlife Partners
	University of California Cooperative Extension – Fresno County

This Page is Intentionally Blank

Acknowledgements

The Kings Basin Water Authority would like to thank the following members of the IRWMP Update Work Group who made significant contributions to this updated IRWMP:

Brock Buche – City of Fresno
Buzz Burleson – Fresno Metropolitan Flood Control District
Carole Combs – Tulare Basin Wildlife Partners
Chris Kapheim – Alta Irrigation District
Cristel Tufenkjian – Kings River Conservation District
David Orth – Kings River Conservation District
Dean Uota – City of Dinuba
Denise Akins – County of Tulare
Eric Osterling – King River Conservation District
Gary Serrato – Fresno Irrigation District
Heather Bashian – Provost & Pritchard Consulting Group
Jerry Lakeman – Fresno Metropolitan Flood Control District
Joe Prado – County of Fresno
Kathy Wood McLaughlin – Tulare Basin Watershed Coordinator
Laurel Firestone – Community Water Center
Lisa Koehn – City of Clovis
Owen Kubit – Provost & Pritchard Consulting Group
Paul Boyer – Self Help Enterprises
Phil Desatoff – Consolidated Irrigation District
Rick Hoelzel – Kings River Conservation District
Ronald Samuelian – Provost & Pritchard Consulting Group
Simarjit Dhanota – California Department of Water Resources

The Kings Basin Water Authority would also like to thank all members and interested parties that provided valuable input and comments on the Draft IRWMP.

This Page is Intentionally Blank

TABLE OF CONTENTS

EXECUTIVE SUMMARY 1
1 INTRODUCTION 1-1
1.1 Background 1-1
1.2 Vision for the IRWMP 1-4
1.3 Purpose, Need and Common Understanding for the IRWMP 1-5
1.4 IRWMP Development 1-6
1.5 Planning Horizon 1-7
1.6 Organization of the Report 1-7
2 GOVERNANCE 2-1
2.1 Regional Water Management Group 2-1
2.2 IRWMP Adoption 2-2
2.3 Committees and Work Groups 2-3
2.4 Decision Making 2-5
2.5 Stakeholder Participation 2-5
2.6 IRMWP Implementation 2-6
3 REGION DESCRIPTION 3-1
3.1 Introduction 3-1
3.2 Watershed/Water System Description 3-1
3.3 Internal Boundary Description 3-7
3.4 Water Supply and Demand 3-23
3.5 Water Quality Conditions 3-35
3.6 Major Water Related Objectives and Conflicts 3-38
3.7 Regional IRWM Boundary 3-38
3.8 Neighboring or Overlapping IRWM Regions 3-43
4 DISADVANTAGED COMMUNITIES 4-1
4.1 Introduction 4-1
4.2 Important Cultural/Social Values of the Region 4-1
4.3 Tribal Government Involvement and Collaboration 4-2
4.4 Economic Conditions/Trends of the Region 4-2
4.5 Disadvantaged Communities (DACs) within the Region 4-4

4.6 Kings Basin DAC Pilot Study 4-12
4.7 Disadvantaged Community Issues 4-13
5 GOALS AND OBJECTIVES 5-1
5.1 Process and Organization 5-1
5.2 Regional Goals 5-2
5.3 Measurable Objectives 5-4
5.4 Program Preferences 5-6
6 RESOURCE MANAGEMENT STRATEGIES 6-1
6.1 Introduction 6-1
6.2 Reduce Water Demand 6-3
6.3 Improve Operational Efficiency and Transfers 6-5
6.4 Increase Water Supply 6-7
6.5 Improve Water Quality 6-11
6.6 Improve Flood Management 6-14
6.7 Practice Resource Stewardship 6-14
6.8 Other Strategies 6-19
7 PROJECT REVIEW PROCESS 7-1
7.1 Identification of Projects 7-1
7.2 Project Prioritization for Specific Funding Opportunities 7-3
8 IMPACTS AND BENEFITS 8-1
8.1 General Benefits of Regional Water Management 8-1
8.2 Impacts and Benefits of Resource Management Strategies 8-2
8.3 Regional Benefits and Impacts 8-10
8.4 Impacts and Benefits to Interested Parties and DACs 8-11
8.5 Project Specific Impact/Benefit Analysis 8-12
8.6 Revisions and Updates to Benefits and Impacts 8-12
9 PLAN PERFORMANCE AND MONITORING 9-1
9.1 Regional Monitoring Efforts 9-1
9.2 Monitoring IRWMP Objectives 9-3
9.3 Monitoring Progress in Implementing Projects 9-3
9.4 Project-Specific Monitoring 9-3
9.5 Reporting Procedures and Responsibilities 9-4

10 DATA MANAGEMENT 10-1
10.1 Data Collection and Accessibility 10-1
10.2 Data Needs 10-2
11 FINANCING 11-1
11.1 General Funding Procedures 11-1
11.2 Federal Funding 11-3
11.3 State Funding 11-4
11.4 Local Funding 11-4
12 TECHNICAL ANALYSIS 12-1
12.1 Water Resources Model 12-1
12.2 Revised Groundwater Overdraft Calculations 12-2
12.3 Climate Change 12-3
12.4 Disadvantaged Communities 12-4
13 RELATION TO LOCAL WATER PLANNING 13-1
13.1 Introduction 13-1
13.2 Water Plans Utilized in the IRWMP 13-1
13.3 Relationship between IRWMP and Local Plans 13-7
14 RELATION TO LOCAL LAND-USE PLANNING 14-1
14.1 Introduction 14-1
14.2 Link between IRWM and Land Use Planning 14-1
14.3 IRMWP Relationship to Land Use Planning Agencies 14-2
14.4 Efforts to Establish Relationships with Land Use Planning Agencies 14-5
15 STAKEHOLDER INVOLVEMENT 15-1
15.1 Stakeholders 15-1
15.2 Public Outreach Methods 15-2
15.3 Public Outreach for IRWMP Development 15-4
15.4 Decision Making 15-5
15.5 Future Public Outreach 15-5
16 COORDINATION AND INTEGRATION 16-1
17 CLIMATE CHANGE 17-1
17.1 Introduction 17-1
17.2 Literature Review 17-2

17.3 General Impacts from Climate Change 17-3
17.4 Vulnerability Assessment 17-4
17.5 Climate Change Models 17-12
17.6 Adaptation Measures 17-15
17.7 Climate Change Monitoring 17-16
17.8 Mitigation of Greenhouse Gas Emissions 17-17
17.9 Climate Change in other IRWMP Sections 17-18
18 REFERENCES 18-1

APPENDICES

A – Descriptions of Members and Interested Parties
B – Adopting Resolution
C – Joint Powers Agreement
D – Letter of Agreement with Madera Region Regional Water Management Group
E – Public Notices

LIST OF FIGURES

Figure 1-1: Regional Map 1-3
Figure 3-1: IRWMP Region and Groundwater Basin Boundaries 3-4
Figure 3-2: District, County and Urban Areas within IRWMP Region 3-8
Figure 3-3: Spheres of Influence within IRWMP Region 3-9
Figure 3-4: Neighboring IRWMPs 3-44
Figure 4-1: Disadvantaged Communities 4-11
Figure 5-1: Goals and Objectives Hierarchy 5-2
Figure 12-1: Change in Groundwater Storage in Kings Basin (1964-2035) 12-3
Figure 14-1: IRWMP Relationship to Local Planning 14-2
Figure 15-1: Public Outreach and Stakeholder Involvement 15-3
Figure 16-1: Coordination and Integration Components 16-1
Figure 17-1: Process for Climate Change Planning 17-2
Figure 17-2: Estimated Impacts to Kings River Flows 17-13

LIST OF TABLES

Table 1-1: Organization of the Report 1-8
Table 3-1: Members and Interested Parties 3-10
Table 3-2: Stakeholder Classification 3-11
Table 3-3: CVP Contractors in IRWMP Area 3-16
Table 3-4: Flood Capacities to Be Maintained on the Kings River 3-30
Table 3-5: Agencies and Roles in Relation to DWR Water Management Strategies . 3-41
Table 4-1: Socio-Economic Information on Counties in the IRWMP Region 4-2
Table 4-2: Unincorporated Disadvantaged Communities 4-6
Table 4-3: IRWMA Member and Interested Party DACs 4-10
Table 5-1: Regional Goals 5-3
Table 5-2: Measureable Objectives 5-4
Table 5-3: Program Preferences 5-6
Table 6-1: Resource Management Strategies 6-2
Table 8-1: Benefits and Impacts of Resource Management Strategies 8-4
Table 9-1: Regional Monitoring Programs 9-1

Table 13-1: Urban Water Management Plans 13-2
Table 13-2: Groundwater Management Plans 13-3
Table 13-3: Water, Wastewater and Stormwater Master Plans 13-4
Table 13-4: Master Plan Components Germane to IRWMP 13-5
Table 13-5: Agricultural Water Management Plans 13-6
Table 13-6: General Plans 13-7
Table 14-1: Land Use Planning Documents 14-3
Table 17-1: Projected Changes in Precipitation 17-14
Table 17-2: Projected Increased in Temperature (F°) 17-15
Table 17-3: General Climate Change Predictions 17-15

ABBREVIATIONS

AEWSD ..... Arvin Edison Water Storage District
AF ..... Acre-Feet
AID ..... Alta Irrigation District
AWEP ..... Agricultural Water Enhancement Program
AWMC ..... Agricultural Water Management Council
AWMP ..... Agricultural Water Management Plan
BAP ..... Basin Advisory Panel
BMP ..... Best Management Practice
CASGEM ..... California State Groundwater Elevation Monitoring
CDPH ..... California Department of Public Health
CEQA ..... California Environmental Quality Act
CFS ..... Cubic Feet per Second
CID ..... Consolidated Irrigation District
Corps ..... United States Army Corps of Engineers
CSA ..... County Service Areas
CSD ..... Community Services District
CVP ..... Central Valley Project
CVPIA ..... Central Valley Project Improvement Act
CWC ..... California Water Code
DAC ..... Disadvantaged Community
DBCP ..... Dibromochloropropane
DFG ..... Department of Fish and Game
DMC ..... Delta Mendota Canal
DMM ..... Demand Management Measure
DMS ..... Data Management System
DPLA ..... Division of Planning and Local Assistance
DWR ..... Department of Water Resources
DWSAP ..... Drinking Water Source Assessment & Protection
EPA ..... Environmental Protection Agency
EWMP ..... Efficient Water Management Practice
FCMP ..... Flood Control Master Plan
FEMA ..... Federal Emergency Management Agency
FID ..... Fresno Irrigation District
FMFCD ..... Fresno Metropolitan Flood Control District
FWS ..... Fish and Wildlife Service
GHG ..... Greenhouse Gas
GIS ..... Geographic Information Systems
GWMP ..... Groundwater Management Plan
ILRP ..... Integrated Lands Regulatory Program
IGSM ..... Integrated Groundwater Surface Water Model
IRWM ..... Integrated Regional Water Management
IRWMA ..... Integrated Regional Water Management Authority
IRWMP ..... Integrated Regional Water Management Plan
JID ..... James Irrigation District

JPA..... Joint Powers Agreement
KBWA.....Kings Basin Water Authority
KRCD .....Kings River Conservation District
KRWA ..... Kings River Water Authority
LAFCO .....Local Agency Formation Commission
LID.....Low Impact Development
LGA .....Local Groundwater Assistance
MCL.....Maximum Contaminate Level
MHI.....Median Household Income
MOU.....Memorandum of Understanding
MSR ..... Municipal Service Review
MVWA .....Mid-Valley Water Authority
NAWQA.....National Water Quality Assessment
NCCSP.....National Center for Conservation Science and Policy
NEPA ..... National Environmental Policy Act
NFG..... North Fork Group
NOAA ..... National Oceanic and Atmospheric Administration
NGO .....Nongovernmental Organizations
NRCS .....Natural Resources Conservation Service
O&M .....Operations and Management
PG&E .....Pacific Gas & Electric
PPM ..... Parts Per Million
PUD.....Public Utility District
RCD .....Resource Conservation District
RMS ..... Regional Management Strategies
RWQCB ..... Regional Water Quality Control Board
SB ..... Senate Bill
SCE.....Southern California Edison
SDMP.....Storm Drain Management Plan
SKFCSD.....Selma-Kingsburg-Fowler County Sanitation District
SLW .....Supercooled Liquid Water
SSJVWQC .....San Joaquin Valley Water Quality Coalition
SSMP .....Sewer System Management Plan
SWMP .....Stormwater Management Plan
SWP ..... State Water Project
SWRCB.....State Water Resources Control Board
TDS .....Total Dissolved Solids
THM ..... Trihalomethanes
TLB..... Tulare Lake Basin
TMDL .....Total Maximum Daily Load
TMF..... Technical Managerial & Financial
USBR ..... United States Bureau of Reclamation
USDA .....United States Department of Agriculture
USFWS .....United States Fish and Wildlife Services
USGS ..... United States Geologic Survey

UWMP ..... Urban Water Management Plan
UWMPA ..... Urban Water Management Planning Act
VOC ..... Volatile Organic Compound
WWD ..... Water Works Districts
WWMP ..... Wastewater Management Plan

This Page is Intentionally Blank

EXECUTIVE SUMMARY

Introduction

The Kings Basin Integrated Regional Water Management Plan (IRWMP) is a collaborative effort between 54 public, private and non-governmental agencies to manage water resources in the Kings Groundwater region (Kings Basin). The Kings Basin is a sub-basin of the San Joaquin Valley groundwater basin, within the Tulare Lake Hydrologic Region. The IRWMP region includes nearly all of the Kings Sub-basin and small portions of the Delta-Mendota, Kaweah and Tulare Lake Sub-basins.

Historically, water management in the Kings Basin was limited to independent operations by local water agencies and individual water users. Local agencies initiated a process of regional cooperation in 2001 and prepared an IRWMP in 2007. This regional effort continued to grow and evolved into the formation of the Upper Kings Basin Integrated Water Management Authority (Kings Basin Water Authority or Authority) in 2009. In 2012, the Authority included 17 official members and 37 interested parties. The 2007 IRWMP was updated to comply with new IRWMP standards established by the Department of Water Resources (DWR), describe the new governance structure, document changes in policies and procedure, and include information on new stakeholders and their input on water management issues. The region and its IRWMP were accepted by DWR during the IRWMP Regional Acceptance Process of 2009.

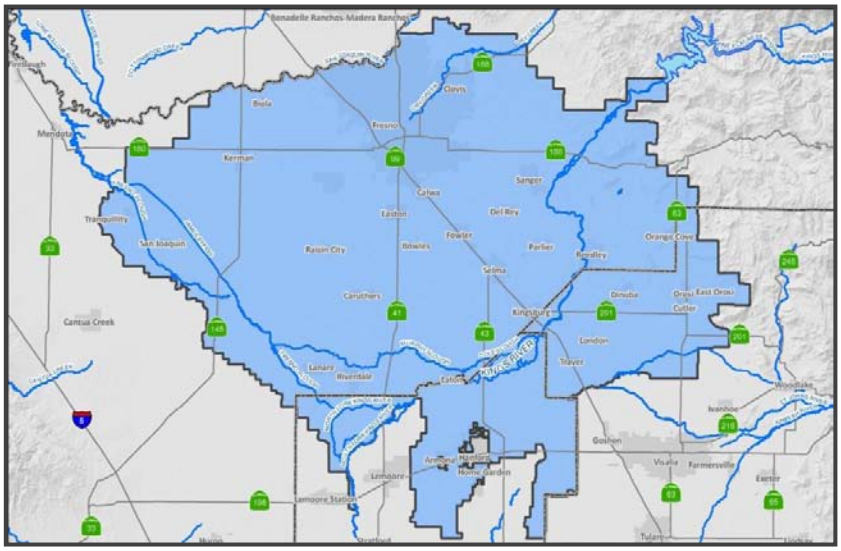
> "The vision of the Kings Basin Water Authority is a sustainable supply of the Kings River Basin's finite surface water and groundwater resources through regional planning that is balanced and beneficial for environmental stewardship, overall quality of life, a sustainable economy, and adequate resources for future generations."

This updated IRWMP Planning horizon extends 20 years to the year 2032. By working with varied interests and needs, the IRWMP planning process has opened the doors to partnerships, funding opportunities, operational connectivity, and increased awareness of planning efforts and potential projects.

Region Description

The Kings Basin IRWMP covers 610,000 acres (953 square miles) and includes parts of Fresno, Kings and Tulare Counties. The IRWMP area also includes numerous cities, communities, water districts, irrigation districts, and special districts.

The region uses both surface and groundwater to meet water needs. The Kings River is the major source of surface water. Operation of Pine Flat Reservoir provides a facility to regulate the Kings River flows and provides storage, flood control, hydropower and recreational benefits. The San Joaquin River defines the northern boundary of the IRWMP region, and provides surface water to some areas in the northern portion of the Kings Basin.



Map of Kings Basin IRWMP Area

Much of the Kings Basin is developed for agriculture and wide varieties of crops are grown. Most crops require irrigation water during the dry season, and irrigated lands cover about 480,000 acres. An extensive network of canals is used to deliver water to agricultural lands and groundwater recharge facilities. The region is comprised of several major urban areas, including the Fresno-Clovis metropolitan area. The majority of the IRWMP area has been ecologically modified through urbanization and agriculture. The Kings River supplies the most prominent riparian and wetland habitat in the area, and provides the main corridor for fish and wildlife movements.

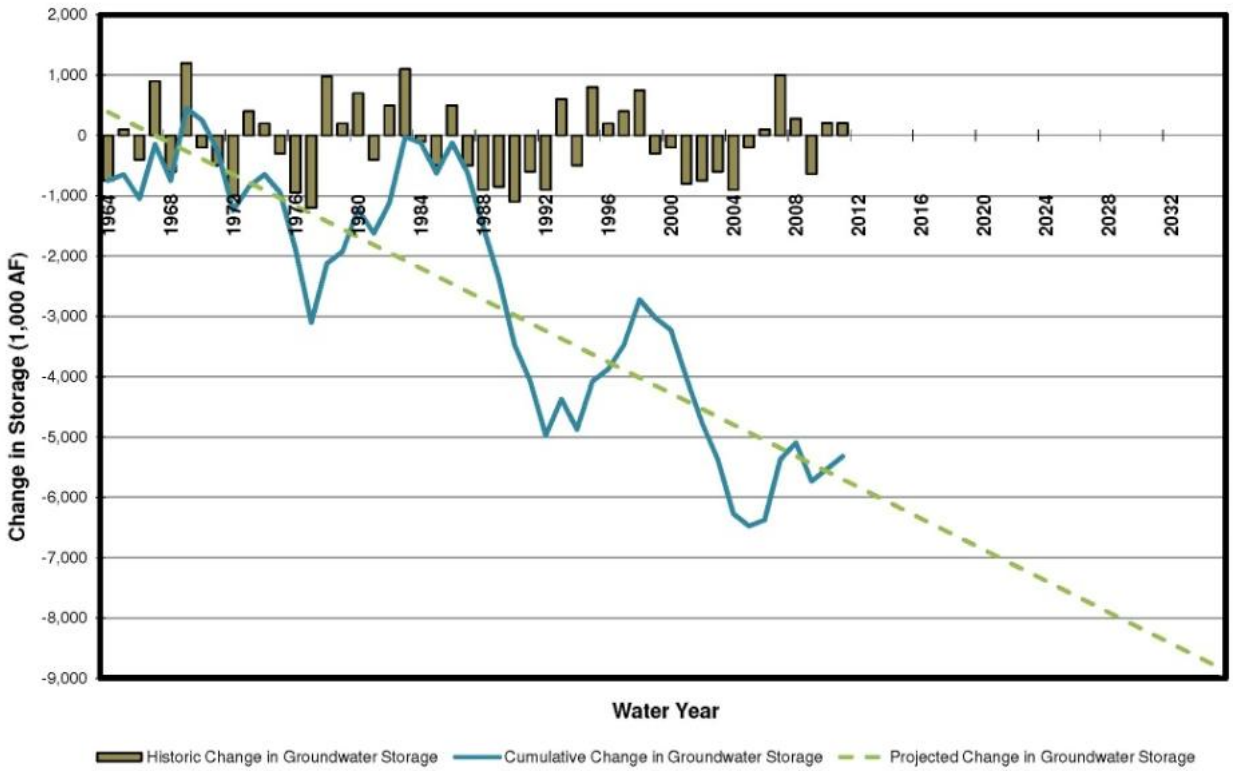
Kings River

The IRWMP boundary is logical for regional management since the local agencies share the same groundwater basin, use the same surface water sources and the stakeholders face similar water management issues and concerns (Chapter 3).

Water Management Challenges

The region faces many water management challenges including groundwater overdraft, surface water shortages in dry years, and groundwater quality problems in certain areas. Groundwater overdraft is generally considered the largest regional problem with the current plan area overdraft estimated to be 100,000 to 150,000 AF/year. The long-term decline in groundwater storage will be significant if current water management strategies are maintained. Correcting the overdraft through regional efforts will help lead to overall maintenance and improvement in the quantity, quality and cost of development of groundwater resources in the region.

Within certain areas of the region and for certain stakeholders, water quality and water



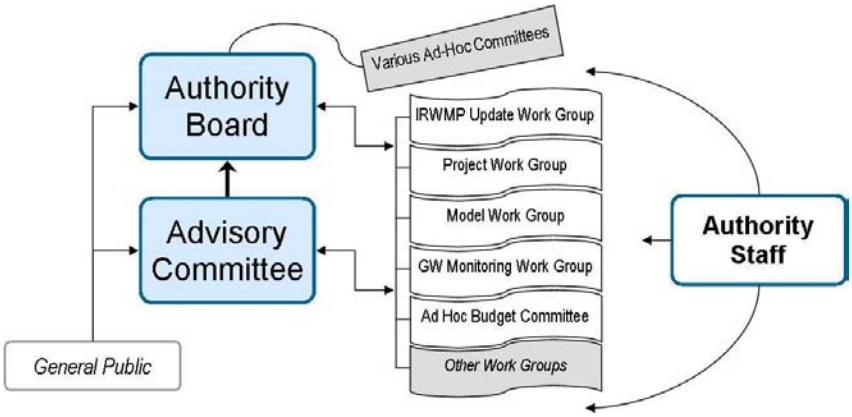
Historical and Projected Groundwater Level Decline

reliability are higher priorities than overdraft correction. Communities completely reliant on groundwater for drinking water purposes are experiencing an increasingly difficult time meeting drinking water standards. Improving and protecting water quality remains a significant challenge that can also benefit from regional and cooperative efforts.

The DWR established 16 IRWM Plan Standards (August 2010) that must be addressed in updated IRWMPs. These are addressed in separate chapters of the IRWMP and are summarized below:

Governance

The Authority is governed by a Joint Powers Agreement (JPA) made effective on March 1, 2009. The JPA formed a legal Authority that satisfies the definition of a Regional Water Management Group according to the California Water Code. Members must execute the JPA and pay an annual assessment. Interested parties can participate free of cost. The Authority is governed by a Board of Directors comprised of one representative from each Member agency. An Advisory Committee and numerous Work Groups provide advice to the Board of Directors and assist with IRWMP plan development, technical studies, project evaluation, and administrative efforts. The organizational structure provides balanced opportunities for stakeholder participation. (Chapter 2)



Joint Power Authority Organization Chart

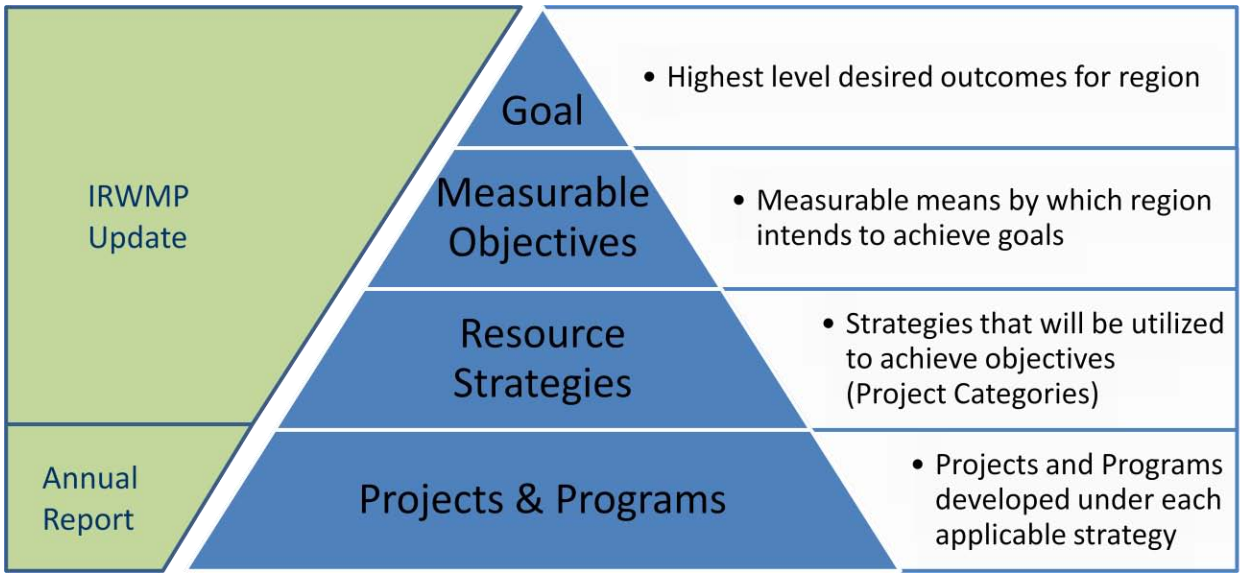
Disadvantaged Communities

A Disadvantaged Community (DAC) is a community with mean annual household income less than 80% of the statewide average. The Kings Basin includes approximately 90 unique DACs. Many of the DACs have critical water supply and water quality needs. Agriculture is a large sector of the economy in many DACs, and maintaining this economic base requires a reliable water supply. Water supplies are also needed to accommodate urban, commercial and industrial growth in DACs. A regional study on DAC water issues, to be completed in 2013, will engage DACs, identify water, sewer, and storm drain issues, and develop potential projects to address their water supply problems. (Chapter 4)

Goals and Objectives

The Authority developed regional Goals and Objectives to provide focus to their planning efforts. These Goals and Objectives consolidate urban, agricultural and environmental concerns. Goals are the highest level priorities, and objectives are more specific actions to meet the goals. The objectives can be accomplished through resource management strategies, projects and programs. The process to identify Goals and Objectives considered those developed in the 2007 IRWMP, the 2010 IRWMP Guideline requirements, and changed conditions within the basin since the 2007 IRWMP was adopted. The regional goals include: 1) reduce groundwater overdraft; 2)

increase water supply reliability; 3) improve water quality and drinking water reliability; 4) enhance flood protection; and 5) enhance ecosystems and the services they provide. Mitigating groundwater overdraft is generally considered the highest regional priority, but water quality and water reliability are higher priorities in some areas. Fifteen measureable objectives were identified to help meet the five goals. Each objective was assigned a metric so its progress can be measured. (Chapter 5)



Hierarchy of Goals, Objectives, Strategies and Programs

Resource Management Strategies

A resource management strategy is a category for a type of project, program, or policy that helps local agencies manage their water and related resources. This IRWMP evaluates 33 strategies listed in the 2009 California Water Plan Update, and 'Drought Planning', a strategy added by the Authority. The evaluations include a description of each strategy, current use and applicability in the Kings Basin, and constraints to development. The Kings Basin actively uses 27 Resource Management Strategies and therefore maintains a diverse and comprehensive water management portfolio. High priority strategies include urban and agricultural water use efficiency, conjunctive use, recycled municipal water, and urban runoff management. (Chapter 6)

Project Review Process

The Authority has a project review process to identify and rank potential projects for funding or inclusion in grant applications. The Authority calls for project submittals once a year to include in a regional list, but stakeholders can submit project descriptions at any time. The project description is reviewed for completeness and conformance to IRWMP objectives and goals. If a project meets those requirements, it is added to the list and then documented in an annual report. The list is prepared to help prevent

duplication, foster project integration, and encourage stakeholders to be prepared for grant solicitations. When funding opportunities arise the Authority notifies stakeholders. A Project Selection Panel (Panel) is formed to review potential projects. Stakeholders are invited to submit more detailed project information, and the projects are prioritized by the Panel. The Panel identifies the most promising projects for inclusion in grant applications. The recommended list then requires approval from the Advisory Committee and Board of Directors. (Chapter 7)

Impacts and Benefits of Plan Implementation

Historically, local water management, especially groundwater, was limited to independent operations by each overlying water agency. Regional water management planning enhances the local, fragmented approach with a more comprehensive and cooperative methodology. Some problems, such as groundwater overdraft, can only be solved with regional cooperation. A comprehensive list of benefits and impacts from implementing the IRWMP were identified for the Kings Basin and surrounding IRWMP regions. The impact/benefit analysis can be used to prioritize goals, prioritize resource management strategies, set benchmarks for evaluating IRWMP performance, and identify potentially adverse impacts from implementation projects that are often overlooked. A benefit of the Plan's implementation is in measuring against a baseline for water supply and water quality to reconcile and measure regional project benefits with such baseline criteria over time. (Chapter 8)

Groundwater Recharge Basin in City of Clovis

Plan Performance and Monitoring

Stakeholders in the Kings Basin participate in various independent but related regional efforts to monitor surface water quality, groundwater levels, surface water flows, Kings River levees, and Kings River Fisheries. The Authority will prepare an Annual Report to document monitoring data and serve as a status report for the stakeholders, Board of Directors and the State. The report will summarize regional monitoring efforts, and document success in meeting IRWMP objectives, success in implementing projects, an

updated project list, proposed amendments to the IRWMP, and changes in governance, policies, and membership. (Chapter 9)

Data Management

The Authority has developed data management procedures to ensure the efficient use of existing data and accessibility to stakeholders. Existing data management includes groundwater levels by the Kings River Conservation District (KRCD), surface water flows by the Kings River Water Association (KRWA) and Friant Water Authority (FWA), and water quality by the Southern San Joaquin Water Quality Coalition. The Authority also maintains data on proposed projects in a database. The Authority previously developed a Data Management System (DMS) that it is not currently utilizing in anticipation of employing DWR's DMS once available. (Chapter 10)

Financing

The Authority requires funding for operations, IRWMP updates, regional technical studies, grant applications, and project implementation. The Authority's administrative and governance operations are funded by an annual dues payment by each member, thus ensuring on-going funds to keep the Authority operating. Numerous stakeholders also contribute by offering the use of facilities and volunteering time to operations and committees. Infrastructure projects are typically funded with project proponent funds and augmented with State or Federal grants and loans. The Authority tracks funding opportunities and shares the information with stakeholders. (Chapter 11)

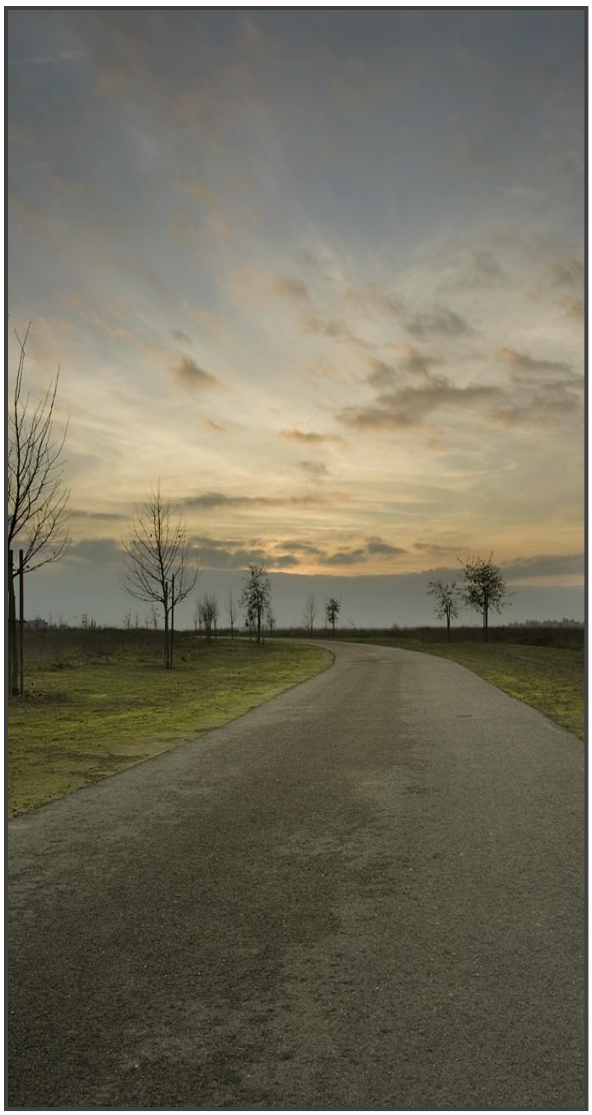
Technical Analysis

The Authority prepared numerous studies to support the 2007 IRWMP. Topics covered include regional water supplies, water demands, hydrogeologic conditions, land use, and water quality. As a result, only a limited amount of new analysis was needed to update this IRWMP. The Kings Basin Integrated Groundwater and Surface Water Model (Kings IGSM or Model) is a regional model that simulates surface water and groundwater systems in the entire Kings Basin. The model was developed in 2007 and remains the primary analytical tool available to the Kings Basin. Prior model runs concluded that under current water management conditions groundwater levels will continue to decline. A simpler technique using a trendline was used to estimate future overdraft. Each year the Authority will compare the projected versus actual change in groundwater storage to monitor progress and refine long-term goals. (Chapter 12)

Relation to Local Water Planning

Local agencies have their own water planning documents that reflect their policies and goals. Local water plans include Urban Water Management Plans, Groundwater Management Plans, Water, Wastewater and Stormwater Master Plans, Water

Conservation Plans, Agricultural Water Management Plans, and General Plans. Water plans from the Member and Interested Party agencies were reviewed and sections of the IRWMP were updated based on information, issues, and potential solutions provided in the plans. The local planning documents are often a reflection of the goals, objectives, and strategies of the IRWMP. The Authority is comprised of many local leaders, city council members, county supervisors and water agency directors, which serve as a link between the IRWMP and local water planning efforts. The Authority believes that regional efforts lead to more effective and better informed local efforts. Regional planning can serve as a basemap or guideline for the entire region to follow in local water resources planning. (Chapter 13)



Local Recreational Area

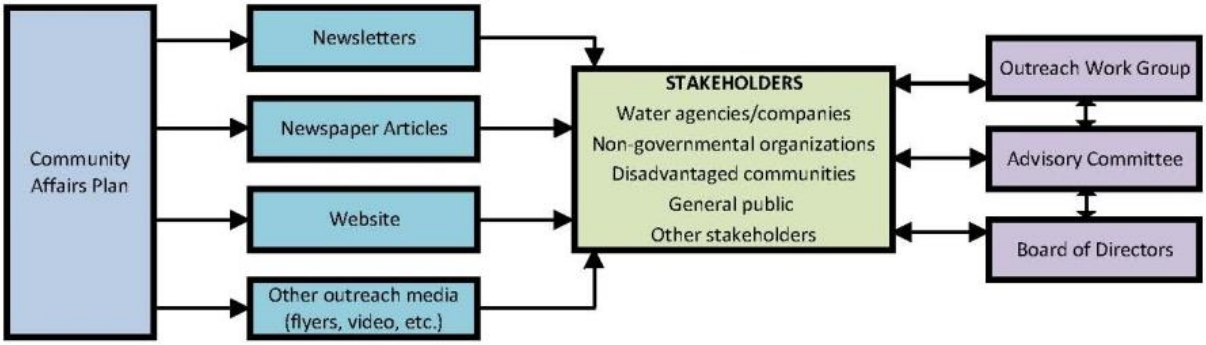
Relation to Local Land-use Planning

Local cities and counties manage land use according to General Plans and Municipal Service reviews. These documents were reviewed for consistency with the IRWMP and to incorporate local planning elements. The IRWM process provides many opportunities to collaborate and integrate with local land planners both at the city and county levels. Many general plans discuss integrated land use and water supply planning. However, many land use documents provide few, if any, details on regional overdraft, groundwater management, new water supply development, and impact on irrigation facilities. The land-use planning documents also have few details on how they plan to reach their water management goals. Several key approaches were identified to strengthen cooperation and communication with land-use planners. (Chapter 14)

Stakeholder Involvement

The Authority includes a diverse group of members and interested parties, which is the result of on-going public outreach efforts since 2004. Outreach efforts are led by an Outreach Work Group and follow a Community Affairs Plan, which is a living document and remains the backbone of the public outreach effort. Outreach methods include the

Authority website, newspaper articles, newsletters, e-mails, printed materials, speaker's bureau, Advisory Committee, Work Groups, and Board of Directors meetings. Stakeholder involvement is considered fundamental to the success of the IRWMP, and outreach efforts will continue to educate current participants and seek new members and interested parties. (Chapter 15)



Stakeholder Involvement Process

Coordination and Integration

Coordination involves public outreach and facilitation efforts to bring stakeholders together and working as a unified group. Integration is defined as combining separate pieces into an efficient unified effort. These two IRWMP standards are closely related. The Authority's governance structure fosters integration and coordination through the organizational structure, opportunities for participation, and a public outreach program. The Authority has an integrated process to solicit and review projects and promotes multi-agency efforts. Data management is integrated through regional monitoring efforts, an annual Kings Basin report, and a regional hydrologic model. The Kings Basin also communicates regularly with neighboring IRWMP groups and State DWR staff. (Chapter 16)

Pine Flat Reservoir during Low Water Levels

Climate Change

Climate change in the Kings Basin could impact precipitation patterns, and cause higher temperatures and earlier snowmelt. The area is especially vulnerable due to its dependence on mountain snow as a water supply. The IRWMP includes a climate change vulnerability assessment for water supplies, water demands, water quality, flooding, ecosystems, and hydropower. Climate change adaptation will be accomplished through 'no-regret' strategies, which are actions that have benefits with or without climate change. The main strategies will include water conservation,

recycled water use, groundwater recharge, and increasing water storage capacity. (Chapter 17)

Kings Basin Water Authority

The Authority is an open organization and encourages participation from local water agencies, land-use agencies, industry organizations, non-governmental organizations, and individuals in the Kings Basin. The Authority's Advisory Committee meets every three months at the office of the Fresno County Farm Bureau.

Please contact Eric Osterling or Cristel Tufenkjian (KRCD) at 559-237-5567 or visit their website at www.kingsbasinauthority.org if you have any questions about the IRWMP or Authority, or would like to become a member or interested party.

Funding for updating the Kings Basin Water Authority IRWMP was in part provided by the California Department of Water Resources through a Proposition 84 IRWM Planning Grant.

Prepared by:

1 INTRODUCTION

The Kings Basin Water Authority Integrated Regional Water Management Plan (IRWMP) was developed to improve coordination and collaboration on regional water management in the Kings Basin. IRWMPs are prepared by regional water management groups comprised of a collection of agencies, stakeholders and individuals who share a common interest in managing water resources in a specific hydrologic region. The IRWMP for the Kings Basin Water Authority (Authority) was originally prepared in 2007, and updated in 2012 to satisfy new State standards for IRWMPs.

1.1 Background

The Kings Groundwater region (Kings Basin) is located in the southern part of the San Joaquin Valley groundwater basin in the Central Valley of California. It is primarily an agricultural area, which uses both surface water and groundwater for irrigation purposes. The two primary sources of surface water for the Kings Basin are:

- Kings River; and
- San Joaquin River via Friant-Kern Canal, a component of the Friant Division of the federal Central Valley Project (CVP).

These two surface water sources are not sufficient to meet the water demand in the Kings Basin alone. Therefore, the water agencies in the area have been managing the available supplies through conjunctive use, which is the combined use of surface water and groundwater supplies and storage.

Due to insufficient surface water supplies, the Kings Basin has been operating under overdraft conditions for many years, with an average annual overdraft of approximately 100,000 to 150,000 acre-feet (WRIME, 2003). Overdraft means that, on an average basis, more water is removed from the groundwater basin than is replaced, resulting in significant declines in groundwater levels throughout the basin. According to Bulletin 118 (DWR, 2003), the groundwater in storage in Kings Basin was about 93 million acre-feet (AF) in 1961; this estimate of storage was to a depth of 1,000 feet or less. It is also estimated that about 6 million AF of groundwater was mined from the Kings Basin during the past 50 years (See **Figure 12-1**).

The continued groundwater overdraft and the urban growth pressure in the region call for improved water resources management. Historically, the management of the water resources has been limited to independent operations by overlying local water agencies and individual water users. It is recognized that piecemeal planning constrains the potential for a solution to the region's most pressing issues, and increases the potential for competition and conflict over the available water supplies.

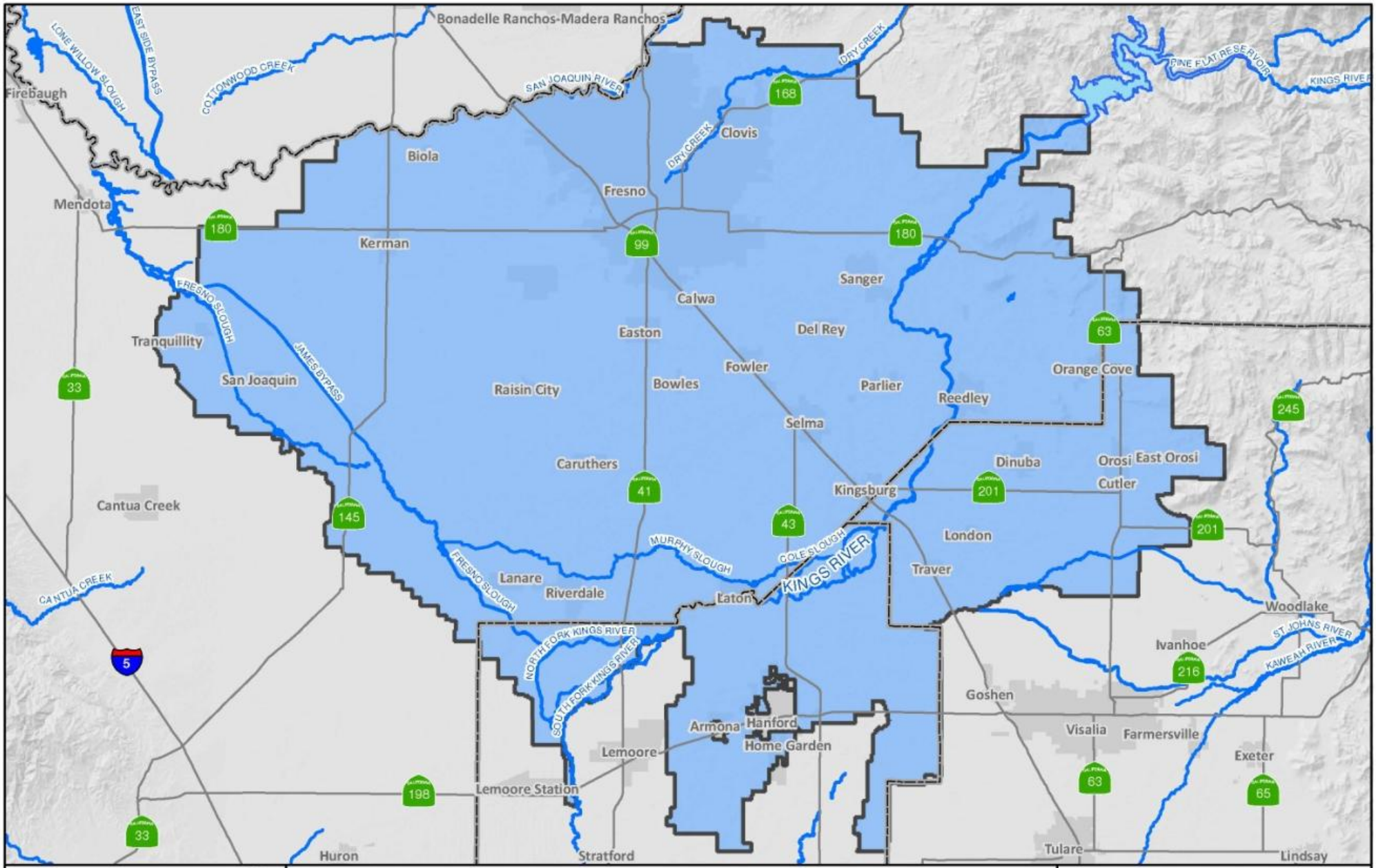
As a result, the local agencies initiated a process of regional cooperation in 2001 to address the overdraft problem and develop implementable solutions. Kings River

Conservation District (KRCD), Alta Irrigation District (AID), Consolidated Irrigation District (CID), and Fresno Irrigation District (FID) formed a Basin Advisory Panel (BAP), sought technical, facilitation, and financial support from the California Department of Water Resources (DWR), and signed a Memorandum of Understanding (MOU) that defined how they would work together to manage existing supplies and develop new supplies for the Kings Region.

The BAP made significant progress by working together to define the water resources problems but realized that the involvement of other stakeholders in the basin would be necessary if regional solutions were to be developed. As a result of these early efforts, the water districts solicited wider stakeholder participation and the Upper Kings Water Forum (Water Forum) was formed in 2004 to coordinate water resources planning in the Kings Basin. The Water Forum embarked on developing an IRWMP for the region to improve water management, reduce conflicts, protect water quality, and ensure sustainable resources management through regional cooperation. The IRWMP was completed in 2007.

In 2009, the Water Forum evolved into the Authority, a more formal organization governed by a Joint Powers Agreement (JPA). The Authority attracted several additional agencies in the lower Kings Basin, and, therefore, it now represents most of the water agencies in the Kings Basin. As a result, the Authority goes by the informal name of Kings Basin Water Authority. In 2012, the Authority included 17 official members and 37 interested parties.

The area covered by this IRWMP is shown on **Figure 1-1** and spans over parts of three counties: Fresno, Kings, and Tulare. The boundary roughly follows the border of the DWR defined Kings Groundwater Sub-basin. The IRWMP planning process included city and county governments, non-governmental organizations and other stakeholders. This diverse range of perspectives has been valuable in developing a consensus and selecting water management strategies for inclusion in the IRWMP that have a broad array of support.



0 4 8 Miles

EST. 1966
PROVOST & PRITCHARD
CONSULTING GROUP
An Employee Owned Company
286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

Legend

2012 IRWMP Boundary

Figure 1-1

Kings Basin IRWMP

Regional Map

1.2 Vision for the IRWMP

In 2006, the Authority adopted a 'vision statement' to ensure a common view of the future among all members. This vision set the direction of the Kings Basin IRWMP and guided the collaborative planning and decision-making process. The IRWMP defines issues, guiding principles, regional goals, objectives, strategies, actions, and projects to enhance the beneficial uses of water for the Kings Basin and ensure the sustainability of the water supply.

> **"The vision of the Kings Basin Water Authority is a sustainable supply of the Kings River Basin's finite surface water and groundwater resources through regional planning that is balanced and beneficial for environmental stewardship, overall quality of life, a sustainable economy, and adequate resources for future generations."**
>
> **Adopted in February 2006**

The Authority has taken the initiative to bring together the different interests in the Kings Region to better communicate, collaborate, and cooperate in solving regional issues that are beyond the capacity of any one entity to address. The Authority has recognized that all of the stakeholders in the region, whether public agencies or non-governmental organizations, have unique perspectives and that all of the individual interests need to be recognized if the IRWMP is to be successful.

Participating entities must continue to recognize and support the concept that regional integration will enhance their ability to manage their operations and collective resources, will increase their water supply reliability, and will provide a framework to improve water management across the region. More importantly, all participating entities should be assured that by participating in an IRWM program, they will not lose opportunities to control their own future, nor will they lose their autonomy. Regional integration does not seek to diminish the individual purveyor's decision-making power or a local government's power to exercise its rights. Instead, it seeks to enhance the collective power of the local entities and the ability to manage their resources. Participating entities would also be able to address water management issues on a much larger scale through an integrated planning framework.

By working with varied interests and agendas, the IRWMP planning process has opened the doors for partnerships, funding opportunities, operational connectivity, and increased awareness of planning efforts, projects and opportunities. In developing regional plans and prioritizing multi-benefit projects, it is important not only to coordinate efforts with other planning agencies within the region, but also to coordinate across regional boundaries. The Authority is working towards building bridges with surrounding regional efforts.

Since 2001, the Authority has leveraged over $35 million in financial support for use toward planning activities and to construct projects that address groundwater, water conservation and efficiency, water quality, riparian habitat, flood corridors, and critical

water supply and water quality needs of disadvantaged communities (DACs) throughout the basin.

The Authority has brought together a significant amount of information, communication concerning complex and controversial issues, and has developed a plan to address water supply and water quality issues in the Basin. Not all of these issues are going to be fully addressed in this IRWMP, but the Authority and the integrated planning framework are expected to provide an on-going mechanism for resolving conflicts and within which water agencies, regulators, and environmental groups and other stakeholders can talk, identify common problems and concerns, and work together to find solutions. The Authority is prepared to address the continuing challenges related to coordinating groups with widely differing missions, agendas, and interests. Implementation of the IRWMP cannot succeed without continuous review and modification to meet new and unanticipated challenges.

1.3 Purpose, Need and Common Understanding for the IRWMP

Historically, water management in the Kings Basin has been limited to independent operations by overlying local water agencies and individual water users. This situation began to improve with the development of the BAP, and the region now has an effective regional water management group in the form of the Authority. The regional water management group was formed by the local land and water agencies and stakeholders to improve communication, collaboration, and cooperation; to develop a consensus on the regional problems and solutions; and to resolve or avoid conflicts. A general consensus has been achieved concerning the purpose of the Kings Basin IRWMP, which includes:

- Document how the Authority worked together through a collaborative process to identify issues, goals, and objectives for water resources management in the Kings Basin;
- Improve water management, reduce conflicts, protect water quality, and ensure sustainable resources management through regional cooperation;
- Identify and define different water management scenarios for the Kings Basin, evaluate alternatives to determine the most economical projects and programs to manage, and develop the surface and groundwater supplies in a sustainable manner;
- Prioritize immediate, near-term, mid-term, and long-term investments and define engineering solutions, program priorities, and institutional approaches to implement the IRWMP; and
- Provide a roadmap to work together within the Kings Basin and surrounding regions to further develop and manage the available water supplies and address water quality issues.

The need and value of the IRWMP is clear. The continued groundwater overdraft is not sustainable and the urban growth in the region, coupled with the need to sustain the

agricultural economy, call for improved water resources management in the Kings Basin.

In 2006, the Authority drafted 'Agreements in Principle', which were then reviewed and adopted by the elected bodies representing the Authority throughout the winter of 2006–07. The Agreements in Principle contained a statement of common understanding that expresses the need for the Kings Basin IRWMP. The Agreements in Principle include:

- The [Authority] participants represent public agencies and community organizations that overlie the Upper Kings Basin and share a common groundwater resource. Any action affecting groundwater within any of the overlying land-use or water-district jurisdictions could impact that area and also have effects (positive or negative) throughout the basin.
- Overdraft of the Kings Groundwater Basin is a common problem for the cities, counties, and water districts in the region. If allowed to continue, it could threaten the region's economic prosperity and could reduce agricultural productivity as well as urban growth and development. This problem cannot be solved by any individual entity or jurisdiction; it is a regional problem that requires a regional solution.
- Solutions conceived in a vacuum to serve a limited area of interest or impact cannot adequately address regional water resource problems related to overdraft, water supply reliability, water quality, flood control, or ecosystems management.
- Groundwater overdraft has the potential to result in conflicts between geographic areas and different water use sectors in the basin. Local control and management must be demonstrated, and if the area does not take the initiative to develop [their own solutions via the] IRWMP, it is possible that [less workable or even the wrong] solutions could be imposed by the courts or the State.
- [Additional supply,] conjunctive use and groundwater management projects are needed to halt and reduce overdraft, avoid conflicts over the available groundwater supplies, and meet the IRWMP Goals and Objectives.
- [Additional supply,] conjunctive use and groundwater management is the integrating theme for the IRWMP. The planning framework has been designed to integrate water quality, ecosystem, flood control, and land use/recreation management strategies within this prevailing theme.
- The IRWMP will recognize, preserve and protect Kings River water rights. [The Kings Basin is hydrologically and hydraulically interconnected and is a resource shared by all individuals and organizations that overlie this common pool of resource. The activities of one organization have an effect on the activities of the other organizations.]

1.4 IRWMP Development

The initial IRWMP, prepared in 2007, was the outcome of a two-year collaborative planning and facilitated process that included completion of a wide range of technical

studies, preparation of briefings and technical memorandums, development of the Kings Basin Integrated Groundwater and Surface Water Model (Kings IGSM), extensive stakeholder involvement and community affairs process, and numerous meetings among various work groups and participants. The local funding for these efforts was supplemented by a Proposition 50 Planning Grant and other technical assistance grants from the DWR.

The IRWMP was updated in 2012 for the following reasons:

- Comply with new IRWMP standards (DWR, 2010)
- Include information on the new governance structure
- Document changes in policies and procedures
- Include information on new members and interested parties that have joined since 2007, as well as their input on regional water management issues

The IRWMP update was led by an IRWMP Update Work Group, comprised of approximately ten volunteers from the members and interested parties. Each chapter was individually discussed through an open and transparent process. The IRWMP follows the required standards documented in '*Proposition 84 & Proposition 1E Integrated Regional Water Management Guidelines'* (DWR, 2010). Funding for the IRWMP update was provided by a Proposition 84 IRWMP Planning Grant and in-kind support from the above stated volunteers.

1.5 Planning Horizon

The IRWMP planning horizon extends 20 years into the future, until 2032. This is consistent with the standard 20-year planning horizon for IRWMPs. Some components of the plan extend further than twenty years, such as long-term predictions for groundwater overdraft and climate change.

1.6 Organization of the Report

This report is organized according to the sixteen IRWM Plan Standards listed by DWR (2010). A chapter is dedicated to each standard with an additional chapter on DACs. A brief description of each chapter follows.

Table 1-1: Organization of the Report

Chapter	Subject	Description
1	Introduction	Provides background information on the Kings Basin, explains the Authority's vision for the Kings Basin IRWMP, its purpose and need, and the organizational structure of the IRWMP.
2	Governance	Describes the history of the regional water management group, the existing governance structure including the JPA, board of directors, committees, work groups, and decision making protocols, and the role of governance in implementing the IRWMP.
3	Region Description	Describes members and interested parties, local hydrology, geology, and physiography of the Kings Basin, the basis for the IRWMP boundary, and the local water infrastructure.
4	Disadvantaged Communities	Describes the geography, demographics, economic conditions, and water resources problems in DACs in the Kings Basin.
5	Goals and Objectives	Describes the Authority's process for identifying and prioritizing issues to be addressed in the IRWMP, and the Goals and Objectives that were established to resolve the identified issues.
6	Resource Management Strategies	Presents 34 different Resource Management Strategies (RMS) that the Authority considered, and describes their applicability and use in the Kings Basin.
7	Project Review Process	Describes the process used to solicit and review projects for possible funding or inclusion in grant applications
8	Impacts and Benefits of Plan Implementation	Discusses the general benefits of regional water management, impacts and benefits of RMS, impacts and benefits to neighboring IRWMPs, DACs, and interested parties, and evaluating impacts and benefits for specific projects.
9	Plan Performance and Monitoring	Describes several regional monitoring plans, describes the Authority's plan to monitor progress in meeting IRWMP Goals and implementing projects, reporting procedures and responsibilities, guidelines for project-specific monitoring, and the content of the Annual IRWMP report.

Chapter	Subject	Description
10	Data Management	Describes the Authority's existing and future plans for data collection, storage, and dissemination.
11	Financing	Provides a general overview of existing and potential funding sources for Authority operations, IRWMP updates, regional studies, grant application preparation, project implementation, and project operation and maintenance.
12	Technical Analysis	Describes the capabilities of the region's custom hydrologic model, and provides a new long-term estimate for groundwater overdraft.
13	Relation to Local Water Planning	Describes local water plans prepared by cities, irrigation districts, and other special districts, and their compatibility with the IRWMP.
14	Relation to Local Land-use Planning	Describes local land-use plans and their goals related to water management, the compatibility of the water management goals with the IRWMP, and possible future collaborations with land-use planners.
15	Stakeholder Involvement	Discusses the public outreach effort during the IRWMP update, and a plan for future public outreach.
16	Coordination and Integration	Discusses the Authority's efforts to coordinate projects and activities with local agencies, stakeholders, neighboring IRWMPs, state agencies, and federal agencies.
17	Climate Change	Includes predicted impacts to the region from climate change, a vulnerability assessment for the Kings Basin, proposed adaptation measures, plan for monitoring climate change, and a process for evaluating greenhouse gas emissions in project selection.
18	References	Lists the documents cited in the Kings Basin IRWMP.

This Page is Intentionally Blank

2 GOVERNANCE

This section discusses the governance structure for the Regional Water Management Group including their Joint Powers Agreement (JPA), communication protocols and decision making policies. Some governance topics are not specifically discussed in the JPA or other official governance documents, but are incorporated in this IRWMP by reference to the separate policy documents.

2.1 Regional Water Management Group

The Regional Water Management Group is governed by a JPA that was made effective on March 1, 2009. The JPA formed a legal Authority called the Upper Kings Basin Integrated Regional Water Management Authority (Kings Basin Water Authority or Authority). The Authority satisfies the definition of a Regional Water Management Group provided in the California Water Code §10539 since it includes: 1) more than three local agencies; 2) at least two local agencies that have statutory authority over water supplies or water management; and 3) members that participate by means of a written agreement (JPA) that was approved by the governing bodies of the local agencies.

In 2012, the Authority is comprised of 17 official members and 37 interested parties, who are documented in Exhibits A and B of the JPA agreement. Those members and interested parties are shown on **Table 3-1** and **Figure 3-2**, and a description of each organization is provided in **Appendix A**. An organization chart for the Authority is shown below as **Figure 2.1**.

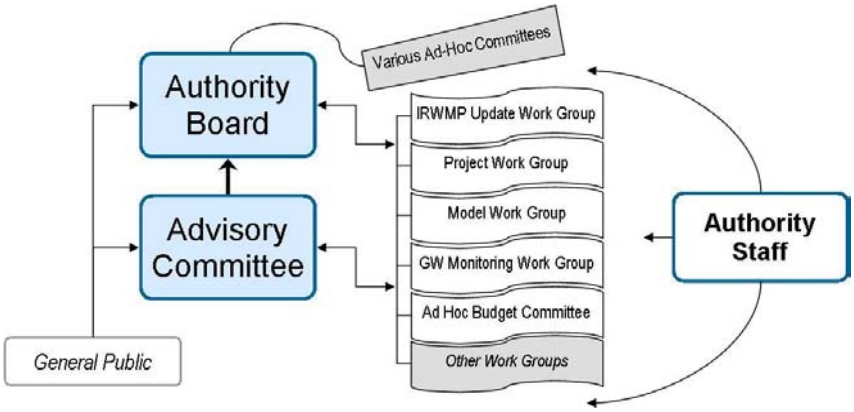


Figure 2.1 – Kings Basin Water Authority Organization Chart

Members must execute the JPA and pay an annual assessment set by the Board. All of the Members are public agencies with local water management authority. Interested Parties are those public and private entities that have opted not to become a member or are legally precluded from becoming a member, have provided a formal expression of interest in the Authority's activities, and been designated as an Interested Party by the

Board of Directors. Interested parties can participate free of cost. Refer to **Table 3-2** for information on which interested parties have water management authority.

The Members and Interested Parties represent a diverse range of interests. These include cities, counties, water districts, irrigation districts, community service districts, public utility districts, regional water management agencies, flood control agencies, canal companies, private water companies, private farming companies, and non-governmental organizations. This group is sufficient in breadth and participation to develop and implement the Integrated Regional Water Management Plan (IRWMP).

The Kings River Conservation District (KRCD) has taken a leading role in facilitating the efforts of the Authority. KRCD's role is logical since they are established as a regional water management agency, their jurisdiction encompasses the entire area covered by the IRWMP, and they have an agreement with the Authority to act as their Fiscal and Administrative Agent. KRCD was created by the state legislature pursuant to the Kings River Conservation District Act and has regional authority and responsibilities consistent with the IRWMP goals for groundwater management, flood control, water quality preservation, environmental stewardship, and public information. Certain members of KRCD staff serve as staff to the Authority for Authority business.

2.2 IRWMP Adoption

Public Notice Requirements and Plan Adoption

The IRWMP was updated and adopted through a formal public noticing procedure according to California Government Code §6066. This included notices in a local newspaper declaring 'an intent to update the IRWMP', and 'an intent to adopt the updated IRWMP'. This procedure is documented in more detail in Chapter 15 – Stakeholder Involvement.

Plan Adoption

The Plan was formally adopted by the Authority. **Appendix B** includes a copy of the resolution from the Authority adopting the plan. Member agencies and interested parties are required to adopt this IRWMP through separate action by their local governance structure and provide the Authority with proof of adoption.

History of Regional Water Management Group

The Authority initially began in 2001 as a group called the Basin Advisory Panel (BAP). The BAP included the KRCD and three local irrigation districts. This group sought technical, facilitation, and financial support from the California Department of Water Resources (DWR) and was organized under a Memorandum of Understanding (MOU). The BAP enjoyed success on several regional projects, and, as a result, attracted several more members to join their group. The BAP eventually evolved into the Upper Kings Basin Water Forum (Water Forum) in 2004. The Water Forum prepared the initial

IRWMP for the region in 2007. The Authority was formed in 2009 to replace the Water Forum.

Joint Powers Agreement

A JPA (**Appendix C**) was made effective on March 1, 2009 and formed the Upper Kings Basin Integrated Regional Water Management Authority. The entity's legal name became the Upper Kings Basin Integrated Regional Water Management Authority. Following expansion of the IRWMP boundary to include much of the lower Kings Basin, the Board took action and adopted the common or brand name Kings Basin Water Authority (Authority) as a shorter and more descriptively accurate name for the entity.

The JPA was developed with input from members and interested parties. In developing the JPA, the Authority also reviewed several JPAs developed by other regional water management agencies in California for ideas on content and governance procedures.

The Authority is governed by a Board of Directors comprised of one representative for each Member agency. At a minimum, Member agencies are required to designate at least one primary representative and one alternate. Primary representatives are typically elected officials. Each Board member has one vote. Interested parties do not need to execute the JPA, but are governed by its provisions. Interested parties are non-voting, but have an opportunity to provide direct input into nearly all Authority activities through committee and work group participation. Committees and Work Groups are described in Section 2.3.

Some of the powers of the Authority, documented in Section 2.04 of the JPA, are listed below:

- Coordinate activities to modify and implement the IRWMP
- Select projects for grant applications
- Prepare and submit grant applications
- Assist members in developing water projects
- Manage grant funding
- Create committees
- Enter into contracts and agreements
- Enter into litigation
- Engage consultants and employees
- Acquire and manage property
- Acquire by eminent domain
- Issue bonds and incur debt

2.3 Committees and Work Groups

An Advisory Committee and numerous Work Groups were formed to assist the Board of Directors with IRWMP development, technical studies, project evaluation, and

administrative efforts. A brief description of the Advisory Committee and each Work Group is provided below.

Advisory Committee

The Advisory Committee (Committee) is the advisory body of the Authority and reports directly to the Board of Directors. The Committee is the only standing committee defined by the JPA and includes one representative from each Member and Interested Party. Each Member and Interested Party has one vote on the Committee. The Committee provides advice to the Board, but has no authority to take action that binds the Authority. Advisory Committee Meetings are open to the public and any individual is welcome to attend. The Advisory Committee was developed primarily to allow interested parties and the general public a convenient forum to voice their ideas and concerns at no cost.

Work Groups

Several Work Groups have been formed, and more may be formed in the future, to address specific topics. The following Work Groups meet on an as-needed basis, but most were active in 2012. The Work Groups present results from their work at regular Advisory Committee meetings. Any member or interested party can volunteer to serve on a Work Group. All interested individuals have the opportunity to serve on Work Groups. Volunteers generally serve as long as they wish or until a specific project is completed. Time commitments are typically no more than a few hours per week, since most volunteers also work full time for other agencies or organizations. A list of the Work Groups and their responsibilities is provided below:

Monitoring Work Group: Address regional surface water and groundwater monitoring topics such as California State Groundwater Elevation Monitoring Program (CAGEMP), Groundwater Management Plan (GWMP) updates, Irrigated Lands Regulatory Program (ILRP), etc.

Projects Work Group: Maintain list of proposed projects, develop project ranking criteria, and rank and prioritize projects proposed for funding.

Model and Data Work Group: Coordinate development and use of the Kings Basin Integrated Groundwater and Surface Water Model (Kings IGSM) including data collection, review of model results, and improvements and upgrades to the model. Other models and data sources may be used as they become available or necessary.

IRWMP Update Work Group: Provide input on updates and amendments to the IRWMP.

Disadvantaged Communities Work Group: Prepare grant applications for projects in DACs. Perform studies intended to help DACs with water resources problems.

Outreach Work Group: Perform public outreach efforts to engage the public in the Authority's efforts, recruit new members and interested parties, and increase awareness of local water management problems and the successes of the Authority. Develop public outreach media including flyers, websites, etc.

Ad Hoc Budget Committee: Discuss topics related to finances for the Authority including annual assessments, reserve accounts, project financing, operational costs, etc.

2.4 Decision Making

Decisions for the Authority are ultimately made by the Board of Directors. The decisions fall into three general categories as described below:

1. Minor Decisions. Decisions that do not have a material effect on long-term activities or policies of the Authority, such as approving minutes, administrative decisions, or incurring expenses less than $10,000. Minor Decisions require affirmative vote by 50% of the Board.
2. Major Decisions. Any decision that is not a Minor or Supermajority Decision. Adopting an updated IRWMP or selecting a Project are examples of a Major Decision. The special process for selecting projects is discussed further in Chapter 7 – Project Review Process. Major Decisions require the affirmative vote of two-thirds of the Board present at a meeting.
3. Supermajority Decisions. Decisions of high importance to the Authority such as whether to issue bonds or initiate litigation. Supermajority Decisions require the affirmative vote of two-thirds of all of the eighteen Board members.

The Advisory Committee has been part of the governance since the formation of the Authority to help inform the Board and offer all members, interested parties, and the general public an opportunity to provide input that can assist in decision making. Board meetings also include an agenda item for public comments, during which any interested party or member of the public can directly address the Board.

2.5 Stakeholder Participation

<u>Balanced Opportunity for Participation</u>

The governance structure helps ensure a balance of interested parties participate in the IRWMP process through the following policies and procedures:

- Advisory Committee. The Advisory Committee was established to advise the Board of Directors and also give interested parties a voice in regional water management. Interested parties are not formal members and are not required to pay annual assessments. This allows parties to participate even if they do not have the ability to pay the assessments required from Members.

- Work Groups. Work Groups perform the majority of work for the IRWMP development and on-going projects. Any member or interested party can serve on a Work Group.
- General Public. Advisory Committee and Board of Directors meetings are open to the general public, and each includes an agenda item for comments from the general public. These meetings are also conducted according to the Ralph M. Brown Act (California Government Code Sections 54950, et seq.), thus ensuring that the public can attend and participate in all official meetings.
- Board of Directors. Each member of the Board of Directors has one vote, regardless of size or financial resources of the agency they represent. This provides equal representation of all formal members.

These policies have worked successfully in engaging a diverse group of members and interested parties, as evidenced by the varied participants described in Section 2.1.

Communication

The Governance structure helps to foster adequate communication primarily through the Advisory Committee, Work Groups and Board of Directors. Communication is also enhanced by the public outreach efforts developed and implemented by the Outreach Work Group (see Section 2.4). The Authority performs a wide variety of public outreach efforts, which are described in Chapter 15 – Stakeholder Involvement.

2.6 IRMWP Implementation

Long-Term Implementation

The governance structure helps to ensure long-term implementation of the IRWMP through the following policies and procedures:

- Annual Assessments. Each member must pay an annual assessment, which is determined by the Board at the beginning of the fiscal year, and is based on funding needed to pay for all anticipated operational expenses. These funds ensure a long-term self-sustaining organization.
- Reserve Fund. The Authority has established a Reserve Fund Policy (Policy No. UKB-004) that establishes a target amount of $500,000 for reserve funds. These reserve funds could allow the Authority to continue operating when expenses exceed their annual revenue.
- Advisory Committee. The Advisory Committee provides an opportunity for all stakeholders to participate and voice their opinions, ideas and concerns. This creates an open and transparent process that is widely supported, and likely to be supported in the future, by the local water agencies and stakeholders.
- Joint Powers Agreement. The Members have all signed a Joint Powers Agreement outlining the governance structure for the Authority. Members can remove themselves from the Agreement, but by signing it they have expressed interest in a long-term commitment to regional water management. The JPA

provides stability to the Authority, and helps to ensure that it will be active in the long-term.

Coordination with Neighboring IRWMPs

The Authority takes several steps to coordinate with neighboring IRWMPs including:

- Letter of Agreement with Madera Regional Water Management Group (**Appendix D**)
- Participation in IRWMP 'Round Table of Regions' meetings, a statewide effort to bring all IRWMPs together to discuss important issues.
- Regularly attending meetings for the Tulare Basin Integrated Regional Planning Effort, a regional collaboration by several IRWMPs to discuss inter-regional topics in the Tulare Lake Basin, and active participation in sub-committees considering issues for the Tulare Basin, such as climate change
- Coordination with the Tulare Basin Watershed Initiative which works throughout the Tulare Lake Hydrologic Region.
- The Authority is on the mailing list for the Madera IRWMP and Westside San Joaquin IRWMP, and they in turn are on the mailing list for the Authority. This provides the different IRWMP groups information about on-going efforts and meeting times, locations, and agenda.
- The Authority frequently communicates with other IRWMPs regarding common regional water management projects, such as the California Statewide Groundwater Elevation Monitoring Program or the Irrigated Lands Regulatory Program.

Establishment of Plan Objectives

The IRWMP Goals and Objectives were established with the assistance of an IRWMP Update Work Group and the Advisory Committee, which were both formed by the Authority as part of its powers. This involved a collaborative process including members, interested parties, the general public, and participants from a variety of agencies and organizations. The Advisory Committee presented the recommended Goals and Objectives to the Board of Directors, who approved them when the IRWMP was adopted.

IRWMP Updates

The Authority has established a goal of updating the IRWMP every 5 years, or as needed to satisfy new IRWMP standards established by DWR. To document on-going progress, the Authority plans to prepare an annual report which will include a revised project list, changes to policies and procedures, and other relevant information that should be included in the IRWMP. These annual reports will be considered attachments to the current IRWMP, and the information will be formally incorporated into the IRWMP when it is updated. Refer to Chapter 9 – Plan Performance and Monitoring for more information on the annual reports.

IRWMP updates will be led by the IRWMP Update Work Group (See Section 2.4). The Advisory Committee will review and comment on the revised IRWMPs, and present a recommended IRWMP to the Board of Directors for formal adoption. According to the JPA, amendments to the IRWMP must be adopted by the Board of Directors as a Major Decision.

The Authority will seek grant funds for updating the IRWMP, but recognizes that they may not always be available. Consequently, the Authority has established a Reserve Fund Policy (Policy No. UKB-004) that establishes a target amount of $500,000 for reserve funds. IRWMP updates were identified as one of the primary tasks that could be funded with the reserve funds.

3 REGION DESCRIPTION

3.1 Introduction

This chapter describes the physical conditions, water infrastructure, and stakeholders in the Integrated Regional Water Management Plan (IRWMP) area. The purpose of this section is to summarize regional water resources data so all stakeholders have the necessary background data to participate in regional planning and decision making. Specific topics that are discussed include:

- Watersheds/Water System
- Internal Boundary
- Water Supply and Demand
- Water Quality Conditions
- Major Water Related Objectives and Conflicts
- Regional IRWM Boundary
- Neighboring or Overlapping IRWM Regions

3.2 Watershed/Water System Description

3.2.1 Physical and Hydrological Conditions

The Kings River is the major source of surface water in the Kings Groundwater Sub-basin (Kings Groundwater Basin or Kings Basin) and the region is reliant on surface water supplies derived primarily from the Kings River. Pine Flat Reservoir regulates the flow on the Kings River and provides storage, flood control, and recreational benefits. The Kings River is a natural river along much of its upper reaches, while its lower reaches have been re-channeled and include many weirs, diversion structures, and levees.

The San Joaquin River defines the northern boundary of the IRWMP Region. It is a source of both surface water supply and groundwater recharge in the Kings Basin. Several entities have water entitlements from the Central Valley Project (CVP) Friant Division and divert San Joaquin River water into the area via the Friant-Kern Canal under temporary or permanent contracts with the CVP. Some CVP flood water releases are also utilized intermittently by these entities in the region.

An extensive network of canals is used to deliver water to agricultural lands, to existing groundwater recharge facilities, and to a few surface water treatment facilities. Although the weirs, diversion structures, canals, and recharge facilities are managed by different local and regional water agencies, they are all part of a single interconnected physical and hydrologic system. The stakeholders in the area use similar surface water supplies; however, the boundary of the Kings Groundwater Sub-basin was the

primary foundation for delineating the IRWMP boundary, as discussed in the following section.

3.2.2 Groundwater Basin Boundaries

The Kings Basin is a large groundwater subbasin located within the southern part of the San Joaquin Valley Basin, in the Central Valley of California. The groundwater basin boundary as defined in the Department of Water Resources (DWR) Bulletin 118 is shown in **Figure 3-1.** The groundwater basin covers an area of 1,530 square miles. The current IRWMP region, as defined above, includes the majority of the Kings Groundwater Basin. DWR estimates that the groundwater storage for the entire Kings Basin is about 93 million acre-feet (AF) to a depth of more than 1,000 feet (DWR Bulletin 118, 2003). The Kings Basin, consisting primarily of lands served by Alta Irrigation District (AID), Consolidated Irrigation District (CID), and Fresno Irrigation District (FID), accounts for a large percentage of the groundwater pumping in the region. The Upper Kings Basin has a total groundwater storage capacity of 35 million acre-feet (AF) to an average depth of about 500 feet (KRCD, 1993). The groundwater storage in the Lower Kings Basin is estimated to be about 44 million AF to an average depth of about 1,000 feet (WRIME, 2005b). The Upper Kings Basin refers to approximately the northeastern two-thirds of the Basin, and the Lower Kings Basin refers to the southwestern one third (see **Figure 2-1** in 2007 IRWMP).

There are many land owners and multiple local and regional water agencies and irrigation districts that overlie the Kings Basin. This means that the actions of a groundwater user or an overlying land owner may have an effect on a number of other water users. The San Joaquin and Kings Rivers are hydraulically connected with the underlying groundwater basin and are major sources of recharge.

The Kings Groundwater basin has an extensive monitoring network. The Kings River Conservation District (KRCD) obtains water levels from about 1,100 wells in the region based on monitoring records from 19 local agencies. This extensive data was used in the IRWMP plan development and associate technical analysis, including modeling.

3.2.3 Environmental Resources

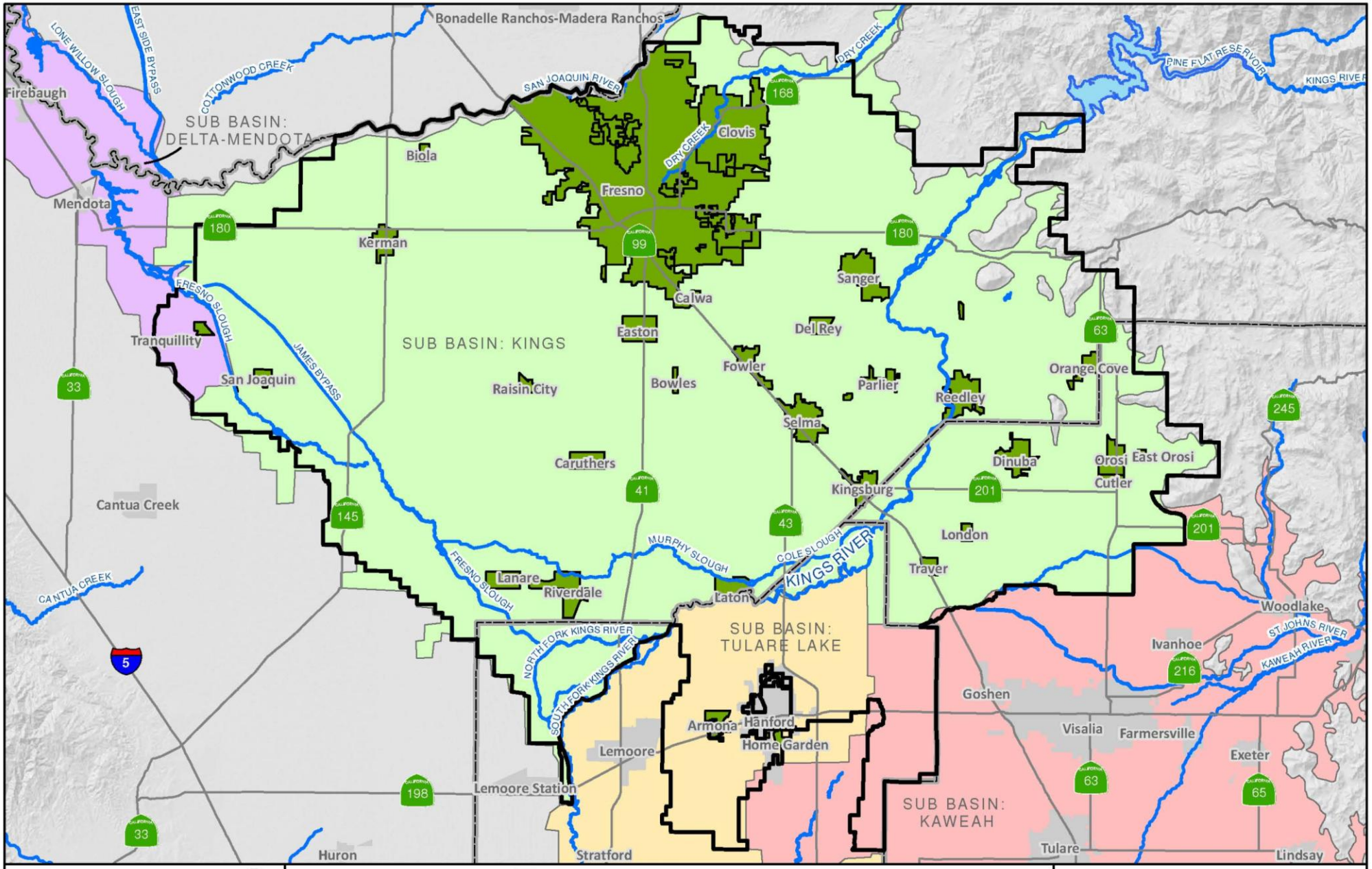
KRCD staff documented the Environmental Baseline Conditions in the Kings Region (KRCD, 2006b). The purpose of the document was to provide a baseline of existing biological and habitat resources in the Kings Region. It describes the biotic regions, plant and wildlife habitats, wildlife and fish species, special status species, wetland, regulatory setting and agencies, standards of significance for environmental impacts and the potential biological impact in the Kings Region. The information was compiled to guide the planning and siting of projects in order to avoid impacts to biological resources; expedite preparing project initial studies or California Environmental Quality Act (CEQA) documents; support resolution of permitting issues; and reduce the potential for project delays due to unforeseen environmental constraints. The compiled information may also help identify how to incorporate environmental benefits into project

plans. Technical support for environmental efforts is provided by Tulare Lake Hydrologic Region Watershed Coordinator and supplemented by other member and Interested Party stakeholders representing the environmental community.

Rapid development often tends to create ecosystem imbalances that have long-term adverse impact on a region. Therefore, proper identification and protection of areas of special biological significance and sensitive habitats is an essential component of a successful IRWMP. The currently known areas of special biological significance and other sensitive habitats are described below.

3.2.4 Kings River

The Kings River is the main river in the project study area and the lower San Joaquin Valley. The river runs through Fresno, Tulare, and Kings Counties, and is the best and most prominent riparian and wetland habitat in these counties. The river and its associated habitat are special areas of biological significance. The Kings River, its tributaries, and sloughs are the lifeline of riverine-riparian habitat that links the Sierra Nevada Mountains to the foothills to the valley floor. Historically, the Kings River has been linked to the Tulare Lake, the expansive wetlands in the Kerman-Mendota area, and the San Joaquin River through manmade conveyances, and also northward to the Sacramento Delta. These areas have considerable fish, wildlife, and habitat resources. The habitat linkages and resources still exist, but have been reduced and degraded over the last century. The river and its riparian habitat are the main corridors for fish and wildlife movements. The river is a major stopover habitat for birds migrating south from the Sierra Nevada Mountains, western United States, and even Canada. Such birds range from small warblers to the bald eagle. The flood corridor also provides a buffer between the river and the adjacent farmland and towns.



0 4 8 Miles

EST. 1968
PROVOST & PRITCHARD
CONSULTING GROUP
An Employee Owned Company

286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

DWR Bulletin 118 Sub Basin

- DELTA-MENDOTA
- KAWEAH
- KINGS
- TULARE LAKE

- 2012 IRWMP Boundary
- Communities

Figure 3-1

Kings Basin IRWMP

Groundwater Basin Boundary

6/5/2012 G:\Clients\Upper Kings Basin IRWMA - 2048\20481001 - IRWMP Update\GIS\Map\Figure 3_1 GW Basin.mxd

3.2.5 Conservation Areas

The IRWMP Region is geographically located among several important conservation areas. Important conservation areas in the region include the San Joaquin River to the north, Sierra and Sequoia National Forests to the east, and the Griswold, Tumey, and Panoche Hills to the west. Important conservation areas closer to the IRWMP Region include a 6,000-acre Wetland Reserve Program parcel near Helm, another 1,000-acre Wetland Reserve Program parcel near Lemoore, the 12,000-acre Mendota Wildlife Management Area, the 3,000-acre Alkali Sink Ecological Reserve and Kerman Ecological Reserve near Kerman, lands on the Lemoore Naval Air Station near Lemoore, and a 500-acre sensitive plant preserve near Piedra. Also, small parcels of native grassland and alkali sink habitats that have not been developed or farmed are scattered throughout the valley. A few developed and undeveloped county parks occur near the Kings River, which provide open space, wildlife habitat, and recreation. Such parks include Avocado Lake Park, Green Belt Parkway, China Creek Park, Laton-Kingston Park, and Burris Park. The Tulare Basin Wildlife Partners (TBWP), an Interested Party of the IRWMP, is a non-profit organization with a mission to facilitate conservation projects in the Tulare Basin. They have developed a list of over 40 potential conservation projects in the area (Tulare Basin Wildlife Partners, 2012)

The conservation areas provide riverine, riparian, wetland, Valley Oak woodland, annual grassland, and alkali sink habitats that are all unique. Such areas are known to have a high abundance and diversity of fish and wildlife, including both resident and migratory populations. The areas are also habitat for threatened, endangered, and sensitive species such as the Valley Elderberry Longhorn Beetle, San Joaquin Kit Fox, American Badger, Giant Garter Snake, Western Pond Turtle, Swainson's Hawk, Tricolored Blackbird, Burrowing Owl, California Jewelflower, and Keck's Checkerbloom.

3.2.6 Protected Areas and Impaired Water Bodies within the Region

The State Water Resources Control Board (SWRCB) develops a list of water quality limited stream segments or water bodies, known as a 303(d) list pursuant to the Clean Water Act (1972), Article 303(d). This list indicates whether the water body is meeting the needs of the designated beneficial use as a result of known water quality problems. The latest available 303(d) list was prepared by the SWRCB and the Regional Water Quality Control Board (RWQCB) in 2002. It includes the segments of the north and south forks of the Kings River from Island Weir to the Stinson and Empire Weirs. The Kings River in this reach has elevated levels of electrical conductivity, molybdenum, and toxaphene. The 303(d) list gives the reach a low priority for the development of a Total Maximum Daily Load (TMDL).

Mendota Pool, on the western edge of the Kings Basin is also included in the 303(d) list and has been defined as impaired by elevated selenium levels, potentially because of agriculture, groundwater withdrawal, or other sources. The 303(d) list also gives Mendota Pool a low priority for the development of a TMDL. The Lower Kings Basin is

not likely a significant contributor to the issues at Mendota Pool, but could be affected by water quality issues should Mendota Pool water be considered as a source of water for recharge or treated for potable use.

3.2.7 Important Ecological Processes and Environmental Resources

The majority of the IRWMP Region has been ecologically modified through urbanization and agriculture, making the remaining habitat limited and valuable. The IRWMP will seek to integrate and incorporate the existing resource protection strategies and policies, as defined in the prevailing land use plans, with the water resources strategies as part of the development of the IRWMP. KRCD, the Kings Basin Water Authority (Authority), and Nongovernmental Organizations (NGOs) will work with the responsible and trustee agencies through early consultations to collect prior studies and resources inventories so that contemporary information on ecological processes and environmental resources are included in the IRWMP. The information will be used to conduct preliminary environmental evaluations and to screen water management strategies and IRWMP alternatives. The information will also be used to: (1) influence project designs and avoid impacts, and (2) identify opportunities to enhance or improve conditions for the purposes of providing regional benefits.

3.2.8 Wetlands and Riparian Resources

The rivers and streams that flow from the Sierra Nevada Mountains historically meandered through broad floodplains in the San Joaquin Valley. Because of urbanization and agriculture, these broad floodplains have been restricted to narrower belts along the rivers and streams or otherwise modified for flood control. Within this modified landscape, remaining riparian habitat is of great value to resident and migratory animal species as it provides corridors and linkages to and from the biotic regions of the county. The numerous essential habitat elements provided by the remaining riparian/riverine corridors in the area make them perhaps the most significant contributor to wildlife habitat throughout the region. The Kings Basin still contains large wetlands and wildlife refuge areas, while the foothills contain vernal pools. These areas support many specialized plant and animal species. Existing county and city policies will be referenced to provide guidance to the IRWMP and to make the goals, policies, and objectives of the land use or regional habitat conservation plans part of the regional program. Avoidance, minimization, and mitigation will be provided in project designs by project proponents and used to rank and evaluate alternatives for the development of the IRWMP. KRCD also maintain waterways under permits for maintenance that protect and minimize impacts to habitat.

3.2.9 Fish and Wildlife Habitat

The Region includes a range of habitats that are found from the crest of the Sierra Nevada Mountains, through the foothills of the Sierra Nevada, and into the San Joaquin Valley. Different parts of the region can be described in terms of 29 distinct habitat types based on the composition and structure of vegetation found in each area. Within

these habitats, there is a close relationship between natural vegetation and wildlife. The disruption of natural vegetation areas alters the food chain upon which many animals are dependent. The preservation of natural vegetation areas is, therefore, key to the abundance and well being of many wildlife species. Existing land use and habitat management policies will be documented and used to ensure compliance and consistency with current goals to protect natural areas and preserve the diversity of remaining habitats in the Region.

3.2.10 Climate Change

Climate change is an issue of concern in the Kings Basin and is discussed extensively in Chapter 17.

3.3 Internal Boundary Description

The IRWMP Region is well defined, as shown in **Figure 3-1,** which also shows the Kings Groundwater Basin. The IRWMP Region consists of the geographic areas under the jurisdiction of the IRWMA members and includes the majority of the Kings Groundwater Basin as defined by DWR Bulletin 118 Update 2003. The total land area of the IRWMP region is 610,000 acres with an irrigated land area of about 480,000 acres.

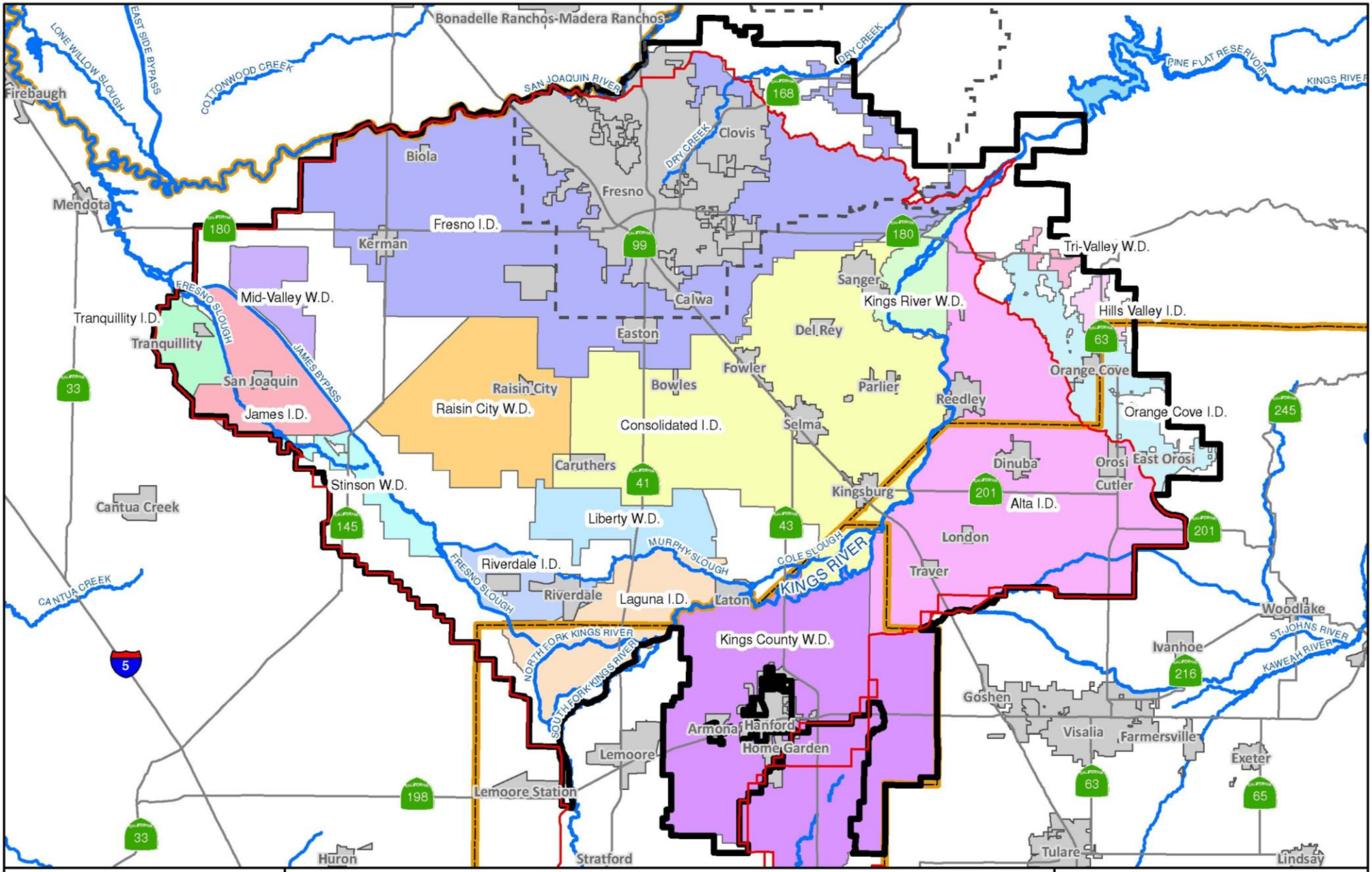
The IRWMP Region also includes regional and smaller local water agencies and spans over parts of three counties: Fresno, Kings, and Tulare. The irrigation districts, county boundaries and the city limits and spheres of influence within the IRWMP Region are shown in **Figure 3-2** and **Figure 3-3**. The urban spheres of influence and current city boundaries are important because the water districts and urban entities need to work together to ensure compatibility and consistency between the prevailing land use and water supply plans for the area.

3.3.1 Jurisdictional Authorities

The success of an IRWMP depends on the participation of those agencies that have jurisdictional authority to implement the plan. Therefore, jurisdictional authority is used as an important basis for defining the boundary of the IRWMP Region. Both land use and water supply authorities are needed to effectively develop and implement the plan and, as such, the IRWMA includes representatives from the overlying counties, incorporated cities, and the water districts and agencies **Figure 3-2**, presented earlier, shows the irrigation districts in the IRWMP Region.

3.3.2 Members and Interested Parties

The IRWMA is comprised of 17 members and 37 interested parties, as discussed in Chapter 2. **Table 3-1** lists those agencies and organizations. **Table 3-2** shows the agency classification per California Water Code (CWC) §10541(g)y. A description of each member and interested party is provided in **Appendix A**.



0 4 8 Miles

EST. 1968
PROVOST & PRITCHARD
CONSULTING GROUP
An Employee Owned Company
286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

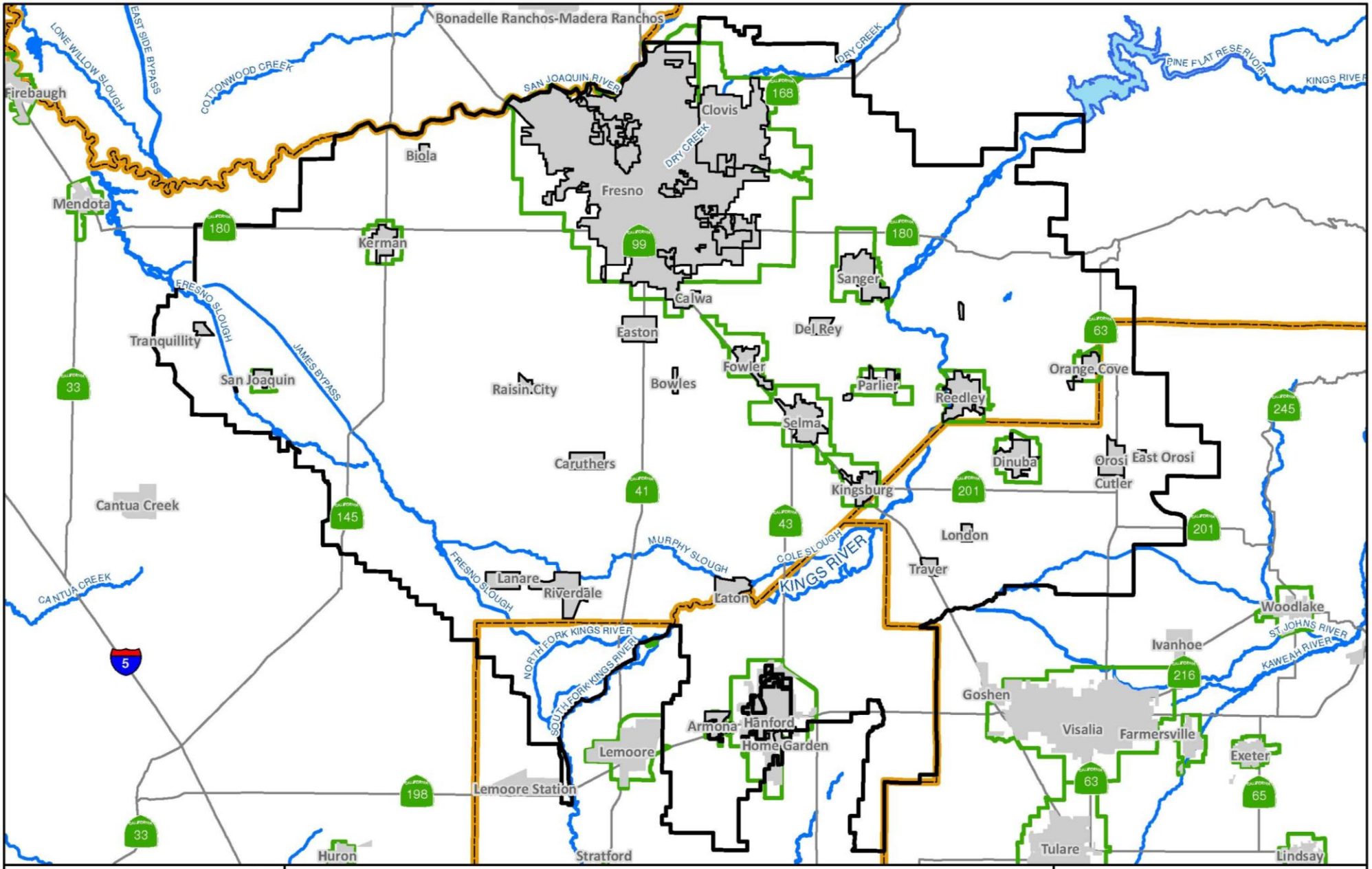
Legend

- Kings River Conservation District
- Fresno Metropolitan Flood Control District
- 2012 IRWMP Boundary
- City Boundary
- County Boundary

Figure 3-2

Kings Basin IRWMP

District, County and Urban Areas within IRWMP Region



0 4 8 Miles

EST. 1868
PROVOST & PRITCHARD
CONSULTING GROUP
An Employee Owned Company
286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

Legend

- 2012 IRWMP Boundary
- Sphere of Influence
- City Boundary
- County Boundary

Figure 3-3

Kings Basin IRWMP

Spheres of Influence

G:\Clients\Upper Kings Basin IRWMA - 2048\20481001 - IRWMP Update\GIS\Map\Figure 3_3 Sphere of Infuence v10.mxd

Table 3-1: Members and Interested Parties

Members	Interested Parties
Alta Irrigation District	Bakman Water Company
City of Clovis	Biola Community Services District
City of Dinuba	California State University, Fresno
City of Fresno	California Native Plant Society
City of Kerman	City of San Joaquin
City of Kingsburg	Community Water Center
City of Parlier	County of Kings
City of Reedley	Crescent Canal Company
City of Sanger	Cutler Public Utility District
City of Selma	East Orosi Community Services District
County of Fresno	Easton Community Services District
County of Tulare	El Rio Reyes Conservation Trust
Consolidated Irrigation District	Fresno County Farm Bureau
Fresno Irrigation District	Hardwick Water Company
Fresno Metropolitan Flood Control District	James Irrigation District
Kings County Water District	Kings River Conservancy
Kings River Conservation District	Kings River Water Association
	Laguna Irrigation District
	Laton Community Services District
	Liberty Canal Company
	Liberty Water District
	London Community Services District
	Mid-Valley Water District
	Orange Cove Irrigation District
	Orosi Public Utility District
	Raisin City Water District
	Reed Ditch Company
	Riverdale Irrigation District
	Riverdale Public Utility District
	Sanger Environmental Fund
	Self-Help Enterprises
	Sierra Club, Tehipite Chapter
	Sierra Resource Conservation District
	Sultana Community Services District
	Terranova Ranch, Inc.
	Tulare Basin Wildlife Partners
	University of California Cooperative Extension – Fresno County

Table 3-2: Stakeholder Classification

Organization	Stakeholder Classification												
	Wholesale and retail water purveyors	Wastewater agencies	Flood control agencies	Municipal/County Governments & Special Districts	Electrical corporations	Native American tribes	Self-supplied water users	Environmental stewardship	Community organizations	Industry organizations	State, Federal, & Regional Agencies/Universities	Disadvantaged communities	Other groups
Alta Irrigation District	X			X									
City of Clovis	X	X		X			X						
City of Dinuba	X	X	X	X			X					X	
City of Fresno	X	X		X			X					X	
City of Kerman	X	X	X	X			X					X	
City of Kingsburg	X	X	X	X			X						
City of Parlier	X	X	X	X			X					X	
City of Reedley	X	X	X	X			X					X	
City of Sanger	X	X	X	X			X					X	
City of Selma		X	X	X			X					X	
County of Fresno				X									
County of Tulare				X									
Consolidated Irrigation District	X			X									
Fresno Irrigation District	X			X									
Fresno Metropolitan Flood Control District			X	X									
Kings County Water District				X									
Kings River Conservation District			X	X				X			X		
Bakman Water Company	X						X					X	
Biola Community Services District	X	X	X	X			X					X	
California State University, Fresno											X		X
CA Native Plant Society, Sequoia Chapter								X					
City of San Joaquin	X	X	X	X			X					X	
Community Water Center									X				
County of Kings				X									
Crescent Canal Company	X												X
Cutler Public Utility District	X	X		X			X					X	

Organization	Stakeholder Classification												
	Wholesale and retail water purveyors	Wastewater agencies	Flood control agencies	Municipal/County Governments & Special Districts	Electrical corporations	Native American tribes	Self-supplied water users	Environmental stewardship	Community organizations	Industry organizations	State, Federal, & Regional Agencies/Universities	Disadvantaged communities	Other groups
Easton Community Services District			X	X								X	
East Orosi Community Services District	X	X		X			X					X	
El Rio Reyes Conservation Trust								X					
Fresno County Farm Bureau										X			
Hardwick Water Company	X						X					X	
James Irrigation District	X			X									
Kings River Conservancy								X					
Kings River Water Association								X					
Laguna Irrigation District	X			X									
Laton Community Services District	X	X		X			X					X	
Liberty Canal Company	X												X
Liberty Water District	X			X			X						
London Community Services District	X	X		X			X					X	
Mid-Valley Water District	X			X									
Orange Cove Irrigation District	X			X									
Orosi Public Utility District	X	X		X			X					X	
Raisin City Water District	X			X			X					X	
Reed Ditch Company	X												
Riverdale Irrigation District	X			X									
Riverdale Public Utility District	X	X	X	X			X					X	
Sanger Environmental Fund								X					
Self-Help Enterprises													X
Sierra Club, Tehipite Chapter								X					
Sierra Resource Conservation District													X
Sultana Community Services District	X	X		X			X					X	
Terranova Ranch, Inc.							X						X
Tulare Basin Wildlife Partners								X					

Organization	Stakeholder Classification												
	Wholesale and retail water purveyors	Wastewater agencies	Flood control agencies	Municipal/County Governments & Special Districts	Electrical corporations	Native American tribes	Self-supplied water users	Environmental stewardship	Community organizations	Industry organizations	State, Federal, & Regional Agencies/Universities	Disadvantaged communities	Other groups
Univ. of CA Cooperative Extension											X		X

3.3.3 Water Districts/Special Districts

General and special districts are the two major types of water districts. General districts like AID, CID, and FID are formed under specific sections of the state code that define the procedures, powers, authorities, and other characteristics of the district. Special districts like KRCD or the Fresno Metropolitan Flood Control District (FMFCD) are formed by special acts of the legislature creating the districts and prescribing their powers. In addition, there are many types of districts formed, such as public utility districts and community services districts, to provide unique or specialized services to local land owners. Each of the districts has specific powers and authorities, governance, electoral processes, funding mechanisms, and programs for its jurisdiction. Water districts, private ditch companies, and municipal water service providers located in and around the IRWMP area are shown in figures provided in Chapter 3.

3.3.4 Mid-Valley Water Authority

The Mid-Valley Water Authority (MVWA) is a Joint Powers Authority (JPA) that was created to secure a supplemental water supply and to support the construction of a conveyance facility for the delivery of supplemental water to the MVWA service area; KRCD is the lead agency. The MVWA was formed in 1982 with 30 public agencies, though currently the MVWA has 20 agencies and has become relatively inactive. The service area extends from Merced County in the north to the southern boundary of the Arvin-Edison Water Storage District (AEWSD), and includes approximately 3.4 million acres. The MVWA completed the San Joaquin Valley Conveyance Investigation in cooperation with Reclamation. The Central Valley Project Improvement Act (CVPIA) has precluded the MVWA from obtaining a water supply from the CVP until certain environmental objectives are obtained and stalled further development of the proposed conveyance and delivery facilities. Currently, there are no active plans or projects for the MVWA.

3.3.5 Community Services Districts, Public Utility Districts, and County Service Areas

Both Community Services Districts (CSD) and Public Utility Districts (PUD) provide water, sewer, and other public services to unincorporated communities. CSDs are formed under California Government Code §61000 et seq and PUDs are formed under California Public Utility Code §15501 et seq. Both types of Districts have their own locally elected five member board of directors. There are 14 CSDs and PUDs in the IRWMP Region, 9 of which are Interested Parties. The following is a list of CSDs and PUDs located within the IRWMP boundary:

Fresno County: Biola CSD, Caruthers CSD, Del Rey CSD, Easton CSD, Lanare CSD, Laton CSD, Riverdale PUD, Tranquillity PUD

Tulare County: East Orosi CSD, London CSD, Sultana CSD, Cutler PUD, Orosi PUD

Kings County: Home Garden CSD

The county Local Agency Formation Commission (LAFCO) keeps track of the various special districts within each county, maintains maps of the service area, and approves municipal service reviews and any boundary changes. The county LAFCOs also maintain maps of the districts. Many of the CSDs and PUDs provide service to small areas with limited tax bases and many of the areas served are rural and can be defined as disadvantaged communities. Many of these small public agencies have limited management or technical capacity and are constrained by limited funding.

There are many small County Service Areas (CSAs) within the IRMWP region that provide water and/or sewer service. In the Fresno County portion of the IRWMP Region, water service only is also provided by CSAs 5 (Wildwood Estates), 10 (Cumorah Knolls and Mansionette Estates), 14 (Belmont Country Club), and 42 (Raisin City). These are very small service areas with a limited number of connections. These areas have a wide range of needs, some of which are further discussed in the disadvantaged community section of this report. In Tulare County, CSA #2 encompasses most of the unincorporated portions of that county. Tulare County has elected to form Zones of Benefit where water and/or sewer services are needed in this countywide county service area. Within the boundaries of the IRWMP are the Delft Colony, Seville, Traver and Yettem Zones of Benefit.

3.3.6 Resource Conservation Districts

Resource Conservation Districts (RCDs) are established locally under the provisions of Division 9 to the Public Resource Code and LAFCO rules for each county. RCDs have close ties to county governments, but have their own locally appointed, independent boards. RCDs are grass roots organizations that undertake projects for soil and water conservation, wildlife habitat enhancement and restoration, watershed restoration, conservation planning, and education. RCDs are usually technically supported by the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS,

formerly the Soil Conservation Service). RCDs have become more active in the past 10 years with increased emphasis on watershed planning and water quality protection. There are two RCDs that are active in the IRWMP Region: the Navelencia Resource Conservation District and the Tulare County Resource Conservation District. The Sierra RCD is an interested party and is located outside of the IRWMP area, but covers watershed lands that provide water to the region. No specific comprehensive watershed plans, projects, or programs have been identified that would serve as an action for the IRWMP.

3.3.7 Water Associations

Water associations are private groups, which work together to represent the interests of their members. KRWA, the Friant Water Authority, and the Southern San Joaquin Valley Water Quality Coalition (SSJVWQC) are three such associations in the IRWMP area.

3.3.8 Kings River Water Association

The history of water management on the Kings River is marked by numerous disputes over water rights. These disputes eventually led to the formation of the Kings River Water Association (KRWA) as a way to solve disputes and to coordinate water management along the river. Under a series of complex agreements and water schedules documented in the "Blue Book," KRWA serves as the water master to manage the Kings River flow and the conserved storage in Pine Flat Reservoir. KRWA is comprised of 28 member agencies that have contracts for the 1,006,000 AF of conserved storage in Pine Flat Reservoir.

The boundaries of KRWA define the Place-of-Use for the Kings River water rights held by KRWA in trust for the individual members. The Place-of-Use must be defined in the water rights permits issued by the SWRCBD. The areas outside of the KRWA boundaries that do not have surface water rights to the Kings River or CVP supplies are reliant on groundwater. Under KRWA policies, surface water can be transferred between KRWA members within the adopted KRWA Place-of-Use. Through KRWA, members pay for irrigation storage benefits on the Pine Flat Dam and for retirement of the bonds and obligations to the federal government.

3.3.9 Friant Water Authority and CVP Contractors in the IRWMP Region

The Friant Water Authority (FWA) represents Friant Division CVP Contractors that house federal water contracts with Reclamation. The Friant Division includes Millerton Lake, the Madera Canal, Friant-Kern Canal, and associated facilities. The Friant-Kern Canal crosses the IRWMP Region and is operated and maintained by the Friant Water Authority. The region also includes entities that receive water from the Mendota Pool Unit of the CVP. The Delta-Mendota Canal (DMC) ends at Mendota Pool, just north and west of the IRWMP Region, and provides water to these federal contractors. The CVP Contractors in the IRWMP area are shown in **Table 3-3.**

Table 3-3: CVP Contractors in IRWMP Area

Contractor	Contract Date	Duration	Type	Entitlement (AF)	Use
Fresno Irrigation District	January 2012	Permanent Contract	Class 2	75,000	M&I and Irrigation
Garfield Water District	January 2012	Permanent Contract	Class 1	3,500	Irrigation
International Water District	January 2001	25 years	Class 1	1,200	M&I and Irrigation
Orange Cove Irrigation District	January 2012	Permanent Contract	Class 1	39,200	M&I and Irrigation
City of Orange Cove	January 2001	25 years	Class 1	1,400	M&I
City of Fresno	January 2012	Permanent Contract	Class 1	60,000	M&I
Fresno County Waterworks District #18	January 2001	25 years	Class 1	150	M&I
Tranquillity Irrigation District	February 2005	25 years	Project Water	13,800	M&I and Irrigation
Tranquillity Public Utility District	February 2005	25 years	Project Water	70	M&I and Irrigation
James Irrigation District	February 2005	25 years	Project Water	35,300	M&I and Irrigation
Coelho Family Trust	February 2005	25 years	Project Water	2,080	M&I and Irrigation

Notes:
Project Water – Water from the Central Valley Project
M&I – Municipal and Industrial Users
Permanent Contract – Contractor has entered into a 9(d) repayment contract for capital repayment

The Friant Division provides two classes of water contract entitlement. Class 1 water is the most dependable supply and would normally be available in-whole or in-part for delivery each year. Class 1 water is typically contracted to districts that serve areas with limited or no access to groundwater of acceptable quality. Class 2 water is that supply in excess of Class 1 that is only periodically available for delivery. Because of uncertainty regarding availability and time of occurrence, Class 2 water is not as dependable as Class 1. Class 2 water is typically under contract to districts with access to good groundwater supplies or other surface water sources. These districts can accept recurring CVP deficiencies and rely primarily on their other sources of supply.

The Friant Water Authority is a key player in the plan to restore the San Joaquin River.

FID is the only CVP contractor in Fresno County that has a Class 2 contract entitlement. The City of Fresno has a Class 1 contract, which is unusual for a large urban center. This represents a secure source of supply, which is very important to the Fresno-Clovis Metropolitan Area.

3.3.10 Southern San Joaquin Valley Water Quality Coalition

KRWA and KRCD are participating in the SSJVWQC, which was established in 2002 to deal with water quality issues and concerns affecting the Kings River area and the

Tulare Lake Basin. Some of the pending water quality issues identified by the SSJVWQC are:

Expiration of the agricultural waiver exemption for water discharge requirements;

The State and Regional Water Quality Control Boards' 303(d) list of impaired waterways to be used to calculate TMDL under the Clean Water Act; and

The Regional Board's triennial review of the San Joaquin and Sacramento River Basin Plan includes examination of TMDL and water quality issues.

The SSJVWQC participating agencies believe that they will be better served approaching these and other water quality issues using a regional approach rather than individually.

3.3.11 Groundwater Planning and Project Development Groups

Two other local groups, the McMullin Group and North Fork Group (NFG), are active in the Lower Kings Basin. Both are local stakeholder groups cooperating on groundwater projects and on obtaining grants and loans. The NFG has a Memorandum of Understanding (MOU) with DWR for conjunctive use projects. KRCD is working to support both groups in identifying capital facilities and programs that would provide regional benefit.

3.3.12 Land Use Planning Agencies — Incorporated Cities and Unincorporated Communities

The incorporated cities, unincorporated communities, and county boundaries were shown in **Figure 3-2**. The IRWMP Region overlaps parts of Fresno, Tulare, and Kings Counties. The legal authority for the various city and county actions and programs is derived from two essential powers of local government: corporate and police powers. Using their corporate power, local governments collect money through bonds, fees, assessments, and taxes and spend it to provide services and facilities, such as police and fire protection, streets, water systems, sewage disposal facilities, drainage facilities, and parks. Using their police power, local governments regulate the use of private property through zoning, subdivision, and building regulations in order "to promote the health, safety, and welfare of the public." City and county general plans provide the formal framework for the exercise of these powers by local officials, for guiding land use decisions over a specified planning horizon, and for making assumptions about the future for planning purposes. A city defines its planned growth over a specific planning horizon in the city's general plan. The city's defined growth area and Sphere of Influence (SOI) are important for forecasting future land use conversions from agricultural to urban uses and are used to determine future water requirements.

3.3.13 Local Agency Formation Commission

Fresno, Kings, and Tulare Counties' LAFCOs are responsible for overseeing the formation and boundary changes (jurisdictional areas) of cities and special districts. Proposals for reorganization or annexation are subject to review by the appropriate county's LAFCO under the Cortese-Knox-Hertzberg Local Government Reorganization Act of 2000 (CKHA) (CGC §56000). Annexation is the inclusion, attachment, or addition of territory to a city or district (CGC §56017) and can involve detachments from other special districts. The process is also referred to as reorganization. LAFCOs have numerous powers under the CKHA, but those of primary concern are the powers to act on local agency boundary changes and to adopt SOIs for local agencies and special districts.

For the IRWMP, the city and county general plan land use diagrams and LAFCO-approved SOIs provide the basis for calculation and evaluation of potential future water demands. A consolidated map of the SOIs in the IRWMP Region is presented in **Figure 3-3,** which shows the proposed and accepted future city boundaries at build-out. The SOI is established for the specific planning horizon as defined by the prevailing general plans for cities or as currently recognized for water districts that are the purveyors to the unincorporated community. Prior to updating an SOI, state law requires a LAFCO to approve a Municipal Service Review (MSR) for public services provided within the SOI.

3.3.14 State and Federal Agencies

The DWR IRWMP Standards state that an IRWMP needs to identify state or federal agencies involved with strategies, actions, and projects; areas where a state agency or other agencies may be able to assist in funding, communication, cooperation, or implementation of IRWMP components or processes; or where state or federal regulatory decisions and approvals are required for implementation. A number of state and federal agencies are currently involved in various aspects of water management in the IRWMP Region and surrounding areas. This section discusses the state agencies and their potential influence on the IRWMP development and implementation. The state and federal agencies have a wide range of jurisdictional authority and responsibilities assigned by law that can help or influence the IRWMP.

3.3.15 Department of Water Resources

DWR has been a partner in the IRWMP planning process from the beginning and has provided technical and financial support to the IRWMA and KRCD. DWR operates and maintains the State Water Project (SWP), including the California Aqueduct; provides dam safety and flood control services; assists local water districts like KRCD in water management and conservation activities; promotes recreational opportunities; and plans for future statewide water needs. DWR, which is not a regulatory agency, has historically provided both grant and loan funding to local agencies to plan and build water supply projects and implement groundwater programs. Proposition 84 is the most

recent program with the guidelines, standards, and process used to evaluate projects and distribute funds to local agencies. DWR also establishes standards and guidelines and provides support for Urban Water Management Plans (UWMP) and Groundwater Management Plans (GWMP). There has been an increased emphasis on groundwater planning and development of conjunctive use programs throughout the state.

3.3.16 State Water Resources Control Board/Regional Water Quality Control Boards

The CWC defines the roles and responsibilities of the SWRCB and the nine RWQCBs. The SWRCB administers surface water rights, water pollution control, and water quality functions throughout the state, while the nine RWQCBs conduct planning related to water quality, permitting, and enforcement activities. The SWRCB sets statewide policy and, together with the RWQCBs, implements state and federal laws and regulations. Federal water quality requirements are managed by the SWRCB under the Porter-Cologne Water Quality Control Act (CWC §13000). The SWRCB does not have the authority for managing groundwater or determining groundwater rights. The SWRCB distributes and manages a range of grant- and loan-funded programs, including the Clean Water State Revolving Loan fund to build wastewater facilities, and grants for watershed management programs.

Both the Kings River and the San Joaquin River have been determined to be fully appropriated by the SWRCB (Decision 1290). This means that there is no water on the Kings River that could be assigned a new water rights permit (CWC §§ 1205–1207). Minor potential sources of surface water may still be subject to appropriation through water impounded by flood control detention facilities built on the Fresno Stream Group, Mill Creek, or the Arroyo Pasajero Stream Group on the west side of the San Joaquin Valley. A water rights application has been filed for potential impounded water on the Fresno Stream Group for purposes of groundwater recharge by FID, the Cities of Fresno and Clovis, and FMFCD.

The IRWMP Region is covered by the Central Valley Water Quality Control Plan — Tulare Lake Basin (Basin Plan), last revised in January 2004 (RWQCB, 2004). The Basin Plan establishes the water quality objectives and standards for the IRWMP Region and the policies and programs of the RWQCB to ensure that water quality is protected and meets all of the designated beneficial uses. The Basin Plan is expected to be updated in 2013 or 2014. The Authority is coordinating efforts with CV-SALTS.

3.3.17 Department of Fish and Game

The mission of the California Department of Fish and Game (DFG) is to manage California's diverse fish, wildlife, and plant resources, as well as the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public. In 2006, DFG identified seven strategic initiatives that signify the continual evolution of DFG and its direction. The Initiatives include:

- Initiative 1: Enhance communications, education and outreach

- Initiative 2: Develop statewide land stewardship based upon resources needs including acquisitions, enhancements and management
- Initiative 3: Develop strong water resource management program
- Initiative 4: Develop and enhance partnerships
- Initiative 5: Improve regulatory and permitting programs
- Initiative 6: Enhance organizational vitality by focusing on employees and internal systems
- Initiative 7: Expand scientific capacity

DFG has both planning and regulatory functions and is responsible for protection and enhancement of public trust resources, like the Kings River. For planning purposes, DFG is a partner with KRCD and KRWA to plan and develop the Kings River fisheries management program. DFG also supports development of habitat conservation plans and strategies for upland, aquatic, and riparian habitats, so it can serve as a resource in these areas. DFG regulatory functions that could influence the implementation of the IRWMP are related to the California Endangered Species Act and to environmental review and permitting of potential projects. State law requires any person, state or local governmental agency, or public utility to notify DFG before beginning an activity that will substantially modify a river, stream, or lake. DFG will determine if the activity could have a substantial, adverse affect on an existing fish and wildlife resource and whether a Lake or Streambed Alteration Agreement is required.

3.3.18 California Department of Public Health

The California Department of Public Health (CDPH) permits municipal drinking water systems, regulates contaminant sources, establishes and enforces regulations for the use of reclaimed wastewater, and runs a range of other programs to protect water quality and public health and safety. The CDPH also possesses extensive data on water quality for existing systems in the IRWMP Region.

The CDPH is the lead agency for developing and implementing the Drinking Water Source Assessment and Protection (DWSAP) Program. The drinking water source assessment is the first step in the development of a complete drinking water source protection program. The assessment includes a delineation of the area around a drinking water source through which contaminants might move and reach the drinking water supply; an inventory of Possible Contaminating Activities (PCA) that might lead to the release of microbiological or chemical contaminants within the delineated area; and a determination of the PCAs to which the drinking water source is most vulnerable. Assessments have been conducted for water systems in the IRWMP Region. The CDPH sets Maximum Contaminant Levels (MCL) for trace elements, different types of organic contaminants, microbial (biological) contaminants, trihalomethanes, and many other potential contaminants to ensure that the water is safe for human consumption.

The CDPH will be concerned about IRWMP goals for protection of water quality and any IRWMP projects that may negatively impact municipal and domestic beneficial uses. The CDPH has produced “The Purple Book,” which contains California health laws

related to reuse of disinfected tertiary recycled water (CDPH, 2001b), and works with the RWQCBs to ensure protection of water quality and to review projects that propose to make use of reclaimed water. Any IRWMP projects that include delivery and treatment of surface water would need to meet Title 22 standards. At a minimum, water designated for municipal uses cannot contain concentrations of chemical constituents that exceed the MCLs specified in Title 22 of the California Code of Regulations, which are incorporated by reference into the water quality objectives for groundwater in the RWQCB Basin Plan.

The CDPH distributes and manages a range of grant and loan programs, including the Drinking Water State Revolving Fund, Proposition 50 and Proposition 84 programs to fund necessary drinking water facilities.

3.3.19 U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (Corps) operates and maintains Pine Flat Dam and Reservoir, administers recreation facilities around the reservoir, and is in charge of all matters related to flood control, including flood releases. The Corps has important flood control and floodplain management responsibilities in areas with federal levies. The Corps is also responsible for the Clean Water Act 404 permits in situations where waters of the United States may be impacted by projects such as those that may be developed under the IRWMP.

In 1993, the Corps began a fish and wildlife habitat enhancement study for the Kings River and Pine Flat Reservoir. This resulted in a reconnaissance study that identified possible projects and led to a cost-sharing agreement between KRCD and the Corps in 1996 to further evaluate the feasibility of potential projects and develop the Pine Flat Dam Fish and Wildlife Habitat Restoration Feasibility Study. The earlier reconnaissance work identified the turbine bypass project that was subsequently built in 2002 and was funded in cooperation with KRCD. The turbine bypass project provides for flexible operations and allows for the release of cold water from the Reservoir to support the downstream fishery at times when the power plant is not in operation. Both efforts are part of the coordinated fisheries management program in cooperation with KRCD, KRWA, and DFG.

3.3.20 U.S. Bureau of Reclamation

The relationship between the US Bureau of Reclamation (USBR) and the local agencies in the IRWMP is limited because only a few agencies in the Kings Basin receive water from USBR (CVP water). Most receive water from the Kings River, which is not under USBR jurisdiction. The role of the USBR has been developed and modified by various laws since 1902. The Reclamation Reform Act determined that acreage limitation provisions of USBR law did not apply to Corps projects even though they were repaid via USBR repayment contracts.

Reclamation is the owner and operator for most of the CVP. Local entities such as FWA operate many of the conveyance features of the CVP such as the Friant-Kern Canal. This includes the Friant Division on the San Joaquin River and all of the other facilities north of the IRWMP Region, including the East Side, San Luis, San Felipe, Delta, American River, Shasta/Trinity, and Sacramento River Divisions. All of the long-term CVP contracts have been subject to renewal and are in various stages of completion. Those without long-term contracts have been operating with interim contracts.

CVP facilities could be used to transfer or import water from other areas into the IRWMP Region. The IRWMP might evaluate using the CVP facilities to "wheel" or convey water obtained through agreement for transfer or exchange. Water from the CVP Friant Division is currently delivered under contract to entities in the IRWMP Region. Water diverted at the Delta is delivered down the DMC to contractors in the lower part of the Kings basin. These operations could be influenced by the CVPIA or other Reclamation programs on the San Joaquin River, including the Upper San Joaquin River Basin Storage Investigation and the San Joaquin River Riparian Habitat Restoration Program.

In 1992, Congress passed multipurpose water legislation containing 40 separate titles, providing for water resource projects throughout the West. Title 34, the CVPIA, significantly changed the way the CVP is operated by mandating changes in management, particularly for the protection, restoration and enhancement of fish and wildlife. Major areas of change include:

- 800,000 acre-feet of water dedicated to fish and wildlife annually;
- tiered water pricing applicable to new and renewed contracts;
- water transfers provision, including sale of water to users outside the CVP service area;
- special efforts to restore anadromous fish population by 2002;
- restoration fund financed by water and power users for habitat restoration and enhancement and water and land acquisitions;
- no new water contracts until fish and wildlife goals achieved;
- no contract renewals until completion of a Programmatic Environmental Impact Statement;
- terms of contracts reduced from 40 to 25 years with renewal at the discretion of the Secretary of the Interior;
- installation of the temperature control device at Shasta Dam;
- implementation of fish passage measures at Red Bluff Diversion Dam;
- firm water supplies for San Joaquin Valley wildlife refuges; and development of a plan to increase CVP yield

3.3.21 U.S. Fish and Wildlife Service, NOAA Fisheries

The U.S. Fish and Wildlife Service (FWS) is the federal agency that conducts a wide range of activities for conservation, habitat planning, and protection of endangered species. It is the primary federal agency charged with management and enforcement of the Federal Endangered Species Act (Federal ESA) as it applies to terrestrial and aquatic habitats. The National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries Service) manages marine fishery resources, including inland waters that support anadromous species. This includes compliance with the Federal ESA for salmon, steelhead, and other anadromous species issues.

Within the IRWMP Region, the FWS or NOAA Fisheries will get involved if an action has effects on federally listed threatened and endangered species. This would include any action that involves use of federal facilities, permits, or funding. NOAA Fisheries would become involved if there is a potential impact to salmon or steelhead species. In their conservation role, the FWS manages habitat and refuges, such as the San Luis National Wildlife Refuge Complex west of the region near Los Banos. The FWS has also developed the San Joaquin Upland Species Recovery Plan which seeks to protect listed species in the San Joaquin Valley and preserve important habitat.

3.3.22 U.S. Department of Agriculture, Natural Resources Conservation Service

The NRCS works with local agencies and land owners and provides technical support for conservation of land and water, prevention of erosion, preservation or restoration of habitat, and other programs to help conserve resources. NRCS provides financial assistance for many conservation activities. Participation in NRCS programs is voluntary. Some NRCS programs, such as the Farm Bill, help farmers and ranchers resolve environmental issues on their land, enhance the long-term quality of the environment, and conserve natural resources. This includes technical support and funding programs, such as the Agricultural Management Assistance and Wetland Reserve programs. NRCS can make incentive payments to agricultural producers to voluntarily address issues and incorporate conservation practices into their farming operations. Producers may construct or improve water management structures or irrigation structures; plant trees for windbreaks or to improve water quality; and mitigate risk through production diversification or resource conservation practices, including soil erosion control, integrated pest management, or transition to organic farming. NRCS has also been active in helping dairies develop nutrient and conservation management plans.

3.4 Water Supply and Demand

The IRWMP Region includes a complicated network facilities managed by the local water and land use agencies. This section discusses facilities, including water storage, water delivery, groundwater recharge, wastewater collection and treatment, flood control, and storm water management. The various systems and their capacities are described and their relationships to the IRWMP are discussed.

3.4.1 Water Supplies and Demands

Specific water supply and demand estimates are found in other IRWMP chapters and external documents. The potential impacts of climate change on water supplies and demands are discussed in Chapter 17. Water supplies and demands in the Kings Basin were evaluated by WRIME (*Analysis of Water Supplies in the Kings Basin* and *Baseline Conditions*).

3.4.2 Kings River Integrated Water Supply and Flood Control Facilities

The major water supply and flood control facilities are part of an integrated system that is managed to meet multiple objectives. Multiple districts and land use agencies (city and county) are involved in the operations of the water supply and flood control facilities within the IRWMP Region. The facilities have been uniquely designed and built over time to capture, conserve, and manage the available water flowing into the IRWMP Region.

The following discussion characterizes the major regional water supply and flood control systems within the IRWMP Region and describes the more localized facilities used to manage water. The Kings and San Joaquin Rivers flow westerly from the Sierra Nevada into the IRWMP Region. The San Joaquin and Kings River watersheds contribute recharge to the Kings Groundwater Basin. The Kings Groundwater Basin is designated by DWR (DWR, 2003a) and is a smaller sub-basin of the larger San Joaquin Basin Hydrologic Study Area. Three dams have been constructed to control flows on the San Joaquin and Kings Rivers. These dams are the Pine Flat Dam on the Kings River, and the Friant and Mendota Dams on the San Joaquin River. The upper watershed has a number of other dams that provide both hydroelectric and water storage benefits and are critical to the timing and availability of water to the region.

These major regional facilities, in combination with the more localized network of canals, recharge/retention ponds, and flood control reservoirs, provide the foundation for identifying water management opportunities to meet IRWMP Objectives. The CVP (Delta Mendota Canal; Friant Kern Canal) and SWP Aqueduct make up the backbone of the state and federal water distribution system in the San Joaquin Valley. CVP and SWP infrastructure could potentially be used to develop new sources of imported water (transfers or exchanges) for the IRWMP Region.

Both the San Joaquin and Kings Rivers are sources of supply and groundwater recharge to the IRWMP Region and are subject to significant variation in annual runoff resulting from annual changes in mountain precipitation. Reservoir storage has helped to regulate and make more efficient use of available water during dry years and to protect life and property in wet years. However, storage capacity is generally inadequate to accommodate runoff during very wet years and substantial flows are lost to the IRWMP Region due to flood releases. During winter and spring months, river systems in the IRWMP Region swell with heavy rainfall and snow melt runoff. To conserve water, reservoirs are used to store winter rains for use in the summer. These

same storage reservoirs are used for flood control as well as water supply storage which can cause conflicts when storage space is needed for flood protection.

In addition to the natural stream channels, a complex network of local and regional canals deliver conserved water in summer months for irrigation, groundwater recharge, and municipal purposes, and flood water in winter months for groundwater recharge. The AID, FID, and CID canals convey water supplies primarily to agricultural users, though FID also conveys water to surface water treatment plants in Fresno and Clovis for municipal purposes. In winter months, the same facilities are used to convey stormwater around and away from developed areas. In the developed urban areas, local storm drainage systems composed of street gutters, inlets, underground storm drains, retention ponds, pumping stations, and open channels are used to collect and control stormwater runoff and direct runoff to the AID, FID, CID canals for flood control purposes. Many of the stormwater retention ponds are multi-purpose and provide benefits to groundwater recharge and recreation. As an example, FID through an agreement with the City of Fresno, City of Clovis and FMFCD delivers surface water for groundwater recharge to several stormwater basins during the typical irrigation season.

3.4.3 Pine Flat Dam

Pine Flat Reservoir is a major water facility that regulates the flow in the Kings River. It is located approximately 10 miles to the east of the Kings Groundwater Basin in the Sierra Foothills. The dam was completed in 1954 primarily as a flood control project with water conservation storage benefits. It has a capacity to hold 1,000,000 AF of water.

The Pine Flat Dam is managed by three agencies through a cooperative agreement: (1) The Corps determine the flood releases and criteria, (2) KRWA manages the conservation storage, and (3) KRCD operates the hydropower plant.

The management of the surface water rights has evolved since KRWA's formation in 1927. From its inception, KRWA has coordinated operations to serve each of its 28 members and to manage the Kings River entitlements. In practice, releases, diversions, and flow management on the Kings River are carefully coordinated by KRWA. Under the direction of KRWA, the irrigation releases are made from the dam in accordance with the terms of the water rights licenses, the provisions of Decision 1290 set forth by the SWRCB, and a complex series of agreements and water entitlement schedules ("Blue Book Agreements"). Pine Flat Dam has established operating parameters that change throughout the year and are used to allocate storage and flood capacity. Management of the reservoir space is based on forecasts, expected runoff patterns, snow measurements, and expected fill dates. With a large volume available for snowmelt and a sufficient storage to runoff ratio, Pine Flat Dam operations normally avoid emergency spillage.

3.4.4 Other Upstream Kings Storage Facilities

Pacific Gas and Electric (PG&E) owns and operates storage facilities on the Kings River and its tributaries upstream of the Pine Flat Dam. These upstream storage facilities (Courtright Lake and Wishon Dam) have a combined capacity of about 251,700 AF and are operated primarily for the production of electrical energy. The operation of these projects can affect the flow, timing, or availability of water in Pine Flat Reservoir.

Other storage reservoirs and power projects have been proposed on the Kings River, most notably at Rodgers Crossing on the Kings River and on Dinkey Creek, a tributary to the North Fork of the Kings River. Neither of the projects was developed because of funding issues. Two potential low elevation reservoirs that were previously identified include an off-stream storage site on Mill Creek in Wonder Valley and the Piedra Afterbay below Pine Flat. Neither of these facilities has been developed.

3.4.5 Kings River Diversions and Weirs

There are a number of weirs on the river used to divert and manage Kings River flows. The individual water districts have authority over the operations for the weirs and water delivery canals. In addition to these 10 major weirs, there are 20 minor weir facilities and a large number of pumps. The weirs control diversions into the specific canals of the various water districts or ditch companies.

During time of flood release and high flows, water diverted to the North Fork travels up the Fresno Slough and through the James Bypass. These flows only occur during the winter in wet years. Once this water flows north and reaches the San Joaquin River, there is no opportunity for further capture or conjunctive use in the Kings Groundwater Basin.

3.4.6 Canals, Delivery Facilities, and Recharge Ponds

There is an extensive canal network owned and operated by the irrigation and water district within the region. The canal network is used to convey water to users within those districts. The water is used directly for agricultural, groundwater recharge, irrigation and municipal purposes in the region.

The region has more than 1,200 miles of canals and pipelines to deliver water to agricultural lands and to existing recharge facilities. Many of those facilities were originally constructed in the late 1800s. The major canals that service the Kings Basin include the Fresno Canal, Gould Canal, Alta Canal, and Consolidated Canal.

3.4.7 Other San Joaquin Storage Facilities

Southern California Edison (SCE) and PG&E own and operate a number of dams and reservoirs on the San Joaquin River and its tributaries upstream of Friant Dam. The most notable of these are Huntington Lake and Shaver Lake. These upstream storage facilities are operated for the production of electrical energy and have a combined

capacity of about 609,530 AF. Their operation affects the flow of water into Millerton Lake and subsequently the timing and availability of releases to Friant Division Contractors. None of these storage facilities is designed or operated for flood control and the Corps currently has no jurisdiction over releases from these structures. Inflow increases requiring flood releases from the upper San Joaquin River dams could result in uncontrolled releases from Friant Dam.

3.4.8 Federal and State Facilities

Regional facilities owned and operated by the federal and state governments could have an influence on the IRWMP. Potential sources of future supply could include importation, water transfers, or exchanges that make use of these facilities to convey water into the IRWMP Region.

3.4.9 Friant Division of the CVP

San Joaquin River flows are regulated by Friant Dam, which was constructed in 1942 and is managed by Reclamation as part of the Friant Division of the CVP. The CVP Friant Division consists of Friant Dam and Millerton Lake, the Friant-Kern Canal, which runs south to Kern County, and the Madera Canal, which runs northwesterly to Madera County. The Friant-Kern Canal conveys water into and through the IRWMP Region.

Releases from Friant Dam to the San Joaquin River and the Friant-Kern Canal provide surface water to users within Fresno County, including City of Fresno, Orange Cove Irrigation District, and the FID. There are no CVP contracts in the Tulare County portion of the IRWMP Region, which includes all of the AID service area.

The reservoir, Millerton Lake, has a storage capacity of about 520,300 AF. The storage capacity of Millerton Lake has been insufficient for flood protection in wet years causing emergency releases and downstream flooding problems. In 1997, releases exceeded downstream channel capacity which is supposed to be maintained at 8000 cubic feet per second (cfs). Inflow into Millerton was estimated at over 120,000 cfs and outflow peaked at 60,000 cfs. The Corps has evaluated the operational plans for all the dams in the San Joaquin River system to determine the possibility of coordinated releases to reduce the likelihood of coincident peak flows downstream. Nevertheless, with a large storm in 1997, the storage capacity of Millerton Lake was exceeded and a short-term high peak flow occurred below Friant Dam and several levee breaks downstream contributed to flooding along the San Joaquin River.

The amount of capacity in Millerton Lake that Reclamation keeps available for runoff varies throughout the year according to defined operating criteria that have been developed and agreed to by federal agencies (e.g., Reclamation, Corps) and state agencies (most notably the DWR).

The Friant-Kern Canal carries irrigation water from Millerton Reservoir south to its terminus in Kern County. The Friant-Kern Canal was constructed by Reclamation and is

now managed by the Friant Water Authority. The average annual delivery from the canal is about one million AF with a design capacity of 5,000 cfs at its head. There is a spillway into the Kings River just upstream of a double barrel 24-foot diameter siphon under the river. This spillway can be used to deliver San Joaquin River water to the Kings River. At times when San Joaquin Flood water can be delivered, the Kings River can be in flood conditions as well. San Joaquin River high flows in excess of long-term contractor demands can be contracted for on a one-year temporary basis under Section 215 of Reclamation Law, thus the name 215 Water.

3.4.10 Mendota Dam

Mendota Dam is operated primarily for irrigation. The Dam was built to divert San Joaquin River water under riparian and pre-1914 rights held by predecessors to the Exchange Contractors. Mendota Pool is a 5,000 AF reservoir created by Mendota Dam located on the San Joaquin River just outside the City of Mendota. The primary functions of the dam are storage and diversion of irrigation water for agriculture, although the water level in the pool also functions to maintain water levels in the Mendota Wildlife Management Area. Mendota Pool provides little or no flood protection. Mendota Dam holds flows from the San Joaquin River as well as discharge and releases from the Kings River via the North Fork (Fresno Slough and James Bypass). The DMC conveys water from the Delta to Mendota Pool from the north. Several irrigation channels then divert the Delta flows to irrigation districts with CVP contracts. Reclamation, in coordination with the Central California Irrigation District, manages this system, which is part of the CVP. Reclamation has proposed replacing the existing structure with a new Mendota Dam, which may raise the water level in the pool.

3.4.11 CVP Exchange Contracts

Reclamation holds the majority of San Joaquin River water rights, which were acquired by Reclamation during the development/construction of the CVP Friant Division facilities. These water rights were obtained through purchase and exchange agreements with the individuals and entities that held those water rights at the time the Friant Division facilities were developed. Historically, San Joaquin River water was diverted by the downstream users at Mendota Pool and Sack Dam, who became exchange contractors. The exchange contractors receive water from the DMC in exchange for their San Joaquin water. San Joaquin River water is now delivered to the east side of San Joaquin Valley through the CVP Friant-Kern and Madera Canals to supplement groundwater pumping and help mitigate overdraft problems. Reclamation has obligations to deliver project water downstream of Friant Dam to Gravelly Ford through water rights settlement contracts.

Reclamation also provides an exchange supply for larger riparian water right holders farther downstream of Gravelly Ford. These water users are the Exchange Contractors including Central California Irrigation District, Firebaugh Canal Water District (formerly Firebaugh Canal Company), San Luis Canal Company, and Columbia Canal Company,

which obtain their water supply from the Delta via the Delta-Mendota Canal and Mendota Pool.

If Reclamation is not able to meet its contractual obligations for water deliveries from the Delta, the exchange contract provides for releases from Friant Dam and delivery using the San Joaquin River. This could reduce water available for other CVP contractors in the IRWMP Region.

3.4.12 Regional and Local Flood Control and Storm Water Management

The large scale flood control for the IRWMP Region is provided by Pine Flat Dam and Pine Flat Reservoir and to a lesser degree by Friant Dam and Millerton Lake. More localized flood control and storm water management facilities are operated by a mix of special districts and land use agencies.

3.4.13 Kings River Flood Control Facilities Operations and Maintenance

The Federal Flood Control Act of 1944 authorized the construction of Pine Flat Dam and also authorized certain channel improvements along the Kings River downstream from the dam. Federal law requires that a local agency assume sponsorship of the levee projects. At the urging of the irrigation districts in the area, the KRCD undertook the sponsorship of the channel improvements in 1959 and the waterways banks along the right and left of the Kings River were transferred to the KRCD for operation and maintenance in 1971. In total, the KRCD maintains more than 140 miles of levees. Under the general provisions of the flood control regulations, the KRCD is responsible for maintenance and operation of flood control works for structures and facilities during flood periods and for the continuous inspection and maintenance of the project works at other times.

The principle mission of the Corps during flood emergencies is to operate Pine Flat Dam, work with the KRCD to ensure that flood control works are properly operated and maintained, and offer technical advice to enable local interests to obtain maximum flood protection.

Levee maintenance requires periodic inspections to ensure that maintenance measures are being effectively carried out. Such inspections are made immediately prior to the beginning of the flood season, immediately following each major high water period, and otherwise at intervals not exceeding 90 days and such intermediate times as are necessary to ensure the best possible care of the levees. Measures are taken to control erosion; exterminate burrowing animals; provide for removal of wild growth and drifts deposits; suppress or eradicate invasive plants and repair damage caused by erosion or other forces. In order to ensure that channel maintenance is accomplished in a manner which minimizes any adverse environmental impact, removal of healthy, large-diameter trees within the floodway is avoided where practical and vegetation is preserved as a part of selected clearing of the waterside berm, channel bank, or levee slope during normal maintenance operations. Semiannual reports are prepared for the

Corps covering inspection of bridges, weirs, and structures within the designated floodway, maintenance, and operation of the protective works.

The Kings River Channel Improvement Project was designed by the Corps to protect the adjacent lands, railroads, highways, and towns from floods expected to occur less frequently than once in 100 years. Non-damaging flood flows are conveyed through the flood project to the Mendota Pool where they join flows from the San Joaquin River. In extreme flood years, when flood capacity to the San Joaquin River will be exceeded, damaging flood flows are then diverted to the Tulare Lake. Flood project works constructed on the Kings River generally consisted of channel and levee improvements needed to maintain the capacities defined in **Table 3-4**.

Table 3-4: Flood Capacities to Be Maintained on the Kings River

River Segment	Flood Capacity
Main Kings River	
Lemoore Weir to Island Weir	9,100 cfs
Island Weir to Crescent Weir	6,300 cfs
Kings River North (Fresno Slough)	4,750 cfs
Kings River South	3,200 cfs
Clarks Fork	2,500 cfs
Crescent Bypass	1,500 cfs

3.4.14 The Fresno Metropolitan Flood Control District and Fresno-Clovis Area

The FMFCD Service Plan, adopted in 2009, describes in detail the regional and local storm drainage and flood control facilities for the Fresno-Clovis metropolitan area (FMFCD, 2009). The Service Plan includes 163 adopted or proposed drainage areas, each providing service to approximately one to two square miles. All but five of the developed drainage areas are served by a retention or detention facility. Flood flows in the larger foothill streams of Big Dry Creek, Alluvial Drain, Pup Creek, Redbank Creek, and Fancher Creek are controlled by dams and detention basins constructed by the Corps of Engineers with FMFCD as the local sponsor and are known as the Redbank and Fancher Creeks Project. FMFCD has also constructed a second dam on Fancher Creek as a local project identified as the Fancher Creek Detention Basin. These facilities have largely eliminated the 100-year floodplain from the metropolitan area. These streams are collectively referred to as the Fresno County Stream Group.

Between the easterly boundary of the planned urban storm water drainage system and FMFCD's eastern boundary, there are approximately 175 miles of streams and channels, many of which are severely obstructed. FMFCD operates a rural streams program to preserve, restore, and maintain these channels, and to complete any additional facilities necessary to safely convey storm flows through the rural area and the downstream urban areas.

The local drainage program relates to the collection and safe disposal of storm water runoff generated within the urban and rural watersheds or "drainage areas." FMFCD local storm water drainage system consists of storm drains, detention and retention basins, and pump stations. Many of FMFCD's basins are also utilized for groundwater recharge.

3.4.15 Flood Control in the Incorporated Areas

Most of the incorporated cities in the IRWMP Region operate their own storm drainage and flood control system. The exceptions are the cities of Fresno and Clovis which are managed by FMFCD. Many cities also rely on the larger levee systems maintained by KRCD and the irrigation districts for flood protection. The irrigation district canals also move water around and away from the cities. The local storm drainage and flood control systems for the incorporated cities within the IRWMP Region are described below. The local storm drainage system for the Cities of Clovis and Fresno were described above.

3.4.16 San Joaquin River Flood Control Facilities and Operations

From Friant to Gravelly Ford, the San Joaquin River is part of the Designated Floodway Program administered by the State Reclamation Board. Land use restrictions and river management practices allow the river to meander, flood the overbank areas, and remain in a relatively natural state. Downstream of Gravelly Ford, the river is confined by levees. The design capacity of the San Joaquin River from Friant Dam to Chowchilla Bypass is in excess of 8,000 cfs while the channel capacity downstream is reduced. The major San Joaquin River flow constraint is the reach near Mendota and Firebaugh. Beyond that point, San Joaquin River channel capacity continues to decrease for some distance due to lack of annual flooding and natural channel clearing since Friant Dam was constructed. Further, downstream, the river channel has been deepened and widened by historic flows of the Merced River, Tuolumne River, and other tributaries.

3.4.17 Tulare County Unincorporated Areas

Tulare County has summarized existing information regarding Tulare County's drainage facilities, specifically identifying communities that lack storm drain facilities or rely only on surface drainage (Tulare County, 2004). Tulare County is the lead agency in providing storm drain infrastructure within the unincorporated areas of the county. Many of the unincorporated small communities have no underground drainage infrastructure, leaving only surface drainage which is more subject to flooding, and/or have infrastructure that is not properly functioning due to little or nonexistent facility maintenance. The County also recognizes that surface draining also poses a potential threat to wildlife, farm animals, and groundwater supplies, as there is limited ability to treat the water before it flows into a basin, or other surface waters such as a creek, irrigation ditch, or river. Storm water drainage infrastructure within unincorporated Tulare County is owned and managed by the Tulare County Resources Management

Agency. Storm drain infrastructure improvements are generally constructed in conjunction with transportation improvement projects and site development projects.

The flood carrying capacity in rivers and streams has decreased as trees, vegetation, and structures have increased along the Kings River and other local drainage ways. Confined floodplains can result in significantly higher water elevations and higher flow rates during high runoff and flood events. Updated channel analyses have not been performed to determine the amount of obstruction posed by vegetation and development in the Kings River channels. As such, the background report acknowledges that the Federal Emergency Management Agency (FEMA) maps depicting the 100-year floodplain for the rivers probably do not reflect the true extent and risk of flooding hazards in Fresno, Kings, and Tulare counties. FEMA is currently updating the flood zone maps in California.

3.4.18 Domestic Water Service Providers and Systems

Domestic water service is provided by a wide mix of providers. Municipal utilities provide water to most of the larger cities with the exception of Selma, which is served by California Water Service Company. Historically, all of the cities relied on groundwater. As a result of overdraft and groundwater quality issues, the Cities of Clovis and Fresno constructed surface water treatment plants to increase their conjunctive use programs and make use of available surface supplies and entitlements. Unincorporated communities in Fresno and Tulare Counties are served by CSDs, CSAs, or PUDs and rely almost exclusively on groundwater. The capital facilities plans of the domestic service providers are critical to the water quality program element of the Kings Basin IRWMP.

Information on public water systems was obtained through review of the city and county general plans, local GWMPs, available water supply master plans or capital facility plans, and through contacts with Fresno and Tulare LAFCOs, CDPH, local public works departments, and County General Plans.

Areas of residential development exist throughout the unincorporated areas of the IRWMP Region. Domestic users in the areas of development concentration that are not served by public entities, rely on individual wells, or are provided water by small mutual water companies or private community water systems

3.4.19 Wastewater Collection, Treatment, Disposal

The capital facilities plans of the local wastewater treatment service providers are critical components of the water quality program element of the Kings Basin IRWMP. Wastewater collection, treatment, and disposal are regulated by the Central Valley RWQCB. Local government and special districts own and operate collection systems (sewers) and wastewater treatment plants. All of the entities that treat and discharge wastewater obtain permits from the RWQCB to discharge treated plant effluent and dispose of biosolids (sludge). Residents in rural areas that are not served by sewers

most often use on-site septic systems. Industries are sometimes required to provide pretreatment of their waste prior to discharge to a publicly owned treatment works or they must obtain separate discharge permits from the RWQCB if they are operating independent facilities. The objective of such permits is to preserve surface and groundwater quality for beneficial use and to protect the public health. With the exception of Reedley, which has an NPDES permit, none of the plants discharge directly to surface water.

In 2006, there were 362 permitted dischargers in Fresno County. More than 70% of all discharges are classified as municipal, and are mostly domestic waste, and 90% of municipal flows are generated within corporate city limits. Similar statistics were not readily available for Tulare County. Most non-municipal waste is derived from agricultural-related industries, primarily food processing and packing. Detailed information on wastewater treatment and disposal facilities for the incorporated and unincorporated areas is provided in the Baseline Conditions, Technical Memorandum (WRIME 2006).

3.4.20 Incorporated Cities

All incorporated cities within Fresno County and Tulare County are served by local wastewater collection and treatment facilities. The majority of treated wastewater is domestic (household type) waste with a small amount (estimated at 0–11% depending on the city) coming from industrial discharges. Most treatment plants provide secondary treatment, but some smaller cities still have only primary treatment facilities. Other cities in the county generally have adequate capacity for the foreseeable future. The Fresno County General Plan Background Report (Fresno County, 2000) provided a summary of treatment facilities and identified sources of available sewer collection system maps. A baseline conditions report has been produced by Tulare County as part of the general plan update program (Tulare County, 2004). There are no metropolitan areas in the Kings County part of the IRWMP Region.

3.4.21 Unincorporated Communities

Unincorporated communities use special districts to provide wastewater collection, treatment and disposal facilities. Fresno County owns and operates nine sewage and wastewater treatment facilities on behalf of water works districts (WWDs) and CSAs. Tulare County unincorporated areas are served by a number of districts as discussed below. The RWQCB actively encourages consolidation of services and increased reclamation of treated effluent as the most economical methods to achieve water quality objectives in the area.

Most treatment facilities currently use evaporation/percolation ponds for effluent disposal. The RWQCB recognizes this as a viable interim disposal solution, but remediation of treated effluent for irrigation purposes is preferred in order to reduce impacts to groundwater and salts accumulation. Nitrogen removal/reduction is now being required for new discharge permits issued by the RWQCB. To achieve the

nitrogen removal reclamation goals communities must now operate more costly activated sludge treatment plants and/or dispose of reclaimed wastewater by application to specified crops through irrigation at agronomic rates.

Industries, mostly food processing plants, also treat wastewater treatment and discharge in unincorporated areas of the county. The RWQCB issues discharge permits to industrial facilities.

Many rural landowners use private on-site septic systems for wastewater treatment and disposal. Over the past few years, an average of approximately 500 permits for new individual septic systems have been issued annually in the unincorporated portions of Fresno County, though it is not known how many are issued specifically in the IRWMP Region. Similar information for Tulare County was not obtained.

Fresno County's Mandatory Sewer Connection Ordinance requires connection to public sewer systems, where they are available, precluding the issuance of permits for installation of individual septic systems in such cases. In areas where public systems become available where they did not previously exist, structures of individual septic systems must be connected to the public system within three years or sooner if the existing facilities pose a health risk. In the event that required connections are not made within the required three-year period, the County may cause such a connection to be made, with the cost of the connection assessed to the landowner.

Areas served by on-site septic systems have had problems with accumulation of nitrates in groundwater (e.g., the Calwa, Sunnyside, Figarden and Mayfair areas through the Fresno-Clovis Metropolitan Area); however, these problems have been ameliorated when these areas are connected to a sewer utility. Most areas that remain on septic continue negatively to impact groundwater quality.

3.4.22 Environmental Water Demand

In the Kings Basin, some water is dedicated to meeting environmental demands. In 1964, DFG set an instream flow requirement of 50 to 100 cfs below Pine Flat Dam to sustain fish and wildlife. However, this requirement is not restrictive for most of the year. The Kings River is not designated a Wild and Scenic River below Pine Flat Dam, so there is no water requirement for this purpose. During summer months, the large quantities of water that are released to meet agricultural demands are also used to cover the instream flow requirement. During the winter months, Mill Creek and Hughes Creek, tributaries to the Kings River below the Pine Flat Dam, naturally feed the Kings River to meet the instream flow requirement. There is also a small area of managed wetlands that require Kings River water; however, the demand for these wetlands is less than 10,000 AF per year. There is no Bay-Delta outflow requirement because, despite existing manmade conveyances, historically the Kings River water did not flow north to the San Joaquin River (KRCD, 1997).

Water dedicated to environmental uses cannot be put to use for other purposes in the location where the water is reserved; however, it may be put to other uses further downstream as mentioned in the above paragraph. Another example is the mainstream of the Kings River and the South and Middle forks above 1,590 feet elevation. These stretches of river are designated as Wild and Scenic Rivers. However, after flowing through these sections of river the same water is then used to meet urban and agricultural demand once it reaches the valley.

There are ongoing fisheries studies in the Kings River, below Pine Flat Dam as part of the Kings River Fishery Management Program, described below. Preliminary results indicate that meeting fishery flow requirements and environmental demands associated with restoration in this area could be integrated with conjunctive use projects in the region to provide multiple benefits.

3.5 Water Quality Conditions

This section briefly reviews current surface water and groundwater quality conditions, known problems, and surface water and groundwater quality management programs. The quality of the available surface water and groundwater supplies influences the ability to put the water to use. If the quality of the water is degraded beyond the ability to put the water to the intended use, overall supply is limited, or the cost for additional treatment is increased.

3.5.1 Surface Water Quality

The major surface water source for the IRWMP Region is the Kings River, which has high quality water due to its origin in the uplands of the Sierra Nevada Mountains. As it collects agricultural return flows in the Valley, the instream water quality gradually declines but is still considered of high quality. The water quality in the Kings River in its upper reaches is generally of high quality.

The lower Kings River from the Island Weir to the Stinson and Empire Weirs has elevated levels of salinity, molybdenum, and toxaphene, as listed in the Clean Water Act 303(d) list maintained by the SWRCB. The SWRCB gives the reach a low priority for the development of a TMDL.

The Kings Basin is covered by the Basin Plan (Central Valley RWQCB 2004). The Basin Plan addresses the surface water quality issues of the Kings River, indicated by the listing on the 303(d) list, stating that the likely sources of the contaminants are either surface or subsurface agricultural drainage and declaring that additional on-farm management practices may be necessary as the levels of boron, molybdenum, sulfates, and chlorides become high enough to affect agricultural uses and aquatic resources. A number of Best Management Practices (BMPs) have been recommended. The Basin Plan also recommends a surface water monitoring network selected from existing DWR monitoring points. Samples will be taken to monitor for the mineral character of the stream, occurrence of toxic substances, general levels of nutrients and biological

responses, and common physical characteristics. In addition, the Basin Plan calls for continued monthly monitoring by KRCD of the Kings River for salinity, pH, and temperature; continued monitoring by RWQCB for constituents and areas of special concern; and monitoring by RWQCB of storm discharges from Naval Air Station Lemoore for hydrocarbons.

The U.S. Geological Survey (USGS) has done water quality work in the San Joaquin–Tulare Basins through the National Water Quality Assessment (NAWQA) program. The bulk of readily available data has been concentrated in the San Joaquin River and in the areas closer to the Sacramento–San Joaquin Delta; there are few data points for the Kings Basin. Other available USGS information was collected during studies to describe water quality associated with various land uses, rather than identifying local or regional water quality trends and conditions. There is some USGS information on surface water quality, including a bed sediment and tissue sampling event in 1992. Results of bed sediment sampling in 1992 showed levels below detection limits for 16 organochlorine pesticides in the Kings River bed sediments below Pine Flat Dam and below Empire Weir 2 near Stratford. Three sites in the Kings Basin were sampled for 14 organochlorine pesticides in tissue of fish below Pine Flat Dam, at Peoples Weir near Kingsburg, and below Empire Weir 2 near Stratford. Detections were made for dichlorodiphenyldichloroethane (P, P'-DDD) (6µg/kg below Empire Weir 2 near Stratford) and dichlorodiphenyldichloroethylene (P, P'-DDE) (16 µg/kg at Peoples Weir near Kingsburg and 95 µg/kg below Empire Weir 2 near Stratford); all other locations showed no detections (USGS, 2004).

For nearly two decades, growers in California operated under a conditional waiver that allowed for discharge of agricultural return flow and storm water runoff from agricultural lands (among others) without the issuance of a waste discharge requirement. In 1999, SB 390 was adopted and resulted in the sunset of all waivers on January 1, 2003. Since the passage of SB 390, the RWQCB has adopted conditional waivers as an interim step in an evolving irrigated lands program. The interim wavers are focused on building the capacity of local groups, engaging with individual dischargers, and starting data collection, all of which will be part of the foundation for the longer-term program.

As a result, growers have been organizing into groups such as the SSJVWQC, which represents growers in KRCD, KRWA, and other water districts to the south. The mission of the SSJVWQC is to develop plans and implement practices that address water quality issues and concerns affecting the Tulare Lake Basin as part of the agricultural waste discharge permit waiver program. The SSJVWQC participating agencies believe that they will be better served approaching these and other water quality issues on a regional basis rather than individually, and will implement monitoring plans to detect problems and management plans should problems be identified.

3.5.2 Groundwater Quality

The Kings River drainage area is predominantly underlain by granitic rocks. Therefore, the water from the drainage area is of the following types: calcium sodium; sodium

calcium; and calcium bicarbonate type, the last one being the predominant type. The same type of water is also typically seen in the groundwater system. Groundwater adjacent to both perennial and intermittent streams generally is similar in chemical type to that in the streams. Adjacent to intermittent streams, dissolved solids content in groundwater generally is lower than that in surface water, but near perennial streams, it is usually higher than that in surface water. As groundwater in the area moves down gradient from areas of recharge, it exchanges some of its calcium and magnesium with sodium on exchange positions of clay minerals and thus increases slightly in sodium content. In the central western and southwestern parts of the study area, where sodium bicarbonate water occurs, there is an increase in percent sodium. In the northwestern part of the study area near the valley trough, groundwater is sodium chloride type.

Approximately 95% of the groundwater in the IRWMP Region is bicarbonate type containing calcium, magnesium, or sodium as the predominant cation. The average Total Dissolved Solids (TDS) concentration is 250 parts per million (ppm). Concentrations can exceed 2,000ppm as aquifer depth increases. Aside from pesticide and nitrate concerns in some areas, the groundwater is well suited for drinking.

The most widely detected pesticide in groundwater is the nematodecide dibromochloropropane (DBCP). DBCP, which has not been allowed for crop application since the late 1970s, was applied primarily to vineyards and stone fruit orchards, and is still widely detected throughout the study area. Triazine and other organonitrogen herbicides are commonly detected in groundwater when DBCP is found. In general, pesticides in groundwater of the east side of the valley are more prevalent than in groundwater of the west side of the valley.

Although DBCP is the most commonly detected pesticide, other detected pesticides and herbicides include: atrazine; bromacil; 2, 4-DP; diazinon; 1, 2-dibromoethane; dicamba; 1, 2-DCP; diuron; prometon; prometryn; propazine; and simazine. With the exception of diazinon, all these pesticides are applied directly to the soil, not to vegetation. Pesticide concentrations found in the study area rarely exceed drinking water standards, with the exception of DBCP. Pesticide residues in groundwater can be attributed largely to soil properties, chemical or physical properties of the pesticides, types of pesticides used, land use or cropping pattern, and depth to groundwater. Most groundwater pesticide residues are detected on the east side of the valley. These residues were attributed to sandy or coarse-grained soils of Sierra Nevada provenance, a relatively shallow groundwater table in some subareas, and the use of water soluble pesticides with long environmental half-lives. The lack of detections in the west side of the valley is attributable to a long residence time of pesticides in fine-grained sediments of the unsaturated zone and the slow velocity of water recharge. The long residence time allows for degradation reactions to take place.

Uranium is a naturally occurring, inherently radioactive, element. One possible way for it to contaminate ground water is for it to be leached into the water supply from the aquifer rock. Most occurrences of uranium have been detected in the central and southern portion of the region, specifically in the small communities of Kerman, Raisin City,

Hardwick, Easton, Monson and Yettem, and has occasionally exceed the State MCL of 20 µg/L.

Nitrate concentrations in study area groundwater have frequently exceeded drinking water standards. A nitrate sampling program conducted from 1950 to 1969 included eight samples that had concentrations greater than 90ppm; 50 samples had concentrations greater than 45ppm but lower than 90ppm; and 1,814 samples had concentrations lower than 45ppm. In a nitrate sampling program conducted in 1995, nitrate concentrations exceeded the drinking water standard in about 17% of the 30 samples taken from domestic water supply wells.

The 303(d) list mentioned in the Surface Water Quality section covers only surface water. The State of California produces a 305(b) report, which contains the 303(d) list pursuant to the Clean Water Act. California voluntarily includes groundwater information in the 305(b) report. The most recent 305(b) report is the 2002 California 305(b) Report of Water Quality (SWRCB August 2003). Groundwater summary statistics in the 305(b) report note that Kings Basin (as defined in Bulletin 118, Basin 5-22.08) contains public supply wells that exceed MCLs for certain constituents. From the samples, one or more constituent exceeded MCLs for the following contaminant groups:

- Inorganics-Primary (8 samples);
- Inorganics-Secondary (41 samples);
- Radiological (24 samples);
- Nitrates (23 samples);
- Pesticides (105 samples); and
- Volatile Organic Compounds (VOCs) (17 samples).

3.6 Major Water Related Objectives and Conflicts

The Kings Basin IRWMP Region has many objectives and conflicts. Primary concerns include: Groundwater Overdraft, Water Supply Reliability, Degradation of Water Quality, Urban Development, Protection of Water Rights, Sustaining the Agricultural Economy, Protection of Life and Property from Flooding, Protection of the Environment, and Disadvantaged Communities. Each area of concern is discussed in further detail in Chapter 5 – Goals and Objectives. Chapter 6 – Resource Management Strategies describes applicable strategies for managing water supplies in the Kings Basin.

3.7 Regional IRWM Boundary

3.7.1 Ongoing Regional Partnerships

The Kings Basin IRWMP Region is defined with full recognition to the need for supporting and leveraging ongoing regional partnerships. In 2001, the KRCD, AID, CID, and FID signed an MOU with the DWR to coordinate data collection, field pilot studies, and water resources planning activities. The proposed IRWMP is synergistic with this MOU partnership due to common elements of planning. The IRWMP Region is larger

than the region encompassed by this MOU partnership and includes other agencies within the physical and hydrological boundaries of the Kings Basin.

KRWA and KRCD, two key agencies involved with the IRWMP effort, are participating in the SSJVWQC, which was established in 2002. This partnership will facilitate the evaluation and analysis of both data and policy matters on water quality issues for the purposes of IRWMP development.

Stakeholders in the Kings Basin are preparing a coordinated implementation plan which will integrate monitoring and reporting efforts of the four major SB-1938 Groundwater Management Plans (GWMP) that overlay the Kings Basin. This coordinated effort will improve efficiencies and the consistency and accuracy of data, and annual reporting will better reflect the hydrogeologic and management conditions of the Kings Basin. A stakeholder-driven process, coordinated through a Lower Kings Basin Advisory Panel and consisting of water district and ditch company representatives, provided oversight to plan development. Stakeholders in the Upper Kings Basin participate in a similar process. There are other existing and more localized cooperative efforts within the Kings Basin, such as the McMullin Group and NFG. KRCD is supporting these groups and will coordinate the IRWMP effort with these groups as needed.

3.7.2 Potential for Achieving More Benefits by Operating as a Region

A key criterion for defining the IRWMP Region is the potential to achieve greater benefits by operating as a region. As mentioned before, the management of the water resources in the Kings Basin has been locally driven by overlying water agencies and individual water users. However, an overdraft problem in an expansive and interconnected groundwater basin cannot be effectively managed by local measures and actions taken individually by overlying users. In addition, a comprehensive exploration of water resources management alternatives requires an integrated look at the entire watershed and groundwater basin beyond the jurisdictional boundaries of any single local agency. Since the defined IRWMP Region is hydrologically and physically interconnected, it is logical to conclude that there are multiple opportunities for achieving greater benefits by operating as a region.

3.7.3 Appropriateness of the IRWMP Region for Water Management

The Kings Basin region was approved by DWR through DWR's Regional Acceptance Process (RAP) in 2009. The geopolitical region defined for the Kings Basin IRWMP is appropriate for integrated water resources management for the following reasons:

- It is a large area served by multiple local agencies and stakeholders who share the same primary river and groundwater resources;
- The key water management drivers are the same or very similar throughout the region; these drivers include, but are not limited to, water rights, land use, development pressure, socio-economic and cultural makeup, groundwater overdraft, water quality problems, and regional goals;

- Because of size and diversity of the proposed region, all required components of the integrated water management strategies (IRWMP Guidelines by DWR, August 2010) can be considered in the IRWMP;
- It includes the major water rights holders on the Kings River as willing partners in the process;
- It includes the cities which are facing development pressure and growth;
- It includes major irrigation districts and local agencies, who own and operate water facilities in the entire Kings Basin;
- The cooperative planning in the region will help reduce conflict between water users or resolve water rights disputes, an identified State priority;
- The region will be analyzed as a single hydrologic region with well-defined hydrologic boundaries for development of water budgets and analysis of project impacts;
- Surface and groundwater resources are already being actively monitored and managed by entities that cover the region, the KRCD and KRWA, with the proactive management by irrigation districts, municipalities and other entities. As a result, integrated regional planning is appropriate for optimizing the water resources across the region;
- The IRWMP boundary is roughly the same as the boundary for the Kings Groundwater Basin (see **Figure 3-1**); and
- The JPA satisfies the definition of a Regional Water Management Group provided in the CWC §10539 (see Chapter 2 – Governance).

Local, regional, state, and federal agencies that have relationships and potential roles in developing the IRWMP are listed in **Table 3-5**, which also compares the agencies' roles to the resource management strategies recommended by DWR. These strategies are discussed in detail in Chapter 6.

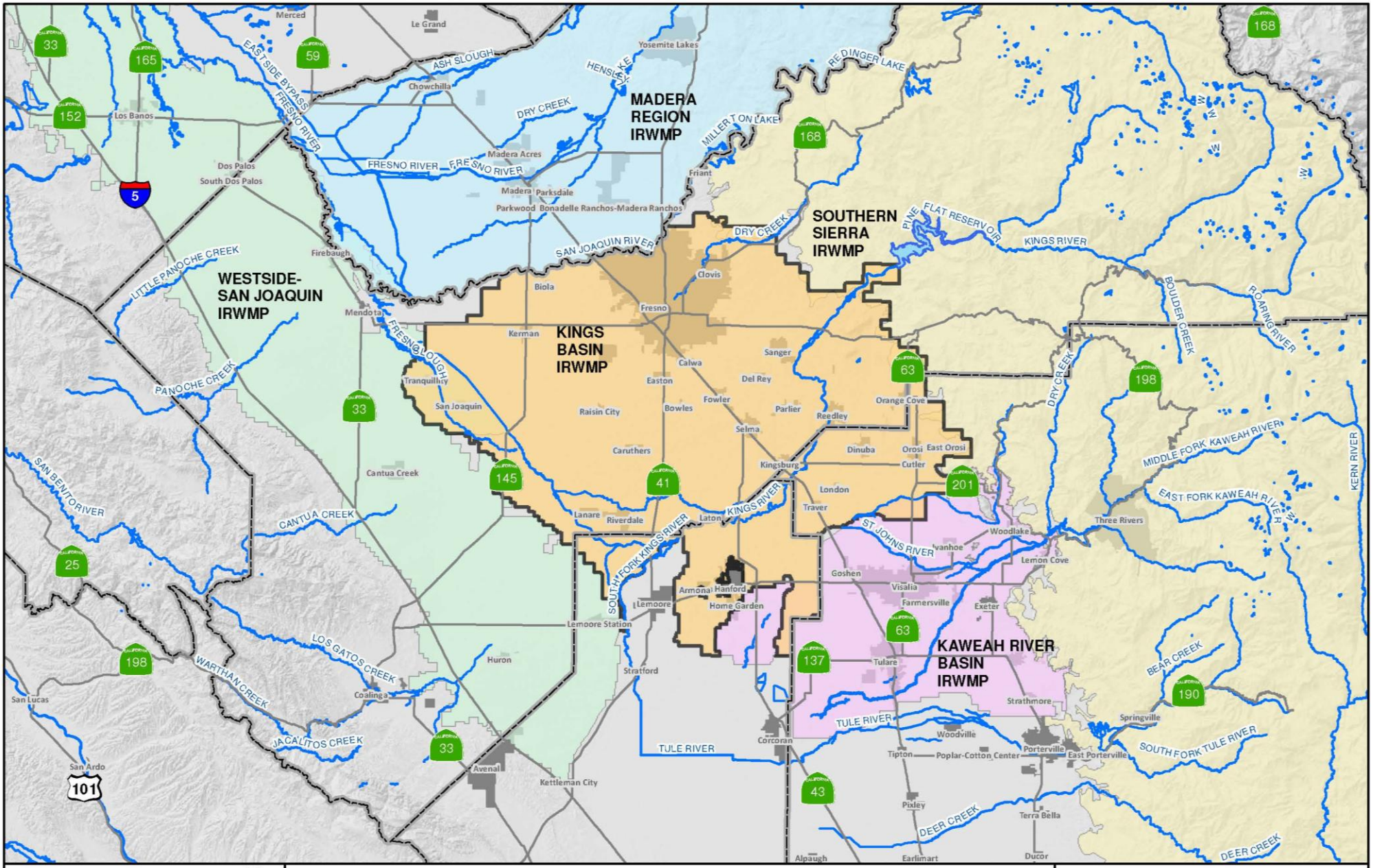
Table 3-5: Agencies and Roles in Relation to DWR Water Management Strategies

Organization	Roles Related to DWR Resource Management Strategies																							
	Agricultural lands stewardship	Agricultural water use efficiency	Conveyance (canals)	Drinking water treatment and distribution	Economic incentives (Loans, Grants, and Pricing)	Ecosystem restoration	Floodplain management	Groundwater storage / Conjunctive Use	Groundwater remediation / Aquifer remediation	Matching water quality to water use	Pollution prevention	Precipitation enhancement	Recharge areas protection	Recycled municipal water	Surface storage – regional/local	System re-operation	Urban land use management	Urban runoff management	Urban water use efficiency	Water-dependent recreation	Watershed management	Water transfers	Wastewater treatment	Permit Requirements
Local																								
Special Districts																								
Alta Irrigation District		■	■		■	■		■		■					■	■		■				■		
Consolidated Irrigation District		■	■		■	■		■		■					■	■		■				■		
Fresno Irrigation District		■	■		■	■	■	■		■				■	■	■		■				■		
Kings River Conservation District		■			■	■	■	■		■	■	■	■		■	■					■			
Fresno Metropolitan Flood Control District			■		■	■	■	■					■		■		■	■			■			
Water Associations																								
Kings River Water Association															■	■						■		
Friant Water Users Association		■	■			■	■	■							■	■						■		
CSDs and PUDs				■										■			■	■	■				■	
Counties (Fresno, Kings, Tulare)																								
Public Works			■	■	■		■	■						■				■	■				■	
Planning	■				■	■	■										■							■
Health/Environmental Health				■	■				■		■			■									■	
Agricultural Commissioner											■													
Cities																								
Clovis				■	■			■			■		■	■	■		■	■	■				■	■
Fresno				■	■			■	■		■		■	■	■		■	■	■			■	■	■
Fowler				■	■						■						■	■	■					■
Kerman				■	■						■						■	■	■				■	■
Kingsburg				■	■						■						■	■	■					■
Parlier				■	■						■						■	■	■				■	■
Reedley				■	■						■						■	■	■				■	■
Sanger				■	■						■						■	■	■				■	■
Selma				■	■						■						■	■	■					■
Dinuba				■	■	■					■			■			■	■	■				■	■

Organization	Roles Related to DWR Resource Management Strategies																							
	Agricultural lands stewardship	Agricultural water use efficiency	Conveyance (canals)	Drinking water treatment and distribution	Economic incentives (Loans, Grants, and Pricing)	Ecosystem restoration	Floodplain management	Groundwater storage / Conjunctive Use	Groundwater remediation / Aquifer remediation	Matching water quality to water use	Pollution prevention	Precipitation enhancement	Recharge areas protection	Recycled municipal water	Surface storage – regional/local	System re-operation	Urban land use management	Urban runoff management	Urban water use efficiency	Water-dependent recreation	Watershed management	Water transfers	Wastewater treatment	Permit Requirements
Other Regional																								
SKF Regional Sanitary District											■												■	
State																								
Department of Water Resources		■	■		■	■	■	■	■	■					■	■			■			■		
Regional Water Quality Control Board					■				■	■	■			■				■			■		■	■
State Water Resources Control Board		■		■	■	■			■	■	■			■	■						■	■	■	■
Department of Fish and Game					■	■														■	■			
California Department of Public Health				■					■	■	■		■	■									■	■
Department of Food and Agriculture	■				■						■													
Department of Pesticide Regulation									■		■													■
Department of Toxic Substances Control									■		■												■	■
California State University, Fresno	■	■																						
University of California Cooperative Extension – Fresno County	■	■																						
Federal																								
Corps of Engineers					■	■	■			■	■		■		■	■				■	■			■
Bureau of Reclamation		■	■		■	■		■		■					■	■				■		■		
Fish and Wildlife Services, NOAA Fisheries					■	■				■											■	■		■
Environmental Protection Agency					■	■				■	■			■				■			■		■	■
Department of Agriculture, NRCS	■	■			■	■					■										■			

3.8 Neighboring or Overlapping IRWM Regions

The IRWM region is bounded by the Westside-San Joaquin IRWM (west), the Kaweah River Basin IRWM (south), the Madera IRWM (north) and the Southern Sierra IRWM (east). The Kings Basin IRWMA region does not overlap its neighboring regions, as the various IRWM groups have made efforts to coordinate their boundaries as much as possible, as required by DWR. The Madera and Kaweah River Basin IRWMs are working through the process of updating their respective IRWMPs at this time. Coordination between IRWM regions is discussed more fully in Chapter 2 – Governance. **Figure 3-4** shows the IRWMP boundaries of the neighboring IRWMPs.



0 7.5 15 Miles

EST. 1968
PROVOST & PRITCHARD CONSULTING GROUP
An Employee Owned Company
286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

Legend

- 2012 IRWMP Boundary
- Madera Region IRWMP
- Kaweah River Basin IRWMP
- Southern Sierra IWRMP
- Westside-San Joaquin IRWMP

Figure 3-4

Kings Basin IRWMP

Neighboring IRWMP Map

6/5/2012 G:\Clients\Upper Kings Basin IRWMA - 2048\20481001 - IRWMP Update\GIS\Map\Figure 3_4 Neighboring IRWMPs v10.mxd

4 DISADVANTAGED COMMUNITIES

4.1 Introduction

Disadvantaged communities (DACs), or economically disadvantaged communities, are prevalent in the Kings Basin and have many critical water supply and water quality needs. The purpose of this section is to identify the DACs in the Kings Basin and highlight their general needs. Specific topics that are discussed include:

- Important Cultural/Social Values of the Region
- Tribal Government Involvement and Collaboration
- Economic Conditions/Trends of the Region
- Disadvantaged Communities within the Region (DACs)
- Kings Basin DAC Pilot Study
- DAC Goals

4.2 Important Cultural/Social Values of the Region

The San Joaquin Valley of California is home to five of the top 10 counties in the nation in agricultural production. Fresno and Tulare Counties are ranked number one and two in this list. The Kings Basin Water Authority (Authority) region includes these two counties and a portion of Kings County, another predominantly agricultural area. The relatively less expensive land costs in the Central Valley and perpetual population growth in California is expected to make this region a leader in the growth rate over the next 20 years.

This growth will test an already challenged region that is home to many of California's poorest communities. Chronic high unemployment has plagued the counties in the region for more than three decades. Low per capita income and isolation from the economic engines of the San Francisco Bay Area and Los Angeles Basin have led to clusters of poverty in many of the counties in the San Joaquin Valley. According to the 2010 census, between 20% and 25% of those residing in the San Joaquin Valley counties were foreign-born compared to roughly 12.9% of U.S. residents. Language barriers are also prevalent in this region. More than 40% of the people in this region speak a language in their home that is other than English, compared to approximately 20% nationwide. Despite these challenges, the region is home to hard-working people, labor leaders, business leaders, and entrepreneurs who are collaborating to bring about change for the betterment of the region. Relevant social and economic data is presented below in **Table 4-1**.

Table 4-1: Socio-Economic Information on Counties in the IRWMP Region

	Fresno County	Tulare County	Kings County
Population 2000	763,000	368,000	129,000
Population 2010	930,450	442,179	152,982
Percent Population Growth	21.9%	20.2%	18.6%
Median Household Income	$45,221	$43,397	$44,609
Median Age	30.6	29.6	31.1
% of Total Workers Employed in Agriculture	9.9%	18.5%	17.6%

Source: 2000 and 2010 Census Data

4.3 Tribal Government Involvement and Collaboration

There are no Native American tribes located within the Kings Basin Integrated Regional Water Management (IRWM) area, therefore no involvement or collaboration was directly conducted. However, as discussed in Chapter 3, the Authority is in contact and cooperation with neighboring Integrated Regional Water Management (IRWM) regions. Overall, water management and planning efforts benefit the Kings Basin region and neighboring regions, which has a potential to affect the Native American tribes within the adjacent regions.

4.4 Economic Conditions/Trends of the Region

Economic development in the region requires a stable and reliable water supply of appropriate quality. Water supply reliability and water quality are critical to maintaining the local economy in three primary sectors: jobs creation, economic diversification, and housing. During the second half of the twentieth century, the region's economy was driven by agriculture and residential development. Despite the success of the agricultural economies and urban growth, the Region's unemployment rate remained among the highest in California and the average wage levels were low. During the first portion of the twenty-first century, the national recession raised unemployment rates and lowered average wage levels further. Economic development will require the water districts, counties, cities, private sector, and other organizations to create good jobs at a faster rate than population growth to bring the region in line with the rest of California in terms of employment rates and wage levels.

4.4.1 Jobs

The region's counties and cities are working to create jobs, expand and diversify the economic base, and prepare the labor force for the changing global economy. One of the regional priorities is to expand the region's job base to strengthen the area's historical economic base of agriculture. It is essential for the region's agricultural economy to remain at the cutting edge in crop selection and growing practices, and this requires an adequate water supply. Many, if not most, DACs in the region are farmworker communities, either historically or currently, or both. Income from

agricultural employment is essential to the continued survival of rural DACs, as there are often few non-agricultural employment opportunities in rural areas.

Technological and marketing advances have opened up new global markets for the Region's produce. At the same time, shifts in cropping patterns can have very positive impacts for employment opportunities. Shifts in consumer preferences and technological advances in food processing have created many new economic opportunities in agriculture. Combined with emerging international markets, the volume demand can support a scale of production well beyond the crop levels currently produced. Therefore, value-added food processing can become a much stronger industrial sector in the region, creating an increased number of well-paying jobs, but this can only occur with a sustainable supply of good quality water.

4.4.2 Diversified Economic Base

A stable and reliable water supply is needed to improve economic stability, accelerate the pace of job growth, maintain the quality of life for residents in the region, and diversify the job base. Opportunities for diversification exist both in old and new industrial sectors. Industries such as metal fabrication and machinery that have emerged from the Region's historical agricultural economy are now heavily engaged in production of a wide range of components for the consumer economy. Newer business opportunities in areas such as information technology have also gained a foothold in the region.

Historically, it has been the more recent immigrants to the region (whether from the Chinese in the 1880s and 90s, from the post-Civil War South in the 1900s, from Europe and the American Midwest in the 1930s, from Southeast Asia in the 1960s and 70s, or from Latin America over several decades) who have performed the field work that is so fundamental to the region's agricultural economy. Over time, each wave of immigrants is gradually replaced by the next, as second-generation immigrants find work in other sectors, or in different parts of the agricultural sector. A diversified economy is critical in supporting the upward mobility of each successive generation.

Every year, the area plays hosts to millions of visitors, more than half of which come for recreation. As the region's economy diversifies, demand for business travel will increase, with the need to develop more and better accommodations, amenities, and services. Water is needed to diversify the economy, support recreational uses, and sustain current economic development and land use plans.

4.4.3 Housing

An essential component of housing affordability in the IRWMP area is the impact fees and monthly user fees associated with domestic water supplies. Local governments must commit to providing appropriate programs to promote housing opportunities for all income groups, which is codified in the Housing Element of their General Plan. This plan must accommodate the Regional Housing Needs Allocation (RHNA) that is

formulated at the state level, and distributed to the Council of Governments for local allocation. In communities with lower household incomes, water costs constitute a higher percentage of the family budget, and thus have a direct effect on the ability of local governments to meet their housing goals. This problem is exacerbated in those disadvantaged communities who have contaminated drinking water supplies, since they are often compelled to spend money on bottled water or household treatment, bringing the sum total of water expenses to levels exceeding $100 per month in some cases.

4.5 Disadvantaged Communities (DACs) within the Region

The process for identifying and including disadvantaged communities (DACs) in the development of the Kings Basin IRWMP was based on the criteria defined in California Water Code (CWC) §79505.5(a). The CWC identifies "a community with an annual median household income (MHI) that is less than 80 percent of the statewide annual MHI" as disadvantaged. The IRWMP used Census 2010 data and 80 percent of the statewide annual MHI ($60,392) to reach a DAC MHI threshold of $48,314.

Severely disadvantaged communities (SDACs) are defined elsewhere in the California Water Code as those communities with an MHI less than 60% of the statewide MHI (CWC §13476(j)). Based upon the census numbers noted above, the SDAC threshold is $36,235.

The resulting map of DACs within the region is shown in Figure 4-1. Table 4-2 lists the unincorporated areas that fall under the category of disadvantaged community or severely disadvantaged community within the region. The table includes population and income data.

4.5.1 Small and Severely Disadvantaged Communities

Due to the lower income levels generally found in the San Joaquin Valley and the IRWMP region, most communities meet the definition of a DAC. However, there is a significant difference in capacity between an extremely large DAC such as the city of Fresno with approximately a half million people and a small severely disadvantaged community such as East Orosi or Hardwick (population of a few hundred). For that reason, an emphasis has been placed on understanding the needs of the smaller DACs and SDACs.

The San Joaquin Valley is traditionally rural by nature, and although Valley cities are growing, the agricultural nature of the region ensures that much of the population remains dispersed throughout the vast expanse of the Valley. The region is peppered with tiny towns, often founded and still populated by farmworkers, which can only continue to exist if their basic infrastructure needs can continue to be met. Water is the most essential, and the most local, of these needs. The entities that provide domestic water service to rural towns (usually small special districts or mutual water companies) have very limited capacity. Operating a well and maintaining a simple distribution system is one thing, but when water treatment plants or other sophisticated

improvements are needed, these systems' small size is crippling. They lack the economy of scale to spread costs over many users, and they often lack commercial or industrial users who could contribute revenues.

In addition to economy of scale, other unique challenges faced by small DACs and SDACs include:

- Geographic isolation, making consolidation challenging
- Low revenues and high delinquency rates
- Small or nonexistent reserve funds
- Dependence on a sole source of water
- Small pools of interested, informed individuals who can run the water systems and governing boards
- Lack of equipment and other resources
- Lack of access to technology in an increasingly technological world
- Limited ability to hire paid staff or consultants
- Isolation or exclusion from regional or state dialogue around water policy
- Lack of office space and record storage

4.5.2 Participation and Involvement of Disadvantaged Communities in IRWMP

The purpose of this section is to describe the involvement of the disadvantaged communities in the Kings Basin IRWM planning process.

The IRWMA undertook proactive steps to ensure inclusion of the disadvantaged communities' needs and interests in the planning process of the IRWMP and in the regional project definitions. After the disadvantaged communities' representatives were identified, the IRWMA extended an invitation to attend the IRWMA meetings. Meeting minutes and educational materials were made available to the representatives to help them become familiar with the IRWMA's efforts in developing the IRWMP. The opportunity to join the IRWMA was also extended to interested disadvantaged communities. Several communities that met the criteria for disadvantaged communities have joined the IRWMA in the last five years. IRWMA Members and Interested Parties who are DACs are listed in **Table 4-3**. The region also includes many unique DACs who are not IRWMA Members or Interested Parties, listed in **Table 4-2**. The disadvantaged communities, as members of the IRWMA, participated in the development of the Goals and Objectives for the IRWMP. Additional outreach efforts targeted underrepresented communities that were unincorporated. For the DAC communities that remained unrepresented, the IRWMA recruited the services of Self-Help Enterprises, Tulare County, and Community Water Center to identify and provide needs assessment of the unincorporated disadvantaged communities. The needs assessment and a discussion of possible DAC projects can be found in the Kings Basin Water Authority DAC Pilot Project – Final Report, which will be available in late 2012 or early 2013.

Table 4-2: Unincorporated Disadvantaged Communities

Community Name	County	Estimated Dwellings	Estimated Population	2000 US Census Bureau Decennial Census		2005-2009 American Community Survey				Income Surveys		
				MHI	% of State MHI	MHI	Margin of Error	% Margin of Error	% of State MHI	MHI	% of State MHI	Survey Year
Alhambra 1 MHP†	Fresno		50			$35,572	GIS Block Group		59%			
Alkali Flats†	Fresno	100		$23,262	49%	$21,607	±$17,783	82%	36%			
Bar 20 Partner†	Fresno	15	60			$35,000	GIS Block Group		58%			
Beran Way (FCSA #39 A&B)	Fresno	34	158	$30,385	64%	$38,036	±$14,163	37%	63%			
Biola	Fresno	250	1,200	$32,667	69%	$36,094	±$33,007	91%	60%			
Burrel†	Fresno	16		$31,538	66%	$34,271	±$6,380	19%	57%			
Calwa†	Fresno	227	762	$29,983	63%	$31,528	±$18,829	60%	52%			
Camden Trailer Park†	Fresno	25	100	$25,982	55%	$83,214	±$74,919	90%	138%			
Caruthers†	Fresno	672	2,103	$40,109	84%	$41,731	±$11,093	27%	69%	$29,750	49%	2007
Centennial Apartments	Fresno		100			$37,371	GIS Block Group		62%			
Centerville†	Fresno	14		$21,932	46%	$88,490	±$42,849	48%	147%			
Clarin Apartments	Fresno		100			$30,602	GIS Block Group		51%			
Clover MHP	Fresno		50			$23,003	GIS Block Group		38%			
Country View Alzheimer Center	Fresno	2	100	$41,667	88%	$44,821	±$59,845	134%	74%			
Cutler†	Tulare	1,197	6,300	$24,330	51%	$31,105	±$3,143	10%	52%			
Date Street†	Fresno	22	22	$27,895	59%	$29,333	±$21,519	73%	49%			
Del Rey†	Fresno	240	950	$26,458	56%	$43,281	±$12,335	28%	72%			
Delft Colony†	Tulare	100	400	$27,857	59%	$50,278	±$78,604	156%	83%			
Double L Mobile Ranch Park†	Fresno	37	80	$27,895	59%	$29,333	±$21,519	73%	49%			
Doyal's MHP†	Fresno	15	22			$35,000	GIS Block Group		58%			
Easton	Fresno	623	1,966	$31,172	66%	$40,426	±$3,497	9%	67%			

Community Name	County	Estimated Dwellings	Estimated Population	2000 US Census Bureau Decennial Census		2005-2009 American Community Survey				Income Surveys		
				MHI	% of State MHI	MHI	Margin of Error	% Margin of Error	% of State MHI	MHI	% of State MHI	Survey Year
Easton Estates Water Company	Fresno	106	371	$28,750	61%	$39,213	±$5,314	14%	65%			
East Orosi†	Tulare	102	426	$26,071	55%	$26,163	±$1,091	4%	43%			
Elm Court†	Fresno	14	40	$25,741	54%	$29,063	±$9,754	34%	48%			
El Monte Village MHP	Tulare	49	100	$43,333	91%	$68,250	±$23,015	34%	113%	Recommend survey		
Fred Rau Dairy†	Fresno	24	80			$34,402	GIS Block Group		57%			
George Cox Water System	Fresno	20	40	$33,750	71%	$49,063	±$44,343	90%	81%			
Gleanings For The Hungry	Tulare	12	31	$30,987	65%	$42,321	±$18,575	44%	70%			
Golden State Trailer Park†	Fresno		50			$24,809	GIS Block Group		41%			
Gravesboro†	Fresno		45			$34,098	GIS Block Group		56%			
Green Acres Mobile Home Estate	Fresno	112	300	$31,483	66%	$38,720	±$7,106	18%	64%			
Hacienda†	Fresno		2			$24,809	GIS Block Group		41%			
Hamblin	Kings	40	240	$31,250	66%	$47,500	±$27,260	57%	79%			
Hardwick	Kings	40	150	$31,786	67%	$53,750	±$12,624	23%	89%	$23,000	38%	2010
Home Garden†	Kings	450	1,750	$25,450	54%	$33,092	±$7,697	23%	55%			
Kamm Ranch Company†	Fresno		1			$34,402	GIS Block Group		57%			
Kings Park Apartments†	Fresno	40	120	$19,668	41%	$26,635	±$9,407	35%	44%			
Lacey Courts MHP	Kings		50			$37,203	GIS Block Group		62%			
Lanare†	Fresno	169	600	$26,375	56%	$36,806	±$10,029	27%	61%			
Laton	Fresno	454	1,236	$35,408	75%	$54,792	±$15,587	28%	91%			
Linda Vista Farms†	Fresno	26	40			$26,300	GIS Block Group		44%			

Community Name	County	Estimated Dwellings	Estimated Population	2000 US Census Bureau Decennial Census		2005-2009 American Community Survey				Income Surveys		
				MHI	% of State MHI	MHI	Margin of Error	% Margin of Error	% of State MHI	MHI	% of State MHI	Survey Year
London†	Tulare	450	2,014	$21,678	46%	$38,701	±$5,934	15%	64%			
Lopez Labor Camp	Tulare	25	50	$31,736	67%	$37,311	±$18,597	50%	62%			
Maddox Dairy†	Fresno		3			$31,543	GIS Block Group		52%			
Malaga†	Fresno	448	900	$28,983	61%	$33,092	±$23,330	71%	55%			
Mayfair†	Fresno		1,300	$23,293	49%	$24,375	±$8,143	33%	40%			
Millbrook Mobile Home Village	Fresno		50			$38,809	GIS Block Group		64%			
Monmouth	Fresno		40	$37,404	79%	$46,696	±$8,742	19%	77%			
Monson	Tulare	40	200	$38,750	82%	$39,375	±$6,620	17%	65%	$15,000	25%	2010
Monte Verdi FCSA #44D)	Fresno	125	500			$40,395	GIS Block Group		67%			
Norseman Mobile Home Park	Tulare	31	70	$44,063	93%	$73,529	±$32,868	45%	122%	Recommend survey		
Old Fig Garden	Fresno		290			$45,591	GIS Block Group		75%			
Orosi†	Tulare	1,870	7,318	$30,400	64%	$34,394	±$9,206	27%	57%			
Parkland A.G. †	Fresno		13			$25,000	GIS Block Group		41%			
Perry Colony†	Fresno	50		$33,043	70%	$28,889	±$13,716	47%	48%			
Raisin City†	Fresno	60	350	$24,167	51%	$13,056	±$9,359	72%	22%			
Riverdale	Fresno	930	3,000	$29,886	63%	$39,555	±$12,806	32%	65%			
Rubys Valley Care Home	Fresno	1	158	$38,264	81%	$41,118	±$8,183	20%	68%			
Seville Water Company	Tulare	89	400	$41,827	88%	$45,536	±$13,335	29%	75%	$14,000	30%	2007
Shady Acre Trailer Park†	Fresno		50			$34,273	GIS Block Group		57%			
Shady Lakes MHP†	Fresno	56	130	$38,438	81%	$28,971	±$11,229	39%	48%			
Shasta MHP†	Fresno	12	20	$28,594	60%	$23,911	±$5,296	22%	40%			
Sultana	Tulare	224	750	$30,987	65%	$42,321	±$18,575	44%	70%			

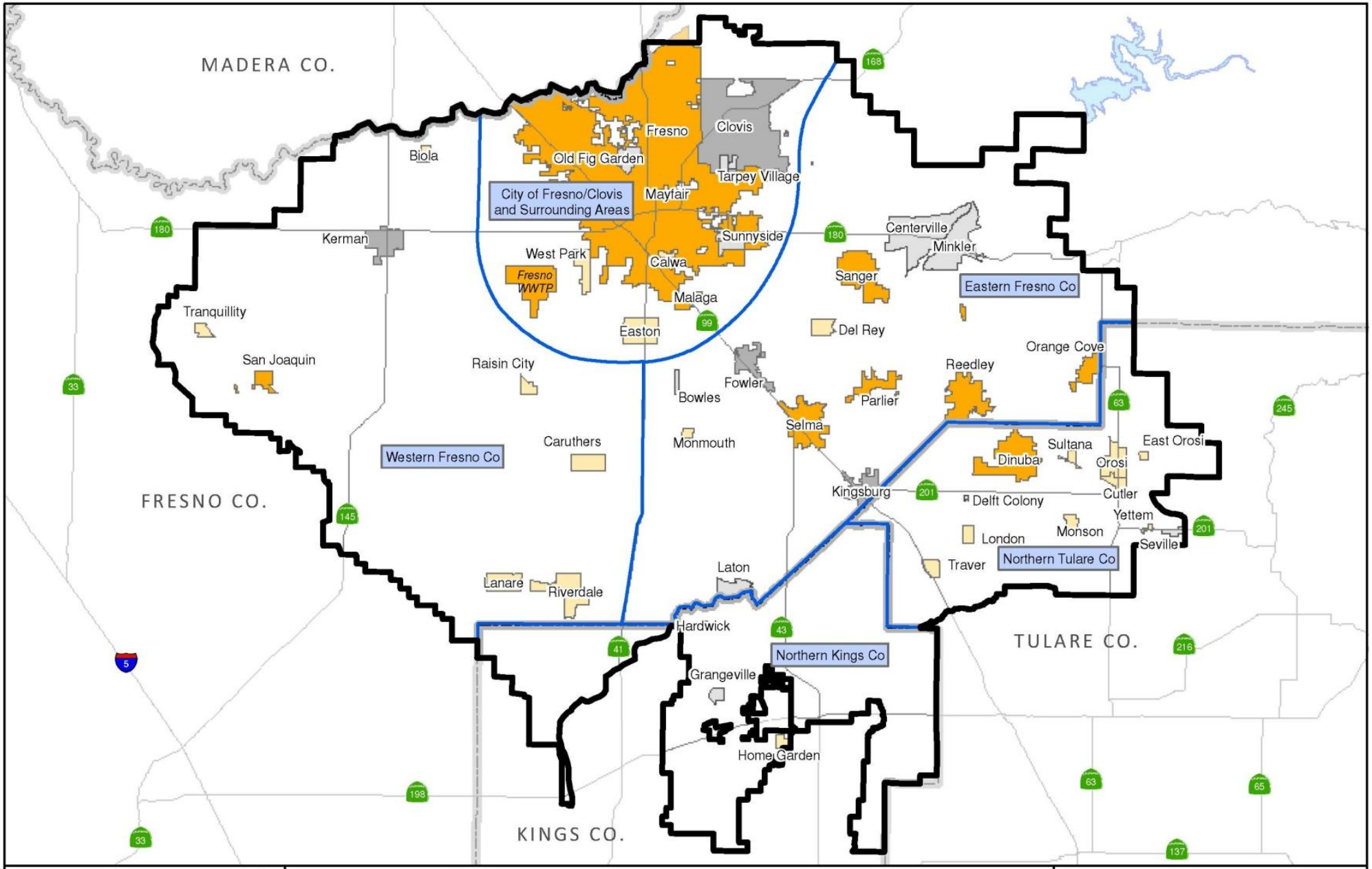
Community Name	County	Estimated Dwellings	Estimated Population	2000 US Census Bureau Decennial Census		2005-2009 American Community Survey				Income Surveys		
				MHI	% of State MHI	MHI	Margin of Error	% Margin of Error	% of State MHI	MHI	% of State MHI	Survey Year
Sunnyside Convalescent Hospital†	Fresno	3	116	$37,007	78%	$33,359	±$11,154	33%	55%			
Sunset West MHP	Fresno	162	239	$31,483	66%	$38,720	±$7,106	18%	64%			
The Willows	Fresno		10			$47,471	GIS Block Group		79%			
Three Palms MHP†	Fresno	101	202	$34,868	73%	$30,104	±$11,253	37%	50%			
Todd's Trailer Court†	Fresno		50			$34,273	GIS Block Group		57%			
Tranquillity†	Fresno	326	820	$29,259	62%	$24,352	±$39,164	161%	40%			
Traver†	Tulare	180	732	$24,500	52%	$37,212	±$6,041	16%	62%			
Valley Care and Guidance	Fresno		158			$39,770	GIS Block Group		66%			
Viking Trailer Park	Fresno	48	80	$33,000	69%	$68,403	±$17,908	26%	113%	Recommend survey		
Del Oro-Metropolitan (Watertek) †	Fresno	29	60	$20,976	44%	$17,667	±$25,819	146%	29%			
West Park (FCSA #39 A&B)	Fresno	100	158	$31,932	67%	$44,444	±$12,021	27%	74%			
William Hopkins Water System	Fresno	12	25			$44,909	GIS Block Group		74%			
Woodward Bluffs MHP	Fresno	167	300	$29,375	62%	$43,625	±$13,425	31%	72%			
Yettem†	Tulare	64	350	$31,736	67%	$37,311	±$18,547	50%	62%			
Zonneveld Dairy†	Fresno	34	141			$30,365	GIS Block Group		50%			

Notes:
† Community is designated as an SDAC by one or more of the datasets shown.

Table 4-3: IRWMA Member and Interested Party DACs

Community Name	IRWMA Designation*	County	Estimated Dwellings	Estimated Population	2000 US Census Bureau Decennial Census		2005-2009 American Community Survey			
					MHI	% of State MHI	MHI	Margin of Error	% Margin of Error	% of State MHI
City of Dinuba	M	Fresno	5,444	19,921	$33,345	70%	$39,845	±$2,493	6%	66%
City of Fresno	M	Fresno	162,943	457,908	$32,236	68%	$43,036	±$687	2%	71%
City of Parlier†	M	Fresno	3,339	13,067	$24,539	52%	$33,523	±$4,015	12%	56%
City of Reedley	M	Fresno	6,090	21,387	$34,682	73%	$44,100	±$3,710	8%	73%
City of Sanger	M	Fresno	7,223	24,021	$32,072	68%	$42,968	±$2,551	6%	71%
City of Selma	M	Fresno	6,844	22,498	$34,713	73%	$44,227	±$3,465	8%	73%
City of San Joaquin†	IP	Fresno	943	3,819	$24,934	53%	$26,640	±$2,747	10%	44%
Bakman Water Company†	IP	Fresno		13,960			$31,670			52%
Biola CSD	IP	Fresno	250	1,200	$32,667	69%	$36,094	±$33,007	91%	60%
Cutler PUD†	IP	Tulare	1,197	6,300	$24,300	51%	$31,105	±$3,143	10%	52%
East Orosi CSD†	IP	Tulare	102	426	$26,071	55%	$26,163	±$1,091	4%	43%
Easton CSD	IP	Fresno	623	1,966	$31,172	66%	$40,426	±$3,497	9%	67%
London CSD†	IP	Tulare	450	2,014	$21,678	46%	$38,701	±$5,934	15%	64%
Orosi PUD†	IP	Tulare	1,870	7,318	$30,400	64%	$34,394	±$9,206	27%	57%
Raisin City WD†	M	Fresno	60	350	$24,167	51%	$13,056	±$9,359	72%	22%
Riverdale PUD	IP	Fresno	930	3,000	$29,886	63%	$39,555	±$12,806	32%	65%
Sultana CSD	IP	Tulare	224	750	$30,987	65%	$42,321	±$18,575	44%	70%

Notes:
** M – Member; IP – Interested Party*
† Community is designated as an SDAC by one or more of the datasets shown.



EST. 1968
PROVOST & PRITCHARD
CONSULTING GROUP
An Employee Owned Company
286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

Figure 4-1

Kings Basin IRWMP

Disadvantaged Communities

5/19/2012 \\pineflat\dwg_dgn\Clients\Upper Kings Basin IRWMA - 2048\20481001 - IRWMP Update\GIS\Map\DACs_DWR.mxd

4.6 Kings Basin DAC Pilot Study

4.6.1 Purpose and Goal

Simultaneous to the preparation of the IRWMP, the Authority is conducting the Kings Basin DAC Pilot Study, which will culminate in the Kings Basin DAC Pilot Study Final Report. The Pilot Study boundary is coterminous with the Kings Basin Region.

The purpose of the Pilot Study is to engage and integrate the DACs into the Kings Basin IRWM planning process through DAC identification and outreach, needs prioritization, and project development with regards to water, sewer and flooding/storm drain issues. This purpose will be accomplished through several tasks and subtasks. Task 1 includes the identification, mapping and initial outreach to the DACs within the region. Task 2 includes organization of DAC workgroups, outreach meetings, project development and prioritization.

During Task 1, the Kings Basin Region was divided into several smaller, geographic regions to aid in communication, project development and collaborative efforts between DACs. Following the development of the sub-regions, the DACs were mapped, as shown in **Figure 4-1**, and a list was developed to facilitate initial contact with DAC representatives.

Initiation of Task 2 began with setting up community meetings for each sub-region. Each sub-region will have three to five community meetings, beginning with a general educational meeting, followed by information gathering and project identification meetings. Depending on the involvement, cooperation and depth of issues additional meetings will be held to further develop and prioritize possible projects.

Once the data gathering and outreach phases have been completed, the Pilot Study workgroup will compile its findings and fully develop three to five preliminary pilot project scopes and cost estimates for each sub-region, which will be detailed in the Final Report. These projects will be presented to the IRWMA for review and possible inclusion in the IRWMP Annual Report Project List, as discussed in Chapter 7.

4.6.2 Pilot Study References

During the course of the pilot study, the workgroup used several other studies and sources of information to identify known problems for disadvantaged communities. Those studies include:

- Tulare Lake Basin DAC Study (in progress)
- *Addressing Nitrate in California's Drinking Water with a focus on the Tulare Lake Basin and Salinas Valley Groundwater* (Harter Report, 2012).
- *Communities that Rely on Contaminated Ground Water* (SWRCB Report, 2012)

The Tulare Lake Basin (TLB) DAC Study, which overlaps the Kings Basin entirely, is a similar study being conducted simultaneous to the Pilot Study but with a much broader purview. The purpose of the TLB DAC Study is to identify feasibility studies and pilot projects with the end goal of developing an integrated water quality and wastewater treatment program plan for the entire basin. The Pilot Study used a shared data base with the Tulare Lake Basin Study for consistency and to eliminate the duplication of efforts.

The Harter Report and the State Water Resources Control Board report were used as a foundation to identify DAC's with known water quality problems and to incorporate them into the selection process for potential pilot projects.

The Harter Report was written in response to the 2008 passage of Senate Bill SBX2 1, which required the SWRCB to prepare a report to the legislature to "improve the understanding of the causes of [nitrate] ground water contamination, identify potential remediate solutions and funding sources to recover costs expended by the State…to clean up or treat groundwater, and ensure the provision of safe drinking water to all communities" (Harter Report, 2012). The University of California was contracted to prepare the report with a focus on the nitrates in the groundwater of the Tulare Lake Basin and a portion of Salinas Valley. The report categorizes its findings in 6 categories: sources of nitrate pollution, reducing nitrate pollution, groundwater nitrate pollution, groundwater remediation, safe drinking water supply, and regulatory, funding and policy Options

The SWRCB Report was written in response to Assembly Bill AB2222, which required the SWRCB to submit a report to the legislature that identifies: communities in California that rely on contaminated groundwater as a primary source of drinking water; the principal contaminants and constituents of concern; and potential solutions and funding sources to clean up or treat groundwater, or provide alternative water supplies (SWRCB Report 2010). The report identifies 682 communities with contaminated groundwater as their primary source and focuses on groundwater quality, not necessarily the quality of water served to the populations within the identified communities. Due to availability of data, the report does not discuss private water supplies or systems not regulated by the State. The proposed solutions in the report fall into three categories: pollution prevention, cleanup, and provision of safe drinking water through alternative water supplies or treatment.

4.7 Disadvantaged Community Issues

The DACs of the Kings Basin region have several significant obstacles to surmount in order to obtain safe drinking water, provide sewer services and plan for flooding/stormwater related issues. Those obstacles include water quality, Technical, Managerial and Financial (TMF) Capacity, economies of scale, aging or inadequate infrastructure, and geographical location.

4.7.1 Water Quality

Many DACs in the region have a long and documented history of water quality violations including nitrate, uranium, arsenic, volatile organics and a variety of other constituents. The contamination in some DACs is sufficient that the communities are, at times, issued "unsafe to drink" or "boil water" orders requiring the use of bottled water exclusively for consumption purposes.

Water quality contaminants in rural DACs and SDACs originate from a variety of sources. Some are naturally occurring, such as arsenic or uranium, which are indigenous to the geology of the area. Other contaminants are related to land use: point source and nonpoint source discharges from agriculture, food processing, dairies, and human wastes. The potential solutions are as varied as the contamination sources, and are difficult to standardize across multiple communities due to variables such as geographic location, local hydrologic conditions and chemistry, water system size, water source, and local preference. Solutions often include the following: drilling new or deeper wells, or modifying existing wells; to access different parts of the aquifer; treatment facilities including blending; and consolidation in a variety of forms. Occasionally, cease-and-desist orders may be issued to individual polluters, but typically this is not an immediate solution since many types of pollution tends to persist long after the discharge stops.

4.7.2 TMF Capacity & Economies of Scale

TMF Capacity refers to the ability of a community to have Board leadership and personnel with the necessary technical and managerial skills to run the facilities as well as the financial wherewithal of the community to afford the necessary steps required to obtain safe drinking water, provide sewer service or prevent flooding. TMF Capacity is an obstacle that DACs across the country struggle with on a continual basis.

Due to financial constraints, it is often difficult, if not impossible, for a DAC to offer the competitive salaries required to maintain a skilled staff. However, due to the income levels within a DAC, water providers are extremely restricted in their ability to raise rates in order to provide for higher salaries. The end result is a self-perpetuating cycle where the DAC citizens continue to pay for services that can be substandard or virtually non-existent, and the water provider struggles to meet basic expenses.

Economies of scale refer to the cost advantages that an enterprise obtains due to its relatively large size. Small DACs often come out on the losing side of the economy of scale ratio. They shoulder many of the same costs for maintenance, permitting, pumping and staffing as any other water system would, but with a smaller, poorer customer base over which to spread the cost. In this situation, the smaller DACs would often benefit from operating jointly with one or more other small DACs. Each DAC would then only be responsible for a portion of the staffs' salaries, operating costs, consultants cost, etc. By consolidating with other nearby DACs, they could potentially hire more skilled staff and solve a portion of the TMF capacity deficiencies.

Other TMF challenges exist. Small DACs can rarely afford to hire a true manager, so system management often falls by default to volunteer Board members, or to an administrative person that lacks proper technical training or experience. Staff turnover, poor management and technical deficiencies can result from this situation.

A small rate base also makes reserves accumulation difficult. Small water systems often find themselves stuck in a "reactionary" operations cycle, always putting out fires rather than planning ahead for capital improvements to the system. Some systems operate on a month-to-month basis like a family living from paycheck to paycheck.

These are only a few examples of the TMF challenges that DACs cope with. Closer scrutiny of individual communities reveals unique situations that carry unique problems and unique solutions. TMF is a focus area of both the Kings Basin DAC Pilot Study and the Tulare Lake Basin DAC Pilot Study.

4.7.3 Geographical Location

As discussed previously, several of the issues associated with the DACs can be solved by collaboration or consolidation with other nearby DACs. However, many of the DACs are geographically isolated or lack the clout to negotiate with a larger nearby communities. There needs to be a motivation for collaboration or consolidation with all parties. The efforts of the IRWMP are intended to provide a forum where DACs and non-DACs can come together to provide solutions to the regional water supply and quality issues, regardless of geography. The Pilot Study will identify geographic opportunities for solutions.

4.7.4 Aging or Inadequate Infrastructure

The water and wastewater infrastructure of many DACs is substandard or aging. The communities often lack public drinking water infrastructure and rely on shallow, inadequately constructed or sealed private wells or have old and severely leaking distribution systems that result in poor water pressure, bacterial contamination, and other drinking water challenges. Frequently, small DACs lack meters and are therefore unable to monitor water use or implement conservation policies effectively. Many small DACs also have inadequate or failing septic systems. The water and wastewater needs of small DACs are being inventoried through the Tulare Lake Basin DAC Water Study and Upper Kings DAC Pilot Study and will be further discussed in Chapter 12.

4.7.5 IRWMP Goals in Relation to DACs

The IRWMA and IRWMP plans to focus on continued outreach to the DACs and encouragement of participation in the IRWMA, as well as support project development and implementation to accomplish water quality Goals and Objectives as part of the Basin plan. The IRWMA will produce an annual report with an updated list of proposed projects in the region, which will include DAC projects that meet regional Goals and Objectives. To support this goal the IRWMA will be committed to fostering relationships

with the DACs and maintaining an updated list of the DACs within the region and their primary contact information.

5 GOALS AND OBJECTIVES

The Kings Basin Water Authority (Authority) developed regional Goals and Objectives to provide focus to their planning efforts. Goals are defined as the highest level priorities for the region, and objectives are more specific actions that can be taken to meet one or more of the goals. These Goals and Objectives are described below along with the process used to identify them.

5.1 Process and Organization

The process for the development of the regional Goals and Objectives included the following steps:

1. Review the previously developed regional Goals and Objectives in the 2007 Integrated Regional Water Management Plan (IRWMP),
2. Identify the August 2010 IRWMP Guideline requirements for Goals and Objectives, and
3. Consider changed conditions within the basin.

The Goals and Objectives were identified by the IRWMP Update Work Group and later approved by all of the members and interested parties.

To identify the region's Goals and Objectives, the Authority sought to understand the development and consensus building efforts. These were documented in several prior reports, including:

- The original Memorandum of Understanding (MOU) adopted in May 2001 by the Department of Water Resources (DWR), Kings River Conservation District (KRCD), Alta Irrigation District (AID), Consolidated Irrigation District (CID), and Fresno Irrigation District (FID);
- The Water Forum Concept Paper (Upper Kings Water Forum, 2004);
- Basin Assessment Report (WRIME, 2003b);
- IRWMP Guidelines (DWR, 2004);
- Existing IRWMP Goals and Objectives (2007 IRWMP);

The Goals and Objectives were also developed using recent State guidelines including 20x2020 Water Efficiency Goals; and requirements of California Water Code (CWC) §10540(c).

The existing IRWMP includes Goals and Objectives listed in several areas of the IRWMP, and the August 2010 IRWMP Guidelines requires further clarification to develop a clear understanding and relationship of Goals, Objectives, Resource Strategies and Projects. The Kings Basin has organized the hierarchical pyramid and definitions shown in **Figure 5-1**. It is important to understand one Resource Management Strategy may apply to more than one Measurable Objective, and similarly

one Measurable Objective may apply to more than one Goal. The Goals and Objectives incorporate adaptation for climate change considerations.

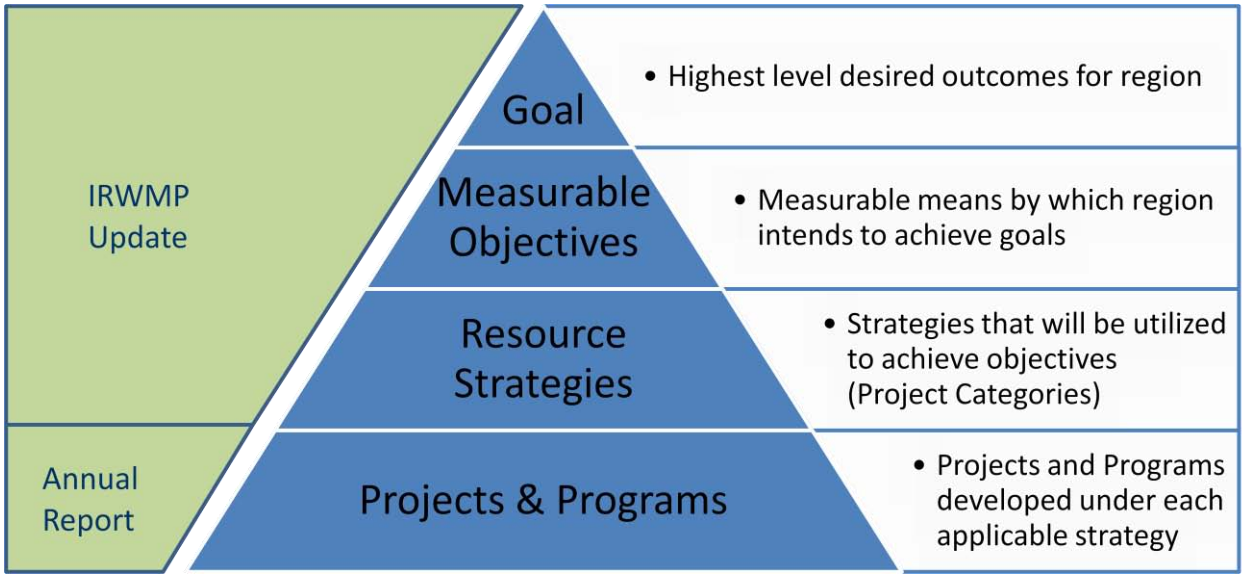


Figure 5-1: Goals and Objectives Hierarchy

The goals and measureable objectives are discussed in the two following sections. Resource Management Strategies are discussed in Section 6, and Projects and Programs are listed in Appendix A.

5.2 Regional Goals

The review of the existing goals determined that the primary goals for the Region listed in the 2007 IRWMP remain the highest level priorities for the Region. These Regional Goals (RG) remain the primary goals for the region and are listed below. Correction of the overdraft has previously been considered the highest priority for the entire region, however within certain areas of the region and for certain stakeholders, water quality and water reliability are higher priorities than overdraft correction. The RGs have not been ranked, but have been identified with a number to clarify relationships between objectives, resource management strategies, and projects. These goals were seen as the highest level priorities for the region, consolidating urban, agricultural and environmental concerns.

Table 5-1: Regional Goals

No.	Goal
RG1	Halt, and ultimately reverse, the current overdraft and provide for sustainable management of surface and groundwater
RG2	Increase the water supply reliability, enhance operational flexibility, and reduce system constraints
RG3	Improve and protect water quality
RG4	Provide additional flood protection
RG5	Protect and enhance aquatic ecosystems and wildlife habitat.

5.2.1 RG1 – Halt the Current Overdraft and Provide for Sustainable Management of Surface and Groundwater

Groundwater overdraft continues to be a significant concern for the Kings Basin. The Kings Basin Integrated Groundwater and Surface Water Model (IGSM) provided the technical basis for quantifying the existing and potential future overdraft (WRIME 2007b). The model and related technical work helped the region by providing data and analysis results to conclude that a primary water management goal should be to "halt and ultimately reverse the current overdraft of the groundwater aquifer". This goal will help lead to overall maintenance or improvement in the quantity, quality and cost of development of groundwater resources in the region. Overdraft increases the competition for the available supply and creates conflicts between agricultural, environmental, and urban water users, and between geographic areas within the region. Declining groundwater levels and groundwater migration across jurisdictional boundaries are also a potential source of increased conflict. This goal integrates the surface and groundwater management that can then reconcile and measure project benefits over time with current baseline data shown in a basin water balance format.

5.2.2 RG2 – Increase Water Supply Reliability, Enhance Operational Flexibility, and Reduce System Constraints

Water demand has exceeded the available surface and groundwater supplies as they are currently developed and managed with the existing capital facilities and institutional arrangements. A reliable surface water supply is not assured in normal and dry years. Groundwater makes up the balance of urban and agricultural water demands when surface water is not available. In addition, some areas in the basin are entirely reliant on groundwater. Therefore, the long-term sustainability and reliability of the surface and groundwater supply must be addressed in the IRWMP. Increasing operational flexibility and reducing system constraints are integrated into this goal.

5.2.3 RG3 – Improve and Protect Water Quality

Many areas within the region have significant groundwater quality concerns, limiting available suitable supply. Continued and further degradation of water quality and the migration of poor quality water are significant concerns in the overall operation of the groundwater basin. Therefore, existing water quality needs to be maintained or improved to ensure that there is water of acceptable quality to meet current and future agricultural, urban, and environmental requirements. Understanding the improvement from regional water quality projects in current areas of poor quality groundwater, i.e., nitrates, arsenic, dibromochloropropane (DBCP), is integrated into this goal.

5.2.4 RG4 – Provide additional flood protection

Flood protection levels within the region are varied, and major storm events in certain areas have the potential for significant impacts to existing land use. Regional and local flood control facility improvements will help better manage flood runoff, protect existing or proposed land uses of all types, and capture water to balance supply.

5.2.5 RG5 - Protect and enhance aquatic ecosystems and wildlife habitat.

The region is committed to aquatic ecosystem enhancement as demonstrated by the Kings River Fisheries Program (see Section 9.1). Protecting and enhancing the fisheries program and wildlife habitat within the region remains a priority goal for the region through the establishment of standalone ecosystem and wildlife programs, as well as incorporation of habitat improvements within new project development.

5.3 Measurable Objectives

Measurable Objectives were developed to accomplish the Goals of the Region. Objectives identified throughout the 2007 IRWMP were consolidated and measurements added. Combined with Goals of the region, the following Measurable Objectives (MO) address the requirements of CWC §10540(c). Some of the Objectives apply to multiple Goals for the Region, so the applicable Goals for each Objective are included in the table below.

Table 5-2: Measureable Objectives

No.	Applies To Goals	Objective	Measurement
MO1	RG1, RG2	Increase amount of groundwater in storage with intent to eliminate the groundwater overdraft in 20 years	Report of change in overdraft in accordance with Section 12.2 and net effect of new projects capacity/performance
MO2	All	Identify opportunities and Projects	List of projects and opportunities and their potential

No.	Applies To Goals	Objective	Measurement
MO3	RG1, RG2 RG3, RG4	Identify DAC priority needs and promote/support solutions to DAC water issues	DAC studies and project development/implementation
MO4	RG1, RG2 RG3, RG4	Increase average annual supply and reduce demand	Documentation of amount of increase/decrease
MO5	RG1, RG2	Increase dry year supply	Documentation of amount of increase
MO6	RG2, RG4	Increase regional conveyance capacity	Total AF available (both capacity and re-operation)
MO7	RG3	Compile baseline water quality data for ground & surface water	Report of data collected and evaluate changes in the basin in annual report by considering population served and compliance orders from available sources such as ECHO and SDWIS
MO8	RG3	Encourage Best Management Practices, policies & education that protect water quality	Documentation of efforts/education
MO9	RG3	Identify sources of water quality problems & promote/support solutions to improve water quality	Report of information gathered
MO10	All	Increase surface storage	Documentation of amount
MO11	RG5	Sustain the Kings River Fisheries Management Program	Report on program
MO12	RG5	Pursue opportunities to incorporate habitat benefits into projects	List of opportunities considered and accomplishments
MO13	All	Increase public awareness of IRWM Efforts	Public relations and annual reporting
MO14	All	Involve local water districts and land use agencies in generating and confirming the current and future water needs to ensure compatibility and consistency with land use and water supply plans.	Tracking of Involvement with land use planning officials and inclusion in planning documents.
MO15	RG1, RG2	Comply with SBx7-7	Review of compliance by stakeholders

5.4 Program Preferences

The State of California established 15 Program Preferences (formerly Program Preferences and Statewide Priorities) for IRWMPs. These Program Preferences are listed and briefly described in the DWR Proposition 84 and 1E IRWMP Guidelines (August 2010). The Program Preferences are specific topics that should be addressed in IRWMPs. Each Program Preference is addressed in this IRWMP, and they were also an important consideration in identifying Goals and Measureable Objectives. Table 5-3 lists the Measureable Objectives and with which Program Preference they are consistent.

Table 5-3: Program Preferences

No.	Program Preferences	Measurable Objectives														
		1 – Increase Groundwater Storage	2 – Identify Opportunities/Projects	3 – Identify DAC Needs and Solutions	4 – Increase Supplies / Reduce Demands	5 – Increase Dry Year Supply	6 – Increase Conveyance Capacity	7 – Compile Baseline Water Quality Data	8 – Water Quality Education	9 – Improve Water Quality	10 – Increase Surface Storage	11 – Sustain Kings River Fisheries	12 – Incorporate Habitat Benefits	13 – Increase Public Awareness of IRWMP	14 – Improve Water/Land Use Planning	15 – Comply with SB7x-7
1	Regional Project/Programs		◆													
2	Defined Hydrologic Region													◆		
3	Resolve Water Conflicts													◆	◆	
4	Bay-Delta Program Objectives															
a	Water Quality								◆	◆						
b	Levee Integrity										◆					
c	Water Supply Reliability				◆											
d	Ecosystem Restoration												◆			
5	Disadvantaged Communities			◆				◆	◆	◆				◆		
6	Integrate Water/Land Use Planning													◆	◆	
7	Stormwater Planning										◆				◆	
8	Drought Preparedness	◆			◆	◆					◆					
9	Water Efficiency				◆											◆
10	Climate Change Response				◆	◆	◆				◆	◆	◆			
11	Environment Stewardship											◆	◆			
12	Integrated Flood Management						◆				◆					
13	Protect Water Quality			◆				◆	◆	◆			◆			
14	Improve Tribal Resources													◆		
15	Equitable Distribution of Benefits		◆	◆					◆					◆		

6 RESOURCE MANAGEMENT STRATEGIES

6.1 Introduction

A resource management strategy (strategy) is defined as a project, program, or policy that helps local agencies and governments manage their water, and related resources (DWR, 2009 California Water Plan Update). Resource management strategies include structural and non-structural solutions. Structural solutions involve development of capital facilities such as conveyance structures (pipelines or canals), recharge ponds, and water treatment plants. Non-structural solutions are programmatic or policy solutions, such as drought response plans or water conservation ordinances.

The 2009 California Water Plan Update describes 33 different resource management strategies. The State does not expect that all strategies be practiced in every region, but encourages water managers to employ as many strategies as practical to diversify their water management portfolio. This Integrated Regional Water Management Plan (IRWMP) evaluates 33 strategies listed in the 2009 California Water Plan Update, as well as 'Drought Planning', a strategy added by the Kings Basin Water Authority (Authority) for a total of 34 considered strategies. The evaluations include the following:

- Description of the strategy
- Discussion of current use in Kings Basin
- Evaluation of applicability in the Kings Basin
- Constraints to development
- Impacts of climate change on the efficacy of the strategy
- Ability of strategy to help adapt to climate change impacts

The strategies were evaluated through an open and transparent process by the IRWMP Update Work Group and further considered by the Authority members & interested parties. The Work Group individually evaluated each strategy, identified which were applicable to the region, and discussed the future of the strategy.

Table 6-1 shows the 34 strategies that were evaluated and which are applicable to the Kings Basin. Those that are not currently applicable will be periodically reviewed as part of the IRWMP's adaptive management strategy. The Kings Basin actively uses 27 of the strategies and, as a result, maintains a diverse and comprehensive water management portfolio.

Table 6-1: Resource Management Strategies

Category	Strategy	Applicable to Region
Reduce water demand	Agricultural water use efficiency	X
	Urban water use efficiency	X
Improve operational efficiency and transfers	Conveyance - Delta	
	Conveyance - regional/local	X
	System reoperation	
	Water transfers	X
Increase water supply	Conjunctive management and groundwater storage	X
	Desalination	
	Precipitation enhancement	X
	Recycled municipal water	X
	Surface storage - CALFED	
	Surface storage - regional/local	X
Improve water quality	Drinking water treatment and distribution	X
	Groundwater remediation/Aquifer remediation	X
	Matching quality to use	X
	Pollution prevention	X
	Salt and salinity management	X
	Urban runoff management	X
Improve flood management	Flood risk management	X
Practice resource stewardship	Agricultural lands stewardship	X
	Economic incentives (loans, grants & water pricing)	X
	Ecosystem restoration	X
	Forest management	X
	Land use planning and management	X
	Recharge area protection	X
	Water-dependent recreation	X
	Watershed management	X
Other strategies	Crop idling for water transfers	X
	Dewvaporation or atmospheric pressure desalination	
	Fog collection	
	Irrigated land retirement	X
	Rainfed agriculture	X
	Waterbag transport/storage technology	
	Drought planning[1]	X

1 – Added by Kings Basin Water Authority

Following is a general description of each strategy and its use in the Kings Basin. Refer to the 2009 California Water Plan Update for further detail on each strategy.

6.2 Reduce Water Demand

6.2.1 Agricultural Water Use Efficiency

Agricultural water use efficiency can be improved through a variety of measures by the governing irrigation or water district, and by local growers. The 2009 California Water Plan Update lists 16 Efficient Water Management Practices (EWMPs) including:

- Water management plans
- Water conservation coordinator
- Water management services to water users
- Improve communication and cooperation
- Policy changes
- Facilitate alternative land use (drainage)
- Facilitate use of recycled water
- On-farm irrigation systems improvements
- Water transfers
- Canal lining and piping to reduce seepage
- Flexible water ordering
- Spill and tail-water recovery systems
- Conjunctive use of surface and groundwater
- Automate canal-control structures/telemetry
- Water measurement and water use reports
- Pricing or other incentives

These EWMPs are used throughout the Kings Basin, and are an important component of the regional water management strategy. Their use varies by irrigation and water district. In some areas, certain EWMPS are not used because they are not economical or practical. For instance, some districts do not line their canals because canal seepage is an important part of their conjunctive use program. Some EWMPs are implemented on a regional scale, such as the Agricultural Water Enhancement Project (AWEP), a program to help improve on-farm water management that is administered by Kings River Conservation District (KRCD) (see section 6.7.2 – Economic Incentives for more details).

Alta Irrigation District (AID), Fresno Irrigation District (FID), and KRCD are signatories to the Agricultural Water Management Council (Council) Memorandum of Understanding (MOU). The Council is a non-profit organization that promotes improvements in agricultural water efficiency, and provides technical assistance in preparing Agricultural Water Management Plans (AWMP), which documents successes and goals in implementing EWMPs.

California Senate Bill x7-7 (SBx7-7) requires agricultural water suppliers to prepare an AWMP by the end of 2012, which addresses each of the aforementioned EWMPs. Agencies that do not complete an AWMP will not be eligible for certain State grants or

loans. Water Management Plans prepared for the USBR or the Agricultural Water Management Council will be considered suitable replacements for the State AWMP.

Some obstacles to implementing EWMPs include: lack of grower interest, funding and cost-effectiveness, high water use efficiencies in some areas that reduce feasibility of further water conservation, and local conditions such as topography, micro-climates, etc., that make certain EWMPs impractical.

6.2.2 Urban Water Use Efficiency

Urban water use efficiency results in benefits to water supply and quality through technological and behavioral improvements that decrease indoor and outdoor residential, commercial, industrial, and institutional water use. The primary methods used to improve urban water use efficiency, often called best management practices (BMP) or demand management measures (DMM), are listed below:

- Water survey programs
- Residential plumbing retrofits
- Water system audits
- Metering
- Large landscape conservation programs
- Washing machine rebates
- Public information programs
- School education programs
- Conservation programs for commercial, industrial and institutional accounts
- Wholesale agency assistance programs
- Retail conservation pricing
- Conservation coordinator
- Water waste prohibition
- Low flow toilet replacement

All of these BMPs are practiced in the Kings Basin, but the level of practice varies by water agency. Large municipalities in the region (i.e. Fresno and Clovis) have extensive urban water conservation programs, but they can be difficult to fund and administer in smaller communities. New conservation measures are constantly being developed. For instance, in 2012 Fresno County is developing a water conservation ordinance for their 22 water districts that will include an emergency response plan and conservation rules.

The SBx7-7, also known as the Water Conservation Act of 2009, set a goal of reducing per capita water use by 20% by 2020. To meet these goals, some agencies will need to increase their urban water conservation efforts. Urban Water Management Plans are the primary document for recording urban water conservation measures. A list of agencies that have current Urban Water Management Plans (UWMPs) is provided in Section 13 – Relation to Local Water Planning.

Obstacles to implementing urban water use efficiency measures include funding, public acceptance, reduced revenue from lower water sales, and poor economics (other alternatives such as developing new water supplies may be less expensive).

6.3 Improve Operational Efficiency and Transfers

6.3.1 Conveyance- Delta

Delta conveyance includes managing, conveying and diverting water from the Sacramento-San Joaquin River Delta. The County of Fresno does depend on Delta conveyance with their Cross Valley Canal contract. They have a contract for 3,000 AF from the Shasta unit of the CVP. The water is delivered to Fresno County through a water exchange. While this isn't an integral part of the KBWA, a member entity of the IRWMP does have very tenuous connection to the Delta and conveyance.

6.3.2 Conveyance – Regional/Local

Conveyance provides for the movement of water from the source to areas of need and includes natural channels and constructed facilities, such as canals, pipelines, pumping plants, and diversion structures. Conveyance facilities in the region range in size from small, local end-user distribution systems to large systems that deliver water within each of the irrigation districts. Specific objectives for natural and managed water conveyance activities include urban and agricultural water deliveries, flood management, consumptive and non-consumptive environmental uses, and recreation.

Some conveyance facilities have physical restrictions that limit the volume of water that can be delivered during flood releases, or the volume delivered during peak summer demand period. In some instances, the irrigation systems distribution infrastructure is used by urban areas to convey storm water and this can limit the ability to divert and recharge flood water. Greater conveyance capacity's improved automation and controls can increase operational flexibility, and could be used to deliver surface water to water treatment plants or areas that currently rely on groundwater for their water needs.

Enterprise Flume and Canal - Fresno Irrigation District

Demand for higher conveyance capacity may increase if climate change modifies the timing and volume of river and stream flows. Increased capacity may be needed to deliver water during different times of the year, or to deliver high volumes during short durations.

6.3.3 System Reoperation

System reoperation involves changing existing operation procedures for existing reservoirs and conveyance facilities to increase water related benefits. System reoperation may improve the efficiency of existing water uses or it may increase the emphasis of one use over another. For instance, system reoperation could involve changing reservoir release schedules to improve fisheries or provide flood control. Reoperation may require new facilities or permits, and is sometimes legally challenged.

The Kings River water rights are managed by the Kings River Water Association (KRWA). The primary guidebook for managing Kings River water is the KRWA "Blue Book", which defines the operational policies for the 28 members with water rights to the Kings River. The Blue Book has been instrumental in reducing conflicts between water users, managing available surface supplies, and resolving water rights disputes and interregional water rights issues in the IRWMP Region.

KRWA, KRCD and the California Department of Fish and Game (DFG) jointly developed the innovative Kings River Fisheries Management Program. The program is a voluntary effort by water users to enhance fisheries in the Kings River through a temperature control pool in Pine Flat reservoir, increases in minimum river releases, and several other measures. The program has been successful at improving the local fisheries with support from KRWA members.

Whole scale reoperation of the Kings River is not considered feasible after the improvements made by the Kings River Fisheries Management Program, and legal obligations and water rights documented in the Blue Book. It is believed that Kings River water supplies are being operated as efficiently as possible, within existing legal obligations. However, individual members, such as irrigation districts, may be able to adjust operations to reduce spills, although spills are still relatively low in the Kings Basin. The Fresno Metropolitan Flood Control District (FMFCD) suggested there may be potential to re-operate flood flows at Big Dry Creek Reservoir, although additional study is needed. Changes in water demands and climate change could provide the need for re-operation, and consequently re-operation options will be periodically evaluated.

6.3.4 Water Transfers

Water transfers are defined in the California Water Code (CWC) as a temporary or long-term change in the point of diversion, place of use, or purpose of use as a result of a transfer or exchange of water or water rights. Water transfers can help areas obtain new water supplies, increase supply reliability, reduce or eliminate overdraft, or generate revenue if water is transferred out. Water transfers have become a common part of the local water management landscape. Constraints to water transfers in the Kings Basin include: 1) consistency with KRWA and other local policies; 2) local and state political acceptability; 3) regulatory issues; 4) cost; and 5) availability of facilities.

Water transfers can be intra-basin or inter-basin. Intra-basin transfers have historically occurred between KRWA member water districts. Intra-basin transfers can be useful for conjunctive use projects, and to reduce the volume of water that flows out of the Basin in wet years. Inter-basin transfers into the Kings Basin could create a new source of water to improve supply reliability, and make use of available groundwater storage. Inter-basin transfers from the San Joaquin River via the Friant Division of the Central Valley Project (CVP) historically have occurred. Water-rights issues would need to be resolved through KRWA and possibly State Water Resources Control Board (SWRCB) if transfers were to occur outside of the Kings River place of use. Both intra-basin and inter-basin transfers are viable strategies in the Kings Basin and present opportunities to increase water supplies. In the near term, priority should be on transfers and exchanges within the KRWA area since these are less complex and controversial. In the longer term, the Kings Basin will consider transfers, exchanges, and water banking with interests outside of the area so long as there are tangible, measurable water supply benefits to the Kings Basin.

6.4 Increase Water Supply

6.4.1 Conjunctive Management and Groundwater Storage

Conjunctive management, also referred to as conjunctive use, is the coordinated and planned management of both surface and groundwater resources in order to maximize their efficient use. Conjunctive management is used to improve water supply reliability and environmental conditions, reduce groundwater overdraft and land subsidence, and protect water quality. Since overdraft has a great potential for causing conflicts within the Kings Basin, the Authority has established conjunctive management and groundwater storage as the primary focus of the IRWMP. Overdraft has the greatest potential to result in conflicts between water users, result in economic losses to both urban and agricultural economies, and impacts to the environment.

Groundwater Recharge in the City of Clovis

Conjunctive use includes several components including recharge, followed by groundwater use during dry periods, and a robust monitoring program to help prevent negative impacts and verify the quantity of water in storage.

Conjunctive management has great potential to increase groundwater storage and water reserves. Pine Flat Reservoir can store upwards of 1,000,000 acre-feet (AF) of water. However, the Kings Basin has an available storage capacity of 93,000,000 AF to a maximum depth of 1,000 feet (DWR, 2006 Bulletin 118 Basin Description).

The Kings Basin has a long history of conjunctive use that has resulted in significant water supply benefits. The history of success, familiarity with conjunctive use operations, and demonstrated benefits of such approaches will make it easier for the area to further expand the conjunctive use program. WRIME (2006f) prepared a Regional Conjunctive Use Feasibility Study to evaluate the potential for expanding the existing programs; provide a basis of design for additional facilities; and evaluate the scientific and technical merit of proposed projects. Figure 6 in the feasibility study is a map of 'Recharge Potential Index', which identifies areas with high potential for recharge.

Surface water sources in the area, San Joaquin River and Kings River, are fully appropriated, but they do offer surplus flows in wet years. Another possible source is imported water obtained through purchase, exchange or transfer. The region has considerable capacity to absorb wet year waters, but there is still substantial potential for new facilities. In 2011, approximately 500,000 AF of Kings River water flowed out the Kings Basin area through the Kings River and its distributaries.

Water ponded in recharge basins can also be used to meet local demands. The FMFCD is now using surface water in many basins as a source of landscaping within the basin. Irrigating areas outside, but near the basins, is also possible.

Constraints to developing conjunctive use facilities include:

- Access to prime recharge lands;
- High cost of purchasing land and developing recharge basins and recovery wells;
- Limitations in conveyance capacity to deliver water to basins;
- High operational costs, especially if recharged water is not later recovered and sold;
- Risk that water stored cannot be extracted when needed because of infrastructure, water quality or water level, politics, and institutional or contractual provisions;
- Lack of assurances to prevent third-party impacts and increase willingness of local citizens to participate;
- Potential for recharge to cause migration of known contaminants that would affect municipal or domestic supplies.

In the long term, the Authority should seek opportunities for interregional conjunctive use programs that include water importation and groundwater banking involving third parties, as long as these projects benefit the Kings Basin and appropriate safe guards are established.

6.4.2 Desalination

Desalination is a water treatment process for the removal of salts from water for beneficial use. Desalination is not only used on seawater, but also on low-salinity (brackish) water from groundwater or other sources. In California, reverse osmosis is

the principal method for desalination. This process can also be used to remove other specific contaminants in water, such as trihalomethane precursors, volatile organic carbons, nitrates, and pathogens. The benefits of desalination include:

- Increased water supply;
- Reclamation and beneficial use of impaired waters;
- Increased water supply reliability during drought periods;
- Diversified water supply sources;
- Improved water quality; and
- Public health protection.

The constraints for desalination in the Kings Basin include lack of saline water sources, cost for plant construction and operation, and brine disposal. These constraints limit the applicability of desalination for the IRWMP Region. There are no current opportunities for desalination and it is not a viable strategy for the region.

6.4.3 Precipitation Enhancement

Precipitation enhancement, commonly called 'cloud seeding', artificially stimulates clouds to produce more rainfall or snowfall than would naturally occur. This is performed by injecting seeding agents into the clouds that enable snowflakes and raindrops to form more easily. Precipitation enhancement is not a remedy for drought, since opportunities are generally fewer in dry years. Rather, it works better in combination with surface or groundwater storage to increase 'average' supplies. Most projects suspend operations during very wet years once enough snow has accumulated to meet their water needs.

Aerial Cloud Seeding

Cloud seeding has been conducted for the Kings River watershed since the 1950's through the Kings River Weather Modification Program. The program is the longest running cloud seeding operation in California. The core operational project period is December through March, with the possibility of extending the period due to water supply conditions. The program utilizes the following methods: 1) aircraft seeding of storms as they approach the Sierra foothills upwind of the target area, and 2) seeding using an array of ground-based seeding generators in the foothills. Both seed modes are targeting the pool of low-altitude supercooled liquid water that develops in-cloud over the windward slopes of mountain barriers.

Analyses of the seeding effectiveness have been made at intervals throughout the project's history. A recent published estimation indicates a long-term average increase in Pine Flat Reservoir inflow of about "5.1%, with 90% confidence that the true effect of

seeding is somewhere between +1.5% and +8.8%" (Silverman, 2007). Recent estimations using April 1 snowpack data indicate that, over the full seeded history of the project, an average increase of approximately 4% to 6% has occurred. These numbers fall within the range of 2 to 15 percent cited by the 2009 California Water Plan Update for other successful cloud seeding programs.

Climate change could impact the timing and nature of precipitation events, making it difficult to operate cloud seeding operations since past weather may not be good indicators of future conditions. However, in the snow zone, cloud seeding could offset some of the loss in snowpack expected from global warming. According to the 2009 California Water Plan Update, the State should support research on potential new seeding agents, particularly ones that work at high temperatures. Global warming may limit the effectiveness of silver iodide, the most commonly used agent, which requires cloud temperatures well below freezing, around -5°C, to be effective.

6.4.4 Recycled Municipal Water

Recycled water can be used for a variety of purposes depending on its level of treatment. Some common uses include non-edible crop irrigation, freeway landscaping, groundwater recharge, and industrial processes. The State is supporting the use of reclaimed wastewater as documented in the State Water Plan and the recommendations of California's Recycled Water Task Force (DWR, 2003b). The California Department of Public Health (CDPH) has produced "The Purple Book," which contains health laws related to reuse of recycled water (CDPH, 2001b). CDPH defines the appropriate legal uses based on the level of treatment (primary, secondary, or tertiary). One of the most common uses for recycled water is groundwater recharge. However, groundwater recharge projects that use reclaimed wastewater require CDPH and Regional Water Quality Control Board (RWQCB) approvals based on effluent quality and quantity, spreading area operations, soil characteristics, hydrogeology, residence time, and distance to withdrawal.

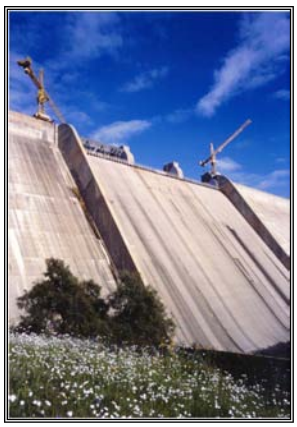
Within the Kings Basin there is more than 100,000 AF/year of wastewater that is treated. Most of this water is percolated to the groundwater or evaporated. The City of Fresno has a reclamation facility, North Fresno Regional Wastewater Reclamation Facility, which treats wastewater for landscape irrigation. The City of Clovis also has a program for directly using recycled water. To increase direct use of recycled water the region would need to make substantial investments in new treatment and distribution infrastructure. Obstacles to using recycled water include the high cost, lack of water supply benefits when recycled water is already being recharged, regulatory issues, public acceptance, and marketability of recycled water. However, the region recognizes that some recycled water supplies are an untapped source, and they will gradually be developed as demands increase.

6.4.5 Surface Storage – CALFED

The CALFED Bay-Delta Program, also known as CALFED, was a department within the government of California that focused on interrelated water problems in the state's Sacramento-San Joaquin River Delta. In 2009, CALFED was replaced by the Delta Stewardship Council. 'CALFED Surface Storage' is the legacy name for a resource management strategy to improve surface storage while simultaneously improving conditions in the Delta. The CALFED Surface Storage strategy includes five potential surface storage reservoirs in California. A surface water storage project in the upper reaches of the San Joaquin River could provide water supply benefits to Friant CVP contractors in the Kings Basin (see **Table 3-3**).

6.4.6 Surface Storage – Regional/local

Surface storage is the use of on- or off-stream reservoirs to collect water for later release and use. Pine Flat Reservoir has played an important role in the region where the pattern and timing of water use does not match the natural runoff pattern. The reservoir has provided historical benefits in the areas of conjunctive management and flood control. KRCD, KRWA, and the US Army Corps of Engineers manage Pine Flat Reservoir and upstream reservoirs to provide storage for KRWA members. Friant Dam provides storage and regulation of San Joaquin River water.



Friant Dam on the San Joaquin River

Smaller storage projects include reservoirs on the Fresno Stream group that provide flood control and some storage benefits. Building large-scale surface storage in California and the nation as a whole is difficult because most of the prime sites already have been dammed and regulatory, political, and economic constraints make planning for and construction of dams extremely slow and difficult. Small-scale reservoir projects may hold more promise due to the significant expense of developing large-scale surface storage. Off-channel reservoirs have been successfully developed by irrigation and water districts in the San Joaquin Valley, and offer potential to some local agencies. In the future, if climate patterns change causing reduced snow pack and increased winter runoff, the priority for surface storage for water supply and flood control purposes could change.

6.5 Improve Water Quality

6.5.1 Drinking Water Treatment and Distribution

Providing a reliable supply of safe drinking water is the primary goal of municipal water systems. To achieve this goal adequate water treatment and distribution facilities are needed. Water treatment must meet State and Federal drinking water standards. The primary constraints to developing water treatment and distribution systems include high capital cost, high O&M cost, and opposition to higher water rates. Climate change

could impact water quality and impact the need for or type of water treatment provided. For instance, more intense precipitation could increase turbidity, and higher temperatures may lead to eutrophic conditions in storage reservoirs.

Most cities in the Kings Basin rely on groundwater to meet municipal needs. Aging infrastructure, urban growth, more strict water quality standards and rising treatment costs pose challenges. The Cities of Clovis and Fresno have constructed surface water treatment facilities to reduce reliance on overdrafted groundwater and to make use of available surface water supplies. Use of surface water in-lieu of groundwater helps reduce overdraft and leaves water in storage in the groundwater basin for use in dry years when surface supplies are less available. Other areas in the basin will likely follow this trend. Construction of regional treatment plants, shared by multiple agencies, could be more economical than constructing several separate plants.

Water Storage Tank in Western Fresno County

6.5.2 Groundwater Remediation/Aquifer Remediation

Groundwater remediation involves extracting contaminated groundwater from the aquifer, treating it, and discharging it to a water course or using it for some other purpose, or injecting it back into the aquifer. Contaminated groundwater can result from a multitude of both naturally occurring and anthropogenic sources. Remediation results in an additional water source that would not be available without remediation, but groundwater treatment is expensive and years or decades may be required to remediate contaminated groundwater sites. Groundwater in the Kings Basin is remediated in numerous locations under the jurisdiction of regulatory programs. These projects typically address specific plumes.

6.5.3 Matching Quality to Use

Matching water quality to use is a strategy that attempts to match water uses with the appropriate water quality. This strategy also tries to avoid using high quality water for certain uses that do not require it. In the Kings Basin, providing treated surface water to municipalities in-lieu of groundwater follows this strategy since groundwater underlying many municipal areas requires treatment. This approach also provides groundwater storage benefits. The groundwater of diminished quality can be applied to other uses, such as irrigation. In addition, re-using wastewater effluent, non-potable surface water

or canal water for groundwater recharge or landscape irrigation are further examples of matching quality to use in the Kings Basin. Obstacles to matching quality to use are public acceptance of using lower quality water (even if it acceptable for the intended use), and the geographical distribution of the water supplies with different qualities, which may not be in or near places they can be beneficially used.

6.5.4 Pollution Prevention

For the vast majority of contaminants, it is generally accepted that a pollution prevention approach is more cost-effective than end-of-the-pipe treatment of wastes or advanced water treatment for drinking water. However, because of the nature and sources of some contaminants, a pollution prevention approach may not be possible, cost-effective, or desirable in some instances. In the Kings Basin, pollution prevention is practiced primarily through regulatory programs for irrigation, confined animal facilities, urban activities, wastewater disposal, and industrial activities. Some water facilities are also fenced, or access is limited, partly to help preserve good water quality. Pollution prevention also overlaps with the Forest Management and Watershed Management strategies that aim to reduce eroded sediment and pollution from entering water sources.

6.5.5 Salt and Salinity Management

Salt and salinity management includes efforts to limit buildup of salts in the soil and water, and mitigate lands currently impacted by salts. Salinity problems in the groundwater and soil are not prevalent in the Kings Basin, but the western side of the Basin does have noticeably higher salinity levels than the eastern end. Nevertheless, the region is participating in several programs to manage salinity and limit salt buildup in the soil, wastewater and groundwater. These measures include:

1. Participation in the Irrigated Lands Regulatory Program, which monitors salt contents in water supplies;
2. Encourage growers to use surface water over groundwater; and
3. Educational materials prepared by the City of Fresno on how to reduce salt pollution from daily urban activities;
4. Participation in the Central Valley Salts Coalition.

6.5.6 Urban Runoff Management

Urban runoff management is a broad series of activities to manage both storm water and dry weather runoff. Dry weather runoff occurs when, for example, excess landscape irrigation water flows to the storm drain. Urban runoff management has the primary goal of preventing damage from stormwater or urban water used, but should also consider multiple purposes

Urban Runoff Facilities

such as water supply and habitat enhancement. Increased urbanization also may result in increased paved areas and runoff. This serves to change the local conditions and may affect groundwater recharge of natural precipitation. Consequently, including groundwater recharge as part of stormwater management is considered very important in the Kings Basin.

The FMFCD manages urban runoff in a large portion of the urban area in the Kings Basin. Several other cities and districts also provide urban runoff management. The Cities of Fresno and Clovis, through FMFCD and with the assistance of FID, capture stormwater through joint-use facilities designed for both flood control and groundwater recharge. Some recharge/retention ponds also provide recreational benefits. The Fresno and Clovis General Plans, FMFCD Service Plan, and FID policies provide good examples of how recharge/retention ponds and canal facilities can be integrated to meet multiple objectives. FMFCD's urban drainage basins are considered a regional Low Impact Development (LID) measure in the State's Water Plan.

6.6 Improve Flood Management

6.6.1 Flood Risk Management

Flood risk management is a strategy that assists individuals and communities in managing flood flows to prepare for, respond to, and recover from a flood. Some examples of flood risk management include levees, floodwalls, floodplain zoning, floodplain function restoration, disaster preparedness, and flood emergency response.

FMFCD manages floodwaters in a large portion of the urban area in the Kings Basin and KRCD manages the Pine Flat Dam and numerous levees along the Kings River. The Kings River is the major hydrologic features in the region that poses a flood risk. In addition, there are several smaller streams, creeks and sloughs in the Kings Basin. Flood risk management is important since many floodplain areas are developed with cropland or infrastructure. An existing levee system, maintained by KRCD, protects primarily rural agricultural lands along the Kings River. Other strategies for improving flood protection that supply both flood control and water supply benefits include recharge basins, off-channel reservoirs, and flood control basins. Climate change could increase the severity and intensity of flooding, necessitating prudent monitoring for changes in flooding, and intensive floodplain protection and management.

6.7 Practice Resource Stewardship

6.7.1 Agricultural Lands Stewardship

Agricultural lands stewardship broadly means the conservation of natural resources and protection of the environment on agricultural land. Land managers practice stewardship by conserving and improving land for food, fiber and bio-fuel production, as well as watershed functions, soil, air, energy, plant and animal and other conservation purposes. Agricultural land stewardship also protects open space and the traditional

characteristics of rural communities. As more land becomes developed in the Kings Basin, agricultural land will be increasingly relied on for flood control, water conservation, habitat preservation, and carbon sequestration, while maintaining ongoing production of crops. Some agricultural land stewardship examples include wind breaks, noxious weed control, riparian buffers, cover crops, composting, fish friendly farming, and creation of wetland reserves.

Examples of agricultural land stewardship in the Kings Basin include the Terranova project, and managed grazing at Big Dry Creek and Fancher Creek. Constraints to developing these types of projects include funding, financial incentives for landowners, landowner interest and recognition of benefits, and regulatory barriers.

6.7.2 Economic Incentives (Loans, Grants and Water Pricing)

Economic incentives include financial assistance, water pricing, and water market policies intended to influence water management. Examples of economic incentives include low interest loans, grants, free services, rebates, and water rate structures. Economic incentives can influence the amount of use, time of use, wastewater volume, and source of supply. Economic incentives can also produce environmental and social benefits, and avoid or delay construction of new facilities.

Economic incentives are prevalent throughout the Kings Basin, although they vary by agency. Some specific incentives include: tiered pricing, metering, rebate programs for installing conservation devices, and discounted prices for recycled water. KRCD and KRWA are administering a large incentive program for agriculture called the Agricultural Water Enhancement Program (AWEP). AWEP is a voluntary conservation initiative that provides financial and technical assistance to implement for projects that conserve water and improve water quality. Funding for the program includes $14 million over a 5-year period. As of early 2012, 8,648 acres were awarded funds to help convert flood irrigation to micro-sprinkler irrigation.

6.7.3 Ecosystem Restoration

Ecosystem restoration focuses on restoration of aquatic, riparian and floodplain ecosystems because they are the natural systems most directly affected by water and flood management actions, and are likely to be affected by climate change. Examples of ecosystem restoration include curtailing waste flows into natural water bodies, reducing barriers to fish migration, meadow restoration, native plant preservation, and restoring wetlands. Ecosystem restoration can also be directly incorporated into engineered projects, such as groundwater recharge basins. These types of projects are often done in collaboration with government agencies or non-governmental organizations.

Local Wildlife

The Authority recognizes the importance of ecosystem restoration to protect water rights, improve water quality,

provide flood protection, and increase public support for water projects. Examples of ecosystem restoration in the Kings Basin include the Kings River Fisheries Management Program, Coehlo and Gragnani Wetlands Restoration Project (through the USDA Wetlands Reserve Program), and the FMFCD Rural Streams Program. Constraints to developing ecosystem restoration projects include funding, high land costs in some areas, feasibility of integrating restoration elements into proposed projects, regulatory constraints, political acceptance, weed control when near agricultural lands, and concerns for spillover of endangered species onto adjoining lands.

6.7.4 Forest Management

Sequoia National Forest

Forests in California are used for sustainable production of resources such as water, timber, native vegetation, fish, wildlife, and livestock, as well as outdoor recreation. The economic value of water produced by forests equals or exceeds that of any other forest resource (CWP 2009 update). Almost all forest management activities can affect water quantity and quality. This strategy focuses on those forest management activities that are designed to improve the availability and quality of water for downstream users. Some forest management strategies include meadow restoration to regulate stream flows, abandoned mine reclamation, forest fire management, and ecosystem restoration. A recent example is the Big Meadows Improvement Project completed in 2007 in Sequoia National Forest.

There is little forest in the IRWMP area, but the Kings River watershed is largely forested. Most of the forest land is managed by the National Forest Service. The Authority therefore is not directly involved in forest management, but can assist and facilitate these efforts through the following: 1) Communicate with local watershed organizations; 2) Write letters of support for forest management projects; 3) Collaborate with neighboring IRWMP groups in the Sierra Nevada Mountains.

6.7.5 Land Use Planning and Management

Integrating land use and water management should consider planning for housing and economic development needs of a growing population while providing for the efficient use of water and preservation of water quality. The way we use land – the pattern and types of land use, transportation and level of intensity – has a direct relationship to water supply and quality, flood management, and other water issues. For example, land use planners could require xeriscape to reduce water demands, or permeable pavement to reduce flood risks.

Previously, planning for land use and water supplies was conducted by different agencies, at different times, for different planning horizons, often using different methodologies, assumptions, and data. This resulted in inconsistencies in the plans,

poor coordination of public investments, and subjected agencies to legal challenges. Some local land use plans do not address, or only acknowledge, regional water issues, such as overdraft. Consequently, integrating land and water use planning is an important goal in the Kings Basin.

In 1996, the federal Safe Drinking Water Act issued a requirement for states to provide Technical, Managerial and Financial (TMF) capacity requirements for public water system operations to ensure sustainability and long-term compliance with drinking water standards. California put forth Section 116540 of the California Health and Safety Code (CHSC) in response to the federal requirements, which applies TMF criteria to community water systems as well as non-community water systems and water systems changing ownership or seeking funding from the State. The CHSC section reads:

> *"No public water system that was not in existence on January 1, 1998, shall be granted a permit unless the system demonstrates to the department that the water supplier possesses adequate financial, managerial, and technical capability to assure the delivery of pure, wholesome, and potable drinking water. This section shall also apply to any change of ownership of a public water system that occurs after January 1, 1998."*

The CDPH has a TMF criteria document and assessment form available on their website, which the local land use agencies are able to use to facilitate compliance with the TMF requirements for new water system or those undergoing facility improvements.

The Authority and IRWMP process provide an ideal opportunity to integrate land and water supply planning. The Authority has addressed this topic with the formation of a Land Use and Water Supply Work Group and land use planning workshops held in 2007. Relation to Local Water Planning and Relation to Local Land-use Planning are discussed in more detail in Chapters 13 and 14, respectively.

6.7.6 Recharge Area Protection

Protection of recharge areas is based on two primary goals: 1) ensure that areas suitable for recharge are protected from development into urban infrastructure; and 2) preventing pollutants from entering groundwater to avoid expensive treatment that may be needed prior to potable, agricultural, or industrial uses. Recharge area protection has high importance since it is necessary to develop groundwater recharge and banking projects, which were identified as the most important strategy for the region.

Local city and county land use agencies can apply their land use authorities and develop policies to protect recharge areas, or require mitigation for groundwater impacts associated with new development. Agencies can also develop cash reserves or other options to acquire prime lands quickly from willing sellers when they are available on the market. High land costs, lack of readily available capital, and inability to rapidly act when land is on the market are constraints to protecting prime recharge areas.

The Fresno County General Plan has policies that encourage development of retention-recharge basins. The General Plan policies of the Cities of Clovis and Fresno also seek to preserve recharge areas for use as recharge/retention ponds. In addition, the FMFCD purchases land in areas slated for development in order to build both recharge and retention ponds. As part of the IRWMP feasibility analysis, favorable recharge areas have been mapped in the region (see Kings Basin Conjunctive Use Feasibility Analysis by WRIME, 2006). In addition, prime recharge areas are often locally mapped by cities or irrigation districts.

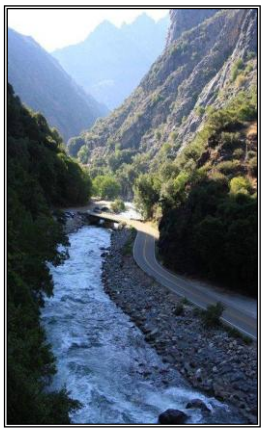
6.7.7 Water-Dependent Recreation

Recreation and public access include the management of lands and water resources by local, state, and federal public agencies under an implied principle of public trust responsibility. As trustee to public resources, the state and federal agencies must consider the benefit and use of land and water resources for recreational opportunities. Natural resource values often define the character and aesthetic appeal of water-dependent recreation, making it desirable and interesting to visitors. However, poorly planned use, misuse, or overuse of any recreation resource can degrade natural resource values and recreational experiences.

Providing public recreation benefits and planning to integrate benefits into projects may increase public approval. In other words, if a project provides recreational opportunities, the public may be more supportive of the project overall thus helping to protect its water supply benefits. Climate change could modify hydrologic patterns and impact existing recreational opportunities. An adaptive management philosophy is needed by recreational facility managers so that opportunities remain available.

Recreational opportunities are provided throughout the Kings Basin at water resources facilities including reservoirs, along the Kings River corridor, and in some flood control basins. Where cost effective and feasible, recreational elements should be included in new facilities in order to provide multiple benefits. Cost, timing, liability, and other issues may constrain the ability to integrate recreational benefits into water resources projects.

6.7.8 Watershed Management



Kings River Watershed

Watershed management is the process of evaluating, planning, managing, restoring, and organizing land and other resource uses within an area of land that has a single common drainage point. This strategy is important for maintaining good water quality and a healthy ecosystem. In the upper part of the Kings River watershed, above Pine Flat Reservoir, a number of watershed planning efforts are occurring through the Resource Conservation Districts and National Forest Service. Other watershed management programs are implemented by non-governmental organizations. One example is the El Rio Reyes Conservation, a regional California land trust

whose mission is to safeguard the Kings River and its lands for future generations. The Trust believes the best way to accomplish this task is to conserve open space and riparian habitat and provide means to ensure the viability of the farms surrounding the river. The IRWMP acknowledges these existing programs, seeks opportunities to coordinate efforts, and when appropriate, write letters of support for funding projects.

6.8 Other Strategies

6.8.1 Crop Idling for Water Transfers

Crop idling for water transfers is removal of lands from irrigation so the water supply can be transferred to other lands. The strategy is a temporary measure and the idled land would be returned to irrigation at a later time. Crop idling is not the same as idling lands with the intent to improve soil and crop sustainability and productivity (i.e. crop rotation).

Local Crops

Benefits from crop idling include payment to farmers who sell their water supply, and redistribution of water to another area that needs it. The payments could be used for on farm-related investments, or to develop water conservation measures. Costs include loss of crop production and annual costs to manage the land to avoid negative impacts, such as weed spreading. Loss of crop production can have numerous socio-economic impacts on local communities. Crop idling is not feasible with permanent crops, which comprise much of the farmland in the Kings Basin.

Crop idling is sometimes practiced within irrigation and water districts. Some districts allow growers to fallow their land for a season and sell the water to another grower in the same district. Crop idling is not currently performed on a regional scale between different water agencies due to legal issues regarding water transfers, and some public opposition to transferring water out of their service area. However, this strategy could have some benefit, especially with canal company stock used in the Kings County Water District, a special type of water right that does not have defined place-of-use boundaries.

6.8.2 Dewvaporation or Atmospheric Pressure Desalination

Dewvaporation is a specific process of humidification-dehumidification desalination. Brackish water is evaporated by heated air, which deposits fresh water as dew on the opposite side of a heat transfer wall. Since there are no saline or brackish water supplies in the Kings Basin this strategy is not applicable.

6.8.3 Fog Collection

Fog collection involves collecting fog on a fine mesh or array of parallel wires that drips into collection containers. There has been some interest in fog collection for domestic water supply in dry coastal areas that have frequent fog. Because of its relatively small production, fog collection is limited to producing domestic water where little other viable water sources are available. Fog collection has not yet been used as a water source in California. Some areas in the Kings Basin receive dense fog. However, the fog is sporadic and typically occurs in winter months when water demands are low. Therefore, this strategy is not applicable to the Kings Basin.

6.8.4 Irrigated Land Retirement

Irrigated land retirement is the removal of farmland from irrigated agriculture to provide water supplies elsewhere and/or take unproductive land out of production. Land retirement can enhance water reliability by making water available for redistribution. Land use changes from land retirement can impact neighboring lands, such as through the spread of weeds or wildlife. In addition, retiring land can have large socioeconomic impacts on local community including loss of jobs and income. However, retired land can be converted to other uses with low water demands such as grazing, solar farms, wildlife habitat, etc., which could offset some of the socioeconomic impacts. Costs for retiring land include the price of land and the annual cost of managing the land to avoid environmental impacts. Land retirement should only be performed on a voluntary basis. When retiring lands the highest priority should be given to lands with poor quality, low productivity, and land management problems, such as poor drainage of irrigation waters.

Climate change may reduce water supplies or increase water demands, resulting in a greater need to retire lands. Climate change could also impact water quality leading to increased salinity buildup in certain lands, providing a higher incentive to retire the lands. Land retirement would still be a suitable alternative if the climate changes, but some impacts, such as wildlife or weed spreading may differ from historical retirement programs.

No permanent land retirement has been performed in the Kings Basin. However, permanent land retirement was implemented in the neighboring Westlands Water District, located west of the Kings Basin. Most of the retired lands had serious drainage problems. Their program was implemented as a last resort to address chronic water shortage and drainage problems, but it has successfully retired thousands of acres and increased water reliability for other landowners. The Authority believes that land retirement can be an effective method to reduce water demands and increase water reliability for other uses. Lands that may be candidates for land retirement are those with no surface water supply or no infrastructure to use surface water. However, it is considered a measure of last resort and the other resource management strategies, especially floodwater capture, should be further developed before land retirement is considered.

6.8.5 Rainfed Agriculture

Rainfed agriculture is the practice of providing all crop consumptive use directly by rainfall. Due to the unpredictability of rainfall frequency, duration, and amount, there is significant uncertainty and risk in relying solely on rainfed agriculture. However, rainfed agriculture is practiced in the Kings Basin. Some growers plant crops such as winter wheat and safflower that can be watered entirely by rainfall during the rainy season. However, some winter crops have been planted and subsequently lost during dry years. Rainfed agriculture is less risky if the growers have the option to apply irrigation water as an emergency measure. Due to the inherent risks with rainfed agriculture, it probably has little potential for increased use. Climate change has the potential to change precipitation patterns which may benefit or adversely impact rainfed agriculture. According to the 2009 California Water Plan update, water supply improvements using rainfed agriculture will require development of new varieties of plants, and new and innovative soil and water management.

6.8.6 Waterbag Transport/Storage Technology

Waterbag transport/technology involves diverting water in areas that have unallocated freshwater supplies, storing the water in large inflatable bladders, and towing them to an alternate coastal region. This strategy is not currently being used in California and would likely have high costs and extensive permitting requirements. The Kings Basin is roughly 100 miles to the coast and water delivered by waterbags would need to be conveyed directly to the region or through complex exchanges. Transporting the bladders by rail has also been proposed, but this would also be costly and only limited quantities could be transported on a bladder that fit on rail cars. Due to its high cost, difficulty in permitting, and difficulty conveying the water to the Kings Basin, this alternative is not considered feasible.

6.8.7 Drought Planning

The Department of Water Resources (DWR) resource management strategies did not include drought planning. In recognition that a drought is a regular occurrence in the Kings Basin, the Authority decided to include drought planning as a resource management strategy. The Kings Basin has a productive groundwater supply that can be used as a reserve supply in droughts. However, during droughts, impacts can still be felt from higher water costs, declining groundwater levels, higher groundwater pumping costs, and in a prolonged drought, some wells can go dry. Water users that rely primarily or solely on surface water are the most impacted in droughts.

In the Kings Basin, the most appropriate response to drought planning is to develop conjunctive use and groundwater banking projects that reduce overdraft, and capture wet year water for storage in the groundwater basin. Statewide droughts can present opportunities for the region if groundwater banks are developed to store water for third parties. These can increase revenue for local agencies, and would likely include a small water supply benefit for the water bank owner.

Drought-stricken Crops

Many local agencies have drought response plans. However, the Kings Basin does not have a regional drought response plan. Such a plan would need to identify participants and their responsibilities, develop a drought monitoring plan, and develop drought response measures. There is currently no adopted hydrologic index and no standard definition of a drought in the Kings Basin. The development of drought index to characterize hydrologic year types and define drought conditions is needed. A regional drought response plan would help to better characterize drought conditions, and allow water users to pool and share their water resources and help to minimize regional impacts.

7 PROJECT REVIEW PROCESS

This section has been developed to document and provide an update to the Authority's Project Review process. The Kings Basin Water Authority's (Authority) project review process and procedure was first identified in the 2007 Integrated Regional Water Management Plan (IRWMP) and was later updated by action of the Authority's Board on October 10, 2007. In review and consideration of the 2010 IRWM Guidelines, some modifications to the process have been developed to fully address the guidelines. The process for developing the region's project list involves two primary steps:

1. Identification of projects to implement the IRWMP
2. Project prioritization related to specific grant opportunities

This section describes the project review process, and is adopted by the Authority's Board by adoption of this IRWMP. The process developed includes the procedure for:

- Submitting a project to the IRWMP
- Review of projects to implement the IRWMP
- Communicating the list of selected projects

Because of the continual efforts by Members and Interested Parties to develop new projects and further refine existing projects, new and revised projects are considered and approved by the Board on a quarterly basis and the Board includes the project list in its Annual Report.

7.1 Identification of Projects

Identification of projects is open to all stakeholders within the region. The Authority has encouraged inclusion of all types of projects and programs provided they address at least one of the IRWMP's measureable objectives that conform to at least one of the regional goals. As stated in Chapter 5, the regional goals are the broadest statement of intent or purpose for the IRWMP and are intended to address the primary problems and resource conflicts in the region. The coequal goals of the IRWMP are to:

- Halt, and ultimately reverse, the current overdraft and provide for sustainable management of surface and groundwater;
- Increase the water supply reliability, enhance operational flexibility, and reduce system constraints;
- Improve and protect water quality;
- Provide additional flood protection; and
- Protect and enhance aquatic ecosystems and wildlife habitat.

The following three step quarterly process has been developed for identification of projects to implement the objectives of the IRWMP. The process is completed each quarter and the project list included as part of the Authority's annual report.

Step 1. Call for Projects

The Authority releases a Call for Projects by email to all members, interested parties and stakeholders at least once per year. The request is also announced at Advisory Committee and Board Meetings, and posted on the Authority's website. Project proponents are asked to complete a Project Information Form that can be submitted to the Authority by email, mail, facsimile, or through the Authority's website tool. The Project Information Form will typically include the following information:

- Project Name
- Project Proponent(s)
- Project Location
- Project Size
- Project Status (Conceptual, Planning, Feasibility Study, Preliminary Design)
- Background description of the project (or project need if conceptual)
- Project Workplan
- What is the primary IRWMP Regional Goal (RG) that applies to this project and how does the project help meet that objective?
- Identify any other IRWMP RG that applies to the project? How the project will help meet those objectives.
- What is the primary IRWMP Measurable Objective (MO) that applies to this project and how does the project help meet that objective?
- Identify any other IRWMP MO that applies to the project? How the project will help meet those objectives.
- Which Resource Management Strategies the project is related to and how.
- Does the project provide specific benefits to critical disadvantaged community (DAC) water issue? If so, how and are there any Environmental Justice concerns?

The Authority may add to or modify the form and the information requested. Although a specific request is made each year prior to the annual report preparation, a project can be added to the project list at any time throughout the year. The process is open to all projects regardless of the current status. Projects still at a conceptual level are encouraged to be added to the list, as inclusion of conceptual projects is intended to help prevent duplication and help foster project integration and development discussion amongst stakeholders in the region. All projects must be submitted by either an Interested Party or Member. Interested Parties must seek sponsorship of their projects from one or more Members in order to be considered for funding. Interested Parties do not need to have secured Member sponsorship prior to submitting for Project List inclusion.

Step 2. Review by Project Workgroup

The Project Workgroup is defined in Chapter 2 as an active workgroup, who receives all of the Project Information Forms and reviews each submitted form for content and consistency. The Workgroup confirms the accuracy and reasonableness of the submitted project information. If necessary, the Workgroup will clarify project

information with the project proponent(s). During this step in the process, the Project Workgroup also considers and recommends possible project integration, regional applications, multiple benefits, and other strategic project efforts that could benefit the IRWM Objectives. A project list is generated in which projects are identified based on the primary IRWMP RG and MO that they will meet, as well as additional IRWMP RG and MO that apply.

Step 3. Project list included in Annual Report

Upon completion of the Project Workgroup review, the project list is reviewed and finalized and included into the Annual Report. The completion of the annual report is subject to other factors included in the report, such as the availability of groundwater monitoring data. The Annual Report, including project list is approved by the Authority Board, who has the authority to reprioritize or modify the project list. The completed project list is also made available to all stakeholders, and is posted and available on the Authority's website.

After completion of the project list each year, as new projects are brought forth by Members and Interested Parties, the Authority requests the project information form for those new projects and maintains the submitted project information until the annual list of projects is updated. The Annual Report will also include an update as to completed projects.

7.2 Project Prioritization for Specific Funding Opportunities

While the Project List is continually being added to, and an updated list adopted annually, there is need for project prioritization when specific grant opportunities arise. The Authority has developed the following eight step process for project prioritization based on funding opportunities.

Step 1. Presentation of Funding Opportunity Information

In addition to IRWM specific funding opportunities, the Authority considers other funding opportunities. Funding opportunity information is brought to the Authority by members, interested parties, consultants and other stakeholders. With many opportunities, it is important that a basic understanding of the opportunity, project eligibility and selection criteria is disseminated within the region. These opportunities come from a variety of sources for a wide range of projects and programs. The Authority, through its active and regular meetings, communication and website, offers an arena for communication of these opportunities. At its regular Advisory Committee and Board meetings, funding opportunities from various sources are presented to all participants, and are communicated to the region through meeting minutes available on the Authority website as well as via direct email.

Step 2. Establish Project Selection Panel (Panel)

Upon the decision to consider specific IRWM and other grant opportunities that require project prioritization, a Panel is selected by the Project Workgroup. The Panel shall

have at least three individuals (Members or Interested Parties) and no more than 7 individuals. The Panel works with Authority staff and others as needed to develop a Project Information Request that is tailored to the specific funding opportunity and a template form is developed. The template form also includes a scoring matrix based on the information required. The scoring matrix typically matches that of the funding opportunity, with the addition of other categories considered for prioritization including consideration to improve baseline conditions in areas of the region. At a minimum, the project information request form will include:

- Grant specific requirements
- Project Sponsor
- List of each applicable IRWMP Measurable Objective, how the project applies, and a description or estimate of the benefit
- Current project status and detailed schedule for completion
- Workplan
- Technical feasibility
- Economic feasibility
- Funding of local cost share (if required)
- Climate change and Greenhouse Gas (GHG) reducing considerations

Step 3. Project Information Request

The Panel provides information regarding the grant to Members and Interested Parties. An email announcement will be made, and typically a portion of an Advisory Committee meeting or if needed a separate workshop will be held to educate project proponents of the funding requirements and template form to be submitted. The template form is provided to the potential applicants and a submittal deadline is established. The forms can be submitted by email, mail, hand delivered, or through the Authority's web site. The form and deadline are posted on the Authority's website.

Step 4. Project Prioritization by Panel

After the deadline, the Panel is provided copies of the forms submitted for each project. The Panel members then individually score each project. After scoring each project, the Panel meets to review the scores and provide a prioritized project list based on the scoring. The Panel then presents the prioritized list to the Authority. This can be done by email notification or through the Authority website, and may also be presented at a separate meeting.

Step 5. Recommendation of Projects to be Included in Funding Application

The prioritized project list may include more projects or funding requested than is eligible or reasonable to submit for the specific funding opportunity. The Panel will consider and develop a recommended list of projects based on the prioritized scoring that should be included in the funding application request. It is possible that a highly prioritized project may not be able to proceed with the application or be initiated within the required timeframe. As part of this step, the Panel will then solicit confirmation from

each of the recommended project proponents to ensure that they can proceed with additional efforts required to prepare the application, and discuss possible mechanisms to assist with application preparation. An agreement for funding of the application process, contract legal review of funding master agreement and sub-agreements and funding agreement between member sponsors for interested parties (if necessary), will be developed amongst the applicants and included in the Advisory Committees final recommendation.

Step 6. Advisory Committee Recommendation

The Panel's recommendation, including the list of projects and funding source for application preparation will be presented to the Advisory Committee for discussion, consideration, and a recommendation to the Board.

Step 7. Board Approval

The Advisory Committee's recommendation will be presented to the Board, and the Board will make the final decision for approval of the projects to be included in the funding application.

Step 8. Funding Application Development and Submission

Following approval by the Board, the project proponents will complete the necessary information for the funding application preparation and submittal.

This Page is Intentionally Blank

8 IMPACTS AND BENEFITS

This section describes the general benefits and impacts from implementing the Kings Basin Integrated Regional Water Management Plan (IRWMP). Impacts were identified for both the local Kings Basin and surrounding IRWMP regions. Specific topics addressed include general benefits of regional water management, impacts/benefits of relevant resource management strategies, impacts/benefits to interested parties and disadvantaged communities (DACs), evaluation of impacts/benefits in project evaluation, and a plan for updating the impact/benefit analysis.

Identifying the impacts and benefits of implementing the IRWMP is important for the following reasons:

1. The impact/benefit analysis can be used to prioritize goals and resource management strategies.
2. Identifying adverse impacts from resource management strategies is important, since they are often overlooked by the more obvious benefits of the strategies.
3. The impact/benefit analysis can be used as a benchmark for evaluating IRWMP performance.

8.1 General Benefits of Regional Water Management

Historically, local management of the water resources, especially groundwater, was limited to independent operations by each overlying water agency and individual water users. If individual agencies and landowners continue to act individually, it is likely that competition and conflict will increase, groundwater overdraft will continue, and there will be increased risk for water quality impairment, land subsidence, litigation, and higher groundwater pumping costs. Regional water management replaces the local, fragmented approach with a more comprehensive and cooperative methodology. The key benefits of regional water management include:

- Development of a long-term vision for regional water management for water supply and water quality issues
- Management of water resources within a recognized hydrologic boundary rather than many isolated political boundaries
- Establishment of goals and policies for the most economical and efficient use of available water resources
- Reduced potential for conflicting goals/projects among those who share the same river and groundwater basin
- Forum for all parties to share ideas and information
- Effective management of overdraft in the Kings Groundwater Basin as a whole
- Improvement in local and regional water supply reliability
- Improved protection from drought
- Reduced costs of developing one regional plan versus individual agency plans

- In certain cases reduced costs of developing regional projects rather than several smaller local projects
- Reduced dependence on imported water
- Increased operational flexibility of the water infrastructures in the region for common benefit
- Reduced potential for conflicts and litigation
- Protection and improvement of groundwater quality and implementation of regional water management strategies to implement solutions to address drinking water issues
- Shared development and use of same hydrologic model and analytical tools for project evaluation
- Reduced cost of data collection, data sharing, and data management
- Increased political influence needed to protect and preserve water resources
- Increased chances for obtaining state/federal grant funds as a region rather than as a local agency.

These benefits would be lost if the IRWMP document is not maintained, the Kings Basin Water Authority (Authority) does not remain active, or the Authority members do not implement regional projects and programs.

A primary effect from not implementing the IRWMP would be continued groundwater overdraft and continued issues associated with long term water supply and water quality impacts, the largest water management problems in the region. This will result in the following impacts:

- Declining water levels
- Potential land subsidence
- Increased pumping costs
- Increased costs to lower pumps, deepen wells or construct new wells
- Potential conflicts between overlying water users for available groundwater supplies
- Loss of economic activity at the farm level
- Inability to respond to dry year conditions
- Reduced supply reliability
- Limitations on planned development and inability to comply with revised state laws requiring proof of adequate and sustainable water supplies.
- Inability of the basin to address regional water quality issues such as drinking water solutions for DACs

8.2 Impacts and Benefits of Resource Management Strategies

The screening level analysis of impacts and benefits from implementing 27 different resource management strategies are included in **Table 8-1**. These strategies come from a list of 33 resource management strategies listed in the California Water Plan

Update (DWR, 2009). Twenty seven of those strategies were deemed applicable to the Kings Region and are discussed in detail in Chapter 6. The impacts and benefits of implementing the strategies broadly represent the potential benefits and impacts of implementing the IRWMP. **Table 8-1** was developed through interactive discussions by the IRWMP Update Work Group.

Table 8-1: Benefits and Impacts of Resource Management Strategies

Strategy		Kings Basin		Interregional	
		Benefits	Impacts	Benefits	Impacts
Reduce Water Demand	Agricultural Water Efficiency	• Extend supply • Reduced cost • More efficient use of chemicals • Reduced subsurface drainage • Protection of water quality	• Reduced groundwater recharge • Lost revenue if usage based • Causes operational changes • Irrigation hardware needed • Hardware maintenance • Irrigator training requirements	• More interregional basin exchanges possible • Reduced subsurface drainage	• Reduced supply to neighbors from spills and drainage
Reduce Water Demand	Urban Water Efficiency	• Extend supply • Reduced cost • Reduced home chemical use • Delayed capital costs • Protection of water quality • Reduced energy use • Reduced groundwater overdraft • Reduction in green waste	• Causes operational changes • Lost revenue if usage based • Inconvenient watering times • Creates hard demand that reduces opportunities for drought response	• More interregional basin exchanges possible • Reduced wastewater treatment • Reduction in urban runoff • Stretch existing water supplies	• Reduced supply to neighbors from wastewater effluent or runoff
Improve Operational Efficiency and Transfers	Conveyance - Regional/local	• Maintain water rights • Revenue generation • Conjunctive use • Improved water quality • Increased flood control capabilities • Deliver surface water to areas that use only groundwater	• Increased use of facilities • Shortened maintenance periods • Greater costs for larger facilities		• Reduced flows to the Delta
Improve Operational Efficiency and Transfers	System Reoperation	• Water quality improvements • Flood protection • Recreation benefits • Power generation • Ecosystem restoration	• Loss of historical supplies to other uses	• Temperature control for local fisheries • Flood protection • Ecosystem restoration • Litigation reduction	• Greater management requirements
Improve Operational Efficiency and Transfers	Water Transfers	• Efficient use of surface supplies • Revenue generation • Groundwater recharge • Agricultural sustainability	• Loss of local water supplies • Groundwater mining • Environmental impacts	• Agency cooperation	• Inflated water prices • Environmental impacts

Strategy		Kings Basin		Interregional	
		Benefits	Impacts	Benefits	Impacts
Increase Water Supply	Conjunctive Management & Groundwater Storage	• Dry year supply • Extends use of existing basin • Overdraft reduction • Improved water supply reliability • Groundwater recharge • Better groundwater management	• Increased pumping costs compared to surface water • Litigation challenges • Increased data collection needs & costs • Uncertainty of impacts to facility neighbors • Facility capital costs • Land use changes for facilities	• Water quality improvement • Improved water supply reliability • Drought relief • Reduction in flood flows	• Water supply uncertainty if surplus flows diverted more frequently • Less flows to the Delta
	Precipitation Enhancement	• Quick project development • Increase in water supply • Power development	• Accuracy of location & timing		• Increase in supply in one area at the expense of downwind area • Added snow removal burden in some area • Public concern over accumulation of seeding agent
	Recycled Municipal Water	• Reliable supply • Improved water quality • Allows for development • Drought resistant supply	• Increased operations & maintenance cost • Public acceptance • Water quality concerns with microbial contaminants, salinity, heavy metals, and pharmaceuticals	• Interregional exchange	
	Surface Storage - Regional/local	• Water supply reliability & augmentation • Flood control • Hydroelectric power generation • Recreation • Sediment transport management	• Permitting requirements • Environmental mitigation • Cost • Limited sites available • Failure impacts • Beneficiary determination • Property tax losses • Habitat losses • Operational control	• Water transfers • Ecosystem management	• Reduction in downstream flows • Habitat migration

Strategy		Kings Basin		Interregional	
		Benefits	Impacts	Benefits	Impacts
Improve Water Quality	Drinking Water Treatment & Distribution	• Protect public health • Maintain regulatory compliance	• Increased O&M costs • Increasingly stringent regulations • Trained operators • Facility security • Treatment residual disposal • Deteriorating infrastructure • Reduce energy relative to groundwater pumping • Protects groundwater supply when used in-lieu of groundwater pumping	• Regionalization/ Consolidation of facilities	
	Groundwater Remediation/Aquifer Remediation	• Protect public health • Maintain regulatory compliance • Avoided costs of purchasing additional supply	• Costly • Highly trained operations staff • Public perception/acceptance of treated water	• Contaminant plumes kept from spreading	
	Matching Quality to Use	• Best use of available local water supplies • Most economical choice • Treatment avoided or limited	• Possible environmental impacts • Infrastructure costs • Conveyance costs	• Upstream and downstream partnerships	• Water quality degradation • Effluent dominated streams • Salinity increases
	Pollution Prevention	• Improved water quality • Consistent with anti-degradation policies • More cost effective than "end of the pipe" treatment	• Increased regulations • Increased costs • Increased management needs • Increased monitoring costs	• Protect water at source • Agriculture irrigation	• Difficult to distinguish between level of impacts of natural and introduced contaminants at times • Lack of access to some recreational areas
	Salt and Salinity Management	• Increase longevity of irrigated lands • Protect water supplies • Postpone loss of beneficial uses	• Deep percolation required • Movement of salts from one area to another • Increased management	• Reduced avoided costs • Regional collaboration	• Economic impacts of lands are retired
	Urban Runoff Management	• Water source for local recharge • Improve flood protection • Reduce surface water pollution • Minimize soil erosion & sedimentation problems • Local resource from waters historically lost to an area • Mimic natural hydrologic cycles	• Cost to treat and manage runoff • Increased cost to urban developments • Disease from standing water in basins	• Regional collaboration and coordination	• Possible groundwater contamination from recharged water

Strategy		Kings Basin		Interregional	
		Benefits	Impacts	Benefits	Impacts
Improve Flood Management	Flood Risk Management	• Enhanced flood protection • Reduce risk to lives & property • Recharge possible if captured • Riparian habitat improvements • Possible floodplain function restoration	• Structural approaches are costly • Permitting requirements involved • Long term ongoing maintenance of facilities • Emergency response planning required • Planning may limit development in some areas	• Reduce downstream flood risk • Reduce flood recovery costs • Manage upstream water • Regional planning required	• Planning may limit development in some areas • Revisions to flood insurance mapping
Practice Resources Stewardship	Agricultural Lands Stewardship	• Reduces pressure to agricultural lands from urban development • Increased economic viability for agricultural lands • Habitat improvement • Encourages agricultural practices which also benefit environmental and restoration concerns	• Conservation easement costs • Cost to implement BMPs	• Preservation of open spaces & agricultural land • Regional planning urban growth strategy • Flood impact reduction • Food security • Recreational opportunities	• Reduced tax base for county and state governments
	Economic Incentives (Loans, Grants, & Water Pricing)	• Decreased costs for grant recipients • Reduced wait for needed infrastructure • Reduction in water demand from water pricing structures	• Burdensome application processes • Increased federal or state directives in local issues • Increased administrative costs • Funding is intermittent	• Local return from statewide obtained funds • Societal goals obtained	• Increase in State debt burden • Social inequities
	Ecosystem Restoration	• General quality of life increase • Protection and enhancement of fish & wildlife resources	• Increased short term costs to goods and services • Water supply loss	• Increased recreational opportunities • Increased diversity of native species • Natural water quality improvements • Sustainability to water and flood management projects	• Conflicting objectives in flood management • Opposition to conversion of farmland to habitat

Strategy		Kings Basin		Interregional	
		Benefits	Impacts	Benefits	Impacts
Practice Resources Stewardship	Forest Management	• Reduction in sedimentation in local rivers and streams • Water quality betterment, by protection of land surface from erosion	• Economic impacts to loggers and other forest users	• Air quality protection via fuel reduction • Water quality improvement • Winter snowpack improved with vegetation management • Recreational opportunities • Increased water storage in the watershed • Protection of water supplies • Reduced risk of fire spreading into area	• Reduction of carbon footprint
	Land Use Planning and Management	• Improved communication among different agencies • Proper planning helps ensure new developments have reliable and sufficient water supplies • Potential for reduced water demands based on development designs • Opportunities to reduce flooding and increase recharge	• Difficulty in getting some land and water use planners to cooperate • Increased costs to coordinate efforts	• Potential for reduced inter-regional conflicts	• Financial savings • Economy of scale by avoiding conflict • Overlaps of various interregional long term plans
	Recharge Area Protection	• Provide sustainable and reliable water supply of good quality • Removal of some microbes and contaminants during recharge • Flood protection	• Vectors and odors	• Prevention of pollutants entering groundwater	
	Water-Dependent Recreation	• Positive agency public relations • Revenue generation • Quality of life benefits to health	• Increased liabilities • Water quality degradation • Addition facility O&M costs • Lack of funding	Recreational opportunities for travelers	
	Watershed Management	• Community level solutions • Water quality improvement • Protection of local water rights • Flow attenuation	• Difficulty of diverse stakeholders working together	• Community collaboration • Flood mitigation • Quality of life • Habitat provision • Mineral/Nutrient cycling • Recreation opportunities	

Strategy		Kings Basin		Interregional	
		Benefits	Impacts	Benefits	Impacts
Other Strategies	Crop Idling for Water Transfers	• Drought water supply reliability • Stable farm income in water short years	• Introduction of wildlife, weeds, pests and trash dumping to the area • Changes to local community way of life		• Local tax base losses • Changes in school populations
	Irrigated Land Retirement	• Generation of stable water supplies • Reduction in agricultural drainage to an area	• Taxpayer burden of land cost • Increased management costs of government owned retired lands • Lower income and higher unemployment		• Possible growth inducement due to increased water supplies • Community and region may lose way of life, jobs • Local tax base losses • Changes in school populations
	Rainfed Agriculture	• Reduction in runoff with no-till systems	• Increased uncertainty of crop production • Low value of viable crops in historical irrigated agricultural areas • Increased runoff and erosion potential		
	Drought Planning	• Improved water reliability • Prevent loss of crops or crop idling	• Costs to develop and maintain drought response plan • Implementing plan may be unpopular • Lack of funds for additional storage	• Lower regional groundwater overdraft • Lower demand for dry year water supplies	

8.3 Regional Benefits and Impacts

Identifying regional benefits and impacts is important since they are often ignored due to a focus on local benefits and impacts. Project proponents often look only within their political boundary and areas that provide their revenue. Recognition that projects affect other regions is a crucial step in developing effective inter-regional water management. The Kings Basin IRWMP may influence surrounding areas as described below. Refer to **Figure 3-4** for a map of the surrounding IRWMP organizations.

North – Madera Region IRWMP

The Madera Region IRWMP is located north of the Kings Basin. The Kings and Madera IRWMPs are separated by the San Joaquin River, which creates a partial hydrologic boundary, but the two regions are still hydrologically connected. Both the Madera and Kings regions are experiencing groundwater overdraft, and water management strategies that address or exacerbate overdraft would affect both regions. Both regions would also be affected by projects that impact the flow rate or water quality in the San Joaquin River.

South – Kaweah River Basin IRWMP and Tulare Lake Basin

The Kaweah River Basin IRWMP is located southeast of the Kings Basin IRWMP. These regions do not have significant hydrologic connection, except for some groundwater flow. IRWMP implementation in either region is believed to be relatively neutral in their effects on the other region.

The Tulare Lake Basin is located southwest of the Kings Basin IRWMP. This region is not currently covered by an IRWMP. Historically, Kings River flows flooded this area, but now this only occurs during very wet years. Consequently, flood control and diversion projects could negatively or positively impact the Tulare Lake Basin.

East – Southern Sierra IRWMP

The Southern Sierra IRWMP occupies lands to the east of the Kings Basin IRWMP. These lands are upstream and at higher elevation than the Kings Basin, so activities in the Kings Basin would not influence the Southern Sierra IRWMP. However, the Southern Sierra IRWM region includes the Kings Watershed, the primary water source for the Kings region and the Fresno County Stream Group, the upland watershed for the Fresno/Clovis metropolitan area. The Authority can provide support to and help coordinate forest management and watershed management in the Southern Sierra IRWMP area that benefits both regions.

West - Westside – San Joaquin IRWMP

The Westside – San Joaquin IRWMP is located on the western side of the Kings Basin. Major problems in this area include groundwater overdraft, surface water shortages, and soil salinity buildup. This area could benefit from Kings Basin projects that improve water quality that may flow to the west. This area would be impacted if Kings River flood flows are diverted in the Kings Basin, although the impacts could be positive (less downstream damage and flooding) or negative (less floodwater to divert for recharge or beneficial use). The Westside-San Joaquin region could also benefit from groundwater recharge efforts in the Kings Basin if groundwater flows westward.

8.4 Impacts and Benefits to Interested Parties and DACs

The Authority has taken several steps to engage interested parties and DACs in the IRWMP development and implementation. Some local agencies, organizations and DACs are not full members of the Kings Basin Water Authority, but can participate in a meaningful way as Interested Parties. Implementation of the IRWMP is expected to have the following benefits to DACs and Interested Parties:

- Discussion Forum. Provide a forum to discuss water management issues, concerns, and priorities, especially those important to DACs.
- Information Dissemination. Share information to which DACs or Interested Parties may not normally have access. For instance, DACs and Interested Parties may not have the staff to regularly track Department of Water Resources (DWR) grant projects or attend other regional or statewide meetings. This type of information it typically summarized for everyone's benefit at regular Advisory Committee meetings.
- Funding Opportunities. IRWMP members can apply for a variety of grant programs from DWR, including some that are specifically for IRWMP members. Interested Parties can also apply for these funds when they team with an IRWMP member that sponsors them.
- Special DAC Efforts. DACs can get greater recognition, publicity and input on their water resources issues through special DAC projects. One example is the DAC Outreach Pilot Study for the Kings Basin, which will identify critical water issues and potential projects in local DACs. Funding for this study was acquired by the Authority specifically for the benefit of local DACs. The study is overseen by a DAC Work Group that is part of the Authority, and is frequently mentioned and discussed at Advisory Committee Meetings. The study results will also be incorporated into the IRWMP.

DACs and Interested Parties are not expected to bear any significant impacts from the IRWMP implementation, except local impacts that may occur from new projects. These impacts would require mitigation before the project is supported by the Authority (see Section 8.5).

8.5 Project Specific Impact/Benefit Analysis

The Authority requires that impacts and benefits from specific projects be evaluated through the California Environmental Quality Act (CEQA) or National Environmental Policy Act (NEPA) process. The Authority will generally not support projects that have adverse impacts unless a thorough mitigation plan is developed. Project impacts and benefits must be described when projects are submitted for funding consideration. Completion of the CEQA or NEPA process is not required during the project evaluation phase, but a thorough discussion of benefits and impacts is required. However, a complete and approved CEQA or NEPA analysis would be viewed more positively than a preliminary assessment since it provides greater assurance of project success.

As a minimum, the benefit/impact analysis should address the topics found in a CEQA analysis including: aesthetics, air quality, biological resources, cultural resources, geology and soils, hydrology and water quality, land use and planning, noise, population and housing, public serves and utilities, recreation, and transportation and circulation.

8.6 Revisions and Updates to Benefits and Impacts

The impacts and benefits of IRWMP implementation will be revised according to the following guidelines:

- Impacts and benefits will be reviewed and revised whenever the IRWMP is updated or DWR establishes new guidelines for this standard. It is expected that the IRWMP will be updated at least every 5 years.
- Impacts and benefits will be revised, as appropriate, to reflect anticipated or observed changes in the regional climate.
- Impacts and benefits will be revised to reflect lessons learned, or new impacts or benefits identified during implementation of local projects.

9 PLAN PERFORMANCE AND MONITORING

This chapter describes several regional monitoring programs in the Kings Basin, procedures for monitoring progress in meeting the Integrated Regional Water Management Plan (IRWMP) objectives and implementing projects, and guidelines for preparing project-specific monitoring plans. In addition, an annual report is described which will include annual monitoring data and evaluations.

9.1 Regional Monitoring Efforts

Several regional monitoring efforts are performed in the Kings Basin. Each of these programs covers most or all of the Kings Basin and is described below.

Table 9-1: Regional Monitoring Programs

Irrigated Lands Regulatory Program *Lead Monitoring Agency: Kings River Conservation District* The Southern San Joaquin Valley Water Quality Coalition (Coalition) is a group of agencies formed to comply with the State's Irrigated Lands Regulatory Program (ILRP), which regulates discharges from agricultural lands. The Coalition encompasses the entire Tulare Lake Basin (4.4 million acres) and is comprised of four subwatershed groups (Kings, Kaweah, Tule and Kern River). The Coalition monitors surface water (irrigation and stormwater) and prepares annual reports. In the future, the ILRP may require groundwater quality monitoring.	
Groundwater Level Monitoring *Lead Monitoring Agency: Kings River Conservation District* Kings River Conservation District (KRCD) publishes an annual groundwater report that includes regional groundwater contours (depth and elevation), and changes in groundwater storage for the Kings Basin. Current groundwater conditions are evaluated and compared to the past. The report uses data provided by several agencies on hundreds of wells. KRCD is also the lead agency for a local group that submits groundwater level data to the California State Groundwater Elevation Monitoring (CASGEM) program.	

Surface Water Monitoring *Lead Monitoring Agencies: Kings River Water Association / Friant Water Authority* Kings River Water Association (KRWA) monitors surface water in the Kings River and its watershed including snowpack, reservoir stage, reservoir inflow and outflow, Kings River flows, and Kings River diversions. The Friant Water Authority monitors San Joaquin River water delivered through the Friant-Kern Canal.	
Kings River Levee Monitoring *Lead Monitoring Agency: Kings River Conservation District* Since 1959, KRCD staff has worked to protect the flood carrying capacity of Kings River channels and levees. Maintenance efforts have focused on approximately 140 levee miles along the river. . Flood control maintenance crew works to minimize and ultimately eliminate the danger of flood and erosion hazards. The crew controls weeds and brush along the levee banks and clears downed trees from the channels. KRCD conducts 24-hour patrols, surveys the levees, and monitors the levee banks for sloughing, erosion and boils.	
Fisheries Monitoring *Lead Monitoring Agency: Kings River Water Association* The Kings River fisheries program monitors habitat conditions, stream flows, water quality, water temperature, hatchery planting programs, fish populations and movements, and macro-invertebrates within the lower Kings River and Pine Flat Reservoir.	
Land Subsidence Monitoring *Lead Monitoring Agency: Kings River Conservation District* As part of a coordinated effort to develop a Groundwater Management Plan, KRCD and several other agencies are identifying a network of benchmarks to track and evaluate for land subsidence. The program is still in the developmental stages and is expected to begin within a few years.	

9.2 Monitoring IRWMP Objectives

Each year the Authority will measure their success in meeting the IRWMP objectives. Each objective is listed in **Table 5-2** along with its metric and how it will be monitored. For example, for Objective No. 3: Identify Disadvantaged Community (DAC) Priority Needs, the Kings Basin Water Authority (Authority) will describe any studies or other efforts to identify water-related needs in disadvantaged communities. Also, for Objective No. 5: Increase Dry Year Supply, the Authority will document the amount of dry-year supply developed from new projects.

9.3 Monitoring Progress in Implementing Projects

The Authority will monitor progress in implementing projects. This will include projects sponsored by the Authority, and major projects performed independently by members and interested parties. Each year the following will be documented:

- List of projects approved for funding from Authority grant applications
- Description of new projects that are underway or completed and their anticipated benefits

9.4 Project-Specific Monitoring

Project monitoring is important to track the success and benefits of a project, ensure it is being operated properly, and to comply with laws and regulations. Examples of project-specific monitoring include monitoring water quality, groundwater depth, flood frequency, and effects a project may have on habitat or particular species. Project-specific monitoring is the responsibility of the agency(s) that are implementing a project and expect to directly benefit from the project. These agency(s) are also responsible for developing project monitoring plans.

The Authority requires draft monitoring plans for projects that are considered for funding. Final monitoring plans are prepared after final designs are completed, and are typically approved by regulatory or funding agencies. Draft monitoring plans must include the following information when applicable:

<u>General Information</u>

- Project description
- Describe what is being monitored (water quality, water flows, etc.).
- Need for monitoring

<u>Monitoring Program</u>

- Monitoring frequency and schedule
- Overall monitoring time period (e.g. 5 years, life of project, etc.)

- Monitoring locations
- Monitoring protocols
- Monitoring tools and equipment
- Laws and regulations pertinent to monitoring
- Quality control procedures

Data Management

- How monitoring data will be stored and tracked
- How monitoring data will be incorporated into Statewide databases
- Targets to be reached (if any)
- Measures to remedy or react to problems encountered during monitoring
- Reporting procedures

Other Topics

- Funding source for on-going monitoring
- Responsibilities (who will perform the monitoring)

9.5 Reporting Procedures and Responsibilities

An Annual Report will be prepared to document the aforementioned monitoring efforts, an updated project list, proposed amendments to the IRWMP, and changes in governance, policies, and membership.

The Authority will assign a member of the Advisory Committee to oversee preparation of the Annual Report. The Authority may also use consultants to help prepare the report. Members and interested parties will need to contribute information on completed or on-going projects. Timely cooperation from the stakeholders is crucial to prepare an accurate and complete annual report. Below is a proposed outline for the Annual Report with a brief description of each section.

1 – Executive Summary

The executive summary will summarize the main points in the report. The executive summary will be written so it can be used for public outreach efforts such as press releases, newsletter articles, newspaper articles, etc.

2 - Physical Conditions

2.1 - Surface Water Hydrology

Summarize surface water data including reservoir storage, water diversions, and percent water allocation on the Kings and San Joaquin Rivers.

2.2 – Precipitation

Summarize data from local precipitation stations, snowpack volume, and departures from long-term averages.

2.3 - Groundwater Levels

Summarize groundwater level data from the KRCD Annual Groundwater Report including groundwater levels, groundwater depths, and changes in groundwater storage. Update graph summarizing long-term groundwater overdraft in the Kings Basin (See **Figure 12-1**).

2.4 - Water Quality

Summarize available groundwater quality data from local and regional studies and State databases. Due to the local and varied nature of water quality in the Kings Basin, focus on general changes in water quality and general conclusions provided in water quality studies.

3 - Success in Meeting Plan Objectives

Identify progress made by the Authority and local stakeholders in meeting each of the IRWMP's 14 objectives. Describe progress in terms of the metric provided for each objective (see Section 5.3).

4 - Implementation Projects

4.1 - Regional Studies

Describe regional water related studies performed by the Authority or other agencies such as KRCD, DWR, Department of Public Health, United States Geological Survey, etc.

4.2 - Project List

Solicit updated project data from the members and interested parties and store it in the Projects Database.

4.3 - Completed or On-going Projects

Describe the progress made on on-going and completed implementation projects.

4.4 - Grant Funding

Discuss grant funding that was applied for or awarded to the Authority.

4.5 - Lessons Learned

Document lessons learned from studies, project monitoring, or project implementation in the region that could affect regional goals; regional priorities, resource management strategies used, and project operations and monitoring.

5 - Proposed IRWMP Amendments

Document proposed amendments to the IRWMP. These differ from changes in governance or policy documented in Section 6 of the annual report. Any member or interested party can propose an amendment to the IRWMP. These proposed changes will be re-evaluated when the IRWMP is formally updated, which is expected to be about every five years.

6 – Governance, Policies and Membership

6.1 - Changes in Governance and Policies

Document changes in governance and policies that have been formally adopted by the Board of Directors.

6.2 - Changes in Regulations

Provide updates on regulations that may impact the Authority such as new requirements for IRWMPs, regional monitoring requirements for groundwater levels, etc.

6.3 - Changes in Members and Interested Parties

Document changes in the members and interested parties in the Authority.

6.4 - Coordination with Other IRWMPs

Document important coordination efforts with other IRWMPs.

The report will be based on the Kings River water year (October to September). Each year data collection will begin in October and the reported completed by the end of January.

10 DATA MANAGEMENT

Data management processes and procedures within the region have been developed to ensure the efficient use of existing available data where applicable and provide accessibility to stakeholders within the region. This section describes the current data management processes and additional data needs within the region.

10.1 Data Collection and Accessibility

Annual groundwater data collection and contour mapping are a primary focus within the region. Water level data is collected by several agencies within the region. A common protocol for groundwater data level collection has been developed. The groundwater level data is provided to Kings River Conservation District (KRCD) staff by Members and Interested Parties in a variety of formats, including hard copy notes, spreadsheet, database and Geographic Information Systems (GIS) data files. KRCD staff maintains a database of groundwater level data and produce contour maps. The Data Management System utilized by KRCD for groundwater data is a geodatabase that enables exporting to common formats such as spreadsheet or database files allowing local agencies and stakeholders to utilize the data.

KRCD staff submitted and was accepted as the local agency for submitting data to meet the requirements of SBx7-6 and California State Groundwater Elevation Monitoring (CASGEM). Local agencies perform their own quality assurance of the groundwater level data collection, and KRCD staff performs quality assurance on the data provided by the local entities by comparing to previous data collected and nearby data from other sources.

Surface water data is maintained within the region by the Kings River Water Association (KRWA) as well as the Friant Water Authority and local surface water purveyors. Daily readings are taken and the surface water delivery data is provided in monthly and annual reports. The KRCD also serves as the lead agency for the region with the Southern San Joaquin Valley Water Quality Coalition (Coalition) which is a group of agencies formed to comply with the State's Irrigated Lands Regulatory Program (ILRP). KRCD collects surface water samples and prepares an annual report related to the ILRP requirements.

The Kings Basin Water Authority (Authority) worked with a consultant in 2008 and 2009 to develop a Data Management System (DMS) to address groundwater and surface water input and reporting. The DMS that was developed has not been fully implemented, as the Authority considers the practical need and usage. The region has also been awaiting the completed development of a DMS by the Department of Water Resources (DWR) to compare to the region's needs and consider consistency with DWR format. The Authority will continue to monitor the status of DWR's DMS

development as well as other alternatives, and utilize the most reasonable and practical tool for the Authority's needs.

The development of the IGSM was a significant effort prior to the completion of the 2007 IRWMP, and was critical in documenting the aquifer changes in the region over time. The region has adopted a policy regarding the use of the data contained within the model and how future updates or focused area considerations of the model are to be completed. Currently, the IGSM data is available to members who desire to utilize the data, but updating and running the model requires an experienced technician familiar with the model type.

A project listing is also maintained by the Authority. The region currently uses a web based tool for data entry regarding each project, but is considering conversion to a Microsoft Access or similar database for maintaining the list. A more detailed description of the project listing is provided in Section 7 – Project Review Process.

10.2 Data Needs

The Authority will continue to gather, collect and maintain data in formats that are easily compatible with other formats and usable within statewide systems. There are some additional data needs within the region, and the Authority will continue to work on methods to collect and maintain this data in an efficient and practical manner. These data needs include:

- Groundwater quality data collection within areas not served by a community water system remains a data gap within the region.
- Groundwater pumping data for agricultural and rural usage
- Priority project needs within Disadvantaged Communities
- Annual report information as described in Chapter 9 including:
    - Surface water hydrology
    - Groundwater levels
    - Water quality
    - Plan objective progress information
    - Project listing
    - Project status updates, benefits, and operational information

11 FINANCING

This section provides a general overview of potential funding sources, programs, and project partnerships available from federal, state, and local sources. The Kings Basin Water Authority (Authority) needs funding for operations, updating the Integrated Regional Water Management Plan (IRWMP), regional technical studies, preparing grant applications, project implementation, and project operation and maintenance.

The funding sources, agreements, and mechanisms will vary depending on the program or project, source of funds, how costs and benefits are distributed, and other political and economic variables. The development of new water supplies and the necessary infrastructure is a major financial undertaking that may require debt service.

The Kings River Conservation District (KRCD) staff will track federal, state, and regional funding sources and keeps the Authority apprised of opportunities for grants, loans or other forms of assistance. A standing agenda item on funding sources will be used to brief the community.

Several administrative topics on Authority finances can be found in the Joint Powers Agreement (JPA) (**Appendix C**), including the fiscal year, fund and account management, property, bonds, budgets, and payments to the Authority. These topics are not discussed here, but additional details can be found in Article IV of the JPA.

11.1 General Funding Procedures

Funding for IRWMP Operations

The Authority's administrative and governance operations are funded by an annual payment made by each member. In 2011, the Authority had eighteen members and the annual payment was $7,000. The annual dues are re-evaluated and approved each year by the Authority Board. Interested parties are not required to make an annual payment. In 2009, new members were required to pay a one-time $30,000 fee to cover past planning investments, such as the IRWMP development. This payment can be amortized over multiple years. KRCD staff, and Authority members and interested parties also contribute in-kind costs by volunteering their time to attend advisory committee meetings, board meetings, committee and work group meetings, and participate in various administrative and governance projects. KRCD has also made direct monetary contributions to assist with the development of the authority and various governance tasks. However, KRCD may not be able to make these contributions in the future. The annual payments are expected to be collected as long as the Authority is active, thus ensuring some general funding to keep the Authority operating. There is a dilemma in collecting the funds necessary to prepare applications that benefit disadvantaged communities (DACs). Some DACs, especially small and severely DACs, lack the resources to cover the full cost of preparing funding applications. To date, a

nominal amount has been charged to some of these communities to cover application preparation costs. It is recommended that an approach be developed that will show commitment from beneficiaries, but not preclude the participation of the neediest communities in resolving their water issues.

Funding for Updating IRWMP

The IRWMP was originally drafted and updated using funds from Department of Water Resources (DWR) Proposition 50 and Proposition 84, respectively. The cost share for the IRWMP update was provided by in-kind salary costs for Members and Interested Parties. The IRWMA will seek DWR funds for future IRWMP updates, but realizes that these funds may not be available, or that their timing may not coincide with the appropriate time for an update. If DWR funding is not available then updates could be funded through a combination of in-kind costs and fees collected from IRWMP members. The Authority plans to prepare annual reports documenting progress, data collected, changes to policies, etc. These annual reports will be the basis for any plan update, and using them will reduce the cost of a full plan update.

Funding for Grant Applications

The Authority has submitted grant applications that benefit the entire IRWMP area and some that directly benefit one or more agency. Applications that benefit the entire Authority, such as for an IRWMP update or regional study will be funded with the Authority's general funds. Applications that directly benefit one or more agency will be funded by those agencies receiving the benefits. Requiring members to fund their own applications helps to ensure that they are serious and committed to their projects.

Funding for Project Development

Project development includes feasibility studies, design and construction. Federal, State and local funding are options for project development. Generally, these funds are only available to Authority members when the Authority submits a grant application. However, interested parties can apply for these funds as long as an Authority member sponsors them, or if an interested party partners on a project with a member. This policy helps interested parties and DACs to qualify for project funding. If for any reason a project proponent who was part of the final project package withdraws from funding, the Authority staff will discuss with the granting agency whether any funding will be withdrawn. Remaining funding will be split among remaining partners according to the default determination or negotiation option.

In October 2010, the Authority developed a Partial Grant Funding Split Policy (Policy No. UKB-001) that documents the default policy in case a grant award of less than 100% is received for a package including multiple projects. Unless otherwise agreed upon by the proponents, each project in the application will have their reward reduced by the percentage that the total grant award was decreased from the requested amount. For instance, if two projects requested $6 million and $4 million respectively, and only

80% of the money is awarded, then each would receive 80% of their original request ($4.8 and $3.2 million, respectively).

The Policy also has the following "Project Drop-out Contingency" that states the following:

> "*If for any reason a project proponent who was part of the final project package withdraws from funding, the Authority staff will discuss with the granting agency whether any funding will be withdrawn. Remaining funding will be split among remaining partners according to the default determination or negotiation option*."

The Authority also has a 'Negotiation Option' that allows project proponents to negotiate a different split based on any rational or reasoning they think is appropriate. Any agreement must be acceptable to all parties whose award is affected and approved by the Authority Board of Directors

11.2 Federal Funding

Federal funds are available through a variety of mechanisms, including subsidies, appropriations, in-kind services, grants, loans, and cost-sharing agreements. These funding mechanisms are described below.

Legislative Approach

Federal funding can be secured through the legislative process to directly fund an approved project. A public agency working with a local congressional representative can initiate this process. The project may require the establishment of federal interest through an act of Congress (authorization) and then be funded in subsequent years (appropriation). An appropriation can be made the same year if the project is consistent with the Goals and Objectives of an existing federal program. Competition for congressional funds is formidable and requires broad support of local, regional, and state interests for projects to be successful in obtaining funding.

Federal Agency Interest

Funding can also be secured directly from federal agencies. Local projects may be eligible for funds and in-kind services through directed actions and partnerships. Federal agencies commit to projects during their respective internal budgeting processes and have the flexibility to disperse funding over several years. KRCD has secured funding in this way through several partnerships with the U.S. Bureau of Reclamation (USBR) and the U.S. Army Corps of Engineers (Corps).

Federal Assistance Programs

A third option is to apply for project funding under an existing federal agency grant, loan, or assistance program. Potential partnering agencies include the USBR, Corps, U.S.

Environmental Protection Agency (EPA), U.S. Department of Agriculture (USDA), U.S. Fish and Wildlife Service (USFWS), and U.S. Geological Survey (USGS). Eligibility, cost sharing, and application requirements vary among the programs.

11.3 State Funding

State funds are similar to the federal funding mechanisms and include legislations, state agency interest and state assistance programs.

Legislative Approach

Although the dollar amounts available from the state are usually not as substantial as federal funding opportunities, the state legislative process is somewhat more straightforward. Appropriating funds through the state legislature is extremely competitive and subject to the state budget conditions.

State Agency Interest

Discretionary funds may be available in the form of directed action assistance or in-kind services. Partnerships with agencies such as the DWR Division of Planning and Local Assistance (DPLA), Department of Fish and Game (DFG), and California Department of Public Health (CDPH) may yield monies and services.

State Assistance Programs

A third option is to apply for project funding under an existing grant, low-interest loan, or assistance program administered by any of the various state agencies. In the past, propositions 13, 204 and 50 have all provided substantial state-wide funds for water resources projects. Proposition 84 provided significant funds specifically for IRWMP updates and implementation projects and continues to be a source of funding through DWR. Additional Propositions will likely be needed to maintain the current level of state IRWMP funding. The state also has other funding programs, such as the Local Groundwater Assistance (LGA) program, that funds groundwater studies and monitoring. The LGA program does not currently require applicants be members of an IRWMP, and projects are typically local. However, regional projects are still eligible for funding, and the IRWMA itself can apply for a LGA grant. The State Water Resources Control Board (SWRCB) administers the Clean Water SRF program and Small Community Wastewater Grant programs that fund wastewater projects. The California Department of Public Health (CDPH) administers the Drinking Water SRF program as well as Proposition 50 and 84 programs to fund drinking water projects.

11.4 Local Funding

Local funding will vary by source and agency authority. City and county government can generate local funding from a variety of sources including: general funds, water

rates, development or impact fees, sales tax connection fees, capital improvement programs, revenue bonds, acreage or ad valorem assessments, and sales taxes. Water and irrigation districts can generate local funds through benefits assessment, water standby and availability charges, sales taxes, water service fees, developer fees; or by generating revenue through water sales, groundwater banking, exchange, or transfer related contracts. Increasing benefits assessments or fees by the overlying water district, irrigation districts or the land use agency, may require studies and a special election and/or protest hearing pursuant to state laws including Proposition 218. Local funding is often the funding source for grant cost sharing and project operation and maintenance.

Operation and Maintenance Funding

Operation and maintenance (O&M) funding for infrastructure projects is generally required from those agencies directly benefitting from the project. The Authority is not responsible for project O&M expenses and grant and loan programs typically do not cover these expenses. Before undertaking a new project, a member must estimate the O&M expenses and define a long-term funding source.

Funding Trends

A number of key trends related to state and federal funds will influence local access to funds and the Authority's financial strategy.

1. State and federal deficits. Deficits have reduced the availability of general-fund revenues to the agencies that previously provided technical support and funds for water-project development.
2. Reduced state and federal grant and loan funding. Many state and federal programs for grant and loan funding have been reduced or curtailed as more pressing social needs redirect funds.
3. Bond funding for planning and implementation. In the past, propositions 204, 13 and 50 have provided a source of funding for groundwater investigations, project construction, and groundwater management plans. IRWMP funding from these sources has ended. Proposition 84 funding is currently available and is available to each IRWM region on a competitive basis. The will of the voters for additional state debt, along with the state bonding capacity, is uncertain. It appears the next water bond will not be on the ballot until at least 2014.
4. Increased requirements for generating special district fees and assessments. Proposition 218 did for special districts what Proposition 13 did to local government ad valorem taxes. Any new fee or assessment requires notice to property owners. Some assessments require voter approval and compliance with legislative and constitutional mandates to conduct the election, and engineering studies to prove benefits and distribute costs.

5. State move toward fee-based revenue for service. Reduced general-fund revenues have put the burden on state agencies to increase fees for service such as water-rights permits, dam safety, and other payments by the regulated community.
6. Increased competition for grant and loan funds. Reduced local government revenues increase competition for any sources of non-local funds.
7. Beneficiary pays principal. Large state and federal programs, such as CALFED, are requiring detailed economic analyses that document who receives project benefits and how payment for program implementation is to be distributed.

IRWMP Approach and Policy to Finance and Funding

The Authority has established the following guidelines regarding project funding:

1. Local funding sources must be firmly defined for all projects requiring local funds.
2. Local funding match requirements are to be provided by the project stakeholder or stakeholders (partners) that are the direct beneficiaries as defined by engineering and economic evaluations.
3. Specific agreements between project partners must clearly define the mechanism for cost sharing and on-going project O&M.
4. All new projects not already covered by an existing funding mechanism will need to expeditiously engage their communities and obtain approvals for any new project funding, whether for capital construction or O&M costs.
5. Impact fees on new development are appropriate for funding IRWMP related projects where the nexus between the development and impacts to the groundwater basin can be substantiated by a groundwater impact study.

For IRWMP common elements defined in the IRWMP, the following funding principles apply:

1. The common elements represent programs to meet common needs of the overlying water users in the Kings Basin and all stakeholders derive some benefit from implementing these programs.
2. The common elements can most cost effectively be implemented and managed by the Authority, and should be compensated for services provided in coordinating programs.

Reserve Funds

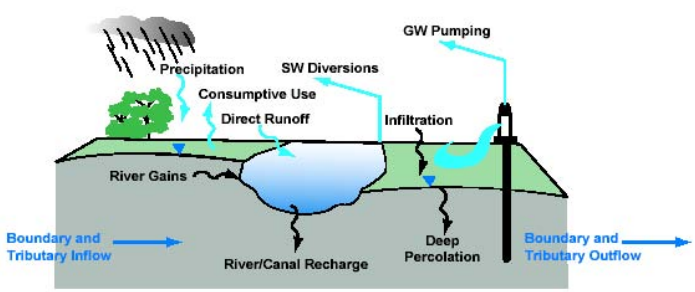
The Authority developed a Reserve Fund Policy in January 2012 (Policy No. UKB-004) that sets a target amount not to exceed $500,000 as a reserve fund. The policy identifies several possible uses for the reserve account including development of collective benefit projects, matching funds for projects, IRWMP updates, and other miscellaneous costs.

12 TECHNICAL ANALYSIS

The Kings Basin Water Authority (Authority) performed extensive analyses to support the 2007 Integrated Regional Water Management Plan (IRWMP). These analyses included studies on regional water supplies, water demands, hydrogeologic conditions, land use, and water quality. Many of these studies were used to help develop a regional hydrologic model for the Kings Basin. The information in these studies is still generally considered valid and was used in preparing this IRWMP. In addition, since 2007 several local studies performed by stakeholders yielded useful information to include in this IRWMP. As a result, only a limited amount of new analysis was needed to update this IRWMP. Below are discussions on these new analyses including: 1) Revised groundwater overdraft calculations; 2) Climate change assessments; and 3) Assessment of water quality conditions in Disadvantaged Communities. A description of the Kings Basin hydrologic model is also provided, since it remains the primary analytical tool available to the Kings Basin.

12.1 Water Resources Model

The Kings Basin Integrated Groundwater and Surface Water Model (IGSM or Model) is a regional model that simulates surface water and groundwater systems in the entire Kings Basin. It is the first comprehensive model of the Kings Basin that incorporates the past four decades of detailed historic conditions. The model was calibrated with data from a 41-year period, and can be used to simulate future conditions. Detailed information on the Kings Basin IGSM is available in a model development and calibration document (WRIME, 2007b). Section 4 of the 2007 IRWMP includes detailed justification for the parameter values used in the model, and the results of model runs to estimate future overdraft.



General Hydrologic Cycle for Kings Basin

The objectives of the model are to provide the following:

1. An analytical tool that can represent the groundwater and surface water flow systems and their interactions;
2. A planning level analytical tool that can provide quantitative information on a comparative basis to help answer questions on the groundwater and surface water system characteristics, and help evaluate alternative water management strategies;

3. A tool that can be used in assessing management strategies consistent with the IRWMP Goals and Objectives; and
4. A calibrated model that documents the historical conditions in the basin, quantifies overdraft, and creates better understanding of how the Kings Basin has been operated in the past.

The model supports the Authority's adaptive management strategy and can be used for comparison of alternatives; selection and sizing of facilities; determination of project feasibility; environmental evaluations; and evaluation of project benefits and costs.

Prior model runs evaluated three conditions: 1) baseline condition; 2) conditions in 2030 assuming no new development occurs; and 3) conditions in 2030 assuming some urban growth, which includes some agricultural areas being converted to urban lands. The modeling results concluded that, under current water management conditions, groundwater levels will continue to decline, groundwater overdraft will increase, and new depression areas will develop. Groundwater overdraft will be the greatest in the areas of Raisin City Water District, and the Cities of Fresno and Clovis.

Several studies were performed to collect data and project future conditions for modeling efforts. These reports provide important technical data that is generally still considered valid. These reports include:

- Hydrogeologic Investigation (Brown and Caldwell and WRIME, Feb. 2006)
- Modeling Objectives and Strategy (WRIME, Feb. 2006)
- Baseline Conditions (WRIME, Mar. 2006)
- Analysis of Water Demands in Kings Basin (WRIME, Apr. 2006)
- Analysis of Water Supplies in Kings Basin (WRIME, May 2006)
- 2005 Existing Conditions & 2030 Baseline Assumptions (WRIME, Oct. 2006)
- Summary of Land Use and Water Use (WRIME, Sept 2004)
- Hydrologic Modeling of the Kings Groundwater Basin (WRIME, Nov. 2005)

The Authority may develop or use other hydrologic models in the future, especially if alternative platforms are found that can increase the flexibility or utility of the model.

12.2 Revised Groundwater Overdraft Calculations

Groundwater level data is collected biannually and documented in an annual regional groundwater report. This data is used to generate groundwater contour maps and estimate the change in groundwater storage (See Chapter 9 – Plan Performance and Monitoring and Chapter 10 – Data Management). **Figure 12-1** shows historic changes in groundwater storage from 1964 to 2011. The Kings Basin model was used to estimate future overdraft by assuming the future hydrology mimics past hydrology (see Section 4 in 2007 IRWMP). Future groundwater overdraft was re-evaluated using a simple trend-line analysis. This method extended the average groundwater level

decline between 1964 and 2011 to the year 2035. The results from this simplified analysis are shown on **Figure 12-1**.

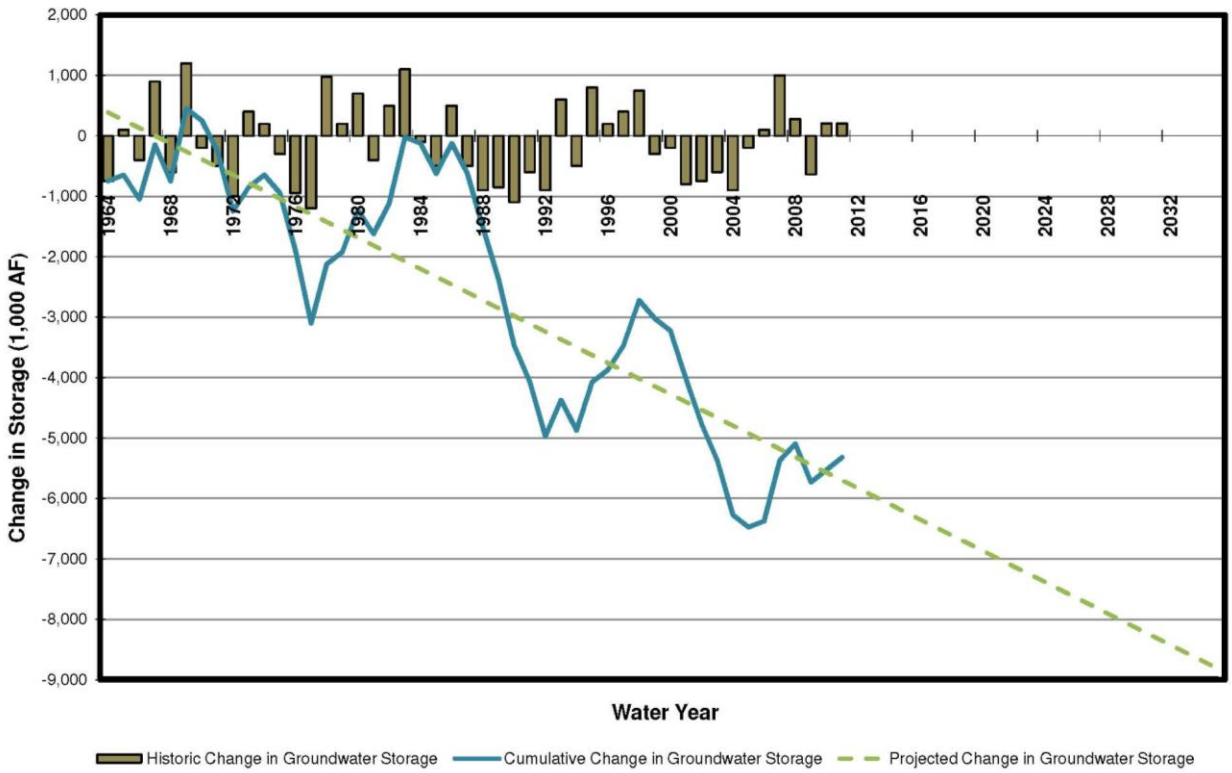


Figure 12-1: Change in Groundwater Storage in Kings Basin (1964-2035)

Figure 12-1 predicts an average groundwater storage decline of 122,000 acre-feet per year (AF/year). In comparison, detailed model runs documented in the 2007 IRWMP estimated a decline from 1964-2004 of 161,000 AF/year and a long-term decline of 105,000 AF/year. **Figure 12-1** illustrates the significance of the groundwater overdraft problem in the Kings Basin, and consequently the Authority has identified groundwater overdraft as their primary concern. The trendline method is a simplified analysis that does not require sophisticated model runs, but still yields reasonable results. Each year the Authority will compare the projected and actual change in groundwater storage as one method of documenting desired outcomes versus actual conditions. The results of this comparison will also help to refine long-term goals for water conservation and overdraft mitigation.

12.3 Climate Change

The Authority investigated the potential impacts from climate change through a climate change vulnerability assessment, and review of several climate model runs performed by others (see Chapter 17). Future analysis could include updated climate change

projections to reflect new data, methods, or understanding of climate change, and evaluation of river flow data for evidence of climate change.

12.4 Disadvantaged Communities

The Kings Basin Water Authority is performing a study (Kings Basin DAC Pilot Study) to evaluate water supply and water quality problems in local disadvantaged communities (DACs). The study is on-going and results will be published in 2013. The results of the study will both highlight and enhance knowledge of groundwater quality problems throughout the Kings Basin. Refer to Section 4.6 for a more extensive description of the study. The results of this study will be considered an Appendix to this report and thereby incorporated into this IRWMP.

13 RELATION TO LOCAL WATER PLANNING

13.1 Introduction

This chapter discusses the relationship between the Integrated Regional Water Management Plan (IRWMP) process and current local water planning efforts. The purpose of this section is to summarize the local planning elements being incorporated into the IRWMP, and the coordination of the local efforts to maintain consistency with the IRWMP and other local efforts within the Region. The specific topics discussed in this Chapter include:

- Water Plans Utilized in the IRWMP
- Relationship between IRWMP and Local Plans

Climate change elements in local water plans are addressed in Section 17.

13.2 Water Plans Utilized in the IRWMP

Water Plans can take a variety of forms and cover a wide variety of components including drinking water, wastewater, flood control and storm drainage.

Within the Region, there are communities with many different forms of water plans. The water plans discussed within this Chapter include:

- General Plan (Conservation Element)
- Groundwater Management Plan (GWMP)
- Agriculture Water Management Plan (Ag WMP)
- Urban Water Management Plans (UWMP)
- Water Master Plan (WMP)
- Sewer System Master Plan (SSMP)
- Wastewater Management Plan (WWMP)
- Stormwater/Storm Drain Master Plan (SWMP or SDMP)
- Flood Control Master Plan (FCMP)
- Water Conservation Plan (WCP)

Water plans from the Member and Interested Party agencies were reviewed and sections of the IRWMP were updated based on information, issues, and potential solutions provided in the plans.

<u>Urban Water Management Plans</u>

The UWMP is a requirement of the Urban Water Management Planning Act (UWMPA) (Division 6, Part 2.6 of the California Water Code (CWC) §10610-10656). The UWMPs must be filed every five years and submitted to the Department of Water Resources

(DWR). The submittal is required to meet the requirements of the UWMPA, including the most current amendments that have been made. The UWMPA applies to urban water suppliers with 3,000 or more connections being served or supplying more than 3,000 acre-feet (AF) of water annually.

UWMPs are required of the state's urban water suppliers in an effort to assist their resource planning and to ensure adequate water supplies are available for future use. A secondary purpose of the UWMP is to provide a plan or series of plans during water drought situations.

Table 13-1: Urban Water Management Plans

Members & Interested Parties	Water Planning Documents
City of Clovis	Clovis 2010 UWMP Update (November 2011)
City of Dinuba	Dinuba 2010 UWMP Update (In Progress)
City of Fresno	Fresno 2010 UWMP Update (In Progress)
City of Kerman	Kerman 2010 UWMP (March 2012)
City of Kingsburg	Kingsburg 2009 UWMP Update (June 2009)
City of Reedley	Reedley 2005 UWMP Update (August 2007)
City of Sanger	Sanger 2005 UWMP Update (February 2008)
City of Selma	California Water Service Company 2010 UWMP Update, Selma District (June 2011)

The components of the UWMP include system supply and demand, supply reliability, water shortage contingency, and conservation measures. Portions of each chapter are dedicated to discussing groundwater pumping, recharge, groundwater levels, and conservation measures for reducing demand. The IRWMP has a stated goal of including all of these components, providing opportunity for collaboration and integration between the Kings Basin Water Authority (Authority) and a regional perspective and the local water suppliers.

Groundwater Management Plans

Many communities and water agencies have prepared a GWMP or are part of a larger regional plan, as shown below. The purpose of groundwater management plans is to work toward improving or maintaining a reliable groundwater supply within the area. Additionally, a GWMP will serve as a resource for neighboring communities within the same hydrologic region to assist in coordinated groundwater planning efforts.

The remaining members or interested parties who do not have a water planning document (UWMP or GWMP) are able to adopt the IRMWP to serve the goals of water management within their communities.

Table 13-2: Groundwater Management Plans

Members & Interested Parties	Water Planning Documents
Alta Irrigation District	AID GWMP (June 2010)
City of Clovis	Fresno Area GWMP (December 2005)
City of Dinuba	AID GWMP (June 2010)
City of Fresno	Fresno Area GWMP (December 2005)
City of Kerman	Fresno Area GWMP (December 2005)
City of Kingsburg	CID GWMP (July 1995)
City of Parlier	CID GWMP (July 1995)
City of Reedley	AID GWMP (June 2010)
City of Sanger	CID GWMP (July 1995)
City of Selma	CID GWMP (July 1995)
County of Fresno	Fresno Area GWMP (December 2005)
Consolidated Irrigation District	CID GWMP (July 1995)
Fresno Irrigation District	Fresno Area GWMP (December 2005)
Fresno Metropolitan Flood Control District	Fresno Area GWMP (December 2005)
Kings County Water District	KCWD GWMP (May 2011)
Kings River Conservation District	KRCD Lower Kings Basin GWMP (April 2005)
Bakman Water Company	Fresno Area GWMP (December 2005)
City of San Joaquin	JID GWMP (November 2010)
Crescent Canal Company	KRCD Lower Kings Basin GWMP (April 2005)
James Irrigation District	JID GWMP (November 2010)
Laguna Irrigation District	KRCD Lower Kings Basin GWMP (April 2005)
Liberty Canal Company	KRCD Lower Kings Basin GWMP (April 2005)
Liberty Water District	LWD GWMP (January 1996)
Raisin City Water District	KRCD Lower Kings Basin GWMP (April 2005)
Riverdale Irrigation District	KRCD Lower Kings Basin GWMP (April 2005)

GWMP have several components that overlap the objective of the IRWMP, including groundwater management, local agency involvement, and groundwater sustainability. Nearly all of the GWMPs are to some extent regional efforts; for example, the Fresno Area Regional GWMP includes ten participating agencies, seven of which are Members or Interested Parties of the IRWMP. Groundwater degradation and overdraft causes and solutions are primary topics of discussion in the IRWMP. Considering the semi-regional perspective of many of the GWMPs, incorporation of the information and conclusions of the GWMPs will be relatively easy. Also, in future GWMP updates, the IRWMP can be utilized as a resource to help guide the local agencies to maintain a regional perspective.

Water, Wastewater and Stormwater Master Plans

Water, Wastewater and Stormwater Master Plans are typically prepared by incorporated cities and counties or flood control agencies. The plans give a framework for the future development of the area; indicating types and sizes of facilities required for various type of land use. These types of master planning efforts are largely tied to the Land Use element of the General Plans for the communities, which are discussed more extensively in Chapter 14.

Table 13-3: Water, Wastewater and Stormwater Master Plans

Members & Interested Parties	Water Planning Documents
City of Clovis	Clovis WMP Update (1995 and 1999) Clovis WWMP Update (1996) Clovis Recycled WMP (July 2005) Clovis SSMP (July 2009) FMFCD Services Plan (September 2009)
City of Dinuba	Dinuba WMP (January 2008) Dinuba 2010 SSMP (September 2010) Dinuba SDMP (June 1989)
City of Fresno	Fresno Metropolitan Water Resources Management Plan Update (December 2007) Fresno SSMP (2009) Fresno WWMP (2006) FMFCD Services Plan (September 2009)
City of Kingsburg	SKFCSD[1] SSMP (October 2006) Kingsburg SDMP (June 2005)
City of Reedley	Reedley SSWMP (July 2009)
City of Selma	SKFCSD[1] SSMP (October 2006)
County of Fresno	Fresno County SSMP (April 2010) FMFCD Services Plan (September 2009)
County of Tulare	Tulare County Flood Control MP (June 1971)
Fresno Metropolitan Flood Control District	FMFCD Services Plan (September 2009)
City of San Joaquin	WMP (July 1995) SSMP (July 1995)

Notes:
[1] Selma-Kingsburg-Fowler Sanitation District

Components of typical sewer, water and storm drain master plan documents are listed in **Table 13-4**.

Table 13-4: Master Plan Components Germane to IRWMP

Type of Master Plan	Typical Components
Sewer System Management Plan (SSMP)	Emergency Overflow Response Plan Fats, Oil and Grease Control Plan[1] System Evaluation & Capacity Assurance Monitoring, Measurement & Modifications
Wastewater Master Plan (WWMP)	Hydraulic Model & Analysis Land Use Flow Projections Capital Improvement Program
Water Master Plan (WMP)	Existing System Details Future System Details
Storm Drain / Flood Control Master Plan (SDFCMP)	Groundwater Recharge Future Drainage Ideology

The components of the SSMP and WWMP are important points of consideration for the Authority because sewer system problems can cause complex problems with water quality if a plan is not in place to address the issues as they arise. The cities with sewer master plans illustrate their prevention and reaction plans and provide important information for the IRWMP to reference.

WMPs, from the large Fresno Metropolitan Plan to the smaller city plans, all include details on the existing system and incorporate land use demands in determining the requirements for building future system components. The integration of land use components in the water planning document resonates with the IRWMP goal of more extensive coordination between land use and water planning representatives.

SDMPs provide a vehicle for discussion of recharge basin locations throughout the Kings Basin Region. A few plans cover a larger area and include multiple communities, such as the Fresno Metropolitan Flood Control Master Plan. These types of plans provide a semi-regional approach to stormwater and have already started the process of a regional approach to this topic. The IRWMP can easily incorporate some of the strategies from these larger plans and provide an avenue for them to coordinate in the future, helping to maintain a region-wide approach to stormwater issues.

Water Conservation Plans

WCPs are intending to provide for a plan during periods of short- and long-term drought conditions. Many cities that are required to prepare a UWMP include their water conservation plan within the UWMP rather than preparing a separate document. The City of San Joaquin is one of the smaller communities who prepared a separate Water Conservation Strategy.

The WCPs, whether a stand-alone plan or as an inclusion in the UWMP, provide a comprehensive look at conservation measures. Typically, these plans provide for

reactionary measures during periods of drought, not for overall water use reduction in a normal year.

Agricultural Water Management Plans

The Central Valley Improvement Act of 1992 (CVPIA) and Section 210(b) of the Reclamation Reform Act of 1982 requires the preparation and submittal of a Ag WMP from certain entities that enter into a repayment contract or water service contract with the Bureau of Reclamation (USBR). Each Plan is required to be updated every 5 years.

The purpose of Ag WMPs is to provide past and current statistics on population, irrigated acres, crop demands, soil conditions, water demands and conservations practices within the Districts.

Table 13-5: Agricultural Water Management Plans

Members & Interested Parties	Water Planning Documents
Alta Irrigation District	AID Ag WMP
Fresno Irrigation District	FID Ag WMP (December 2008)
James Irrigation District	Ag WMP (2010)

Ag WMPs contain a section on the water supply of the District (both surface and groundwater), which specifically discusses the conjunctive uses within the District. Conjunctive use is listed as a Statewide Priority in the IRWM Guidelines and is discussed in Chapter 8 of this IRWMP. Conjunctive use is also a method to integrate water and land use management strategies, which is another item of importance to the Authority. Ag WMPs also have a strong focus on agricultural water use efficiency, an important resource management strategy in the Kings Basin.

General Plans

California Government Code (§65350-65362) requires that each county and city in the state develop and adopt a General Plan. The General Plan consists of a statement of development policies and includes a diagram or diagrams and text setting forth objectives, principles standards, and plan proposals. It is a comprehensive long-term plan for the physical development of the county or city. In this sense, it is a "blueprint" for development.

The General Plan must contain seven (7) state-mandated elements. It may also contain any other elements that the legislative body of the county or city wishes to adopt. The seven (7) mandated elements are: Land Use, Open Space, Conservation, Housing, Circulation, Noise, and Safety. The General Plan may be adopted in any form deemed appropriate or convenient by the legislative body of the county or city, including the combining of elements.

Table 13-6: General Plans

Members & Interested Parties	Water Planning Documents
City of Clovis	Clovis 2020 General Plan (April 1993)
City of Dinuba	General Plan Policies Statement (September 2008)
City of Fresno	Fresno 2025 General Plan (February 2002)
City of Kerman	Kerman 2027 General Plan (2007)
City of Kingsburg	Kingsburg Comprehensive General Plan (July 1992)
City of Parlier	Parlier 2030 General Plan (February 2010)
City of Reedley	Reedley 2012 General Plan (August 1993)
City of Sanger	Sanger 2025 General Plan (November 2003)
City of Selma	Selma 1997 General Plan Update (August 1997)
County of Fresno	Fresno County General Plan (August 2010)
County of Tulare	Tulare County 2030 General Plan (February 2010)
City of San Joaquin	1996 General Plan (June 1996)
County of Kings	2035 Kings County General Plan (January 2010)

General Plans contain a section on water resources within the Conservation Element, which confers the agencies goals with respect to water management within their jurisdiction. This discussion provides a simplistic way for the Goals and Objectives of the IRWMP to be compared to the local agencies'; also allowing for coordination of those goals between documents to provide a unified theme for the region. Many of the general plans within the Kings Basin specifically discuss cooperation with the IRWMP or local agencies in relationship to groundwater recharge, water balancing, water quality issues, etc.

13.3 Relationship between IRWMP and Local Plans

The Region is home to many incorporated cities, unincorporated communities, and counties, which are shown on several figures in Chapter 3. The water planning representatives from the communities and counties are encouraged to actively participate in the Authority and many take advantage of the IRWM process to be involved in regional efforts. These representatives provide important data and information and provided critical guidance during the planning process.

The local planning documents are often a reflection of the same goals, objectives, and strategies as the IRWMP. The Authority is comprised of many local leaders, council members and department directors, who serve as a link between the IRWMP and local water planning efforts. Further, the local agency members and interested parties individually adopt this IRWMP as a separate action by their Board or Council.

Jurisdictions of Local Plans

The local planning documents are confined to the area under the city, community or local entity's purview. For the cities and communities, the jurisdiction is limited by the city limits or sphere of influence depending on the document. The county's jurisdiction is limited by the county limit lines and typically applies only to the unincorporated areas of the county. Special districts such as water, conservation, irrigation or flood control, community services and public utility districts will have an adopted district boundary which serves as the jurisdiction limit. Special districts may also have Local Agency Formation Commission (LAFCO) approved spheres of influence.

Local Plan Updates

The majority of local planning documents are either mandated for periodic update or the local agency elects to update them for accuracy. To the extent feasible, the IRWMP will consider the most current documents during IRWMP Update processes but will not amend or update the IRWMP based solely on a local planning document update. Members and interested parties should refer to the IRWMP in their local plans where applicable.

Regional Efforts Lead to Local Efforts

The regional planning efforts are intended to serve as a basemap or guideline for the entire region to follow in regards to water resources. The foundation of the IRWMP will continue to be the successful implementation of local projects and programs that help accomplish the region's Goals and Objectives. Local agencies without planning documents in place may elect to use the IRWMP in lieu of or as a beginning point for their own local planning documents.

Planning Document Inconsistencies

Inconsistencies may occur occasionally between the regional and local planning documents. Some of these occurrences may be solved through discussion and collaboration between the local agency and the Authority. If it is determined the inconsistency is of vital significance to the IRWMP and out of sequence with a planned update, the Authority will incorporate updated information into the Annual Report or, if necessary, prepare a special update.

14 RELATION TO LOCAL LAND USE PLANNING

14.1 Introduction

This chapter discusses the relationship between the Integrated Regional Water Management Plan (IRWMP) process and current Local Land Use Planning efforts. The purpose of this section is to summarize the local planning elements being incorporated into the IRWMP and the coordination of the local efforts to maintain consistency with the IRWMP and other local efforts within the Region. The specific topics discussed in this Chapter include:

- Link Between IRWM and Land Use Planning
- IRWMP Relationship with Land Use Planning Agencies
- Future Efforts to Establish Relationships with Land Use Planning Agencies

14.2 Link between IRWM and Land Use Planning

The IRWM process provides for many opportunities to collaborate and integrate with local land planners both at the city and county levels. Integration of the prevailing land use with water supply plans and the water planning process is an important strategy for the Kings Basin IRWMP. The Authority includes several local council members and agency directors, who oversee many divisions of their respective jurisdictions, including land use planning. Inclusion of land use planning personnel in the IRWMP process allows for the regional Goals and Objectives to be more completely implemented through policy change and project development.

The link between IRWM and land use planning has a considerable number of common considerations, both providing an opportunity to garner important input on a multitude of issues. The issues which could be effected include: flood management, groundwater recharge, conjunctive water use, treatment facilities, water conservation, municipal and recreational development, general plan policies, planning and development review, and land use modification to improve water resource management.

Water agencies can encourage local land use agencies to protect groundwater recharge areas; restrict and provide alternatives to development in floodplains; evaluate adequacy of water quality and septic system disposal for new developments; and encourage development of local water, wastewater and storm drain projects to integrate and maximize the potential for meeting regional goals and measureable objectives.

14.3 IRMWP Relationship to Land Use Planning Agencies

The IRWMP Region overlaps parts of Fresno, Tulare, and Kings Counties. The incorporated cities, unincorporated communities, and county boundaries in the Kings Region are shown in Chapter 3. City and County representatives from the planning or public works agencies actively participated in the IRWM process. These representatives provide a conduit to the elected bodies through the planning process. They also support collection of important data and information and provide critical guidance for planning purposes. **Figure 14-1** shows how local planning efforts in the Kings Region are integrated and how the IRWMP fits into larger scale efforts.

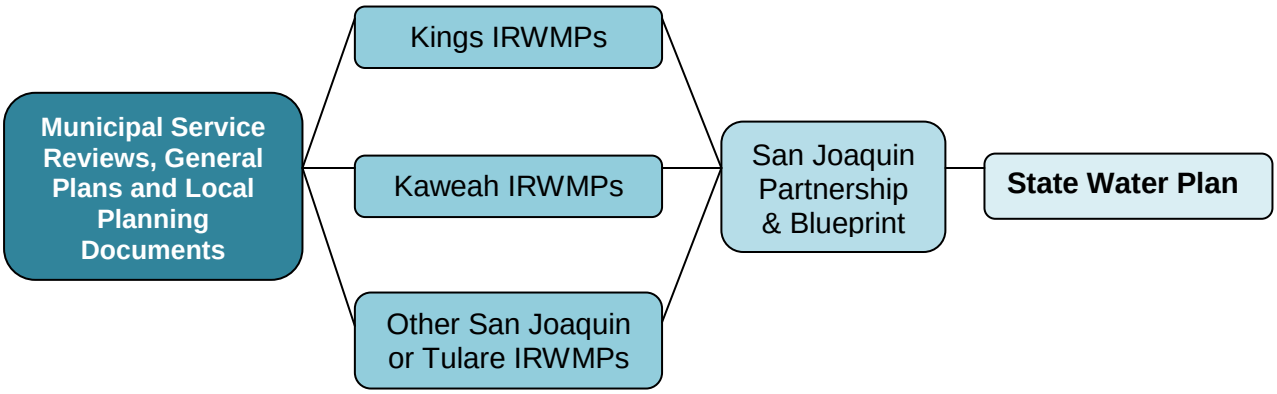


Figure 14-1: IRWMP Relationship to Local Planning

Under California law, the management of land use is the responsibility of local government. Land use planning requirements for each jurisdiction are defined by City and county general plans and the associated goals, policies, objectives and programs. They guide land use decisions at the city and county level, typically resulting in less detailed or comprehensive review of regional water issues. They are comprehensive and integrated across the full spectrum of land, water, and natural resources management elements.

In the past, land use and water supply decisions were made independently; however, in recent years legislation and court precedence have begun changing the planning process. Two such pieces of legislation, SB610 and SB 221, are companion measures with the intent to promote collaborative planning between cities, counties and water suppliers. SB610 requires the preparation of Urban Water Management Plans and water supply assessments for larger development projects or land use plans. SB221 prohibits a land use agency from approving a subdivision map of more than 500 units without a letter of verification that sufficient and reliable water is available.

Similarly, Local Agency Formation Commissions (LAFCOs) are required to ensure water supplies are available before approving city or district boundary amendments.

Additionally, they are responsible for approving a Municipal Service Review (MSR) prior to updating a sphere of influence, which must be updated every five years.

Updates to the General Plan Guidelines recommend that local agencies include a Water Element in their general plans with the intent that the general plans would incorporate the city or county's Urban Water Management Plan (UWMP) (if applicable) and codify requirements to comply with SB610/221.

For the development of the IRWMP, the city and county information was important for characterizing the historical and existing conditions in the Kings Region (WRIME, 2006); documenting demand and supply conditions (WRIME, 2006); formulating the assumptions for the future without project land use and water supply conditions (WRIME, 2006); and developing and evaluating the project elements. The IRWMP process included consideration of the existing land use plans to help ensure consistency with the IRWMP, and thus minimize the potential for conflicts between the plans

The city and county agencies and Fresno, Kings and Tulare County Local Agency Formation Commissions were consulted to obtain critical planning information, including general plans and MSRs, which are listed in **Table 14-1.**

Table 14-1: Land Use Planning Documents

Members & Interested Parties	Land Use Planning Documents
City of Clovis	Clovis 2020 General Plan (April 1993)
City of Dinuba	General Plan Policies Statement (September 2008) MSR (May 2006)
City of Fresno	Fresno 2025 General Plan (February 2002)
City of Kerman	Kerman 2027 General Plan (2007)
City of Kingsburg	Kingsburg Comprehensive General Plan (July 1992)
City of Parlier	Parlier 2030 General Plan (February 2010)
City of Reedley	Reedley 2012 General Plan (August 1993)
City of Sanger	Sanger 2025 General Plan (November 2003)
City of Selma	Selma 1997 General Plan Update (August 1997)
County of Fresno	Fresno County General Plan (August 2010)
County of Tulare	Tulare County 2030 General Plan (February 2010)
Consolidated Irrigation District	MSR (July 2007)
Fresno Irrigation District	MSR (July 2007)
Biola CSD	MSR (July 2007)
City of San Joaquin	1996 General Plan (June 1996)

Members & Interested Parties	Land Use Planning Documents
County of Kings	2035 Kings County General Plan (January 2010)
Cutler PUD	MSR (March 2007)
East Orosi CSD	MSR (October 2011)
Easton CSD	MSR (July 2007)
Laton CSD	MSR (July 2007)
Liberty WD	MSR (August 2007)
London CSD	MSR (May 2006)
Mid-Valley WD	MSR (August 2007)
Orange Cove ID	MSR (July 2007)
Orosi PUD	MSR (May 2006)
Raisin City Water District	MSR (August 2007)
Riverdale ID	MSR (July 2007)
Riverdale PUD	MSR (August 2007)
Sultana CSD	MSR (October 2011)

DWR is recommending that land use planning be one of the water management strategies that should be included in an IRWMP. A review of the existing city and county general plans was conducted and a briefing was prepared (WRIME, 2007a) to support discussion by the Land Use and Water Supply Work Group and the preceding Water Forum. The purpose of this memorandum was to document the review of City and County General Plan goals, objectives, policies, and programs. The review specifically evaluated how each general plan recognizes regional water resources issues; incorporates water management strategies; and how achievement of these goals could be supported by the IRWMP being developed by the Water Forum. The technical memorandum identifies the policy "drivers" that provide a basis for integrating land use, water supply plans, and the planning process. Since the WRIME memorandum was prepared, the Dinuba and the counties of Tulare and Kings have updated their general plans; the City of Fresno has also prepared an amendment to their General Plan (2009) and is in the process of preparing an update to the 2025 General Plan to extend the planning horizon. A review of the updated general plans and all MSRs was conducted for the IRWMP and the observations are included in the list below.

The findings and observations of the reviews included the following:

- County general plans are characteristically more regional in their viewpoint
- City general plans do not typically focus on regional overdraft issues and solutions
- City general plans do not generally identify impacts to irrigation district facilities as a result of development in terms of infrastructure and flood water releases

- Water supply reliability and safety is usually discussed in the general plans but in generalities; the plans should be more specific in directives toward how water supply shall be provided and verified
- Most general plans do not specifically discuss new water supply development and suggestions for groundwater management
- Many general plans do discuss integrated land use and water supply planning
- The more recent general plan updates focus on more regional efforts overall due in part to new requirements for general plans; however they still discuss water issues in generalities, not specifics
- MSRs typically discuss general information regarding recharge and growth, without listing specific plans toward reaching these goals

14.4 Efforts to Establish Relationships with Land Use Planning Agencies

As previously discussed, cooperation between land planning representatives and the IRWM is critical to the successful implementation of regional water management efforts. Establishing new and strengthening existing relationships will contribute to the Kings Basin's success. There are several key approaches for facilitating the future relationships with local agencies:

- Internal discussion within the Authority regarding land planning issues
- Review and comment on new land planning policies of the agencies within the Region
- Encourage land-use planners to attend regular Advisory Committee meetings
- Give presentations on water planning and IRWMPs at local chapters for land-use planning professional societies
- Exploration of projects that will facilitate the modification of land planning policy to encourage implementation of region-wide beneficial water management
- Conduct bi-annual meetings between the Authority and local land planning representatives for the purposes of discussing upcoming policy changes or implementation of the IRWMP
- Promote inter-agency communication between the land planning and water management staff
- Maintain a current list of land planning staff at all local agencies including counties, cities and unincorporated communities

The IRWM is committed to maintaining open channels of communication and facilitating continued involvement of the land planning community in the IRWMP process and implementation.

This Page is Intentionally Blank

15 STAKEHOLDER INVOLVEMENT

Stakeholder involvement includes efforts to recruit and engage a diverse group of stakeholders to participate in all aspects of the Kings Basin Water Authority (Authority). Stakeholder involvement, also called public outreach, is fundamental to the success of the Authority. This chapter discusses the public outreach strategy, outreach performed to update the IRWMP, and future plans for public outreach.

15.1 Stakeholders

The Authority includes a diverse group of members and interested parties, which is the result of on-going public outreach efforts since 2004. The California Water Code (CWC) §10541(g) identifies 13 different stakeholder categories. The Authority includes 11 of the 13 different stakeholder categories. **Table 3-2** lists the members and interested parties, and their corresponding stakeholder categories. The Kings Basin Water Authority also satisfies the definition of a Regional Water Management Group provided in the CWC (see Section 2.1).

Critical water supply and water quality issues of Disadvantaged Communities (DACs) are important Kings Basin concerns. Most of the communities in the Kings Basin meet the state definition of DAC, which is having a median household income less than 80 percent of the statewide average. While most small DACs cannot afford the costs to become Members of the Authority, many do participate free of cost as Interested Parties. Special efforts have been made to educate and engage DACs within the planning area. These efforts are described in Chapter 4 – Disadvantaged Communities. Chapter 4 also describes the social/cultural makeup of the region, the process for identifying DACs, and the goals and preliminary results of two large studies aimed at identifying water related problems and possible solutions in local DACs.

The Authority performed extensive outreach while preparing the 2007 Integrated Regional Water Management Plan (IRWMP). On-going outreach efforts since then have attracted more stakeholders to participate. As a result, most of the stakeholders in the region are actively participating in the IRWMP as Members or Interested Parties. However, a few are not involved either because they did not respond to previous outreach efforts, or in some cases were not directly contacted. The IRWMP Update Work Group openly discussed which stakeholders were not involved in the IRWMP and should be directly contacted. The following list was generated:

- California State University at Fresno
- Reedley College
- Local Chambers of Commerce
- University of California Cooperative Extension (agriculture)
- Local Farm Bureaus

- Agricultural commodity groups
- Malaga County Water District
- Community of Easton

Outreach is being conducted to these stakeholders by the Outreach Work Group. As a result of these efforts, the Fresno County Farm Bureau and University of California Cooperative Extension both joined as Interested Parties in April 2012. Easton Community Services District and California State University, Fresno joined as Interested Parties, in June and September 2012, respectively. In October 2012, the Board approved altering Raisin City Water District's status from Member to Interested Party.

15.2 Public Outreach Methods

In 2005, with the support of the Outreach Work Group, the Authority prepared a Community Affairs Plan to outline the stakeholder coordination process. The Community Affairs Plan is a living document and remains the backbone of the public outreach effort. The plan identifies the following goals for the public outreach process:

1. Brand the Authority as a regional entity addressing water reliability and quality, and agricultural, urban and natural resource needs.
2. Educate the public about the region's water resources issues.
3. Promote an IRWMP to gain support for water management strategies being considered by the Authority.
4. Mobilize the electorate to vote on projects that improve regional water reliability and quality.

The Authority, through the efforts of the Outreach Work Group and approval of the Board, developed a logo for the Authority to assist with the branding of the Authority as a regional entity. The logo has been incorporated into all materials, website, and e-mails that are distributed by the Authority.

The Authority maintains a website (www.kingsbasinauthority.org) that posts a variety of information on regional water management efforts including: Board of Director meeting schedules, agendas and minutes, Advisory Committee meeting schedules, agendas and minutes, list of members and interested parties, recent news, and documents (governing documents, reports, technical papers, applications and proposals). The website includes all of the major documents developed by the Authority. This website is updated regularly and also serves as an archive for important documents developed by the Authority.

The Authority is frequently the subject of local newspaper articles. In 2011 and 2012, they were featured in the following articles:

- *Eastern Merced Regional Water Authority in the Works*, Merced Sun-Star, February 22, 2012

- *Regional Water Planning Faces Uncertain Future*, AgAlert, January 25, 2012
- *Coalition of Water Organizations Has Proven Effective*, Sanger Herald, January 19, 2012
- *Groundwater Supply Dripping with Importance*, Kingsburg Recorder, January 18, 2012
- *Groundwater Supply Dripping with Importance*, Selma Enterprise, January 2012
- [Kings Basin] *Water Authority Leverages Funds for Regional Projects*, Dinuba Sentinel, January 5, 2012
- *Work of Local Water Association Praised*, Hanford Sentinel, December 12, 2011
- *Message from the General Manager (regarding KBWA)*, Floodline, Winter 2011-2012

These articles are often based on press releases and editorial meetings initiated by the Authority**.** The Authority is also highlighted through a video and case study by the Pacific Institute as a successful regional water management effort.

News on the Authority is frequently published in the Kings River Conservation District (KRCD) newsletter. In the Fall 2011 newsletter, an article described the Proposition 84 planning grant to update the IRWMP. In July 2012, an article provided more details on the IRWMP.

Stakeholders have opportunities to participate in the Authority through the Advisory Committee, Work Groups, and the Board of Directors. These groups are explained in Section 2 – Governance. Information is made available to stakeholders through the following methods: newsletters, newspaper articles, Authority website, Advisory Committee Meetings, Board of Directors meetings, e-mails, and various other public outreach efforts. **Figure 15-1** shows how stakeholders are contacted and how they can communicate with other members and interested parties.

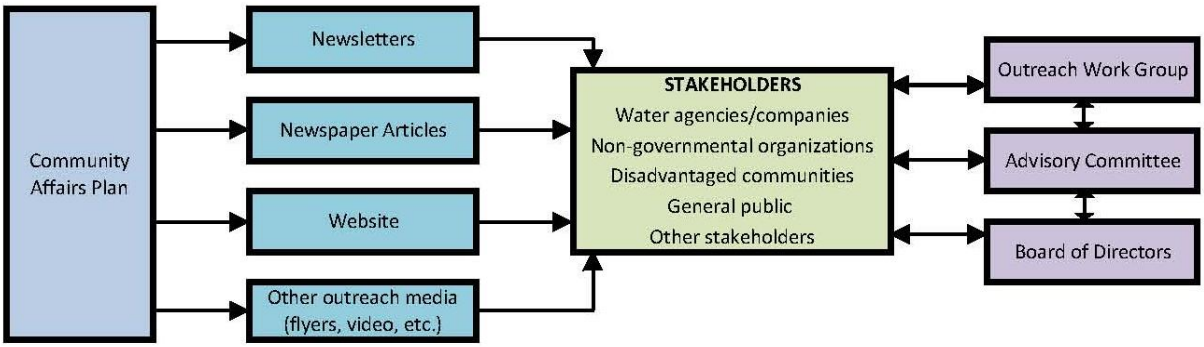


Figure 15-1: Public Outreach and Stakeholder Involvement

15.3 Public Outreach for IRWMP Development

15.3.1 Public Outreach for 2007 IRWMP

The Authority used a comprehensive public outreach program to recruit new members and solicit comments on the 2007 IRWMP. This included a combined approach of community relations and mixed media to reach the target audiences. Public outreach efforts included stakeholder and committee meetings, website pages, printed materials, newspaper articles, newsletter articles, and a speaker's bureau program that conducted presentations to 25 organizations. These efforts are documented in the 2007 IRWMP (Section 2.2.6), and were successful in engaging the majority of stakeholders in the region to join as members or interested parties.

15.3.2 Public Outreach for 2012 IRWMP Update

The public outreach process for updating the 2012 IRWMP included the following:

- The intent to prepare an updated IRWMP was announced at the Authority Advisory Committee and Board meetings. The item was noted on agenda that was publicly noticed and put on the Authority's website.
- In compliance with the California Water Code, the Authority published notices that the IRWMP was being updated and considered for adoption. The notices were published in the widely circulated Fresno Bee, which is the major newspaper in the area. Copies of the notices are included in **Appendix E**. The first notice, published on November 5 and 12, 2011, informed the public that the Authority was updating the IRWMP to address an expanded plan area and new stakeholder interests, as well as to meet new State standards. The general public was invited to participate in updating the IRWMP. The second notice, published on August 31 and September 7, 2012, informed the public that the Authority was intending to adopt the updated IRWMP and solicited public review and comment on the document.
- Approximately fourteen stakeholders volunteered to serve on an IRWMP Update Work Group. In addition to the Work Group members, several additional stakeholders attended the meetings and contributed.
- Through a series of nine interactive meetings over a ten month period, the Work Group reviewed each IRWMP standard and the content in the existing IRWMP. During these sessions, the Work Group members shared ideas and concerns, and came to consensus on the information to include in the updated IRWMP.
- IRWMP update progress reports were given at each Authority Advisory Committee and Board meeting, including announcement of the next IRWMP update Work Group meeting and an invitation for anyone interested to attend and participate.

- The draft revised IRWMP was prepared and submitted to each Work Group member for comments. The Work Group had approximately one month to review the draft IRWMP.
- In excess of three hundred comments were received from the Work Group. A list of comments was developed and discussed at a Work Group meeting and incorporated in the IRWMP.
- The public was notified that the revised IRWMP was available for review through a local newspaper notice, KRCD newsletter article, Authority website, and during several Advisory Committee and Board of Directors meetings. Stakeholders were provided approximately one month to review the IRWMP and provide comments.
- Comments were collected from Advisory Committee members, Board of Directors, and the general public. A list of comments was developed and reviewed at the Advisory Committee meeting and a finalized IRWMP was produced.
- The Final IRWMP was sent to the Board for review in advance of a regularly scheduled Board of Directors meeting. A presentation was made at the meeting on the content of the IRWMP, and questions from Board members as well as others in attendance were addressed by the Authority's consultant and members of the IRWMP Update Work Group.

15.4 Decision Making

The Authority's decision making process is transparent and all stakeholders are afforded the opportunity to provide input on decisions. Decisions are generally made by the Board of Directors who comprises the formal Members of the Authority. All stakeholders have opportunities to provide input and comments on decisions at Board meetings or through participation in work groups, special committees, and the Advisory Committee. Decisions to fund projects or include them in grant applications are made by a special Projects Work Group. Chapter 2 – Governance includes a description of the different committees and work groups, and the decision making protocols for the Authority.

15.5 Future Public Outreach

Future public outreach will follow the model developed during past outreach efforts. Public outreach will follow the Community Affairs Plan, which will be assessed yearly and updated, with a focus on Advisory Committee meetings, the website, newsletters, and directly contacting potential stakeholders. The IRMWP Update Work Group also concluded that the significance of the groundwater overdraft was not widely understood, and one focus of future outreach will be educating the public on the gravity of the situation, and progress made to reduce overdraft.

Most organizational stakeholders in the region are already members or interested parties, but some have not participated. The Authority recognizes that the opportunity for a stakeholder to become involved is not limited to the beginning stages of plan development. A stakeholder may become involved later as their awareness of IRWM increases or new issues or concerns develop. The Authority will continually invite new stakeholders to participate to further increase the depth and diversity of membership.

16 COORDINATION AND INTEGRATION

Coordination and integration are two closely related Integrated Regional Water Management Plan (IRWMP) standards intended to help ensure IRWMP members are working together. The Kings Basin Water Authority (Authority) was formed as a Joint Power Authority (JPA) with the intent of establishing a foundation of coordination and integration within the region. The Authority's organization and regular meetings and efforts demonstrate those efforts. This IRWMP describes a variety of processes for stakeholders to coordinate and integrate water management efforts. This section describes these processes and references other sections of the IRWMP where they are discussed in greater detail.

Coordination involves public outreach and facilitation efforts to bring stakeholders together and work as a unified group. Coordination efforts can include specific tasks or implementation of on-going policies and procedures. The goals of coordination include the following:

- Reduce conflicts among local agencies and stakeholders
- Identify opportunities for regional or multi-agency projects
- Increase awareness of adjacent IRWMPs and their efforts
- Improve awareness of state, federal, and local agency resources, plans and projects

Integration is defined as combining separate pieces into an efficient unified effort. The broad goal of regional water management is to integrate the stakeholders into a single entity for addressing regional issues.

Coordination and integration include five main components, as shown in **Figure 16-1**.

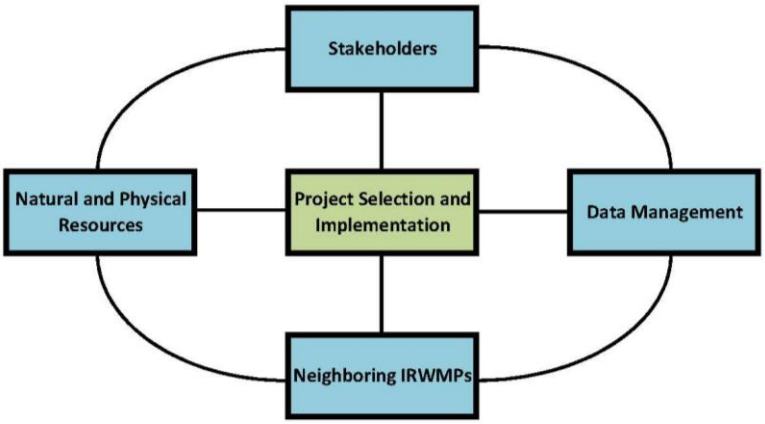


Figure 16-1: Coordination and Integration Components

Coordination and integration efforts generally overlap, and therefore they are jointly discussed below. Coordination and integration are covered in several IRWMP chapters, so the discussions below are introductory and refer to other IRWMP sections for more details.

Stakeholders

The Authority has established a governance structure that fosters both integration and coordination of stakeholders through the following:

- The members are organized under a JPA, which provides a formal and structured organization to manage regional water resources (Section 2.3). The Authority is a separate entity from each member, but all members are integrated through seats on the Board of Directors. Each member pays annual dues, helping to ensure that the Authority has long-term funding to operate.
- The governance structure allows any stakeholder to participate as an interested party (Section 2.4). Interested parties do not need to pay annual dues, allowing stakeholders with limited funding to participate. Interested parties can attend regular Advisory Committee meetings or serve on Work Groups (Section 2.4). Advisory Committee meetings provide all stakeholders a forum to exchange ideas and provide input to the Board of Directors. Numerous Work Groups provide opportunities for stakeholders to provide input on specialized topics. The Advisory Committee and Board meetings are quarterly and are scheduled for the year.
- The Authority uses a variety of public outreach methods to inform stakeholders of the Authority's efforts and accomplishments, and solicit comments on projects and studies (Section 15).

Natural and Physical Resources

The Kings Basin includes valuable natural resources and water infrastructure. These resources benefit local agencies but can also be used for regional projects. Several agencies working together have significantly more resources than one working alone. Therefore, the integration of resources has the ability to enhance the outcome of any project. Resource integration can include sharing data, technical expertise or infrastructure. Resources integration is addressed as follows:

- The IRWMP provides various details on the members, interested parties, and other local, State and Federal agencies in the Kings Basin (Chapter 3 and Appendix A). This data informs stakeholders on the roles and responsibilities of other stakeholders, and their physical and natural resources. This ensures that stakeholders have the necessary background data to participate in regional planning and decision making.

- The Authority performed a climate change vulnerability assessment (Section 17.4). This is an integrated assessment for the Kings Basin, and helps to show potential climate change impacts to the region as a whole.

Project Selection and Implementation

The Authority coordinates and integrates projects through the following policies and procedures:

- The Authority is performing a regional study on water resources problems in disadvantaged communities (Section 4.6). The study is helping to integrate and improve coordination among the Disadvantaged Communities (DACs) and the Authority.
- The Authority uses an integrated process to solicit and review projects for funding (Chapter 7). The process requires input from a Projects Work Group and the Board of Directors.
- The Authority has listed the general benefits of regional water management (Section 8.1). The goal of this list is to inform stakeholders of the value of coordinating and cooperating on regional efforts.
- The Authority has identified the benefits and impacts of implementing different types of projects (Section 8.2). This information is provided for stakeholders within the Kings Basin and for neighboring IRWMPs. The purpose of this list is to help improve coordination among parties impacted by new projects.
- The Authority solicits and publishes a list of projects so each stakeholder is aware of proposed projects. This list can also help prevent duplication in new projects. The list will be updated annually and incorporated into the Annual Report.
- Several integrated (multi-agency) projects have been proposed by the stakeholders. The Authority will work to further develop and promote these types of projects.

Data Management

The Authority has successfully developed several programs to coordinate and integrate data management among the different parties in the Kings Basin. These programs include the following:

- The Kings Basin implements several regional monitoring programs (e.g. groundwater level, water quality, etc.) that require coordination among numerous stakeholders (Section 9.1).
- The Authority plans to prepare an annual report that will integrate data from all of the members and interested parties, evaluate progress in meeting regional Goals and Objectives, document progress in implementing projects, and document proposed amendments to the IRWMP (Section 9.5).

- The Authority has developed the Kings Basin Integrated Groundwater and Surface Water Model (IGSM), which simulates hydrologic conditions in the entire Kings Basin (Section 12.1). The model was calibrated with regional hydrologic data from a 41-year period. The model can be used for regional analysis or project specific analysis.
- The Authority performs annual groundwater overdraft calculations using data collected throughout the Kings Basin (Section 12.2). The calculations provide common ground for the members and interested parties to evaluate overdraft problems and identify needed solutions.

Neighboring IRWMPs

The Authority abuts four different IRWMP Groups (see **Figure 3-3)**. The IRWMPs do not overlap, as the various IRWMP groups have made efforts to coordinate their boundaries as much as possible. The Authority does not currently have any major conflicts with other IRWMP groups. The neighboring IRWMPs have many similarities to the Kings Basin including large agricultural demands, reliance on surface water and groundwater, and groundwater overdraft concerns. Nevertheless, this IRWMP covers a distinct hydrologic region, so the Authority sees no merit in merging with any neighboring IRWMPs. The Authority is actively involved with neighboring IRWMPs and provides information on their efforts at Advisory Committee meetings and in several sections of this IRWMP, as described below:

- The Authority coordinates with neighboring IRWMPs through letters of agreement, the IRWMP Round Table of Regions, the Tulare Basin Integrated Regional Planning Effort, and regular communication with some neighboring IRWMPs (Section 2.7)
- This IRWMP describes how projects in the Kings Basin could positively or negatively impact the four neighboring IRWMPs (Section 8.3). This information should be considered when developing new projects and coordinating them with neighboring IRWMPs.

17 CLIMATE CHANGE

17.1 Introduction

Climate change is a long-term alteration in global weather patterns such as precipitation, temperature, wind and severe weather events. Climate change can occur from both natural and anthropogenic effects. Scientists believe that a primary driver of climate change is greenhouse gas concentrations, including methane and carbon dioxide. Anthropogenic release of these gases is expected to accelerate the rate of natural climate change. Paleoclimatic evidence, such as ice cores, lake varves, and tree rings show a direct correlation between greenhouse gas concentrations and global temperatures (Ruddiman, 2002). There is broad scientific agreement that climate change is occurring and that emissions of heat-trapping gases are the primary cause.

Climate change impacts in the Kings Basin cannot be precisely predicted, but if they occur, they could include different precipitation patterns and river flows, higher temperatures, and earlier snowmelt. The California Department of Water Resources (DWR) recognizes that current climate change projections are not precise, but they require that climate change planning be incorporated into Integrated Regional Water Management Plans (IRWMPs). Further, due to the uncertainty in predictions, water managers should prepare for a range of future conditions.

The general strategy to plan for climate change in the Kings Region includes: 1) identify vulnerabilities 2) implement adaptation measures; and 3) monitor for climate change. This planning process is shown in **Figure 17-1**.

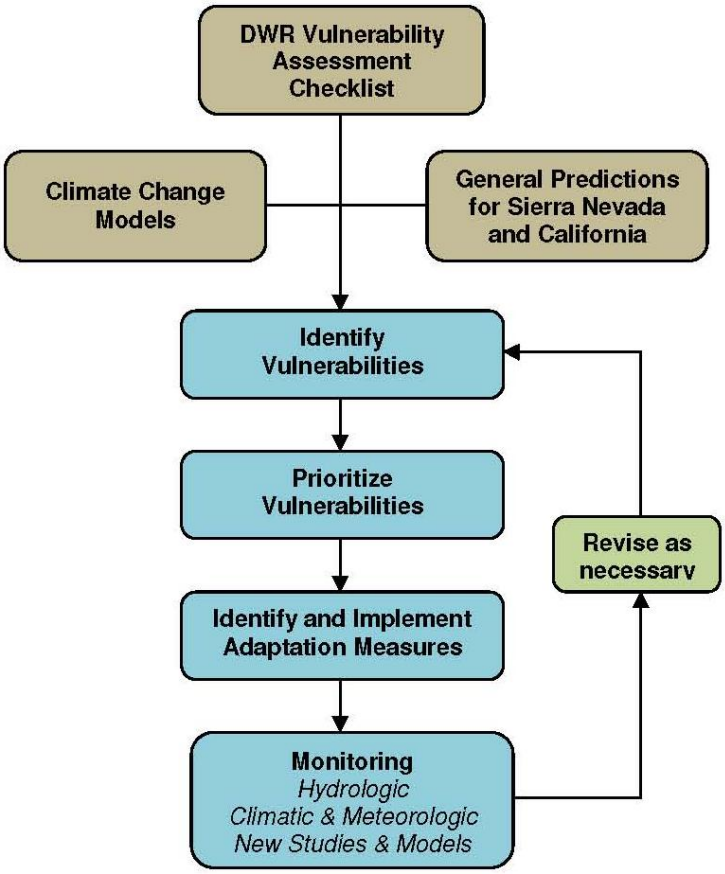


Figure 17-1: Process for Climate Change Planning

Specific topics addressed in this section include: climate change literature, general impacts from climate change, a vulnerability assessment for the Kings Basin, climate change modeling results, adaptation measures, climate change monitoring, and consideration of greenhouse gas emissions in the project review process.

17.2 Literature Review

Numerous documents were used to evaluate climate change in the Kings Basin. The primary document was the *Climate Change Handbook for Regional Water Planning*, (DWR and EPA, 2011). This handbook is the most recent, practical climate change document published by the DWR, and provides numerous tools for addressing climate change. This document is not required for preparing IRWMPs; however, DWR does recommend that it be used.

Other important climate change documents that were used include California Natural Resources Agency (2009), California State University at Fresno (2008), Conrad (2012), Climatewise (2010), DWR (October 2008), and U.S. Global Change Research Program

(2009). Lastly, several reports that describe climate change modeling results were reviewed. These are discussed in Section 17.5.

Several local water and land use plans address climate change. The climate change goals and policies in these plans are consistent with this IRWMP. For example, the General Plans for the City of Selma, Tulare County and Kings County outline numerous climate change mitigation measures such as energy efficiency requirements at new developments, compact urban development, and promoting development of renewable energy. The City of Clovis Urban Water Management Plan proposes water conservation measures to reduce energy demands and mitigate for climate change. The City of Fresno Metropolitan Water Resources Management Plan (2007) identifies a need for more flood control space to address more frequent flood flows caused by climate change. The City of Fresno also assumes a ten percent decrease in Kings River and San Joaquin River water supplies to Fresno from climate change impacts, although there is no specific basis used to determine this number. Climate change is missing from many older planning documents; however, it is being addressed in most new planning efforts.

17.3 General Impacts from Climate Change

This section discusses potential general impacts from climate change on the Kings Basin. Specific impacts are uncertain, but it is generally agreed that the climate will warm and have a variety of impacts on precipitation, hydrology, and the ecosystem. Some of the potential climate change impacts listed by DWR (Oct. 2008), California Natural Resources Agency (2009) and the U.S. Global Change Research Program (June 2009) include:

<u>Precipitation</u>

- Changes in the seasonality of precipitation
- Increase in frequency and intensity of droughts
- More precipitation and less snowfall, resulting in less water stored in the snowpack
- Increased frequency of rain-on-snow events
- Changes in temperatures and cloud cover that inhibit or prevent cloud seeding
- Lower overall precipitation and increased aridity

<u>Streamflow</u>

- Changes in the timing of spring runoff
- Increased flood risk, creating conflicts between water storage and flood control

<u>Water Demands</u>

- Higher temperatures leading to higher evapotranspiration rates from plants, soils and open water surfaces

- Extended growing seasons resulting in higher evapotranspiration for urban landscape and permanent crops

Water Quality

- Higher water temperatures leading to fish distress and algae growth
- Changes in erosion patterns resulting from changes in runoff and overland flow

Other

- Increased fire risk to rangeland and forests
- Potential for increase in diseases, pest invasions and weed invasions
- Heat waves and crop stress leading to lower crop yield
- Overall geographic changes in distribution of flora and fauna

The California water system is especially vulnerable to climate change due to its dependence on mountain snow accumulation and snowmelt processes. Sierra snow is the largest water reservoir in California, and is an important storage mechanism for the Kings Basin. Earlier peak runoff, more intense storms that quickly wash through the system, and lower snowpack levels could all contribute to lower water availability, and increased demand on groundwater.

Predicted changes in precipitation vary, but most predictions include a reduction in overall moisture. For example, Koopman et al. (2010) states that six climate change models described in several California Energy Commission reports showed a drier climate for Central California. On the other hand, California State University at Fresno (2008) states that global climate change models suggest near similar precipitation regimes but with a potential variation of 15-25%. Bashford et al. evaluated two climate change scenarios, including one wet scenario and one dry scenario. The purpose of listing these different predictions is not to throw doubt onto climate change science, but rather show that some uncertainty exists, and water managers should therefore plan for a range of conditions.

Climate change could also have some positive impacts including less frost damage to crops, longer agricultural growing seasons, and less demand for winter heat. However, the Kings Basin water system is designed for a specific climate, and warmer temperatures will generally be detrimental since they will increase water demands and reduce snowpack storage in a water-short area. The risks to the region from no action are clear and include a reduction in available water supply, greater groundwater overdraft, urban water shortages, higher water costs, and lower agricultural output.

17.4 Vulnerability Assessment

A local vulnerability assessment was performed using the 'Vulnerability Assessment Checklist' found in the *Climate Change Handbook for Regional Water Planning* (DWR and EPA, 2011). This checklist, provided below, evaluates vulnerabilities to water

demand, water supply, water quality, flooding, ecosystems and habitats, and hydropower from potential climate change.

1. Water Demand

1.a - Are there major industries that require cooling/process water in your planning region?

The region includes a large number of fruit, vegetable, and meat processing plants, but the temperature of the process water is not likely a major factor. The Kings River Conservation District (KRCD) operates a natural gas peaking powerplant (Malaga Peaking Plant) in the area, but cooling water is provided entirely from groundwater. No other major thermal powerplants are located in the region.

1.b - Does water use vary by more than 50% seasonally in parts of your region?

Seasonal water use varies substantially (greater than 50%) in the region. The majority of water is used in the summer for crop irrigation and some landscape irrigation. Water demands are very low in the winter when much of the farmland is idle, most permanent crops are dormant, and effective precipitation provides most of the needed moisture. Approximately one-third of urban water demands occur in the winter with the other two-thirds in the summer.

1.c - Are crops grown in your region climate-sensitive? Would shifts in daily heat patterns, such as how long heat lingers before night-time cooling, be prohibitive for some crops?

The region experiences hot dry summers, and, as a result, most of the crops grown have a relatively good resistance to heat. Changes in heat patterns would probably only impact crop yields if there is a significant increase in temperature. Changes in heat patterns could increase the demand for crop irrigation water. Although freezing temperatures do harm some crops, they are beneficial to some permanent crops that need a certain number of chilling hours below freezing for an effective dormancy. Freezing temperatures also kills some types of pests. Therefore, a reduction in the number of freezing days could negatively impact some crops.

1.d - Do groundwater supplies in your region lack resiliency after drought events?

Groundwater provides an important supplement to surface water in the Kings Basin. Groundwater is used to meet demands not met by surface water, and the demand for groundwater increases during droughts. The region has experienced several severe droughts and the groundwater supply has proven resilient, although there is generally still a steady decline in groundwater levels due to long-term overdraft.

1.e - Are water use curtailment measures effective in your region?

Surface water curtailments include urban water conservation measures and reductions in surface water allocations. Historically, water users have been able to supplement surface water supplies with groundwater, resulting in few water shortages. However, if groundwater levels continue to decline then groundwater will become less reliable as a backup supply. The area has a hardened demand due to a large number of permanent plantings, so new water conservation programs may have to be implemented in the future if less surface water is available.

1.f - Are some instream flow requirements in your region either currently insufficient to support aquatic life, or occasionally unmet?

Minimum in-stream flow requirements are almost always met. These flows have the highest priority for the surface waters, and flows would be insufficient only in an extreme drought.

2. Water Supply

2.a - Does a portion of the water supply in your region come from snowmelt?

Yes, most of the surface water comes from snowmelt in the Sierra Nevada Mountains. This surface water is used throughout the region. Therefore, the Kings Basin is vulnerable to potential climate change impacts on snow including earlier spring runoffs, less water storage as snowpack, and more frequent rain-on-snow events that could cause flood releases out of reservoirs.

2.b - Does part of your region rely on water diverted from the Delta, imported from the Colorado River, or imported from other climate-sensitive systems outside your region?

A small portion of the Kings Basin, including James Irrigation District, Tranquillity Irrigation Districts, and Fresno Slough Water District, use Delta water as a portion of their water supply. However, as part of their water contracts, these districts can receive San Joaquin River water in place of Delta water if Delta water is not available.

2.c - Does part of your region rely on coastal aquifers? Has salt intrusion been a problem in the past?

No, the region does not rely on coastal aquifers.

2.d - Would your region have difficulty in storing carryover supply surpluses from year to year?

The local reservoirs have some capacity to store carryover water from year to year without encroaching on flood control space. The space to store the water, and ability to keep it in storage, depends on the hydrology. In some years, agencies can carryover water and in other years they cannot. Additional carryover storage capacity would be welcomed by the local water agencies. The region does have very large sub-surface storage capacity. New groundwater banks are needed to further utilize this underground storage space.

2.e - Has your region faced a drought in the past during which it failed to meet local water demands?

Surface water supplies are reduced during droughts, but groundwater is generally used to meet shortfalls, in addition to some urban water conservation. As a result, almost all water demands have been met in past droughts. If groundwater levels continue to decline, then it may not be a reliable backup supply in the future and some demands may not be met.

2.f - Does your region have invasive species management issues at your facilities, along conveyance structures, or in habitat areas?

Some invasive plant species can clog natural channels and canals if they are not properly managed, so most agencies include this as part of their maintenance activities. Agencies in the area have been alerted to the potential for invasive species such as quagga mussels and how to help prevent their spread.

3. Water Quality

3.a - Are increased wildfires a threat in your region? If so, does your region include reservoirs with fire-susceptible vegetation nearby which could pose a water quality concern from increased erosion?

No reservoirs are located in the Kings Basin itself, but several reservoirs are found in the watersheds that provide surface water to the region. Vegetation surrounds these reservoirs, but it is generally sparse in the immediate vicinity of the larger reservoirs and would not pose a large water quality concern from increased erosion. Some reservoirs at higher elevations have thick forest on the reservoir rim, or are located in steeper terrain where post-fire erosion could potentially affect water quality.

3.b - Does part of your region rely on surface water bodies with current or recurrent water quality issues related to eutrophication, such as low dissolved oxygen or algal blooms? Are there other water quality constituents potentially exacerbated by climate change?

Warmer water could cause conditions that lead to eutrophication. However, the surface waters in the region, Kings River and San Joaquin River, are derived from Sierra snowmelt, and are cold and very pure. These waters have few nutrients that support algae growth and it is generally not a problem. However, algae is a problem in the canals that carry Kings River water to treatment facilities and can become a problem during very low flows at the distal end of the rivers.

3.c - Are seasonal low flows decreasing for some waterbodies in your region? If so, are the reduced low flows limiting the waterbodies' assimilative capacity?

No decreases in low flows for the local water bodies have been observed, although no detailed analysis has been performed. Changes in annual low flows from climate change would be difficult to identify since low flows already vary due to natural climate variations and management of reservoir releases.

3.d - Are there beneficial uses designated for some water bodies in your region that cannot always be met due to water quality issues?

Local surface water supplies are able to meet all beneficial uses, which include recreation, hydropower, aquatic habitat, irrigation, and municipal water use. However, operational adjustments are often made to improve water quality for fish. Groundwater quality varies throughout the region and is not suitable for municipal use in some areas. Groundwater quality may degrade further as groundwater levels continue to decline.

3.e Does part of your region currently observe water quality shifts during rain events that impact treatment facility operation?

Yes, even though surface waters in the region generally have excellent water quality, storm activity can cause very high turbidity spikes that can affect the operation of surface water treatment facilities.

4. Sea Level Rise

The Kings Basin is at an average elevation of about 300 feet above mean sea level and is approximately 100 miles from the ocean. Therefore, sea level rise is not a threat to the region.

5. Flooding

5.a - Does critical infrastructure in your region lie within the 200-year floodplain? DWR's best available floodplain maps are available at: http://www.water.ca.gov/floodmgmt/lrafmo/fmb/fes/best_available_maps/.

Most of the floodplains in the Kings Basin are farmland. Some houses, roads, and water supply infrastructure (wells, canals, etc.) are also located in the floodplains. Major flooding would not likely cause serious disruptions to essential emergency-response services.

5.b - Does part of your region lie within the Sacramento-San Joaquin Drainage District?

No.

5.c - Does aging critical flood protection infrastructure exist in your region?

Major flood control facilities include Pine Flat Dam and Kings River levees. In addition, Friant Dam on the San Joaquin River impacts flooding along the San Joaquin River, on the northern boundary of the Kings Basin. These facilities are all considered to be in good condition.

5.d - Have flood control facilities (such as impoundment structures) been insufficient in the past?

Major flood control facilities including dams and levees have been sufficient in past years. Levee breaks along the Kings River would likely not cause serious problems and in most cases would only flood farmland.

5.e - Are wildfires a concern in parts of your region?

Wildfires are not generally a concern in the Kings Basin, but they are a concern in the San Joaquin River and Kings River watersheds which are largely forested. Wildfires can result in severe short-term erosion and water quality degradation of surface waters.

6. Ecosystem and Habitat Vulnerability

6.a - Does your region include inland or coastal aquatic habitats vulnerable to erosion and sedimentation issues?

No.

6.b - Does your region include estuarine habitats which rely on seasonal freshwater flow patterns?

No.

6.c - Do climate-sensitive fauna or flora populations live in your region?

A variety of flora and fauna live in the area and some are likely climate sensitive. Due to urban and agricultural development, some have limited ability to migrate as a means of adapting to climate change.

6.d - Do endangered or threatened species exist in your region? Are changes in species distribution already being observed in parts of your region?

Yes, several threatened and endangered species are found in the area. No noticeable changes in species distribution are known to have occurred since the region was developed.

6.e - Does the region rely on aquatic or water-dependent habitats for recreation or other economic activities?

Recreation is an important part of the local culture on the Kings River, San Joaquin River and in Pine Flat Reservoir. These recreational opportunities also provide a minor benefit to the local economy.

6.f - Are there rivers in your region with quantified environmental flow requirements or known water quality/quantity stressors to aquatic life?

The San Joaquin River and Kings River both have schedules for minimum environmental flows. These flows are the highest priority water uses, and are likely to be met, except possibly in an exceptionally dry year.

6.g - Do estuaries, coastal dunes, wetlands, marshes, or exposed beaches exist in your region? If so, are coastal storms possible/frequent in your region?

No.

6.h - Does your region include one or more of the habitats described in the Endangered Species Coalition's Top 10 habitats vulnerable to climate change (http://www.itsgettinghotoutthere.org/)?

The Kings Basin is not included in the list of top 10 habitats vulnerable to climate change. However, the Kings River watershed is located in the Sierra Nevada Mountains, which is on the list.

6.i - Are there areas of fragmented estuarine, aquatic, or wetland wildlife habitat within your region? Are there movement corridors for species to naturally migrate? Are there infrastructure projects planned that might preclude species movement?

Due to the large amount of urban and agricultural development, prime wildlife habitat is generally fragmented in the valley portion of the Kings Basin. However, wildlife could feasibly travel between prime habitat areas through agricultural land, or along the Kings River corridor and its tributaries. In the foothills, and forested areas east of the basin, large un-fragmented wilderness areas are found. A high-speed rail project is proposed that could further fragment habitats in the Kings Basin.

7. Hydropower

7.a - Is hydropower a source of electricity in your region?

Yes. Hydropower is generated on the Kings River, San Joaquin River, and along the Friant-Kern Canal. The electricity is sold to the local power company and delivered to the electric grid, so it is not necessarily used directly in the Kings Basin, but is a valuable resource.

7.b - Are energy needs in your region expected to increase in the future? If so, are there future plans for hydropower generation facilities or conditions for hydropower generation in your region?

Energy demands are likely to increase in the region due to population growth, and to accommodate any climate change. No new major hydropower projects are planned for the area and are probably not likely to be pursued due to permitting difficulties. Some small hydropower projects are being considered along canals or at existing dams to utilize fish release flows. However, the energy generated from these projects would be small.

<u>Conclusions from Vulnerability Assessment</u>

Based on the analysis above the following vulnerabilities were identified for the Kings Basin. These vulnerabilities are listed in their order of importance.

1. **Backup Water Supplies.** The region has a reliable water supply, largely because groundwater is a dependable backup supply during droughts and the dry season. However, the groundwater level is declining and groundwater demands may increase if climate change reduces precipitation or causes earlier spring runoff that cannot be stored. If groundwater levels decline too much then the groundwater will become a less reliable supply, and groundwater quality may decline. This vulnerability can be measured with several parameters including

groundwater overdraft, groundwater level decline, groundwater remaining in storage, and changes in well yields.

2. **Inadequate Water Storage.** Storage facilities in the Kings Basin include Pine Flat reservoir, several smaller reservoirs in the upper Kings River watershed, and groundwater banks in the valley. These facilities have been successful in helping the region regulate seasonal and year-to-year flows; however, there is still demand for more storage. These facilities may be inadequate if warming reduces water storage in the form of snow. Obtaining permits to construct large dams is difficult, and, therefore, storage would have to be developed with numerous groundwater banks and off-channel reservoirs. This vulnerability can be measured by the volume of new storage developed in acre-feet.
3. **Climate Sensitive Crops.** Warmer temperatures could reduce losses for some crops from winter freezes, but other crops depend on some winter freezes to kill pests or ensure an effective dormancy. Higher temperatures could result in lower yields for these crops. No adaptation measures are available for this impact, other than changing crop types, which is expensive if permanent plantings are impacted. This vulnerability can be measured with the number of chilling hours below freezing, and impacts to crop productivity each year.
4. **Flooding.** Flooding is not currently a large problem, but increases in high flows could create future problems since it is unlikely that large flood control dams can be constructed. Therefore, proper floodplain zoning and limiting high-value development on floodplains is crucial to preventing future problems. This vulnerability can be measured by the number of essential structures constructed in the 200-year floodplain.

These vulnerabilities will be re-evaluated at least every five years to reflect changes in local cropping, water demands, water supplies, new facilities, and climate change projections.

17.5 Climate Change Models

Climate change models are tools that can help identify a range of possible future climatic conditions. The Kings Basin Water Authority (Authority) did not perform model studies, primarily because several other organizations have modeled the local area. The results from each model differ, likely a result of different assumptions and differences in understanding the earth's processes and feedbacks. Taken as a group, however, climate models present a range of possible future conditions. Two models are described below followed by several general predictions for the State of California and Sierra Nevada mountain range.

<u>Climate Change Sensitivity Study of California Hydrology</u>

In 2001, the Lawrence Berkeley National Laboratory and National Oceanic and Atmospheric Administration published a report entitled '*Climate Change Sensitivity Study of California Hydrology'*. Six headwater basins in California were evaluated

including the Kings River Basin. Two climate change projections were used including a warm/wet scenario (HadCM2 run 1) and a cool/dry scenario (PCM run B06.06), based on projections provided by the Third Assessment Report of the Intergovernmental Panel on Climate Change. The 'cool/dry' scenario still includes increasing temperatures, but at a slower rate than the 'warm/wet' scenario. The conditions described by these global models were used to assess local conditions in specific areas of California.

The study provided estimated changes in temperature and precipitation for the two scenarios during different time periods. These impacts are ultimately reflected in changes to streamflows, which are illustrated in **Figure 17-2**. The streamflow ratios represent the ratio of projected streamflow to historical conditions (historical conditions have a ratio of 1.0).

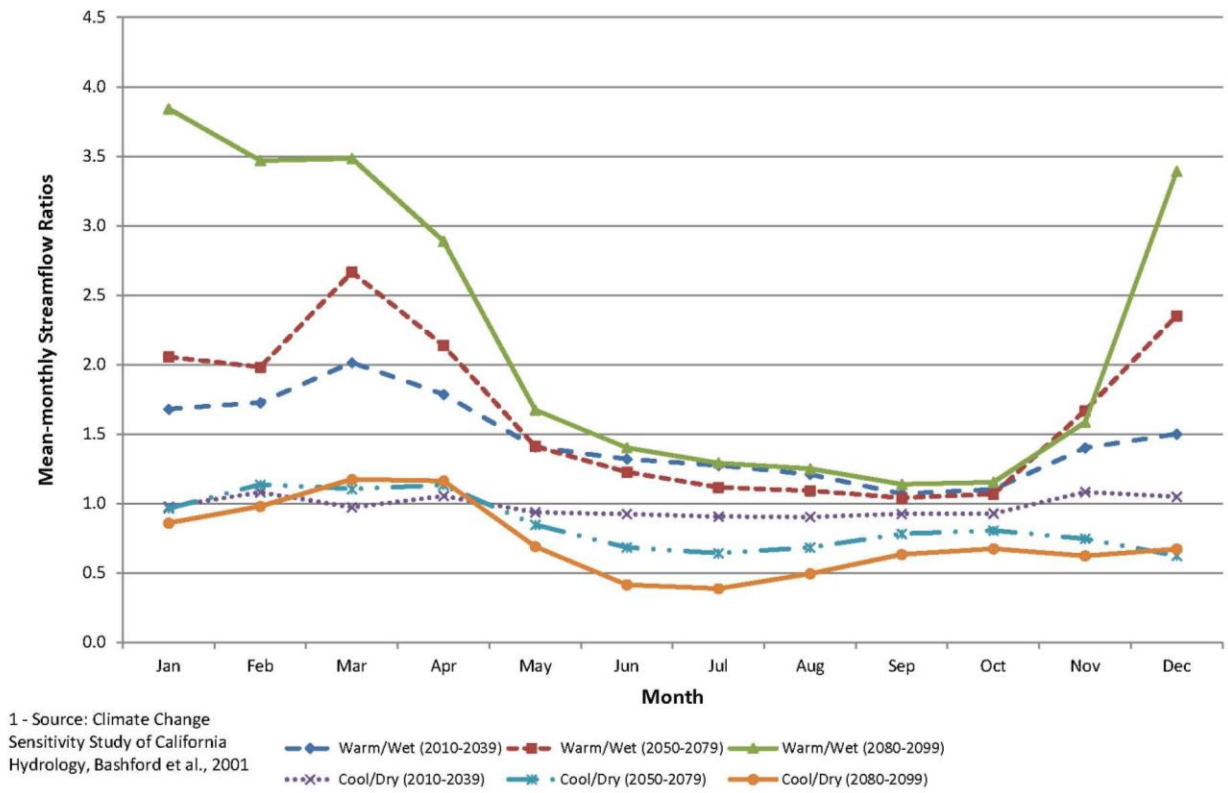


Figure 17-2: Estimated Impacts to Kings River Flows
(Warm/Wet and Cool/Dry Climate Change Scenarios)

Figure 17-2 shows two vastly different scenarios, and illustrates both the uncertainty in climate change predictions and the importance of being prepared for a range of impacts.

The warm/wet scenario would provide additional water, which would be welcome in the water-short Kings Basin. However, some of this moisture would be lost to higher

evaporation and transpiration, and some would leave the basin as flood flows. This scenario could also present serious flooding problems throughout the Kings Basin, especially along the Kings River.

The cool/dry scenario would result in less overall moisture. Streamflows would be higher in the late winter and early spring due to earlier snowmelts. Late spring and summer flows would be lower, which could have serious water supply impacts.

The report also lists seven previous studies that suggested Sierra Nevada streams are likely to peak earlier in the season under global warming. In addition, a key finding was that basin elevation has the greatest influence on streamflow sensitivity to climate change. The Kings Basin watershed is at a high elevation compared to some of the other basins modeled, and was less sensitive to rising temperatures.

Future Climate Conditions in Fresno County and Surrounding Counties

In 2010, the National Center for Conservation Science and Policy (NCCSP), prepared a report entitled '*Future Climate Conditions in Fresno County and Surrounding Counties'*. The report predicted climate change impacts in Fresno, Madera, Kings and Tulare Counties. The entirety of the Kings Basin is included in the study area.

The report is based on climate change model outputs provided by the USDA Forest Service Pacific Northwest Research Station and mapped by the NCCSP. Three global climate models were selected that represent a range of projections for temperature and other climate variables. These three models are Hadley (HADCM from the UK), MIROC (from Japan), and CSIRO (from Australia). Model outputs were converted to local scales using data on historic precipitation and temperature patterns. NCCSP mapped climate variables for a historical period (1960-1990) and for two future periods (2035-2045 and 2075-2085). Results were divided into a lower region (<1,000 feet elevation) and an upper region (> 1,000 ft elevation). The predicted changes in precipitation and temperature are summarized in **Table 17-1** and **Table 17-2**. The report did not provide predicted changes in streamflow.

Table 17-1: Projected Changes in Precipitation

Time Period	Average Precipitation (% change from historic)			
	Lower Region		Upper Region	
Historic	9.4 in	-	29.9 in.	-
2035-2045	6.9 – 10.6 in.	-27% to +13%	21.7 – 33.6 in.	-28% to 12%
2075-2085	6.8 – 8.8 in.	-28% to -7%	20.5 – 28.2 in.	-32% to -6%

Note: USDA Forest Service Model

Projections for future precipitation varied among the three models, but all three agreed on drier conditions, on average, by late century, especially in the spring.

Table 17-2: Projected Increased in Temperature (F°)

Time Period	Upper Region	Lower Region
Historic	46.4	62.3
2035-2045	+2.5 – 4.8	+2.3 – 4.3
2075-2085	+5.2 – 8.9	+4.7 – 8.2

Note: USDA Forest Service Model

General Predictions for California and the Sierra Nevada Mountain Range

Several publications provide general statements on predicted climate change in California and the Sierra Nevada range. These general statements are not specific to the Kings Basin and are generally considered less reliable than local modeling results. However, they are useful for discussion and comparison purposes, and are listed in **Table 17-3**

Table 17-3: General Climate Change Predictions

Source	Prediction
Climate Change Adaptation Strategies for California's Water (DWR, 2008)	Water managers should use a drought component that assumes, until more accurate information is available, a 20 percent increase in the frequency and duration of future dry conditions.
	DWR projects that Sierra snowpack will experience a 25 to 40 percent reduction from its historic average by 2050.
Sierra Climate Change Toolkit, 2nd Edition (Sierra Nevada Alliance, 2007)	In most cases, total annual streamflow into major Sierra Nevada reservoirs is projected to drop about 10 to 20 percent before mid-century and 25 to 30 percent before the end of the century.
The Ahwannee Principles for Climate Change (Local Government Commission, 2009)	The State's largest reservoir (snowpack) is predicted to lessen by one third over the next 50 years and to half its historic size by the end of the century.

17.6 Adaptation Measures

Climate change adaptation is a response that seeks to reduce the severity of climate change impacts to human and natural systems. The adaptation measures identified below do not address a specific quantified impact, but rather focus on a range of

potential impacts. Since climate change predictions will never be perfect, flexibility and diversity in adaptation measures is fundamental. The adaptation measures will also help the region to improve resiliency, which is defined as the ability to return to original conditions after a disturbance or impact.

The DWR defines 'no-regret' strategies as actions that provide measurable benefits today while also reducing vulnerability to climate change (DWR, 2011). In other words, they are strategies that provide benefits with or without climate change. For instance, constructing a water bank would provide needed water supply benefits in the present, but could mitigate climate change impacts through floodwater capture, increasing water storage, and enhancing wetland habitat. The Water Education Foundation (2010) believes that planning for climatic uncertainty will also benefit planning for regulatory, environmental, economic, and social uncertainty.

The IRWMP Update Workgroup concluded that no-regret strategies should comprise the majority of adaptation measures. Consequently, the threat of climate change further justifies the need for many water management strategies already being used in the region. Furthermore, climate change adaptation is not in conflict with current Goals and Objectives of the region.

Most of the resource management strategies described in Section 6 would assist with climate change adaptation. However, the following strategies were deemed the most practical and effective for climate change adaptation in the Kings Basin:

- Improve urban and agricultural water efficiency
- Increase use of recycled water (where energy efficient)
- Revise land use planning policies to encourage conservation (e.g. low impact development or water efficiency standards)
- Develop groundwater recharge and banking projects
- Develop water storage projects inside and outside of the Kings Basin
- Increase ability to capture floodwater both for flood control and water supply
- Restore mountain meadows, wetlands, and riparian areas to regulate flows resulting in more summer runoff
- Change crop types to accommodate climate change

The overall theme with these strategies is to expand the extreme conditions (drought and floods) that the region can accommodate. Eliminating or reducing groundwater overdraft is considered the primary strategy for addressing water supply impacts from climate change.

17.7 Climate Change Monitoring

Climate change monitoring includes two components: 1) monitoring hydrologic and meteorologic parameters for climate change; and 2) monitoring climate change literature, legislation and modeling results.

The Kings Basin already includes a robust network for monitoring the hydrology, meteorology, water demands, water use, crop yields and wildlife. No immediate improvements are needed to monitor for climate change. The monitoring programs are periodically evaluated and upgraded, and the need for improvements to evaluate climate change will also be periodically evaluated.

Water projects were designed and are operated on the assumption that future hydrology will mimic past hydrology. Climate change will likely change future hydrology. However, the specific changes to the hydrology are uncertain, and some scientists are still undecided on whether the region will have a wetter or drier climate. Consequently, future projects will continue to be designed based on past hydrology until more definitive predictions are available. However, the potential change in hydrology is the driving force behind adaptation measures which will be pursued by the Authority.

The science of climate change, and the tools to mitigate and adapt to climate change, are still evolving. As a result, every five years as part of the California Water Plan Update process, DWR will provide revised estimates of changes to sea levels, droughts, and flooding that can be expected over the following 25 years. The Authority will also stay apprised of new studies, reports, literature, legislation, and climate change model runs that are pertinent to the area. When needed this literature will be shared with the Authority members and interested parties, and incorporated into the IRWMP updates.

17.8 Mitigation of Greenhouse Gas Emissions

Mitigation of climate change can be achieved by selecting and promoting projects that help to reduce greenhouse gas emissions (GHG) emissions. While the Authority is not responsible for air quality management, and they can only have a small impact on global emissions, it is sensible to consider emissions in project selection in view of the negative impacts climate change may have on water resources. The Authority is also dedicated to helping the State meet GHG emission reduction goals. These goals, prescribed in the California Global Warming Solutions Act of 2006 (AB 32), include reaching 2000 emission levels by 2010, 1990 levels by 2020, and 80% below 1990 levels by 2050.

All of the resource management strategies described in Chapter 6 can assist with climate change mitigation through reduction in energy demand, ecosystem enhancement, or carbon sequestration. For instance, water conservation can reduce energy demands to pump, convey, and treat water supplies. Another example is riparian area restoration, which can sequester carbon and create habitat for species impacted by climate change.

Projects are primarily ranked based on their water supply benefits, but GHG emissions and climate change adaptation were added as secondary considerations. Specifically, the following questions were added to the Project Review Process form:

1. Will this project result in reduced greenhouse gas emissions? If yes, explain how and quantify.
2. Will this project increase greenhouse gas emissions? If yes, explain how and quantify.
3. Will this project contribute to adaptation strategies to respond to climate change impacts?

Beginning July 1, 2012, GHG emissions for California Environmental Quality Act (CEQA) studies are required to be calculated using the California Emissions Estimator Model (CalEEMod). CalEEMod quantifies potential criteria pollutant and GHG emissions from construction and operations for a variety projects. The Authority will also require that this model be used on projects considered for funding.

17.9 Climate Change in other IRWMP Sections

Climate change is discussed in several other IRWMP sections including:

- **Chapter 5 – Goals and Objectives.** This chapter includes general goals related to climate change adaptation and mitigation.
- **Chapter 6 - Resource Management Strategies –** This chapter discusses the impacts of climate change on the efficacy of different strategies, and the ability of strategies to help adapt to climate change.
- **Chapter 7 - Project Review Process –** The project review process includes new questions related to GHG emissions (Section 17.8)
- **Chapter 12 - Relation to Local Water Planning –** This chapter summarizes the climate change adaptation and mitigation strategies from local water plans, and evaluates their consistency with the goals of this IRWMP.

18 REFERENCES

Bashford, K.E., Miller, N.L., and Strem, E., *Climate Change Sensitivity Study of California Hydrology: A Report to the California Energy Commission, LBNL Technical Report No. 49110*, November 2001.

California Department of Water Resources and US Environmental Protection Agency Region 9, *Climate Change Handbook for Regional Water Planning*, November 2011.

California Department of Water Resources, *California Water Plan Update, Bulletin 160-09*, 2009.

California Department of Water Resources, *California's Groundwater – Bulletin 118, Update 2003*, 2003.

California Department of Water Resources, *Climate Change Adaptation Strategies for California's Water*, October 2008.

California Department of Water Resources, *Proposition 84 and Proposition 1E Integrated Regional Water Management Guidelines*, August 2010.

California Natural Resources Agency, *2009 California Climate Adaptation Strategy*, 2009.

California State University at Fresno, Harmsen, F., Hunsaker, D., Van de Water, P., and Luo Y.V., Mitigation and Adaptation Strategies for Climate Change in Fresno California, August 2008

Climatewise, *Maintaining Resilient Natural Systems in Fresno County and Surrounding Counties: A Summary*, 2010.

Conrad, E., *Climate Change and Integrated Regional Water Management: A Preliminary Assessment of the Report to IRWM Climate Change Requirements – Final Draft for Comments*, University of California Berkeley, Department of Environmental Science, Policy and Management, February 2012.

California Department of Public Health, *"The Purple Book" California Health Laws Related to Recycled Water,* 2001.

Fresno County*, Voluntary Rangeland and Foothill Water Quality Guidelines,* 2000.

Fresno Metropolitan Flood Control District*, District Services Plan, 2009.*

Kings River Conservation District and Kings River Water Association, *Kings River Handbook,* 1997.

Kings River Conservation District, *Consolidated Irrigation District Surface Water Study,* 1993.

Pitzer, G., *Linking Climate Change Science to Water Management Decisions*, Water Education Foundation, 2010.

Provost & Pritchard Consulting Group, *Tulare Lake Basin Study,* 2012.

Regional Water Quality Control Board, *Water Quality Control Plan for the Tulare Lake Basin (Basin Plan),* 2004.

Report for the State Water Resources Control Board, Center for Watershed Sciences, University of California, Davis, *Addressing Nitrate in California's Drinking Water with a Focus on Tulare Lake Basin and Salinas Valley Groundwater*, January 2012.

Ruddiman, W.F., *Earth's Climate: Past and Future*, W. H. Freeman and Company, New York, NY, 2002

Sierra Nevada Alliance, *Sierra Climate Change Toolkit, 2nd Edition*, 2007.

State Water Resources Control Board, *2002 California 305(b) Report of Water Quality,* August 2003.

State Water Resources Control Board, *Communities that Rely on Contaminated Ground Water,* February 2012.

State Water Resources Control Board, *Decision 1290,* 1967.

The National Center for Conservation Science and Policy, Koopman, M.E., Leonard, J.L., and Nauman, R.S., *Future Climate Conditions in Fresno County and Surrounding Counties*, , July 2010.

Tulare Basin Wildlife Partners, *Tulare Basin Conceptual Conservation Projects for Tulare Basin Watershed Initiative and High Speed Rail Mitigation Recommendations*, February 17, 2012.

Tulare County, *General Plan Background Report Draft* and *Preliminary Issues Report, Tulare County General Plan,* 2004.

U.S. Global Change Research Program, *Global Change Impacts in the United States*, June 2009

WRIME, *Analysis of Water Supplies in the Kings Basin, Technical Memorandum, Phase I, Task 4,* 2006.

WRIME, *Baseline Conditions, Technical Memorandum, Phase 1, Task 5,* 2006.

WRIME, *Hydrologic Modeling in Kings Basin, A White Paper,* 2005.

WRIME, *Upper Kings Basin Assessment Report*, 2003.

This Page is Intentionally Blank

APPENDIX

This Page is Intentionally Blank

KINGS BASIN WATER AUTHORITY

INTEGRATED REGIONAL WATER MANAGEMENT PLAN

APPENDIX A

DESCRIPTION OF MEMBERS AND INTERESTED PARTIES

This Page is Intentionally Blank

1.1 Agency Descriptions

1.1.1 Voting Members

Alta Irrigation District (AID)

AID was formed under the Wright Act, passed in 1887, and is one of the oldest irrigation districts in the state. AID provides surface water from the Kings River to farms in its 129,000-acre service area through a series of unlined canals. AID diverts water at Cobbles Weir into canals that transport water into a system that serves the area from Reedley to west of Orange Cove in eastern Fresno County, as well as serving the Dinuba, Orosi, and Traver areas of northern Tulare County. AID has 100,000 acre-feet (AF) of storage in Pine Flat and 19,275 AF of storage in the other upstream reservoirs. In addition to providing surface water to meet irrigation demands, AID uses flood flows from the Kings River to recharge the groundwater basin. No estimate of the amount of water recharged through the basins is available. AID estimates it gets 45,600 AF of incidental recharge annually along its 360 miles of unlined irrigation delivery canals. AID has long recognized the significance of groundwater resources to the area and has been monitoring the water levels for the past 80 years. In August 1994, AID adopted an AB 3030 Groundwater Management Plan and will be updating the plan to meet revised state requirements. On June 6, 2010, AID amended its AB 3030 Groundwater Management Plan to be compliant with SB 1938 Groundwater Management Plan requirements.

City of Clovis

The City of Clovis was incorporated in 1912 and lies just west of the Sierra Nevada foothills and northeast of the city of Fresno in Fresno County. The City encompasses 23.10 square miles and is home to 95,631 residents (2010 Census). The City provides water to its residents from surface and groundwater sources. The City operates a surface water treatment plant on the east side of town and has numerous wells throughout the City. Almost all water deliveries are metered. The City delivers approximately 24,803 AF of water annually, as of 2010. The delivery amount is expected to increase to 27,662 AF by 2015; however, deliveries increases are expected to slow due to conservation measures the City will be implementing. In addition to providing water supply to its citizenry, the City partakes in groundwater recharge efforts and estimates it contributes 8,400 AF to recharge annually. The City is also a participant in the Fresno Area Regional Groundwater Management Plan.

In 1989, the City of Clovis assumed the operation of a small water system, which served an unincorporated county island called Tarpey Village. The unincorporated area is home to approximately 3,888 people (2010 Census). Tarpey Village is largely individually unmetered because of the agreement between the former County Waterworks District No. 8 and the City, which allowed them to stay unmetered.

However, over time 435 residential and commercial customers in Tarpey Village have had meters installed at their request in order to control their water costs.

City of Dinuba

The City of Dinuba, founded in 1888 and incorporated in 1906, is located in the northwest corner of Tulare County in the heart of the agriculturally rich San Joaquin Valley. The City encompasses approximately 3.42 square miles and is home to more than 20,000 people. The City provides water to its residents through several deep underground water wells, which pump approximately 4,700 AF/year for distribution.

City of Fresno

The City of Fresno, founded in 1885, is located in northern Fresno County. The City encompasses over 110 square miles and serves a population of over 502,000 people. The City serves the entire area within its City Limits with the exception of Bakman Water Company, Pinedale County Water District, Herndon Water Company, Park Van Ness Mutual Water Company, California State University at Fresno, and private groundwater users within the county islands.

The City currently delivers approximately 163,300 AF of water annually, which is a combination of surface and groundwater. The groundwater supply accounts for 88% of the total supply and is provided through 275 municipal water wells throughout the City. The surface water supply accounts for the remaining 12% and comes from the 30MGD surface water treatment plant in the northeastern area of town. The 2015 projected water deliveries are 189,300 acre-feet annually; however, conservation measures are being implemented and the rate of increase is expected to decline as the City reaches 2020. The City also has 13,800 AF available annually for groundwater recharge efforts, which contributes to the total 54,000 acre-feet per year of total recharge in the near vicinity. The recharge is accomplished through 1,200 acres of recharge basins, 220 acres of which are owned by the City. The City is also a participant in the Fresno Area Regional Groundwater Management Plan.

City of Kerman

The City of Kerman, founded in 1910, is located approximately fifteen miles west of the City of Fresno and fifteen miles south of the City of Madera and encompasses nearly 2,000 acres. The City is home to over 15,000 people; delivering 4,196 AF of water annually to its customer base and expecting to deliver 5,105 AF annually by 2015. The water supply for the City is primarily city-produced groundwater; however, an effort is being made to deliver recycled water to agricultural customers in the area surrounding the City. Approximately 930 AF of recycled water are also being used for groundwater recharge efforts annually. The City is also a participant in the Fresno Area Regional Groundwater Management Plan.

City of Kingsburg

The City of Kingsburg, incorporated in 1908, is located in Fresno County along its southern border, immediately north of the Kings River at the crossing with State Route 99. The City occupies an area of about 5 square miles and has a population of 11,945 people, which receive water deliveries of 4,974 AF annually from groundwater supplies. The City expects to deliver 5,766 AF in 2015. Incidental groundwater recharge occurs from the City's use of treated effluent for non-food crops and in percolation ponds.

City of Parlier

The City of Parlier, incorporated in 1921, encompasses approximately 1,365 acres in southeast Fresno County. The City is 15 miles southeast of the city of Fresno. The City delivers pumped groundwater to a population of 13,080. Governance of the City consists of an elected 5-member City Council; staff includes a City Manager and nearly fifty full- and part-time employees.

City of Reedley

The City of Reedley is located in southeast Fresno County, approximately 25 miles southeast of the City of Fresno. The City contains approximately 3,116 acres and is home to over 25,000 people. The water supply is derived from pumped groundwater via wells throughout the City. The City is governed by a five-member City Council, administered by a City Manager and has 110 full-time and 80 part-time employees.

City of Sanger

The City of Sanger is located in the heart of the Central Valley at the base of the Sierra Nevada Mountains' foothills in Fresno County. Its sphere of influence is about 8.75 square miles (5,600 acres). Incorporation of the City occurred in 1911, and water service is provided to a population of approximately 24,260. The City obtains its entire water supply from groundwater; the demand is approximately 6,000 AF/year. The City participates in groundwater recharge through storm water and secondary effluent percolation basins located throughout the service area.

City of Selma

Incorporated in 1897, the City of Selma encompasses approximately 3,152 acres along State Route 99 between the cities of Fowler to the north and Kingsburg to the south. The City is governed by a five-member elected City Council and employs a City Manager and over 150 staff members. The City's 23,194 residents are receiving water from California Water Service Company (Cal Water). Cal Water was incorporated in 1926 and has provided water service to the City since 1962. Water supplies are solely from groundwater sources and amount to approximately 6,000 AF/year. Cal Water does not provide water for groundwater recharge; however, Selma-Kingsburg-Fowler Sanitation District (SKF) contributes to groundwater recharge through secondary effluent percolation basins located west of the city of Kingsburg.

County of Fresno

Fresno County, created in 1856 is located near the center of California's San Joaquin Valley which, together with the Sacramento Valley to the north, forms the Great Central Valley, one of the distinct physical regions of the state. The Coast Range foothills, which form the county's western boundary, reach a height of over 4,000 feet near the city of Coalinga while some peaks along the crest of the Sierra Nevada, the county's eastern boundary, exceed 14,000 feet. The Valley floor in between is fifty to sixty miles wide and has an elevation near the city of Fresno of about 325 feet. The current, official boundaries of the County were established in 1909.

Fresno County is one of the largest, fastest growing, and most diverse counties in the state of California. It is the 10th most populous county with an estimated 917,515 residents. Fresno County is home to 15 incorporated cities, all located on the Valley floor. Over 60 percent of the County's total population resides in the neighboring cities of Fresno and Clovis. Fresno County directly provides water to several small waterworks districts. The County is also a participant in the Fresno Area Regional Groundwater Management Plan.

County of Tulare

The County of Tulare, named for historic Tulare Lake, was formed in 1852 and continued to adjust its boundaries until 1893. Centrally located within the State of California, the County includes an area of 4,863 square miles. The extensively cultivated and very fertile valley floor in the Western half, has allowed Tulare County to become the second-leading producer of agricultural commodities in the United States. The County has a growing population of 425,000. The Eastern half of the County is comprised primarily of public lands within the Sequoia National Park, National Forest, and the Mineral King, Golden Trout, and Domelands Wilderness areas. Visalia, the County seat, is the gateway to Sequoia National Park and a variety of recreational activities.

Consolidated Irrigation District (CID)

CID was organized on September 8, 1921, in accordance with the Irrigation District Law of the State of California Water Code. CID diverts water at the Gould and Fresno Weirs to provide surface water from the Kings River to farms within the service area of approximately 145,000 acres using a series of unlined canals. CID has 119,000 AF of storage in Pine Flat and another 22,937 AF in other upstream storage facilities. CID has been monitoring groundwater levels since the 1920s. The current groundwater monitoring program consists of about 80 wells spaced on a 2-mile grid throughout the district. In July 1995, the CID adopted an AB 3030 Groundwater Management Plan.

Fresno Irrigation District (FID)

FID was organized in 1920 as the successor to the privately owned Fresno Canal and Land Company in accordance with the Irrigation District Law of the State of California

Water Code. FID has a service area of approximately 245,000 acres and diverts Kings River water from the Fresno Weir into the 680-mile canal and pipeline distribution system for both agricultural and municipal water uses. FID has rights to store 120,000 AF in Pine Flat reservoir and an additional 23,130 AF of storage in upstream reservoirs. This storage and Kings River water are used by FID to deliver an average annual supply of approximately 500,000 AF. FID obtains most of its surface water supplies from the Kings River but also has a contract with the United States Bureau of Reclamation (Reclamation) for 75,000 AF of Class 2 water from the Friant Division of the CVP. The City of Fresno and FID have collaborative agreements that enable the delivery of the City's 60,000 AF of Class 1 water for beneficial uses, such as, groundwater recharge and treatement for potable uses. FID is also a participant in the Fresno Area Regional Groundwater Management Plan.

Fresno Metropolitan Flood Control District (FMFCD)

The FMFCD provides flood control and urban storm water services for streams in the Fresno stream group in a 400-square mile watershed located between the Kings and San Joaquin Rivers. It is a special district with jurisdictional authorities defined by the California Water Code. The FMFCD manages the local drainage and regional flood control programs in and surrounding the Fresno-Clovis area and its programs are closely integrated and coordinated with FID and the Cities of Fresno and Clovis to provide efficient, comprehensive services. Capital facilities, such as pipeline and basins, are funded through local development ordinances. The FMFCD is authorized to collect property taxes within its service area.

The FMFCD Services Plan guides district actions and serves as a good example of an integrated program. The Services Plan provides detailed description of the goals, programs, facilities, regulations, agreements, and implementation plans for each of the major program areas. The FMFCD Services Plan and the pending capital facilities plan are foundational actions for the Upper Kings Basin IRWMP.

The major program areas include flood control, rural streams, local storm water drainage, storm water quality management, water conservation, recreation, and wildlife management. The FMFCD program is unique in that it uses a multipurpose, multi-objective approach and most retention pond facilities are designed for flood control, groundwater recharge, and recreational purposes.

FMFCD facilities provide water supply and water quality benefits by capturing an average of 90% of all urban runoff. This is accomplished through a cooperative groundwater recharge program in partnership with the Cities of Fresno and Clovis, Fresno County, and FID. The FMFCD participates in the land use and development review process to ensure that design requirements are met; to make recommendations regarding new development; and to help the land use agencies prevent flood loss and damage to rural streams, private property, and district facilities. FMFCD is also a participant in the Fresno Area Regional Groundwater Management Plan.

Kings County Water District (KCWD)

The Kings County Water District, formed in 1954, is located in the northeastern corner of Kings County, bordered by Fresno County to the north and Tulare County to the east. The District was formed to assist northeastern Kings County with retaining its water rights for use within the area. The District entirely owns Riverside Ditch Company and partially owns Peoples Ditch Company, Last Chance Water Ditch Company and Lakeside Ditch Company. By purchasing stock in as many ditch companies as possible, the District can make certain the water is being used within the area, and not being exported elsewhere. Including these companies, the District encompasses approximately 143,000 acres.

The District owns and operates numerous recharge basins throughout the District and the 10 mile Riverside Ditch; used for direct delivery of surface water to agricultural customers. Numerous other conveyance and recharge facilities within District boundaries are owned either by aforementioned ditch companies or by other entities with overlapping boundaries.

Kings River Conservation District (KRCD)

The Kings River Conservation District was formed in 1951 through special state legislation. Today, KRCD's jurisdiction covers approximately 1.2 million acres within Fresno, Kings and Tulare counties.

KRCD is a public agency that strives to protect the Kings River water resources through flood control, power, on-farm water management and groundwater development.

KRCD is governed by a seven-member Board of Directors; six of the members represent the six divisions within KRCD and the seventh member is elected as a district-wide representative. All members must reside within the jurisdiction for which they are representative. Additionally, the District has a senior management staff comprised of the General Manager, Deputy General Manager of Power Operations, Deputy General Manager of Flood & Environmental Operations and the Deputy Manager of Business Operations. The senior management staff coordinates a work force of approximately 50 individuals.

1.1.2 Interested Parties

Bakman Water Company (BWC)

Bakman Water Company was established in 1948, lays just west of the Sierra Nevada foothills, within the Fresno city limits in Fresno County. BWC encompasses approximately 1,650 acres and is home to 8,723 residents. The agency has a water demand of less than 4,000 AF/year, which is supplied solely through groundwater pumping. BWC is also a participant in the Fresno Area Regional Groundwater Management Plan.

Biola Community Services District (BCSD)

Biola CSD is located approximately 13 miles northwest of the City of Fresno in Fresno County. The District serves a varying population of 1,100 to 1,600 with water pumped from the aquifer. Services offered by the District include street lights, water, sewer, storm drainage and solid waste. BCSD is governed by a five-member Board of Directors, who is appointed by the Fresno County Board of Supervisors. The District also has three staff members including a General Manager, Office Assistant and part time Field Worker.

California State University, Fresno (Fresno State)

Established in 1911, California State University, Fresno is the premier regional university serving Central California's diverse, growing population. With an enrollment of more than 22,000 students, Fresno State offers 59 undergraduate degree programs and 44 master degree programs in the liberal arts and sciences as well as in a variety of professional disciplines emphasizing agriculture, business, engineering and technology, health and human services, and education. Fresno State's campus includes approximately 1,000 acres of irrigated farm land and a 300 acre main education center that are collectively an independent water entity within the cities of Clovis and Fresno. Fresno State is also home to the California Water Institute, the Center for Irrigation Technology and the International Center for Water Technology.

California Native Plant Society, Sequoia Chapter

Originally formed in 1965 in the east bay region, the California Native Plant Society (CNPS) is a statewide non-profit organization of amateurs and professionals with a common interest in California's native plants. Their members work to promote native plant appreciation, research, education, and conservation through five statewide programs and 33 regional chapters in California.

City of San Joaquin

The City of San Joaquin is located approximately 20 miles southwest of Fresno, California in Fresno County and includes an area of 704 acres. The City was incorporated in 1920 and has a city manager form of government with five council members, a city manager, and 10 full-time staff members. The City is home to approximately 4,000 people.

Community Water Center (CWC)

Community Water Center, a non-profit organization located in Visalia, seeks to ensure that all communities have access to safe, clean and affordable water. Their mission is to create community-driven water solutions through organizing, education and advocacy in California’s San Joaquin Valley. CWC was founded in 2006 by Co-Directors Susana De Anda and Laurel Firestone to focus on fostering strategic grassroots capacity to address water challenges in small, rural, low-income communities and communities of

color. Since their inception, CWC has become a source of drinking water expertise and a center for community water organizing in Tulare County. The Center aims to ensure communities have a voice in water planning, policy and in decision making that affects whether they have access to reliable, affordable water supply. Their work focuses on engaging communities in water infrastructure planning and funding processes, and eliminating barriers to community participation.

County of Kings

King County is bordered by Kern County to the south, Tulare County to the east, Fresno County to the north and Monterey County to the west. The County contains 1,391 square miles (890,545 acres) and is home to nearly 155,000 people. In the county area, nearly 750,000 acres are farmland, with 655,000 being actively harvested.

The County contains nine cities/towns, seven rural communities, one Native American reservation and is home to portions of six irrigation districts, three community service districts, one public utility district, one water district and the Kings River Conservation District, discussed above.

Crescent Canal Company (CCC)

Organized in 1885, the Crescent Canal Company, a member of the Kings River Water Association, is located in southern Fresno County. The Company currently has 583 'points' outstanding (one 'point' is equivalent to 1/16th of a share). CCC has guaranteed storage space for up to 27,936 acre feet primarily in Pine Flat Reservoir plus an additional 2,793 acre feet of 'over storage' if space is available; however, the Company may not be able to fully utilize its storage space when Pine Flat is in flood release. Historically, the Company has received a mean entitlement of 21,256 AF with a median value of 14,803 AF.

The Company operates one canal, the Crescent Canal, which takes water out of the lower North Fork of the Kings River and runs for roughly 20 miles with a capacity of approximately 100 cfs. Crescent Canal, being at the end of the Kings River distribution system, suffers significant channel seepage losses, and is dependent upon running in coordination with other units on the river to minimize losses and, in fact, make an irrigation run practicable. These "coordinated runs", in non-flood release periods, typically begin in the spring or early summer and continue until the available water is used or water demands are satisfied. In a typical year, with amounts approximating an average water supply, the irrigation run will operate from early June to late August or mid-September. The shortest coordinated run, occurring in dry years, may last no more than 30 days.

Cutler Public Utility District (CPUD)

Cutler PUD was formed in 1922 and is located nine miles north of Visalia in the northern portion of Tulare County. The community of Cutler has approximately 5,000 residents and delivers water to them from three wells. Services offered by the PUD include water

and sewer, with both systems operating at or near capacity. The PUD is governed by a five-member Board of Directors and augmented by fluctuating full- and part-time staff.

East Orosi Community Services District (EOCSD)

East Orosi Community Service District was established in 1954 by Tulare County Board of Supervisors Resolution and is adjacent to CPUD, discussed above. The District serves a 53 acre area with approximately 500 residents, all receiving water via two wells, which have frequent nitrate exceedances. The CSD is governed by a three member board of directors.

Easton Community Services Distinct (ECSD)

Easton Community Service District was formed in 1959 by residents of to provide street lighting. Currently, ECSD encompasses approximately 701 acres and provides street lighting, storm drainage, recreation and park, and landscape maintenance services to the community of Easton. The 2010 Census shows Easton to have a population of approximately 2,100 although approximately 18% of population figure includes residents living outside the boundaries of the ECSD. The ECSD Board is comprised of 5 elected or appointed CSD residents serving a four-year term, a General Manager and a Consultant to help guide the CSD through the research and activation process of possibly providing a water system to the ECSD residents. ECSD Board meets monthly.

El Río Reyes Conservation Trust

El Río Reyes Conservation Trust is a regional California land trust whose mission is to safeguard the Kings River and its lands for future generations. The Trust believes the best way to accomplish this task is to conserve open space and riparian habitat and provide means to ensure the viability of the farms surrounding the river.

The directors of the Trust are all residents of the Kings River area who understand and appreciate the long-term benefits and challenges of maintaining the Kings River in its natural state. The Trust's main area of interest on the Kings River is from Pine Flat Dam at Piedra to the Empire Weir No. 2 near Stratford, California; a total of approximately 81 miles. The Trust works closely with landowners and other interested parties and stakeholders, and with government agencies to minimize the impacts of housing developments and mining activities on Kings River lands. The Trust also endeavors to assist local residents and landowners in enhancing the environmental and economic benefits attached to the well being of the river and its agricultural lands. Along with its own resources, El Río Reyes Conservation Trust draws on the expertise of other conservation organizations and other individuals to assist it in the furtherance of its mission.

Fresno County Farm Bureau (FCFB)

The Fresno County Farm Bureau is a non-profit membership organization founded in 1917 to promote and protect agriculture. FCFB has 34 Director members that guide the

organization along with three full time and two part time staff members. The organization provides agricultural advocacy and outreach activities for its nearly 4,000 members. FCFB represents its members at the city, county, state and national levels of government. FCFB's primary objective is to engage in areas related to the management and development of water supply on behalf of their members.

Hardwick Water Company (HWD)

Hardwick Water Company serves the community of Hardwick in the northeastern portion of Kings County, with an area of 90 acres and a population of 138. The community was established in 1895, but remains an unincorporated village. The community draws on water pumped from the aquifer via a single well.

James Irrigation District (JID)

The history of James Irrigation District stretches back to the 19th century, when Jefferson G. James established the 72,000-acre James Ranch lying on both sides of the Fresno Slough. JID is located approximately 30 miles southwest of the City of Fresno and is comprised of 26,000 acres, of which about 22,000 acres are currently irrigated. The District, organized in 1920, provides agricultural water to growers within its boundaries. The District is governed by a five-member Board of Directors.

A system of 65 well pumps, 26 booster pumps and 100 miles of canals and pipelines distribute irrigation water to growers' orchards vineyards and fields. The District has several sources of water supply: (1) a United States Bureau of Reclamation Central Valley Project contract, (2) San Joaquin River Schedule 2 contract rights, (3) Kings River floodwater and (4) groundwater. The Kings River water rights are currently leased to the Kings River lower river districts. In addition to rights to groundwater within the District service area, the District also has a deeded groundwater right to certain lands east of the Fresno Slough Bypass up to 200 cubic feet per second.

The District's current annual water demands are approximately 65,000 AF. At this time, the District has enough water sources to meet the needs of its growers. The District utilizes a variety of water management strategies including groundwater recharge, water transfers, and water regulating reservoirs to better manage its water resources.

Reclamation District 1606 (RD 1606) overlaps a portion of James Irrigation District and has a small surface water supply. RD 1606 has the same staff as JID but is governed by a different Board of Directors.

Kings River Conservancy (KRC)

The Kings River Conservancy is a federally registered 501(c) 3 non-profit corporation founded on the principle that advocating for and protecting the Lower Kings River benefits the community at large. The Conservancy advocates for the stretch of Kings River from Pine Flat Dam to Highway 99 in Fresno County.

Kings River Water Association (KRWA)

Kings River Water Association focuses on stewardship of the Kings River environment and its user, which provides water to over one million acres. Since 1927, KRWA and its 28-member San Joaquin Valley agencies have been stewards of this vital resource, serving a growing population and effectively working with others in search of an even better, brighter future. KRWA's five-member staff is headed by the river's Watermaster, and carries out policy established by the Executive Committee.

All KRWA member agencies are public districts or canal companies with rights to provide Kings River water for beneficial irrigation use on nearly 20,000 San Joaquin Valley farms in portions of Fresno, Kings and Tulare counties.

KRWA oversees Kings River entitlements and deliveries, and protects water quality while enhancing the environment. KRWA, as the name implies, is a private association. It is one of two regional agencies that oversee the river. The other is the Kings River Conservation District (KRCD), as discussed above.

Laguna Irrigation District (LID)

Laguna Irrigation District was originally founded in 1920 and is located approximately 25 miles south of the City of Fresno within both Fresno and Kings Counties. LID encompasses 35,000 acres, of which the majority is used for agricultural purposes and has a combined storage share of nearly 33,000 AF. The District is governed by a five-member Board of Directors and employees a General Managers and an Office Manager.

The District's system consists of approximately 50 miles of canals and pipelines, which convey water supply from the Kings River. LID's Kings River water rights are held in trust by Kings River Water Association and are comprised of 44,000 AF from Pine Flat and 8,481 AF feet from other upstream storage points.

Laton Community Services District (LCSD)

Laton CSD was formed in 1981 and is located in the southern portion of Fresno County, near the Kings County line, approximately 20 miles southeast of the city of Fresno. The District serves a population of nearly 1,300 people and provides water service through a network of mains and groundwater wells. Services provided by the District include water, sewer, solid waste, fire protection and streetlights. The District has a five-member Board of Directors and employs two operations/maintenance and two clerical staff members.

Liberty Canal Company (LCC)

Liberty Canal Company, a mutual water company, was developed in 1882 and is located in the southern portion of Fresno County. LCC services an area of approximately 4,500 acres and has a combined storage share of over 13,000 AF on the Kings River.

Liberty Water District (LWD)

Liberty Water District, formed in 1970, is located along the southern border of Consolidated Irrigation District, approximately 17 miles due south of the city of Fresno in Fresno County. The District encompasses approximately 21,142 acres. The District is a minor shareholder (3.3%) in the Liberty Canal Company (LCC), and Kings River water received from LCC is recharged using the District's groundwater recharge facility \when supplies are available. The District is governed by an elected five-member Board of Directors.

London Community Services District (LCSD)

London CSD is an unincorporated community in Tulare County, established in 1952. It lies approximately 10 miles northwest of the city of Visalia. London CSD serves a population of approximately 2,000 people. The District's water supply consists entirely of groundwater procured from the aquifer.

Mid-Valley Water District (MVWD)

Mid-Valley Water District was founded in 2002 and encompasses approximately 13,678 acres. The District provides a varying amount of water to its customers, ranging from zero AF in 2002 to 3,916 AF in 2006. The District is governed by an elected five-member Board of Directors.

Orange Cove Irrigation District (OCID)

The Orange Cove Irrigation District, located 25 miles southeast of the City of Fresno, consists of 28,000 acres of farmland. The District was established by local landowners in 1937 in anticipation of development of the Friant Division, a cornerstone of the federal Central Valley Project built by the Department of Interior's Bureau of Reclamation. In 1949, the District became the first Friant Division Contractor with a Class 1 Contract for 39,200 AF of water supply stored and regulated in Millerton Lake.

The reliability of the District's Class 1 Contract supply has historically been very high, receiving a 100% allocation more than 90% of the time. Because of the San Joaquin River Restoration Program enacted by Public Law 111-11 in March 2009, the District's water supply reliability will be diminished.

The District is governed by a five member Board of Directors all of whom resides and farms within the District. With a total staff of seven employees, the District operates and maintains a fully SCADA enabled delivery system consisting of 120 miles of pressurized pipeline that is charged by some 45 high efficiency pumps adjacent to turnouts dispersed throughout 15 diversion locations along the Friant-Kern Canal to deliver water to some 400 landowners.

Aptly named, the District's primary crop is oranges, with 80% of its irrigated acreage devoted to that citrus. The District has no other water supply sources and must rely on

effective precipitation and an underlying groundwater supply to balance the crop consumptive requirements.

Orosi Public Utility District (OPUD)

Orosi is an unincorporated area in Tulare County approximately 10 miles north of the city of Visalia, adjacent to the community of Cutler, discussed above. Orosi PUD was formed in 1922 and serves approximately 8,000 residents. The community is supplied with water from the groundwater supply through 5 wells. The District is governed by an elected 5-member Board of Directors.

Raisin City Water District (RCWD)

The RCWD covers an area of approximately 58,719 acres and is primarily an agricultural area; it also includes the community of Raisin City. The RCWD is outside of the Kings River Water Association area and does not have surface water entitlement from the Kings River or water from the San Joaquin River. The RCWD is solely dependent on groundwater, pumped by individual growers, as the source of irrigation water and has no infrastructure or facilities. The District's purpose is to improve groundwater conditions in the area; to this end, they are a part of the McMullin Recharge Group. The District is governed by an elected five-member Board of Directors and employs one part-time secretary.

Reed Ditch Company (RDC)

The Reed Ditch Company is a mutual water company servicing a small area northwest of Riverdale with Kings River water delivered through Murphy Slough. RDC, founded in the early 1900's, has a service area of approximately 3,500 acres and a combined storage share of over 8,700 acre-feet.

Riverdale Irrigation District (RID)

Riverdale ID is a 15,143 acre irrigation district located in southwest Fresno County, approximately 20 miles southwest of the city of Fresno. The District has a combined storage share of over 26,000 AF on the Kings River. The District has a 3-member Board of Directors and three full- and part-time employees.

Riverdale Public Utility District (RPUD)

Riverdale is a small community in southwest Fresno County, approximately 20 miles southwest of the city of Fresno. The District delivers water to a population of 2,500 people from several wells throughout the community. Services provided by the District include water, sewer, storm drainage, solid waste, fire protection and street lighting. The District has a 5-member Board of Directors and employs a staff consisting of a Superintendent, Office Manager and Maintenance worker.

Sanger Environmental Fund

The Sanger Environmental Fund is a non-profit public benefit corporation established in 1991. The purpose of the SEF is to implement pollution control programs and/or public education programs relating to pollution, natural resources and the environment within the boundaries of the Sanger Unified School District (SUSD). SEF has provided funding for projects at various SUSD sites for trees, greenhouses, water station equipment, environmental project materials, scholarships, and science projects at the SUSD District Fair. SEF also collaborates with the City of Sanger and SUSD to fund, support, and participate in the maintenance of the Sanger Nature Study Area.

Self-Help Enterprises (SHE)

Self-Help Enterprises (SHE) is a private, nonprofit 501(c)(3) tax exempt corporation established under the laws of the State of California. Its mission is to improve the living conditions and community standards of low-income families in an eight-county rural area of California's San Joaquin Valley including Kern, Tulare, Kings, Fresno, Madera, Merced, Mariposa and Stanislaus counties. This service area includes the Kings Basin IRWMP area. SHE's primary office is located in Visalia and a satellite office is in Madera, just south and north of the Kings Basin area respectively.

SHE has a strong Board of Directors consisting of 18 volunteer members from diverse backgrounds. From the date of incorporation in 1965, SHE has reserved at least one-third of board membership for participants in programs administered by SHE that serve low-income families. This direct involvement by SHE participants in leadership roles enhances the organization's connection and responsiveness to the interest and needs of those it serves.

Through July of 2011, SHE had assisted 5,875 families in building their own homes through the mutual self-help housing program, developed and owns 1,154 deed restricted affordable rental units, repaired or rehabilitated 6,021 homes, and financially assisted 1,447 families in the purchase of their first home. In addition, SHE has provided technical assistance to small disadvantaged communities to assist them in developing almost 200 water and wastewater projects for over 27,000 families in San Joaquin Valley counties. Such small disadvantaged communities are recognized as having critically high rates of poverty and unemployment, with many having an urgent need for investment in water and wastewater infrastructure.

Sierra Club, Tehipite Chapter

The Sierra Club was founded in 1892 by John Muir and works to protect communities, wild places, and the planet as a whole. The Tehipite Chapter of the Sierra Club includes all of the Fresno, Madera, Mariposa, and Merced County areas, all of Yosemite National Park and all of Tulare County north of Avenues 384 and Elkhorn, including Kings Canyon National Park but excluding Sequoia National Park.

Sierra Resource Conservation District (SRCD)

SRCD was formed in 1956 and includes approximately 3,063 square miles. The area is over 50% of the total acreage of Fresno County (3,817,025). The SRCD is bounded on the north by the Fresno-Madera County line; on the east by the Fresno-Mono and Fresno-Inyo County lines; on the south by the Fresno-Tulare Co line with a small portion of the North east corner of Tulare Co and the Sequoia National Park Boundary; and on the west by Blackstone Avenue, Herndon Avenue, Fowler Avenue, and Jensen Avenue as they intersect with each other, and also includes the campus of California State University Fresno (CSUF). There are three Indian Rancherias within the district.

The mission of the District is to take available technical, financial and educational resources, whatever their source, and focus or coordinate them at the local level to meet the present and future natural resource needs of the local land user. To accomplish this, SRCD maintains working relationships with Federal, State and County Agencies and Departments, non-profit organizations, educational institutions which have natural resource duties and responsibilities under law, and with public and private landowners to save the basic resources, soil, water, and air of the state from unreasonable and economically preventable waste and destruction. The SRCD can and does act as a liaison between the private landowner and a multitude of land use programs to meet natural resource objectives.

Sultana Community Services District

Sultana is a community in Tulare County, approximately 5 miles east of the city of Dinuba encompassing approximately 317 acres. The District was formed in 1977 and delivers water to a population of less than 1,000 by pumping groundwater through two wells. The District is governed by an elected 5-member Board of Directors.

Terranova Ranch, Inc.

Terranova Ranch was established in 1979 and encompasses 5,500 acres. It is located in Helm, California, which is in the central San Joaquin Valley, approximately 25 miles southwest of the City of Fresno. Portions of the property are in Raisin City WD and the remainder of the Ranch not in any water or irrigation district.

In 1993, the ranch began converting to organic farming and today approximately 600 acres are certified by CCOF, California Certified Organic Farmers. Terranova farms and processes tomatoes, garlic, pima cotton, alfalfa hay, lettuce seed, broccoli seed, basil seed, and walnuts and is dependent on groundwater for agricultural production, but is committed to conjunctive use. They have an agreement with Kings River Water Association to use high flows off the North Fork of the Kings River when available and partakes in water conservation practices by using buried drip irrigation where possible.

Tulare Basin Wildlife Partners (TBWP)

Tulare Basin Wildlife Partners was established in 2005 as a 501(c)3 non-profit organization with an aim to preserve the natural heritage and improve the quality of life for all Californians by conserving and restoring critical Tulare Basin upland, wetland, and riparian habitats for people and wildlife. The organization covers the entire Tulare Basin, including portions of Fresno, Kern, Kings and Tulare counties.

University of California Cooperative Extension – Fresno County

UC Cooperative Extension was established in Fresno County since 1917 in coordination with the Fresno County Farm Bureau. UCCE-Fresno staffs 7 farm advisors and several program managers that administer programs in 4-H Youth Development, adult and youth food and nutrition programs and the Master Gardener program.

The mission if UCCE is to organize, develop and extend research based information that improves the lives of Fresno County residents. The organization is focused on helping farmers and ranchers increase productivity through improved resource management, pest and disease management, improved livestock production practices, and support commodity marketing issues.

KINGS BASIN WATER AUTHORITY

INTEGRATED REGIONAL WATER MANAGEMENT PLAN

APPENDIX B

ADOPTING RESOLUTION

This Page is Intentionally Blank

UPPER KINGS BASIN INTEGRATED REGIONAL WATER MANAGEMENT AUTHORITY
FRESNO, CALIFORNIA

KINGS BASIN
Water Authority

RESOLUTION NO. 12-02

RESOLUTION OF THE BOARD OF DIRECTORS OF THE UPPER KINGS BASIN INTEGRATED REGIONAL WATER MANAGEMENT AUTHORITY AUTHORIZING ADOPTION OF THE KINGS BASIN INTEGRATED REGIONAL WATER MANAGEMENT PLAN (IRWMP)

BE IT RESOLVED that the revised Integrated Regional Water Management Plan attached under Item Number 12 of the October 17, 2012 Board Agenda Packet was adopted at the regular meeting of the Board of Directors of the Upper Kings Basin Integrated Regional Water Management Authority on this 17th day of October, 2012, by the following vote:

AYES: Directors Armstrong, Nielsen, Poochigian, and Blayney. Alternate Directors Uota, Querin, Martinez, Kapheim, Orth, Akins, Moore, Burleson, and Mills

NOES: None

ABSENT: Directors Neely, Mitchell, Fast, and Gray

Chair

ATTEST:

Secretary

This Page is Intentionally Blank

KINGS BASIN WATER AUTHORITY

INTEGRATED REGIONAL WATER MANAGEMENT PLAN

APPENDIX C

JOINT POWERS AGREEMENT

This Page is Intentionally Blank

UPPER KINGS BASIN INTEGRATED REGIONAL WATER MANAGEMENT JOINT POWERS AGREEMENT

THIS AGREEMENT is made and effective as of March 1, 2009 pursuant to the Joint Exercise of Powers Act (Government Code Sections 6500, *et seq.*) by and between the public agencies listed on the attached Exhibit A in order to form the Upper Kings Basin Integrated Regional Water Management Authority. This Agreement is made with reference to the following facts.

A. Each of the parties to this Agreement is a public agency vitally interested in the management of water supplies delivered to those within that agency's boundaries. One of the water supplies of great importance to each of the parties is the Kings River.

B. Because the parties share a common interest in maximizing the beneficial use of Kings River water, they have jointly been pursuing integrated regional water management planning strategies for the Upper Kings Basin (as defined below) through an informal coalition sometimes referred to as the Upper Kings Basin Water Forum. Through the Upper Kings Basin Water Forum, the parties have developed an integrated regional water management plan for the Upper Kings Basin and have undertaken various activities in furtherance of that plan.

C. The parties wish to facilitate continued integrated water resource management on the Upper Kings Basin by forming a joint powers authority to replace the informal Upper Kings Basin Water Forum and to pursue appropriate water resource planning opportunities in accordance with the applicable provisions of California law.

THEREFORE, in consideration of the mutual promises, covenants and conditions hereinafter set forth, it is agreed by and among the parties hereto as follows:

Article I: Definitions

As used in this Agreement, unless the context requires otherwise, the meaning of the terms hereinafter set forth shall be as follows:

(a) "Act" shall mean the Integrated Regional Water Management Planning Act of 2002, codified in Part 2.2 (commencing with Section 10530) of Division 6 of the California Water Code, as it may be amended, revised or superseded from time to time.

(b) "Advisory Committee" shall mean the advisory body of the Authority created by Section 3.02 of this Agreement, consisting of representatives from the Members and the Interested Parties.

(c) "Authority" shall mean the Upper Kings Basin Integrated Regional Water Management Authority, being the separate entity created by this Agreement.

(d) "Board of Directors" or "Board" shall mean the governing body of the Authority as established by Section 3.01 of this Agreement.

(e) "Fiscal Year" shall mean that period of twelve months established as the Fiscal Year of the Authority pursuant to Section 4.01 of this Agreement.

(f) "Interested Parties" shall mean those public and private entities that have (i) either opted not to become Members of the Authority or are legally precluded from becoming Members, (ii) provided a formal expression of interest in the Authority's activities and (iii) been designated by the Board of Directors as Interested Parties. The parties listed on the attached Exhibit B shall be the initial Interested Parties. The Board of Directors may from time to time add additional Interested Parties or remove Interested Parties. Interested Parties need not execute this Agreement, but shall be governed by its provisions. Interested Parties shall be non-voting, but shall be provided with an opportunity to provide input into Authority activities for consideration by the Board of Directors, Advisory Committee and Members.

(g) "IRWMP" shall mean the integrated regional water management plan for the Upper Kings Basin adopted pursuant to the Act by the Upper Kings Basin Water Forum, as it may be modified or amended from time to time.

(h) "Major Decision" shall mean any decision by the Board of Directors that is not a Minor Decision or Supermajority Decision. A Major Decision shall require the affirmative vote of two-thirds of the members of the Board of Directors present and voting at a meeting at which a quorum is present.

(i) "Minor Decision" shall mean a decision by the Board of Directors that does not have a material effect on the long-term activities or policies of the Authority, including (i) setting, amending or approving agendas, (ii) approving or amending minutes, (iii) approving the payment of bills or other amounts due as a result of the routine activities of the Authority, (iv) incurring any expense or series of related expenses totaling not more than $10,000 in any Fiscal Year and (v) purely administrative decisions that do not set policy for the Authority. In the event of a disagreement as to whether a decision is a Minor Decision, the Chairman shall determine whether such decision is a Minor Decision, and such determination shall be final. A Minor Decision shall require the affirmative vote of a majority of the members of the Board of Directors present and voting at a meeting at which a quorum is present.

(j) "Members" shall mean those the parties identified on the attached Exhibit A, and any parties that shall hereafter become Members in accordance with the terms and provisions of this Agreement.

(k) "Participation Percentage" shall mean the percentages described in Section 3.03 as they may be modified from time to time.

(l) "Special Activities" shall mean activities that are consistent with the purpose of this Agreement, but which are undertaken by fewer than all the parties in the name of the Authority pursuant to Section 3.07.

(m) "Supermajority Decision" shall mean any decision by the Board of Directors to (i) initiate litigation in the name of the Authority, (ii) issue bonds or other form of indebtedness obligating the Authority for an amount in excess of $100,000, (iii) adopt or amend the Authority's budget, (iv) change any Participation Percentage, (v) admit any new Member to the Authority or (vi) terminate any Member. A Supermajority Decision shall require the affirmative vote of two-thirds of the members of the Board of Directors.

(n) "Upper Kings Basin" shall mean the area depicted on the attached Exhibit C.

Article II: Creation of Authority

Section 2.01 – Creation.

The parties, pursuant to their joint exercise of powers, hereby create a public entity to be known as the "Upper Kings Basin Integrated Regional Water Management Authority."

Section 2.02 – Term.

This Agreement shall remain in effect until terminated by mutual agreement of all the parties hereto. Notwithstanding any other provision herein, this Agreement shall remain in effect and be binding upon the parties hereto and upon all subsequent parties joined herein for such a period as the Authority desires to engage in any activities under this Agreement. The foregoing provision shall not apply, however, to any party that withdraws or is terminated from its participation in the Authority in accordance with this Agreement.

Section 2.03 – Purpose.

The purpose of this Agreement is to provide for the joint exercise, through the Authority, of powers common to each of the parties in order to (i) engage in integrated regional water management planning and related activities under the Act in the Upper Kings Basin for the benefit of the water users within the boundaries of the Members, including without limitation those activities formerly conducted by the Members through the Upper Kings Basin Forum, (ii) coordinate, manage, maintain, modify, amend and implement the IRWMP under the Act, including without limitation assisting the Members in the development of water management projects and/or grant applications for projects included in or consistent with the IRWMP, (iii) participate through the Authority in water management projects included in or consistent with the IRWMP, and (iv) engage in such other activities related thereto as are incidental, necessary and convenient to the mutual benefit and interest of the Members. Activities unrelated to integrated regional water management planning under the Act in the Upper Kings Basin and/or the IRWMP shall not be undertaken by the Authority.

Section 2.04 – Powers.

The Authority shall have the power to take any action to carry out the purposes of this Agreement. Subject to the applicable voting requirements described in this Agreement, the Authority is authorized, in its own name, to do all acts necessary for the exercise of said powers, including, but not limited to, any and all of the following: to coordinate all activities necessary to maintain, modify, amend and implement the IRWMP in accordance with the Act; to screen and

select projects for grant applications; to prepare and submit grant applications on behalf of the Members; to assist Members in the development of water management projects; to participate in water management projects; to allocate and manage grant funding; to create and appoint committees and sub-committees; to undertake, on behalf of the Members, all actions required by the California Department of Water Resources and the State Water Resources Control Board related to the IRWMP; to make and enter into contracts and agreements; to sue and be sued in its own name; to engage or employ agents, consultants and employees; to acquire, construct, manage, maintain and operate any buildings, works, or improvements; to acquire by eminent domain, or otherwise, and to hold or dispose of any property; to issue bonds and all other forms of indebtedness, to the extent and on the terms provided by law for any of the parties herein or for any separate entity so permitted; and to incur debts, liabilities and obligations as approved by the Board of Directors in accordance with this Agreement. The Authority may levy assessments. Alternatively, in lieu of assessments (either in whole or in part), the Authority may fix and collect charges for any service furnished by the Authority. In accordance with California Government Code Section 6509, the foregoing powers shall be subject to the restrictions upon the manner of exercising such powers pertaining to the ALTA IRRIGATION DISTRICT, as specified in Division 11 of the California Water Code.

Notwithstanding the foregoing, Members of the Authority shall at all times retain control and authority, independent of the Authority, over their own internal matters, including water supplies, facilities, and water supply projects.

Section 2.05 – Adoption of IRWMP.

The Members agree that the IRWMP shall be coordinated and managed by the Authority, and that all modifications or amendments of the IRWMP shall be adopted only by the Authority's Board of Directors and in accordance with this Agreement. Modifications and amendments of the IRWMP shall be a Major Decision.

Article III: Internal Organization

Section 3.01 – Governing Body.

The Authority shall be governed by a Board of Directors which is hereby established and which shall be composed of one representative of each of the Members, and who shall be selected and designated in writing from time to time by the governing body of the respective party from among the elected members of that party's governing body. Each party, in addition to appointing its member to the Board, shall appoint at least one alternate to the Board who shall be a director, officer or employee of that party, but need not be an elected member of that party's respective governing body. The role of each alternate Director shall be to assume the duties of the Director appointed by his/her member entity in case of the absence or unavailability of such Director. The Directors and alternates so named shall continue to serve until their respective successors are appointed.

Interested Parties shall be notified of Board meetings when members of the Board are so notified, and each agenda for Board meetings shall provide an opportunity for participation by representatives of Interested Parties in attendance.

Section 3.02 – Advisory Committee and Other Committees.

The Board of Directors shall establish an advisory body known as the "Upper Kings Basin Integrated Regional Water Management Authority Advisory Committee" that shall consist of representatives of the Members and representatives of the Interested Parties. Each Member and each Interested Party may (but need not) appoint one member to the Advisory Committee. In addition to appointing a member to the Advisory Committee, each Member and each Interested Party may appoint at least one alternate to the Advisory Committee. Members and alternates shall be designated in writing from time to time by the respective governing body of each appointing entity. The Advisory Committee shall provide advice to the Board, but shall have no authority to take action that binds the Authority in any way.

Advisory Committee members and alternates need not be elected representatives of their respective appointing entities. The Advisory Committee shall meet from time to time as required by the Board or as the Advisory Committee establishes. A majority in number of the members of the Advisory Committee shall constitute a quorum for the transaction of the Advisory Committee's business. Each member of the Advisory Committee shall be entitled to one vote. All questions and matters of any nature whatsoever coming before the Advisory Committee shall be determined, provided a quorum is present, by the concurrence of at least a majority of the members of the Advisory Committee.

The Board of Directors may establish other committees as it determines necessary and shall establish membership, quorum, and voting requirements when the committees are established.

Section 3.03 – Participation Percentages.

The Participation Percentages of the Members shall be equal, and shall be automatically adjusted without further action of the parties or the Board of Directors upon the admission, withdrawal or termination of a Member. The Participation Percentages may be otherwise changed only upon a vote of the Board of Directors. Any such change in the Participation Percentages shall be a Supermajority Decision and shall not be deemed an amendment to this Agreement.

Section 3.04 – Seal; Bylaws.

The Board may (but need not) adopt an official seal for the Authority and adopt such bylaws as it may deem necessary to regulate the affairs of the Authority in accordance with this Agreement. The bylaws may be amended from time to time by the Board of Directors as it may deem necessary. Amendment of the Bylaws shall be a Major Decision.

Section 3.05 – Quorum.

A majority in number of the members of the Board of Directors shall constitute a quorum for the transaction of Members' business. Each member of the Board of Directors shall be entitled to one vote. Any member of the Board of Directors abstaining from a vote shall be counted for purposes of determining the existence of a quorum, but shall not be deemed to be voting. Amendment of this Agreement shall be governed by Section 7.01.

Section 3.06 – Meetings.

Meetings of the Board of Directors and Advisory Committee shall be conducted in accordance with the Ralph M. Brown Act, California Government Code Sections 54950, *et seq.*

Section 3.07 - Special Activities.

With the prior approval of the Board of Directors, Members may undertake Special Activities in the name of the Authority. Prior to undertaking a Special Activity, the Members electing to participate in the Special Activity shall enter into an activity agreement. Such activity agreement shall provide that (i) no Special Activity undertaken pursuant to such agreement shall conflict with the terms of this Agreement and (ii) the Members to the activity agreement shall indemnify, defend and hold the other parties to this Agreement and the Authority harmless from and against any liabilities, costs or expenses of any kind arising as a result of the Special Activity described in the activity agreement. All assets, rights, benefits, debts, liabilities and obligations attributable to a Special Activity shall be assets, rights, benefits debts, liabilities and obligations solely of the Members that have entered into the activity agreement for that Special Activity, in accordance with the terms of the activity agreement, and shall not be the assets, rights, benefits, debts, liabilities and obligations of those Members that have not executed the activity agreement. This Section 3.07 shall survive the termination of expiration of this Agreement.

Section 3.08 – Officers.

The officers of the Authority shall include a Chairman, a Vice-Chairman who shall serve in the absence of the Chairman, a Secretary-Treasurer, and such other officers as the Board of Directors may appoint from time to time. Each officer shall serve at the pleasure of the Board of Directors, or for such terms as the Board of Directors may establish, and shall have those powers set forth in this Agreement or delegated to them by the Board of Directors.

Article IV: Financial Provisions

Section 4.01 – Fiscal Year.

The Fiscal Year of the Authority shall be from July 1 through June 30 of each year.

Section 4.02 – Funds; Accounts.

Subject to Section 5.02 of this Agreement, the Secretary-Treasurer shall be responsible for all money of the Authority from whatever source. All funds of the Authority shall be strictly and separately accounted for and regular reports shall be rendered of all receipts and disbursements at least quarterly during the Fiscal Year. The books and records of the Authority shall be open to inspection by the Members and by bondholders as and to the extent provided by resolution or indenture. The Secretary-Treasurer shall contract with a certified public accountant to make an annual audit of the accounts and records of the Authority which shall be conducted in compliance with Section 6505 of the California Government Code.

Section 4.03 – Property; Bonds.

The Board of Directors shall from time to time designate the officers and persons, in addition to those specified in Section 4.02 above, who shall have charge of, handle, or have access

to any property of the Authority. The Authority shall acquire such fidelity bonds or comparable insurance covering such officers and persons in amounts designated by the Board of Directors; provided, that if no bond amount is set by the Board of Directors, no bond shall be required. Such designation shall be subject to ratification by the Members in compliance with California Government Code Section 6505.1.

Section 4.04 – Budget.

By a date set by the Board of Directors each Fiscal Year, the Board of Directors shall adopt an annual budget for the Authority for the ensuing Fiscal Year. Adoption of the annual budget or any amendment thereof shall be a Supermajority Decision.

Section 4.05 – Payments To The Authority.

All fees, costs and expenses incurred by the Authority for Member actions and activities shall be allocated to and paid by the Members in accordance with the Participation Percentages as defined in Section 3.03 on a schedule set by the Board of Directors; provided, that no Member shall be obligated to make any such payment unless and until such Member's governing body has approved and appropriated the funds necessary to make such payment. In the event a payment by a Member is otherwise required but is not made because such Member's governing body has not approved such payment or appropriated the funds necessary to make such payment, such Member shall be subject to termination as a Member pursuant to Section 6.02 but upon any such termination shall not be liable for the amount of such payment.

Article V: Contract Management; Fiscal Agent

Section 5.01 – Management.

In addition to, or in lieu of, hiring employees, the Authority may engage one or more third parties to manage any or all of the business of the Authority on terms and conditions acceptable to the Board of Directors. A third party so engaged may, but need not, be a Member. Any third party so engaged shall have such responsibilities as are set forth in the contract for such third party's services.

Section 5.02 – Fiscal Agent.

Without limiting the breadth of Section 5.01, the Board of Directors may select a Member or a third party to act as the fiscal agent for the Authority pursuant to an agreement with the fiscal agent approved by the Board of Directors. The approval of such agreement shall be a Majority Decision.

Article VI: Relationship of Authority And Its Members

Section 6.01 – Separate Entity; Property.

In accordance with California Government Code Sections 6506 and 6507, the Authority shall be a public entity separate from the parties to this Agreement. To the greatest extent permitted by law, otherwise agreed herein the debts, liabilities and obligations of the Authority shall not be

debts, liabilities or obligations of the member entities. The Authority shall own and hold title to all funds, property and works acquired by it during the term of this Agreement.

Section 6.02 – Admission, Withdrawal and Termination of Members.

Additional qualified parties may join in this Agreement and become Members upon the approval of the Board of Directors. Prior to being admitted as a new Member, a party shall (i) execute an agreement to be bound by the terms of this Agreement as if such party had been an original signatory hereto and (ii) pay an amount set by the Board of Directors to make the contributions to Authority activities by all Members (including the new Member) equitable. The admission of a new Member and determination of such amount shall be a Supermajority Decision.

Notwithstanding anything herein to the contrary, any Member may withdraw from this Agreement by giving 60 days written notice of its election to do so, which notice shall be given to the Board of Directors and to each of the other parties; provided, that such withdrawal does not in any way impair any contracts, resolutions, indentures or other obligations of the Authority then in effect. In the event of a disagreement between the Authority and the withdrawing party as to whether such withdrawal shall cause the impairment of any contracts, resolutions, indentures or other obligations of the Authority, such determination shall be made by the vote of 75% of the directors representing the non-withdrawing Members present and voting. Subject to the foregoing, a Member's withdrawal will be effective as of the date the notice of withdrawal is provided.

A withdrawing Member shall in all events remain liable for its proportionate share of (i) any call for funds or assessment levied by the Authority prior to the date it provides its notice of withdrawal, (ii) any contribution required by Section 6.04 to reflect the Participation Percentages in existence at the time the subject act or omission occurred, and (iii) the amount of any annual budget approved not more than 60 days prior to the date it provides its notice of withdrawal; provided, that a Member not concurring in an amendment of this Agreement that withdraws within the 60-day period described in Section 7.01 shall not be liable for any such amounts except to the extent they are delinquent on the date of withdrawal.

Any Member may be terminated, by a vote of the Board of Directors and upon termination shall no longer be a member of the Authority. Termination of a Member shall be a Supermajority Decision. A Member so terminated shall not be liable for the amounts described in clauses (i), (ii) and (iii) of the immediately preceding paragraph except to the extent they are delinquent on the date of termination.

In the event a Member withdraws from the Authority or is terminated in accordance with the terms and conditions hereof, such Member shall not receive a refund of any amounts advanced to the Authority by such Member prior to the date of its withdrawal or termination.

Section 6.03 – Disposition Of Property Upon Termination Or Determination By Board Of Surplus.

Upon termination of this Agreement or upon determination by the Board of Directors that any surplus money is on hand, such surplus money shall be returned to the then member entities of the Authority which contributed such monies in proportion to their Participation Percentages. The Board of Directors shall first offer any properties, works, rights and interests of the Authority for

sale to the member entities. If no such sale is consummated, then the Board of Directors shall offer the properties, works, rights and interests of the Authority for sale to any governmental agency, private entity or persons for good and adequate consideration. The net proceeds from any sale shall be distributed among the Members in proportion to their Participation Percentages. If no such sale is consummated, then all of the properties, works, rights and interests of the Authority shall be allocated to the Members in the same manner as the allocation of the net proceeds from the sale.

Section 6.04 – Agreed Upon Share Of Liability Or Judgment For Damages.

The parties to this Agreement do not intend hereby to be obligated either jointly or severally for the debts, liabilities or obligations of the Authority, except as may be specifically provided for in California Government Code Section 895.2 as amended or supplemented. Provided, however, if the Members of the Authority are, under such applicable law, held liable for the acts or omissions of the Authority caused in the performance of this Agreement, caused by negligent or wrongful act or omission occurring in the performance of this Agreement, such Members shall be entitled to contribution from each of the other Members so that after said contribution each party shall bear a share equal to its Participation Percentage in existence at the time the subject act or omission occurred. The right of contribution shall include any and all loss, liability, fines, penalties, forfeitures, costs and damages whether in contract, tort or strict liability, including but not limited to personal injury, death at any time and property damage, and for any and all claims, demands and actions in law or equity, including attorney's fees and litigation expenses (hereinafter collectively referred to as "judgment" for purposes of this section.) The right of contribution is limited to the amount paid in satisfaction of the judgment in excess of the Participation Percentage of the Members so paying. No Member may be compelled to make contribution beyond its share based upon its Participation Percentage of the entire judgment in existence as of the date of the subject act or omission.

Section 6.05 – Insurance.

The Board of Directors shall, from time to time and at least annually, review the general liability, automobile, directors and officers, and other insurance coverage maintained by the Authority for adequacy and determine the nature, extent and limits of insurance to be maintained by the Authority. The Authority shall purchase and maintain such insurance as the Board determines to be appropriate after such review.

Article VII: Miscellaneous Provisions

Section 7.01 – Amendment.

This Agreement may be amended from time to time by the concurrence of 75% of all of the Members. To provide non-concurring parties an opportunity to withdraw from the Authority as provided herein, an amendment shall be binding on all parties hereto 60 days after the required concurrence has been obtained.

Section 7.02 – Severability And Validity Of Agreement.

Should the participation of any party to this Agreement, or any part, term or provision of this Agreement be decided by the courts or the legislature to be illegal, in excess of that party's

authority, in conflict with any law of the State of California, or otherwise rendered unenforceable or ineffectual, the validity of the remaining portions, terms or provisions of this Agreement shall not be affected thereby and each party hereby agrees it would have entered into this Agreement upon the same terms as provided herein if that party had not been a participant in this Agreement.

Section 7.03 – Assignment.

Except as otherwise provided in this Agreement, the rights and duties of the parties to this Agreement may not be assigned or delegated without the approval of the Board of Directors, which approval shall be a Supermajority Decision. Any attempt to assign or delegate such rights or duties in contravention of this section shall be null and void. Any assignment or delegation permitted under the terms of this Agreement shall be consistent with the terms of any contracts, resolutions or indentures of the Authority then in effect. This Agreement shall inure to the benefit of and be binding upon the successors and assigns of the parties hereto. This section does not prohibit a party from entering into an independent agreement with another agency regarding the financing of that party's contributions to the Authority or the disposition of proceeds which that party receives under this Agreement so long as such independent agreement does not affect, or purport to affect, the rights and duties of the Authority or the parties under this Agreement.

Section 7.04 – Execution In Parts Or Counterparts.

This Agreement may be executed in parts or counterparts, each part or counterpart being an exact duplicate of all other parts or counterparts, and all parts or counterparts shall be considered as constituting one complete original and may be attached together when executed by the parties hereto. Facsimile signatures shall be binding.

Section 7.05 – Notices.

Notices authorized or required to be given pursuant to this Agreement shall be in writing and shall be deemed to have been given when mailed, postage prepaid, or delivered during working hours to the addresses set forth for each of the parties beneath their signatures on this Agreement, or to such other changed addresses communicated to the Authority and the member entities in writing.

Section 7.06 – Governing Law and Venue.

This Agreement shall be governed by, construed, and enforced in accordance with the laws of the State of California, excluding any conflict of laws rule which would apply the law of another jurisdiction. Venue for purposes of the filing of any action regarding the enforcement or interpretation of this Agreement and any rights and duties hereunder shall be Fresno County, California. The parties to this Agreement hereby expressly waive any right to remove any action to a county other than Fresno County as permitted pursuant to California Code of Civil Procedure Section 394.

Section 7.07 – Attorney's Fees.

If any party commences any proceeding or legal action to enforce or interpret any term, covenant or condition of this Agreement, the prevailing party in such proceeding or action shall be entitled to recover from the other party its reasonable attorney's fees and legal expenses.

IN WITNESS WHEREOF, the parties hereto, pursuant to resolutions duly and regularly adopted by their respective governing boards, have caused their names to be affixed by their proper and respective officers as of the day and year first above-written.

NAME OF MEMBER:_____

By: _____
Its: _____

By: _____
Its: _____

Member's Address:
_____
_____
_____

Dated: _____

EXHIBIT A

[Exhibit A to be completed after all prospective Members have determined whether to join the Authority. A list of prospective Members will be provided with this proposed form of Agreement.]

EXHIBIT B
Interested Parties

[Exhibit B to be completed after all prospective Interested Parties have determined whether to associate with the Authority. A list of prospective Interested Parties will be provided with this proposed form of Agreement.]

Non-Governmental Organizations:

State Agencies:

This Page is Intentionally Blank

KINGS BASIN WATER AUTHORITY

INTEGRATED REGIONAL WATER MANAGEMENT PLAN

APPENDIX D

LETTER OF AGREEMENT WITH MADERA REGION REGIONAL WATER MANAGEMENT GROUP

This Page is Intentionally Blank

Integrated Regional Water Management -
Letter of Agreement on Communication Between Regions

The Madera and Kings Basin Regional Water Management Groups (RWMG), through a process of open discussion, collaboration and mutual agreement have established an agreement on communication between their regions. This Letter of Agreement establishes the procedures and intentions regarding such communication.

Intent: The Kings Basin and Madera regions share a common border along the Fresno and Madera County line. The two regions, represented by their respective RWMGs, will work to maintain communication on a variety of common water and watershed-based issues.

Procedure: The Kings Basin and Madera RWMGs will be updating their existing Integrated Regional Water Management Plans (IRWMPs) to meet new State requirements over the course of the next several years. As a task to update its IRWMP, the Kings Basin RWMG will add language which describes the nature of its cooperative and collaborative relationship with the Madera RWMG. In the case of Madera RWMG, a revised governance structure is likely to result from its IRWMP update. Madera RWMG will include a formal procedure for communication with Kings Basin RWMG as part of their revised governance structure, or, will describe the nature of its cooperative and collaborative relationship with the Kings Basin RWMG within its updated IRWMP. Until such time, the Kings Basin and the Madera RWMGs agree to actively communicate in accordance with the existing procedures of both RWMGs

On behalf of the Madera Regional Water Management Group:

Carl Janzen

Lead Agency: Madera Irrigation District

Contact: Carl Janzen

Phone Number: 559-673-3514

On behalf of the Kings Basin Regional Water Management Group:

David Orth

Lead Agency: Upper Kings Basin IRWM Authority

Contact: David Orth, Secretary/Treasurer

Phone Number: 559-237-5567

This Page is Intentionally Blank

KINGS BASIN WATER AUTHORITY

INTEGRATED REGIONAL WATER MANAGEMENT PLAN

APPENDIX E

PUBLIC NOTICES

This Page is Intentionally Blank

PUBLIC NOTICE

#54051

NOTICE OF INTENTION TO PREPARE AN UPDATE TO THE KINGS BASIN INTEGRATED REGIONAL WATER MANAGEMENT PLAN

NOTICE IS HEREBY GIVEN that the Upper Kings Basin Integrated Regional Water Management Authority (Authority) plans to prepare an update to the July 2007 Upper Kings Basin Integrated Regional Water Management Plan (IRWMP). This updated IRWMP will be prepared in accordance with the State of California Department of Water Resources Integrated Regional Water Management Plan Guidelines. The IRWMP includes groundwater, surface water, and storm water management objectives and a listing of planned strategies to accomplish the objectives of the IRWMP.

The Authority is a Joint Powers Authority formed under the Joint Exercise of Powers Act (Government Code 6500, et seq.) to manage and implement the IRWMP. The Authority currently includes 18 Members and 23 Interested Parties. A map of the Kings Basin IRWM, as well as a list of each of the Members and Interested Parties can be found at the Authority's website: http://www.krcd.org/water/ukbirwma/.

An IRWMP Update Workgroup of Authority representatives has been formed to steer the development of the IRWMP. Landowners and other interested parties who wish to participate in updating the IRWMP, may do so by submitting a written letter to David Orth, Secretary, Upper Kings Basin IRWM Authority, 4886 E. Jensen, Fresno, California 93725.

This Notice has been prepared in accordance with Government Code 6066 requirements. Following completion of preparation of the IRWMP, the Authority, as well as each member entity, will adopt the IRWMP. Prior to adoption, a Notice of Intent to Adopt the IRWMP will be properly noticed in accordance with Government Code 6066.

October 19, 2011

/s/ David Orth
Secretary

(PUB: November 5,12, 2011)

PUBLIC NOTICE

#10907

NOTICE OF INTENTION TO ADOPT AN UPDATE TO THE KINGS BASIN INTEGRATED REGIONAL WATER MANAGEMENT PLAN

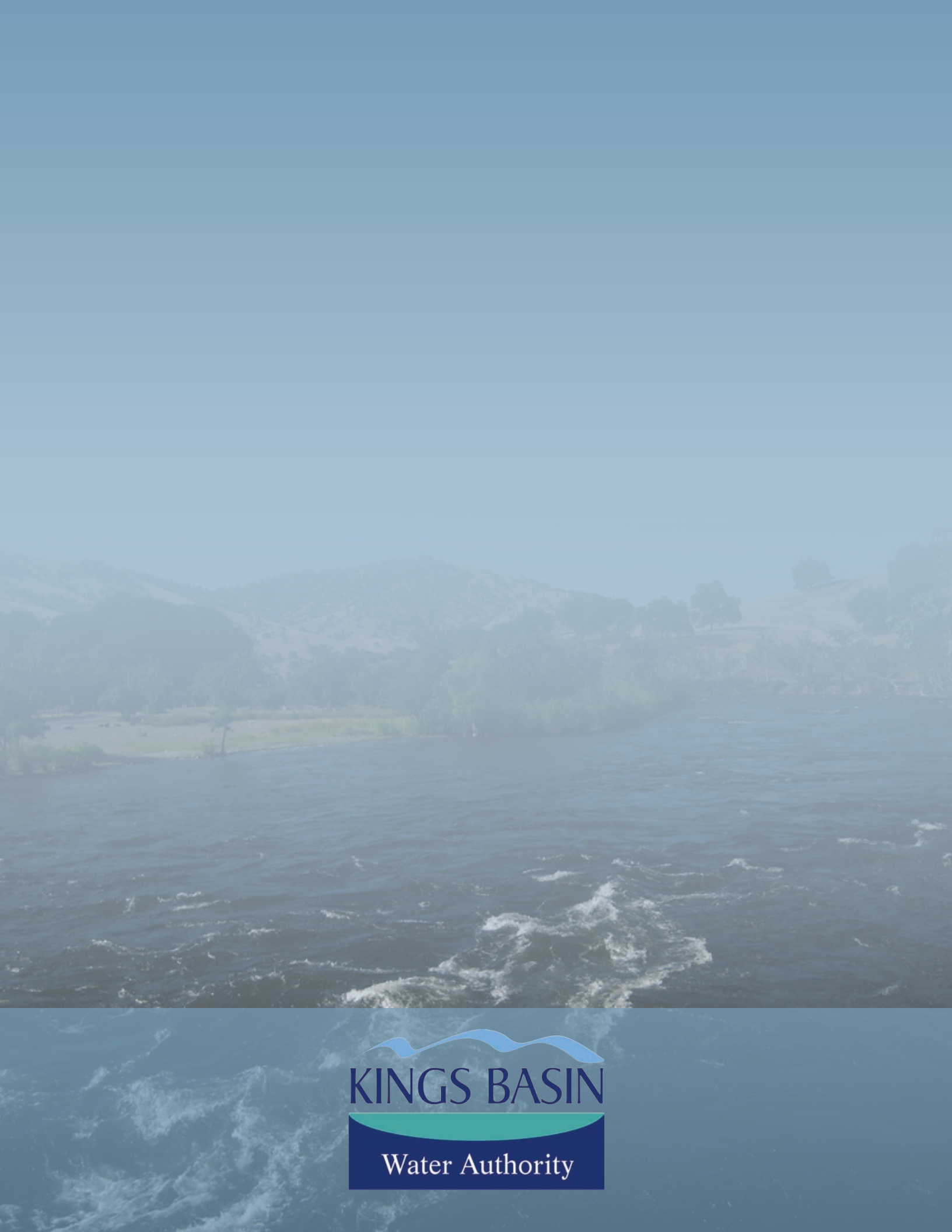
NOTICE IS HEREBY GIVEN that the Upper Kings Basin Integrated Regional Water Management Authority (Authority) intends to adopt an update to the July 2007 Upper Kings Basin Integrated Regional Water Management Plan (IRWMP) at a future Authority Board meeting. This updated IRWMP has been prepared in accordance with the State of California Department of Water Resources Integrated Regional Water Management Plan Guidelines. The IRWMP includes groundwater, surface water, and storm water management objectives and a listing of planned strategies to accomplish the objectives of the IRWMP. The Authority is a Joint Powers Authority formed under the Joint Exercise of Powers Act (Government Code 6500, et seq.) to manage and implement the IRWMP. The Authority currently includes 18 Members and 35 Interested Parties

The Authority published its Notice of Intent to prepare an update to the IRWMP in November 2011 in which landowners and stakeholders were invited to participate in the preparation. An IRWMP Update Workgroup of Authority representatives and stakeholders was formed to steer the development of the IRWMP. The Workgroup has been meeting since November 2011 to develop the IRWMP Update by reviewing each chapter of the IRWMP as well as the Guidelines requirements, and preparing recommended changes to the IRWMP. Presentations have been made at the Authority's regular Advisory Committee Meetings and regular Board meetings to update Members, Interested Parties and Stakeholders on the status of the IRWMP update and invite participation with the Workgroup.

The Authority is now soliciting comment on the updated IRWMP. The updated IRWMP is available at the Authority's website atwww.kingsbasinauthority.org. Comments must be submitted in writing to the Kings Basin Water Authority, 4886 E. Jensen, Fresno, California, 93725, Attn. Eric Osterling, no later than September 14, 2012.This Notice has been prepared in accordance with Government Code 6066 requirements. Following completion of preparation of the IRWMP, the Authority, as well as its member entities and interested parties, will adopt the IRWMP.

/s/ David Orth
Secretary
(PUBLISHING: August 31, September 7, 2012)

This Page is Intentionally Blank



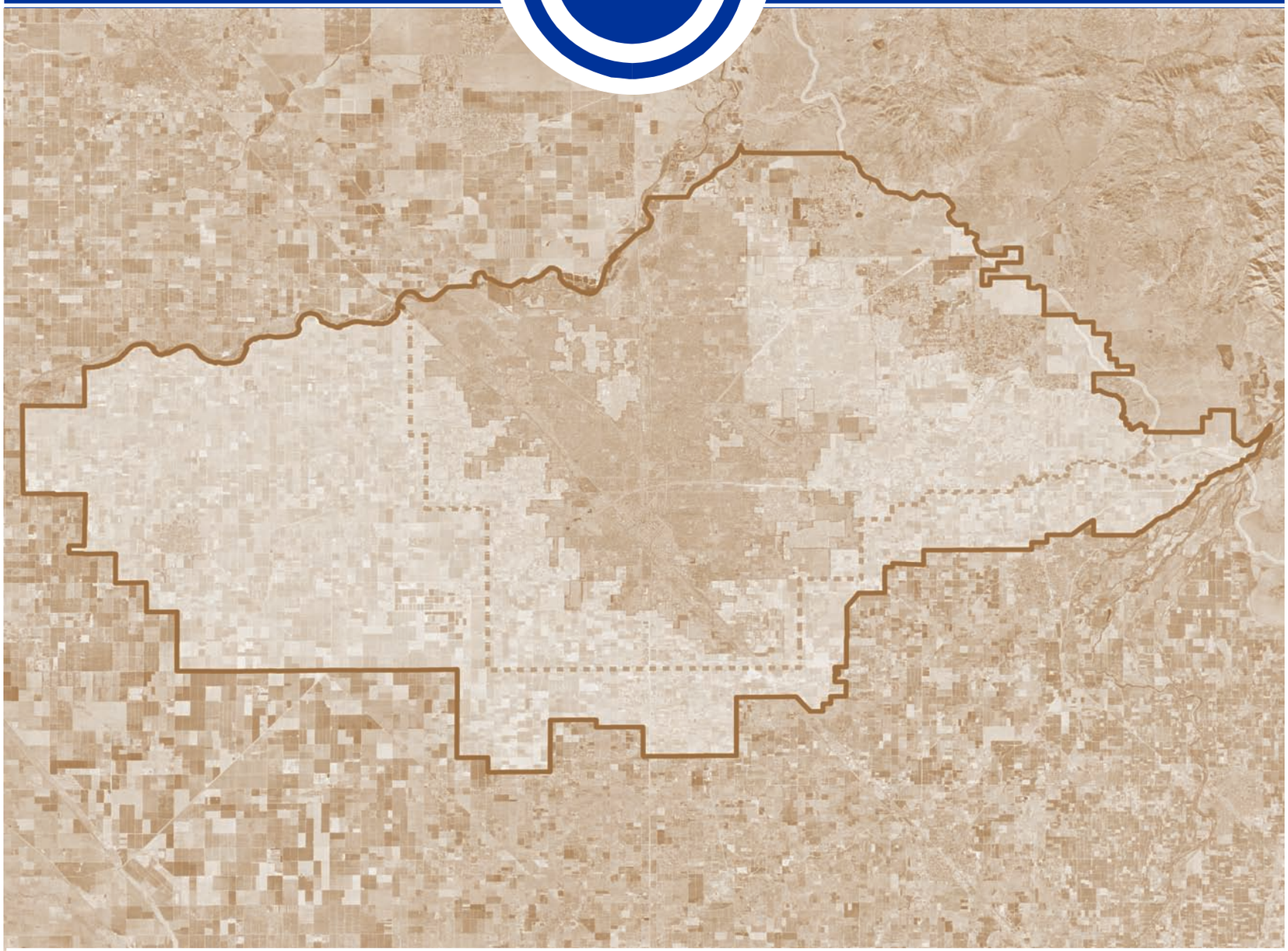
KINGS BASIN

Water Authority

Fresno Area Regional

Groundwater Management Plan

December 2006



● *Fresno Irrigation District* ● *City of Clovis* ● *Fresno Metropolitan Flood Control District* ●
● *County of Fresno* ● *City of Fresno* ● *City of Kerman* ● *Bakman Water Company* ●
● *Garfield Water District* ● *Malaga County Water District* ● *Pinedale County Water District* ●

FRESNO AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

The Fresno Area Regional
Groundwater Management Plan

Adopted by:	On:
Fresno Irrigation District	01/25/2006
City of Clovis	02/13/2006
Bakman Water Company	03/13/2006
County of Fresno	07/18/2006
City of Fresno	04/18/2006
Pinedale County Water District	09/20/2006
Fresno Metropolitan Flood Control District	02/08/2006
City of Kerman	03/01/2006
Malaga County Water District	02/14/2006
Garfield Water District	11/01/2006

1 - INTRODUCTION 1-1
1.1 - Background Information on Regional Group 1-1
1.2 - Plan Area 1-2
1.3 - Purpose for this Groundwater Management Plan 1-5
1.4 - Previous Plans 1-5
1.5 - Statutory Authority for Groundwater Management 1-6
1.6 - Groundwater Management Plan Components 1-6
1.7 - Adoption of Plan 1-8
2 - PARTICIPANT INFORMATION 2-1
2.1 - Fresno Irrigation District 2-1
2.2 - Fresno County 2-2
2.3 - City of Fresno 2-4
2.4 - City of Clovis 2-5
2.5 - City of Kerman 2-6
2.6 - Malaga County Water District 2-6
2.7 - Pinedale County Water District 2-7
2.8 - Fresno Metropolitan Flood Control District 2-7
2.9 - Bakman Water Company 2-8
2.10 - Garfield Water District 2-9
2.11 - Surrounding Area 2-9
3 - GEOLOGY AND HYDROGEOLOGY OF THE FRESNO AREA 3-1
3.1 - Geology 3-1
3.2 - Hydrogeologic Characteristics 3-1
3.3 - Groundwater Conditions within the Plan Area 3-6
3.4 - Historic Groundwater Monitoring Programs 3-6
4 - REGIONAL GROUNDWATER MANAGEMENT OBJECTIVES 4-1
5 - STAKEHOLDER INVOLVEMENT 5-1
5.1 - Advisory Committee of Stakeholders 5-1
5.2 - Relationships with Other Agencies 5-2
5.3 - Plan to Involve the Public and Non-Participating Agencies 5-3
6 - MONITORING PROGRAM 6-1
6.1 - Groundwater Level Monitoring 6-1
6.2 - Groundwater Quality Monitoring 6-4
6.3 - Monitoring Protocols 6-5
6.4 - Land Surface Subsidence Monitoring 6-7
6.5 - Surface Water Monitoring 6-7
7 - GROUNDWATER RESOURCES PROTECTION 7-1
7.1 - Well Destruction 7-1
7.2 - Well Construction Policies 7-1
7.3 - Wellhead Protection 7-2
7.4 - Saline Water Intrusion 7-3
7.5 - Migration of Contaminated Groundwater 7-4
7.6 - Groundwater Quality Protection 7-4
8 - GROUNDWATER SUSTAINABILITY 8-1
8.1 - Groundwater Recharge 8-1
8.2 - Water Conservation and Education 8-3

8.3 - Groundwater Use Limitations 8-4
8.4 - Conjunctive Use of Water Resources 8-6
8.5 - Wastewater Reclamation and Recycling 8-7
8.6 - Operation of Facilities 8-8
9 - GROUNDWATER PLANNING AND MANAGEMENT 9-1
9.1 - Plan Implementation 9-1
9.2 - Groundwater Reports 9-1
9.3 - Plan Re-evaluation 9-2
9.4 - Land Use Planning 9-3
9.5 - Dispute Resolution 9-3
9.6 - Program Funding and Fees 9-4
10 - REFERENCES 10-1

List of Abbreviations..... iii

Figures

1-1 Groundwater Basin Map 1-3
1-2 Map of Participating Agencies 1-4
2-1 Map of Surface Water Facilities 2-3
2-2 Neighboring Agency Map 2-10
3-1 Historical Decline in Groundwater Level 3-3
3-2 Well Hydrographs 3-4
3-3 Groundwater Contours (January 2005) 3-5
6-1 Map of Domestic Production and Monitor Wells 6-3
9-1 Landuse Map 9-6

Tables

1-1 Location of Groundwater Management Plan Components 1-7
2-1 Summary of Participants 2-11
5-1 Memberships in Water Related Organizations 5-5

Appendices

A - Public Participation in Plan Adoption
B- Resolutions to Adopt Plan
C - Memorandum of Understanding
D - Glossary

LIST OF ABBREVIATIONS

AB	Assembly Bill
AF	Acre-feet
CSA	Community Service Area
CVP	Central Valley Project
DBCP	Dibromo-Chloropropane
DHS	Department of Health Services
DWR	Department of Water Resources
EDB	Ethylene Dibromide
EHS	Environmental Health System
EPA	Environmental Protection Agency
FCEHD	Fresno County Environmental Health Department
FID	Fresno Irrigation District
FMFCD	Fresno Metropolitan Flood Control District
GAC	Granulated Activated Carbon
GMP	Groundwater Management Plan
HSA	Hydrologic Study Area
ISI	Integrated Storage Investigations
MCWD	Malaga County Water District
MG	Million Gallons
MGD	Million Gallons Per Day
MOU	Memorandum of Understanding
MTBE	Methyl Tertiary-Butyl Ether
NPDES	National Pollution Discharge Elimination System
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SWTP	Surface Water Treatment Plant
TAC	Technical Advisory Committee
TCE	Trichloroethylene
TCP	Trichloropropane
VOC	Volatile Organic Chemicals or Volatile Organic Compounds
WWD	Waterworks District
WWTF	Wastewater Treatment Facility
WWTP	Wastewater Treatment Plant

1 - INTRODUCTION

This Groundwater Management Plan (GMP or Plan) is a collaborative effort among nine public agencies and one private water company in the Fresno-Clovis metropolitan and surrounding area. The Plan documents a regional approach toward groundwater management, while still addressing individual goals and issues for each of the participants. The Plan satisfies the new requirements for Groundwater Management Plans created by the September 2002 California State Senate Bill No. 1938, which amended Sections 10753 and 10795 of the California Water Code. The Plan also addresses recommended components for a Groundwater Management Plan described in Appendix C of Department of Water Resources Bulletin 118 (2003 Update).

1.1 - Background Information on Regional Group

Background

The desire to develop and adopt a regional groundwater management plan for this region came from an effort to involve local stakeholders in development of a groundwater management plan for the Fresno Irrigation District (FID). In 2004, FID intended to update its groundwater management plan to meet SB 1938 requirements and DWR recommendations. In an effort to solicit comment from stakeholders, FID held a public hearing on July 7, 2004, to notify the public of FID's intent to modify its plan. The notice invited landowners and interested parties to make comment at the meeting and participate on a technical advisory committee. No public comments were received at the hearing. FID adopted a Resolution of Intent to Modify its Groundwater Management Plan on July 7, 2004.

A Technical Advisory Committee (TAC) was formed to provide input during preparation of the Plan. The TAC was comprised of local agency representatives and landowners. The first meeting of the TAC was held on November 18, 2004. A review of the new Water Code requirements was provided, as well as the initial expectations of the TAC. At this initial meeting, some of the agency representatives noted that they planned to prepare their own groundwater management plan and some expressed interest in developing a regional plan. It was decided to conduct another meeting with representatives of agencies that have overlapping boundaries with FID to determine the interest of other local stakeholders to participate in a cooperative or regional plan. This meeting was held on January 27, 2005. The meeting addressed the need for an updated plan, the new requirements in the Water Code, the benefits of a regional plan, and discussions on how to proceed with a regional groundwater management plan. From this meeting, it was determined that there was enough interest in developing a regional plan. The attendees at the meeting identified four major reasons for developing a regional plan:

- Cooperative groundwater management efforts
- Cost savings with preparing a regional plan and annual groundwater reports
- Inclusion of smaller agencies
- Regional funding opportunities

Cooperative Effort

Interested parties continued to meet to develop a Memorandum of Understanding (MOU) for preparation of the regional plan. The MOU was drafted and reviewed by each of the agencies, and monthly meetings with the agency representatives and landowners were held. The MOU was presented before each agency's governing body for discussion and public comment. The MOU was then adopted by each of the agencies. A copy of the signed MOU is included in Appendix B.

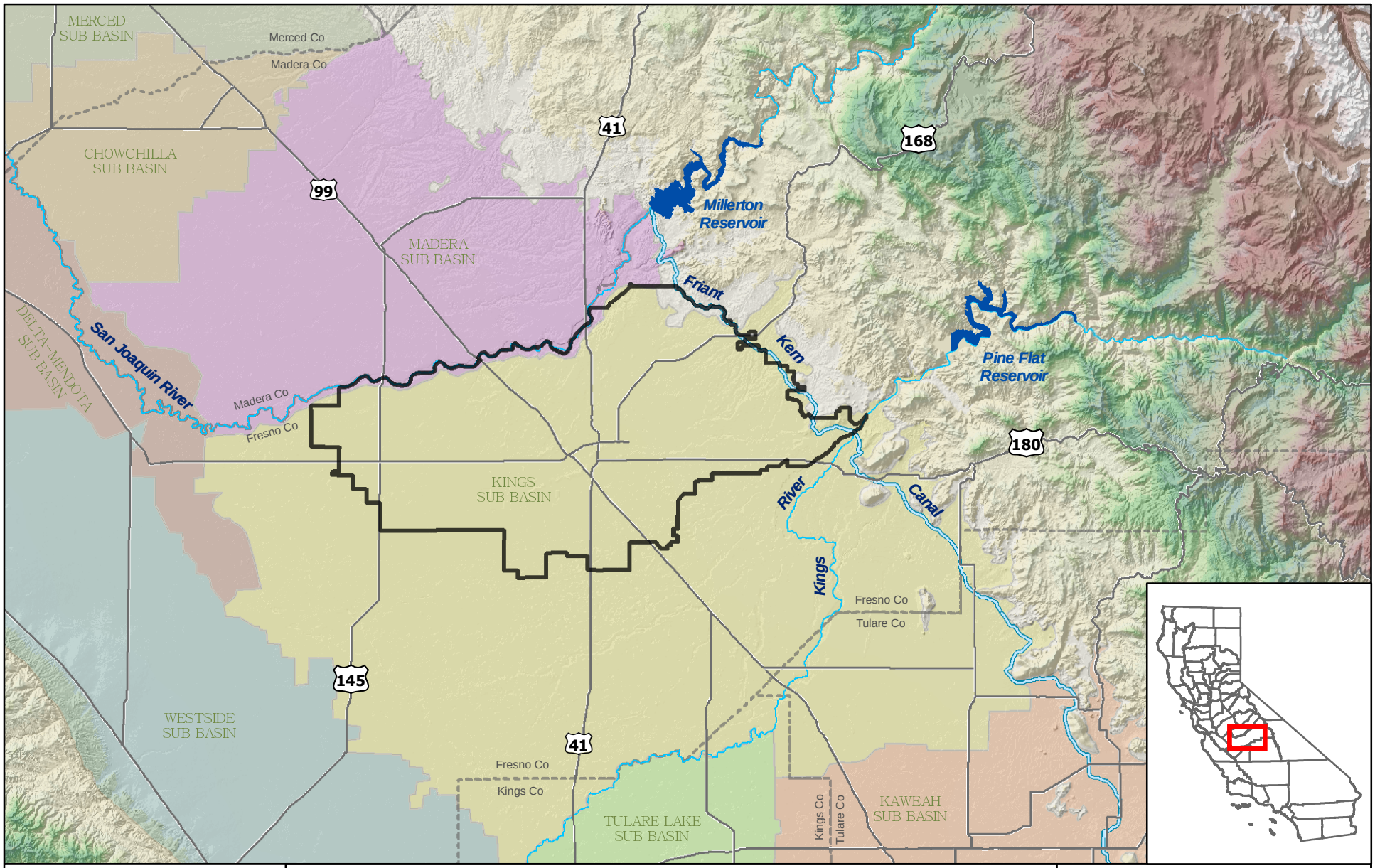
1.2 - Plan Area

The Plan Area lies within the Kings Groundwater Sub-basin, which lies within the San Joaquin Basin Hydrologic Study Area (HSA). The Kings Sub-basin is also identified as sub-basin 5-22.08 of the Tulare Lake Hydrologic Region in the Department of Water Resources Draft Bulletin 118 updated in 2003, as shown in Figure 1-1. The Plan boundary generally follows the boundary of the Fresno Irrigation District, however it is extended in the northeast along Friant Road to Willow Avenue, then east to the Friant-Kern Canal, then south along the Friant-Kern Canal to FID's boundary near the Kings River. The participants to this Plan include:

- Fresno Irrigation District
- County of Fresno
- City of Fresno
- City of Clovis
- City of Kerman
- Malaga County Water District
- Pinedale County Water District
- Fresno Metropolitan Flood Control District
- Bakman Water Company
- Garfield Water District

The participants are described in Section 2 and the Plan boundary and participant boundaries are shown in Figure 1-2. The Plan Area was determined based on the shared aquifer, and includes participants that are within close proximity within the aquifer and are actively managing water resources.

Consistent with provisions of the County's groundwater management plan, it is intended that this Plan supercede the County's existing Groundwater Management Plan only within the Plan Area. The County's existing Plan will still be in effect for the remainder of the County area.



0 3 6 9 12 Miles

N

EST. 1968
PROVOST & PRITCHARD
ENGINEERING GROUP
An Employee Owned Company

286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

Groundwater Sub Basins

- Kaweah
- Kings
- Madera
- Delta-Mendota
- Westside
- Chowchilla
- Merced
- Tulare Lake

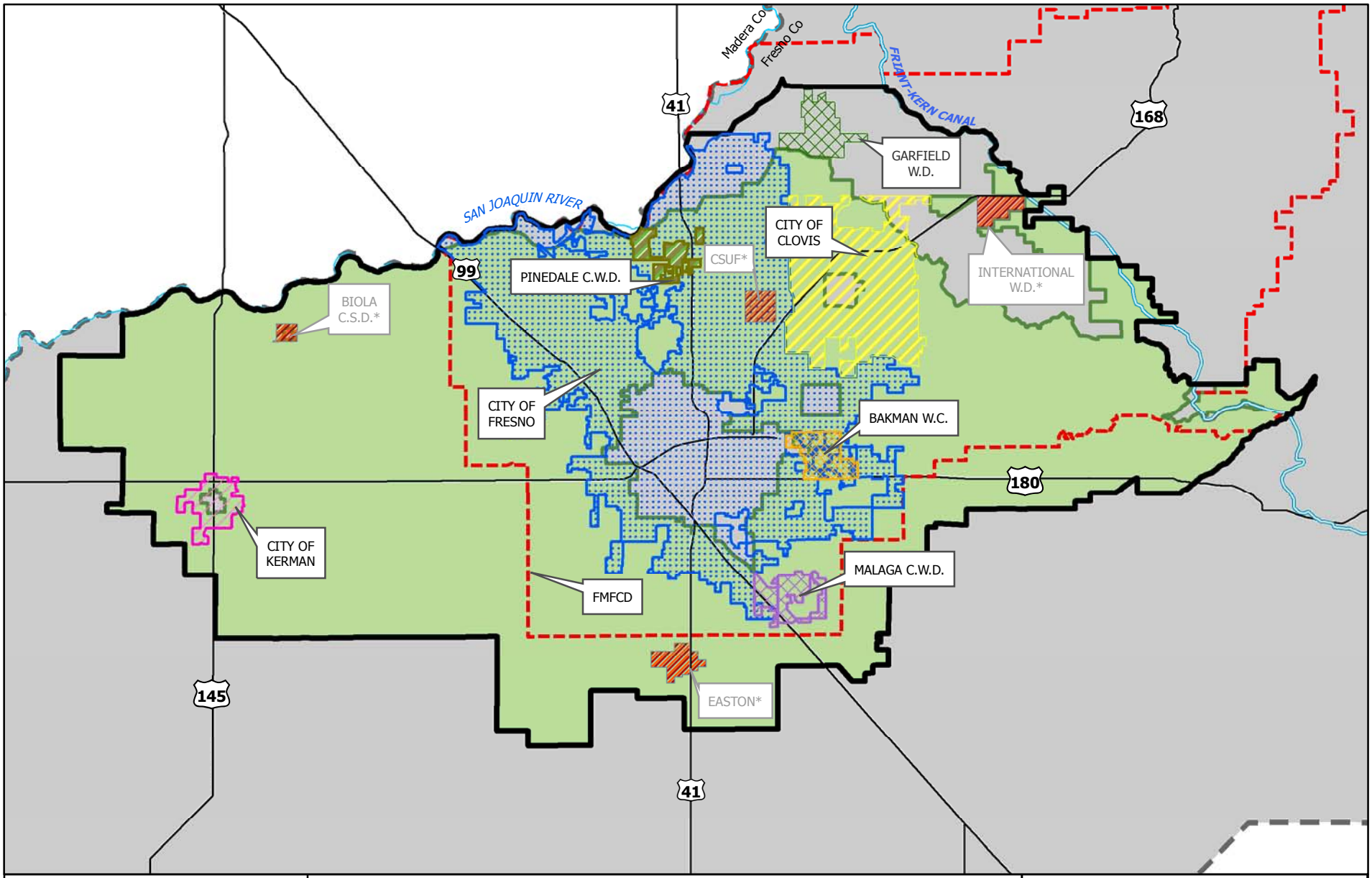
GMP BOUNDARY

Figure 1-1

Groundwater Basin Map

Fresno-Area Regional
Groundwater Management Plan

December, 2005 \\huntington\gis\Clients\FresnoID_1038\10380505\GMP_Vicinity.mxd



0 1 2 3 4 Miles

N

EST. 1968
PROVOST & PRITCHARD
ENGINEERING GROUP
An Employee Owned Company

286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

LEGEND

- COUNTY OF FRESNO
- CITY OF FRESNO
- CITY OF KERMAN
- PINEDALE W.D.
- CITY OF CLOVIS
- BAKMAN W.D.
- GARFIELD W.D.
- MALAGA C.W.D.
- FRESNO I.D.
- FMFCD Boundary
- *Agencies within plan boundary, not participating
- GMP BOUNDARY
- FRIANT-KERN CANAL

The Plan area lies entirely within the County of Fresno, and the County is a participant to the Plan.
The Plan area lies within the Kings River Conservation District.

Figure 1-2

Participating Agencies

Fresno-Area Regional Groundwater Management Plan

December, 2005 \\huntington\gis\Clients\FresnoID_1038\10380505\FresnoRegionGMP_figure1-2.mxd

1.3 - Purpose for this Groundwater Management Plan

The purpose of this Plan is to implement effective groundwater management that works toward maintaining a high quality and dependable water resource for the water users and landowners within the Plan Area, while minimizing negative impacts to other affected parties. The Plan documents the existing groundwater management efforts in the Plan Area that have been successful. The Plan also develops a coordinated and comprehensive approach to the future evaluation and management of groundwater resources within the Plan Area, in concert with other groundwater management activities within the groundwater basin. The Plan integrates past and present effective groundwater management activities with proposed activities to meet the following objectives:

1. Increase awareness of groundwater management efforts being performed by other local parties.
2. Provide benefits of cost savings for preparation, opportunities for regional funding and grant programs, inclusion of smaller local agencies, and the development of more cooperative groundwater efforts.
3. Allow smaller agencies to participate that otherwise would not have been able to fund the preparation of a GMP.
4. Include participants with overlapping boundaries.

1.4 - Previous Plans

Three participants to this Plan have previously adopted Groundwater Management Plans. FID adopted a Groundwater Management Plan in 1995, and the City of Clovis and the County of Fresno each adopted plans in 1997. This Plan supercedes the existing plans for FID and the City of Clovis, as their service areas are included within the Plan boundary. This Plan boundary only covers a portion of the County of Fresno, so at the time of this Plan's adoption, the County's existing plan will still apply to the area outside of this Plan's boundary. Elements from each of the previously adopted plans have been incorporated into this regional plan.

The participants in this Plan also recognize that many of the components of this Plan were previously identified in the Water Resources Management Plan for Fresno-Clovis Urban and Northeast Fresno County prepared by the County of Fresno in 1986 (herein called the 1986 Plan). The 1986 Plan followed the Interim Best Management Plan for Water Quality, Fresno-Clovis Urban and Northeast Fresno County. The 1986 Plan included detailed descriptions of the groundwater quality and quantity conditions within the area, described the water purveyors within the region, and included five of the same participants to this Plan: County of Fresno, City of Fresno, City of Clovis, Fresno Irrigation District, and Fresno Metropolitan Flood Control District. Other water purveyors within the area were described in the Plan, but not included as participants for

implementation. The plan area of the 1986 Plan was smaller than the area described in this Plan. The 1986 Plan includes surface water related objectives that are included in this Plan. Many of the activities of the 1986 Plan are still viable and have become a part of on-going operations for the five agencies involved. However, the committees formed to implement the activities proposed in the 1986 Plan have not actively met for many years, and there is a need to review and update the groundwater related activities described in that plan. This Plan is intended to be a continuation of the groundwater related objectives of the 1986 Plan, which included:

1. Preserve and enhance the existing quality of the area's groundwater.
2. Preserve untreated groundwater as the primary source of domestic water.
3. Maximize the available water supply, including conjunctive use of surface water and groundwater.
4. Conserve the water resource for long-term beneficial use and assure an adequate supply for the future.
5. Manage water resources to the extent necessary to ensure reasonable, beneficial, and continued use of the resource.

1.5 - Statutory Authority for Groundwater Management

The California legislature recognized that local groundwater management is preferable to State or Federal groundwater controls, and passed Assembly Bill 255 (AB 255) in 1989. AB 255 was the first statewide legislation allowing local water agencies to prepare and adopt groundwater management plans for their jurisdictions. California Assembly Bill No. 3030 (AB 3030), which became law on January 1, 1993, superceded AB 255, and authorized local agencies that are within groundwater basins, as defined in California Department of Water Resources (DWR) Bulletin 118, to prepare and adopt groundwater management plans. Each of the public agency participants to this Plan meets the requirements of a "local agency", as defined within Section 10752 of the Water Code.

Agencies adopting a Plan are authorized to enter into agreements with other local agencies or private parties to manage mutual groundwater supplies, including those existing in overlapping areas, as necessary to implement the Plan. Bakman Water Company has been an active participant in the development of this Plan, and has entered into the Memorandum of Understanding for its development and implementation.

1.6 - Groundwater Management Plan Components

This Plan includes the required and recommended components for a Groundwater Management Plan as identified in California Water Code Section 10753, et. seq. This Plan is also consistent with the recommended elements for a Groundwater Management Plan as identified in DWR Bulletin 118 (2003), Appendix C. Table 1-1 identifies the location within this document where each of the components is addressed.

Table 1-1 – Location of Groundwater Management Plan Components

Description	Plan Section(s)
California Water Code Mandatory Requirements (10750 *et seq.*)	
1. Documentation of public involvement	Appendix A, 1.1, 1.7
2. Groundwater basin management objectives	1.3, 4
3. Monitoring and management of groundwater elevations, groundwater quality, land subsidence and surface water	6
4. Plan to involve other agencies located in the groundwater basin	5.3
5. Monitoring protocols	6.3
6. Map of groundwater basin and agencies overlying the basin	Figure 1-1, 1-2
California Water Code Voluntary Components (10750 *et seq.*)	
7. Control of saline water intrusion	7.4
8. Identification and management of wellhead protection areas and recharge areas	7.3, 8.1
9. Regulation of the migration of contaminated groundwater	7.4, 7.5, 8.5
10. Administration of well abandonment and well destruction program	7.1
11. Mitigation of conditions of overdraft	8
12. Replenishment of groundwater extracted by water producers	8.1
13. Monitoring of groundwater levels and storage	6.1
14. Facilitating conjunctive use operations	8.4
15. Identification of well construction policies	7.2
16. Construction and operation by local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects.	7.5, 8.1, 8.2, 8.4, 8.5, 8.6
17. Development of relationships with state and federal regulatory agencies	5.2, 5.3
18. Review of land use plans and coordination with land use planning agencies	9.1
Additional Components Recommended by DWR (App. C of Bulletin 118)	
19. Advisory committee of stakeholders	1.1, 5.1
20. Description of the area to be managed under the Plan	1.2, 2, 3
21. Descriptions of actions to meet management objectives and how they will improve water reliability	4 - 9
22. Periodic groundwater reports	9.2
23. Periodic re-evaluation of Groundwater Management Plan	9.4

1.7 - Adoption of Plan

Public Notice of Intention to Modify/Prepare a Regional Groundwater Management Plan
As required by the California Water Code, a public hearing was duly noticed on July 26, 2005 and August 2, 2005 consistent with California Water Code Section 10753.2(a), and held on August 10, 2005 to discuss adoption and implementation of the regional Plan. No public comments were received at this meeting.

Resolution of Intention to Modify/Prepare a Regional Groundwater Management Plan
Each agency adopted a Resolution for Intention to Modify/Prepare the Fresno-Area Regional Groundwater Management Plan. A copy of each agency's resolution is included in Appendix A. This resolution was then published on December 20, 2005 and December 27, 2005 consistent with California Water Code Section 10753.2(a).

Public Participation in Plan Development
The public was invited to participate in the development of the updated Groundwater Management Plan through the newspaper notices and the public hearing. The draft regional plan was then prepared with input from a Technical Advisory Committee (TAC). The Technical Advisory Committee includes landowners and representatives from each party participating in the plan. In October 2005, the Technical Advisory Committee included:

- Dale Stanton, Assistant General Manager, Fresno Irrigation District
- Bill Stretch, District Engineer, Fresno Irrigation District
- Lon Martin, Water Division Manager, City of Fresno
- Brock Buche, Water Division, City of Fresno
- Lisa Koehn, Assistant Utilities Director, City of Clovis
- Alan Weaver, Public Works Director, County of Fresno
- Phil Desatoff, Geologist, County of Fresno
- Jerry Lakeman, Fresno Metropolitan Flood Control District
- Alan Jacobsen, Public Works Director, City of Kerman
- Tim Bakman, Bakman Water Company
- Russ Holcomb, General Manager, Malaga County Water District
- John Garcia, General Manager, Pinedale County Water District
- Richard Carstens, Landowner
- Chris Palmer, Landowner

Following the public hearing regarding the intent to prepare and adopt the Plan, the Garfield Water District (Garfield) expressed an interest in participating in the Plan. The TAC and participants agreed to Garfield's participation. Garfield provided a Letter of Intent to Participate in the plan, and Exhibit 2 of the MOU was updated to included Garfield, as shown in Appendix C. Garfield held a public hearing on December 8, 2005 regarding intent to participate in the Plan. The meeting was publicly noticed on

November 26, 2005. Garfield's Board of Directors adopted the Resolution of Intent to Prepare and Adopt the Fresno-Area Groundwater Plan on December 8, 2005.

Public Notice of Intention to Adopt a Regional Groundwater Management Plan
As required by the California Water Code, a public hearing was duly noticed on January 10, 2006 and January 17, 2006, consistent with California Water Code Section 10753.2(a), and held on January 25, 2006 to discuss adoption and implementation of the regional Plan.

Resolution Adopting the Regional Groundwater Management Plan
Each agency adopted a Resolution for Adoption of the Fresno-Area Regional Groundwater Management Plan. A copy of each agency's resolution is included in Appendix B. A listing of the date of adoption by each agency is shown below.

Adopted by:	On:
Fresno Irrigation District	01/25/2006
City of Clovis	02/13/2006
Bakman Water Company	03/13/2006
County of Fresno	07/18/2006
City of Fresno	04/18/2006
Pinedale County Water District	09/20/2006
Fresno Metropolitan Flood Control District	02/08/2006
City of Kerman	03/01/2006
Malaga County Water District	02/14/2006
Garfield Water District	11/01/2006

Public Notice of Resolutions Adopting the Regional Groundwater Management Plan
Notice of the resolutions adopting the Fresno-Area Regional Groundwater management Plan was published on November 24, 2006 and December 1, 2006 consistent with California Water Code Section 10753.2(a).

2 - PARTICIPANT INFORMATION

Nine public agencies and one private water company in the Fresno-Clovis metropolitan and surrounding area have collaborated to develop this Plan. The Plan Area covers 455 square miles and is located entirely within Fresno County. The total population in the Plan Area in 2000 was approximately 600,000, according to recent census data. Refer to Figure 1-2 for a map showing the Plan Area boundary and the location of each participant. Table 2-1 summarizes the background information on each of the Plan participants. Figure 2-1 shows the major surface water facilities in the Plan Area, including canals, pipelines, streams, and flood control basins. Following is a brief description of each participant including information regarding the history, demographics, water supply, water quality, and facilities of each.

2.1 - Fresno Irrigation District

The Fresno Irrigation District (FID or District) is a public irrigation district formed pursuant to the California Irrigation District Law (Division 11 of the California Water Code). The District was formed in 1920 as the successor to the privately owned Fresno Canal and Land Company. The District is a local agency responsible for delivery of surface water to lands within the District, and management of groundwater in accordance with this adopted Groundwater Management Plan.

FID is located in the geographical center of Fresno County and extends from the San Joaquin River in the north, south to near the City of Fowler, and roughly from the Friant-Kern Canal to about five miles west of the City of Kerman, as shown in Figure 1-2. The District service area is approximately 245,000 acres (about 380 square miles) and includes the Fresno/Clovis metropolitan area near its center. The District now operates approximately 680 miles of canals and pipelines. Water delivery is provided to approximately 190,000 acres, although this number has been decreasing in recent years as a result of urban expansion.

Potable water is used within the District boundary for municipal, industrial and agricultural purposes. The District delivers approximately 500,000 acre-feet (average annual) of water from the Kings River and Central Valley Project water through the Friant-Kern Canal. Most of this water is delivered to agriculture, although an increasing share of the District's water supply is used for groundwater recharge in the urban area. In 2004, FID began delivery of surface water to surface water treatment facilities operated by the City of Fresno and the City of Clovis. In addition to surface water deliveries, a significant amount of groundwater pumping occurs in the District to meet urban and agricultural demands.

The agricultural lands in the District remain predominantly permanent crops, however the rapid growth of urban development is changing the land use in the Fresno/Clovis

metropolitan area. About 150,000 acres (or 60%) of the District remains as farmed agricultural land. Vineyards make up the largest category of farmland at nearly 30% of the total District acreage. Almonds and citrus are other significant categories. Nearly 30% of the District is now urban, with the remaining 10% of land area classified as rural residential.

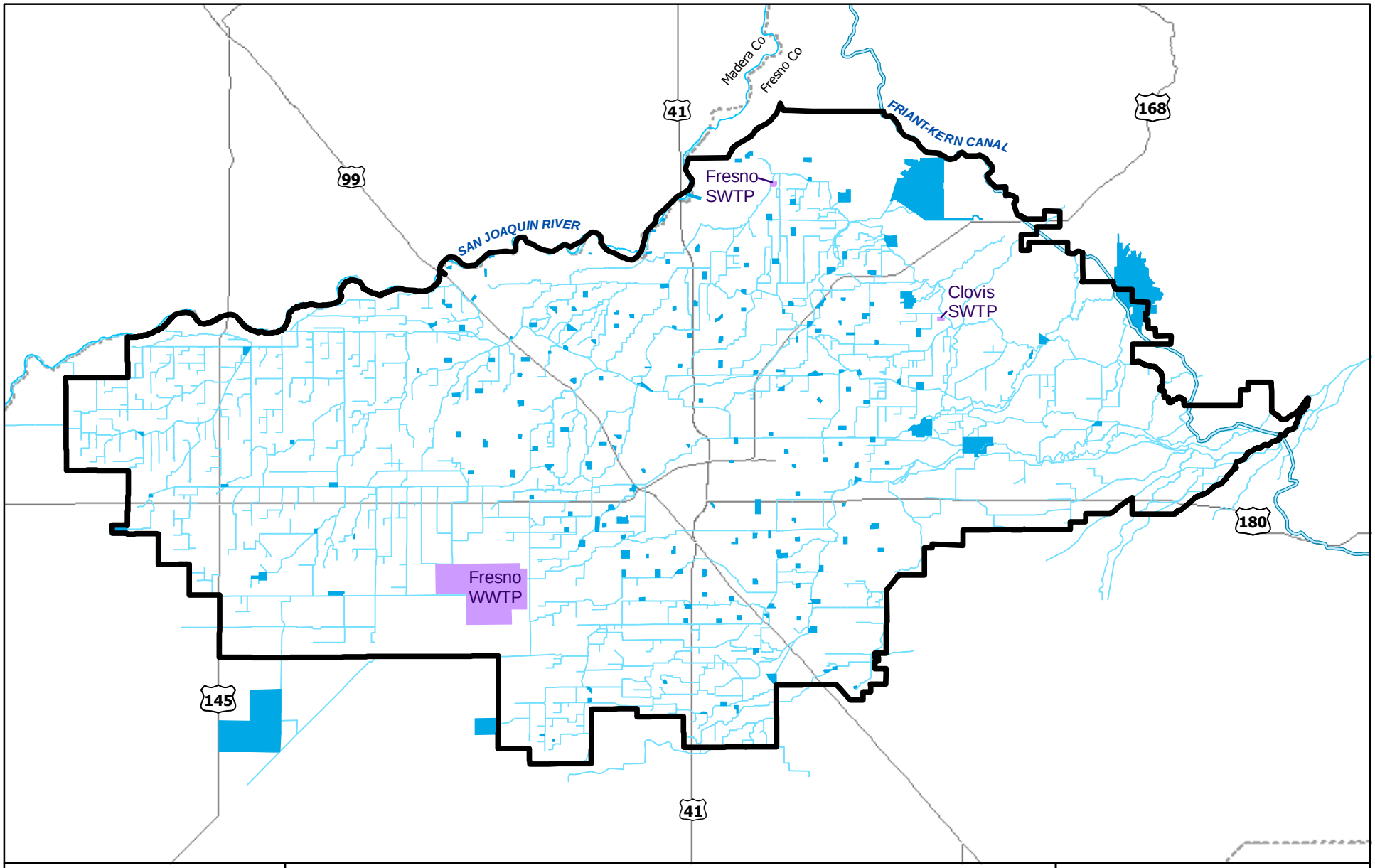
2.2 - Fresno County

Fresno County was established in 1856 and covers 6,016 square miles extending from the Sierra Nevada mountains to the west side of the San Joaquin Valley. The County population was 824,000 in 2000. The area covered in this Plan (455 square miles) lies entirely within Fresno County. Hence, only a portion of Fresno County is addressed in this Plan, although it is generally the most densely populated area in the County.

Fresno County supplies potable water to communities in the Plan Area through six Community Service Areas (CSAs) and one Waterworks District (WWD). The CSAs and WWD have 14 active wells; one of the CSAs is connected to the City of Fresno water system. County staff monitors groundwater levels and groundwater quality in cooperation with CSA and WWD staff. In rural areas, water is supplied from private domestic wells and sewerage is handled almost exclusively with septic systems. Constituents of concern in Fresno County include nitrates, DBCP, radionuclides, and EDB.

Along the eastern border of the Plan Area, groundwater is limited to fractured zones deep within the underlying bedrock. Locating sustainable groundwater supplies in these areas has been problematic in recent years.

Though dated, significant information on the groundwater in Fresno County can be found in the *Water Resources Management Plan for Fresno-Clovis Urban and Northeast Fresno County*, prepared in 1986 by Fresno County.



0 1 2 3 4 Miles

N

EST. 1968
PROVOST & PRITCHARD
ENGINEERING GROUP
An Employee Owned Company
286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

Wastewater Treatment Plant
GWMP BOUNDARY
FMFCD Basins and FID Ponds
Water Facilities (Canals, Pipelins and Streams)

Figure 2-1

Surface Water Facilities

Fresno-Area Regional
Groundwater Management Plan

December, 2006 \\huntington\gis\Clients\FresnoID_1038\10380505\GMP_Facilities.mxd

2.3 - City of Fresno

The City of Fresno was founded in 1885 and had a population in 2003 of 457,000. The total area of the City is 102.5 square miles, but the City only serves water to 87.2 square miles. The City of Fresno serves customers located within the city limits, as well as in some unincorporated areas (county islands). The City of Fresno has and continues to be one of the fastest growing cities in California.

The City of Fresno supplies water to residential, commercial, industrial and landscape irrigation customers. The City does not provide water for any agricultural purposes. In 2005, the City had 120,399 connections, and 14% of the connections were measured. Since water is metered for all of the large water users, 33% of total water deliveries are measured.

The City of Fresno's primary source of water is groundwater from the Fresno Sole Source Aquifer, a large underground aquifer. The City of Fresno's domestic water system is somewhat unique for a water system of its size. Prior to beginning a new 30 million gallons per day (MGD) surface water treatment plant (SWTP) in 2004, the Fresno water system was one of the largest water systems in the United States relying solely on pumped groundwater as its only source of potable water. The total water pumped from Fresno's 250 wells exceeded 54 billion gallons (166,000 AF) in 2003.

The City of Fresno also has two surface water supplies: 60,000 AF of CVP water from the Friant system (San Joaquin River) and more than 100,000 AF (average annual) from the Kings River through a contract with FID. Since the mid-1960's surface water from these rivers has been imported to the City of Fresno via FID canals and placed into groundwater recharge basins. In cooperation with FID and FMFCD, the City of Fresno currently diverts more than 40,000 acre-feet of surface water per year to more than 70 basins throughout the Plan Area for the purposes of groundwater recharge. More than 40,000 AF was recharged during the 2005 irrigation season. Surface water is now also conveyed to the City's new SWTP located in northeast Fresno.

The City of Fresno measures water levels on a quarterly basis and performs water quality testing according to Department of Health Service (DHS) requirements. Eight major contaminant plumes are present in Fresno, and they are being addressed by the responsible parties through assessment and remediation, and some are in advanced stages of mitigation. The inorganic plume contaminants include chloride, nitrate, arsenic, and chromium. Organic plume contaminants include petroleum hydrocarbons and methyl tertiary-butyl ether (MTBE), chlorinated volatile organic chemicals (VOCs), Dibromo-Chloropropane (DBCP) and other pesticides, and trichloropropane (TCP). The City currently has 32 active municipal wells that are treated for DBCP or TCE.

For more information on groundwater in the City of Fresno refer to the City of Fresno Water Conservation Plan (2005), the Fresno Metropolitan Water Resources Management Plan (1992), and the Fresno Municipal Code, Chapter 14, Water Regulations.

2.4 - City of Clovis

The City of Clovis (Clovis) is located in eastern Fresno County, just east of the City of Fresno. Clovis was incorporated in 1912 and now covers an area of 19.76 square miles. The population of Clovis in 2005 was 86,215. Clovis also delivers domestic water to the unincorporated area known as Tarpey Village, which in 2005 has a population of 3,957.

In 2004, groundwater pumping in Clovis was about 7,500 MG (23,000 AF). Clovis has 36 active wells; other wells have been abandoned due to low yields, sanding, or contamination problems. Some wells have facilities for granulated activated carbon (GAC) treatment. Clovis monitors groundwater quality according to DHS requirements, and monitors groundwater levels semi-annually.

Clovis lies on the eastern side of a large cone of depression that underlies the Fresno-Clovis Metropolitan area. In 1997, groundwater overdraft was estimated to be 2,500 AF/year. This amount has increased due to rapid urban growth and a corresponding increase in groundwater demand. Clovis performs intentional groundwater recharge using Kings River water derived from entitlements through FID. The annual surface water entitlement for Clovis currently is over 20,000 AF in an average year. Recharge is performed in single purpose recharge basins owned by Clovis, dual-purpose storm drainage basins owned by the Fresno Metropolitan Flood Control District (FMFCD), and local channels including Dry Creek, Redbank Creek, and Dog Creek. More than 9,000 acre-feet of surface water is currently recharged annually.

In 2004, Clovis also constructed and placed into operation a 15 MGD capacity surface water treatment plant. The plant is providing treated surface water to the easterly portion of Clovis. Clovis, in cooperation with FID, also has areas where surface water from FID's canal system is directly delivered to areas of large landscaping such as cemeteries, schools and parks.

For additional information on the groundwater resources in Clovis refer to the following reports prepared by Provost and Pritchard Engineering Group: *City of Clovis Groundwater Recharge Investigation Report* (1997) and *Groundwater Monitoring and Recharge Investigation Project* (2003).

2.5 - City of Kerman

The City of Kerman (Kerman) is located in central Fresno County, near the western edge of the Plan Area. Kerman was incorporated in 1946 and had a population of 11,500 in 2004. Kerman occupies 2.5 square miles and the surrounding area is predominantly an agricultural community.

Kerman serves urban water to residential (2,104), commercial (307) and industrial (7) connections. All of Kerman's water supplies come from locally pumped groundwater and the City does not have the water rights for any surface supplies. In 2004, Kerman pumped a total of 988 million gallons (3,030 AF) of groundwater. Kerman has four active wells and one well on standby. The construction of two new wells is planned for 2006. Planned improvements will be capable of meeting projected water demands through 2011. Kerman is also developing a groundwater recharge partnership with FID. The program would place combination flood control/recharge basins close to FID conveyance facilities.

Groundwater is available to Kerman from a deep aquifer, beneath the Corcoran Clay, and a shallow aquifer above the Corcoran Clay. The shallow aquifer sometimes has high levels of uranium. Kerman is experiencing accelerated urban growth and expects new developments to rapidly increase water demands. As a result, Kerman is investigating surface water supplies, or the use of water from the shallow aquifer for landscaping, as alternatives for meeting the growing demand.

For more information on Kerman's water supplies and facilities refer to the *City of Kerman Capital Improvement Plan* prepared by Yamabe and Horn in 2004.

2.6 - Malaga County Water District

Malaga County Water District (Malaga or District) is a water and wastewater utility district covering 2.3 square miles just south of the City of Fresno. Malaga began delivering water in 1965 and now serves a residential population of about 1,300 from 224 residential connections and 220 industrial/commercial connections. Residential development in Malaga is nearly complete; existing zoning and readily available land allow for continued commercial and industrial development. All new industrial and commercial enterprises will be required to connect to the District water system.

Since 1982 the demand for water has generally been increasing. Malaga depends entirely upon groundwater to meets its water needs, and, in 2003, District wells supplied 602 million gallons (1,848 AF). However, there is no pumping data available for the many private wells in the area. Malaga is currently in discussions with neighboring agencies to participate in groundwater recharge projects to replenish the groundwater supplies.

Malaga has three active wells and two that have been removed from service due to a variety of contamination problems, including nitrates and DBCP's. Malaga also operates a wastewater treatment plant (WWTP) with a capacity of 1.2 MGD. Effluent from the WWTP is delivered to percolation ponds. If necessary, tertiary treated overflow is discharged into FID's Central Canal.

Additional information on Malaga's facilities, water usage, and groundwater quality can be found in the *2004 Malaga County Water District Water Supply Report* prepared by Provost and Pritchard Engineering Group.

2.7 - Pinedale County Water District

Pinedale County Water District (PCWD or Pinedale) was formed in 1954 and presently delivers water to approximately 2,400 residential and 550 commercial customers. Pinedale covers 1.7 square miles and is located in the north central portion of the Plan Area, with portions of the district in the City of Fresno and unincorporated Fresno County. Some areas in Pinedale remain undeveloped, and consequently water demands are expected to increase as the lands are occupied.

Pinedale has five active wells, but typically only needs to operate three to meet current water demands. Some other wells in Pinedale are no longer used due to TCE contamination. No treatment or chlorination is presently performed on a regular basis on any of the pumped groundwater. Pinedale monitors groundwater quality according to DHS requirements. Pinedale does not presently monitor groundwater levels.

Pinedale also collects sewage and delivers it to the Fresno sewerage system, except for an area in the northwest portion of the district where sewerage is collected by the Pinedale Public Utilities District. About 20 residential units in the eastern portion of Pinedale are still on underground septic systems.

2.8 - Fresno Metropolitan Flood Control District

The Fresno Metropolitan Flood Control District (FMFCD) was founded in 1956 to provide flood control, local storm drainage management, water conservation, and recreational services in the Fresno-Clovis Area. The district is located in the north-central portion of Fresno County between the San Joaquin and Kings Rivers. FMFCD is authorized to control storm waters within an urban area and rural foothill watersheds of approximately 400 square miles, known as the Fresno County Stream Group. About 270 square miles of the service area lies within the area covered by this Groundwater Management Plan.

The FMFCD currently has three reservoirs, five regional flood control detention basins planned, and 163 local basins constructed or in planning. The principal method of disposal of stormwater in the area is groundwater recharge at all of these basins.

FMFCD monitors water deliveries to flood control/recharge basins and tests the chemical composition of sediments that collect in basins. FMFCD does not presently monitor groundwater levels or groundwater quality.

FMFCD is the lead agency for stormwater quality management and has primary responsibility for implementing a Stormwater Quality Management Program developed jointly with the City of Clovis, City of Fresno, County of Fresno, and California State University at Fresno. FMFCD has been involved with the Nationwide Urban Runoff Program (NURP) project, in conjunction with the Environmental Protection Agency (EPA). The goal of the program was to determine the extent to which urban runoff contributes to water quality problems and evaluate various management practices.

FMFCD maintains as its first operational priority the protection of people and property from flood damage. However the FMFCD also aims to conserve water by (1) retaining storm water runoff in basins to facilitate storm water percolation; and (2) cooperating with the Cities of Fresno and Clovis to direct imported surface water entitlements to District facilities for percolation.

For more information on FMFCD refer to the *FMFCD District Services Plan* prepared in 2004.

2.9 - Bakman Water Company

Bakman Water Company (Bakman) is a privately owned utility that has provided water service to the Fresno area since 1948. Bakman delivers water to approximately 1,800 connections serving 10,000 customers. Bakman's service area covers 1,660 acres within the southeastern portion of the City of Fresno and parts of unincorporated Fresno County.

Bakman is currently negotiating a contract with FID for a surface water allotment. Bakman does not have any other contract for surface water to be treated and delivered to its customers, and therefore delivers pumped groundwater to its customers. Bakman pumped a total of 1,270 MG (3,900 AF) of water in 2003. Water is served to residential and commercial customers. Bakman currently has ten active wells, three standby wells, and three inactive wells. Numerous private wells are found in the Bakman service area. However, new developments are required to connect to the Bakman water system.

Water quality concerns in Bakman include nitrate contamination from food processing industries and DBCP. Due to these water quality concerns, three wells have been classified as "standby wells" in accordance with Department of Health Services (DHS) standards. Blending and GAC treatments are working at other wells to reduce nitrate and DBCP concentrations within Bakman's boundary. All wells are plumbed and wired to allow for emergency chlorination.

In 1991, Bakman signed an agreement with FID to fund groundwater recharge projects in FID through an annual payment. In addition, Bakman is presently pursuing groundwater recharge projects within its boundaries.

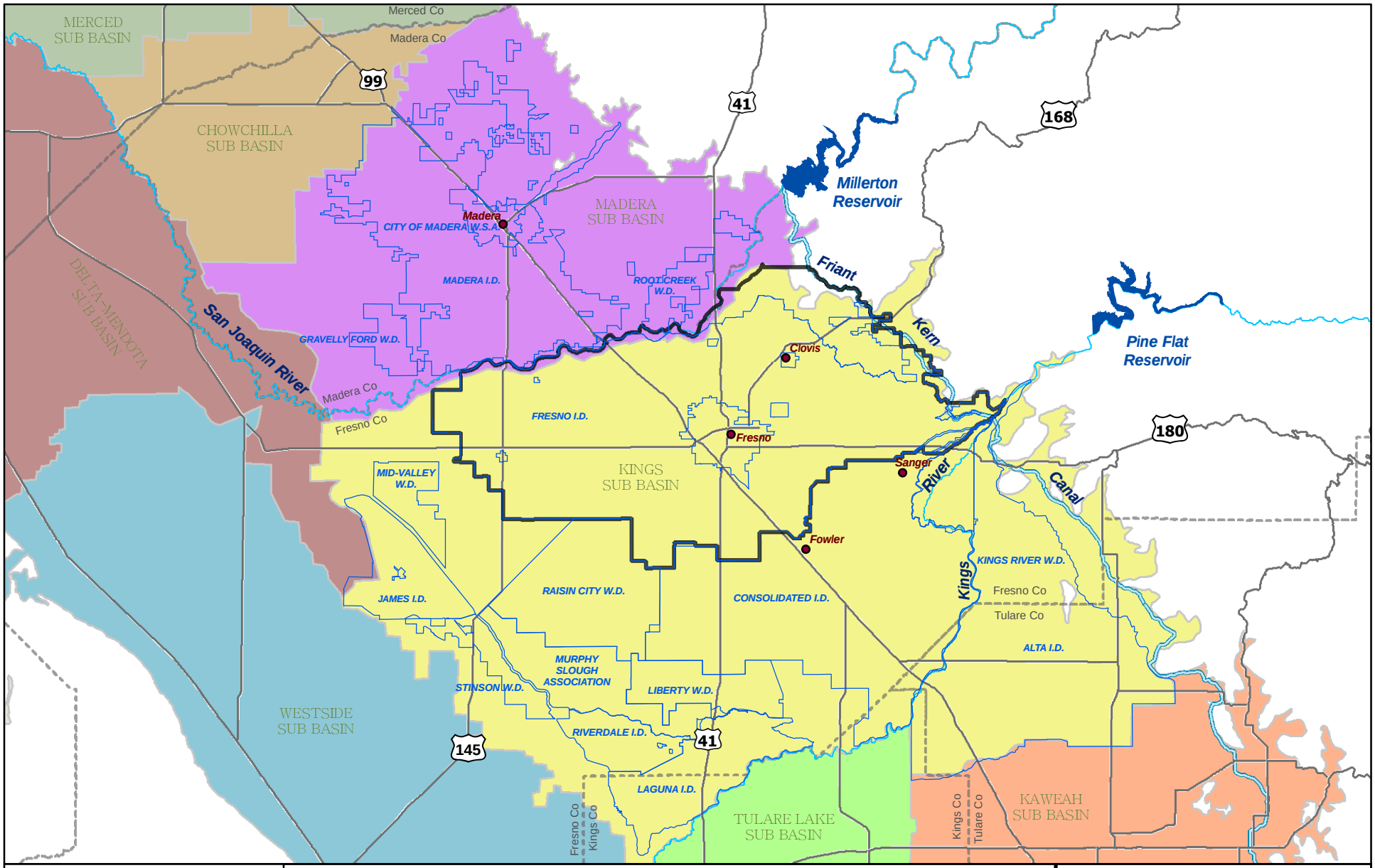
2.10 - Garfield Water District

Garfield Water District (Garfield) delivers surface water for agricultural uses to approximately 1,300 of the 1,750 acres within the District. Garfield recently entered into a Long-Term Renewal Contract with the United States for Project Water Service from the Friant Division. The contract is for 3,500 acre-feet of Class 1 water. Water deliveries to Garfield are made from a turnout on the Friant-Kern Canal, and metered delivery is made to the growers via a pipelined system. The predominant crops in Garfield are grapes, almonds, citrus, olives and stone fruits.

Garfield does not own nor operate any wells. All groundwater within Garfield is pumped from privately owned wells.

2.11 - Surrounding Area

Although not Plan participants, the neighboring water agencies shown in Figure 2-2 will be kept apprised of groundwater projects and policies that may impact them. Lands to the south and west of the Plan Area are particularly important since they are downgradient and located in the same groundwater sub-basin. Lands to the north share less hydrologic connection due to the partial hydraulic barrier created by the San Joaquin River.



0 3 6 9 12 Miles

N

EST. 1968
PROVOST & PRITCHARD
ENGINEERING GROUP
An Employee Owned Company

286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

Groundwater Sub Basins

- Kaweah
- Kings
- Madera
- Delta-Mendota
- Westside
- Chowchilla
- Merced
- Tulare Lake

GMP BOUNDARY

Water Agencies

Figure 2-2

Neighboring Agency Map

Fresno-Area Regional
Groundwater Management Plan

December, 2005 \\huntington\gis\Clients\FresnoID_1038\10380505\GMP_SurrAgencies.mxd

FRESNO-AREA REGIONAL GROUNDWATER MANAGEMENT PLAN
SUMMARY OF PARTICIPANTS

Description	Fresno Irrigation District	Fresno County	City of Fresno	City of Clovis	City of Kerman	Malaga County Water District	Pinedale County Water District	Fresno Metro. Flood Control District	Bakman Water Company
Address	2907 South Maple, Fresno, CA, 93725	2220 Tulare St, 7th Floor, Fresno, CA 93721	1910 East University Ave., Fresno, CA 93703-2988	155 N. Sunnyside Ave. Clovis, CA 93611	850 S. Madera, Kerman, CA 93630	3580 S. Frank St., Fresno, CA 93725	480 W. Birch Avenue, Pinedale, CA 93650	5469 E. Olive Avenue, Fresno, CA 93727	PO Box 7965, Fresno, CA, 93747
Website	www.fresnoirrigation .com	www.co.fresno.ca.us	www.ci.fresno.ca.us	www.ci.clovis.ca.us	-	-	-	www.fresnofloodcontrol .org	www.bakmanwater.com
Gross Area (square miles)	387	6,016 (455 within Plan area)	103	19.8	2.5	2.3	1.7	400 (__ within Plan area)	2.4
Formation Date	1920	1856	1885	1912	1946	1965	1954	1956	1948
Population Served (1)			466,200	90,000	11,500	1,300			10,000
Water Users	Agriculture, Urban	Urban	Urban	Urban	Urban	Urban	Urban	Urban	Urban
Production Wells (2)	0	14	250	36	4	3	5	0	11
Groundwater Pumping - Volume (year)	0		54,000 MG (2003)	7,500 MG (2004)	990 MG (2004)	600 MG (2003)		None	1,270 MG (2003)
Primary Constituents of Concern		Nitrates, DBCP, radionuclides, EDB	Nitrate, arsenic, petro hydrocarbons, VOCs, DBCP, TCP	DBCP, nitrates, TCP	Uranium	Nitrate, DBCP	TCE	Various urban runoff contaminants	Nitrate, DBCP
Groundwater Level Monitoring Program	Y	Y	Y	Y	Y	Y	N	N	Y
Groundwater Quality Monitoring Program	N	Y	Y	Y	Y	Y	Y	Y (monitors storm water quality)	Y

(1) The 'Population Served' is the approximate population that the agency shown is provided.

(2) Only includes active wells owned and operated by the participant. Does not include private wells in the participant's area.

3 - GEOLOGY AND HYDROGEOLOGY OF THE FRESNO AREA

This section provides a brief summary of the geology, hydrogeology, and groundwater conditions in the Plan Area. For additional details refer to the reports listed in Section 10 - References.

3.1 - Geology

The largest geomorphic features in the Plan Area are two high fans deposited by the San Joaquin River and Kings River. A compound alluvial fan of intermittent streams between the two rivers also extends southwesterly from the northeast portion of the Plan Area. Unconsolidated alluvial deposits comprised of layers of cobbles, gravel, sand, silt and clay comprise the aquifer. Highly permeable, course-grained deposits of the ancestral San Joaquin and Kings Rivers underlie most of the area. These deposits comprise Quaternary age alluvium and the underlying Quaternary-Tertiary Continental deposits. These deposits are present above a depth of 350 to 400 feet below land surface and are tapped by most large-capacity wells in the area.
The Tertiary-Quaternary age continental deposits are composed mainly of the fine-grained sands, silts, and clays with some lenses of coarse-grained deposits. The thickness ranges from a feather edge in the east to more than 1,300 feet in the west. These deposits generally yield less groundwater to wells compared to the overlying more permeable deposits.

3.2 - Hydrogeologic Characteristics

Groundwater Basin
The Plan Area lies within the Kings Groundwater Sub-basin, which is located within the San Joaquin Basin Hydrologic Study Area (HSA). The Kings Sub-basin is also identified as sub-basin 5-22.08 of the Tulare Lake Hydrologic Region in the DWR Bulletin 118 updated in 2003. The Kings Sub-basin extends from the Sierra Nevada foothills on the east to the San Joaquin Valley trough on the west, and from the San Joaquin River on the north to roughly the Fresno County line on the south. Refer to Figure 1-1 for the location of each participant in relation to the Kings Sub-basin. The Kings sub-basin has been identified as critically overdrafted, as identified in DWR Bulletin 118-80.

Aquifer Characteristics
Most of the aquifer underlying the Plan Area is generally unconfined but may be semi-confined in some locations due to localized, fine-grained, low permeability layers. For much of the Plan Area there are no extensive low permeability units to isolate deep aquifers from shallow aquifers. At the west edge of the Plan Area, near the City of Kerman, there is an area underlain by the Corcoran Clay.

Groundwater Levels

Groundwater levels in the Plan Area range from about 10 feet to 400 feet below the ground surface. A large cone of depression under the Fresno/Clovis metropolitan area has developed. Figure 3-1 is a chart illustrating the decline in average water level in the Plan Area in recent years. Figure 3-2 shows hydrographs of selected wells within the Plan Area, showing the decline in groundwater levels for wells in the Fresno/Clovis metropolitan area since the 1950's. There is also a mound that has formed in the area of the Fresno-Clovis Regional Wastewater Treatment Facility located south and west of the City of Fresno.

Groundwater Movement

Historically, groundwater moved from northeast to southwest. More recently, the heavy municipal and agricultural pumping in the area has influenced the natural groundwater flow. The pumping cone of depression has caused the southwesterly flows to decrease and flows are generally deflected into the urban area. Figure 3-3 shows recent groundwater levels within the Plan Area.

Transmissivity

The ability of an aquifer to transmit groundwater is measured by its transmissivity. Transmissivity is defined as the quantity of groundwater that would move through a one-foot-wide section of the total thickness of the aquifer under a unit hydraulic gradient. Transmissivity in the Plan Area is spatially distributed with the highest transmissivity in the northwest. Well yields are higher in the northwestern and southwestern portions of the Plan Area. The well yields in the northeast are limited because a thinner aquifer is present above bedrock.

Specific Yield

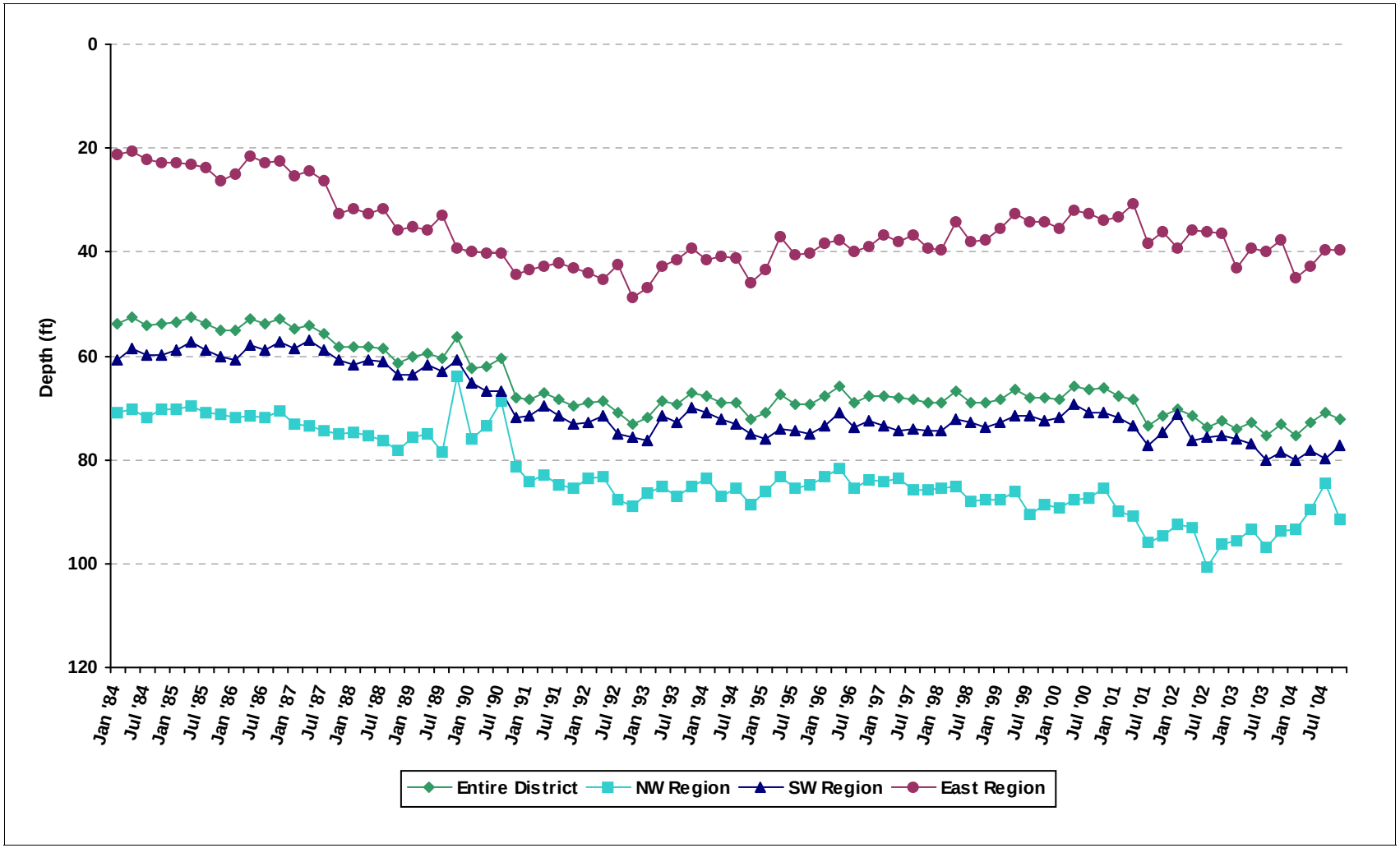
The ability of an aquifer to store groundwater is measured by its specific yield. Specific yield is defined as the quantity of groundwater that could be extracted from a unit volume of aquifer per unit decline in water level. The specific yield of an aquifer is important for evaluating the response of an aquifer to pumping. For example, if the specific yield is known, analysis of well hydrographs can be used to monitor the quantity of groundwater in storage in the reservoir. Estimates of specific yield of the older alluvium range from 0.15 to 0.20. Average values for the underlying continental deposits are estimated to range from 0.07 to 0.12.

Groundwater Development

The most favorable subsurface geologic conditions for the future development of groundwater are in the northwest Fresno area. Subsurface geologic conditions limit groundwater development in the northeast because of shallow bedrock north and northeast of Clovis and the predominance of fine-grained deposits at depth beneath these areas.

Fresno Irrigation District Regional Quarterly Weighted Average Depth To Groundwater

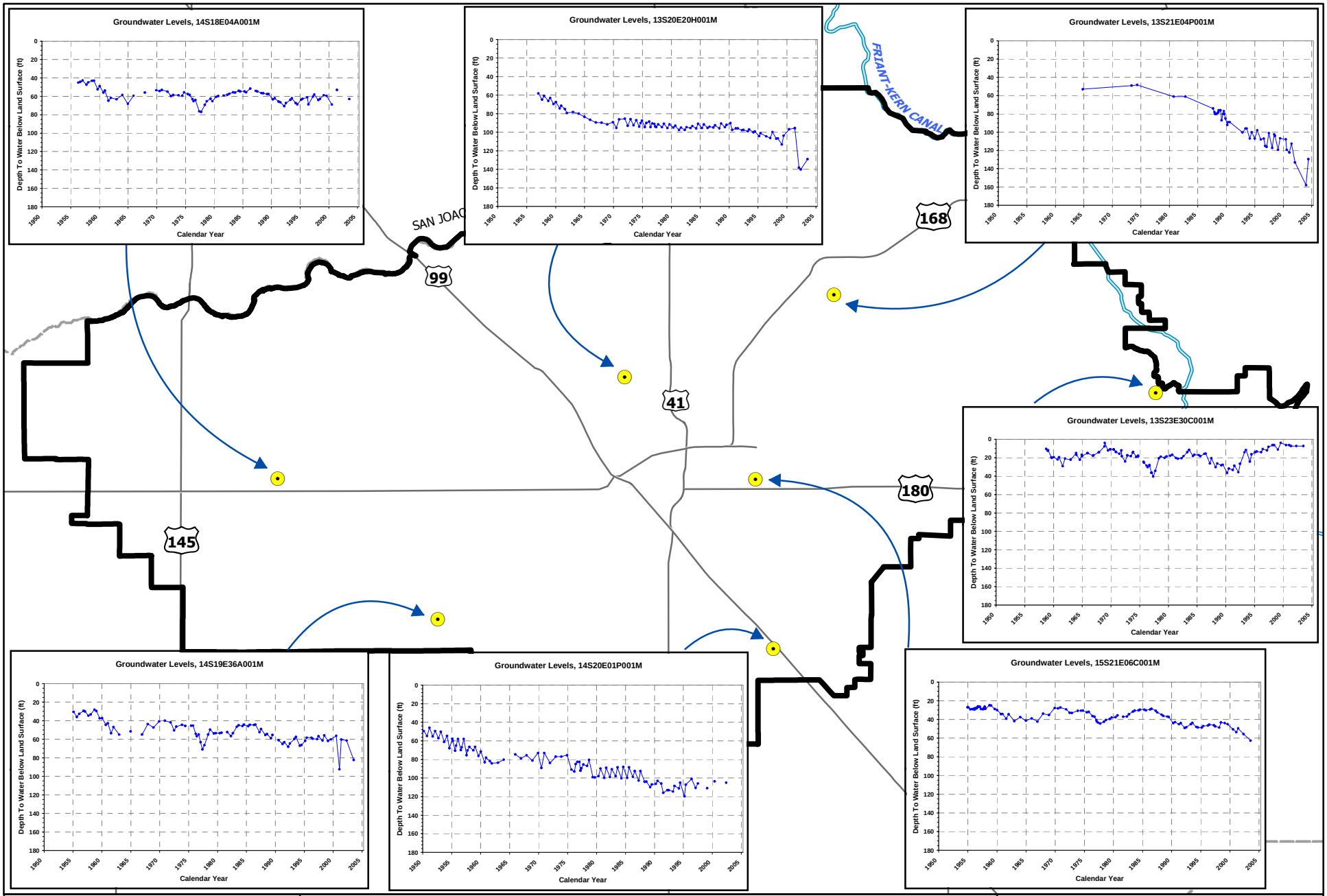
1/1/1984 To 10/1/2004



Printed On: 11/11/2005

*NW Region is north of Belmont Ave, west of Fowler Ave
*SW Region is south of Belmont Ave, west of Fowler Ave
*East Region is east of Fowler Ave

Figure 3-1



0 1 2 3 4 Miles

N

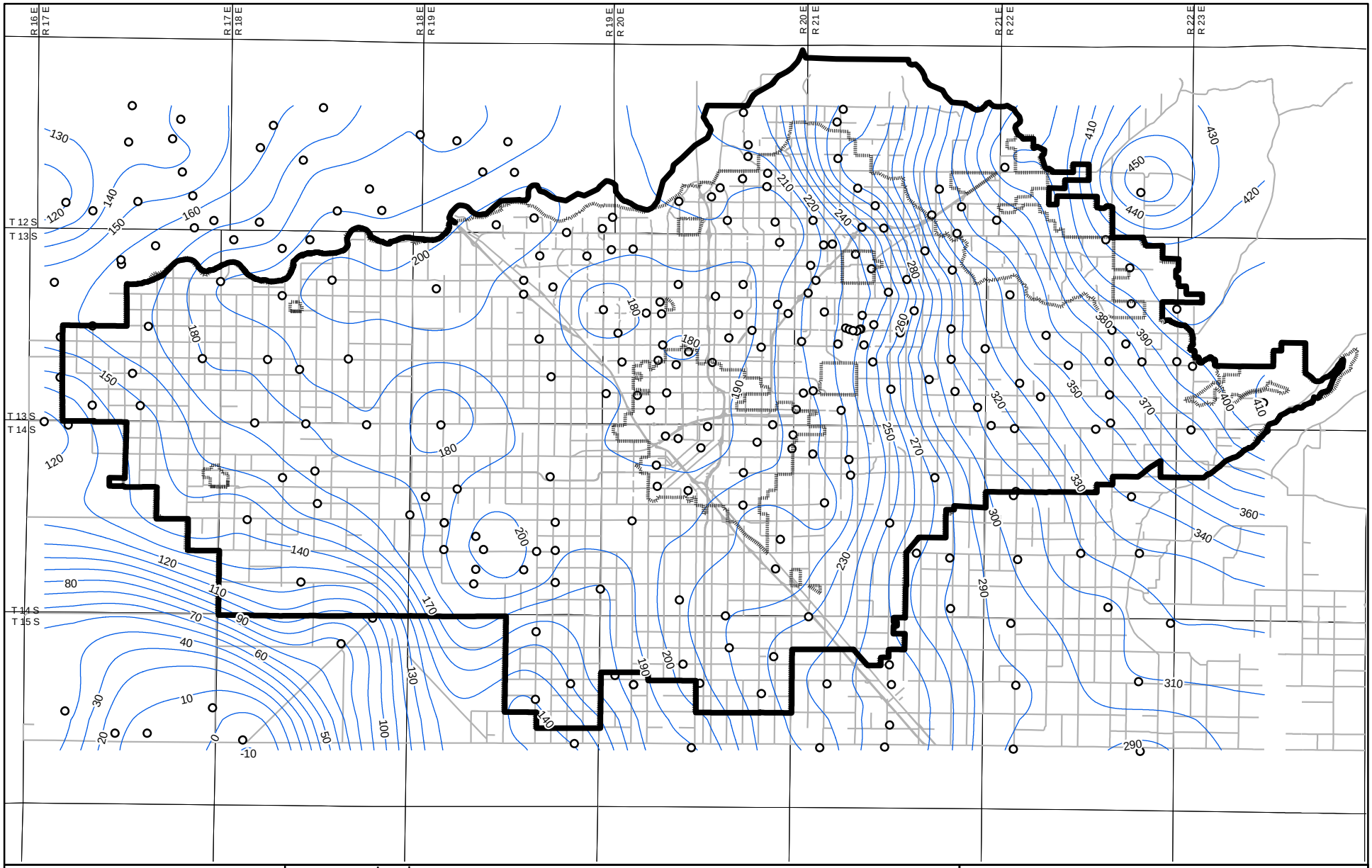
EST. 1968
PROVOST & PRITCHARD
ENGINEERING GROUP
An Employee Owned Company
286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

GMP BOUNDARY
FRIANT-KERN CANAL

Figure 3-2

Well Hydrographs

Fresno-Area Regional
Groundwater Management Plan



0 1 2 3 4 Miles

EST. 1968
PROVOST & PRITCHARD
ENGINEERING GROUP
An Employee Owned Company

286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

Legend

- WSE (contours 10ft)
- Fresno ID Boundary
- Major Streets
- T / R
- Wells (Jan2005)
- GMP BOUNDARY

January 2005 Water Surface Elevation
10 Foot Lines of Equal Elevation

Figure 3-3

FID Annual Groundwater Report
Water Surface Elevation Contours

Fresno-Area Regional
Groundwater Management Plan

Intentional Recharge

Subsurface geologic conditions are favorable for intentional recharge basins beneath the much of the Plan Area. Conditions are less favorable beneath part of the northeast portions of the Plan Area because of the restricting layers above the water table.

Substantial operational information on average infiltration rates is available from stormwater management basins managed by the Fresno Metropolitan Flood Control District. Typical infiltration rates range from about one-third to one-half foot per day. Much of this water is observed to move laterally in highly permeable deposits.

3.3 - Groundwater Conditions within the Plan Area

A combination of surface water supplies and groundwater pumping are used to satisfy the water demands of the area. In agricultural areas, the difference between surface deliveries and the agricultural crop requirements is met by supplemental groundwater pumping almost exclusively by private individual landowners. For many years, all municipal and industrial demands were met entirely from groundwater pumping. However, both the City of Clovis and City of Fresno have recently begun operation of surface water treatment plants.

The Plan participants have long recognized the importance of preserving and maximizing groundwater supplies within its boundaries. Some participants have actively facilitated groundwater recharge and groundwater banking, and have engaged in indirect or "in lieu' recharge programs by delivering surplus surface water whenever possible to minimize groundwater extractions.

Water level measurements taken within the Plan Area show a continued downward trend in the groundwater elevations.

Some areas within the Plan Area's service area suffer from groundwater quality degradation, particularly where the groundwater is used as a potable water supply. Some areas have identified "plumes" of contamination resulting from discharges of industrial or agricultural contaminants, and in some instances groundwater quality has been degraded to below that required by applicable regulatory standards. While most groundwater within the Plan Area is still of acceptable quality, these contamination plumes could spread if not properly managed and controlled.

3.4 - Historic Groundwater Monitoring Programs

Several groundwater studies of the Plan Area have been performed since 1930. These studies are conveniently summarized in the *Water Resources Management Plan for Fresno-Clovis Urban and Northeast Fresno County* (1986) prepared in a cooperative effort by the County of Fresno, the Cities of Clovis and Fresno, the Fresno Irrigation

District, and the Fresno Metropolitan Flood Control District. Most of these studies focused on water quality with the remainder focusing on groundwater levels and storage. Geologic and hydrogeologic information for the Plan Area is described in the U.S.G.S. Open File Report, *Geology, Hydrogeology & Water Quality in the Fresno Area, California (*Page & LeBlanc, 1969).

Groundwater Levels

A groundwater-level monitoring program was developed when FID was formed in 1920. The program included monthly and quarterly measurement of wells within FID. As more farmers installed wells, FID began to use additional wells for measuring water levels. The water level measurement program has been maintained since 1920 and covers the vast majority of the Plan Area. FID began to store and organize water level data in a database in 1995, and has prepared annual Groundwater Reports for many years.

In the early 1970's the DWR completed a study of the aquifer underlying FID to determine the specific yields and available storage in the aquifer by township and range. FID has incorporated this information into its quarterly groundwater reports so that changes in storage are calculated.

Groundwater Quality

Extensive groundwater-quality testing has been performed by various agencies in the Plan Area. Since the 1960's, testing for general chemical, trace mineral, and inorganic substances has been routinely performed on a large number of the community wells located in the Fresno/Clovis metropolitan area.

The available water quality data is voluminous and therefore is not presented in this Plan. The reader is referred to specific Plan participants if they seek water quality data.

In the *Water Resources Management Plan for Fresno-Clovis Urban and Northeast Fresno County* (1986) water quality was evaluated through research and assimilation of all available data, and the collection and analyses of water samples where additional data was needed. Documentary evidence of water quality held by the California Department of Health Services (DHS), Regional Water Quality Control Board (RWQCB), Department of Water Resources (DWR), Fresno County Health Departments Environmental Health System (EHS), and other agencies and municipalities were examined along with a historical review of pertinent literature. In addition, data developed from water quality hydrographs were grouped and evaluated in the report. Since 1986, a vast quantity of additional water quality data has been collected by the aforementioned agencies and the Plan participants.

Land Subsidence and Groundwater Impacts on Surface Water Flow and Quality

The Plan participants have not historically monitored land subsidence and groundwater impacts on surface water flow and quality. Refer to sections 6.4 and 6.5 for more information on these topics, respectively.

4 - REGIONAL GROUNDWATER MANAGEMENT OBJECTIVES

The Plan Area is, and will continue to be, dependent on groundwater as a significant water supply source. The Plan objectives have been developed to monitor, protect and sustain groundwater within the region. These objectives of the Fresno-Area Regional Groundwater Management Plan include:

1. Preserve and enhance the existing quality of the area's groundwater.
2. Correct the overdraft and stabilize groundwater levels at the highest practical beneficial levels.
3. Preserve untreated groundwater as the primary source of domestic water.
4. Maximize the available water supply, including conjunctive use of surface water and groundwater.
5. Conserve the water resource for long-term beneficial use and to assure an adequate supply for the future.
6. Manage groundwater resources to the extent necessary to ensure reasonable, beneficial, and continued use of the resource.
7. Monitor groundwater quality and quantity to provide the requisite information for establishing groundwater policies, goals, and recommended actions.
8. Improve coordination and consistency amongst agencies responsible for the monitoring and management of groundwater in the Plan Area.

The proposed actions identified within each of the sections of this Plan are intended to help accomplish these Plan objectives.

5 - STAKEHOLDER INVOLVEMENT

5.1 - Advisory Committee of Stakeholders

The Technical Advisory Committee (TAC) was formed to guide the development and implementation of this Plan. The TAC includes landowners and representatives from each party participating in the plan. In October 2005, the TAC members include:

- Dale Stanton, Assistant General Manager, Fresno Irrigation District
- Bill Stretch, District Engineer, Fresno Irrigation District
- Lon Martin, Water Division Manager, City of Fresno
- Brock Buche, Water Division, City of Fresno
- Lisa Koehn, Assistant Public Utilities Director, City of Clovis
- Alan Weaver, Public Works Director, County of Fresno
- Phil Desatoff, Geologist, County of Fresno
- Jerry Lakeman, Fresno Metropolitan Flood Control District
- Alan Jacobsen, Public Works Director, City of Kerman
- Tim Bakman, Bakman Water Company
- Russ Holcomb, General Manager, Malaga County Water District
- John Garcia, General Manager, Pinedale County Water District
- Richard Carstens, Landowner in Fresno Irrigation District
- Chris Palmer, Landowner in Fresno Irrigation District

The TAC ensures representation from a broad spectrum of interests including public agencies, private utilities, local landowners, agricultural water purveyors, urban water purveyors, and special districts.

Planned Activities

A TAC will meet semi-annually or more frequently if deemed appropriate. The Committee will have the following responsibilities:

- Review trends in groundwater levels and groundwater quality;
- Evaluate the effectiveness of current groundwater management policies and facilities;
- Discuss the need for new groundwater management policies and procedures;
- Discuss the need for new groundwater supply/enhancement facilities;
- Evaluate the progress of on-going groundwater related projects;
- Assess the overall progress in implementing the programs outlined in the Groundwater Management Plan;
- Recommend updates or amendments to the Groundwater Management Plan;
- Identify regional and multi-party groundwater projects;
- Identify and share information on funding opportunities for groundwater projects;
- Share new ideas and methods for managing groundwater;

- Update Plan participants on the efforts of other regional groups; and
- Review and comment on the Annual Groundwater Report.

5.2 - Relationships with Other Agencies

The participants have been and continue to be involved in many programs, studies and committees that include groundwater related items in this Plan as part of their focus or charge. The Participants will continue to be involved in these efforts. A summary of some of these efforts is included here.

1986 Water Resources Management Plan

As described in the 1986 Water Resources Management Plan (1986 Plan), the Fresno Irrigation District (FID), City of Fresno (Fresno), the City of Clovis (Clovis), the County of Fresno (County), and the Fresno Metropolitan Flood Control District (FMFCD) have partnered in a cooperative effort to develop and implement a comprehensive surface and groundwater management program consistent with the Water Resources Management Plan for Fresno-Clovis Urban and Northeast Fresno County. The 1986 Plan, prepared with a grant from the Environmental Protection Agency (EPA) under Section 205j of the Clean Water Act, is a water quality and quantity project to plan for the preservation and enhancement of the area water supply.

Fresno/Clovis Area Recharge Program

The five agencies have entered into a Master Agreement for management of water quality and quantity for the area. The main thrust of the program involves using the FID's delivery system to deliver portions of the Fresno and Clovis water allocations to certain FMFCD basins for recharge during the summer when the basins are not needed to control urban storm runoff. Fresno and Clovis both own and operate significant recharge facilities to which a portion of the cities' water allocations is also delivered using the FID's system. This program also contains elements designed to protect the quality of groundwater in the area.

Integrated Storage Investigation Program

Other basin wide groundwater management efforts include a Memorandum of Understanding (MOU) with the Department of Water Resources entered into on May 24, 2001, as part of the Integrated Storage Investigation (ISI) program. The MOU between DWR, the Kings River Conservation District, Alta Irrigation District, Consolidated Irrigation District and Fresno Irrigation District, formed a cooperative effort amongst the agencies to review and investigate groundwater conjunctive use efforts on the Upper Kings Basin. During the formation of this program, the Kings Basin Advisory Panel was formed to include the basin stakeholders. The primary goal of the Basin Advisory Panel is "to stabilize groundwater in the Upper Kings Basin by halting, and ultimately reversing, the current overdraft of the groundwater aquifer."

Upper Kings Water Forum

Several of the participants to this Plan are actively involved with the Upper Kings Water Forum. Specifically, the City of Fresno, City of Clovis, County of Fresno, and FID have been involved. Representatives from FID serve on the Upper Kings Forum Planning and Steering Committee. The purpose of the forum has been to develop an Integrated Regional Water Management Plan with assistance from State funding. The forum has also sought funding for construction, or implementation, projects within the region, including projects for the City of Clovis and FID. This Fresno-Area Regional Groundwater Management Plan will be incorporated into the Upper Kings Forum Integrated Regional Water Management Plan.

Water and Groundwater Associations

All of the plan participants are active in the groundwater community. Table 5-1 is a matrix illustrating the many water and groundwater related organizations that each participant belongs to. Many participants hold memberships in similar organizations, which increase opportunities for groundwater management coordination and the sharing of ideas.

Planned Activities

- Continue involvement with existing regional programs including the Fresno/Clovis Area Recharge Program, Integrated Storage Investigation Program, and Upper Kings Water Forum.
- Participate in newly formed regional groups that would complement this Plan.

5.3 - Plan to Involve the Public and Non-Participating Agencies

Water purveyors that are within the Plan boundary, but are not participating, include:

- Biola Community Service District
- Easton Community Service District
- International Water District

Each of these member agencies was invited to be a participating agency to the Plan, but could not financially participate. A copy of the draft Plan was sent directly to these agencies for review and comment. The Plan participants would welcome the participation of these and other agencies in the Plan Area, and they will have the opportunity to join the Plan in the future.

Input from neighboring agencies and interested parties was also solicited during this Plan's preparation.

Existing Activities

- Conducted public workshops regarding the Plan prior to adoption.
- Solicited input from neighboring agencies including Biola Community Service District, Easton Community Service District and International Water District.

Planned Activities

- Allow for agencies within the Plan Area to be incorporated into the Plan.
- Publish annual groundwater reports for distribution to stakeholders and interested parties. Notify the public of the availability of the annual report for their review on websites and newsletters.
- Publish information on the accomplishment of the regional group on websites and newsletters.

TABLE 5-1

FRESNO-AREA REGIONAL GROUNDWATER MANAGEMENT PLAN
MEMBERSHIPS IN WATER-RELATED ORGANIZATIONS

Organization	Fresno Irrigation District	County of Fresno	City of Fresno	City of Clovis	City of Kerman	Malaga County Water District	Pinedale County Water District	Fresno Metro. Flood Control District	Bakman Water Company
Agricultural Water Management Council	●								
American Public Works Association		●	●	●	●			●	
American Water Works Association			●	●	●				
Association of California Water Agencies	●		●			●	●	●	
Association of Metropolitan Water Agencies	●	●	●	●		●	●	●	●
California Rural Water Association					●				
California Storm Water Quality Association								●	
California Urban Water Conservation Council			●			●			
California Water Awareness Campaign			●	●	●			●	●
Central Valley Project Association			●						
Central Valley Water Awareness Committee	●	●	●	●		●		●	●
Central Valley Water Education Center	●	●	●	●					
Fresno-Area Groundwater Management Group	●	●	●	●	●	●	●	●	●
Fresno County Water Advisory Committee				●					●
Fresno/Clovis Area Recharge Program	●		●	●				●	
Kings River Water Association	●								
National Association of Flood and Stormwater Management Agencies								●	
Waldron Pond Group	●			●					
Water Education Foundation			●	●				●	●

6 - MONITORING PROGRAM

A groundwater level and quality monitoring program is a critical component for documenting and evaluating groundwater conditions within the Plan Area. There is a need for a coordinated and consistent level and quality data collection method within the Plan Area as there is not currently a complete groundwater data management system for the Plan Area. The County of Fresno has planned to develop a database management system, but insufficient funding has delayed its development. The cooperative effort through this Plan will help spread some of the financial burden to multiple agencies. The program shall include groundwater level, quality monitoring, as well as any indication of land subsidence. To ensure the integrity and consistency of the data, protocols for collecting and reporting the data are needed, and must be implemented by each agency. The proposed monitoring program is intended to:

1. Provide warning of potential future problems.
2. Use data gathered to generate information for water resources evaluation.
3. Develop meaningful long-term trends in groundwater characteristics.
4. Provide data comparable from place to place in the plan area.
5. Better characterize the quality of well water in the plan area.

6.1 - Groundwater Level Monitoring

Many of the participants routinely perform groundwater level and quality monitoring in accordance with agency standards and State regulations for water purveyors, however the frequency and method for monitoring varies by participant. FID currently collects well water level readings within most of the Plan Area, but the system only includes a few wells in some areas and has very little water quality information. FID developed a groundwater-monitoring program, when it was formed in 1920, to quantify changes in groundwater depth within the District. FID currently collects water level measurements each quarter, and also compiles water level data that is collected yearly from other agencies. Each agency's water-level measuring-program was established separately and the data are managed separately, but FID compiles all the data into a single database. Other agencies from which FID receives groundwater level data include:

- City of Fresno
- City of Clovis
- Consolidated Irrigation District
- Madera Irrigation District
- James Irrigation District
- Malaga County Water District
- California Department of Water Resources

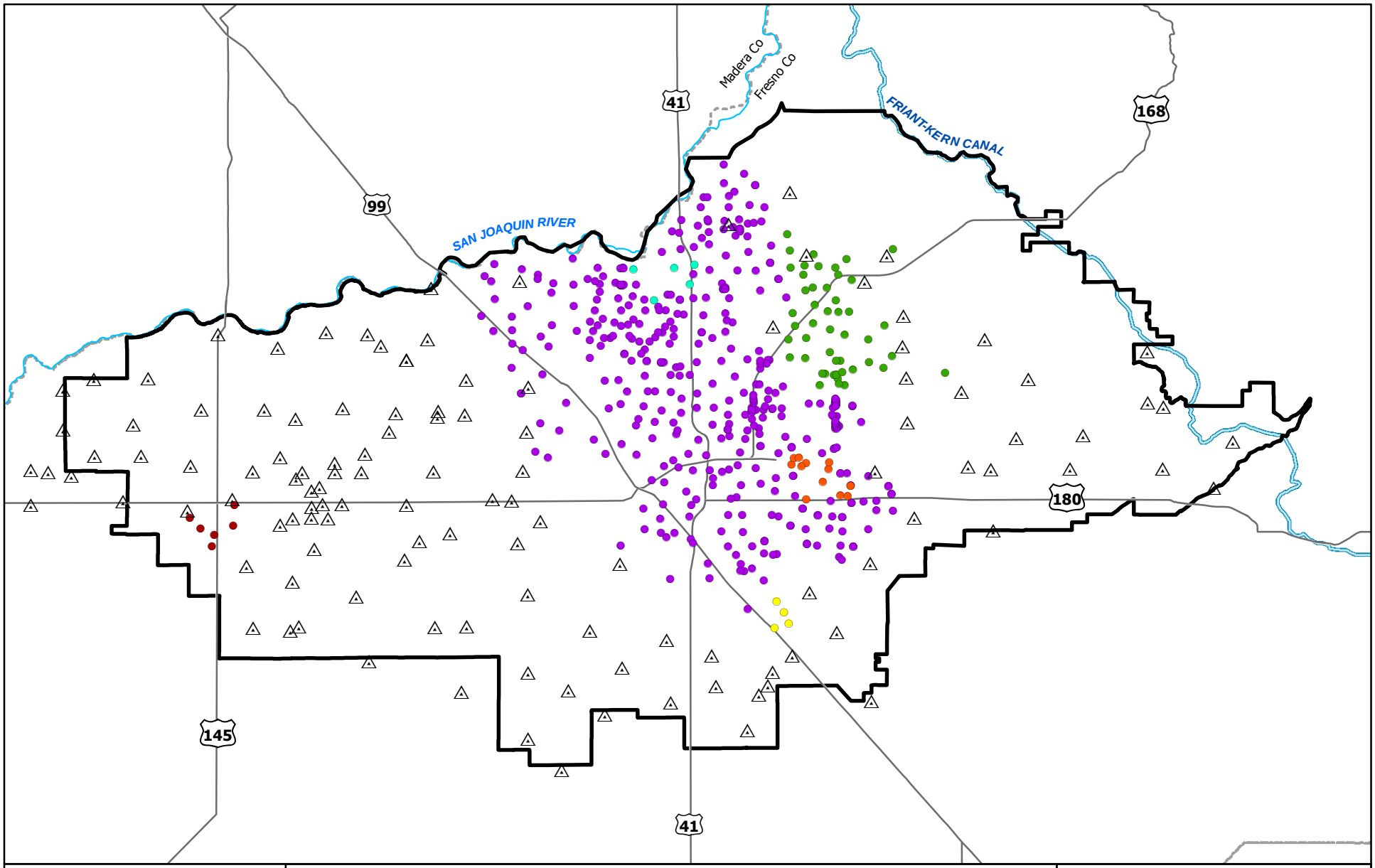
The County of Fresno no longer collects groundwater level data outside of its CSAs or WWDs. Some of the water purveyors, such as Kerman and the City of Fresno, have a water level measurement device in many wells connected to their SCADA systems. Other water purveyors such as Pinedale County Water District do not routinely record groundwater levels. FID and the City of Clovis monitor wells near their recharge facilities. The City of Fresno has several triple completion monitor wells near existing well sites that are monitored, however there are no monitor wells in or around recharge basin facilities that are used to evaluate groundwater recharge effects. A map of the domestic production and monitor wells that are frequently monitored for water level is included as Figure 6-1.

Existing Activities

- Individual monitoring by some participants with limited data sharing.
- Encourage landowners and developers to convert unused wells to monitor wells.

Planned Actions

- Develop a groundwater level monitoring program for the entire Plan Area. This will be accomplished by performing an inventory of monitoring efforts, finding gaps in the data, and adding wells to monitor in gap areas. Well driller's reports or monitored wells will be compared to identify each well's perforation depth.
- Decide on months for water level measurements to be taken so they are consistent for all parties.
- Survey the elevations for all wellheads and use a common survey datum.
- Protect wells in monitoring program from being abandoned.
- Develop Groundwater Database in accordance with 1986 Water Resources Master Plan and Fresno County Ordinance.
- Develop and use standard forms by all participants.
- Develop program for sharing data.



0 1 2 3 4 Miles

N

EST. 1968
PROVOST & PRITCHARD
ENGINEERING GROUP
An Employee Owned Company
286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

GMP BOUNDARY

Wells Monitored By Other Agencies

Wells Monitored By FID

Domestic Production Wells

- Bakman W.C.
- City of Kerman
- City of Fresno
- Malaga C.W.D.
- City of Clovis
- Pinedale C.W.D.

Figure 6-1

Domestic Production and Other Monitored Wells

Fresno-Area Regional Groundwater Management Plan

December, 2005 \\huntington\gis\Clients\FresnoID_1038\10380505\GMP_DomProdWells.mxd

6.2 - Groundwater Quality Monitoring

Groundwater within the Plan Area is generally of good quality, however there are some specific areas of concern. Primary contaminants within these areas of concern are nitrates, Dibromo-Chloropropane (DBCP), and TCE. The domestic water purveyors within the Plan Area perform routine water quality monitoring as required by the State Department of Health Services. The requirements for testing are based on the size of the community system. Additional testing is performed at individual sites for specific constituents of concern. Additional water quality testing is needed to update various plumes that have been identified within the area. In addition, there are many locations within the Plan Area where little to no water quality monitoring is performed. Outside of the boundaries of the domestic water purveyors, the County of Fresno will perform basic water quality monitoring for individual wells, however, the City of Fresno recently completed a study of nitrate in wells in the southeast portion of the Plan Area. The City of Fresno has also recently studied nitrate in wells near the Wastewater Treatment Facility.

The following contaminant plumes are found within the City of Fresno's borders:

- Purity Oil plume
- Fresno landfill
- TCE Pinedale groundwater site
- FMC plume
- Salt Plume
- THAN plume
- Old Hammer Field plume
- Weir Floway plume

Most of the groundwater contaminants in the Fresno area are being addressed by responsible parties through assessment and remediation, and some are in advanced stages of mitigation. The responsible parties of many of the point source contaminants (i.e. hydrocarbons and VOCs) are working with state (Regional Water quality Control Board, Department of Toxic Substances Control) and local (FCEHD) agencies to remediate the contaminants. Area wide contaminants are being addressed via wellhead treatment (DBCP) and plans are underway to address others, such as nitrate.

The groundwater quality beneath portions of the City of Fresno is compromised by a number of inorganic and organic chemical contaminants. The inorganic contaminants include chloride, nitrate, arsenic, manganese and chromium. Organic contaminants include petroleum hydrocarbons and MTBE, volatile organic compounds (VOCs), DBCP and other pesticides, and trichloropropane (TCP). The sources of these contaminants are primarily anthropogenic and include industrial facilities, fuel storage and dispensing sites, agricultural applications, septic systems, and food processing facilities.

Management of these plumes is a key issue that the City of Fresno has historically focused on and will continue to address.

The Fresno Irrigation District does not have specific water quality requirements since they only supply agricultural water. However, they are cognizant of recommended water requirements for crops and use these as guidelines when evaluating water quality.

Existing Activities

- Routine water quality monitoring and reporting by domestic water purveyors as required by DHS.
- County offers free water quality testing to individual landowners outside of a community system. This data is either not retained or not readily available.
- Monitor sediment in recharge/flood control basins according to FMFCD's Standard Operating Procedures for Monitoring, Maintaining and Disposal of Stormwater Basin Sediment.

Planned Actions

- Develop a coordinated monitoring program by methods similar to groundwater level monitoring evaluation; inventory existing efforts, find gaps in data monitoring, then add wells to monitor in gap areas. Critical to this effort will be an understanding of perforation intervals within each well to identify the depth of the various constituents of concern.
- Protect wells in monitoring program from being abandoned.
- Develop program for sharing data to participants.
- Improve access to County individual water quality testing information.
- Prepare groundwater quality maps on a periodic basis with the aid of a qualified hydrogeologist.

6.3 - Monitoring Protocols

Monitoring protocols are necessary to ensure consistency in monitoring efforts and consistency is required for monitoring evaluations to be valid. Consistency should be reflected in factors such as location and reference elevation at sample points, sampling procedures, testing procedures, time of year and frequency of sample collection. Without such common ground, comparisons between and among reports must be carefully considered. Consequently, more uniform data gathering procedures are proposed in order to increase the reliability of analyses. Specific protocols for water level and water quality monitoring are discussed below.

General protocols that will be used for the groundwater level-measuring program include:

- Perform all water level measurements in as short a period as possible.

- Perform year-to-year measurements at the same time of the year.
- Document the measurement reference point for each well as well as the measuring device and calibration date for the measuring device.
- Document the date and time of each measurement.
- Test each well twice, or more if needed, until consistent results are obtained.
- If there is reason to suspect groundwater contamination, water level measuring equipment will be decontaminated, and in general, measurements will proceed from the least to the most contaminated wells. Also use standardized decontamination procedures.
- Landowners will be contacted for permission to access their property prior to any fieldwork.

The water-quality monitoring protocols may include the following for existing and future monitoring efforts:

- Adequate pumping time prior to sample collection with documentation of stabilized parameters.
- Proper sample containers, preservatives, and holding times.
- Secure chain-of-custody procedures.
- Testing will only be performed at accredited, state-certified laboratories that use proper quality control and quality assurance procedures.
- All samples will be given a quality assurance code, which represents the relative confidence in the water sample.
- Some testing will include spiked, duplicate and field-blank samples for comparison to genuine samples.
- Proper handling procedures (e.g. placing the containers in an ice chest immediately after collection).
- Documentation of all protocols and procedures that are used.
- Uniform time of year for sampling (during periods of both minimal pumping in the winter and heavy pumping in July and August).
- Document the name, contact information, and qualifications of the individuals taking measurements.
- Landowners will be contacted for permission to access their property prior to any fieldwork.

These protocols, and any new protocols that are adopted, will be documented in future Annual Groundwater Reports.

Existing Activities

- Annual calibration of water level measurement transmitters by some agencies
- Use of well sounder for measurement.
- Conduct water quality testing in accordance with DHS and EPA requirements and testing procedures.

Planned Actions

- Collect and compare monitoring protocols from all of the Plan participants. Develop standard regional protocols for water level and water quality monitoring.
- Develop standardized form for collection of data.

6.4 - Land Surface Subsidence Monitoring

No information is available on historic land subsidence in the area. The area may have experienced land subsidence in the early 1900's when it was prevalent in the San Joaquin valley. However, no significant land subsidence is known to have occurred in the last 50 years as a result of land development, water resources development, groundwater pumping, or oil drilling. Lands within the Plan Area will be observed for land subsidence, and, if land subsidence becomes a problem, this Plan will be amended to include preventive and mitigative measures for land subsidence. A Global Position System (GPS) control network has been established throughout the Plan Area. This control network consists of more than twenty control points that are tied to the High Precision Grid Network (HPGN), and the vertical datum is North American Vertical Datum 1988 (NAVD 88). This control network can be utilized to survey existing local benchmarks to monitor subsidence.

Existing Activities

- Established GPS Control Network throughout the Plan Area.

Planned Actions

- Periodic resurvey of control points and local benchmarks for land subsidence.

6.5 - Surface Water Monitoring

Within the Plan Area, large areas of agriculture lands that formerly were irrigated with surface water have been urbanized. Much of these urbanized lands rely solely on groundwater for water supply. Surface water is delivered to the outlying agricultural area, stormwater and recharge basins, and some landscaped areas. While a portion of the historically delivered surface water is routed to recharge basins, it was not until 2004, that the cities of Fresno and Clovis were able to utilize surface water through newly constructed surface water treatment facilities. The location of surface water deliveries within the Plan Area has had an impact on groundwater levels as shown in Figure 3-2. FID maintains daily surface water delivery records, and compares surface water delivered within its boundary to groundwater level changes.

Surface water flows can impact groundwater levels and groundwater quality if the two water sources are hydrologically connected. In addition, pumping may also affect nearby surface water rights if the surface supplies are hydrologically connected to the groundwater. Much of the east-side stream flow water enters into the FID canal system

for delivery to FMFCD and FID basins. FMFCD monitors surface water flows in portions of its boundary.

Changes to surface water quality can also affect groundwater quality by changing the quality of water that seeps from a stream. FID has not performed any water quality monitoring of stream flows entering FID. The water quality of the streams is monitored by other agencies and has historically been found to be of good quality. Between 85% and 90% of the water recharged in the FID is imported water. When importing water for recharge, the FID considers not just the cost but also the quality of the water to be recharged. The Participants will likewise be cognizant of water quality issues on streams in the Plan Area and address water quality issues if they arise.

Existing Activities

- FID reports surface water delivered within Plan Area and compares to groundwater level changes in annual report.
- Monitoring of surface water quality at Fresno and Clovis Surface Water Treatment Plants, as well as along conveyance system to Plants.
- Monitor quality of reclaimed water pumped to FID Canals from wells at the Wastewater Plant.

Planned Actions

- Continue monitoring of surface water deliveries within Plan Area.
- Prepare updated water budget for the City of Fresno and Clovis.
- Prepare water budget for the Plan Area based on annual monitoring program.

7 - GROUNDWATER RESOURCES PROTECTION

7.1 - Well Destruction

Proper destruction of abandoned wells is necessary to protect groundwater resources and public safety. Improperly destroyed wells can provide a conduit for surface or near-surface contaminants to reach the groundwater. In addition, undesired mixing of water with different chemical qualities from different strata can occur in improperly destroyed wells.

The administration of a well construction, abandonment and destruction program has been delegated to the Counties by the State legislature. Accordingly, Fresno County has adopted a permitting program consistent with DWR Bulletin 74-81 for well abandonment and destruction. The City of Fresno also has a permit program for well destruction.

The Participants have and will continue to properly destroy any of their wells that are no longer utilized, and will enforce proper well destruction procedures for all private wells. In addition, the Participants will encourage landowners and developers to convert unusable wells to monitor wells, rather than destroy them, so that they can become a part of the Participants' groundwater monitoring program.

Existing Activities

- The Plan participants destroy wells according to City of Fresno, Fresno County or State of California standards.
- Clovis and Fresno require no longer used residential wells within the City to be properly destroyed.

Planned Actions

- Improve enforcement and consistency of well destruction policies; currently wells are not usually destroyed until the land is sold or the land use changes.
- Identify and map the locations of wells requiring proper destruction in the Plan Area.
- Maintain records on all well destruction performed in the Plan Area.

7.2 - Well Construction Policies

Proper well construction is important to ensure reliability, longevity, and protection of groundwater resources from contamination. Fresno County has adopted a well construction permitting program consistent with Department of Water Resources Bulletin 74-81 to assure proper construction of groundwater wells within the County. Other Plan participants have adopted similar permitting programs and standards.

Proper wellhead protection is essential to ensure that contaminants do not inadvertently enter a well. Well construction policies that are intended to ensure proper wellhead protection are discussed in Section 7.3 – Wellhead Protection.

Some participants construct monitor wells to monitor water levels and water quality. Proper construction of monitor wells is essential to ensure their reliability and longevity. Important items to consider for a properly drilled monitor well include (1) method of drilling, (2) casing type and diameter, (3) perforations or well screen, (4) gravel pack, (5) annular seal, and (6) well development. As a general rule, monitor wells should be placed immediately upgradient and downgradient of a waste discharge site. After the monitor well is developed an aquifer test is recommended. Care should be taken to drill monitor wells deep enough so they won't go dry during summer months or drought periods; however, they should not be drilled so deep as to make monitoring of the shallowest strata difficult. Historical water level fluctuations should be examined to determine the magnitude of fluctuations to be expected in the future.

Existing Activities

- Wells are constructed according to State of California standards and may be further modified to meet site-specific requirements to accommodate a unique geologic setting in the local area.
- Records are maintained for all new wells drilled in the Plan Area.

Planned Actions

- Share well construction results in a 'Lessons Learned' format from water wells constructed in the Plan Area to share experiences among the Plan participants, and prevent common and recurring mistakes.

7.3 - Wellhead Protection

Need for Wellhead Protection

Contaminants from the surface can enter an improperly designed or constructed well along the outside edge of the well casing or directly through openings in the wellhead. A well is also the direct supply source to the customer, and such contaminants entering the well could then be pumped out and discharged directly into the distribution system. Therefore, essential to any wellhead protection program are proper well design, construction, and site grading to prevent intrusion of contaminants into the well from surface sources.

Since wells can be a direct conduit to the aquifer, they must be properly destroyed and abandoned or they will provide an unimpaired route for pollutants to enter the groundwater, particularly if pumping equipment is removed from the well and the casing is left uncapped. Well abandonment is discussed in Section 7.1.

Wellhead Protection Guidelines

Wells constructed by the Participants will be designed and constructed in accordance with DWR Bulletin 74-81. In addition, the Participants will encourage landowners to follow the same standard for privately owned wells. DWR Bulletin 74-81 provides specifications pertaining to wellhead protection, including:

- Methods for sealing the well from intrusion of surface contaminants.
- Covering or protecting the boring at the end of each day from potential pollution sources or vandalism.
- Site grading to assure drainage is away from the wellhead.
- Setback requirements from known pollution sources.

Wellhead Protection Area

As defined in the Federal Safe Drinking Water Act Amendments of 1986, a wellhead protection area is "the surface and subsurface area surrounding a water well or well field supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or well field." Wells are randomly spaced throughout the whole Plan Area. Therefore, the entire Plan Area is treated as a wellhead protection area.

Existing Activities

- Wellhead protection is performed according to DWR guidelines.

Planned Actions

- Identify and properly modify all public wells lacking adequate wellhead protection.

7.4 - Saline Water Intrusion

Saline water intrusion is not currently an identified problem in the Plan Area. The Plan Area is not located within or near large saline water bodies such as the ocean, saline inland lakes, or the saline deep aquifer on the Westside of the San Joaquin Valley. In addition, the Participants strive to prevent the importation of saline surface waters that could ultimately degrade the groundwater. When alternative water sources are available for importation, the Participants consider not only the cost but also the quality, including salinity, of the water. The Participants will monitor water quality in a manner that provides management information about salinity in the area. Should saline intrusion become a problem in the future, a Plan amendment will be prepared.

Existing Activities

- None

Planned Actions

- See Groundwater Quality Monitoring Program.

7.5 - Migration of Contaminated Groundwater

Groundwater contamination can be human induced or caused by naturally occurring processes and chemicals. Sources of groundwater contamination can include irrigation, dairies, pesticide applications, septic tanks, industrial sources, stormwater runoff, and disposal sites. Groundwater within the Plan Area is generally of excellent quality for agricultural use. However, serious water quality problems in the southern and eastern portions of the Plan Area occur due to high concentrations of nitrate and DBCP. The presence of DBCP is primarily due to former pesticide application to the surrounding farmland.

The City of Fresno Nitrate Management Plan project, nearing completion, has yielded 20 to 30 viable projects of various types including blending, intentional recharge, removal of nitrate sources, treatment for nitrate reduction, and exchange of high nitrate water with lower nitrate surface water that can be used for recharge. All of these projects will be compared, ranked for effectiveness, and placed into service as appropriate over the next several years.

Information on existing contaminant plumes is voluminous, particularly for those plumes that have been assessed and are in various stages of remediation. Therefore, information on the plumes is not provided here.

Existing Activities

- Regularly review data and reports from regulatory agencies on contaminant plumes to provide warning of potential future problems.
- Report groundwater contamination to the appropriate regulatory agencies, including the Regional Water Quality Control Board and Department of Toxic Substances Control.

Planned Actions

- Seek to locate recharge basins next to areas with water quality problems to blend water supplies and create a hydraulic barrier to impede movement of contaminant plumes.
- Update maps for all contaminant plumes in the Plan Area.
- Implement some of the viable projects identified in the City of Fresno Nitrate Management Plan to control and reduce nitrate levels in the groundwater.

7.6 - Groundwater Quality Protection

The Fresno groundwater basin has been designated as a Sole Source Aquifer as authorized by Section 14246 of the Federal Safe Drinking Water Act of 1974. The designation, made by EPA in 1978, means the Fresno metropolitan area is dependent on a single source of groundwater and that source must be protected from potential contamination. This designation emphasizes the importance of protecting groundwater

quality in the Plan Area. Groundwater comprises the majority of water used in the Plan Area; consequently pollution prevention is a cardinal component of this GMP. Groundwater quality can be protected through stormwater quality management, septic system management, and water vulnerability planning and management, as discussed below.

Stormwater Quality Management Program

The Fresno Nationwide Urban Runoff Program project was conducted between 1981 and 1983 in conjunction with the US EPA's national effort. The results indicated that runoff contains significant levels of many contaminants, including most of the heavy metals and some organic compounds. Most stormwater in the Plan Area is delivered to flood control/recharge basins where it can percolate to the groundwater or accumulate in the vadose zone. Hence, stormwater quality management is essential to protecting the quality of the local groundwater.

In compliance with the federal Clean Water Act and storm water permit regulations, the FMFCD, County of Fresno, City of Fresno, City of Clovis, and California State University at Fresno, developed a Stormwater Quality Management Program. The program is documented in the *Fresno-Clovis Storm Water Quality Management Plan*, prepared in February 1999. As owner and operator of the storm water drainage system serving the metropolitan area, the FMFCD has primary responsibility for implementing this mandated program. The program includes pollution prevention and control practices for drainage system planning, design, construction, and maintenance. The program also includes public education programs; commercial, industrial and new development storm water quality control practices; monitoring to assess storm water impacts; and ordinances to enforce storm water quality controls.

Septic Systems

Septic systems have been identified as a major contributor to high nitrate levels in the local groundwater. Septic systems are still present in rural areas and some urban neighborhoods within the Plan Area. The Plan participants generally do not permit septic systems to be installed in urban areas, and specific rules and regulations must be followed for septic systems installed in rural areas. The gradual decommissioning of septic systems in urban areas is a principal goal for the Plan participants.

Water Vulnerability

The local aquifer can be contaminated through intentional acts such as vandalism and terrorism. As a result, the Plan participants have adopted numerous strategies to prevent intentional contamination such as security cameras, fencing, and frequent water quality testing for contaminants.

Some plan participants have also prepared Vulnerability Assessments and Emergency Response Plans in compliance with the 2002 Bioterrorism Act. The Bioterrorism Act requires communities serving water to more than 3,300 persons to:

1. Conduct a Vulnerability Assessment.
2. Certify and submit a copy of the Vulnerability Assessment to the EPA Administrator.
3. Prepare or revise an Emergency Response Plan based on the results of the vulnerability assessment.
4. Certify to the EPA Administrator, within 6 months of completing the assessment, that an Emergency Response Plan has been completed or updated.

Existing Activities

- A Stormwater Quality Protection Program is being implemented by FMFCD, Fresno, Clovis and the County of Fresno to reduce the volume of stormwater pollutants that reach the groundwater.
- Runoff-borne pollutants are trapped in flood control/recharge basin sediments for subsequent removal. All new basins are constructed in accord with FMFCD design standards that facilitate pollutant entrapment and management.
- Plan participants that are required to have prepared Vulnerability Assessments and Emergency Response Plans will keep these documents updated.
- The County of Fresno enforces rules and regulations for newly installed septic systems to reduce the incidence of nitrate contamination in the groundwater.

Planned Actions

- Plan participants will seek funding to sewer areas still served with septic tanks, when practical.
- Plan participants will seek funds to improve security at their water facilities and reduce the potential for contamination from acts of vandalism or terrorism.
- Plan participants will make use of available tools, such as View Fresno, the City of Fresno's online facility and geographic program, to strictly enforce rules and regulations regarding permits for new septic systems in locations where there is an existing sewer collection system in close proximity.

8 - GROUNDWATER SUSTAINABILITY

The region is dependant on sustaining the long-term available groundwater in the Plan Area, as it is critical to the livelihood and economy of the area. The actions described within this section are intended to maintain or increase the volume of groundwater that is stored within the Plan Area. Water conservation, groundwater recharge, surface water treatment for domestic delivery, and water recycling are some of the efforts that are used within the area to mitigate the groundwater overdraft and replenish the groundwater supply.

Historic groundwater pumping within the urban area has developed a large cone of depression within the Plan Area. At the present time, groundwater replenishment efforts within the Plan Area do not offset the combined effect of groundwater extractions and subsurface outflow. The result is that the groundwater overdraft within just the FID boundary has been estimated to be approximately 20,000 acre-feet annually (FID GMP Supporting Documents, 1995). The overdraft within the Plan Area is believed to be even greater. This overdraft is evidenced by falling groundwater levels, and manifested by increasing costs of groundwater pumping, some groundwater degradation, and the undesirable migration of contaminant plumes. It is the specific goal of the Plan to correct the overdraft and to stabilize groundwater levels at the highest practical beneficial levels.

The Plan participants view groundwater usage tolls as a last resort for reducing groundwater pumping and reducing overdraft. The participants strive to ensure the unrestricted, non-export related, private use of groundwater within the Plan Area. The Plan participants believe that proper management, conservation and education programs will help to stabilize groundwater levels and preclude the need for groundwater usage fees.

8.1 - Groundwater Recharge

Substantial portions of the groundwater basin underlying the Plan Area are subject to conditions of critical overdraft as designated by the California DWR in Bulletin 118-80. Drinking water supplies and much of the agricultural water supply in the Plan Area are currently dependent on groundwater and, as a result, the groundwater resource has been stressed. Groundwater is a renewable resource through its proper management. Groundwater recharge is a viable method of renewing groundwater consumed. Recharge of surface water through the soils to the groundwater reservoir is also an economical alternative to replacing the existing groundwater supply system with a surface water supply system requiring treatment, storage, and delivery facilities.

Stabilization and recovery of the aquifer are the goals of groundwater replenishment and will result in (1) decreasing the pumping lifts and thereby decreasing the energy

needed for pumping; (2) preventing expenditures for deepening wells; and (3) preventing the premature abandonment of wells which would be necessitated by the lowering of the water table.

Groundwater recharge efforts within the Plan Area primarily involve using FID's delivery system to deliver portions of the Fresno and Clovis water allocations to specific FMFCD basins for recharge during the summer when the basins are not needed to control urban storm runoff. FMFCD owns and operates these basins. Not all basins are used for groundwater recharge, as some have been, or will be, converted to recreational facilities such as parks or athletic fields. Within the City of Fresno, the City Water Division and Parks and Recreation Division have developed a recommended designation for the proposed use of each basin during the non-storm season. FMFCD refers to this designation as each basin's secondary use designation. The designations include recharge, recreation, or dual use. The dual use designation is used for basins that have been developed for recreation, but also have a significant area of the basin remaining for recharge. The City's recommendation was considered and approved by FMFCD's Board of Directors. As new storm water basin locations are identified by FMFCD, the City makes a recommended designation for that basin, and it is then presented to FMFCD's Board of Directors for final determination. Recharge capability is an important consideration when making these designations.

To maintain needed groundwater recharge at these basin sites, it is important to preserve the recharge capability provided by the basin sites designated for recharge.

Although some basins are designated as recreation or dual use facilities, they are not developed as a recreational facility for many years because of a lack of funding or the basins not being fully excavated. This interim period can last several years. In some situations, these basins have been utilized for recharge during the interim period before it is converted to a recreational facility. Once a basin is fully developed as a recreational facility, it is no longer utilized for recharge.

Fresno and Clovis both own and operate significant recharge facilities, to which a portion of the cities' water allocations is also delivered using FID's system.

Some areas in the United States, including Arizona and some parts of California, are performing aquifer storage and recovery through wells. In these programs, surface water (often treated) is directly injected to the groundwater aquifer through existing wells during available periods when the well is not needed for extraction, then the recharged water is later extracted from that same well. Although this type of groundwater storage and recovery is not known to be occurring within the Plan Area, there may be application for such a program within certain portions of the Plan Area.

Existing Activities

- Increase groundwater recharge capabilities within the Plan Area.
- Periodically remove sediment and rip the soils in recharge basins to maintain recharge rates.
- Maintain irrigation canals in an unlined or open bottom condition in those locations where it is determined that canal seepage is a significant source of recharge and does not create detrimental side effects.
- Work cooperatively to minimize development on lands that are favorable for artificial recharge.
- Without compromising flood protection, maximize retention and detention periods for stormwater runoff to maximize percolation to groundwater.
- Measure the volume of water delivered to groundwater recharge basins.
- Use FMFCD basins that are designated for recreational use as recharge basins prior to its conversion to a recreational facility.

Planned Activities

- Investigate the feasibility of groundwater recharge using flood control basins in the vicinity of Bakman Water Company.
- Seek funding to investigate the feasibility of groundwater recharge facilities in western Clovis.
- Construct additional interties between conveyance facilities and flood control basins to facilitate groundwater recharge.
- Develop and maintain an inventory of sites in the region that are suitable for recharge.
- Install flowmeters on all unmetered turnouts to recharge basins in FID.
- Prepare a water budget for the Plan Area to estimate total groundwater pumping, intentional recharge, deep percolation, groundwater inflow and outflow, change in groundwater storage, and, ultimately, the safe yield of the local aquifer.
- Investigate feasibility of aquifer storage and recovery within the Plan Area.
- Investigate feasibility of increasing use of surface water for landscape areas.
- Consider recharge capability of FMFCD basins when considering the secondary use designation for that basin.
- Seek to minimize reduction of groundwater recharge capabilities caused by the conversion of basins already designated for recharge purposes to recreational uses by increasing awareness or impacts of lost recharge capability, promoting alternative considerations, and pursuing replacement recharge capability when necessary.

8.2 - Water Conservation and Education

The Plan participants will at all times encourage effective water conservation measures, including residential and on-farm water saving technologies which produce a true savings of water. Plan participants intend to investigate possible incentive programs

that might be made available to landowners and water users to enhance the efficient use of water within the Plan Area. The participants have always been, and will continue to be, committed to efficiently managing water supplies so as to maximize the beneficial use of surface water while enhancing and preserving the groundwater resources to meet the balance of the water needs of the landowners and water users within the Plan Area. The participants will also participate in cooperative conservation efforts with other agencies and private parties.

Existing Activities

The Plan participants practice a variety of measures to educate the public and encourage water conservation. Some of these measures include:

- Watering restrictions on certain days and certain times of the day.
- Educational and informational programs through mailings, newsletters, websites, radio and television commercials, newspaper advertisements and pamphlets.
- Designated water conservation coordinator to enforce conservation measures, assess fines for water wasting, and perform water audits.
- Rebates for low water use fixtures.
- Require new developments to include water conservation fixtures and technology.
- Involvement in organizations that promote water education and water conservation such as the California Water Awareness Campaign, California Water Education Center, and the Water Education Foundation.
- Require new developments to use water conserving technologies, methods, and practices.
- Some participants use water meters and tiered water pricing to encourage conservation through cost savings to the consumer.
- In compliance with AB 2572, the City of Fresno has developed a water meter installation program and schedule. Meter installations will begin about 2008 and are planned for completion in 2013.

Planned Activities

- Share information among the Plan participants on methods that have been successful in conserving water.
- Secure funds to perform metering studies and install water meters at unmetered residential, commercial, and industrial connections.
- Bakman to implement plan to install meters on new development and existing services by 2025.

8.3 - Groundwater Use Limitations

The California Water Code gives certain participants the power to limit or suspend groundwater extractions. However, such limits will only be implemented if the

participants determine through study and investigation that groundwater replenishment programs or other alternative sources of water supply have proved insufficient or infeasible to lessen groundwater demand. In the unlikely event that it becomes necessary to reduce groundwater extractions, the participants intend to accomplish such reductions under a voluntary program, which will include suitable incentives to compensate users for reducing their groundwater pumping. The participants will not attempt to restrict or otherwise interfere with any landowner or water user exercising a valid right to pump and utilize groundwater.

County of Fresno Ordinance No. 00-013 regulates groundwater extractions and requires permits for transferring groundwater outside of the County. The Participants generally do not support groundwater pumping for export out of the Plan Area unless it involves a transfer or exchange of water that will not negatively impact the water supply available to the Plan Area.

Pumping Well Interference from Adjacent Properties

One cause of overdraft within the Plan Area is pumping by adjacent landowners, primarily to the south and west of the Plan Area. This occurs when water users in an area pump groundwater and the extraction well's capture zone entrains groundwater from a neighboring entity.

Most of the pumping by adjacent landowners is not offset by groundwater replenishment, which results in the lowering of groundwater levels. That, in turn, causes a subsurface outflow of groundwater from the Plan Area. Previous estimates place the combined subsurface outflow to the south and west as much as 80,000 acre-feet annually.

The Participants intend to encourage efforts to secure supplemental surface water supplies for these areas outside of the Plan Area that have insufficient surface water supplies. The Participants have and will continue to consider entering into cooperative agreements with water users and/or appropriate agencies located outside the Plan Area's boundaries but within or adjacent to the Kings sub-basin. Such cooperative agreements may implement voluntary programs and/or may provide for other actions acceptable to the participants and the affected water users/agencies. However, in no event will the participants attempt to unilaterally impose limits on the lawful extraction and use of groundwater outside its boundaries, and nothing in this section is intended to confer powers on the participants to act within the boundaries of another agency in contravention of the Water Code.

Existing Activities

- Some agencies do not permit individual wells to be drilled in their service area, and all new development must be connected to the agency's water system.
- Restrictions on groundwater exporting.

Planned Activities

- Encourage efforts to secure supplemental surface water supplies for these areas outside of the Plan Area that have insufficient surface water supplies.

8.4 - Conjunctive Use of Water Resources

Conjunctive use of water is defined as the coordinated use of both underground and surface water sources so that the combination will result in optimum benefits. The members believe that they will continue to be water short for the foreseeable future. Conjunctive use is one method to provide more water to users while conserving groundwater resources.

The Cities of Fresno and Clovis have constructed water treatment plants for treating their surface water entitlements. This will ultimately result in a reduction in groundwater pumping within the Plan Area and should slow declining groundwater levels. The Plan Participants support these efforts and will continue to encourage other local agencies to maximize use of their surface waters to conserve groundwater resources.

Groundwater banking is the process of recharging excess surface water into the aquifer, storing the water in the aquifer for a period of time, then extracting the recharged water for delivery. This process allows surface water supplies to be extended, as available surface water can be captured, stored, and then delivered during periods of higher demand. The Plan participants will limit extraction to a percentage of the banked water such that benefits are derived for all parties involved, including adjacent landowners. In addition, banking and subsequent extraction of the banked water shall, to the extent possible, occur in close proximity to each other unless the affected parties agree otherwise, and there will be no adverse impact on the local groundwater supply. FID is developing the Waldron Banking Facility located near Kerman, and is also considering an additional banking facility in the southern portion of FID.

Direct delivery of surface water from the canal system to areas of large landscaping, such as cemeteries, golf courses, schools and parks, is another example of a conjunctive use program. Untreated surface water is filtered and then pumped into the landscape irrigation system at these sites. Certain regulations and limitations for the use of untreated surface water apply, but it is permissible. The direct delivery reduces the amount of groundwater needed, and can be less expensive than delivering surface water treated to drinking water standards. Within the Plan Area, only one school site, one park and one cemetery are known to currently be utilizing surface water for irrigation. The large irrigated turf locations are a primary concern, however there are also other locations in the western United States, including California, that are providing direct delivery of surface water for landscaping irrigation at residences. This is not being performed within the Plan Area, but is being considered.

Existing Activities

- Pending development of Waldron Banking Facility.
- Delivery of surface water for landscaping to a few areas of large irrigated turf.

Planned Activities

- Encourage and assist landowners and water users in the transfer of water into the Plan Area, which will have the effect of causing "in lieu" recharge.
- Pursue the acquisition of new water supplies should they become available at affordable costs.
- Support the development of new surface storage and water supply projects that would permit the participants to better utilize surface water supplies.
- Expand conveyance systems to provide surface water to additional land.
- Wherever appropriate and practical, encourage groundwater conservation through the use of available surface irrigation water for non-agricultural purposes.
- Encourage those municipal water agencies that have not already done so to contract for available surface water.
- Work with all appropriate public agencies, private organizations, and individuals within and outside of the plan area to protect existing surface water rights and supplies.
- Seek opportunities to increase conservation storage through groundwater banking programs or off-stream storage to help balance full contract supply years with drought years.
- Construct additional surface water treatment plant capacity for the Cities of Fresno and Clovis.
- Investigate additional groundwater banking facilities.
- Investigate and encourage use of surface water for irrigation of large irrigated turf such as schools, golf courses, cemeteries and parks.

8.5 - Wastewater Reclamation and Recycling

The recycling or reclamation of treated wastewater will extend the overall water supply within the Plan Area. The Regional Water Quality Control Board regulates the use of recycled water based on the treatment method of treatment facilities. While wastewater treatment methods are outside the scope of this plan, the overall water supply of the Plan Area is extended by the reuse of this water.

Wastewater within the City of Fresno is currently piped to the Fresno-Clovis Regional Wastewater Treatment Facility, as shown in Figure 2-1. This facility provides secondary level treatment, and nearly all of the effluent is sent to percolation ponds at the facility. A portion of the water is then reclaimed through a series of reclamation wells, and delivered to FID facilities for on-farm irrigation. The water reclaimed is metered, and the amount delivered is approximately 26,000 acre-feet per year.

Malaga County Water District and the City of Kerman also operate smaller wastewater treatment facilities. The City of Kerman currently delivers tertiary treated wastewater from its facility to neighboring agricultural lands for irrigation. There are other smaller wastewater treatment facilities that are distributing treated wastewater for landscape and irrigation purposes.

The City of Clovis is planning construction of a WWTF in the northeast portion of the Plan Area. The City is also planning to construct distribution facilities for delivering tertiary treated water from this facility to irrigate large landscape areas, including parks, local street and Caltrans right of way landscaping, and agricultural irrigation at California State University Fresno.

Existing Activities

- Delivery of reclaimed water at the Fresno-Clovis Regional WWTF.
- Direct application of effluent for irrigation at the Kerman WWTF.

Planned Activities

- Explore opportunities to optimize reuse of reclaimed water from the Fresno-Clovis Regional Wastewater Treatment Facility.
- Institute water recycling program planned for reuse of wastewater at the proposed Clovis wastewater treatment facility.
- Encourage higher level treatment facilities to facilitate less restricted use of recycled water.
- Encourage new developments to incorporate dual water systems. The secondary water system would use recycled water or groundwater of marginal quality for landscape irrigation.

8.6 - Operation of Facilities

The construction and proper operation of groundwater management facilities is an important facet of this plan. New facilities are needed to keep pace with increased water demands and the desire for improved management.

The participants have a number of opportunities to further improve and enhance the water and groundwater supplies of its landowners and neighbors. The participants will continue to evaluate potential projects that would involve the construction and operation of additional groundwater management facilities. Additional groundwater management facilities can provide needed flexibility and thus allow more optimal management of the groundwater.

Lastly, the members strive to provide the best facilities for delivery of surface water supplies, since they are used conjunctively with groundwater. The members realize that the success of conjunctive-use programs is often contingent on the quality of surface water and conveyance systems.

Existing Activities

- Policy to keep canals unlined where practical to allow for groundwater recharge.
- Cooperative use of stormwater facilities for groundwater recharge.
- Frequent maintenance of recharge ponds to maintain higher infiltration rates.

Planned Activities

- Maintain and upgrade conveyance facilities for capacity and stability.
- Improve canal maintenance procedures to eliminate or reduce canal downtime for deliveries to surface water treatment facilities.

9 - GROUNDWATER PLANNING AND MANAGEMENT

9.1 - Plan Implementation

The Participants have executed a Memorandum of Understanding (MOU) to facilitate the implementation of this Plan. This Plan and associated agreement, serve as a mechanism for cooperative efforts amongst the participants and other agencies within the region. Many of the activities described in the Plan target specific locations within the Plan Area, and therefore may involve only one or a few of the participants. Although certain activities may only involve some participants, the TAC meetings will serve as the primary forum for coordination of cooperative efforts. The annual report will also summarize all related activities within the Plan Area. Implementation of this Plan is expected to result in significant amounts of new knowledge and an achievable improvement in groundwater management in the basin. The participants also recognize that implementing the GMP is in the best interest of their water users. The participants plan to continue all of the 'Existing Activities' listed throughout this Plan. Implementation of each of these tasks would be beneficial to the Plan participants, but will be contingent on available staff time and funding.

Planned Activities

- Implement the Planned Activities described in the Plan.
- TAC to meet semi-annually to discuss regional groundwater management. Comments on the content and value of the GMP will be solicited at each meeting.
- Prepare Annual Reports and Reevaluate the Plan as described herein.

9.2 - Groundwater Reports

The Participants will prepare groundwater reports every year to document groundwater levels, available groundwater storage, historical trends, groundwater quality, and progress on groundwater projects. This information will be used to forecast future problems, plan future groundwater projects, and develop new groundwater policies.

Existing Activities

- Several agencies prepare reports (i.e. water supply reports, water master plans, water conservation plans, urban water management plans, etc.) that document groundwater conditions. These reports will continue to be prepared for use in assessing groundwater conditions within individual agencies.

Planned Activities

- Prepare Fresno Area Regional Groundwater Management Plan Annual Report and include information on all of the Plan participants. Plan will likely include:
  - Groundwater level data
  - Groundwater contour maps
  - Groundwater storage calculations (using specific yield values for each township and range)
  - Evaluation of one-year and five-year historical trends in groundwater levels, contours, and storage, and perceived reasons for any changes
  - Estimation of deliveries to recharge basins
  - Summary of important groundwater management actions during the period covered by the report
  - Discussion on whether management actions are meeting the management objectives
  - Summary of proposed management actions for the future
  - Summary of actions taken to coordinate with other water management, land-use and government agencies
  - Summary of groundwater related actions taken by other regional groups
  - Recommendations for changes in the content or format of the annual report
  - Recommendations for updates to the GMP

- The annual report will cover the prior calendar year and will be completed each year by May 31st.

9.3 - Plan Re-evaluation

Most of the strategies that make up this Plan are established policies, procedures, and ordinances. The goal of this document is to codify them for purposes of identifying an overall management program. Implementation of the various components of the Plan will continue on an on-going basis. As new policies, practices, or ordinances become necessary or desirable to enhance groundwater management, this Plan will be amended as necessary.

The Technical Advisory Committee (TAC) will be responsible for monitoring the progress of the GMP objectives. Refer to Section 5.1 for more information on the membership, policies, and procedures of the TAC. The TAC will attempt to meet twice each year to review and evaluate groundwater conditions as well as evaluate the effectiveness of the GMP.

Planned Activities

- The TAC will meet semi-annually to discuss regional groundwater management. Comments on the content and value of the GMP will be solicited at each meeting.

- Recommendations for modifying, updating, or expanding the GMP will be recorded annually in the Plan Group's Annual Groundwater Report.
- The GMP will be revised through a formal public process every five years, or earlier if a sufficient quantity of revisions, updates, and additions have been identified.

9.4 - Land Use Planning

The intent of this Plan is not to dictate land-use planning policies, but rather to establish some land-use planning goals that can aid in protecting and preserving groundwater resources. Some of the Plan participants have direct land-use planning authority while others do not. However, all of the participants have the opportunity to comment on environmental documents for land-use related activities. The Plan participants will attempt to work cooperatively with other agencies to minimize adverse impacts to groundwater supplies and quality as a result of proposed land-use changes. Some specific land-use planning goals include: (1) preserving areas with high groundwater recharge potential for recharge activities; (2) protecting areas sensitive to groundwater contamination; (3) requiring hydrogeologic investigations, water master plans, and proven and sustainable water supplies for all new developments; and (4) requiring appropriate mitigation for any adverse impacts that land use changes have on groundwater resources. A map showing the extent of the general urbanization within the Plan Area is included as Figure 9-1.

Existing Activities

- Notify residents and agencies of projects that have the potential to impact groundwater within their sphere of influence.
- When appropriate, comment on environmental documents and land-use plans that have the potential to impact groundwater.

Planned Activities

- Determine ways to improve communication between County, Cities and other Private/Public agencies regarding landuse changes that may have an impact on groundwater.

9.5 - Dispute Resolution

Each participant has their own mechanisms for dispute resolution related to groundwater issues. These may include procedures for filing complaints and appeals to a manager, board, or committee. The Plan participants recognize the importance of groundwater as their primary water source and will work diligently to resolve any groundwater disputes according to their internal rules and regulations.

This regional GMP will provide a forum for the participants to discuss groundwater related disputes and identify possible solutions. In addition, it is envisioned that the

regional coordination, improved communication, and multi-party projects that develop as part of this Plan will help to reduce future conflicts among the participants.

Planned Activities

- Discuss issues of concern at semi-annual TAC meeting. Provide recommendations for resolution if appropriate.

9.6 - Program Funding and Fees

Funding individual activities described in this Plan will be provided for in each agency's individual budget. Funding of the Plan preparation and annual report are included in the MOU for implementation. The Plan participants have a variety of options for funding groundwater projects as discussed below.

Water Replenishment Fees

Included in the authority granted to local agencies under the California Water Code were the powers to limit groundwater extractions and implement water replenishment fees based upon the amount of water extracted (extraction based fees must first be approved by majority vote of impacted landowners). Inherent in these powers is the authority to implement metering of private wells. These are considered measures of last resort and the members will make any and all efforts to ensure the private, non-metered use of groundwater by their water users.

Capital Improvement Fees

Some participants have the authority to finance capital improvement projects and collect repayment charges from the benefited parties. This process would require a favorable vote from the constituency approving the repayment fees prior to implementation, and is considered a realistic alternative for large capital projects to improve groundwater facilities.

Grants

Some participants have successfully acquired funding from the DWR and other public agencies for projects that are consistent with the goals of their Groundwater Management Plan. The participants will continue to pursue available grants and low-interest loans from the DWR as well as other state and federal agencies.

Other Revenue Sources

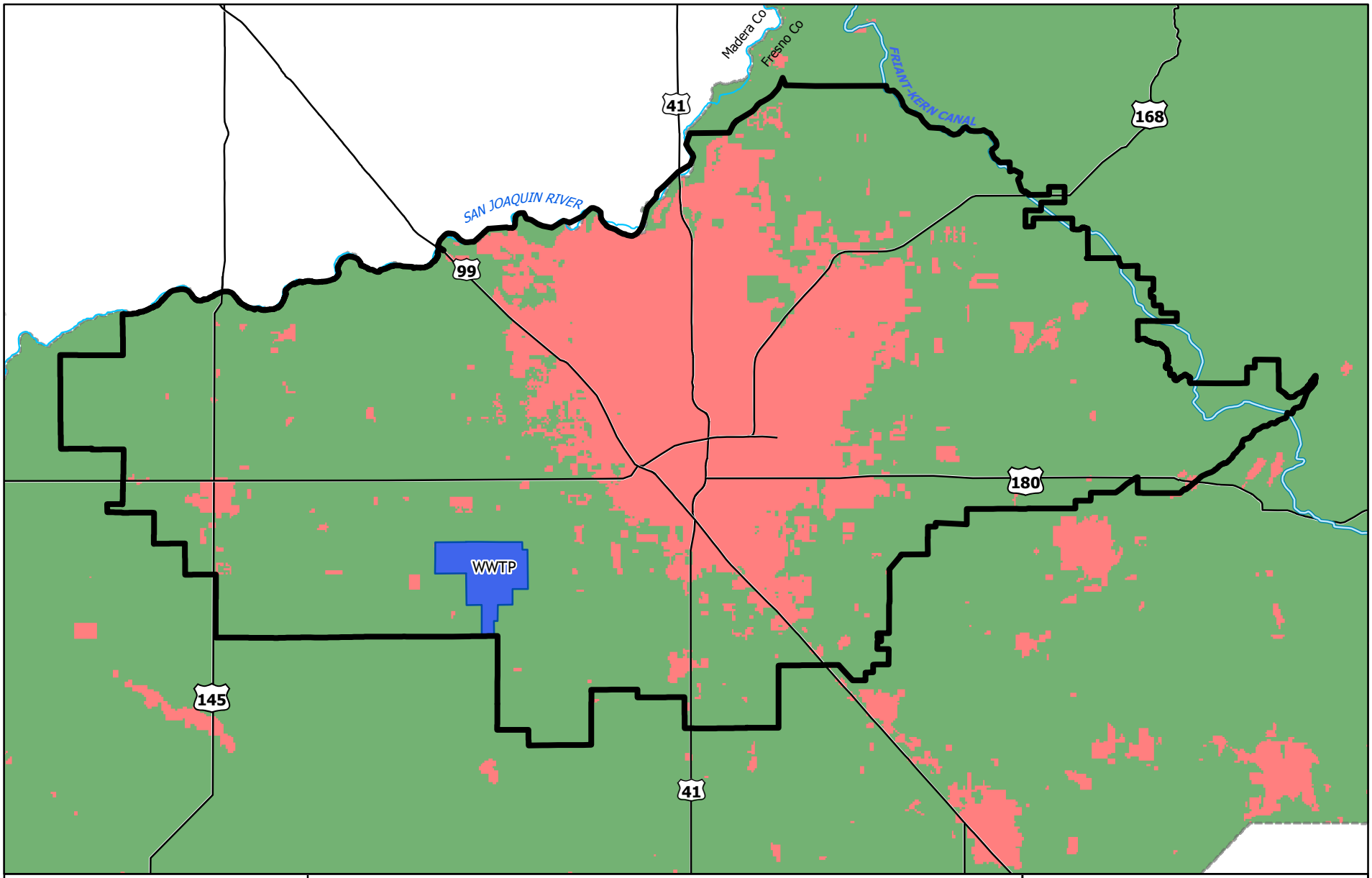
Groundwater projects are also financed through a variety of water user fees, property taxes, sales taxes, fine payments, and development impact fees.

Cost Sharing Agreement

Costs for GMP updates, annual groundwater reports, and other projects involving all of the Plan participants will be distributed according to an accepted cost-sharing agreement that is documented in the MOU.

Planned Activities

- Share information on funding opportunities for groundwater related projects.
- Identify beneficial groundwater projects that become economically feasible when costs are shared among two or more participants.



0 1 2 3 4 Miles

N

EST. 1968
PROVOST & PRITCHARD
ENGINEERING GROUP
An Employee Owned Company
286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

GMP BOUNDARY
FRIANT-KERN CANAL
Urban Land Use
Ag / Irrigated Land Use

Figure 9-1

Landuse Map

Fresno-Area Regional
Groundwater Management Plan

December, 2005 \\huntington\gis\Clients\FresnoID_1038\10380505\GMP_Landuse.mxd

10 - REFERENCES

1. Brown and Caldwell, Fresno Nationwide Urban Runoff Program Project, FMFCD, Annual Reports, 1982, 1983.

2. California Department of Water Resources, *Bulletin No. 118-80 – Groundwater Basins in California*, 1980.

3. California Department of Water Resources, *Bulletin No. 118 update 2003 – Groundwater Basins in California*, 2003.

4. California Department of Water Resources, *Bulletin No. 74-81 – Water Well Standards: State of California*, 1981.

5. California State Senate, *Senate Bill No. 1938, Chapter 603, Groundwater Management: State Funding*, 2002.

6. CH2MHill, *Fresno Metropolitan Water Resources Management Plan*, 1992.

7. City of Clovis Public Utilities Department, *Groundwater Management Plan*, November 17, 1997.

8. City of Clovis, *2000 Urban Water Management Plan*, 2000.

9. City of Fresno, Department of Public Utilities, Water Division, *City of Fresno Water Conservation Plan*, 2005.

10. County of Fresno, *Fresno County Groundwater Management Plan*, 1997.

11. County of Fresno, *Water Resources Management Plan for Fresno-Clovis Urban and Northeast Fresno County*, 1986.

12. Fresno County Public Works Department, *Northeast Fresno Groundwater Supply*, 1976.

13. Fresno Irrigation District, *2000 Groundwater Report*, 2000.

14. Fresno Irrigation District, *Agreement between Fresno Irrigation District and City of Fresno for Exchange of Recycled Water,* June 1974.

15. Fresno Irrigation District, *Groundwater Report as of Jan 1, 2002*, 2002.

16. Fresno Metropolitan Flood Control District, *District Services Plan*, 2004.

17. California State University at Fresno, City of Clovis, City of Fresno, County of Fresno, and Fresno Metropolitan Flood Control District, *Fresno-Clovis Storm Water Quality Management Plan*, February 1999.

18. Kenneth D. Schmidt and Associates, *Technical Report on Groundwater Conditions at and Near the Cities of Fresno and Clovis Wastewater Treatment Facility*, 2002.

19. Provost and Pritchard Engineering Group and Kenneth D. Schmidt and Associates, *City of Clovis Groundwater Recharge Investigation – Phase I*, 1997.

20. Provost and Pritchard Engineering Group, *Groundwater Monitoring and Recharge Investigation Project for the City of Clovis*, 2003.

21. Provost and Pritchard Engineering Group, *Malaga County Water District 2004 Water Supply Report*, 2004.

22. Provost and Pritchard Engineering Group, *Supporting Documents for Fresno Irrigation District Groundwater Management Plan*, 1993.

23. Provost and Pritchard Engineering Group, *Waldron Banking Facility Proposition 13 Groundwater Storage Grant Application for Fresno Irrigation District*, 2003.

24. Thomson West, *California Water Code, 2003 Desktop Edition, Chapter 3 – Groundwater Management Plans*, 2003.

25. United States Department of Agriculture, *A Geologic Approach to Artificial Recharge Site Selection in the Fresno-Clovis Area*, 1980.

26. United States Geologic Survey, *Groundwater Reconnaissance in the Fresno Northeast Area, Open File Report 75-315*, 1975.

27. United States Geologic Survey, *Geology, Hydrology and Water Quality in the Fresno Area, California,* Page and LeBlanc, 1969

FRESNO AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

APPENDIX A

PUBLIC PARTICIPATION IN PLAN ADOPTION

RESOLUTION NO. 2005-09

RESOLUTION OF THE BOARD OF DIRECTORS OF THE FRESNO IRRIGATION DISTRICT

FOR INTENTION TO ADOPT THE FRESNO-AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

WHEREAS, Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the Fresno Irrigation District adopted a groundwater management plan consistent with the provisions of the California Water Code Section 10750 et. seq. on August 12, 1996; and

WHEREAS, the Fresno Irrigation District desires to adopt a groundwater management plan that is consistent with recent amendments to the provisions of the California Water Code Section 10750 et. seq.; and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District and Bakman Water Company have entered into a Memorandum of Understanding to cooperate and participate in the development of the Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within their respective jurisdictions; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions; and

WHEREAS, the District's Board of Directors believes that groundwater can best be managed, as in the past, by local agencies in coordination with owners of lands overlying the groundwater basin; and

WHEREAS, the Board of Directors believes the updating and adoption of a new groundwater management plan will be in the best interests of its constituents and water users and can help meet the projected long-term water needs of the Fresno Irrigation District; and

WHEREAS, a public hearing was held on August 10, 2005 to discuss the adoption and implementation of the Fresno-Area Regional Groundwater Management Plan.

NOW, THEREFORE, BE IT RESOLVED, by the Board of Directors of the Fresno Irrigation District as follows:

The foregoing findings are true and correct:

1. It is the intention of the Fresno Irrigation District to adopt the Fresno-Area Regional Groundwater Management Plan in accordance with Part 2.75 of Division 6 of the California Water Code, and the District's consultant is hereby authorized and directed to draft such a plan;

2. That this resolution shall be deemed a resolution of intention in accordance with California Water Code Section 10753.2;

3. After such a plan has been prepared, a second public hearing will be conducted in accordance with the California Water Code Section 10753.5, et seq. to determine whether to adopt the plan;

4. That the officers of the Fresno Irrigation District are authorized and directed to publish this resolution of intention to update the District's groundwater management plan in accordance with the provisions of California Water Code Section 10753.3 and to provide interested persons with a copy of this resolution upon written request;

5. That the Board of Directors hereby authorizes its officers to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.

RESOLVED by the Board of Directors of the Fresno Irrigation District that the Fresno-Area Regional Groundwater Management Plan be developed to be in compliance with California Senate Bill No. 1938.

The General Manager of the Fresno Irrigation District is hereby authorized and directed to prepare the necessary data, make investigations, sign, and file such application with the California Department of Water Resources.

PASSED AND ADOPTED at a regular meeting of the Board of Directors of Fresno Irrigation District on August 10, 2005.

Jacob C Andresen

Jacob C. Andresen, President

CERTIFICATE OF SECRETARY

I, GARY SERRATO, Secretary of the Fresno Irrigation District hereby certify that the Board of Directors at a regular meeting on August 10, 2005 adopted the foregoing Resolution by the following roll call vote:

	Aye	Nay	Absent	Abstain
President Andresen	✓			
Vice-President Boswell	✓			
Director Niederfrank	✓			
Director Balls	✓			
Director Neely	✓			

Gary R. Serrato

Gary R. Serrato, Secretary

RESOLUTION NO. 05-140

A RESOLUTION OF INTENTION OF THE COUNCIL OF THE CITY OF CLOVIS, CALIFORNIA, TO ADOPT THE FRESNO-AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

WHEREAS, Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the City of Clovis adopted a groundwater management plan consistent with the provisions of the California Water Code Section 10750 et. seq. on November 17, 1997; and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District and Bakman Water Company have entered into a Memorandum of Understanding to cooperate and participate in the development of the Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within their respective jurisdictions; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions; and

WHEREAS, the City of Clovis desires to adopt a groundwater management plan that is consistent with recent amendments to the provisions of the California Water Code Section 10750 et. seq.; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on August 10, 2005 to discuss the adoption and implementation of the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the Clovis City Council believes that groundwater can best be managed, as in the past, by local agencies in coordination with owners of lands overlying the groundwater basin; and

WHEREAS, the Clovis City Council believes the updating and adoption of a new groundwater management plan will be in the best interests of its constituents and water users and can help meet the projected long-term water needs of the City of Clovis.

NOW, THEREFORE, BE IT RESOLVED by the Clovis City Council as follows:

1. It is the intention of the City of Clovis to adopt the Fresno-Area Regional Groundwater Management Plan in accordance with Part 2.75 of Division 6 of the California Water Code, and the Fresno Irrigation District's consultant is hereby authorized and directed to draft such a plan;
2. That this resolution shall be deemed a resolution of intention in accordance with California Water Code Section 10753.2;
3. After such a plan has been prepared in accordance with all applicable law, including but not limited to the California Environmental Quality Act, a second public hearing will be conducted in accordance with the California Water Code Section 10753.5, et seq. to determine whether to adopt the plan;
4. That the officers of the City of Clovis are authorized and directed to publish this resolution of intention to adopt the Fresno-Area Regional Groundwater Management Plan in accordance with the provisions of California Water Code Section 10753.3 and to provide interested persons with a copy of this resolution upon written request;
5. That the Clovis City Council hereby authorizes its officers to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.

BE IT RESOLVED by the City Council of the City of Clovis that the Fresno-Area Regional Groundwater Management Plan be developed to be in compliance with California Senate Bill No. 1938.

The Director of Public Utilities of the City of Clovis is hereby authorized and directed to prepare the necessary data, make investigations, sign, and file such application with the California Department of Water Resources.

* * * * *

The foregoing resolution was introduced and adopted at a regular meeting of the City Council of the City of Clovis held on September 6, 2005 by the following vote, to wit:

AYES: Councilmembers Armstrong, Ashbeck, Flores, Whalen, Mayor Magsig

NOES: None

ABSENT: None

ABSTAIN: None

DATED: September 6, 2005

Mayor

City Clerk

BAKMAN WATER COMPANY

TELEPHONE (559) 255-0324 • P.O. BOX 7965 • 5105 E. BELMONT • FRESNO, CA 93747

MINUTES OF THE SPECIAL MEETING OF THE BOARD OF DIRECTORS OF BAKMAN WATER COMPANY, A CALIFORNIA CORPORATION.

A special meeting of the Board of Directors of the Bakman Water Company was held at the Bakman Water Co. office located at 5105 E. Belmont Ave, Fresno, California.

Date: July 8, 2005 **Time**: 9:00am

Officers present were Richard Tim Bakman, Virginia Bakman, and Dottie Patton.

On July 8, 2005, a special meeting was called to discuss the possibility of being a part of **Memorandum of Understanding** regarding The Fresno Area Regional Groundwater Management Plan.

Purpose This MOU is intended to promote and to provide a means to establish an orderly process to share information, develop courses of action, and to resolve any issues with respect to the cooperative development of the groundwater management plan and with respect to the administration of the groundwater management plan. Administration will include coordination of data received from each party, public noticing, meetings and annual reporting as described herein. This MOU memorializes the interests, intent and responsibilities of the parties with respect to the adoption of a groundwater management plan consistent with the provisions of the California Water Code to provide for collection of data and the development of a plan for the management of groundwater resources within the jurisdictions of the parties hereto.

Payment of Costs Each of the parties hereto shall contribute to the cost of updating the groundwater management plan in accordance with the obligations specified in Exhibit "2" attached hereto. Additionally, any ongoing fees or costs incurred in the administration of the plan (as administration is defined and limited in Section 1 of this MOU) or of this Memorandum of Understanding will be shared by the parties in accordance with percentages identified in Exhibit "2".

The following being all of the directors of Bakman Water Company, hereby consent to and agree to be a part of the **Memorandum of Understanding** regarding The Fresno Area Regional Groundwater Management Plan.

Richard Tim Bakman Water

Virginia A. Bakman

Dottie Patton, Secretary/Treasurer

RESOLUTION NO. 2005-386

A RESOLUTION OF THE COUNCIL OF THE CITY OF FRESNO, CALIFORNIA, FOR INTENTION TO ADOPT THE FRESNO-AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

WHEREAS, Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the Fresno Irrigation District adopted a groundwater management plan consistent with the provisions of the California Water Code Section 10750 et. seq. on August 12, 1996; and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District and Bakman Water Company have entered into a Memorandum of Understanding to cooperate and participate in the development of the Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within their respective jurisdictions; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions.

WHEREAS, the City of Fresno desires to adopt a groundwater management plan that is consistent with recent amendments to the provisions of the California Water Code Section 10750 et. seq.; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on August 10, 2005 to discuss the adoption and implementation of the Fresno-Area Regional Groundwater Management Plan; and

Adopted 9/20/05
Approved
Effective

2005-386

WHEREAS, the Council believes that groundwater can best be managed, as in the past, by local agencies in coordination with owners of lands overlying the groundwater basin; and

WHEREAS, the Council believes the updating and adoption of a new groundwater management plan will be in the best interests of its constituents and water users and can help meet the projected long-term water needs of the City of Fresno.

NOW, THEREFORE, BE IT RESOLVED by the Council of the City of Fresno as follows:

The foregoing findings are true and correct:

1. It is the intention of the City of Fresno to adopt the Fresno-Area Regional Groundwater Management Plan in accordance with Part 2.75 of Division 6 of the California Water Code, and the District's consultant is hereby authorized and directed to draft such a plan;
2. That this resolution shall be deemed a resolution of intention in accordance with California Water Code Section 10753.2;
3. After such a plan has been prepared in accordance with all applicable law, including but not limited to the California Environmental Quality Act, a second public hearing will be conducted in accordance with the California Water Code Section 10753.5, et seq. to determine whether to adopt the plan;
4. That the officers of the City of Fresno are authorized and directed to publish this resolution of intention to update the District's groundwater management plan in accordance with the provisions of California Water Code Section 10753.3 and to provide interested persons with a copy of this resolution upon written request;
5. That the Council hereby authorizes its officers to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.

BE IT FURTHER RESOLVED that the Fresno-Area Regional Groundwater Management Plan be developed to be in compliance with California Senate Bill No. 1938.

BE IT FURTHER RESOLVED that the Director of the Department of Public Utilities is hereby authorized and directed to prepare the necessary data, make investigations, sign, and file such application with the California Department of Water Resources.

* * * * * * * * * * * * * *

STATE OF CALIFORNIA)
COUNTY OF FRESNO) ss.
CITY OF FRESNO)

I, REBECCA E. KLISCH, City Clerk of the City of Fresno, certify that the foregoing resolution was adopted by the Council of the City of Fresno, at a regular meeting held on the 20th day of September, 2005.

AYES : Boyajian, Calhoun, Duncan, Perea, Sterling, Westerlund, Dages
NOES : None
ABSENT : None
ABSTAIN : None

REBECCA E. KLISCH
City Clerk

BY: Rebecca E. Klisch
Deputy

APPROVED AS TO FORM:
CITY ATTORNEY'S OFFICE

BY: _____
Chief Assistant City Attorney

RESOLUTION NO. 05-___

RESOLUTION OF THE OF THE BOARD OF DIRECTORS OF THE PINEDALE COUNTY WATER DISTRICT

FOR INTENTION TO ADOPT THE FRESNO-AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

WHEREAS, Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District and Bakman Water Company have entered into a Memorandum of Understanding to cooperate and participate in the development of the Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within their respective jurisdictions; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions.

WHEREAS, the Pinedale County Water District desires to adopt a groundwater management plan that is consistent with recent amendments to the provisions of the California Water Code Section 10750 et. seq.; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on August 10, 2005 to discuss the adoption and implementation of the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the Board of Directors believes that groundwater can best be managed, as in the past, by local agencies in coordination with owners of lands overlying the groundwater basin; and

WHEREAS, the Board of Directors believes the updating and adoption of a new groundwater management plan will be in the best interests of its constituents and water users and can help meet the projected long-term water needs of the Pinedale County Water District,

BE IT RESOLVED, by the Board of Directors as follows:

The foregoing findings are true and correct:

1. It is the intention of the Pinedale County Water District to adopt the Fresno-Area Regional Groundwater Management Plan in accordance with Part 2.75 of Division 6 of the California Water Code, and the District's consultant is hereby authorized and directed to draft such a plan;

2. That this resolution shall be deemed a resolution of intention in accordance with California Water Code Section 10753.2;

3. After such a plan has been prepared in accordance with all applicable law, including but not limited to the California Environmental Quality Act, a second public hearing will be conducted in accordance with the California Water Code Section 10753.5, et seq. to determine whether to adopt the plan;

4. That the officers of Pinedale County Water District are authorized and directed to publish this resolution of intention to update the District's groundwater management plan in accordance with the provisions of California Water Code Section 10753.3 and to provide interested persons with a copy of this resolution upon written request;

5. That the Board of Directors hereby authorizes its officers to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.

RESOLVED by the Board of Directors of the Pinedale County Water District that the Fresno-Area Regional Groundwater Management Plan be developed to be in compliance with California Senate Bill No. 1938.

The General Manager of the Pinedale County Water District is hereby authorized and directed to prepare the necessary data, make investigations, sign, and file such application with the California Department of Water Resources.

PASSED AND ADOPTED at a regular meeting of the Board of Directors of Pinedale County Water District on 10/5, 2005.

John Garcia

(General Manager)

FRESNO METROPOLITAN FLOOD CONTROL DISTRICT

CERTIFICATION

I, Esther Schwandt, as Clerk to the Board of Directors of the Fresno Metropolitan Flood Control District, do hereby certify the foregoing to be a full, true and correct copy of **Resolution No. 2005-473** adopted by the Board of Directors on **August 24, 2005**, the original of which is on file at the District office.

In witness whereof, I have hereunto set my hand and affixed the Seal of the Fresno Metropolitan Flood Control District.

Esther Schwandt
Clerk to the Board

October 10, 2005
Date

Original document bears our embossment

5469 E. OLIVE • FRESNO, CA 93727 • (559) 456-3292 • FAX (559) 456-3194

RESOLUTION NO. 2005-473

BEFORE THE BOARD OF DIRECTORS OF THE FRESNO METROPOLITAN FLOOD CONTROL DISTRICT

RESOLUTION OF INTENTION TO ADOPT THE FRESNO-AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

WHEREAS, Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District and Bakman Water Company have entered into a Memorandum of Understanding to cooperate and participate in the development of the Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within their respective jurisdictions; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions; and

WHEREAS, the Fresno Metropolitan Flood Control District, "District", desires to adopt a groundwater management plan that is consistent with recent amendments to the provisions of the California Water Code Section 10750 et. seq.; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on August 10, 2005 to discuss the adoption and implementation of the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the Board of Directors believes that groundwater can best be managed, as in the past, by local agencies in coordination with owners of lands overlying the groundwater basin; and

WHEREAS, the Board of Directors believes the updating and adoption of a new groundwater management plan will be in the best interests of its constituents and water users and can help meet the projected long-term water needs of the District,

BE IT RESOLVED, by the Board of Directors as follows:

The foregoing findings are true and correct:

1. It is the intention of the District to adopt the Fresno-Area Regional Groundwater Management Plan in accordance with Part 2.75 of Division 6 of the California Water Code, and the Fresno Irrigation District's consultant is hereby authorized and directed to draft such a plan;
2. That this resolution shall be deemed a resolution of intention in accordance with California Water Code Section 10753.2;
3. After such a plan has been prepared in accordance with all applicable law, including but not limited to the California Environmental Quality Act, a second public hearing will be conducted in accordance with the California Water Code Section 10753.5, et seq. to determine whether to adopt the plan;

4. That the officers of District are authorized and directed to publish this resolution of intention to update the Fresno Irrigation District's groundwater management plan in accordance with the provisions of California Water Code Section 10753.3 and to provide interested persons with a copy of this resolution upon written request;
5. That the Board of Directors hereby authorizes its officers to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.

RESOLVED by the Board of Directors of the District that the Fresno-Area Regional Groundwater Management Plan be developed to be in compliance with California Senate Bill No. 1938.

The General Manager-Secretary of the District is hereby authorized and directed to prepare the necessary data, make investigations, sign, and file such application with the California Department of Water Resources.

PASSED AND ADOPTED this 24th day of August 2005 by the following vote to wit:

AYES: Franco, Spina, Marcus, Groom, Welton, Williams and Rastegar

NOES: None

ABSTAIN: None

ABSENT: None

RESOLUTION NO. 05-54

RESOLUTION OF THE CITY COUNCIL OF THE CITY OF KERMAN APPROVING ENTERING INTO MEMORANDUM OF UNDERSTANDING (MOU) WITH FRESNO IRRIGATION DISTRICT (FID) AND OTHER AGENCIES AND WATER COMPANIES ON GROUNDWATER MANAGEMENT PLAN (GWMP) FOR KERMAN

WHEREAS. the City Council of the City of Kerman ("Kerman") as the legislative body of the City, has authorized the negotiation of a Memorandum of Understanding (MOU) with Fresno Irrigation District ("District"), the City of Fresno ("Fresno"), the City of Clovis ("Clovis"), the Fresno Metropolitan Flood Control District ("Metropolitan"), the Bakman Water Company ("Company"), the City of Kerman ("Kerman"), the County of Fresno ("County"), the Malaga County Water District ("Malaga"), and the Pinedale County Water District ("Pinedale") to provide a means to promote an orderly process to share information, develop courses of action, and to resolve any issues with respect to the cooperative development and administration of the groundwater management plan; and

WHEREAS, the attached Memorandum of Understanding (MOU), Exhibit "A" memorializes the interests, intent and responsibilities of the parties with respect to the adoption of the groundwater management plan consistent with the provisions of the California Water Code; and

WHEREAS, conditions of the MOU are as outlined therein under Conditions and Covenants 1 through 12.

NOW, THEREFORE, BE IT RESOLVED THAT THE CITY COUNCIL OF THE CITY OF KERMAN RESOLVES THAT the City Manager is authorized to sign the Memorandum of Understanding regarding The Fresno Area Regional Groundwater Management Plan and the City Clerk is to attest.

The foregoing resolution was introduced at a regular meeting of the City Council of the City of Kerman held on the 6th day of July, 2005, and passed at said meeting by the following vote:

AYES:	Cromartie, Rodriguez, Sidhu, Stockwell
NOES:	None
ABSENT:	Moore
ABSTAIN:	None

////

The foregoing resolution is hereby approved.

ATTEST:

MAYOR, CITY OF KERMAN

CITY CLERK, CITY OF KERMAN

CITY CLERK'S CERTIFICATE

EDITH M. FORSSTROM does hereby certify as follows:

That she is the City Clerk of the City of Kerman and that the foregoing Resolution, being Resolution No. 05-54 was passed at a regular meeting of the City Council of the City of Kerman held on the 6th day of July, 2005 and she further certifies that the foregoing is a true and correct copy of said Resolution No. 05-54 so adopted.

Edith M Forsstrom

EDITH M. FORSSTROM, City Clerk

RESOLUTION NO. 05-08-23

RESOLUTION OF THE BOARD OF DIRECTORS OF THE MALAGA COUNTY WATER DISTRICT

FOR INTENTION TO ADOPT THE FRESNO-AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

WHEREAS, Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the District adopted a groundwater management plan consistent with the provisions of the California Water Code Section 10750 et. seq. on August 12, 1996; and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District and Bakman Water Company have entered into a Memorandum of Understanding to cooperate and participate in the development of the Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within their respective jurisdictions; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions.

WHEREAS, the Malaga County Water District desires to adopt a groundwater management plan that is consistent with recent amendments to the provisions of the California Water Code Section 10750 et. seq.; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on August 10, 2005 to discuss the adoption and implementation of the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the Board of Directors believes that groundwater can best be managed, as in the past, by local agencies in coordination with owners of lands overlying the groundwater basin; and

WHEREAS, the Board of Directors believes the updating and adoption of a new groundwater management plan will be in the best interests of its constituents and water users and can help meet the projected long-term water needs of the Malaga County Water District,

BE IT RESOLVED, by the Board of Directors as follows:

The foregoing findings are true and correct:

1. It is the intention of the Malaga County Water District to adopt the Fresno-Area Regional Groundwater Management Plan in accordance with Part 2.75 of Division 6 of the California Water Code, and the District's consultant is hereby authorized and directed to draft such a plan;

2. That this resolution shall be deemed a resolution of intention in accordance with California Water Code Section 10753.2;

3. After such a plan has been prepared in accordance with all applicable law, including but not limited to the California Environmental Quality Act, a second public hearing will be conducted in accordance with the California Water Code Section 10753.5, et seq. to determine whether to adopt the plan;

4. That the officers of Malaga County Water District are authorized and directed to publish this resolution of intention to update the District's groundwater management plan in accordance with the provisions of California Water Code Section 10753.3 and to provide interested persons with a copy of this resolution upon written request;

5. That the Board of Directors hereby authorizes its officers to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.

RESOLVED by the Board of Directors of the Malaga County Water District that the Fresno-Area Regional Groundwater Management Plan be developed to be in compliance with California Senate Bill No. 1938.

The General Manager of the Malaga County Water District is hereby authorized and directed to prepare the necessary data, make investigations, sign, and file such application with the California Department of Water Resources.

PASSED AND ADOPTED at a regular meeting of the Board of Directors of the Malaga County Water District on August 23, 2005.

Russ Holcomb
General Manager

RESOLUTION NO. 05-1201

RESOLUTION OF THE BOARD OF DIRECTORS OF THE GARFIELD WATER DISTRICT

FOR INTENTION TO ADOPT THE FRESNO-AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

WHEREAS, Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the Garfield Water District desires to adopt a groundwater management plan that is consistent with recent amendments to the provisions of the California Water Code Section 10750 et. seq.; and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District and Bakman Water Company have entered into a Memorandum of Understanding to cooperate and participate in the development of the Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within their respective jurisdictions; and

WHEREAS, the Garfield Water District has agreed to the terms of the Memorandum of Understanding to cooperate and participate in the development of the Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within its jurisdiction; and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District and Bakman Water Company desire to have the Garfield Water District participate in the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions.

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on December 8, 2005 to discuss the adoption and implementation of the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the Board of Directors believes that groundwater can best be managed, as in the past, by local agencies in coordination with owners of lands overlying the groundwater basin; and

WHEREAS, the Board of Directors believes the updating and adoption of a new groundwater management plan will be in the best interests of its constituents and water users and can help meet the projected long-term water needs of the Garfield Water District,

BE IT RESOLVED, by the Board of Directors as follows:

The foregoing findings are true and correct:

1. It is the intention of the Garfield Water District to adopt the Fresno-Area Regional Groundwater Management Plan in accordance with Part 2.75 of Division 6 of the California Water Code, and the District's consultant is hereby authorized and directed to draft such a plan;

2. That this resolution shall be deemed a resolution of intention in accordance with California Water Code Section 10753.2;

3. After such a plan has been prepared in accordance with all applicable law, including but not limited to the California Environmental Quality Act, a second public hearing will be conducted in accordance with the California Water Code Section 10753.5, et seq. to determine whether to adopt the plan;

4. That the officers of Garfield Water District are authorized and directed to publish this resolution of intention to update the District's groundwater management plan in accordance with the provisions of California Water Code Section 10753.3 and to provide interested persons with a copy of this resolution upon written request;

5. That the Board of Directors hereby authorizes its officers to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.

RESOLVED by the Board of Directors of the Garfield Water District that the Fresno-Area Regional Groundwater Management Plan be developed to be in compliance with California Senate Bill No. 1938.

The Secretary of the Garfield Water District is hereby authorized and directed to prepare the necessary data, make investigations, sign, and file such application with the California Department of Water Resources.

PASSED AND ADOPTED at a regular meeting of the Board of Directors of Garfield Water District on December 8, 2005.

Katherine B. Alves
Secretary

office, 2917 East Shepherd Avenue, Clovis, California. Opportunity for public questions and input will be provided at the hearing.

In compliance with Water Code Section 10753.4 (b), landowners and other interested parties who wish to participate in updating the groundwater management plan, may do so by attending the hearing and indicating their interest or by submitting a written letter to Gary Serrato, Secretary, Fresno Irrigation District, 2907 S. Maple Avenue, Fresno, California 93725.

/s/ **Katherine Alves**
November 21, 2005 Secretary
(PUB: November 26, 2005)

November 26, 2005

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated NOVEMBER 26, 2005

Cathy Hamlen

FPROOFAD

PROVOST & PRICHARD

ATTN: MICHAEL TAYLOR

286 W CROMWELL AVE

FRESNO , CA 937116162

PROOF OF PUBLICATION

COUNTY OF FRESNO
STATE OF CALIFORNIA

EXHIBIT A.

PUBLIC NOTICE

#104099

NOTICE OF ADOPTION OF RESOLUTION FOR INTENTION TO ADOPT THE FRESNO AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

NOTICE IS HEREBY GIVEN that Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, Bakman Water Company, City of Kerman, County of Fresno, Malaga County Water District, Pinedale County Water District and Garfield Water District should adopt a resolution of intention to adopt a Fresno Area Regional Groundwater Management Plan to be in compliance with California Senate Bill No. 1938. This regional groundwater management plan will replace the existing groundwater management plans adopted by the Fresno Irrigation District and the City of Clovis. This regional groundwater management plan will also replace the County of Fresno's existing groundwater management plan for the portion of the county within the plan area.

The resolution adopted by each party reads as follows:

WHEREAS, Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District , Bakman Water Company and Garfield Water District have entered into a Memorandum of Understanding to cooperate and participate in the development of the Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within their respective jurisdictions; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions.

WHEREAS, the (party) desires to adopt a groundwater management plan that is consistent with recent amendments to the provisions of the California Water Code Section 10750 et. seq.; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on August 10, 2005 to discuss the adoption and implementation of the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the (party's governing body) believes that groundwater can best be managed, as in the past, by local agencies in coordination with owners of lands overlying the groundwater basin; and

WHEREAS, the (party's governing body) believes the updating and adoption of a new groundwater management plan will be in the best interests of its constituents and water users and can help meet the projected long-term water needs of the (party),

BE IT RESOLVED, by the (party's governing body) as follows:

The foregoing findings are true and correct:

1. It is the intention of the (party) to adopt the Fresno-Area Regional Groundwater Management Plan in accordance with Part 2.75 of Division 6 of the California Water Code, and the District's consultant is hereby authorized and directed to draft such a plan;
2. That this resolution shall be deemed a resolution of intention in accordance with

The undersigned states:

McClatchy Newspapers in and on all dates herein stated was a corporation, and the owner and publisher of The Fresno Bee.

The Fresno Bee is a daily newspaper of general circulation now published, and on all-the-dates herein stated was published in the City of Fresno, County of Fresno, and has been adjudged a newspaper of general circulation by the Superior Court of the County of Fresno, State of California, under the date of November 22, 1994, Action No. 520058-9.

The undersigned is and on all dates herein mentioned was a citizen of the United States, over the age of twenty-one years, and is the principal clerk of the printer and publisher of said newspaper; and that the notice, a copy of which is hereto annexed, marked Exhibit A, hereby made a part hereof, was published in The Fresno Bee in each issue thereof (in type not smaller than nonpareil), on the following dates.

12/20 . 12/27/05

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated DECEMBER 27,2005

Aiko Yamani

PROVOST & PRICHARD

ATTN: MICHAEL TAYLOR

286 W CROMWELL AVE

FRESNO , CA 937116162

PROOF OF PUBLICATION

COUNTY OF FRESNO
STATE OF CALIFORNIA

EXHIBIT A.

PUBLIC NOTICE

#173824

NOTICE OF HEARING ON INTENTION TO ADOPT THE FRESNO AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

NOTICE IS HEREBY GIVEN that at 4:30 pm on the 10th day of August, 2005, at the office of the Fresno Irrigation District at 2907 S. Maple Avenue, Fresno, California, a public hearing will be held to discuss whether or not the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, Bakman Water Company, City of Kerman, County of Fresno, Malaga County Water District and Pinedale County Water District should adopt a resolution of intention to adopt a Fresno Area Regional Groundwater Management Plan to be in compliance with California Senate Bill No. 1938. This regional groundwater management plan will replace the existing groundwater management plans adopted by the Fresno Irrigation District and the City of Clovis. This regional groundwater management plan will also replace the County of Fresno's existing groundwater management plan for the portion of the county within the plan area.

Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas.

Landowners within these agency boundaries and other interested parties are invited to attend the hearing. Copies of the proposed resolution and other relevant written materials will be available for review by the public at the hearing or may be obtained in advance at the District Office, 2907 S. Maple Avenue, Fresno, California 93725. Opportunity for public questions & input will be provided at the hearing.

In compliance with Water Code 10753.4 (b), landowners and other interested parties who wish to participate in updating the groundwater management plan, including becoming a member of a technical advisory committee, may do so by attending the hearing and indicating their interest or by submitting a written letter to Gary Serrato, Secretary, Fresno Irrigation District, 2907 S. Maple Avenue, Fresno, California 93725.

/s/ Gary Serrato
General Manager

FPROC July 21, 2005

(PUB: July 26, August 2, 2005)

The undersigned states:

McClatchy Newspapers in and on all dates herein stated was a corporation, and the owner and publisher of The Fresno Bee.

The Fresno Bee is a daily newspaper of general circulation now published, and on all-the-dates herein stated was published in the City of Fresno, County of Fresno, and has been adjudged a newspaper of general circulation by the Superior Court of the County of Fresno, State of California, under the date of November 22, 1994, Action No. 520058-9.

The undersigned is and on all dates herein mentioned was a citizen of the United States, over the age of twenty-one years, and is the principal clerk of the printer and publisher of said newspaper; and that the notice, a copy of which is hereto annexed, marked Exhibit A, hereby made a part hereof, was published in The Fresno Bee in each issue thereof (in type not smaller than nonpareil), on the following dates.

July 26, 2005;
August 2, 2005

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated AUGUST 2, 2005

Cathy Aguilera

EXHIBIT A.

PUBLIC NOTICE

#104099

NOTICE OF ADOPTION OF RESOLUTION FOR INTENTION TO ADOPT THE FRESNO AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

NOTICE IS HEREBY GIVEN that Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, Bakman Water Company, City of Kerman, County of Fresno, Malaga County Water District, Pinedale County Water District and Garfield Water District should adopt a resolution of intention to adopt a Fresno Area Regional Groundwater Management Plan to be in compliance with California Senate Bill No. 1938. This regional groundwater management plan will replace the existing groundwater management plans adopted by the Fresno Irrigation District and the City of Clovis. This regional groundwater management plan will also replace the County of Fresno's existing groundwater management plan for the portion of the county within the plan area.

The resolution adopted by each party reads as follows:

WHEREAS, Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District , Bakman Water Company and Garfield Water District have entered into a Memorandum of Understanding to cooperate and participate in the development of the Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within their respective jurisdictions; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions.

WHEREAS, the (party) desires to adopt a groundwater management plan that is consistent with recent amendments to the provisions of the California Water Code Section 10750 et. seq.; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on August 10, 2005 to discuss the adoption and implementation of the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the (party's governing body) believes that groundwater can best be managed, as in the past, by local agencies in coordination with owners of lands overlying the groundwater basin; and

WHEREAS, the (party's governing body) believes the updating and adoption of a new groundwater management plan will be in the best interests of its constituents and water users and can help meet the projected long-term water needs of the (party),

BE IT RESOLVED, by the (party's governing body) as follows:

The foregoing findings are true and correct:

1. It is the intention of the (party) to adopt the Fresno-Area Regional Groundwater Management Plan in accordance with Part 2.75 of Division 6 of the California Water Code, and the District's consultant is hereby authorized and directed to draft such a plan;
2. That this resolution shall be deemed a resolution of intention in accordance with California Water Code Section 10753.2;
3. After such a plan has been prepared in accordance with all applicable law, including but not limited to the California Environmental Quality Act, a second public hearing will be conducted in accordance with the California Water Code Section 10753.5, et seq. to determine whether to adopt the plan;
4. That the officers of (party) are authorized and directed to publish this resolution of intention to update the District's groundwater management plan in accordance with the provisions of California Water Code Section 10753.3 and to provide interested persons with a copy of this resolution upon written request;
5. That the (party's governing body) hereby authorizes its officers to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.

RESOLVED by the (party's governing body) of the (party) that the Fresno-Area Regional Groundwater Management Plan be developed to be in compliance with California Senate Bill No. 1938.

The of the (party) is hereby authorized and directed to prepare the necessary data, make investigations, sign, and file such application with the California Department of Water Resources.

The resolutions were adopted on the following dates: Fresno Irrigation District on 8/10/2005, City of Clovis on 9/6/2005, Bakman Water Company on 7/8/2005, County of Fresno on 10/11/2005, City of Fresno on 9/20/2005, Pinedale County Water District on 10/5/2005, Fresno Metropolitan Flood Control District on 8/24/2005, City of Kerman on 7/6/2005, Malaga County Water District on 8/23/2005, and Garfield Water District on 12/8/2005.

(PUB: December 20,27, 2005)

PROVOST & PRICHARD

ATTN: MICHAEL TAYLOR

286 W CROMWELL AVE

FRESNO , CA 937116162

PROOF OF PUBLICATION

COUNTY OF FRESNO
STATE OF CALIFORNIA

EXHIBIT A.

PUBLIC NOTICE

#47015

NOTICE OF HEARING ON INTENTION TO ADOPT THE FRESNO AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

NOTICE IS HEREBY GIVEN that at five o'clock on the 25th day of January, 2006, at the office of the Fresno Irrigation District at 2907 S. Maple Avenue, Fresno, California, a public hearing will be held to discuss whether or not the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, Bakman Water Company, City of Kerman, County of Fresno, Malaga County Water District, Pinedale County Water District, and Garfield Water District should adopt a resolution of intention to adopt a Fresno Area Regional Groundwater Management Plan to be in compliance with California Senate Bill No. 1938. This regional groundwater management plan will replace the existing groundwater management plans adopted by the Fresno Irrigation District and the City of Clovis. This regional groundwater management plan will also replace the County of Fresno's existing groundwater management plan for the portion of the county within the plan area.

Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas. The Plan includes the required sections for groundwater management plan, as cited in Section 10753 of the California Water Code and Department of Water Resources recommendations as indicated in DWR Bulletin 118, Appendix C. A Technical Advisory Committee of agency representatives and landowners has provided input for the development of the Plan. The Plan includes regional groundwater management objectives, and a listing of existing and planned groundwater management actions to accomplish these objectives.

Landowners within these agency boundaries and other interested parties are invited to attend the hearing. Copies of the proposed resolution and other relevant written materials will be available for review by the public at the hearing or may be obtained in advance at the District Office, 2907 S. Maple Avenue, Fresno, California 93725. Opportunity for public questions & input will be provided at the hearing.

In compliance with Water Code Section 10753.4 (b), landowners and other interested parties who wish to participate in updating the groundwater management plan, including becoming a member of a technical advisory committee, may do so by attending the hearing and indicating their interest or by submitting a written letter to Gary Serrato, Secretary, Fresno Irrigation District, 2907 S. Maple Avenue, Fresno, California 93725.

/s/ Gary Serrato
General Manager

January 5, 2006

(PUB: January 10,17, 2006)

The undersigned states:

McClatchy Newspapers in and on all dates herein stated was a corporation, and the owner and publisher of The Fresno Bee.

The Fresno Bee is a daily newspaper of general circulation now published, and on all-the-dates herein stated was published in the City of Fresno, County of Fresno, and has been adjudged a newspaper of general circulation by the Superior Court of the County of Fresno, State of California, under the date of November 22, 1994, Action No. 520058-9.

The undersigned is and on all dates herein mentioned was a citizen of the United States, over the age of twenty-one years, and is the principal clerk of the printer and publisher of said newspaper; and that the notice, a copy of which is hereto annexed, marked Exhibit A, hereby made a part hereof, was published in The Fresno Bee in each issue thereof (in type not smaller than nonpareil), on the following dates.

January 10, 17, 2006

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated JANUARY 17,2006

Cathy Aguilera

FPROOFAD

PROVOST & PRICHARD

ATTN: MICHAEL TAYLOR

286 W CROMWELL AVE

FRESNO , CA 937116162

PROOF OF PUBLICATION

COUNTY OF FRESNO
STATE OF CALIFORNIA

EXHIBIT A.

PUBLIC NOTICE

#167234

NOTICE OF ADOPTION OF RESOLUTION FOR INTENTION TO ADOPT THE FRESNO AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

NOTICE IS HEREBY GIVEN that Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, Bakman Water Company, City of Kerman, County of Fresno, Malaga County Water District, Pinedale County Water District and Garfield Water District should adopt a resolution of intention to adopt a Fresno Area Regional Groundwater Management Plan to be in compliance with California Senate Bill No. 1938. This regional groundwater management plan will replace the existing groundwater management plans adopted by the Fresno Irrigation District and the City of Clovis. This regional groundwater management plan will also replace the County of Fresno's existing groundwater management plan for the portion of the county within the plan area.

The resolution adopted by each party reads as follows:

WHEREAS, Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District , Bakman Water Company and Garfield Water District have entered into a Memorandum of Understanding to cooperate and participate in the development of the Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within their respective jurisdictions; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions.

WHEREAS, the (party) desires to adopt a groundwater management plan that is consistent with recent amendments to the provisions of the California Water Code Section 10750 et. seq.; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on August 10, 2005 to discuss the adoption and implementation of the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the (party's governing body) believes that groundwater can best be managed, as in the past, by local agencies in coordination with owners of lands overlying the groundwater basin; and

WHEREAS, the (party's governing body) believes the updating and adoption of a new groundwater management plan will be in the best interests of its constituents and water users and can help meet the projected long-term water needs of the (party),

BE IT RESOLVED, by the (party's governing body) as follows:

The foregoing findings are true and correct:

1. It is the intention of the (party) to adopt the Fresno-Area Regional Groundwater Management Plan in accordance with Part 2.75 of Division 6 of the California Water Code, and the District's consultant is hereby authorized and directed to draft such a plan;
2. That this resolution shall be deemed a resolution of intention in accordance with California Water Code Section 10753.2;
3. After such a plan has been prepared in accordance with all applicable law, including but not limited to the California Environmental Quality Act, a second public hearing will be conducted in accordance with the California Water Code Section 10753.5, et seq. to determine whether to adopt the plan;

The undersigned states:

McClatchy Newspapers in and on all dates herein stated was a corporation, and the owner and publisher of The Fresno Bee.

The Fresno Bee is a daily newspaper of general circulation now published, and on all-the-dates herein stated was published in the City of Fresno, County of Fresno, and has been adjudged a newspaper of general circulation by the Superior Court of the County of Fresno, State of California, under the date of November 22, 1994, Action No. 520058-9.

The undersigned is and on all dates herein mentioned was a citizen of the United States, over the age of twenty-one years, and is the principal clerk of the printer and publisher of said newspaper; and that the notice, a copy of which is hereto annexed, marked Exhibit A, hereby made a part hereof, was published in The Fresno Bee in each issue thereof (in type not smaller than nonpareil), on the following dates.

November 24, December 1, 2006

I certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated DECEMBER 1,2006

Cathy Hamlen

EXHIBIT A.

PUBLIC NOTICE

#167234

NOTICE OF ADOPTION OF RESOLUTION FOR INTENTION TO ADOPT THE FRESNO AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

NOTICE IS HEREBY GIVEN that Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, Bakman Water Company, City of Kerman, County of Fresno, Malaga County Water District, Pinedale County Water District and Garfield Water District should adopt a resolution of intention to adopt a Fresno Area Regional Groundwater Management Plan to be in compliance with California Senate Bill No. 1938. This regional groundwater management plan will replace the existing groundwater management plans adopted by the Fresno Irrigation District and the City of Clovis. This regional groundwater management plan will also replace the County of Fresno's existing groundwater management plan for the portion of the county within the plan area.

The resolution adopted by each party reads as follows:

WHEREAS, Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District , Bakman Water Company and Garfield Water District have entered into a Memorandum of Understanding to cooperate and participate in the development of the Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within their respective jurisdictions; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions.

WHEREAS, the (party) desires to adopt a groundwater management plan that is consistent with recent amendments to the provisions of the California Water Code Section 10750 et. seq.; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on August 10, 2005 to discuss the adoption and implementation of the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the (party's governing body) believes that groundwater can best be managed, as in the past, by local agencies in coordination with owners of lands overlying the groundwater basin; and

WHEREAS, the (party's governing body) believes the updating and adoption of a new groundwater management plan will be in the best interests of its constituents and water users and can help meet the projected long-term water needs of the (party),

BE IT RESOLVED, by the (party's governing body) as follows:

The foregoing findings are true and correct:

1. It is the intention of the (party) to adopt the Fresno-Area Regional Groundwater Management Plan in accordance with Part 2.75 of Division 6 of the California Water Code, and the District's consultant is hereby authorized and directed to draft such a plan;
2. That this resolution shall be deemed a resolution of intention in accordance with California Water Code Section 10753.2;
3. After such a plan has been prepared in accordance with all applicable law, including but not limited to the California Environmental Quality Act, a second public hearing will be conducted in accordance with the California Water Code Section 10753.5, et seq. to determine whether to adopt the plan;
4. That the officers of (party) are authorized and directed to publish this resolution of intention to update the District's groundwater management plan in accordance with the provisions of California Water Code Section 10753.3 and to provide interested persons with a copy of this resolution upon written request;
5. That the (party's governing body) hereby authorizes its officers to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.

RESOLVED by the (party's governing body) of the (party) that the Fresno-Area Regional Groundwater Management Plan be developed to be in compliance with California Senate Bill No. 1938.

The (agency authorized representative) of the (party) is hereby authorized and directed to prepare the necessary data, make investigations, sign, and file such application with the California Department of Water Resources.

The resolutions were adopted on the following dates: Fresno Irrigation District on 1/25/06, City of Clovis on 2/13/06, Bakman Water Company on 3/13/06, County of Fresno on 7/18/06, City of Fresno on 4/18/06; Pinedale County Water District on 9/20/06, Fresno Metropolitan Flood Control District on 2/8/06, City of Kerman on 3/1/06, Malaga County Water District on 2/14/06, and Garfield Water District on 11/1/06.

(PUB: November 24, December 1, 2006)

FRESNO AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

APPENDIX B

RESOLUTIONS TO ADOPT PLAN

RESOLUTION NO. 2006-03

RESOLUTION OF THE BOARD OF DIRECTORS OF THE FRESNO IRRIGATION DISTRICT

ADOPTING THE FRESNO-AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

WHEREAS, Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the District adopted a groundwater management plan consistent with the provisions of the California Water Code Section 10750 et. seq. on August 12, 1996; and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District, Garfield Water District and Bakman Water Company have entered into a Memorandum of Understanding to cooperate and participate in the development of the Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within their respective jurisdictions; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions.

WHEREAS, the Fresno Irrigation District desires to adopt a groundwater management plan that is consistent with recent amendments to the provisions of the California Water Code Section 10750 et. seq.; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on August 10, 2005 to discuss the intent to prepare the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the Board of Directors of the Fresno Irrigation District adopted a Resolution of Intent to Prepare the Fresno-Area Regional Groundwater Management Plan on August 10, 2005; and

WHEREAS, the public was invited to participate in the development of the Fresno-Area Regional Groundwater Management and a Technical Advisory Committee comprised of landowners and participant representatives was formed and met regularly to develop the Plan; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on January 25, 2006 to discuss the adoption and implementation of the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the Board of Directors believes that groundwater can best be managed, as in the past, by local agencies in coordination with owners of lands overlying the groundwater basin; and

WHEREAS, the Board of Directors believes the adoption of the Fresno-Area Regional Groundwater Management Plan is in the best interests of its constituents and water users and can help meet the projected long-term water needs of the Fresno Irrigation District,

BE IT RESOLVED, by the Board of Directors as follows:

The foregoing findings are true and correct:

1. That the Board of Directors of the Fresno Irrigation District does hereby adopt the Fresno-Area Regional Groundwater Management Plan as submitted on the date of this resolution.

2. That the officers of Fresno Irrigation District are authorized and directed to publish this resolution of adopt the Fresno-Area Regional Groundwater Management Plan in accordance with the provisions of California Water Code Section 10753.3 and to provide interested persons with a copy of this resolution upon written request;

3. That the Board of Directors hereby authorizes its officers to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.

PASSED AND ADOPTED at a regular meeting of the Board of Directors of Fresno Irrigation District on January 25, 2006.

Jacob C. Andresen

Jacob C. Andresen, President

CERTIFICATE OF SECRETARY

I hereby certify that I am the Secretary of the Fresno Irrigation District and that the foregoing Resolution was duly adopted by the Board of Directors of said District at the Special Meeting duly held in Fresno, California on January 25, 2006, at which meeting a quorum of said Board of Directors was at all times present and acting.

IN WITNESS WHEREOF, I have hereunto set my hand and seal of said District this 25th day of January, 2006.

Gary R. Serrato, Secretary

	Aye	Nay	Absent	Abstain
President Andresen	✓			
Vice-President Boswell	✓			
Director Niederfrank	✓			
Director Balls	✓			
Director Neely	✓			

RESOLUTION NO. 06-37

A RESOLUTION OF THE COUNCIL OF THE CITY OF CLOVIS ADOPTING THE FRESNO-AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

WHEREAS, Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the City of Clovis adopted a groundwater management plan consistent with the provisions of the California Water Code Section 10750 et. seq. on November 17, 1997; and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District, Garfield Water District and Bakman Water Company have entered into a Memorandum of Understanding to cooperate and participate in the development of the Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within their respective jurisdictions; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions; and

WHEREAS, the City of Clovis desires to adopt a groundwater management plan that is consistent with recent amendments to the provisions of the California Water Code Section 10750 et. seq.; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on August 10, 2005 to discuss the intent to prepare the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the City Council of the City of Clovis adopted a Resolution of Intention to Adopt the Fresno-Area Regional Groundwater Management Plan on September 6, 2005; and

WHEREAS, the public was invited to participate in the development of the Fresno-Area Regional Groundwater Management and a Technical Advisory Committee comprised of landowners and participant representatives was formed and met regularly to develop the Plan; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on January 25, 2006 to discuss the adoption and implementation of the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the Clovis City Council believes that groundwater can best be managed, as in the past, by local agencies in coordination with owners of lands overlying the groundwater basin; and

WHEREAS, the Clovis City Council believes the adoption of the Fresno-Area Regional Groundwater Management Plan is in the best interests of its constituents and water users and can help meet the projected long-term water needs of the City of Clovis,

BE IT RESOLVED, by the Clovis City Council as follows:

The foregoing findings are true and correct:

1. That the Council of the City of Clovis does hereby adopt the Fresno-Area Regional Groundwater Management Plan as submitted on the date of this resolution.

2. That the officers of the City of Clovis are authorized and directed to publish this resolution of adoption of the Fresno-Area Regional Groundwater Management Plan in accordance with the provisions of California Water Code Section 10753.3 and to provide interested persons with a copy of this resolution upon written request;

3. That the Clovis City Council hereby authorizes the Public Utilities Director to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.

* * * * * *

The foregoing resolution was introduced and adopted at a regular meeting of the City Council of the City of Clovis held on February 13, 2006, by the following vote, to wit:

AYES: Councilmembers Armstrong, Ashbeck, Flores, Whalen

NOES: None

ABSENT: Mayor Magsig

ABSTAIN: None

DATED: February 13, 2006

CITY OF CLOVIS ★ 1912 ★ INCORPORATED FEBRUARY 27

Mayor

City Clerk

CLERK'S CERTIFICATE

I, Diana Stice, Deputy City Clerk of the City of Clovis do hereby certify that the attached is a true and correct copy of Resolution 06-37 dated February 13, 2006 as it appears in the Office of the City Clerk.

IN WITNESS WHEREOF, I hereunto set my hand and affix the seal of the City of Clovis on February 22, 2006.

CITY OF CLOVIS ★ 1912 ★ INCORPORATED FEBRUARY 27

Diana Stice

Diana Stice, Deputy City Clerk

RESOLUTION NO. 06-01

RESOLUTION OF THE BOARD OF DIRECTORS OF THE BAKMAN WATER COMPANY

ADOPTING THE FRESNO-AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

WHEREAS, Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the District adopted a groundwater management plan consistent with the provisions of the California Water Code Section 10750 et. seq. on August 12, 1996; and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District, Garfield Water District and Bakman Water Company have entered into a Memorandum of Understanding to cooperate and participate in the development of the Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within their respective jurisdictions; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions.

WHEREAS, the Bakman Water Company desires to adopt a groundwater management plan that is consistent with recent amendments to the provisions of the California Water Code Section 10750 et. seq.; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on August 10, 2005 to discuss the intent to prepare the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the Board of Directors of the Bakman Water Company adopted a Resolution of Intent to Prepare the Fresno-Area Regional Groundwater Management Plan on August 10, 2005; and

WHEREAS, the public was invited to participate in the development of the Fresno-Area Regional Groundwater Management and a Technical Advisory Committee comprised of landowners and participant representatives was formed and met regularly to develop the Plan; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on January 25, 2006 to discuss the adoption and implementation of the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the Board of Directors believes that groundwater can best be managed, as in the past, by local agencies in coordination with owners of lands overlying the groundwater basin; and

WHEREAS, the Board of Directors believes the adoption of the Fresno-Area Regional Groundwater Management Plan is in the best interests of its constituents and water users and can help meet the projected long-term water needs of the Bakman Water Company,

BE IT RESOLVED, by the Board of Directors as follows:

The foregoing findings are true and correct:

1. That the Board of Directors of the Bakman Water Company does hereby adopt the Fresno-Area Regional Groundwater Management Plan as submitted on the date of this resolution.

2. That the officers of Bakman Water Company are authorized and directed to publish this resolution of adopt the Fresno-Area Regional Groundwater Management Plan in accordance with the provisions of California Water Code Section 10753.3 and to provide interested persons with a copy of this resolution upon written request;

3. That the Board of Directors hereby authorizes its officers to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.

PASSED AND ADOPTED at a regular meeting of the Board of Directors of Bakman Water Company on March 13, 2006.

President

BAKMAN WATER COMPANY

TELEPHONE (559) 255-0324 • P.O. BOX 7965 • 5105 E. BELMONT • FRESNO, CA 93747

MINUTES OF THE SPECIAL MEETING OF THE BOARD OF DIRECTORS OF BAKMAN WATER COMPANY, A CALIFORNIA CORPORATION.

A special meeting of the Board of Directors of the Bakman Water Company was held at the Bakman Water Co. office located at 5105 E. Belmont Ave, Fresno, California.

Date: March 13, 2006 **Time**: 9:00am

Officers present were Richard Tim Bakman, Virginia Bakman, and Dottie Patton.

On March 13, 2005, a special meeting was called to discuss the possibility of adopting the **Fresno-Area Regional Groundwater Management Plan**

The following being all of the directors of Bakman Water Company, hereby PASSED AND ADOPTED the **Fresno-Area Regional Groundwater Management Plan** on March 13, 2006.

Richard Tim Bakman

Virginia A. Bakman

Dottie Patton, Secretary/Treasurer

RESOLUTION NO. 06-464

RESOLUTION OF THE BOARD OF SUPERVISORS OF THE COUNTY OF FRESNO

ADOPTING THE FRESNO-AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

WHEREAS, Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the District adopted a groundwater management plan consistent with the provisions of the California Water Code Section 10750 et. seq. on August 12, 1996; and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District, Garfield Water District and Bakman Water Company have entered into a Memorandum of Understanding to cooperate and participate in the development of the Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within their respective jurisdictions; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions.

WHEREAS, the Board of Supervisors desires to adopt a groundwater management plan that is consistent with recent amendments to the provisions of the California Water Code Section 10750 et. seq.; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on August 10, 2005 to discuss the intent to prepare the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the Board of Supervisors of the County of Fresno adopted a Resolution of Intent to Prepare the Fresno-Area Regional Groundwater Management Plan on October 11, 2005; and

WHEREAS, the public was invited to participate in the development of the Fresno-Area Regional Groundwater Management and a Technical Advisory Committee comprised of landowners and participant representatives was formed and met regularly to develop the Plan; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on January 25, 2006 to discuss the adoption and implementation of the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the Board of Supervisors believes that groundwater can best be managed, as in the past, by local agencies in coordination with owners of lands overlying the groundwater basin; and

WHEREAS, the Board of Supervisors believes the adoption of the Fresno-Area Regional Groundwater Management Plan is in the best interests of its constituents and water users and can help meet the projected long-term water needs of the County of Fresno,

BE IT RESOLVED, by the Board of Supervisors as follows:

The foregoing findings are true and correct:

1. That the Board of Supervisors of the County of Fresno do hereby adopt the Fresno-Area Regional Groundwater Management Plan as submitted on the date of this resolution.

2. That the officers of County of Fresno are authorized and directed to publish this resolution of adopt the Fresno-Area Regional Groundwater Management Plan in accordance with the provisions of California Water Code Section 10753.3 and to provide interested persons with a copy of this resolution upon written request;

3. That the Board of Supervisors hereby authorizes its officers to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.

THE FOREGOING was passed and adopted by the following vote of the Board of Supervisors of the County of Fresno this 18th day of July, 2006, to-wit:

AYES: Supervisors Anderson, Case, Perea, Waterston, Larson

NOES: None

ABSENT: None

CHAIRMAN, Board of Supervisors

ATTEST:

BERNICE E. SEIDEL, Clerk
Board of Supervisors

By _____ Deputy

Agenda #5

Resolution #06-464

CERTIFICATE OF DELIVERY OF DOCUMENT

I am employed by the County of Fresno as a Deputy Clerk of the Board of Supervisors. On July 18, 2006, I delivered a copy of Resolution No. 06-464 to the Chairman of the Fresno County Board of Supervisors.

Javier Flores, Deputy Clerk

RESOLUTION NO. 2006-146

A RESOLUTION OF THE COUNCIL OF THE CITY OF FRESNO, CALIFORNIA, ADOPTING THE FRESNO-AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

WHEREAS, Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the Fresno Irrigation District adopted a groundwater management plan consistent with the provisions of the California Water Code Section 10750 et. seq. on August 12, 1996; and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District, Garfield Water District and Bakman Water Company have entered into a Memorandum of Understanding to cooperate and participate in the development of the Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within their respective jurisdictions; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions.

WHEREAS, the City of Fresno desires to adopt a groundwater management plan that is consistent with recent amendments to the provisions of the California Water Code Section 10750 et. seq.; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on August 10, 2005 to discuss the intent to prepare the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the Council of the City of Fresno adopted a Resolution of Intent to Prepare the Fresno-Area Regional Groundwater Management Plan on September 20, 2005; and

Adopted _____
Approved _____
Effective _____

2006-146

Management Plan in accordance with the provisions of California Water Code Section 10753.3 and to provide interested persons with a copy of this resolution upon written request;

4. That the Council hereby authorizes its officers to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.

* * * * * * * * * * * * * *

STATE OF CALIFORNIA)
COUNTY OF FRESNO) ss.
CITY OF FRESNO)

I, REBECCA E. KLISCH, City Clerk of the City of Fresno, certify that the foregoing resolution was adopted by the Council of the City of Fresno, at a regular meeting held on the 18th day of April, 2006.

AYES	:	Boyajian, Calhoun, Dages, Perea, Sterling, Westerlund, Duncan
NOES	:	None
ABSENT	:	None
ABSTAIN	:	None

REBECCA E. KLISCH
City Clerk

BY: Rebecca E. Klisch
Deputy

APPROVED AS TO FORM:
CITY ATTORNEY'S OFFICE

BY: _____
Deputy City Attorney

JCH:ns [37684ns/jch] – 4/10/06

REC'D OCT 16 2006

RESOLUTION NO. 7 OF 2006
PINEDALE COUNTY WATER DISTRICT
FRESNO COUNTY, CALIFORNIA

RESOLUTION ADOPTING THE FRESNO-AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

WHEREAS, Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, a groundwater management plan consistent with the provisions of California Water Code Section 10750, et seq, was adopted on August 12, 1996, and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District, Garfield Water District and Bakman Water Company have entered into a Memorandum of Understanding to cooperate and participate in the development of Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within their respective jurisdictions; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions, and

WHEREAS, the Pinedale County Water District desires to adopt a groundwater management plan that is consistent with recent amendments to the provisions of the California Water Code Section 10750 et.seq.; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2 (a), and held on August 10, 2005 to discuss whether or not to adopt a resolution of intention to draft a groundwater management plan for the purpose of establishing a groundwater management program: and

WHEREAS, after the hearing, the Pinedale County Water District adopted a Resolution of Intention to draft a ground water management plan in accord with the provisions of California Water Code Section 10753.2(b), and

WHEREAS, the Pinedale County Water District, after its adoption of said Resolution of Intention, caused said Resolution of Intention to be published pursuant to Section 6066 of the Government Code, and

WHEREAS, a Working Draft of the Fresno Area Regional Groundwater Management was prepared on behalf of the parties to the aforementioned Memorandum of Understanding, and

WHEREAS, a public hearing was duly noticed and heard pursuant to the provisions of Water Code Section 10753.5, and

WHEREAS, the Board of Directors believes that groundwater can best be managed by local agencies in coordination with owners of lands overlying the groundwater basin; and

WHEREAS, the Board of Directors believes the adoption of the Fresno-Area Regional Groundwater Management Plan is in the best interest of its constituents and water users and can help meet the projected long-term water needs of the Pinedale County Water District.

BE IT RESOLVED, by the Board of Directors as follows:

The foregoing findings are true and correct:

1. That the Board of Directors of the Pinedale County Water District does hereby adopt the Fresno-Area Regional Groundwater Management Plan as submitted on the date of this Resolution.

2. That the Board of Directors of the Pinedale County Water District hereby authorizes its Officers to execute all documents and to take any other action necessary or advisable to carry out the purposes of this Resolution.

PASSED AND ADOPTED at a regular meeting of the Board of Directors of the Pinedale County Water District this 20th day of September 2006 by the following vote:

AYES : RICHARD BURRILL, NICOLE COOPER, EDWARD HIGGASON, DAVID RODRIGUEZ, DELTES COOPER

NOES : NONE

ABSENT : NONE

S/ RICHARD BURRILL
RICHARD BURRILL, President of the Board of Directors of Pinedale County Water District.

S/ PAM EINSEL
PAM EINSEL, Secretary of the Pinedale County Water District

Eugene L. Adams
ATTORNEY AT LAW
3554 W. Magill Ave
Fresno, CA 93711-0815
(559) 485-4611

SECRETARY'S CERTIFICATE

I, PAM EINSEL, Secretary of the Pinedale County Water District, do hereby certify that the foregoing is a full, true and correct copy of a Resolution duly adopted at a regular meeting of the Board of Directors of said Pinedale County Water District, duly and legally held at the regular meeting place thereof on the 20th day of September, 2006, of which meeting all of the members of said Board had due notice and at which a majority thereof were present; that at said meeting, said Resolution was introduced by Director EDWARD HIGGASON and read in full and was, thereupon, on motion of Director EDWARD HIGGASON, seconded by Director DAVID RODRIGUEZ and adopted by the following vote:

AYES : RICHARD BURRILL, EDWARD HIGGASON
DAVID RODRIGUEZ, DELTES COOPER, NICOLE COOPER

NOES : NONE

ABSENT: NONE

That I have carefully compared the same with the original minutes of said meeting on file in my office and that said Resolution is a full, true and correct copy of the original Resolution adopted at said meeting and entered in said minutes. That said Resolution has not been amended, modified or rescinded since the date of its adoption and the same is now in full force and effect

WITNESS MY HAND and the Seal of said District this 6th day of October, 2006.

Pam Einsel

PAM EINSEL, Secretary of the
Pinedale County Water District

EUGENE L. ADAMS
ATTORNEY AT LAW
3553 W Magill Ave
Fresno, CA 93711-0815
(559) 485-4611

RESOLUTION NO. 2006-490

BEFORE THE BOARD OF DIRECTORS OF THE FRESNO METROPOLITAN FLOOD CONTROL DISTRICT

RESOLUTION ADOPTING THE FRESNO-AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

WHEREAS, Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the District adopted a Groundwater Management Plan consistent with the provisions of the California Water Code Section 10750 et. seq. on August 12, 1996; and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District, Garfield Water District and Bakman Water Company have entered into a Memorandum of Understanding to cooperate and participate in the development of the Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within their respective jurisdictions; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions; and

WHEREAS, the Fresno Metropolitan Flood Control District desires to adopt a Groundwater Management Plan that is consistent with recent amendments to the provisions of the California Water Code Section 10750 et. seq.; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on August 10, 2005 to discuss the intent to prepare the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the Board of Directors of the Fresno Metropolitan Flood Control District adopted a Resolution of Intent to Prepare the Fresno-Area Regional Groundwater Management Plan on August 24, 2005; and

WHEREAS, the public was invited to participate in the development of the Fresno-Area Regional Groundwater Management and a Technical Advisory Committee comprised of landowners and participant representatives was formed and met regularly to develop the Plan; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on January 25, 2006 to discuss the adoption and implementation of the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the Board of Directors believes that groundwater can best be managed, as in the past, by local agencies in coordination with owners of lands overlying the groundwater basin; and

WHEREAS, the Board of Directors believes the adoption of the Fresno-Area Regional Groundwater Management Plan is in the best interests of its constituents and water users and can help meet the projected long-term water needs of the Fresno Metropolitan Flood Control District; and

BE IT RESOLVED, by the Fresno Metropolitan Flood Control District as follows: The foregoing findings are true and correct:

1. That the Board of Directors of the Fresno Metropolitan Flood Control District does hereby adopt the Fresno-Area Regional Groundwater Management Plan as submitted on the date of this Resolution.
2. That the officers of the Fresno Metropolitan Flood Control District are authorized and directed to publish this resolution of adopt the Fresno-Area Regional Groundwater Management Plan in accordance with the provisions of California Water Code Section 10753.3 and to provide interested persons with a copy of this resolution upon written request;
3. That the Board of Directors hereby authorizes its officers to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.

PASSED AND ADOPTED by the Board of Directors of the District this 8th day of February 2006 by the following vote, to wit:

AYES:	Directors Franco, Welton, Spina, Groom, Williams and Rastegar
NOES:	None
ABSENT:	Director Marcus
ABSTAIN:	None

RESOLUTION NO. 06-17

RESOLUTION OF THE CITY COUNCIL OF THE CITY OF KERMAN

ADOPTING THE FRESNO-AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

WHEREAS, Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the District adopted a groundwater management plan consistent with the provisions of the California Water Code Section 10750 et. seq. on August 12, 1996; and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District, Garfield Water District and Bakman Water Company have entered into a Memorandum of Understanding to cooperate and participate in the development of the Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within their respective jurisdictions; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions.

WHEREAS, the City Council of the City of Kerman desires to adopt a groundwater management plan that is consistent with recent amendments to the provisions of the California Water Code Section 10750 et. seq.; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on August 10, 2005 to discuss the intent to prepare the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the of the City Council of the City of Kerman adopted a Resolution of Intent to Prepare the Fresno-Area Regional Groundwater Management Plan on August 10, 2005; and

WHEREAS, the public was invited to participate in the development of the Fresno-Area Regional Groundwater Management and a Technical Advisory Committee comprised of landowners and participant representatives was formed and met regularly to develop the Plan; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on January 25, 2006 to discuss the adoption and implementation of the Fresno-Area Regional Groundwater Management Plan; and

RECD JAN 05 2006

WHEREAS, the City Council of the City of Kerman believes that groundwater can best be managed, as in the past, by local agencies in coordination with owners of lands overlying the groundwater basin; and

WHEREAS, the City Council of the City of Kerman believes the adoption of the Fresno-Area Regional Groundwater Management Plan is in the best interests of its constituents and water users and can help meet the projected long-term water needs of the City of Kerman.

BE IT RESOLVED, by the City Council of the City of Kerman as follows:

The foregoing findings are true and correct:

1. That the City Council of the City of Kerman does hereby adopt the Fresno-Area Regional Groundwater Management Plan as submitted on the date of this resolution.

2. That the officers of City Council of the City of Kerman are authorized and directed to publish this resolution of adopt the Fresno-Area Regional Groundwater Management Plan in accordance with the provisions of California Water Code Section 10753.3 and to provide interested persons with a copy of this resolution upon written request;

3. That the City Council of the City of Kerman hereby authorizes its officers to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.

PASSED AND ADOPTED at a regular meeting of the City Council of the City of Kerman on the 1st day of March, 2006.

L. Renee Holdcroft

CITY CLERK, CITY OF KERMAN

The foregoing resolution was adopted at a regular meeting of the City Council of the City of Kerman on the 1st day of March, 2006, and passed at said meeting by the following vote:

AYES: Cromartie, Rodriguez, Sidhu, Stockwell

NOES: None

ABSENT: None

ABSTAIN: Council Member Moore

The foregoing resolution is hereby approved.

Gene Moore

MAYOR, CITY OF KERMAN

ATTEST:

L. Renee Holdcroft

CITY CLERK, CITY OF KERMAN

CITY CLERK
RESOLUTION CERTIFICATION

I, L. RENEE HOLDCROFT, do hereby certify as follows:

That I am the City Clerk of the City of Kerman and that the foregoing document, being Resolution No. 06-17, was passed at a regular meeting of the City Council of the City of Kerman held on the 1st day of March, 20 06 and I further certify that the foregoing is a true and correct copy of the document so adopted.

6-1-06
DATE

L. Renee Holdcroft
L. RENEE HOLDCROFT
City Clerk

RESOLUTION NO. 02-14-06 (B)

RESOLUTION OF THE BOARD OF DIRECTORS OF THE MALAGA COUNTY WATER DISTRICT

ADOPTING THE FRESNO-AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

WHEREAS, Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the District adopted a groundwater management plan consistent with the provisions of the California Water Code Section 10750 et. seq. on August 12, 1996; and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District, Garfield Water District and Bakman Water Company have entered into a Memorandum of Understanding to cooperate and participate in the development of the Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within their respective jurisdictions; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions.

WHEREAS, the Malaga County Water District desires to adopt a groundwater management plan that is consistent with recent amendments to the provisions of the California Water Code Section 10750 et. seq.; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on August 10, 2005 to discuss the intent to prepare the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the Board of Directors of the Malaga County Water District adopted a Resolution of Intent to Prepare the Fresno-Area Regional Groundwater Management Plan on August 10, 2005; and

WHEREAS, the public was invited to participate in the development of the Fresno-Area Regional Groundwater Management and a Technical Advisory Committee comprised of landowners and participant representatives was formed and met regularly to develop the Plan; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on January 25, 2006 to discuss the adoption and implementation of the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the Board of Directors believes that groundwater can best be managed, as in the past, by local agencies in coordination with owners of lands overlying the groundwater basin; and

WHEREAS, the Board of Directors believes the adoption of the Fresno-Area Regional Groundwater Management Plan is in the best interests of its constituents and water users and can help meet the projected long-term water needs of the Malaga County Water District,

BE IT RESOLVED, by the Board of Directors as follows:

The foregoing findings are true and correct:

1. That the Board of Directors of the Malaga County Water District does hereby adopt the Fresno-Area Regional Groundwater Management Plan as submitted on the date of this resolution.

2. That the officers of the Malaga County Water District are authorized and directed to publish this resolution of adopt the Fresno-Area Regional Groundwater Management Plan in accordance with the provisions of California Water Code Section 10753.3 and to provide interested persons with a copy of this resolution upon written request;

3. That the Board of Directors hereby authorizes its officers to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.

PASSED AND ADOPTED at a regular meeting of the Board of Directors of Malaga County Water District on February 14, 2006.

Russ Holcomb
General Manager

RESOLUTION No. 06-1101

RESOLUTION OF THE BOARD OF DIRECTORS OF THE GARFIELD WATER DISTRICT

FOR INTENTION TO ADOPT THE FRESNO-AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

WHEREAS, Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of groundwater management plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the Fresno Irrigation District, City of Fresno, City of Clovis, Fresno Metropolitan Flood Control District, County of Fresno, City of Kerman, Malaga County Water District, Pinedale County Water District, Garfield Water District and Bakman Water Company have entered into a Memorandum of Understanding to cooperate and participate in the development of the Fresno-Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions within their respective jurisdictions; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions; and

WHEREAS, the Garfield Water District desires to adopt a groundwater management plan that is consistent with recent amendments to the provisions of the California Water Code Section 10750 et seq.; and

WHEREAS, a public hearing was duly noticed consistent with California Water Code Section 10753.2(a), and held on March 1, 2006, to discuss the adoption and implementation of the Fresno-Area Regional Groundwater Management Plan; and

WHEREAS, the Board of Directors believes that groundwater can best be managed, as in the past, by local agencies in coordination with owners of lands overlying the groundwater basin; and

WHEREAS, the Board of Directors believes the updating and adoption of a new groundwater management plan will be in the best interests of its constituents and water users and can help meet the projected long-term water needs of the Garfield Water District,

BE IT RESOLVED, by the Board of Directors as follows:

The foregoing findings are true and correct:

1. It is the intention of the Garfield Water District to adopt the Fresno-Area Regional Groundwater Management Plan in accordance with part 2.75 of Division 6 of the California Water Code, and the District's engineer is hereby authorized to represent the Garfield Water District in any joint management proceedings;

2. That this resolution shall be deemed a resolution of intention in accordance with California Water Code Section 10753.2;

3. That the plan has been prepared in accordance with all applicable laws, including, but not limited to the California Environmental Quality Act, and a public hearing has been conducted in accordance with the California Water Code Section 10753.5 et seq. to determine whether to adopt the plan;

4. That the officers of Garfield Water District have published a resolution of intention to update the Garfield Water District's groundwater management plan in accordance with the provisions of California Water Code Section 10753.3 and to provide interested persons with a copy of this resolution upon written request; and

5. That the Board of Directors hereby authorizes its officers to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.

RESOLVED by the Board of Directors of the Garfield Water District that the Fresno-Area Regional Groundwater Management Plan be deemed to be in compliance with California Senate Bill No. 1938.

PASSED AND ADOPTED at a regular meeting of the Board of Directors of Garfield Water District on November 1, 2006.

Katherine B. Alves

Katherine Alves, Secretary

SECRETARY'S CERTIFICATE

I, KATHERINE ALVES, the undersigned do hereby certify:

That I am the duly elected and acting Secretary of the GARFIELD WATER DISTRICT and that the foregoing Resolution was adopted on the 1st day of November, 2006.

Katherine B. Alves

Katherine Alves, Secretary

FRESNO AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

APPENDIX C

MEMORANDUM OF UNDERSTANDING

MEMORANDUM OF UNDERSTANDING

REGARDING

THE FRESNO AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

This Memorandum of Understanding ("MOU") is entered into on this 11th day of October, 2005 by and between the FRESNO IRRIGATION DISTRICT ("District"), the CITY OF FRESNO ("Fresno"), the CITY OF CLOVIS ("Clovis"), the FRESNO METROPOLITAN FLOOD CONTROL DISTRICT ("Metropolitan"), the BAKMAN WATER COMPANY ("Company"), the CITY OF KERMAN ("Kerman"), the COUNTY OF FRESNO ("County"), the MALAGA COUNTY WATER DISTRICT ("Malaga"), and the PINEDALE COUNTY WATER DISTRICT ("Pinedale").

RECITALS

WHEREAS, the District adopted a regional groundwater management plan consistent with the provisions of the California Water Code Section 10750 et. seq. on August 12, 1996; and

WHEREAS, the District desires to update its groundwater management plan to make it consistent with recent amendments to the provisions of the California Water Code Section 10750 et. seq.; and

WHEREAS, other parties that are within the boundary of the District wish to enter into this Memorandum of Understanding, so that the parties may cooperate and participate in the cost-efficient development of a regional groundwater management plan for the planning and monitoring activities for groundwater conditions within their respective jurisdictions; and

WHEREAS, the District desires to incorporate the concerns and conditions of the other parties to this Memorandum of Understanding into its updated regional groundwater management plan so that the plan may provide a more comprehensive view and approach toward groundwater within the jurisdictional territory of the parties as identified, more or less, on the map included as Exhibit "1", attached hereto; and

WHEREAS, each of the parties has the authority pursuant to law and their local governing authorities to enter into this cooperative effort to study and plan for the management of groundwater conditions within their respective jurisdictions.

NOW THEREFORE, BE IT RESOLVED, in consideration of the promises contained herein the parties hereto agree upon the following covenants and conditions:

1. Purpose. This MOU is intended to promote and to provide a means to establish an orderly process to share information, develop courses of

action, and to resolve any issues with respect to the cooperative development of the regional groundwater management plan and with respect to the administration of the regional groundwater management plan. Administration will include coordination of data received from each party, public noticing, meetings and annual reporting as described herein. This MOU memorializes the interests, intent and responsibilities of the parties with respect to the adoption of a regional groundwater management plan consistent with the provisions of the California Water Code to provide for collection of data and the development of a plan for the management of groundwater resources within the jurisdictions of the parties hereto.

2. District's Responsibility. The District shall review and revise its groundwater management plan consistent with the current requirements of the California Water Code and the intentions of the parties hereto. The plan will be based upon the existing groundwater management plan of the District and shall incorporate new provisions required by recent changes in California law. The plan will be updated to include necessary revisions to incorporate the jurisdictions of the parties other than the District into the plan, so that the resulting document will satisfy the requirement of the Water Code that each of the parties has prepared a groundwater management plan. The District intends to complete the update of the regional groundwater management plan by December 2005.

3. Payment of Costs. Each of the parties hereto shall contribute to the cost of updating the groundwater management plan in accordance with the obligations specified in Exhibit "2" attached hereto. Additionally, any ongoing fees or costs incurred in the administration of the plan (as administration is defined and limited in Section 1 of this MOU) or of this Memorandum of Understanding will be shared by the parties in accordance with the percentages identified in Exhibit "2".

4. Coordination and Meetings. There shall be an annual coordination meeting between the parties. The District shall provide notice to the parties to this Memorandum of Understanding of the date and time of the meeting and submit a proposed agenda for such meeting. Each of the parties hereto agrees to provide a representative to participate in each of the annual meetings held during the effective dates of the regional groundwater management plan. The meeting may be held more often than annually if the parties hereto agree that more frequent meetings are necessary.

5. Data Provision. The parties to this agreement shall provide water quantity and water quality data for the purposes of preparing an annual report for public and state dissemination. The purpose of such data will be to evaluate the effectiveness of the implementation of the regional groundwater management plan by the parties. The parties hereto may employ consultants or contractors to assist in the preparation of the annual report which costs shall be shared according to the percentages specified in Exhibit "2". Preparation of the first annual report is estimated at 10% of the total Exhibit "2" fees to be shared at the same percentages as identified in Exhibit "2".

6. Membership. Any party to this Memorandum of Understanding may terminate their participation in the Memorandum of Understanding by providing ninety (90) days written notice to the District. Such member shall be responsible for their proportionate share of any costs incurred in administration of the Memorandum of Understanding through the effective date of their termination. Additionally, by agreement of all of the parties hereto, additional parties may be permitted to become participants in the Memorandum of Understanding and the regional groundwater management plan and will be required to pay their proportionate share of costs. Upon the termination of any member's participation or the addition of any additional member, the parties to the Memorandum of Understanding will revise the percentages for cost sharing purposes contained in Exhibit "2" appropriately. Participation in this MOU does not obligate parties to contribute to construction or implementation of groundwater related projects, unless mutually agreed upon.

7. Lead Agency. The District shall be the lead agency for contracting services associated with the development and implementation of the regional groundwater management plan. To the extent the District wishes to receive reimbursement for costs it incurs in addition to those costs identified on Exhibit "2", it shall obtain the prior written approval of each party. Promptly upon incurring approved costs, the District shall submit invoices according to the percentages contained in Exhibit "2" to each of the parties hereto for payment. The parties hereto shall remit payment of their appropriate portion of any such costs and expenses to the District within thirty (30) days of receipt of an invoice. Each party's share of contribution for preparation of the updated regional groundwater management plan as specified in Exhibit "2" shall be paid prior to the initiation of work to update the plan.

8. Budgets. The District shall prepare a proposed annual budget for consideration of the parties hereto at the annual meeting. The budget shall estimate the expenses and costs to be incurred with development of the updated regional groundwater management plan and any subsequent administration and implementation of the plan.

9. Amendments. This Memorandum of Understanding may be amended only by the express written consent of all of the parties hereto.

10. Severability. If any part of this agreement is found to be in conflict with applicable laws, such part shall be inoperative, null and void and so far as it is in conflict with said law that the remainder of the agreement shall remain in full force and effect.

11. Counterparts. This agreement may be executed in counterparts by the parties.

12. Governing Law and Venue. Any disputes or claims arising in connection with, or out of the implementation of this agreement shall be governed by the law of the State of California.

Executed on this _____ day of _____, 2005.

FRESNO IRRIGATION DISTRICT

By: Gary R. Serrato

PINEDALE COUNTY WATER DISTRICT

By: _____

CITY OF CLOVIS

By: _____

FRESNO METROPOLITAN FLOOD CONTROL DISTRICT

By: _____

BAKMAN WATER COMPANY

By: _____

CITY OF KERMAN

By: _____

COUNTY OF FRESNO

By: _____

MALAGA COUNTY WATER DISTRICT

By: _____

CITY OF FRESNO

By: _____

APPROVED AS TO FORM:

HILDA CANTU MONTOY
City of Fresno Attorney

By: _____
Deputy

ATTEST

REBECCA E. KLISCH
City of Fresno Clerk

By: _____

Executed on this _____ day of _____, 2005.

FRESNO IRRIGATION DISTRICT

By: _____

CITY OF CLOVIS

By: _____

BAKMAN WATER COMPANY

By: _____

COUNTY OF FRESNO

By: _____

CITY OF FRESNO

By: _____

APPROVED AS TO FORM:

HILDA CANTU MONTOY
City of Fresno Attorney

By: _____
Deputy

ATTEST

REBECCA E. KLISCH
City of Fresno Clerk

By: _____

PINEDALE COUNTY
WATER DISTRICT

By: _____

FRESNO METROPOLITAN
FLOOD CONTROL DISTRICT

By: _____

CITY OF KERMAN

By: _____

MALAGA COUNTY WATER
DISTRICT

By: _____

Executed on this _____ day of _____, 2005.

FRESNO IRRIGATION DISTRICT

By: _____

CITY OF CLOVIS

By: _____

BAKMAN WATER COMPANY

By: _____

COUNTY OF FRESNO

By: _____

CITY OF FRESNO

By: _____

APPROVED AS TO FORM:

HILDA CANTU MONTOY
City of Fresno Attorney

By: _____
Deputy

ATTEST

REBECCA E. KLISCH
City of Fresno Clerk

By: _____

PINEDALE COUNTY
WATER DISTRICT

By: _____

FRESNO METROPOLITAN
FLOOD CONTROL DISTRICT

By: _____

CITY OF KERMAN

By: _____

MALAGA COUNTY WATER
DISTRICT

By: _____

Executed on this _____ day of _____, 2005.

FRESNO IRRIGATION DISTRICT

By: _____

PINEDALE COUNTY WATER DISTRICT

By: _____

CITY OF CLOVIS

By: _____

FRESNO METROPOLITAN FLOOD CONTROL DISTRICT

By: _____

BAKMAN WATER COMPANY

By: _____

CITY OF KERMAN

By: _____

COUNTY OF FRESNO

By: _____

MALAGA COUNTY WATER DISTRICT

By: _____

CITY OF FRESNO

By: _____

APPROVED AS TO FORM:

HILDA CANTU MONTOY
City of Fresno Attorney

By: _____
Deputy Chief Ast.

ATTEST

REBECCA E. KLISCH
City of Fresno Clerk

By: Elvira Sommerville
Deputy (8/9/05)

Executed on this _____ day of _____, 2005.

FRESNO IRRIGATION DISTRICT

By: _____

PINEDALE COUNTY WATER DISTRICT

By: _____

CITY OF CLOVIS

By: _____

FRESNO METROPOLITAN FLOOD CONTROL DISTRICT

By: _____

BAKMAN WATER COMPANY

By: _____

CITY OF KERMAN

By: _____

COUNTY OF FRESNO

By: _____

MALAGA COUNTY WATER DISTRICT

By: _____

CITY OF FRESNO

By: _____

APPROVED AS TO FORM:

HILDA CANTU MONTOY
City of Fresno Attorney

By: _____
Deputy

ATTEST

REBECCA E. KLISCH
City of Fresno Clerk

By: _____

Executed on this _____ day of _____, 2005.

FRESNO IRRIGATION DISTRICT

By: _____

CITY OF CLOVIS

By: _____

BAKMAN WATER COMPANY

By: _____

COUNTY OF FRESNO

By: _____

CITY OF FRESNO

By: _____

APPROVED AS TO FORM:

HILDA CANTU MONTOY
City of Fresno Attorney

By: _____
Deputy

ATTEST

REBECCA E. KLISCH
City of Fresno Clerk

By: _____

PINEDALE COUNTY
WATER DISTRICT

By: _____

FRESNO METROPOLITAN
FLOOD CONTROL DISTRICT

By: Bob Van Wyk

CITY OF KERMAN

By: _____

MALAGA COUNTY WATER
DISTRICT

By: _____

Executed on this _____ day of _____, 2005.

FRESNO IRRIGATION DISTRICT

By: _____

CITY OF CLOVIS

By: _____

BAKMAN WATER COMPANY

By: _____

COUNTY OF FRESNO

By: _____

CITY OF FRESNO

By: _____

APPROVED AS TO FORM:

HILDA CANTU MONTOY
City of Fresno Attorney

By: _____
Deputy

ATTEST

REBECCA E. KLISCH
City of Fresno Clerk

By: _____

PINEDALE COUNTY
WATER DISTRICT

By: _____

FRESNO METROPOLITAN
FLOOD CONTROL DISTRICT

By: _____

CITY OF KERMAN

By: _____
Attest: _____
City Clerk

MALAGA COUNTY WATER
DISTRICT

By: _____

Executed on this _____ day of _____, 2005.

FRESNO IRRIGATION DISTRICT

By: _____

CITY OF CLOVIS

By: _____

BAKMAN WATER COMPANY

By: _____

COUNTY OF FRESNO

By: _____

CITY OF FRESNO

By: _____

APPROVED AS TO FORM:

HILDA CANTU MONTOY
City of Fresno Attorney

By: _____
Deputy

ATTEST

REBECCA E. KLISCH
City of Fresno Clerk

By: _____

PINEDALE COUNTY
WATER DISTRICT

By: _____

FRESNO METROPOLITAN
FLOOD CONTROL DISTRICT

By: _____

CITY OF KERMAN

By: _____

MALAGA COUNTY WATER
DISTRICT

By: _____

REVIEWED AND RECOMMENDED FOR APPROVAL

By: _____
Alan Weaver, Director
Department of Public Works and Planning

APPROVED AS TO ACCOUNTING FORM

By: _____
Vicki Crow, Auditor-Controller/Treasurer-Tax Collector

APPROVED AS TO LEGAL FORM
Dennis Marshall, County Counsel

By: Susan F. Coberly
Deputy

Fund: 0001
Subclass: 10000
Org Number: 436000300
Account: 7010
Project No.:

COUNTY OF FRESNO

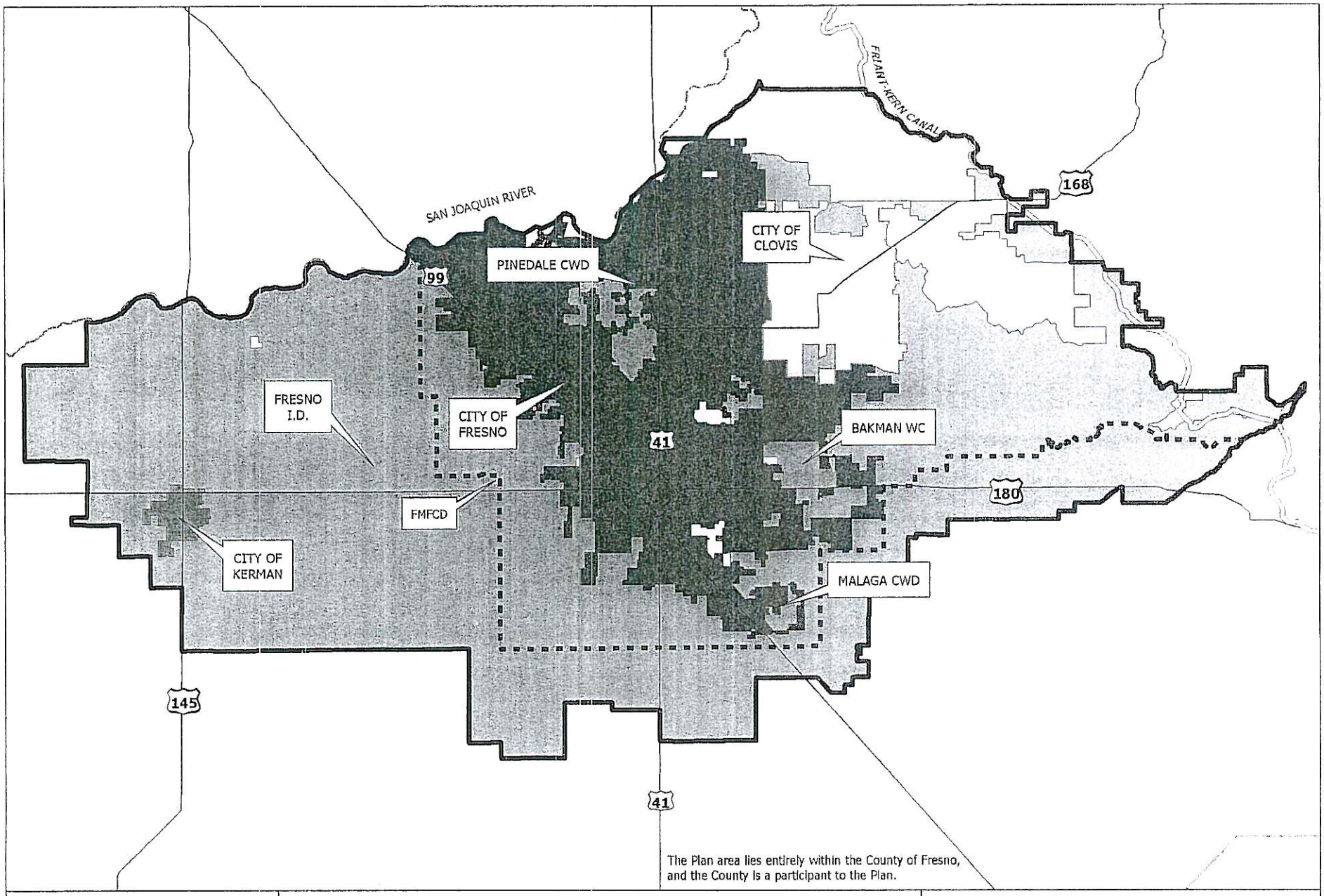
_____
Judith G. Case
CHAIRMAN, Board of Supervisors

OCT 11 2005

ATTEST:

_____
Bernice E. Seidel, Clerk
Board of Supervisors

EXHIBIT "1"



PROVOST & PRITCHARD ENGINEERING GROUP

N

0 1 2 3 4 Miles

BAKMAN WD
CITY OF CLOVIS
CITY OF FRESNO
CITY OF KERMAN
MALAGA CWD
PINEDALE WD
FRESNO I.D.
GWMP BOUNDARY
FRIANT-KERN CANAL
FMFCD

Exhibit 1
Fresno Area Regional
Groundwater Management
Plan Boundary Map

EXHIBIT 2

Agency	Cost Share	Percent Total
Fresno Irrigation District	$25,000	23.81%
City of Fresno	$30,000	28.57%
City of Clovis	$20,000	19.05%
Fresno Metropolitan Flood Control District	$7,500	7.14%
Bakman Water Company	$5,000	4.76%
City of Kerman	$5,000	4.76%
County of Fresno	$5,000	4.76%
Malaga County Water District	$5,000	4.76%
Pinedale County Water District	$2,500	2.38%
Total Estimated GW Mgmt. Plan Cost	**$105,000**	**100%**[1]

[1] Rounded

NOTE: Estimate does not include agency staff time, legal fees or required newspaper notices. Estimate includes consultant work only as required to prepare the Regional Groundwater Management Plan in compliance with SB 1938.

GARFIELD WATER DISTRICT

Mailing Address
P. O. Box 337
Clovis, CA 93613
Phone (559) 299-1120

Office Location
1990 Shaw, Suite A
Clovis, CA 93613
Fax (559) 299-3304

November 2, 2005

Mr. Dale Stanton, P.E.
Fresno Irrigation District
2907 So. Maple Avenue
Fresno, CA 93725

RE: LETTER OF INTENT TO PARTICIPATE IN THE FRESNO AREA REGIONAL GMP

Dear Mr. Stanton:

The Garfield Water District (District) desires to cooperate and participate in the development of the Fresno Area Regional Groundwater Management Plan for the planning and monitoring activities of groundwater conditions in the area. The District hereby arees to the terms of the Memorandum of Understanding (MOU) regarding the Fresno Area Regional Groundwater Management Plan, attached hereto. In accordance with the recommendation of the Technical advisory Committee responsible for the Plan development, the District will make an initial contribution of two thousand five hundred dollars ($2,500.00) to assist in the preparation of the Plan. A revised cost share and percentage total described in Exhibit 2 of the MOU is attached.

The District will duly notice and conduct a public hearing for intent to participate in preparation of the Plan in accordance with California Water Code requirements. Pending comments received during the hearing, the District Board of Directors intends to adopt a resolution of intent to participate in the preparation of the Plan. Following the acceptance of this letter, completion of the public hearing and adoption of the resolution, the District will participate in Plan development and all processes involved with the Plan's anticipated adoption.

Thank you for the opportunity to participate in this Plan.

Respectfully,

GARFIELD WATER DISTRICT

COPY

President

Attachments

FRESNO AREA REGIONAL GROUNDWATER MANAGEMENT PLAN

APPENDIX D

GLOSSARY

GLOSSARY

Acre-Foot: A quantity or volume of water covering one acre to a depth of one foot; equal to 43,560 cubic feet or 325,851 gallons.

Alluvium: A stratified bed of sand, gravel, silt, and clay deposited by flowing water.

Aquifer: A geologic formation that stores and transmits water and yields significant quantities of water to wells and springs.

Confined Aquifer: A water bearing subsurface stratum that is bounded above and below by formations of impermeable, or relatively impermeable, soil or rock.

Conjunctive Operation: The operation of a groundwater basin in combination with a surface water storage and conveyance system. Water is stored in the groundwater basin for later use by intentionally recharging the basin during periods of above-average water supply.

Deep Percolation: The percolation of surface water through the ground and beyond the lower limit of the root zone of plants into a groundwater aquifer.

Ecology: The study of the interrelationships of living organisms to one another and to their surroundings.

Ecosystem: Recognizable, relatively homogeneous units, including the organisms they contain, their environment, and all the interactions among them.

Effluent: Waste water or other liquid, partially or completely treated or in its natural state, flowing from a treatment plant.

Environment: The sum of all external influences and conditions affecting the life and development of an organism or ecological community; the total social and cultural conditions.

Evapotranspiration Of Applied Water (ETAW): The portion of the total evapotranspiration which is provided by irrigation.

Groundwater: Water that occurs beneath the land surface and completely fills all pore spaces of the alluvium, soil, or rock formation in which it is situated.

Groundwater Banking: The importation and storage of a new water supply in a groundwater aquifer for subsequent extraction of a fraction thereof for use by designated beneficiaries. The fraction of the water stored (i.e. banked) in the underground that may be withdrawn is a function of the groundwater mitigation

GLOSSARY

required. Approval, oversight, mitigation and accounting for groundwater banking shall be the responsibility of the local agency whose AB 3030 plan governs. Agreement of the impacted local water service agencies shall also be obtained.

Groundwater Basin: A groundwater reservoir, defined by all the overlying land surface and the underlying aquifers that contain the water stored in the reservoir. In some cases, the boundaries of successively deeper aquifers may differ and make it difficult to define the limits of the basin.

Groundwater Mining: The withdrawal of water from an aquifer in excess of recharge over time. If continued, the underground supply would eventually be exhausted or the water table could drop below economically feasible pumping lifts.

Groundwater Mitigation: An action or activity designed to compensate for the actual or expected negative impact caused by groundwater pumping by appropriators and/or groundwater bankers. Mitigation shall include making provisions for sufficient recharge to offset the effects of all extractions, subsurface outflow and other unrecoverable losses attributable to the appropriation or banking activity. Mitigation may be incorporated into a conjunctive operation of a groundwater basin or subarea thereof with the consent of the agency or agencies responsible for the conjunctive management of such basin or subarea.

Groundwater Overdraft: The condition of a groundwater basin in which the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years during which water supply conditions approximate average.

Groundwater Recharge: Increases in groundwater storage by natural conditions or by human activity.

Groundwater Reservoir: An aquifer or an aquifer system in which groundwater is stored.

Groundwater Storage Capacity: The space or voids contained in a given volume of deposits. Under optimum conditions, the usable groundwater storage capacity is the volume of water that can, within specified economic limitations, be alternately extracted and replaced in the reservoir.

Groundwater Table: The upper surface of the zone of saturation (all pores of subsoil filled with water), except where the surface is formed by an impermeable body.

GLOSSARY

Hardpan: A layer of nearly impermeable soil beneath a more permeable soil, formed by natural chemical cementing of the soil particles.

Hydrologic Balance: An accounting of all water inflow to, water outflow from, and changes in water storage within a hydrologic unit over a specified period.

Hydrologic Basin: The complete drainage area upstream from a given point on a stream.

In-Lieu Groundwater Recharge: A method of replenishing a groundwater resource by delivering an alternate surface supply to agricultural or urban users instead of pumping groundwater, thus leaving water in the underground for future use. Deliveries of surface water to parks, golf courses and freeway landscaping are examples of urban in-lieu recharge.

Intentional Recharge: The addition of surface water to a groundwater reservoir by human activity, such as putting surface water into spreading basins.

Irrecoverable Losses: The water lost to a salt sink or lost by evaporation or evapotranspiration from a conveyance facility, drainage canal, or in fringe areas.

Irrigation Efficiency: The efficiency of water application. Computed by dividing evapotranspiration of applied water by applied water and converting the result to a percentage. Efficiency can be computed at three levels: farm, district, or basin. Applied water may exclude water that percolates to groundwater for subsequent reuse.

Irrigation Return Flow: Applied water that is not transpired, evaporated, or deep percolated into a groundwater basin but that returns to a surface water supply.

Land Subsidence: The lowering of the natural land surface in response to: earth movements; lowering of fluid pressure (or lowering of groundwater level); removal of underlying supporting materials by mining or solution of solids, either artificially or from natural causes; compaction caused by wetting (hydrocompaction); oxidation of organic matter in soils; or added load on the land surface.

Leaching: The flushing of salts from the soil by the downward percolation of applied water.

GLOSSARY

Leaching Requirement: The incremental water necessary to prevent harmful salt accumulations in the soil. LR = ETAW X LF DU100 (1-LF) where LF is the leaching fraction.

Mean Annual Runoff: The average value of annual runoff amounts calculated for a selected period of record for a specified area.

Milligrams Per Liter (mg/L): The weight in milligrams of any substance dissolved in one liter of liquid. Nearly the same as parts per million.

Moisture Stress: A condition of physiological stress in a plant caused by a lack of water.

Natural Flow: The flow past a specified point on a natural stream that is unaffected by stream diversion, storage, import, export, return flow, or change in use caused by modifications in land use.

Net Water Demand: The amount of water needed in a water service area to meet all requirements. It is the sum of evapotranspiration of applied water (ETAW) in an area, the irrecoverable losses from the distribution system, and the outflow leaving the service area.

New Water Supply: A surface water supply which has not historically been imported or brought under control and put to beneficial use by recharge of the groundwater or by direct use. New water would include, but not be limited to:

a. Fresno Stream Group water.
b. C.V.P. Class II water not historically diverted (i.e. obligation water subject to spill from Friant Dam).
c. Kings River flood releases from Pine Flat Dam and divertable under existing license conditions and applicable agreements.
d. Fresno County's C.V.P. Cross Valley Supply.
e. Any other water purchased, exchanged, developed or otherwise acquired that did not constitute a part of the historic water supply for the area in question.
f. City of Fresno's C.V.P. Class I Supply. While this is an existing supply, it can be redirected to portions of the City outside of the District, at any time and at the City's sole discretion, and therefore has all the characteristics of new water.

Nonpoint Source: Waste water discharge other than from point sources. (See Point Source).

GLOSSARY

Perched Groundwater: Groundwater supported by a zone of material of low permeability located above an underlying main body of groundwater with which it is not hydrostatically connected.

Percolation: The downward movement of water through the soil or alluvium to the groundwater table.

Permeability: The capability of soil or other geologic formation to transmit water.

Point Source: A specific site from which waste or polluted water is discharged into a water body, the source of which can be identified. See also Nonpoint source.

Pollution (of water): The alteration of the physical, chemical, or biological properties of water by the introduction of any substance into water that adversely affects any beneficial use of water.

Recharge Basin: A surface facility, often a large pond, used to increase the infiltration of surface water into a groundwater basin.

Reclaimed Waste Water: Waste water that becomes suitable for a specific beneficial use as a result of treatment.

Return Flow: The portion of withdrawn water not consumed by evapotranspiration or system losses which returns to its source or to another body of water.

Reuse: The additional use of previously used water.

Riparian: of, or on the banks of, a stream or other body of water.

Riparian Vegetation: Vegetation growing on the banks of a stream or other body of water.

Runoff: The surface flow of water from an area; the total volume of surface flow during a specified time.

Safe Yield: The maximum quantity of water that can be withdrawn from a groundwater basin over a long period of time without developing a condition of overdraft. Sometimes referred to as sustained yield.

Salinity: General, the concentration of mineral salts dissolved in water. Salinity may be measured by weight (total dissolved solids), electrical conductivity, or osmotic pressure. Where sea water is known to be the major source of salt,

GLOSSARY

salinity is often used to refer to the concentration of chlorides in the water. See also Total Dissolved Solids.

Secondary Treatment: In waste water treatment, the biological process of reducing suspended, colloidal, and dissolved organic matter in effluent from primary treatment systems. Secondary treatment is usually carried out through the use of trickling filters or by the activated sludge process.

Seepage: The gradual movement of a fluid into, through, or from a porous medium.

Service Area: The geographical land area served by a distribution system of a water agency.

Streamflow: The rate of water flow past a specified point in a channel.

Surface Supply: Water supply from streams, lakes and reservoirs.

Tail Water: Applied irrigation water that runs off the end of a field. Tail water is not necessarily lost; it can be collected and reused on the same or adjacent fields.

Tertiary Treatment: In sewage, the additional treatment of effluent beyond that of secondary treatment to obtain a very high quality of effluent.

Total Dissolved Solids: A quantitative measure of the residual minerals dissolved in water that remain after evaporation of a solution. Usually expressed in milligrams per liter. Abbreviation: TDS. See also Salinity.

Transpiration: The process in which plant tissues give off water vapor to the atmosphere as an essential physiological process.

Waste Water: The water remaining after use, liquid waste, or drainage from a community, industry, or institution.

Water Conservation: As used in this report, water conservation is the reduction in depletion. This reduction includes the reduction of the evapotranspiration of applied water and irrecoverable losses to salt sinks.

Waste Water Reclamation: The planned reuse of waste water for specific beneficial purposes.

Water Demand Schedule: A time distribution of the demand for prescribed quantities of water for specified purposes. It is usually a monthly tabulation of

GLOSSARY

the total quantity of water that a particular water user intends to use during a specified year.

Water Quality: Used to describe the chemical, physical, and biological characteristics of water, usually in regard to its suitability for a particular purpose.

Water Reclamation: The treatment of water of impaired quality, including brackish water, waste water, and sea water to produce a water of suitable quality for the intended use.

Water Right: A legally protected right to take possession of water occurring in a natural water way and to divert that water for beneficial use.

Water Year: A continuous 12-month period for which hydrologic records are compiled and summarized. In California, it begins on October 1.

Kings River Conservation District

Lower Kings Basin

Groundwater Management Plan Update

WRIME Water Resources & Information Management Engineering, Inc.

April 2005

TABLE OF CONTENTS

TABLE OF CONTENTS i

List of Tables v

List of Figures v

SECTION 1 INTRODUCTION 1-1

1.1 Introduction 1-1

1.2 Lower Kings Basin and Water Management Areas 1-2

1.3 Purpose 1-5

1.4 Stakeholder and Agency Participation 1-7

Process for Adoption 1-9

1.5 Previous Groundwater Management Plans and Related Efforts 1-9

Water Management Area A 1-10

Water Management Area B 1-10

Water Management Area C 1-11

Other Related KRCD and GWMP Actions in the Lower Kings Basin 1-12

Related GWMPs and Planning Efforts 1-12

1.6 GWMP Components and Consistency with the California Water Code 1-12

1.7 Contents of the GWMP 1-14

SECTION 2 WATER RESOURCES SETTING AND CURRENT CONDITIONS 2-1

2.1 Scope and Approach 2-1

2.2 Physical Setting 2-2

Groundwater Basin 2-2

Basin Topography 2-4

Geology 2-4

Land Subsidence 2-7

Soils and Surface Recharge Potential 2-9

2.3 Land Use and Water Demand 2-9

Climate-Precipitation and Evapotranspiration 2-14

2.4 Groundwater Conditions and Supplies 2-14

Groundwater Levels within the WMAs 2-16
Groundwater Occurrence, Flow, and Changes in Storage 2-16
Change in Groundwater Storage 2-26
Surface Water–Groundwater Connection 2-29
2.5 Surface Water Supplies 2-30
Kings River Surface Water Supplies 2-32
Kings River Supply and Delivery Facilities in the Lower Kings Basin 2-32
2.6 Water Quality 2-39
Surface Water Quality 2-39
Groundwater Quality 2-41

SECTION 3 GOALS AND OBJECTIVES 3-1

3.1 Goals and Objectives 3-1
3.2 Basin Management Objectives 3-2
Method and Approach 3-3
Groundwater Stabilization BMO 3-4
Project Development BMO 3-4
Potential Benefits of Meeting the BMOs and Proposed Projects 3-9

SECTION 4 GROUNDWATER MANAGEMENT OPTIONS 4-1

4.1 Surface Water Options 4-2
New Kings River Surface Water Storage 4-2
Small-Scale Surface Water Storage 4-2
In-Basin Surface Water and Flood Flows 4-3
Water Transfers 4-6
Out-of-Area Surface Water Rights or Storage 4-9
Out-of-Basin Flood Flows 4-9
Reoperation of Pine Flat Reservoir 4-10
4.2 Groundwater Recharge Options 4-11
Direct Recharge to Groundwater 4-11
In-Lieu Recharge 4-19
Regional Groundwater Banking 4-20
4.3 Other Potential Plan Elements 4-23

Land Acquisition 4-23
Conveyance Facilities 4-24
Water Conservation 4-25
Groundwater Monitoring 4-26
4.4 Groundwater Quality Protection Options 4-27
Prevent Groundwater Quality Degradation 4-28
Changes in Surface Water or Groundwater Flow and Quality 4-28
AB 3030 Water Quality Related Options and Program Integration 4-30

SECTION 5 FINANCING AND GOVERNANCE OPTIONS 5-1

5.1 BAP Issues and Planning Principles 5-1
5.2 Financing 5-3
Funding Sources 5-4
5.3 Management and Governance 5-7
Methods of Groundwater Management in California 5-7
Kings Basin Groundwater Management 5-8
Potential Approaches for the Lower Kings Basin 5-8
Individual Interested–Based Model 5-9
Mutual Interest–Based Model 5-10

SECTION 6 MANAGEMENT AND IMPLEMENTATION PLAN 6-1

6.1 GWMP Components 6-1
6.2 Component 1 - Development of Near Term Local Recharge Projects 6-1
Project Actions in Area A 6-2
Project Management Actions in Area B 6-4
Management Actions in Area C 6-6
Funding for Near-Term Projects 6-6
6.3 Component 2 - Long-Term Groundwater Recharge and Banking 6-7
6.4 Component 3 - Stakeholder Involvement, Plan Oversight and Management 6-9
Principles For Plan Management and Implementation 6-9
Support and Coordination 6-10
Governance, Plan Oversight and Organizational Structure 6-11
Funds and Funding 6-12

Conflict Resolution 6-13
6.5 Component 4 - Monitoring and Analysis Program 6-13
Groundwater Quality Monitoring 6-14
Land Surface Elevation Monitoring 6-15
Protocols for Collection of Groundwater Data 6-16
Monitoring Surface Water-Groundwater Interaction 6-16
Support Development of Kings Basin Groundwater Data Center 6-17
Support Development of a Regional Integrated Hydrologic Model 6-18
6.6 Component 5 - Common Elements for Groundwater Resource Protection 6-19
Well Construction Polices 6-19
Protection of Recharge Areas 6-20
Control of the Migration of Contaminated Groundwater 6-20
Monitoring of Saline Water Intrusion 6-21

SECTION 7 REFERENCES 7-1

APPENDIX A LOWER KINGS BASIN GWMP RESOLUTION A-1

APPENDIX B DRAFT GWMP ADOPTION RESOLUTION B-1

APPENDIX C LAND AND WATER USE C-1

C.1 Land and Water Use C-1
Current Land and Water Use C-1
Projected Land and Water Use C-1

APPENDIX D GROUNDWATER EVALUATION D-1

D.1 Groundwater Occurrence and Movement D-1
D.2 Analysis of Groundwater Levels D-2
Details of Analysis D-2
D.3 Analysis of Groundwater Storage D-4
D.4 Summary of Findings D-5

APPENDIX E SURFACE WATER EVALUATION E-1

E.1 Surface Water Availability E-1
E.2 Background E-1
E.3 Kings River Surface Water Supply System E-2
Pine Flat Reservoir E-2
Diversion and Canal System E-2
E.4 Analysis E-2

LIST OF TABLES

Table 1.1. Basin Advisory Panel Participants 1-9
Table 1.2. Lower Kings Basin GWMP Components 1-13
Table 2.1. Summary of WMA Demands and Land Use 2-13
Table 2.2. Cumulative Overdraft and Average Annual Overdraft 2-29
Table 3.1. BMO Measurable Components 3-4
Table 4.1. Summary of Pipeline and Reservoir Options 4-21
Table 5.1. Issues and Concerns 5-2
Table 6.1. Summary of Estimated Costs for Near-Term Lower Kings Basin Groundwater Recharge Projects 6-7
Table C.1. Current Land Use Summary C-2
Table C.2. Projected Land Use Summary C-3
Table D.1. Summary of Groundwater Overdraft Evaluation D-5
Table E.1. Summary of Lower King Basin Canal Characteristics E-2

LIST OF FIGURES

Figure 1.1 Groundwater Basins and KRCD Divisions 1-3
Figure 1.2 Areas of Prior GWMPs 1-4
Figure 1.3 Areas and Water Management Areas 1-6
Figure 1.4 Boundaries of Cities and Water Agencies 1-8
Figure 2.1 Groundwater Basins 2-3
Figure 2.2 Surface Geology and Geologic Cross Section 2-5
Figure 2.3 Representative Geologic Cross Section 2-6
Figure 2.4 Impermeable Clay Layers 2-8
Figure 2.5 Hydrologic Soils Group 2-10

Figure 2.6 General Land Use 2-11
Figure 2.7 Summary of Land Use and Water Demand in Lower Kings Basin 2-12
Figure 2.8 Average Monthly Reference Evapotranspiration (ET) at the Fresno State CIMIS Station & Average Monthly Precipitation at Fresno Yosemite International Airport 2-15
Figure 2.9 Location of Representative Groundwater Wells 2-17
Figure 2.10 Groundwater Trends for WMa A 2-18
Figure 2.11 Groundwater Trends for WMa A1 2-19
Figure 2.12 Groundwater Trends for WMa B 2-20
Figure 2.13 Groundwater Trends for WMA B1 2-21
Figure 2.14 Groundwater Trends for WMA B2 2-22
Figure 2.15 Groundwater Trends for WMA C 2-23
Figure 2.16 Groundwater Trends for WMA C1 2-24
Figure 2.17 Spring 2000 Groundwater Levels 2-25
Figure 2.18 Spring 1950 Groundwater Levels 2-27
Figure 2.19 Groundwater Level Change Between Spring 1950 and Spring 2000 2-28
Figure 2.20 Groundwater Elevations in Area A Compared to Pine Flat Outflow 2-31
Figure 2.21 Diversion Weirs 2-33
Figure 2.22 Annual Flow Volume Below Peoples Weir 2-34
Figure 2.23 Kings River flow Below James Weir 2-35
Figure 2.24 Kings River Exceedance Curve Below James Weir During Flood Release Periods 2-36
Figure 2.25 Water Conveyance Facilities 2-38
Figure 3.1 Groundwater Trends for Area A 3-5
Figure 3.2 Groundwater Trends for Area B 3-6
Figure 3.3 Groundwater Trends for Area C 3-7
Figure 3.4 Cumulative Change in Groundwater Storage for WMA A Cumulative Mass Balance Analysis 3-10
Figure 3.5 Cumulative Change in Groundwater Storage for WMA B Cumulative Mass Balance Analysis 3-11
Figure 4.1 Kings River Place of Use 4-4
Figure 4.2 Existing Recharge Facilities and Conceptual Layout of Potential Recharge Projects 4-13
Figure 4.3 North Fork Group Potential Recharge Areas 4-15
Figure 4.4 McMullin Recharge Project Area 4-17

Figure 4.5 Raisin City Recharge Project with Water from FID Canals 4-18
Figure 4.6 Raisin City Recharge Project with Water from Fresno Treatment Plant 4-22
Figure C.1 Detailed Land Use C-5
Figure C.2 Detailed Projected Land Use C-6
Figure D.1 Depth to Groundwater Contours Spring 2003 ..... D-6
Figure D.2 Groundwater Level Contours Spring 1950 ..... D-7
Figure D.3 Groundwater Level Contours Spring 1970 ..... D-8
Figure D.4 Groundwater Level Contours Spring 1978 ..... D-9
Figure D.5 Groundwater Level Contours Spring 1984 ..... D-10
Figure D.6 Groundwater Level Contours Spring 1995 ..... D-11
Figure D.7 Groundwater Level Contours Spring 2000 ..... D-12
Figure D.8 Change in Groundwater Levels between Spring 2000 and Spring 1950 ..... D-13
Figure D.9 Location of Monitored Groundwater Wells D-14
Figure D.10 Location of Representative Groundwater Wells D-15
Figure D.11 Groundwater Hydrograph for Well 14S17E05D001M in WMA A D-16
Figure D.12 Groundwater Hydrograph for Well 15S17E13R002M in WMA A D-17
Figure D.13 Groundwater Hydrograph for Well 15S18E02A001M in WMA A D-18
Figure D.14 Groundwater Hydrograph for Well 15S18E30L001M in WMA A D-19
Figure D.15 Groundwater Hydrograph for Well 15S17E28K001M in WMA A1 ..... D-20
Figure D.16 Groundwater Hydrograph for Well 17S18E09R001M in WMA B D-21
Figure D.17 Groundwater Hydrograph for Well 16S17E24F001M in WMA B D-22
Figure D.18 Groundwater Hydrograph for Well 17S19E10A001M in WMA B D-23
Figure D.19 Groundwater Hydrograph for Well 17S20E33A001M in WMA B1 ..... D-24
Figure D.20 Groundwater Hydrograph for Well 18S19E14E001M in WMA B1 ..... D-25
Figure D.21 Groundwater Hydrograph for Well 17S20E01C001M in WMA B2 ..... D-26
Figure D.22 Groundwater Hydrograph for Well 17S21E03C001M in WMA B2 ..... D-27
Figure D.23 Groundwater Hydrograph for Well 18S19E35J002M in WMA C D-28
Figure D.24 Groundwater Hydrograph for Well 19S20E22C001M in WMA C D-29
Figure D.25 Groundwater Hydrograph for Well 20S20E07H001M in WMA C1 ..... D-30
Figure D.26 Groundwater Trends for WMA A D-31
Figure D.27 Groundwater Trends for WMA A1 ..... D-32
Figure D.28 Groundwater Trends for WMA B D-33
Figure D.29 Groundwater Trends for WMA B1 ..... D-34

Figure D.30 Groundwater Trends for WMA B2 ..... D-35
Figure D.31 Groundwater Trends for WMA C D-36
Figure D.32 Groundwater Trends for WMA C1 ..... D-37
Figure D.33 Distribution of Specific Yield in Lower Kings Basin D-38
Figure E.1 Kings River Annual Streamflow E-5
Figure E.2 Diversion Weirs E-6
Figure E.3 Kings River Flow Below Peoples Weir E-7
Figure E.4 Kings River Flow Below Lemoore Weir E-8
Figure E.5 Kings River Flow Below Island Weir E-9
Figure E.6 Kings River Flow Below Crescent Weir E-10
Figure E.7 Kings River Flow Below Stinson Weir E-11
Figure E.8 Kings River Flow Below James Weir E-12
Figure E.9 Kings River Exceedence Below Peoples Weir E-13
Figure E.10 Kings River Exceedence Below Lemoore Weir E-14
Figure E.11 Kings River Exceedence Below Island Weir E-15
Figure E.12 Kings River Exceedence Below Crescent Weir E-16
Figure E.13 Kings River Exceedence Below Stinson Weir E-17
Figure E.14 Kings River Exceedence Below James Weir E-18
Figure E.15 Kings River Exceedence Below James Weir during Flood-Release Periods E-19
Figure E.16 Liberty Canal Diversions and Entitlements E-20
Figure E.17 Laguna I.D. Diversions and Entitlements E-21
Figure E.18 Murphy Slough Diversions and Entitlements E-22
Figure E.19 Crescent Canal Diversions and Entitlements E-23
Figure E.20 Stinson Canal Diversions and Entitlements E-24
Figure E.21 Available Water for Diversions Under Entitlement at Liberty Weir during Flood Release Periods E-25
Figure E.22 Available Water for Diversions Under Entitlement at Murphy Slough Weir during Flood Release Periods E-26
Figure E.23 Available Water for Diversions Under Entitlement at Laguna I.D. during Flood Release Periods E-27
Figure E.24 Available Water for Diversions Under Entitlement at Crescent Weir during Flood Release Periods E-28
Figure E.25 Available Water for Diversions Under Entitlement at Stinson Weir during Flood Release Periods E-29

1.1 INTRODUCTION

Managing groundwater to meet current and future water needs is a significant challenge in the Lower Kings Basin. The economy and population of Fresno County continue to expand and place additional stress on the local surface water and groundwater supplies. Agricultural land uses and water needs throughout the basin are relatively stable, but increased production costs stress the farm economy. Competition for available water supplies has increased both locally and regionally, and changes in water policy dictate increased environmental use throughout the region and the state. There are finite local supplies, limitations in the ability to fund new projects, and complex legal and political challenges facing the Lower Kings Basin.

Lower Kings Basin water interests need to be united to meet these challenges. Regional cooperation is needed to wield influence at the state and federal levels; to compete for funding with large, regional organizations and well-funded coalitions; and to overcome technical and organizational challenges. The development of an integrated Lower Kings Basin Groundwater Management Plan (GWMP) is an important step in the process to define a clear strategy to develop cost-effective water supplies and to locally manage the groundwater basin.

Properly managed, the Lower Kings Basin will provide for the water needs of the area for many years, but caution is appropriate since the long-term sustainability of groundwater resources is threatened by "overdraft". This means that, on an annual basis, more water is removed from storage than is returned, resulting in declining groundwater levels, increased pumping cost, and potential conflicts over the available supply. The depletion of stored groundwater can offer an opportunity by providing a substantial volume of storage capacity.

Local and regional benefits and water needs can be met by using the storage space for conjunctive use, banking water in wet years for removal during dry years, capturing flood flows that would otherwise leave the area, and increasing the region's water supply by importing water from other areas. To be successful in both economic (highest benefit, lowest cost) and engineering terms (highest yield), local problems must be put in the context of regional solutions, and local interests must work together to build facilities that produce tangible water supply benefits. Conjunctive use projects could provide both local and regional benefits, and regional support could defray or distribute the costs of projects needed to stabilize and recover the groundwater basin.

1.2 LOWER KINGS BASIN AND WATER MANAGEMENT AREAS

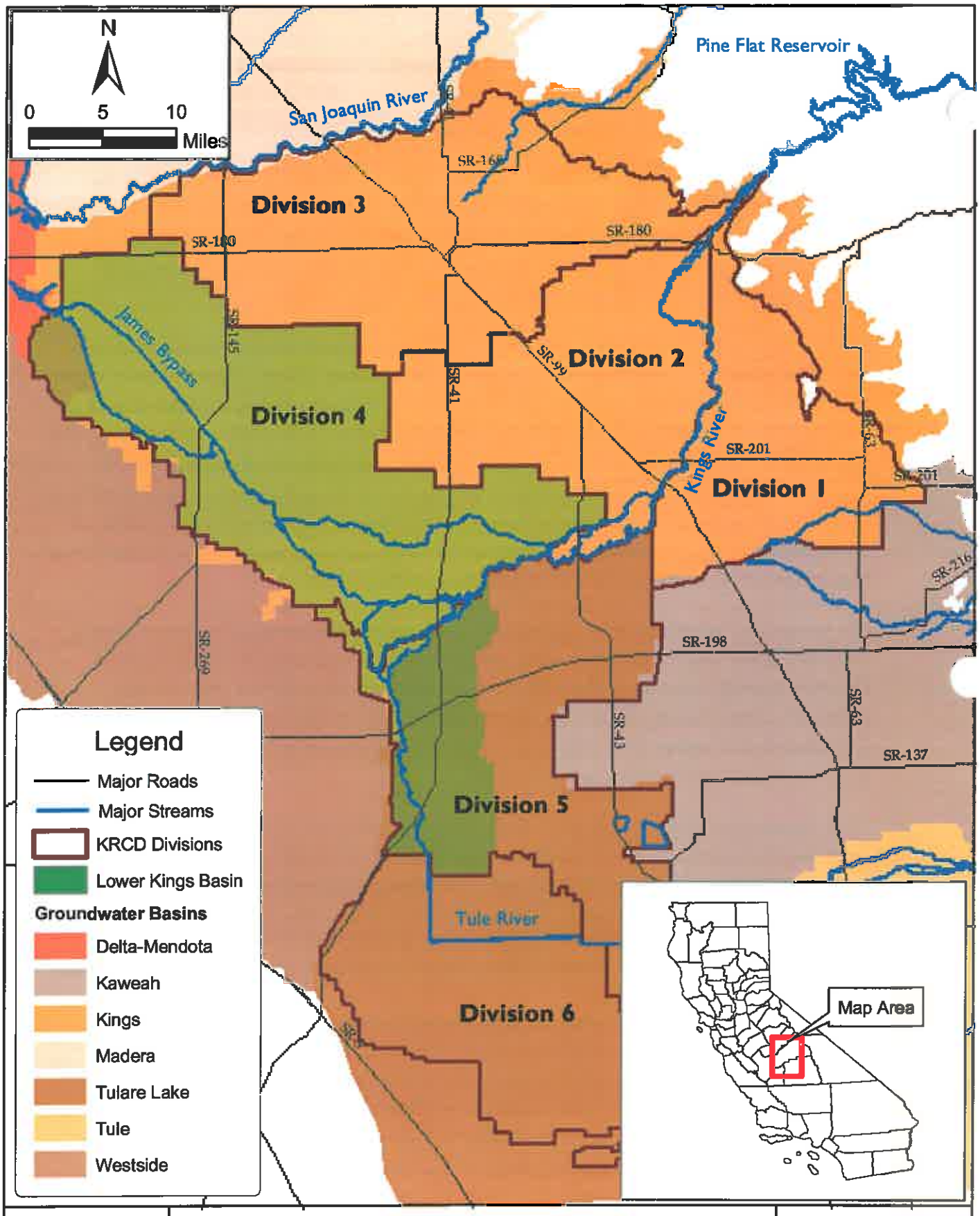
For many years, water users have been managing surface water and groundwater supplies through conjunctive use, and this Groundwater Management Plan (GWMP) is the latest in a long history of water management efforts in the Lower Kings Basin. An important part of this of water management history was the formation in 1951 of the Kings River Conservation District (KRCD) through passage of the KRCD Act.

KRCD is a legislatively defined special district that supports local interests in water planning and management, develops projects, collects groundwater data, and prepares an annual report of groundwater conditions; however, KRCD does not have the legislative authority to manage groundwater. There are six "divisions" within KRCD. Figure 1.1 provides a regional map and the location of those divisions. The Lower Kings Basin is generally located within KRCD divisions 4 and 5 in Fresno and Kings Counties. The Lower Kings Basin planning area covered by this GWMP is located in the southern part the San Joaquin Valley Groundwater Basin. As shown in Figure 1.1, the planning area overlies the Kings Subbasin, as defined in the California Department of Water Resources (DWR) Bulletin 118 (DWR 2003).

The historical groundwater level hydrographs and water level contours document declining water levels and indicate overdraft of the groundwater basin. In 1989, the KRCD Board of Directors (Board) adopted a policy to promote development of additional groundwater recharge facilities in cooperation with other water districts. KRCD has worked with local water districts and ditch companies in the Lower Kings Basin to prepare groundwater management plans for separate areas within its jurisdiction.

Three separate and independent groundwater management plans were prepared by KRCD staff for Water Management Areas (WMAs) designated as A, B, and C; shown on Figure 1.2 (KRCD 1995, 1996, 1998); and adopted by the Board. A number of other water districts in the Lower Kings Basin also produced separate plans to meet the requirements of Assembly Bill (AB) 3030 and qualify for state funds. Boundaries were based on areas with similar issues, stakeholder acceptance, jurisdictional boundaries, hydrogeology, and existing water management facilities.

Since adopting the previous groundwater management plans, KRCD has worked with local stakeholders to implement the recommendations included in the management plans. One recommendation contained in all of the plans was to continue to work with Lower Kings Basin agencies and stakeholders to develop cooperative efforts to mitigate groundwater overdraft and overcome the political and financial challenges that have historically constrained implementation of projects that would increase water supply and improve supply reliability.



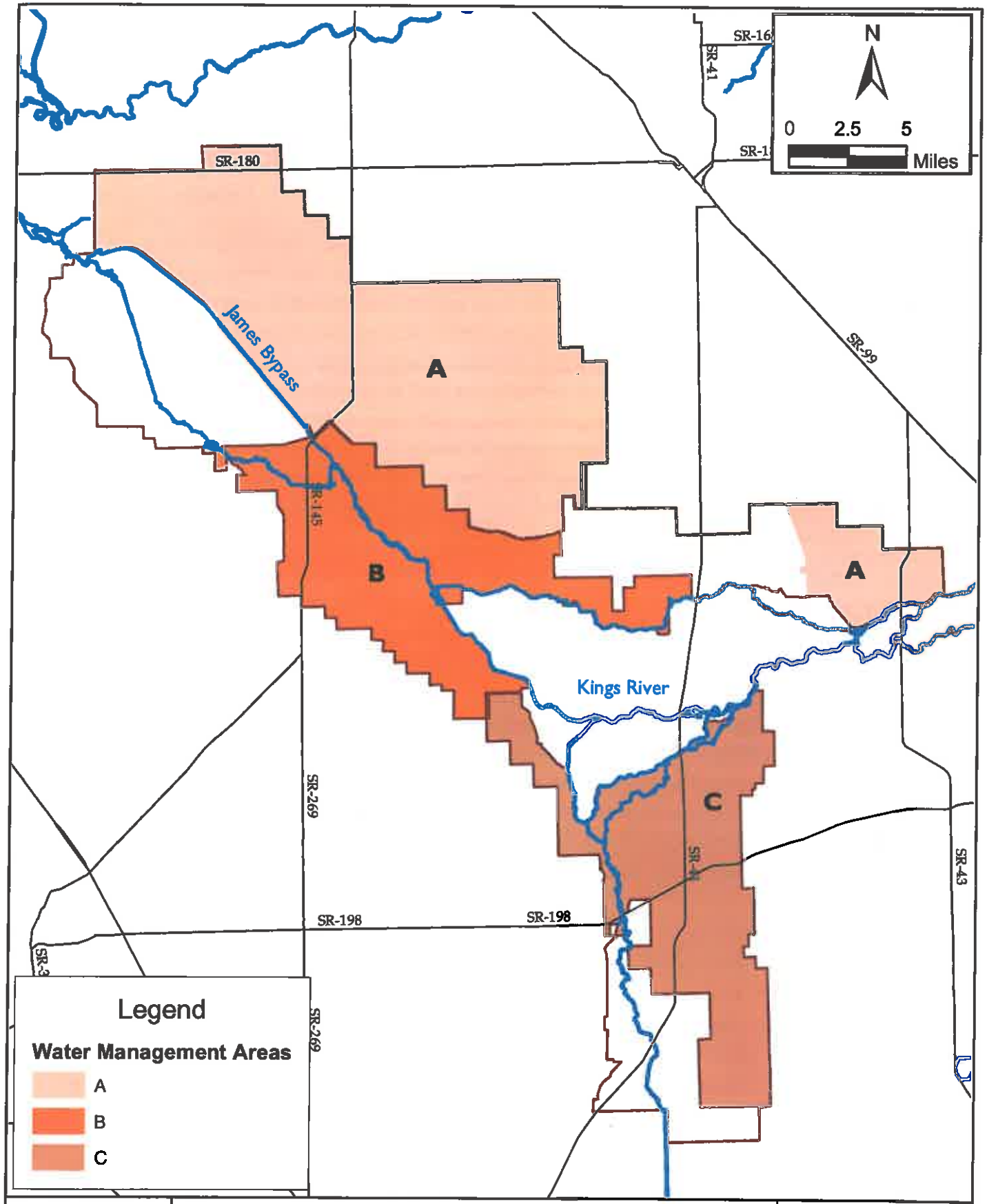
WRIME

Lower Kings Basin GWMP Update

Groundwater Basins and KRCD Divisions

April 2005

Figure 1.1



Lower Kings Basin GWMP Update

Areas of Prior GWMPs

April 2005

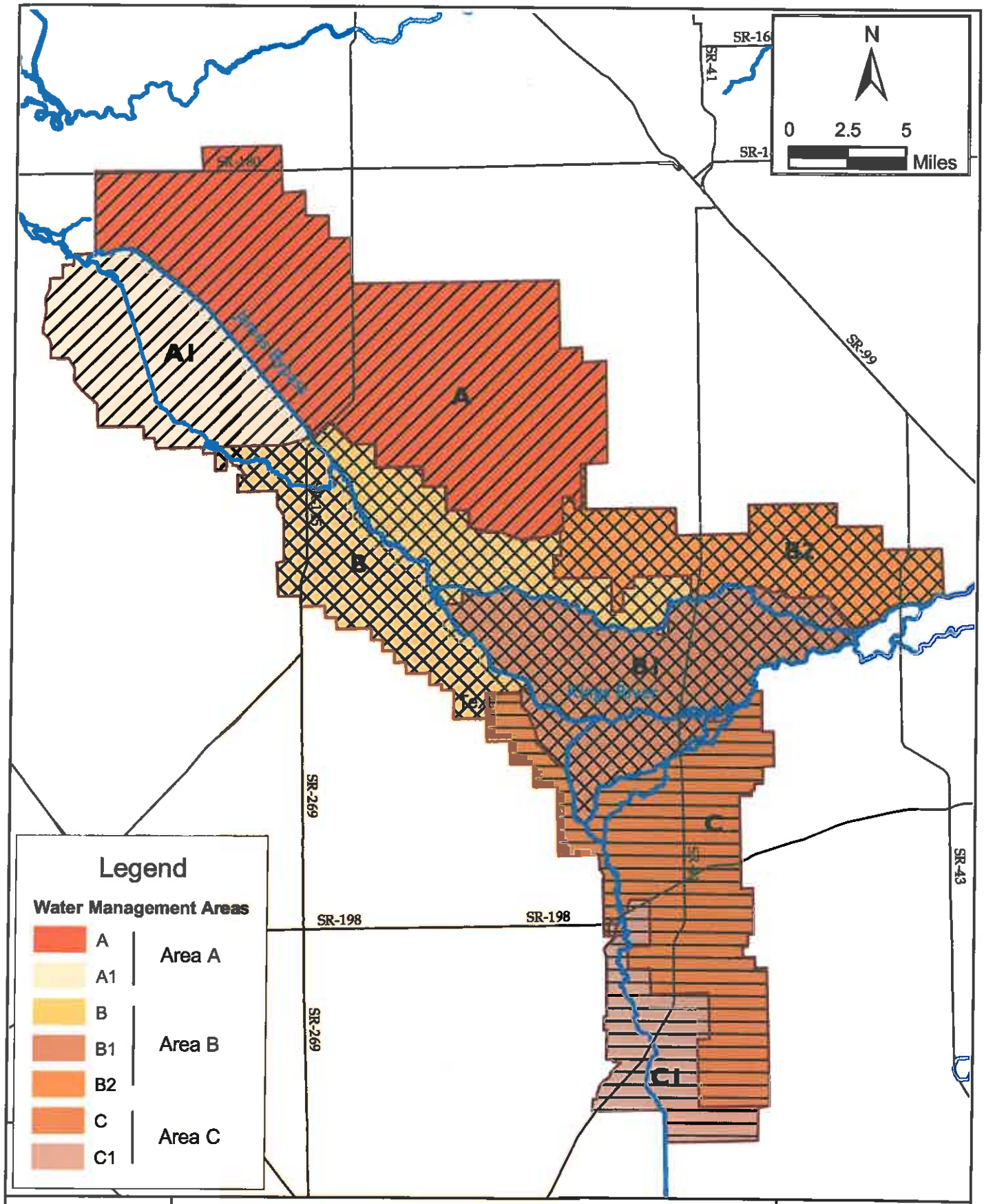
Figure 1.2

The stakeholders have recognized that the groundwater basin is one hydrogeologic unit. As part of the GWMP, WMAs A, B, and C were expanded to be more inclusive of the overlying groundwater basin. In expanding the Areas, the stakeholders sought to recognize the unique geographic distribution of the water supply problems and the water management systems in the Lower Kings Basin. Figure 1.3 presents the expanded WMAs. Throughout this text, reference to the "Area" refers to all of the WMAs with the same letter designation. Hence, Area A includes the original WMA A and WMA A1; with the exception that eastern-most portion of the original area A was reassigned to the new WMA B2; Area B includes the original WMA B, and WMA B1 and WMA B2, and Area C include the original WMA C and WMA C1. These designations were discussed and accepted by the BAP at the February 2005 meeting. The WMAs were used as accounting units to analyze water demands, evaluate groundwater levels and quality trends, and develop engineering solutions that recognize organizational and management differences in the Lower Kings Basin. Each of the Areas has specific Basin Management Objectives (BMOs), action plans, and implementation programs that are incorporated into the overall Lower Kings Basin GWMP.

1.3 PURPOSE

The purpose of this document is to update and integrate the previously prepared GWMPs to reflect changes in the state law; document progress in implementing the previous GWMPs; review, enhance, and coordinate existing groundwater management projects, programs, and policies; and define actions for developing project and management programs to address overdraft and ensure the long-term sustainability of groundwater resources in the Lower Kings Basin. This GWMP provides action items that, when implemented, is intended to maintain or enhance water levels and water quality, minimize land subsidence, and manage available surface and groundwater. As documented in this GWMP, the planning process was conducted to:

- Develop general consensus among Lower Kings Basin stakeholders regarding the characterization of the area's water problems, current and future demands, and groundwater conditions;
- Document the groundwater management goals and objectives, including specific BMOs;
- Develop unique solutions for Areas A, B and C and common programs for the entire Lower Kings Basin;
- Develop management plan components to stabilize the basin groundwater levels, and begin to recover the basin groundwater levels, through conjunctive use and banking that would include surface water supply, conveyance, recharge, and management components; and



Lower Kings Basin GWMP Update

Areas and Water Management Areas

April 2005

Figure 1.3

- Provide an implementation plan and define the ongoing process to continue cooperation, build projects, and meet state requirements.

1.4 STAKEHOLDER AND AGENCY PARTICIPATION

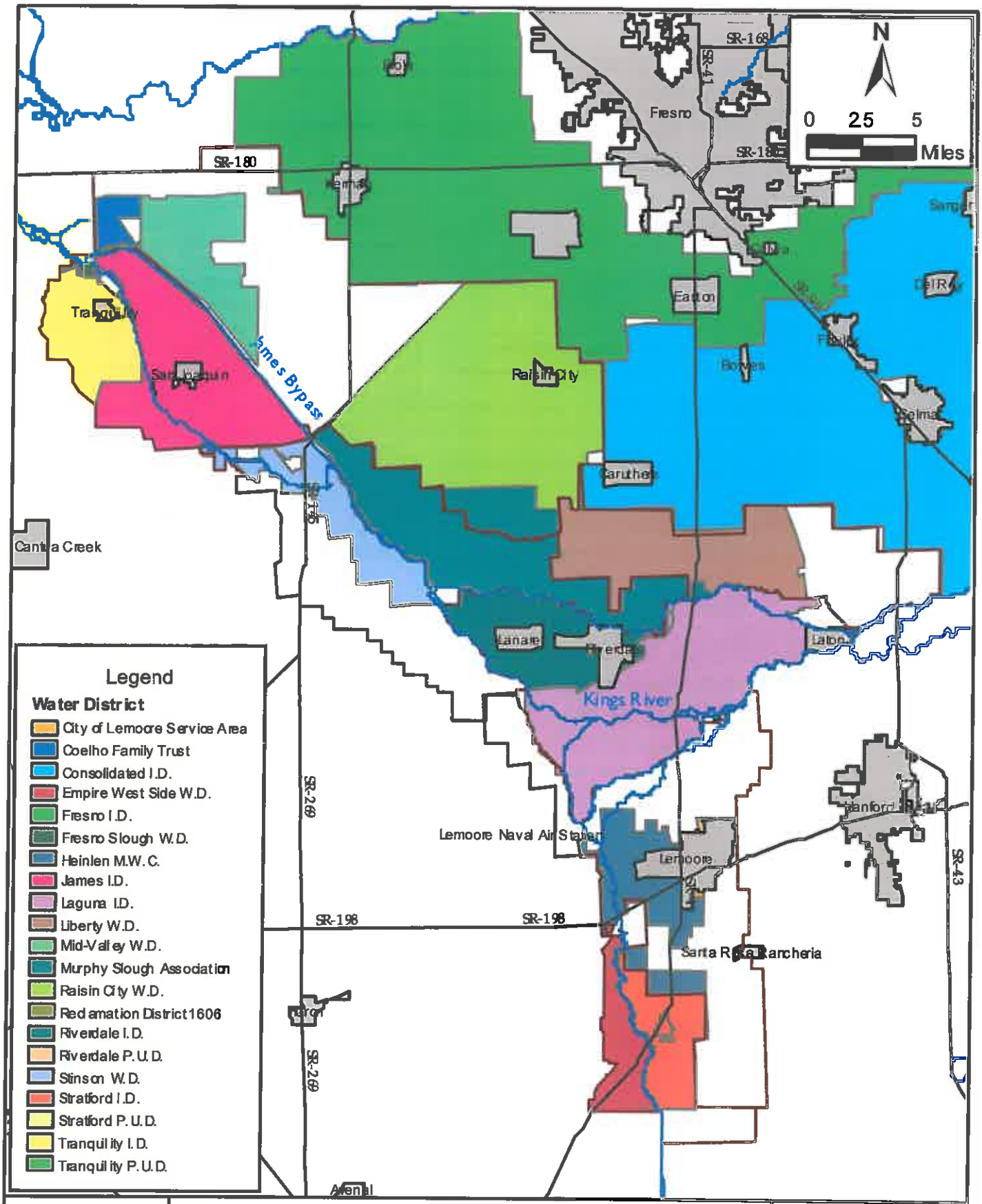
At a regularly scheduled and announced public hearing of the Board on November 12, 2002, a resolution was approved to seek grant funding for a project to update the GWMPs (Appendix A). The Board recognized the need to update the plans to comply with the revised state requirements as defined in Senate Bill 1938 (SB 1938). KRCD prepared and submitted a grant application to DWR seeking funding from the Local Groundwater Management Assistance Act of 2000 (AB 303) and funding was awarded by DWR in June 2003. A contract to prepare the GWMP was awarded by the Board in November 2004 during a regularly scheduled and announced public hearing.

The Lower Kings Basin Advisory Panel (BAP) was organized by KRCD to participate and direct the development of the GWMP. Meetings were held through fall and winter 2004 and spring 2005 to coordinate stakeholder input and incrementally develop the GWMP.

The BAP used a consensus-based approach to groundwater management. The agencies and stakeholders determined that a consensus-based approach to water resources planning and conjunctive water management would increase the likelihood of implementing projects and management actions that are equitable, affordable, and locally controlled, and provide far-reaching local and regional benefits. In addition, such cooperative efforts are intended to reduce the potential for conflicts over water and to increase public support, political influence of the region, and the probability of obtaining local and state funding.

There are a number of existing cooperative efforts within the Lower Kings Basin and groups have formed to implement previous GWMP recommendations and have provided input to this GWMP. The groups have been supported by KRCD and include the McMullin Group in Area A and the North Fork Group (NFG) in Area B. In addition to the BAP meetings, a number of meetings were held with ditch company and water district staff to obtain available data, establishes objectives, discuss project operations, and identify project concepts.

All of the overlying irrigation districts, ditch/water companies, and incorporated cities and counties (Figure 1.4) were invited to participate in the GWMP development. The BAP was open to all stakeholders. KRCD coordinated the BAP, established meeting dates and agendas, and prepared meeting notes and minutes as needed. There was active participation by 15 agencies and ditch companies, as listed in Table 1.1. The BAP was formed to support and provide leadership to develop the GWMP and identify potential recharge projects in the Lower Kings Basin.



WRIME

Lower Kings Basin GWMP Update

Boundaries of Cities and Water Agencies

April 2005

Figure 1.4

Table 1.1. Basin Advisory Panel Participants

Agency or Company	Representative
Burrel Ditch Co. c/o Maddox Farms	Doug Maddox
Clark Forks Reclamation Dist. #2069	JoAnna Alves
Corcoran Irrigation Company	Thomas Vernon
Crescent Canal Company	Mark Borba
John Heinlen Mutual Water Company	Ronnie Silva
Laguna Irrigation District	Scott Sills
Last Chance Water Ditch Company	Neil Bellamy
Lemoore Canal and Irrigation Company	Ronnie Silva
Liberty Canal Company	John Coelho
Liberty Mill Race Company	Brad Harlan
Peoples Ditch Company	Dean Kuntz
Raisin City Water District	Jerry Boren
Reed Ditch Company	Mark McKean
Riverdale Irrigation District	Dean Jensen
Stratford Irrigation District	Charles Meyer

PROCESS FOR ADOPTION

The GWMP will be presented to the Board at a regularly scheduled and publicly announced meeting in May 2005. The draft plan will receive written and oral public comment before adoption by resolution of the Board. A draft resolution supporting adoption and defining how areas will obtain coverage is presented in Appendix B. Once adopted, the other local agencies will schedule and conduct meetings to consider adoption of the plan and seek coverage under the plan. None of the local agencies will be covered by the GWMP unless they specifically seek to be included in the GWMP and appropriate action is taken by the governing body.

1.5 PREVIOUS GROUNDWATER MANAGEMENT PLANS AND RELATED EFFORTS

The purpose of this section is to briefly describe the previous GWMPs and progress made in implementing their recommendations. Each of the previous GWMPs documented the current and future land use and water demand, water supplies, conveyance facilities, regional and site-specific hydrogeologic conditions affecting recharge and groundwater storage, and water budgets for their respective areas. Each individual GWMP briefly described the potential alternatives that could help overcome overdraft, including land fallowing, changing crop types, limiting groundwater extractions, and developing conjunctive use facilities. The unique features and findings of the plans are described below.

WATER MANAGEMENT AREA A

The GWMP for WMA A (KRCD 1995) concluded that regional conditions were generally favorable for artificial recharge and conjunctive use. The report documented the near total reliance on groundwater, the large cone of depression, and extensive overdraft in WMA A, noting that the majority of the local water demand was met through underflow from adjacent areas.

The GWMP also concluded that the area is a prime candidate for conjunctive use and water banking. Constraints to artificial recharge and groundwater storage were identified and related primarily to limitations or lack of facilities to divert and convey water, uncertainty regarding availability of unallocated water in Kings River, and the episodic nature of the flood flows available for recharge. The report also noted the need for a feasibility study and site-specific review of local hydrogeologic conditions where direct recharge might be possible, and further recommended developing or expanding the relationships between local agencies and the state.

KRCD and local stakeholders formed the McMullin Group to build relationships, undertake the recommended feasibility studies, and implement other aspects of the WMA A GWMP. The McMullin Group was formed in 1999 and comprises James Irrigation District (ID), Mid-Valley ID, Raisin City Water District (WD), Tranquility ID, and Terranova Ranch, Inc. Both the James ID and Tranquility ID prepared independent GWMPs for their jurisdiction.

Since its formation, the McMullin Group has met on a regular basis. As indicated in the minutes from the meetings, the group developed local funding and cost sharing sources, coordinated procurement of grant funds, and identified and worked to resolve issues related to implementation of conjunctive use and groundwater recharge projects. KRCD has provided staff support to the group. KRCD also prepared a grant proposal and obtained funding under Proposition 13 from DWR for the feasibility study, drilling, site characterization, and preliminary design of conjunctive use projects at two locations. DWR awarded funds in 2002 for the feasibility investigations. The feasibility study is scheduled to be completed in early 2005.

WATER MANAGEMENT AREA B

KRCD prepared the GWMP for WMA B (KRCD 1996), which was adopted by the Board on February 12, 1996. The WMA B GWMP concluded that the area was favorable for additional artificial recharge and conjunctive use, and documented the need for a feasibility study and site-specific review of local hydrogeologic conditions where direct recharge may be possible. Overdraft was determined to be much less than that in WMA A. Conjunctive use projects in WMA B are less constrained than those in WMA A because many areas have facilities to convey

water to potential sites, and many of the overlying water districts and ditch companies have existing water rights and entitlements. Projects in this part of the Lower Kings Basin planning area have less institutional, legal, or regulatory obstacles than those in WMA A.

To implement the WMA B GWMP, the local stakeholders formed the NFG and entered into a Memorandum of Understanding (MOU) with DWR and KRCD in September 2000. The original WMA B was then expanded to the current boundaries. The purpose of the MOU has been to develop and implement conjunctive use projects consistent with the 1996 GWMP. NFG has also participated in the BAP for purposes of updating the WMA B portion of this GWMP. NFG comprises Burrell Ditch Company, Crescent Canal Company, Liberty Canal Company, Liberty Mill Race Company, Reed Ditch Company, and Stinson Canal and Irrigation Company. Liberty, Laguna, and Riverdale IDs had previously produced GWMPs for their jurisdictions. The Riverdale ID and Laguna ID Board of Directors adopted resolutions to join the NFG in 2004 to create a larger and more representative hydrologic area and be covered under the GWMP.

Actions taken since adopting the 1996 GWMP include forming the NFG, developing the MOU with DWR, and construction of a number of local groundwater recharge projects. Under the MOU with DWR, a Basin Assessment Technical Memorandum was prepared (WRIME 2004) to document current groundwater conditions. At the request of the NFG at the November 2004 meeting, the technical memorandum also included a work plan to complete the data by conducting field investigations and for performing preliminary engineering feasibility studies and designs for recharge ponds. The NFG also requested that KRCD prepare grant applications for AB 303 grant funding. KRCD staff prepared and submitted a 2004–05 AB 303 grant application to conduct the hydrogeologic characterizations and preliminary engineering work.

WATER MANAGEMENT AREA C

The GWMP for WMA C was completed by KRCD in June 1998 and adopted on August 11, 1998. Although the area was not found to be in overdraft, the GWMP was adopted to develop a coordinated approach to the evaluation and management of groundwater. The report documented that WMA C has good availability of surface water supplies. This area is more geologically complex than WMAs A or B and has limited additional recharge potential in much of the region. Additional geologic studies and monitoring were recommended to confirm the presence of clay layers that would constrain direct-recharge projects, although the "in lieu" recharge historically practiced could potentially be expanded. With financial support provided by DWR, KRCD worked with local interests to support drilling exploration holes and constructing dedicated monitoring wells to characterize the aquifers, monitor levels in the confined aquifers to the south in WMA C, and provide important data to document the conclusions of the GWMP.

OTHER RELATED KRCD AND GWMP ACTIONS IN THE LOWER KINGS BASIN

Since adoption of the GWMPs for the Lower Kings Basin, KRCD has continued to implement actions to support the common objectives and recommendations of the plans. These actions were to:

- Use existing KRCD educational and public information programs to promote conjunctive use and groundwater management;
- Publish the 1999 report titled "Artificial Groundwater Recharge in the Kings River Service Area" to map and document ten groundwater recharge programs in the Kings Basin, including recommendations on how other areas can become involved in groundwater recharge programs;
- Expand the KRCD ambient groundwater level monitoring program;
- Produce annual groundwater reports; and
- Prepare applications for a range of grant funds.

RELATED GWMPS AND PLANNING EFFORTS

The Upper Kings Basin water districts include Alta Irrigation District (AID), Consolidated Irrigation District (CID) and Fresno Irrigation District (FID), all of which have prepared and are updating their GWMPs. CID and FID are up gradient from and directly abut the Lower Kings Basin GWMP planning area. The three districts also signed MOUs with DWR to support development of conjunctive use and groundwater recharge projects. A Basin Assessment Report (WRIME 2003a) and preliminary conjunctive use assessment report were produced under the MOU (WRIME 2003b).

This work led to the expansion of the group and formation of the Upper Kings Water Forum, whose purpose it is to develop an Integrated Regional Water Management Plan (IRWMP) through a collaborative effort involving the water districts, environmental interests, overlying cities and counties, and other stakeholders.

1.6 GWMP COMPONENTS AND CONSISTENCY WITH THE CALIFORNIA WATER CODE

Groundwater management is the planned and coordinated local effort of sustaining the groundwater basin to meet future water supply needs. With the passage of AB 3030 in 1992, local water agencies were provided a systematic way of formulating groundwater management plans (California Water Code, Sections 10750 et seq.). AB 3030 also encourages coordination between local entities through joint-power authorities or MOUs. SB 1938, passed in 2002, further emphasized the need for groundwater management in California. SB 1938 requires

AB 3030 groundwater management plans to contain specific plan components to receive state funding for water projects. The Lower Kings Basin GWMP includes the seven mandatory components that are required to be eligible for the award of funds administered by DWR for the construction of groundwater projects or groundwater quality projects. The GWMP also addresses the 12 specific technical issues identified in the California Water Code along with the seven recommended components identified in DWR Bulletin 118 (DWR 2003). Table 1.2 lists the required and recommended components and identifies the specific location within this GWMP where the information can be found.

Table 1.2. Lower Kings Basin GWMP Components

Description	Section(s)
SB 1938 Mandatory Components	
1. Documentation of public involvement	1.4, 1.5
2. BMO(s)	3.3
3. Monitoring and management of groundwater elevations, groundwater quality, inelastic land subsidence, and changes in surface water flows and quality that directly affect groundwater levels or quality	4.2-4.4
4. Plan to involve other agencies located in the groundwater basin	1.5
5. Adoption of monitoring protocols	4.4, 6.5
6. Map of groundwater basin boundary, as delineated by DWR Bulletin 118, with agencies boundaries that are subject to GWMP	1.2
7. For agencies not overlying groundwater basins, prepare the GWMP using appropriate geologic and hydrogeologic principles	N/A
AB 3030 and SB 1938 Voluntary Components	
1. Control of saline water intrusion	4.4
2. Identify and manage well protection and recharge areas	4.4
3. Regulate the migration of contaminated groundwater	4.4
4. Administer well-abandonment and destruction program	4.4
5. Control and mitigate groundwater overdraft	4.2, 4.3
6. Replenish groundwater	4.2, 4.3
7. Monitor groundwater levels	4.4
8. Develop and operate conjunctive use projects	4.3
9. Identify well-construction policies	4.4
10. Develop and operate groundwater contamination cleanup, recharge, storage, conservation, water-recycling, and extraction projects	4.2-4.4
11. Develop relationships with state and federal regulatory agencies	6.3
12. Review land use plans and coordinate with land use planning agencies to	4.4

Description	Section(s)
assess activities that create reasonable risk of groundwater contamination	
DWR Bulletin 118 Suggested Components	
1. Manage with guidance of advisory committee	1.4
2. Describe area to be managed under GWMP	1.2
3. Create links between BMOs and goals and actions of GWMP	3.1, 4.1, 6.1
4. Describe GWMP monitoring programs	4.4
5. Describe integrated water–management planning efforts	4.4
6. Report of implementation of GWMP	6.3
7. Evaluate GWMP periodically	6.3

1.7 CONTENTS OF THE GWMP

The following provides a description for each section included in this GWMP.

Section 1 - Introduction: This section provides background information and context for the GWMP.

Section 2 - Water Resources Setting and Current Conditions: This sections is provided to help define the water supply and management problems to be addressed in the GWMP, and describes the baseline conditions to lay the foundation for establishing GWMP goals and objectives. It contains an overview of the physical setting, including the climate, soils, and geology and describes any major planning constraints. Also presented are current and future land use and water demands, water supplies and sources, existing water supply facilities, groundwater conditions, water quality, and water budgets for the Lower Kings Basin.

Section 3 - Goals and Objectives: This section contains the GWMP goals and objectives and the specific BMOs that were developed to help quantify the groundwater management goals and objectives, establish planning timeframes, define operational parameters, and set measurable targets that may be used by local stakeholders to measure progress or to "trigger" subsequent management responses. BMOs are set for each WMA related to stabilizing groundwater levels and for project development.

Section 4 - Groundwater Management Options: This section provides a description of each surface water and groundwater management option that was considered and discussed by the BAP. Other management options or program elements considered for inclusion in the Lower Kings Basin are also discussed, including the required or recommended elements pursuant to SB 1938. The BMO also sets set up the planning framework and priorities for interpreting the

near-term or long-term applicability of the option. The issues and constraints associated with each individual option were evaluated to determine the applicability and relation to the Lower Kings Basin GWMP; some options were rejected while others were carried forward to be integrated into and develop the GWMP components.

Section 5 - Financing and Governance Options: This section presents an analysis and description of alternative governance and financing options for managing and implementing the GWMP.

Section 6 - Management and Implementation Plan: This section provides information regarding the plan components and how the plan will be managed and implemented.

Section 7 - References

SECTION 2 WATER RESOURCES SETTING AND CURRENT CONDITIONS

This section summarizes the groundwater and water supply problems and issues that are addressed in the GWMP. It describes the historical and baseline conditions and contains an overview of the physical setting, including the climate, soils, and geology and describes the major planning constraints in these resource categories. Current and future land use and water demands, groundwater conditions, water supplies and sources, existing water supply facilities, and water quality in the Lower Kings Basin are presented.

2.1 SCOPE AND APPROACH

Historical groundwater and surface water data were collected and inventoried to support the GWMP update, document problems, and identify potential solutions. Existing hydrologic data, maps, and related water resources reports were compiled and inventoried from local, state, and federal data sources in both digital and hard copy formats.

Site meetings with KRCD staff and water agency representatives were held to obtain available data and maps, review existing facilities and operations, discuss opportunities for developing new facilities, and document potential options and GWMP components. The primary issues, stakeholder interests, expectations, and objectives were also discussed to identify areas of concern and consensus within the Lower Kings Basin.

Previous reports were reviewed and the available data analyzed to document the historical and existing conditions of the groundwater basin and to identify unique characteristics within each Area. This included calculating existing water demands and forecasting future demands using data related to land use, unit water requirements, and the different crop types in the Lower Kings Basin. Groundwater data were analyzed to evaluate trends, document changes in storage, assess groundwater occurrence and flow conditions, and determine available groundwater storage space that might be used for conjunctive use. Composite hydrographs were prepared for each WMA and used to forecast future water level conditions and help the BAP establish BMOs. The results of the analyses were used by the BAP to gain a consensus on the nature and extent of the problem before establishing GWMP goals, general objectives, and the specific BMOs that are presented in Section 3.

The data and results of the analyses are summarized in this section, and the more detailed data and results are provided in the appendices.

2.2 PHYSICAL SETTING

Surface and subsurface conditions influence groundwater management options. Local soils and near surface conditions influence how water applied at the land surface, either from rainfall or irrigation, moves through the soil and percolates downward into the groundwater basin; how canal flows and stream flow contribute to the groundwater budget; and also may influence the location and design of recharge projects and delivery canals. Deeper geologic features control the fate and transport of water once it is in the subsurface, groundwater storage capacity, recharge–discharge relationships, flow between areas, and well designs and pumping rates.

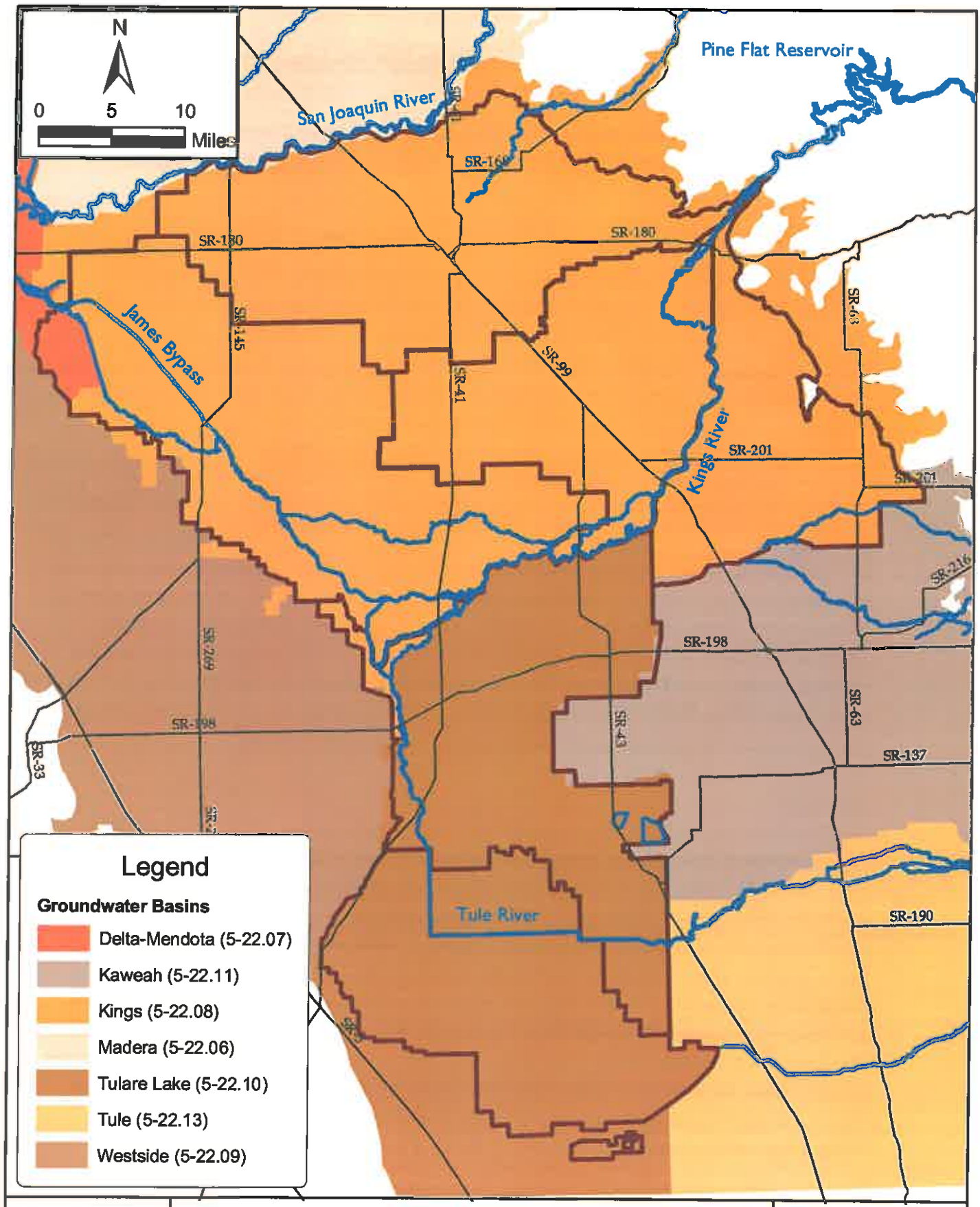
GROUNDWATER BASIN

Figure 2.1 presents a map showing the area of the Kings Subbasin (DWR basin no. 5-22.8) and surrounding groundwater basins as defined by DWR (DWR 2003). The San Joaquin and Kings Rivers are the two principal rivers within or bordering the subbasin.

The Kings Subbasin underlies an area of approximately 1,530 square miles and is part of the San Joaquin Valley Groundwater Basin. It is bounded on the north by the San Joaquin River, which is a source of recharge to both the Madera and Kings Subbasins. There are no geologic features or faults that would prevent water from flowing between the Madera and Kings Subbasins. The western boundary of the Kings Subbasin is defined by the eastern boundaries of the Delta-Mendota and Westside Subbasins. Groundwater can also move between the Delta-Mendota and Westside Subbasins and the Kings Subbasin.

The southern Kings Subbasin boundary runs easterly along the northern boundary of the Empire West Side ID, the southern fork of the Kings River, the southern boundary of Laguna ID, the northern boundary of the Kings County WD, the southern boundaries of CID and AID, and the western boundary of Stone Corral ID. The Kaweah and Tulare Lake Subbasins are to the south and the flow relationships between the Kings Subbasin and these subbasins are less well defined. The eastern boundary of the Kings Subbasin is the alluvium-granitic rock interface of the Sierra Nevada foothills.

The Lower Kings Basin is a locally defined planning area based primarily on surface water management and jurisdictional boundaries. The Lower Kings Basin is also defined by hydrogeology since the Lower Kings Basin has unique groundwater recharge and discharge characteristics. These characteristics will be discussed later in the document. The Lower Kings Basin extends from the western boundaries of FID, CID, and Kings County WD. It is bounded on the north by the San Joaquin River and on south by the southern boundary of Stratford ID.



WRIME	Lower Kings Basin GWMP Update **Groundwater Basins**	April 2005 Figure 2.1

The Upper Kings Basin has a total groundwater storage capacity of 35 million acre-feet to an average depth of about 500 feet (KRCD, 1993). DWR estimates groundwater storage for the entire Kings Basin as 95 million acre-feet to a depth no more than 1,000 feet (DWR Bulletin 118-03). Groundwater storage in the Lower Kings Basin is estimated in this report as 44 million acre-feet to a depth of 1,000 feet. The Lower Kings Basin storage estimate was calculated by multiplying the area of the Lower Kings Basin, the depth of 1,000 feet and the average specific yield of the Lower Kings Basin which was estimated as 12.3%. The total volume of groundwater storage in the Lower Kings Basin, though sizable, is not all useable due to both economical and technical reasons that include increased pumping costs due to deepening groundwater levels and excessive lifts; the possibility to of causing the migration of poor quality water; and the potential to induce land subsidence.

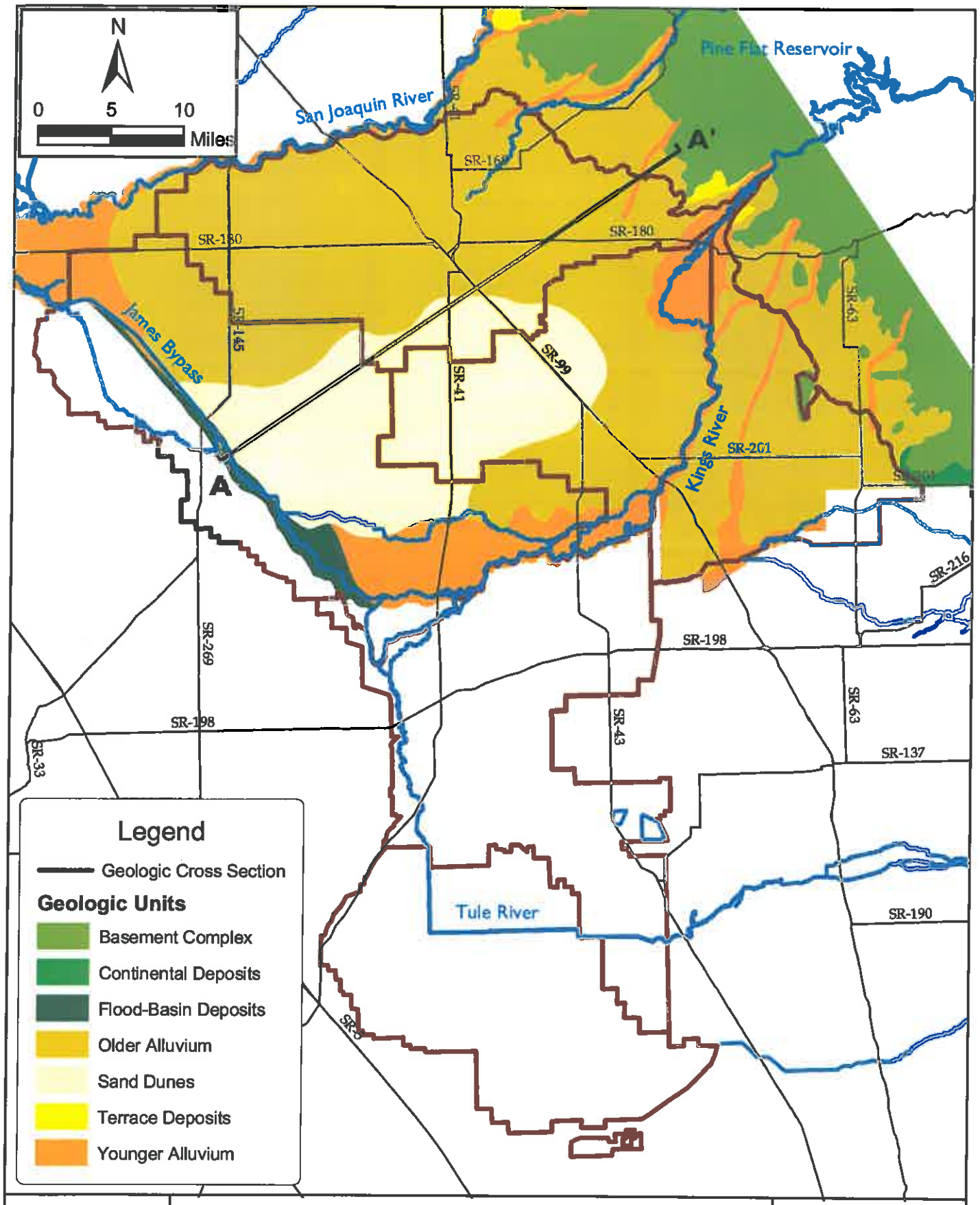
BASIN TOPOGRAPHY

The Kings River watershed covers an area of 1,742 square miles, with the majority being east of the Lower Kings Basin. The watershed includes a portion of the Sierra Nevada mountains with elevations ranging from 500 to 14,000 feet above mean sea level (msl). A large percentage of the watershed lies above an elevation of 5,000 feet, and as such, winter snow pack is the most important source of water storage in the Kings River. There is little change in ground surface elevation in the Lower Kings Basin. Ground surface elevations are the highest on the east side of the Lower Kings Basin and gradually decline to the west toward the axis, or lowest part of the San Joaquin Valley, ranging from 150 to 270 feet above mean sea level.

GEOLOGY

The Lower Kings Basin groundwater aquifer system consists of unconsolidated continental deposits (DWR, 2003). The deposits are divided into formations that include older alluvium, marsh deposits, younger alluvium, and flood-basin deposits. The older alluvium is an important aquifer that readily yields water to wells. It consists of lenses of clay, silt, sand, gravel, cobbles, and boulders and is generally fine grained near the deepest part of the valley. Marsh deposits are mixed in with the older alluvium in the Lower Kings Basin. The younger alluvium is a sedimentary deposit found beneath the river channels and is highly permeable. The flood-basin deposits consist of sand, silt, and clay and occur along Fresno Slough and James Bypass. There are no known major faults or fault zones that have been mapped or identified that would inhibit groundwater flow within the Lower Kings Basin, or between the Lower Kings Basin and surrounding areas.

Figure 2.2 shows the surface geology of the Lower Kings Basin and indicates the location of a geologic cross section presented in Figure 2.3. The western portion of the cross section shows



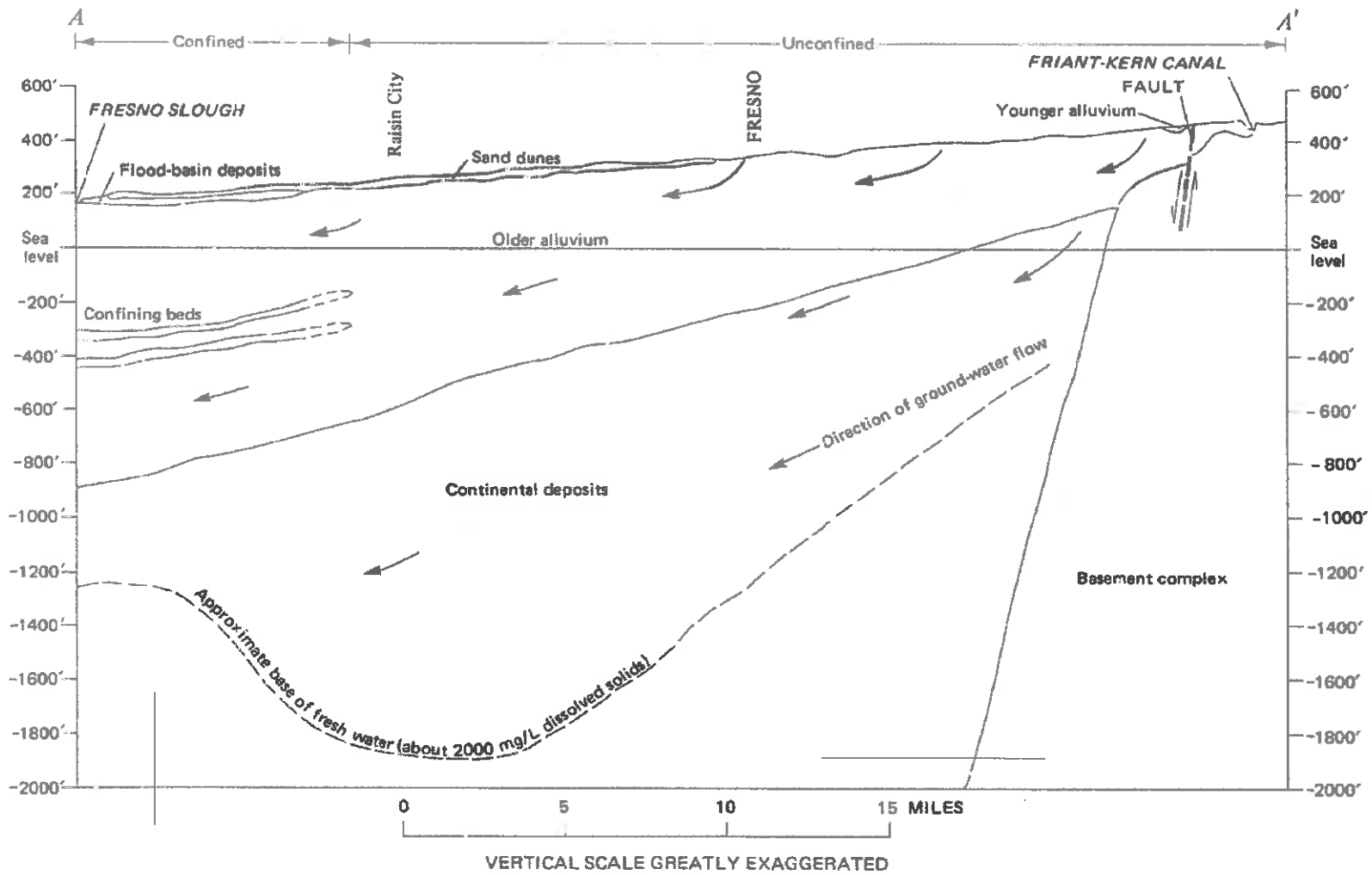
WRIME

Lower Kings Basin GWMP Update

Surface Geology and Geologic Cross Section

April 2005

Figure 2.2



Source: USGS. 1977, *Groundwater in the Fresno Area*, Water Resources Investigations 77-59.

RIME

Lower Kings Basin GWMP Update

Representative Geologic Cross Section

April 2005

FIGURE 2.3

the relationship between geologic units below the surface in the Lower Kings Basin. The figure is illustrative of the clay layers that are present in the Lower Kings Basin. The presence of these clay layers influence conjunctive use and are a factor in locating potential recharge project facilities.

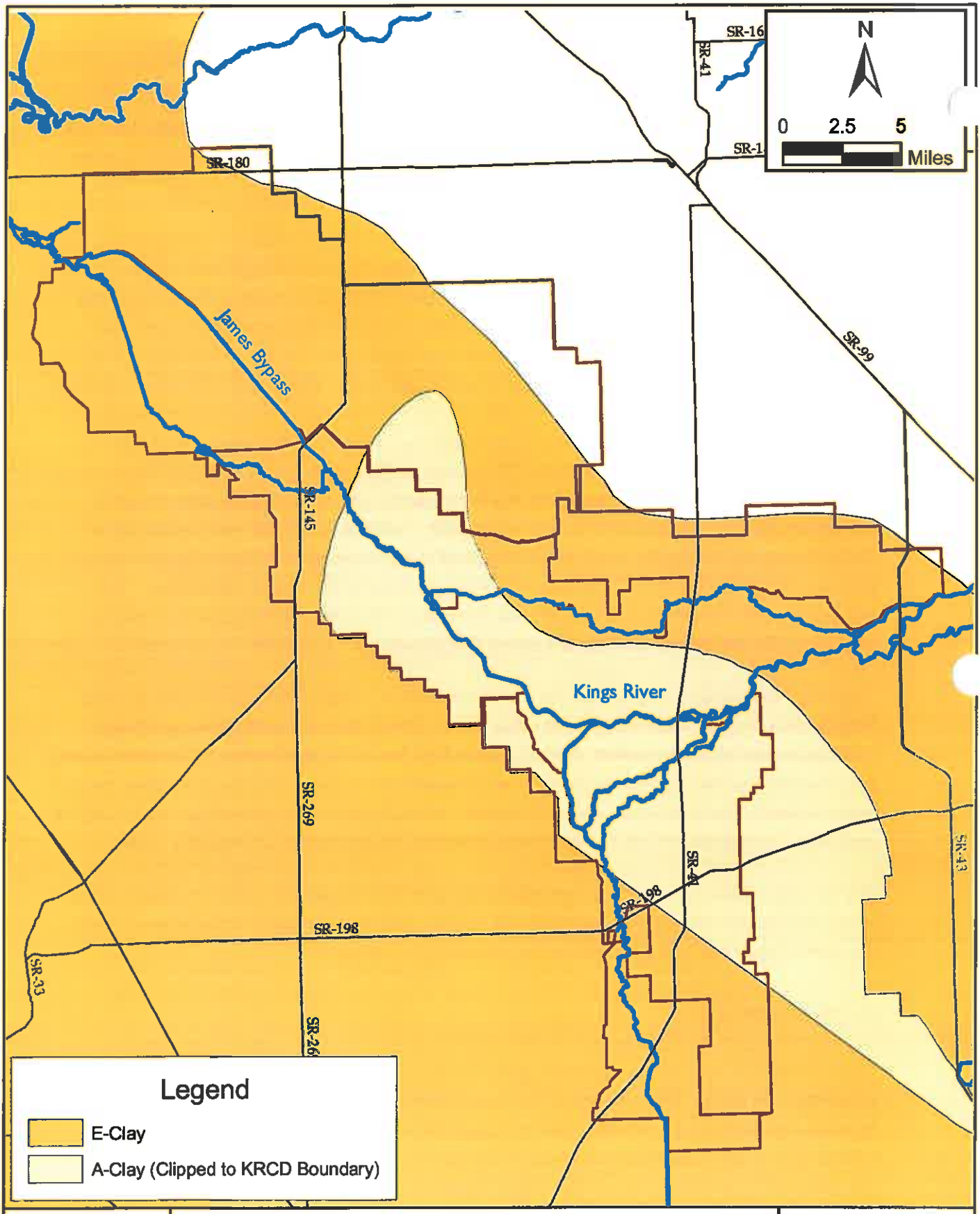
The impermeable clay layers extend throughout much of the Lower Kings Basin, as shown in Figure 2.4. Impermeable and nearly impermeable clay layers are present in the western and southern parts of the Lower Kings Basin and influence where water can be recharged and stored in the groundwater basin. The two most important layers are the A-Clay and E-Clay, which are present throughout much of the Lower Kings Basin. These clay layers are associated with flood and marsh deposits of the San Joaquin Valley lowlands and the Tulare Lake Bed. The clay layers interfinger with alluvial deposits of the valley. The aquifers beneath the clay layers are confined and under pressure. The presence of the confining clay layers also means that sands and gravels that make up the aquifer are not in direct connection with the land surface or potential sources of recharge. As a result, recharge to replace water removed by wells must enter the aquifer from sources up gradient of the pumping wells where the clays become discontinuous. This is the area in the eastern edge of the Lower Kings Basin. The presence or absence of these clay layers is a determinant for siting recharge projects and for evaluating the impacts or benefits of projects and pumping.

Typically, wells in confined aquifer are less susceptible to contaminants that originate at the land surface directly above the area of influence for a well, than are wells screened in semi-confined or unconfined aquifers. In the Lower Kings Basin, the implication is that cities relying on groundwater that are located above clay layers should construct wells in and below the clay layers to lessen the likelihood of contamination. All wells should be constructed with adequate seals between the formations to prevent the downward migration of poor quality water.

Site specific surface, near surface, and subsurface geologic conditions will be evaluated more extensively as part of engineering feasibility studies conducted for specific recharge projects. The specific projects being considered are discussed in Section 4.

LAND SUBSIDENCE

Land subsidence results from excessive groundwater pumping beneath laterally extensive confining clay layers. The removal of the groundwater from the confined aquifer causes increased pressure on the aquifer system located below the confining layer. This results in compaction of the fine-grained layers at depth, and is evident at the ground surface as land subsidence. Up to 6 feet of land subsidence occurred along the western edge of the Kings Basin between 1926 and 1970 (Ireland, 1984). During meetings held with Laguna ID staff, it was indicated that poured-in-place concrete pipes have cracked in unusual patterns and well heads



WRIME

Lower Kings Basin GWMP Update

Impermeable Clay Layers

April 2005

Figure 2.4

Source: USGS PP 1401-D, 1989

have separated from the ground surface in western most part of WMA B1. This may be indication of localized land subsidence and warrants further investigation and analysis.

SOILS AND SURFACE RECHARGE POTENTIAL

Surface recharge potential in the Lower Kings Basin is a function of soil type. The surface recharge potential of the soil was interpreted based on the hydrologic soil group, as categorized by the Natural Resources Conservation Service (NRCS). Hydrologic soil groups are classified according to their ability to infiltrate water and affect runoff. The soils are grouped according to the amount of water infiltration when the soils are thoroughly wet and receive additional precipitation. The four hydrologic soil groups are:

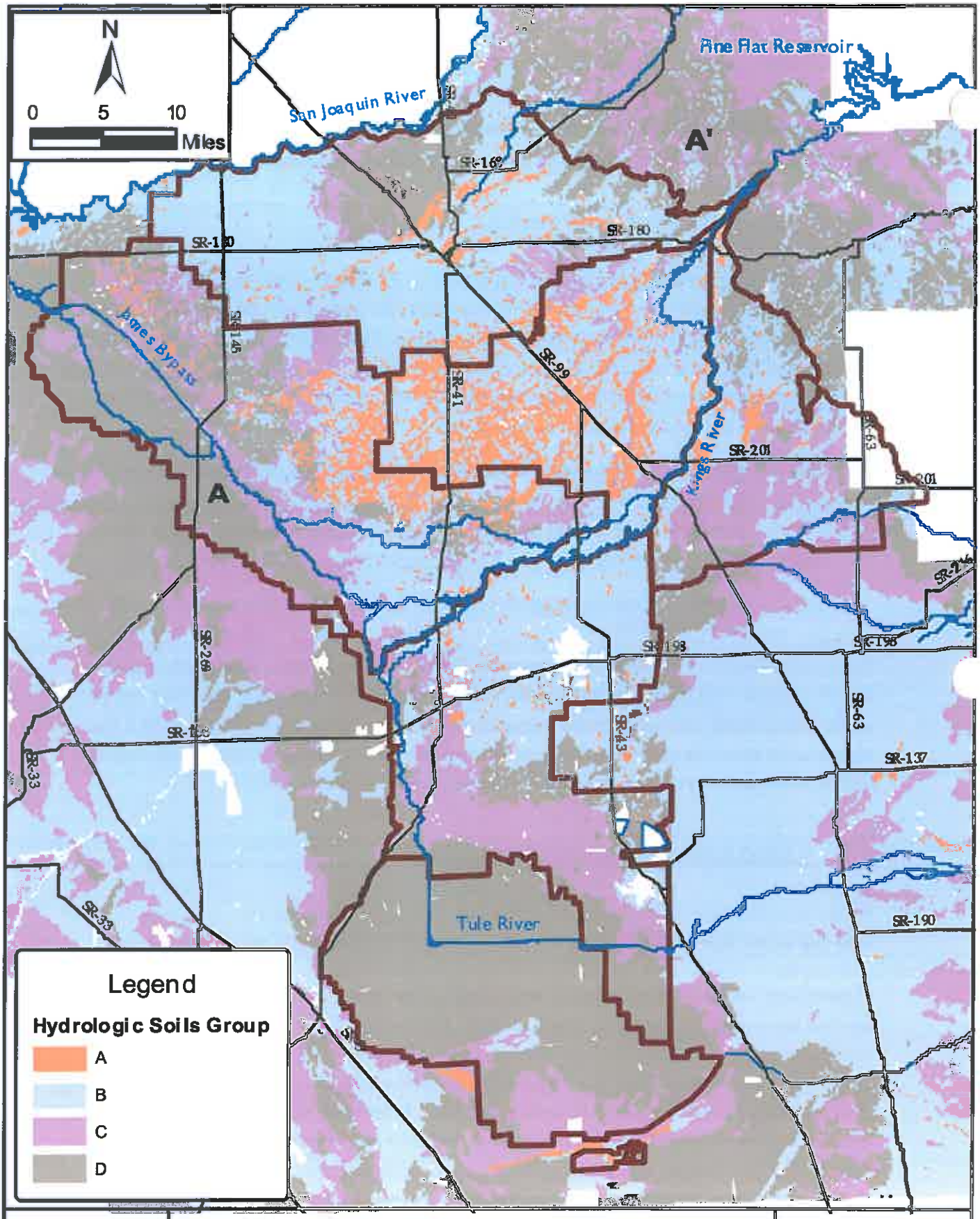
- **Group A**: Soils having a high infiltration rate (low runoff potential) when thoroughly wet;
- **Group B**: Soils having a moderate infiltration rate when thoroughly wet;
- **Group C**: Soils having a slow infiltration rate when thoroughly wet; and
- **Group D**: Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet.

Figure 2.5 shows the hydrologic soil groups in the Lower Kings Basin. In general, Group A soils (i.e., those with the highest infiltration rate) are located along stream and river channels while Group B soils are widespread throughout the Lower Kings Basin. This indicates that soil type is not a major constraint for locating recharge projects. Site specific conditions will be further evaluated as part of a more detailed engineering feasibility study.

2.3 LAND USE AND WATER DEMAND

Water demands vary by land use and crop type. This section summarizes current and future land and water demands. Appendix C contains more detailed data and analysis results.

Current land use and water demands were analyzed using the 1999-2000 DWR land use surveys for Fresno, Kings, and Tulare Counties. Future land use and water demand were developed using estimates of expected land use in 2030. Figure 2.6 shows the generalized land use in the Lower Kings Basin. The figure includes delineation of urban areas as they currently exist and their projected spheres of influence (SOIs). Water duty factors were assigned for each type of land use and for the specific crop types and crop mix found in the Lower Kings Basin. Figure 2.7 shows current and projected land use and water demand in the Lower Kings Basin. More detailed crop maps were used for determining agricultural water demand and these maps

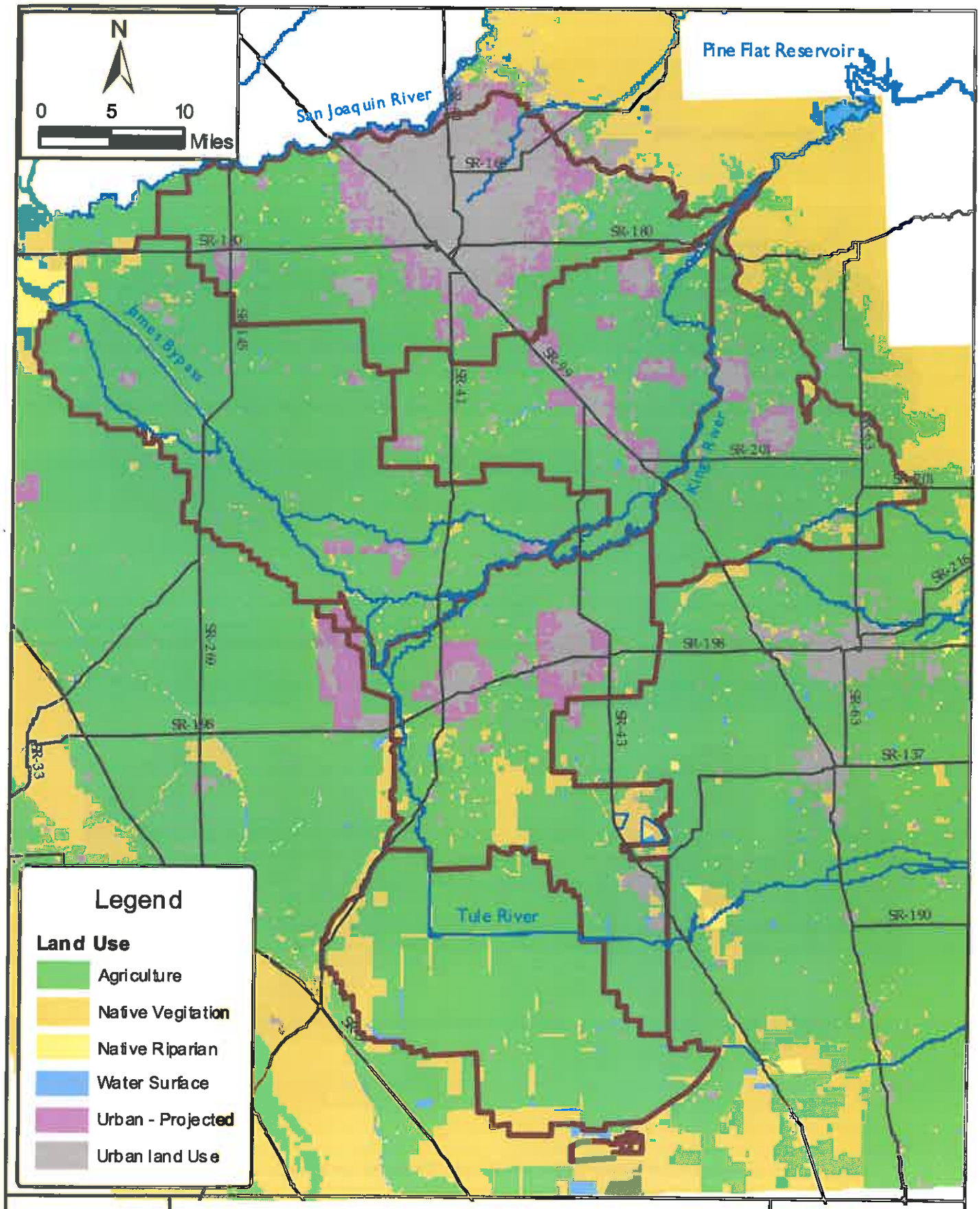


Lower Kings Basin GWMP Update

Hydrologic Soils Group

April 2005

Figure 2.5



RIME

Lower Kings Basin GWMP Update

General Land Use

April 2005

Figure 2.6

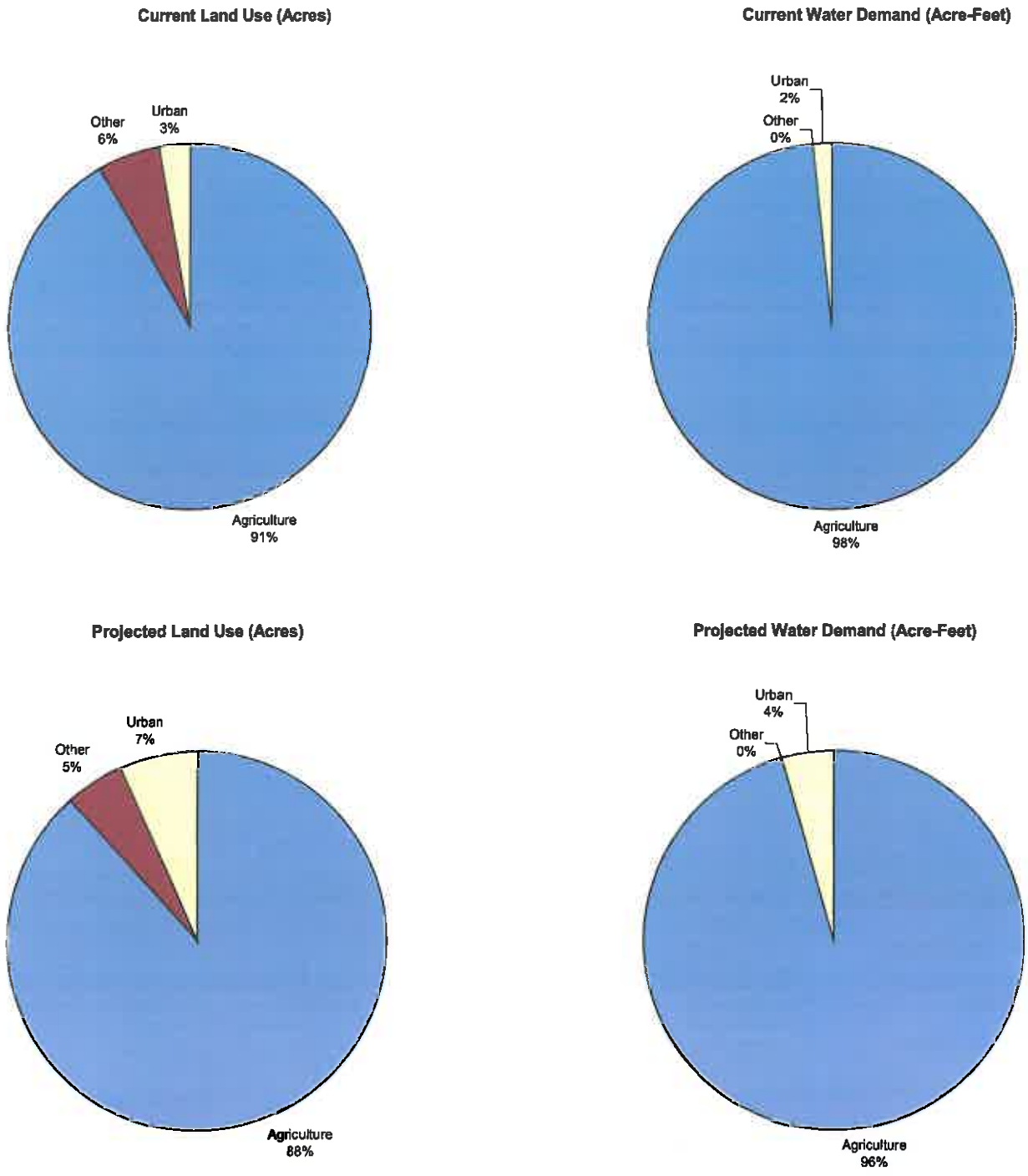


Figure 2.7 Summary of Land Use and Water Demand in Lower Kings Basin

are presented in Appendix C. Table 2.1 summarizes water demand and land use data for each WMA.

Table 2.1. Summary of WMA Demands and Land Use

WMA	Current Conditions					Projected Conditions				
	Agri-culture (Acres)	Other (Acres)	Urban (Acres)	Total (Acres)	Water Demand (AF)	Agri-culture (Acres)	Other (Acres)	Urban (Acres)	Total (Acres)	Water Demand (AF)
A	104,960	4,899	2,408	112,268	321,133	104,552	4,899	2,816	112,268	320,878
A1	36,644	1,275	788	38,707	118,647	36,197	1,269	1,241	38,707	118,010
B	56,533	2,600	725	59,858	161,898	56,414	2,600	844	59,858	161,839
B1	48,796	3,493	1,810	54,099	158,880	45,061	3,158	5,880	54,099	155,060
B2	33,800	283	375	34,459	108,433	33,800	283	375	34,459	108,433
C	46,542	6,100	4,686	57,328	147,854	39,757	4,480	13,091	57,328	142,517
C1	18,641	2,070	372	21,083	50,187	18,641	2,070	372	21,083	50,187
Total	**345,918**	**20,720**	**11,164**	**377,802**	**1,067,032**	**334,423**	**18,760**	**24,619**	**377,802**	**1,056,923**

Approximately 92% of the Lower Kings Basin is in agricultural use and 3% is in urban use under current conditions. Remaining 5% of land area is undeveloped. Agricultural water demand in the Lower Kings Basin was estimated to be 98% of total water demand (total water demand is approximately 1,067,000 acre-feet).

Projected land use and water demand data were developed for 2030 conditions. The primary change in land use is the conversion of agricultural lands to urban development near or adjacent to existing cities and towns. The Lower Kings Basin contains relatively small urban areas that include cities of San Joaquin (WMA A1), Riverdale (WMA B1), Lemoore (WMA C), Raisin City (WMA A), Lanare (WMA B1), Laton (WMA B1), and Tranquility (WMA A1). The cities and county define their growth plans in the most recent general plan. The projection was based on information obtained from local land use planning agencies and the Fresno County Local Agency Formation Commission (LAFCO). The Fresno County LAFCO works with the cities and county to establish a SOI that defines a boundary for urban growth.

For projected agricultural land use conditions, the current crop mix was assumed to remain unchanged from current conditions. Based on the analysis of projected land use data, the agricultural area is expected to be reduced by approximately 11,500 acres and the urban area is expected to increase by 13,500 acres. The increase in urban area includes the development of previously undeveloped lands. The change in land in use represents a 4% reduction in total agricultural area and increase of 120% in urban development from current conditions.

There is corresponding change in water demand with the changes in land use. Future agricultural water demand for the Lower Kings Basin is estimated to be 96% of the total water

demand of 1,057,000 acre-feet. It is expected that the total water demand for the Lower Kings Basin will decrease slightly from current conditions.

CLIMATE-PRECIPITATION AND EVAPOTRANSPIRATION

The climate in the Lower Kings Basin is semi-arid, with mild winters and hot, dry summers. Typical annual rainfall is 8–11 inches per year, with most of the rainfall occurring in winter and spring. Figure 2.8 shows the average monthly distribution of precipitation at Fresno Yosemite International Airport, which, because of its location, is representative of the Lower King Basin. Figure 2.8 also shows the average monthly reference evapotranspiration (ET) at the Fresno State California Irrigation Management Information System (CIMIS) station. Reference evapotranspiration is used by growers to determine crop water needs and schedule irrigation. Water use of specific crops varies, but reference ET provides a good general measure of crop water demands.

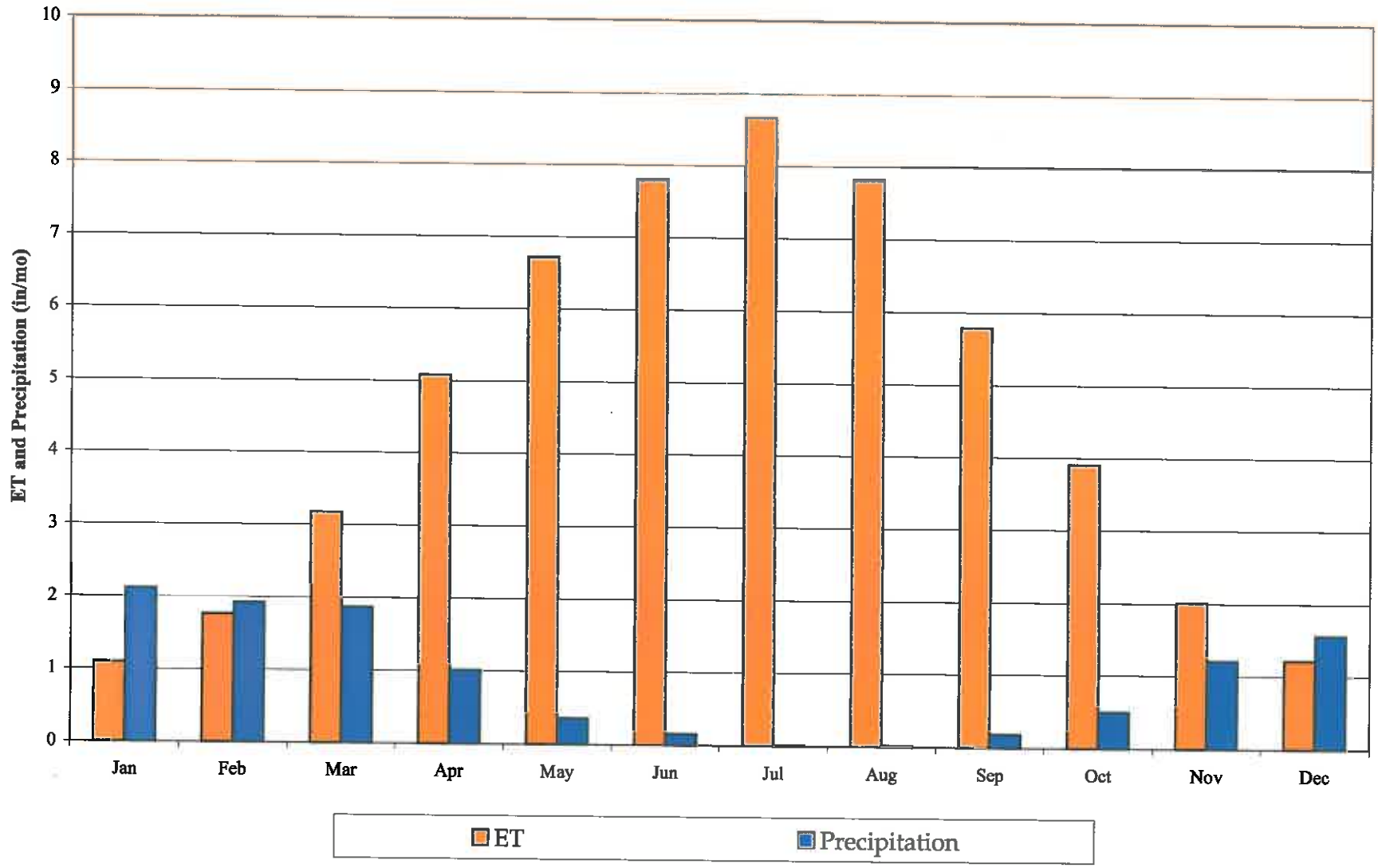
Figure 2.8 shows that precipitation in the Lower Kings Basin does not provide water for crops at times or in the amounts needed to meet crop water demands. The difference between precipitation and ET represents the crop water demand that must be met with applied water. In the Lower Kings Basin this applied water is either delivered surface water or pumped groundwater.

2.4 GROUNDWATER CONDITIONS AND SUPPLIES

Groundwater is used to meet all of the urban demands in the Lower Kings Basin. Groundwater pumping for agricultural use varies as a function of crop water requirements, hydrologic variability, surface water rights, and access to facilities to deliver water.

Within WMA A, there are no surface water delivery facilities and the area does not have water rights to the Kings River or San Joaquin River. Overlying land owners have groundwater rights and are dependent on groundwater to meet 100% of crop water demands. This is also the case in some parts of WMAs B, B2, and C.

Within much of WMAs B, B1, B2, and C, groundwater is used to meet crop water requirements at times when surface water deliveries are not available. The surface water deliveries are derived from water rights and entitlements from the Kings River.



PRIME	Lower Kings Basin GWMP Update **Average Monthly Reference Evapotranspiration (ET) at the Fresno State CIMIS Station & Average Monthly Precipitation at Fresno Yosemite International Airport**	April 2005 FIGURE 2.8

GROUNDWATER LEVELS WITHIN THE WMAS

Groundwater levels in the Lower Kings Basin are monitored by growers, water districts, DWR, and KRCD (KRCD, 2005). Groundwater levels change in response to changes in groundwater recharge, discharge, and extraction. Figure 2.9 shows the location of wells with water level data in the Lower Kings Basin that were used to assess groundwater trends for GWMP. Data vary in quality and accessibility, but there are an adequate number of wells and data available to describe the historical trends and current conditions. Groundwater level changes were evaluated for each WMA by developing a representative groundwater level hydrograph, as described in Appendix D. Figures 2.10 through 2.16 shows the WMA aggregated hydrographs and simple statistical groundwater level trend line from 1950 through 2004. The trend line is an "inverse fit" curve and was determined to be the most accurate representation of the groundwater trends in the area and the best fit to the data. The hydrographs show that for all the WMAs, except WMA C, groundwater levels have steadily declined since 1964, even after construction of the Pine Flat Reservoir in 1954.

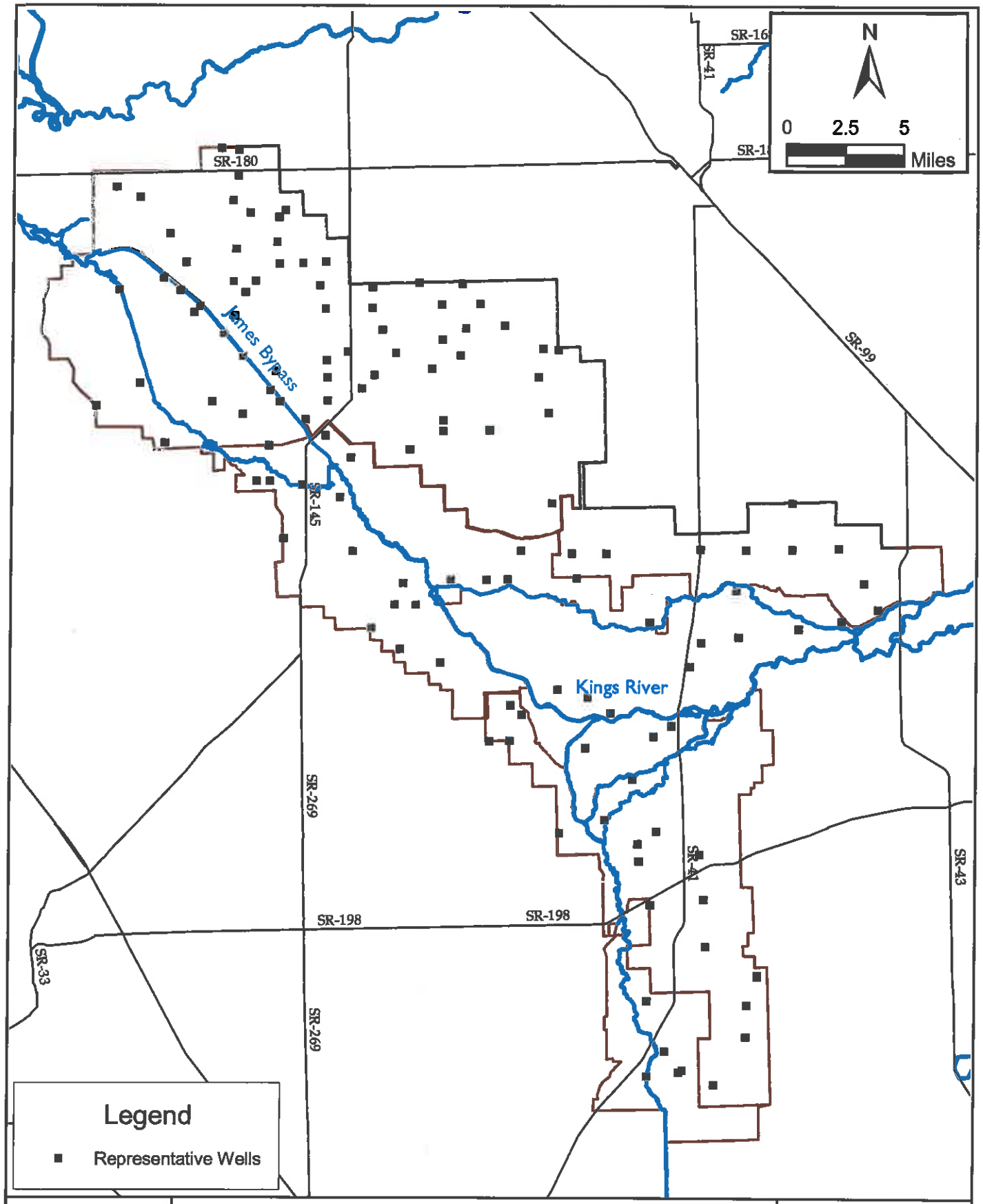
Groundwater levels are responsive to flow conditions in the Kings River and the overall hydrology of the basin; however, it is clear that the groundwater system is pumped at rate greater than that of groundwater recharge. It can interpreted from the groundwater level trend lines that groundwater levels will continue to decline into the future should there be no changes in current operations and management. The reliance on groundwater to meet demands is causing the slow depletion of groundwater storage. The water level contours for the Lower Kings Basin also demonstrate the changes in storage over time.

GROUNDWATER OCCURRENCE, FLOW, AND CHANGES IN STORAGE

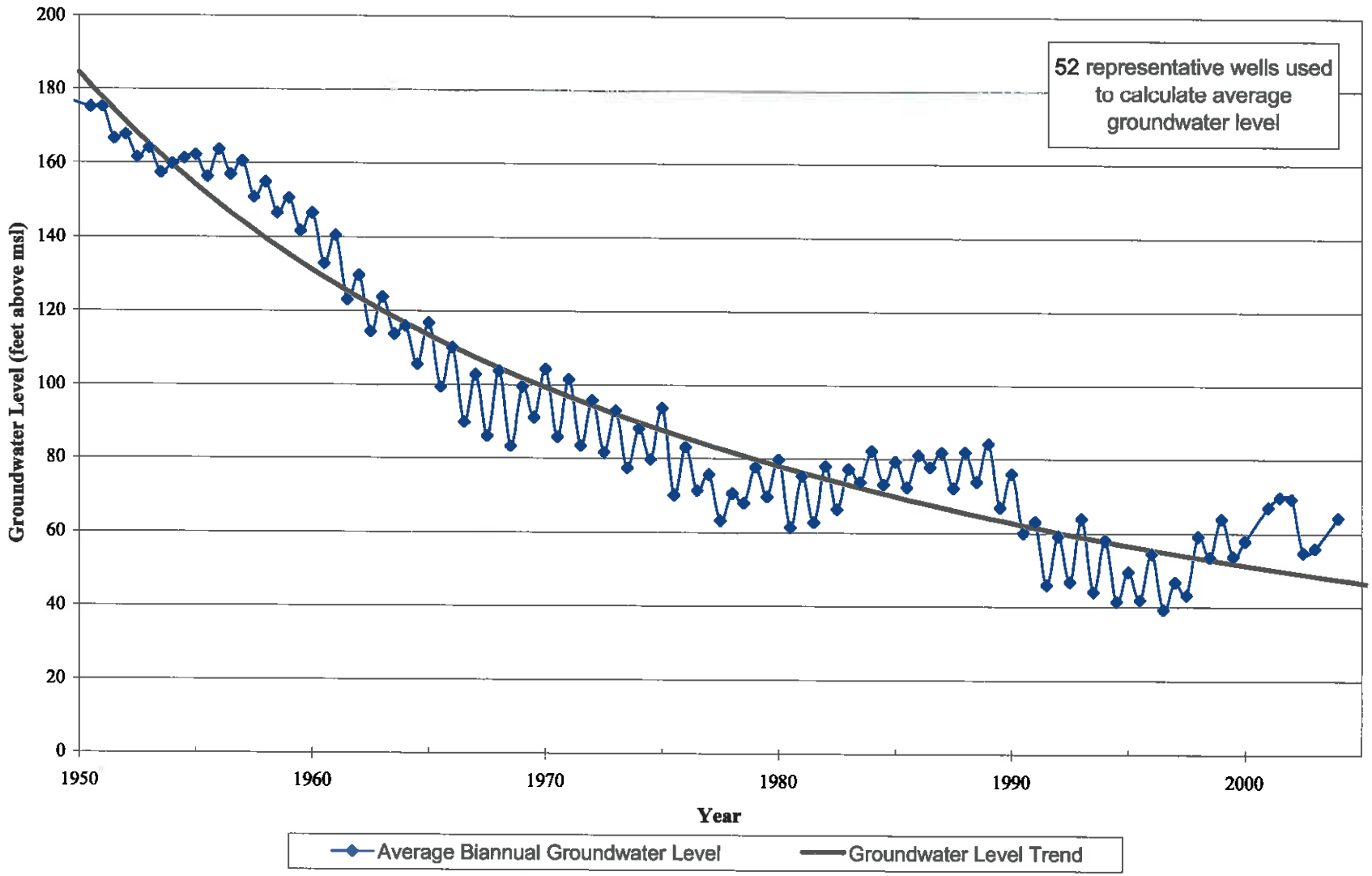
Groundwater table contour maps show lines of equal water level elevations. These maps are used to show the occurrence and movement of groundwater in the Lower Kings Basin. Groundwater table contour maps can also be used to evaluate the changes in storage between two time periods.

Figure 2.17 shows groundwater elevation contours for spring 2000. The figure shows the general regional flow patterns and recharge/discharge relationships in the Lower Kings Basin and was developed from data supplied by KRCD (KRCD, 2005). Appendix D contains other water table maps for different time periods over the past 50 years.

The primary regional groundwater flow pattern is from east to west. The highest groundwater levels are located along the eastern boundary of the Lower Kings Basin at about 240 feet above msl, and the lowest groundwater elevations are located at Raisin City at about 10 feet above



WRIME	Lower Kings Basin GWMP Update **Location of Representative Groundwater Wells**	April 2005 Figure 2.9



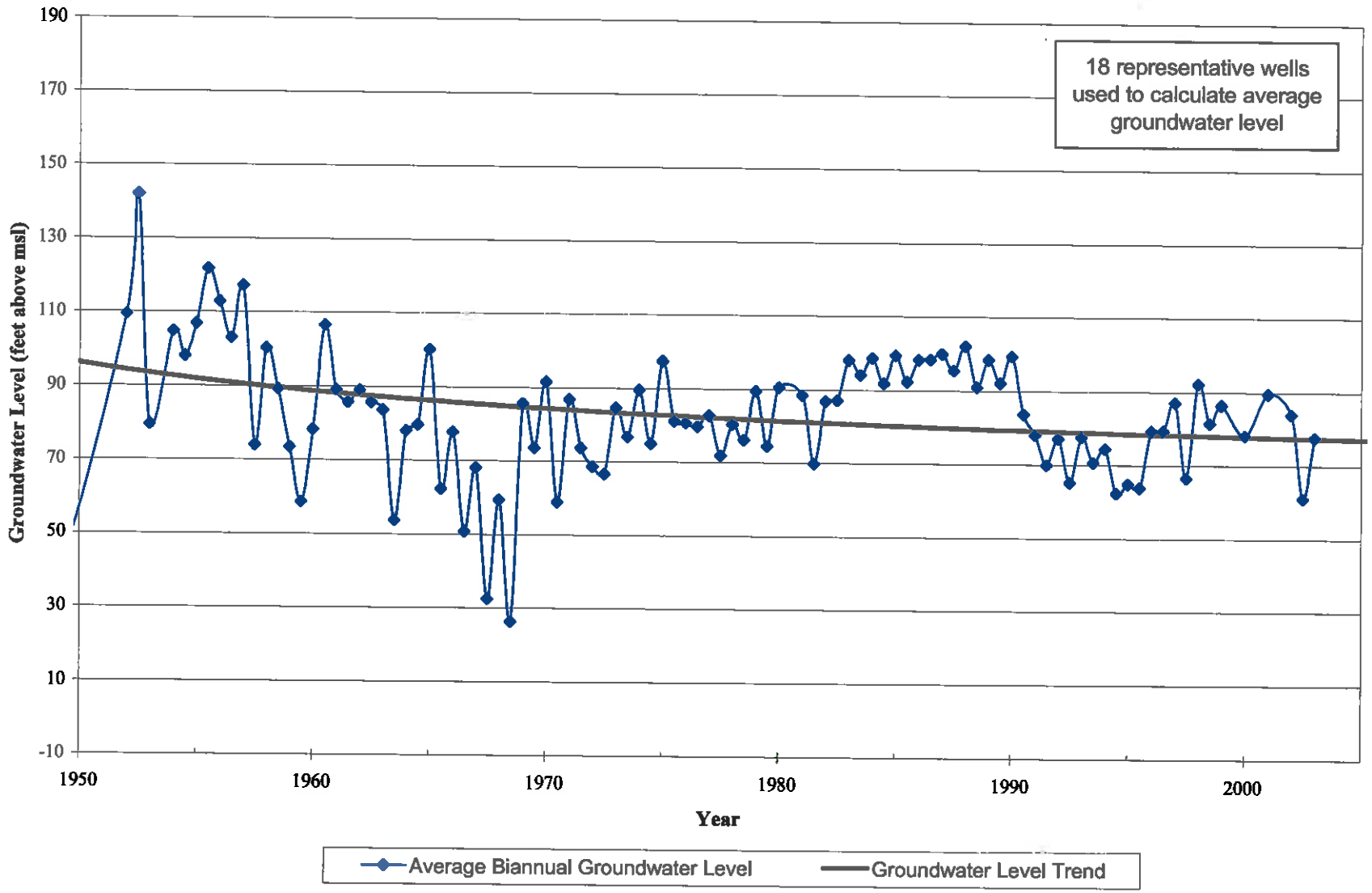
PRIME

Lower Kings Basin GWMP Update

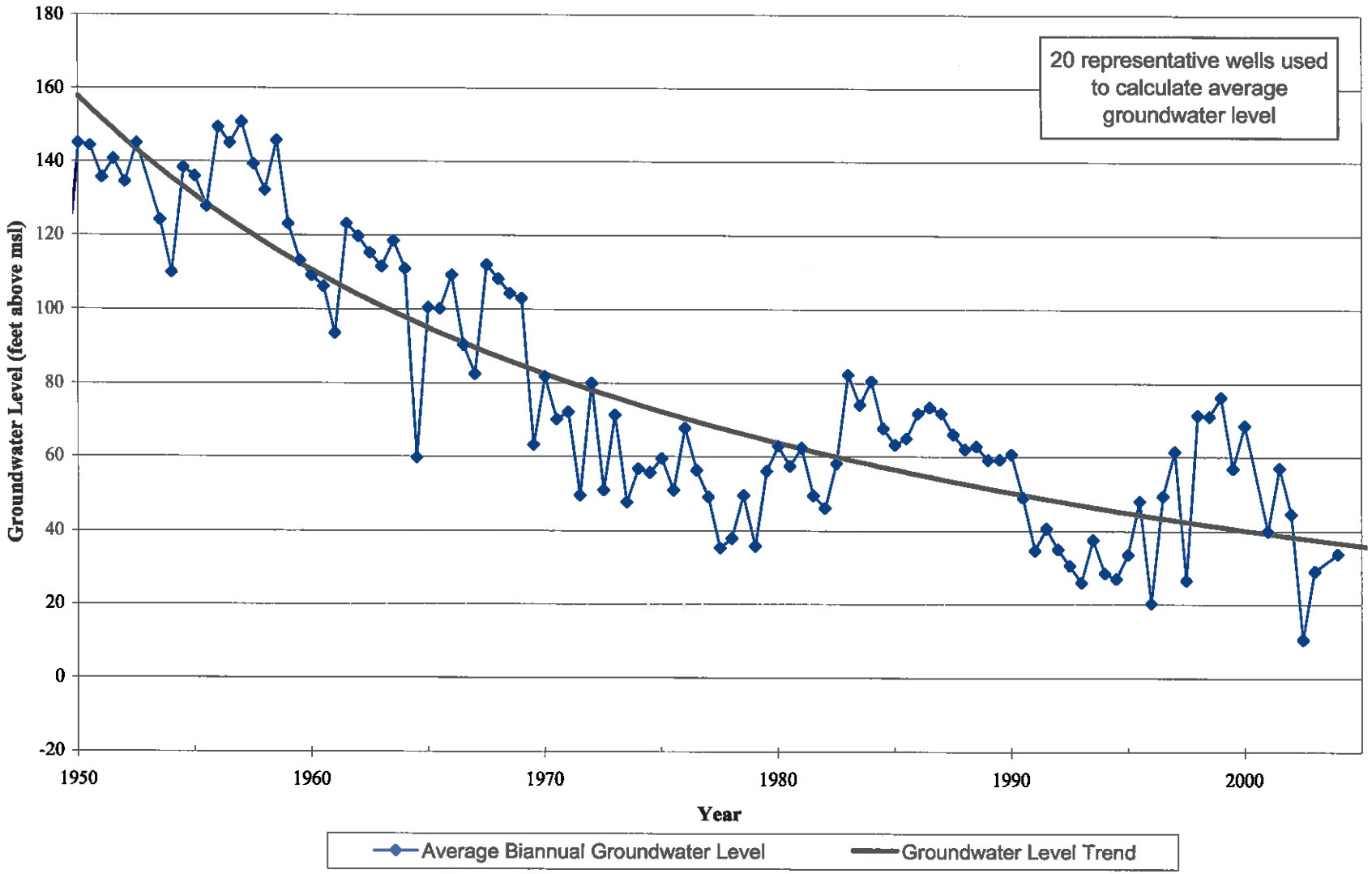
Groundwater Trends for WMA A

April 2005

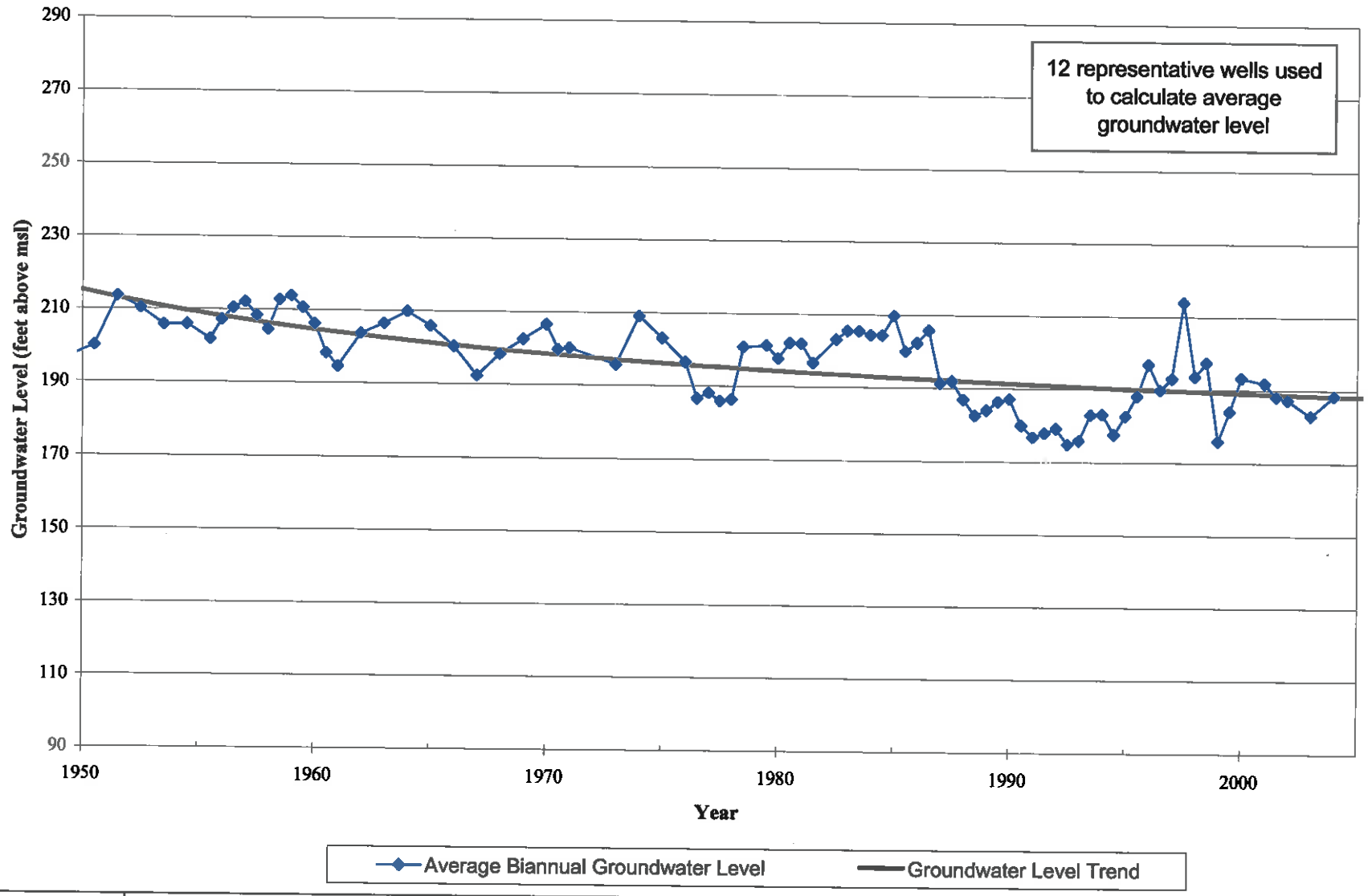
FIGURE 2.10



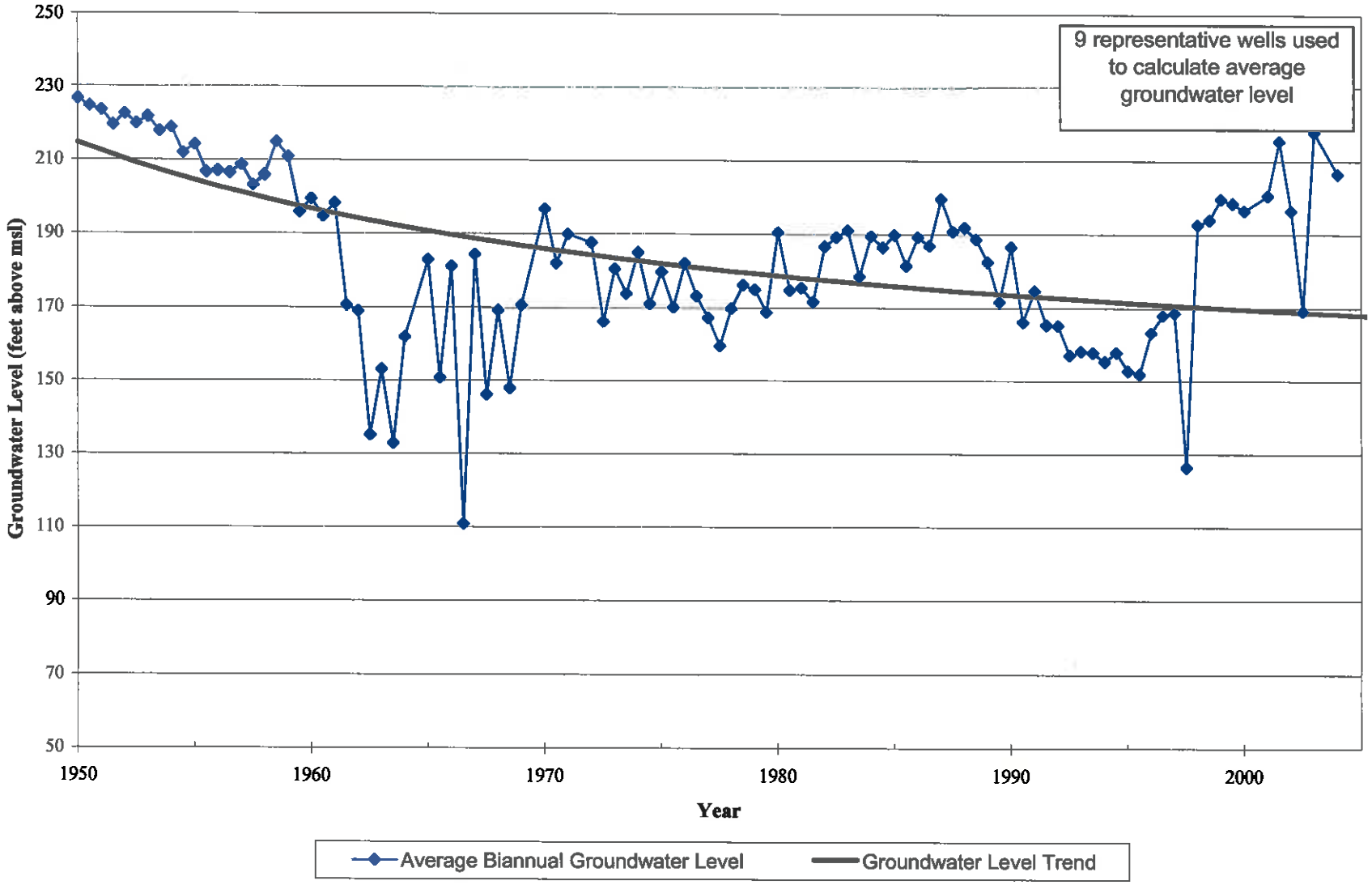
RIME	Lower Kings Basin GWMP Update **Groundwater Trends for WMA A1**	April 2005 FIGURE 2.11



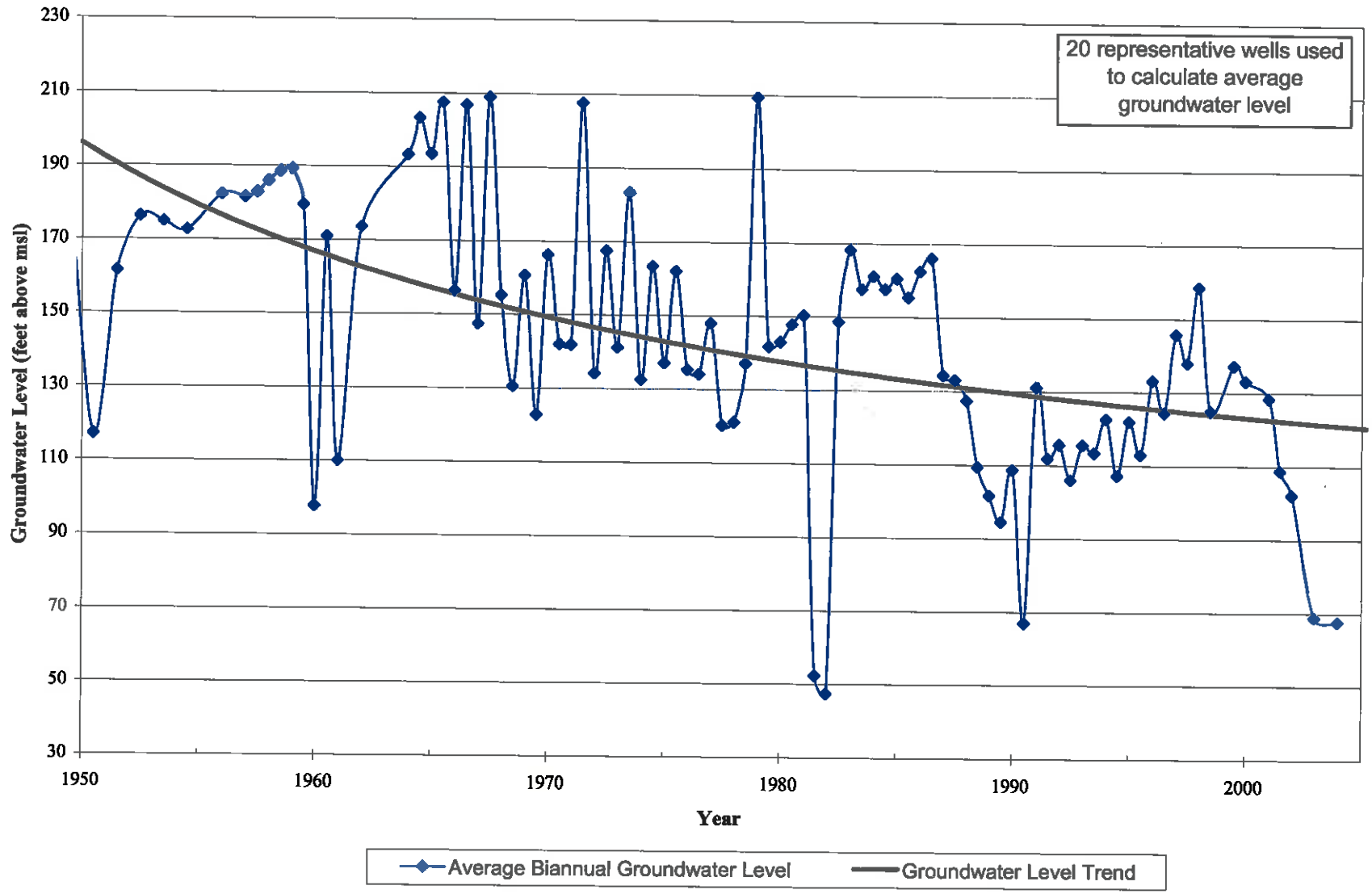
RIME	Lower Kings Basin GWMP Update **Groundwater Trends for WMA B**	April 2005 FIGURE 2.12



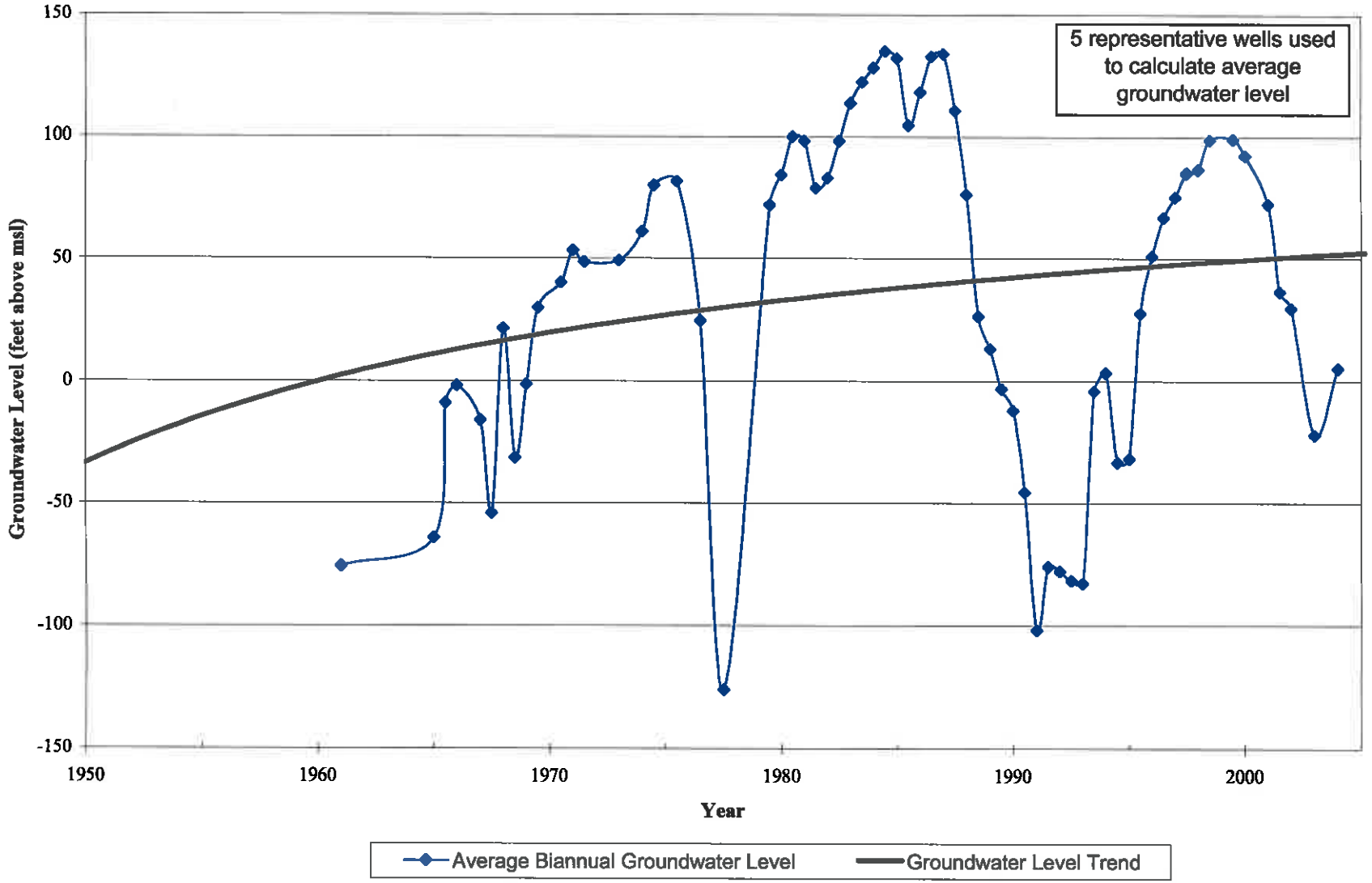
RIME	Lower Kings Basin GWMP Update **Groundwater Trends for WMA B1**	April 2005 FIGURE 2.13



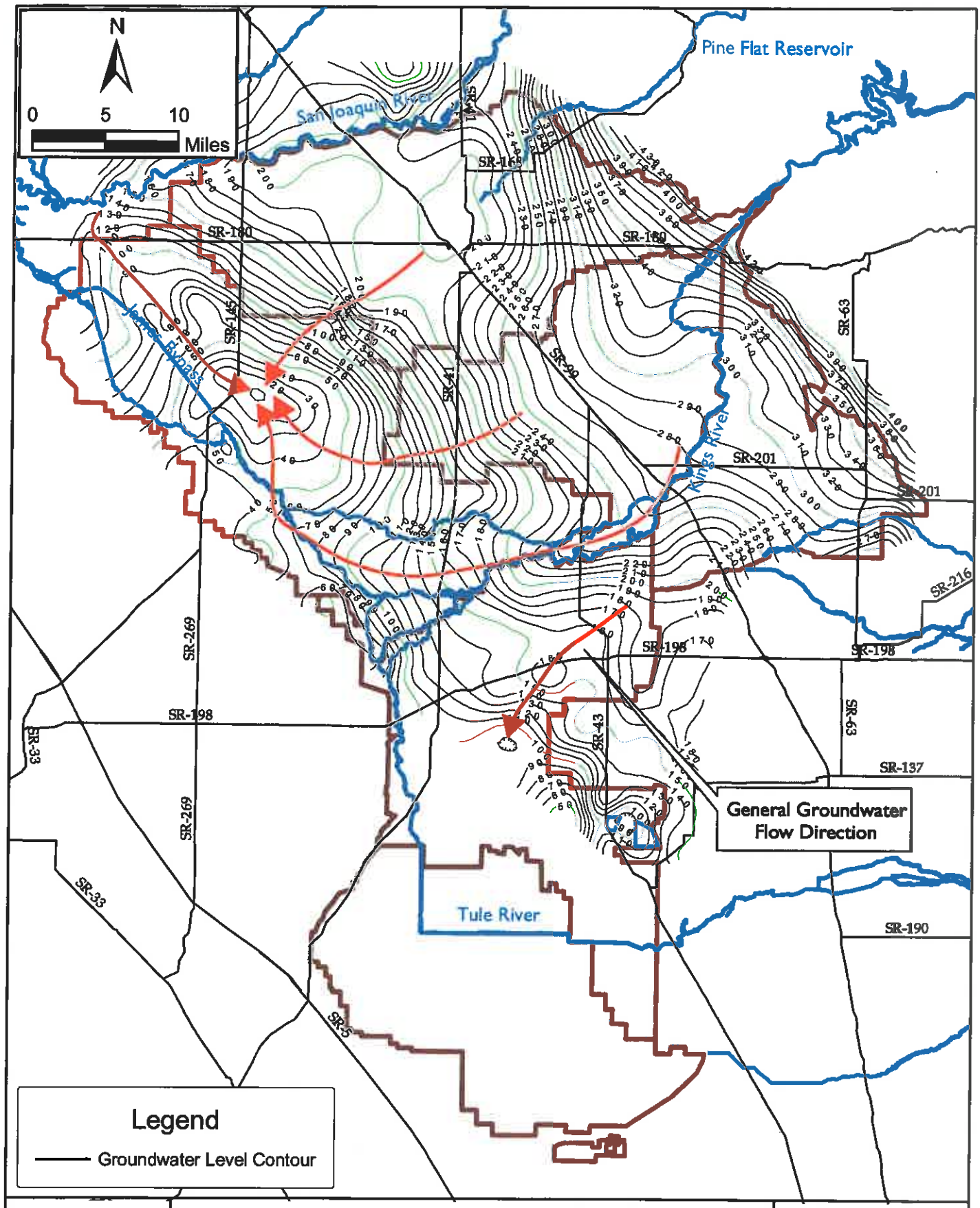
RIME	Lower Kings Basin GWMP Update	April 2005
	Groundwater Trends for WMA B2	FIGURE 2.14



PRIME	Lower Kings Basin GWMP Update	April 2005
	Groundwater Trends for WMA C	FIGURE 2.15



RIME	Lower Kings Basin GWMP Update	April 2005
	Groundwater Trends for WMA C1	FIGURE 2.16



WRIME	Lower Kings Basin GWMP Update **Spring 2000 Groundwater Levels**	April 2005 Figure 2.17

msl. Groundwater moves from sources of recharge to sources of discharge and/or withdrawal. Areas of recharge generally have higher groundwater levels that decline further away from the source of recharge. The effects of recharge can be observed in the 2000 contour map. The water table elevations in the aquifer system are higher along the major rivers (San Joaquin, Kings), smaller streams, sloughs, and in unlined canal networks, where sand and gravel deposits permit water to percolate downward into groundwater storage. Water table elevations are also higher in the area to the east that underlies FID and CID.

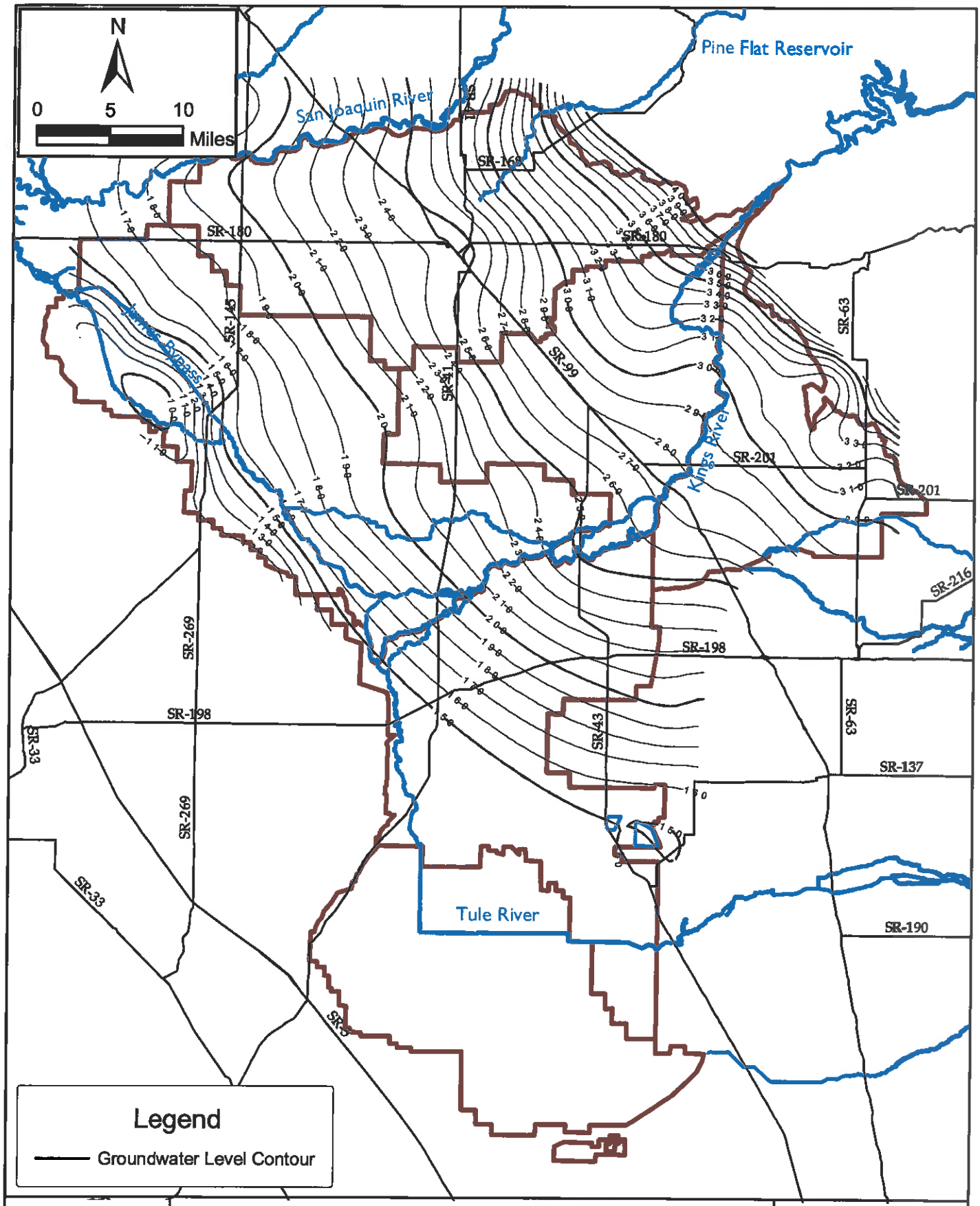
Although not illustrated in Figure 2.17, areas of groundwater discharge may occur along streams where the water table elevation is above the elevation of the stream channel. This information was obtained during the individual interviews with district staff and growers who indicated that flow has been observed in the lower reaches of the Kings River, where the river turns north, at time when upper parts of the river had already gone dry. This condition only occurred during wet years with above average recharge in the lower reaches of the Kings River. In this area, groundwater is also perched above clay layers.

Lowered water table elevations are observed in areas with a high volume of pumping and are farther away from the source of recharge. Figure 2.17 also shows the general flow path of groundwater movement toward the regional cone of depression that forms in WMA A near Raisin City. A groundwater trough, or regional water table depression, is a feature of the Lower Kings Basin in WMA A since there is a total reliance on groundwater and because the area is relatively far away from the Kings and San Joaquin River which are the major recharge sources. Based on the evaluation of contour map, groundwater in this area is primarily recharged from underflow from surrounding areas.

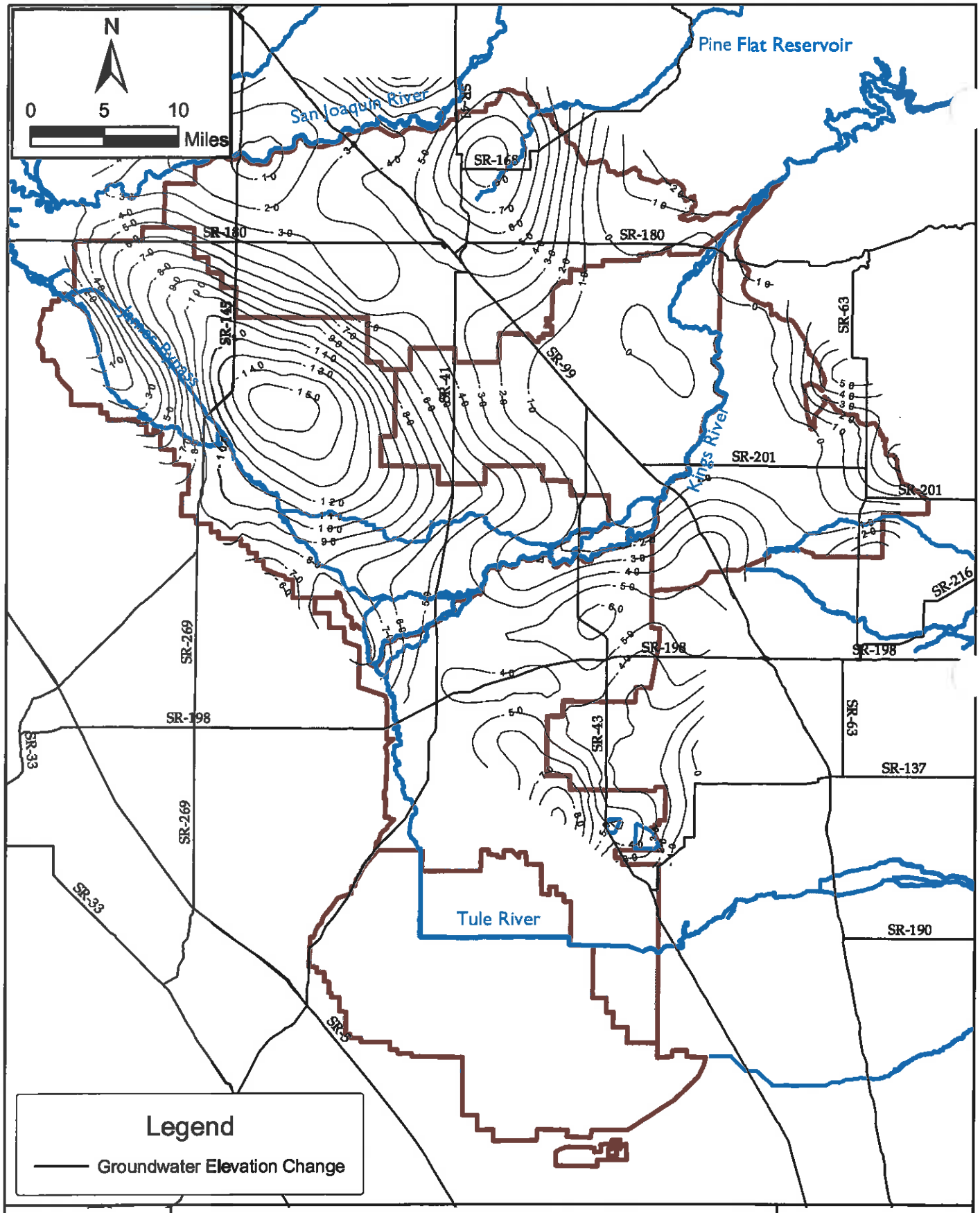
Another regional cone of depression exists under the City of Fresno as a result of year round municipal pumping. As shown in the water table contour maps contained in Appendix D, other years also show this general trend and flow pattern.

CHANGE IN GROUNDWATER STORAGE

Figure 2.18 shows spring 1950 groundwater levels in the Lower Kings Basin. This contour map is illustrative of the groundwater level conditions before the full development of agriculture and prior to construction of Pine Flat Dam. Figure 2.19 shows the change in groundwater levels between spring 1950 and 2000 and demonstrates that there has been a significant reduction in groundwater levels in the Lower Kings Basin. Appendix D contains additional water table maps for different time periods over the past 50 years along with other maps showing the changes between time periods.



WRIME	Lower Kings Basin GWMP Update **Spring 1950 Groundwater Levels**	April 2005 Figure 2.18



Lower Kings Basin GWMP Update

Groundwater Level Change Between Spring 1950 and Spring 2000

April 2005

Figure 2.19

The changes in water levels and the calculated change in groundwater storage indicate that the basin is in overdraft, a condition where more water is removed from storage than replenished on the average over time. The total volume of depletion in groundwater storage was calculated by comparing groundwater contour maps of 1950 and 2000. The analysis of groundwater overdraft is included in Appendix D. An analysis of the regional hydrographs was also conducted to evaluate the cumulative change in storage between 1950 and 2005, and between 1965 and 2005. The latter period was used to demonstrate the positive contribution from the Pine Flat Dam in reducing overdraft. Table 2.2 summarizes the overdraft analysis. WMA C1 does not appear to be in overdraft based on the hydrograph. WMA C1 was not included in the calculation.

Table 2.2. Cumulative Overdraft and Average Annual Overdraft

WMA	Area (acres)	Total Overdraft 1950 to 2005 (AF)	Annual Overdraft 1950 to 2005 (AF/yr)	Total Overdraft 1965 to 2005 (AF)	Annual Overdraft 1965 to 2005 (AF/yr)
A	112,268	1,857,000	34,000	901,000	23,000
A1	38,707	82,000	1,000	40,000	1,000
B	59,858	838,000	15,000	121,000	3,000
B1	54,099	194,000	4,000	406,000	10,000
B2	34,459	249,000	5,000	94,000	2,000
C	57,328	501,000	9,000	243,000	6,000
Total	356,719	3,721,000	68,000	1,804,000	45,000

The previous GWMPs contained water budget calculations for WMAs A, B, and C and also concluded that the area was in overdraft (KRCD, 1993; KRCD, 1995; KRCD, 1996). This study concurs with the previous analyses results and methods to the degree that such analyses can reflect the hydrologic and hydraulic complexity and operations of the Lower Kings Basin. The previous analyses did not cover all of the areas within this integrated GWMP, and data were not readily available to recreate the analyses for the expanded areas. The basin hydrogeology is complex, containing both confined and unconfined aquifers in a multilayered system. To fully evaluate the basin water budget, a model capable of evaluating the interconnected nature of the basin and complex operations should be considered to better define the overdraft, and to analyze the impacts and benefits of current or proposed management actions.

SURFACE WATER–GROUNDWATER CONNECTION

Evaluating changes in aquifer conditions requires understanding the processes and interaction taking place between surface water and groundwater as extractions and recharge in the aquifer occurs over time. Groundwater levels in the Lower Kings Basin are influenced by variations in general hydrologic conditions in the Kings River watershed. In wet periods with above average

precipitation and higher amounts of Kings River runoff, groundwater levels rise in response to a combination of decreased demand for groundwater (i.e., less pumping because of surface water deliveries and flow) and increased natural and artificial recharge. Conversely, during dry periods, groundwater levels fall because of increased groundwater pumping and decreased recharge. Specific data portraying the surface water availability and relationship to groundwater in the Lower Kings Basin are presented below.

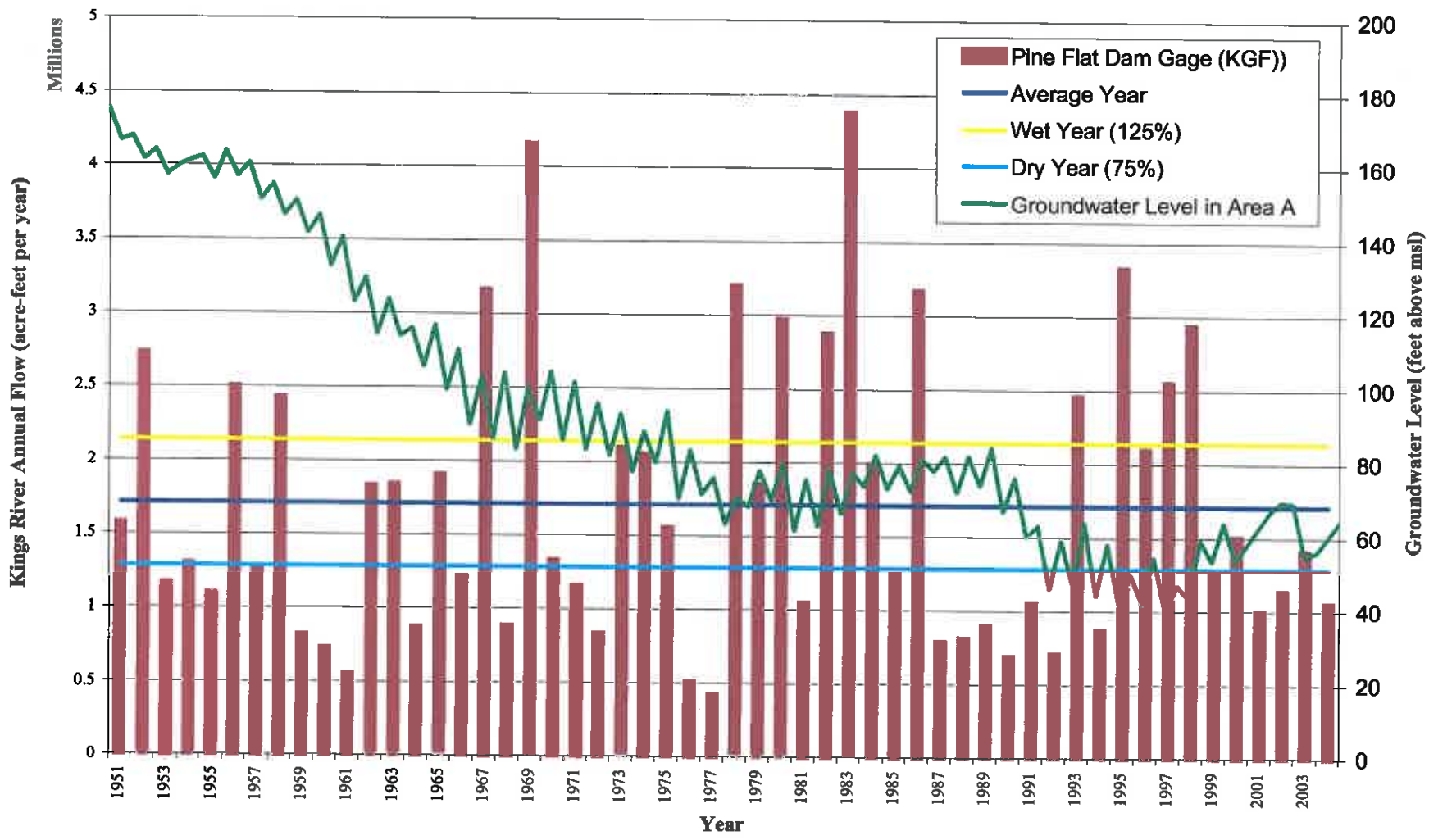
The Kings River Water Association (KRWA) uses the Kings River flows at the Piedra gage, referred to as Pre-Project Piedra (PPP), and the Blue Book of KRWA Water Policy to develop the daily delivery schedule (KWRA, 2000). The PPP is upstream of Pine Flat Reservoir and is used as the main index of hydrologic conditions in the basin. Annual PPP flows are shown on Figure 2.20 from 1951 to 2004, with corresponding average groundwater levels. A comparison of the average groundwater elevations for the Lower Kings Basin to the Kings River PPP flow shows that the groundwater elevations rise and fall with wet years and dry cycles and the high degree of sensitivity to hydrologic conditions. The figure also shows that the overall downward trend in groundwater levels through the history of both wet and dry cycles.

2.5 SURFACE WATER SUPPLIES

The basic hydrologic characteristics and systems operations of the Kings River Basin are discussed below. Also discussed is the historical surface water supply of the Lower Kings Basin. The availability of additional surface water supplies from the Kings River to support groundwater management is presented.

The Lower Kings Basin has practiced the combined use of surface water and groundwater supplies and storage, or conjunctive use, throughout the history of irrigation and water management. The area is fortunate to have developed Pine Flat Reservoir, which is very well sized for the watershed it was designed to regulate for flood control, water supply, and recreational purposes. It successfully captures, conserves, and manages the runoff from the Kings River. The reservoir has been operated very efficiently by the U.S. Army Corps of Engineers (Corps) for flood control and, in cooperation with the KRWA, for water supply purposes (KRWA, 2000).

The State Water Resources Control Board (SWRCB) has declared the Kings River to be fully appropriated (KWRA, 2000). This means there is no additional surface water that is not already committed through the complex systems of water rights and agreements that exists among the members of KRWA. KRWA is the water master for the region and supports management of the system of deliveries and Pine Flat operations on behalf of the 28 member agencies. As discussed further below, additional water diversions for conjunctive use are limited to



RIME	Lower Kings Basin GWMP Update	April 2005
	Groundwater Elevations in Area A Compared to Pine Flat Outflow	FIGURE 2.20

capturing flood flows and improving conjunctive use opportunities for those entities with existing water rights and entitlements. Limitations of the amount of Kings River water available for additional conjunctive use projects in the Lower Kings Basin is in part due to historical success in managing the available surface water supply with Pine Flat Reservoir.

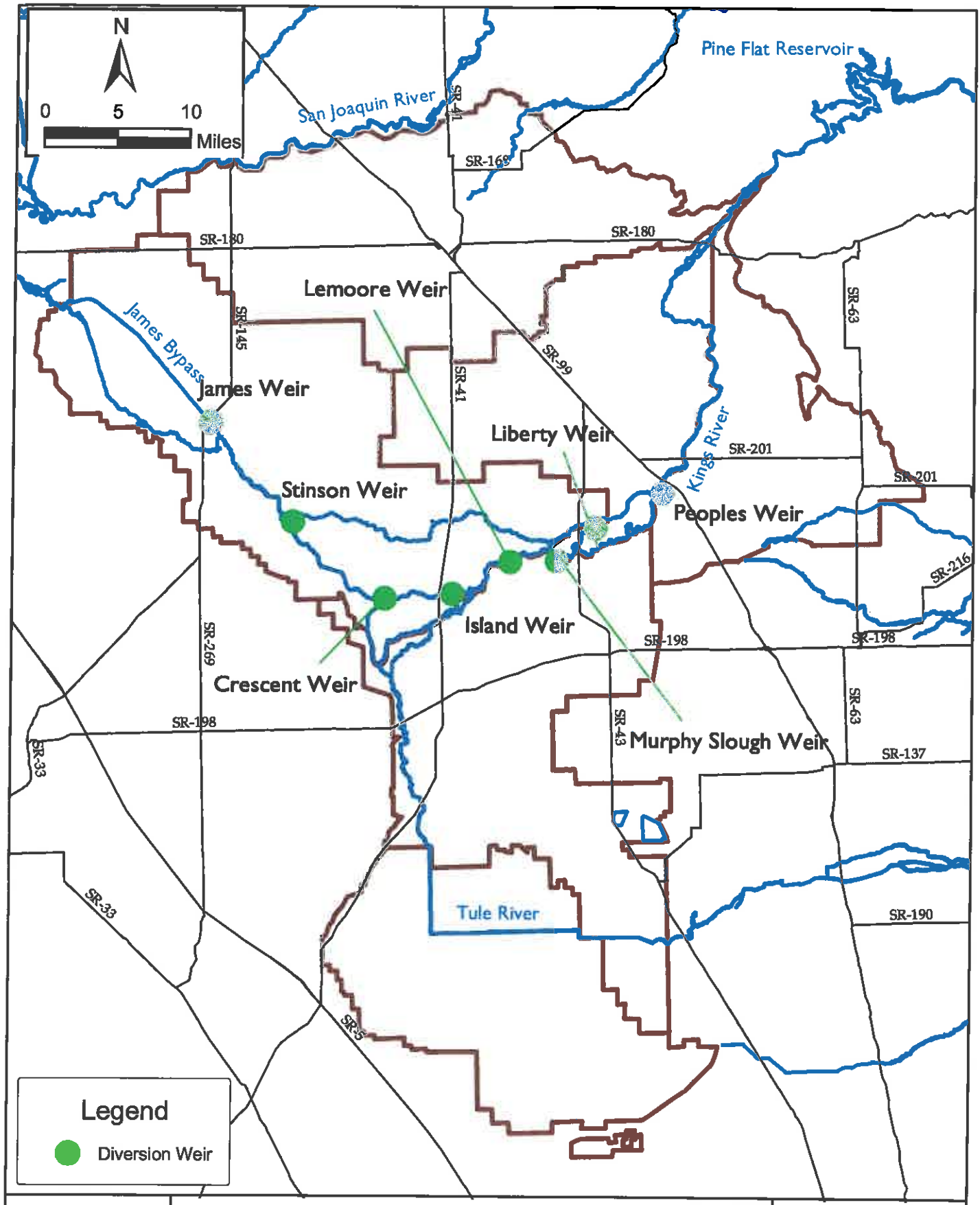
KINGS RIVER SURFACE WATER SUPPLIES

The Kings River flows westward from the Sierra Nevada into Pine Flat Reservoir. Water released from Pine Flat Reservoir to the Kings River is joined with water from Mill Creek and Hughes Creek. These creeks are unregulated and can contribute a noticeable amount of water to the Kings River. The historical flow at the PPP gage was previously provided in Figure 2.20. The average annual runoff of Kings River is about 1.7 million acre-feet (MAF) per year but is widely variable, ranging from a low of 390,000 AF in 1923–24 to a high of 4.48 MAF in 1982–83. This variability in flow is moderated to a large degree through the annual operations of Pine Flat Reservoir and by the reservoir's ability to manage carry over storage behind the dam (KRWA, 2000). Kings River watershed reaches peak flows with snowmelt in May or June. The river flows westward from the Sierra Nevada and into the Lower Kings Basin, where it branches into north and south forks. The southern branch of the Kings River includes Clark's Fork and South Fork, which terminate in the Tulare Lake Bed. The North Fork flows through Fresno Slough and James Bypass to its confluence with the San Joaquin River at Mendota Pool. The Kings River discharges to Mendota Pool only during high flow periods that coincide with flood flow releases from Pine Flat Reservoir.

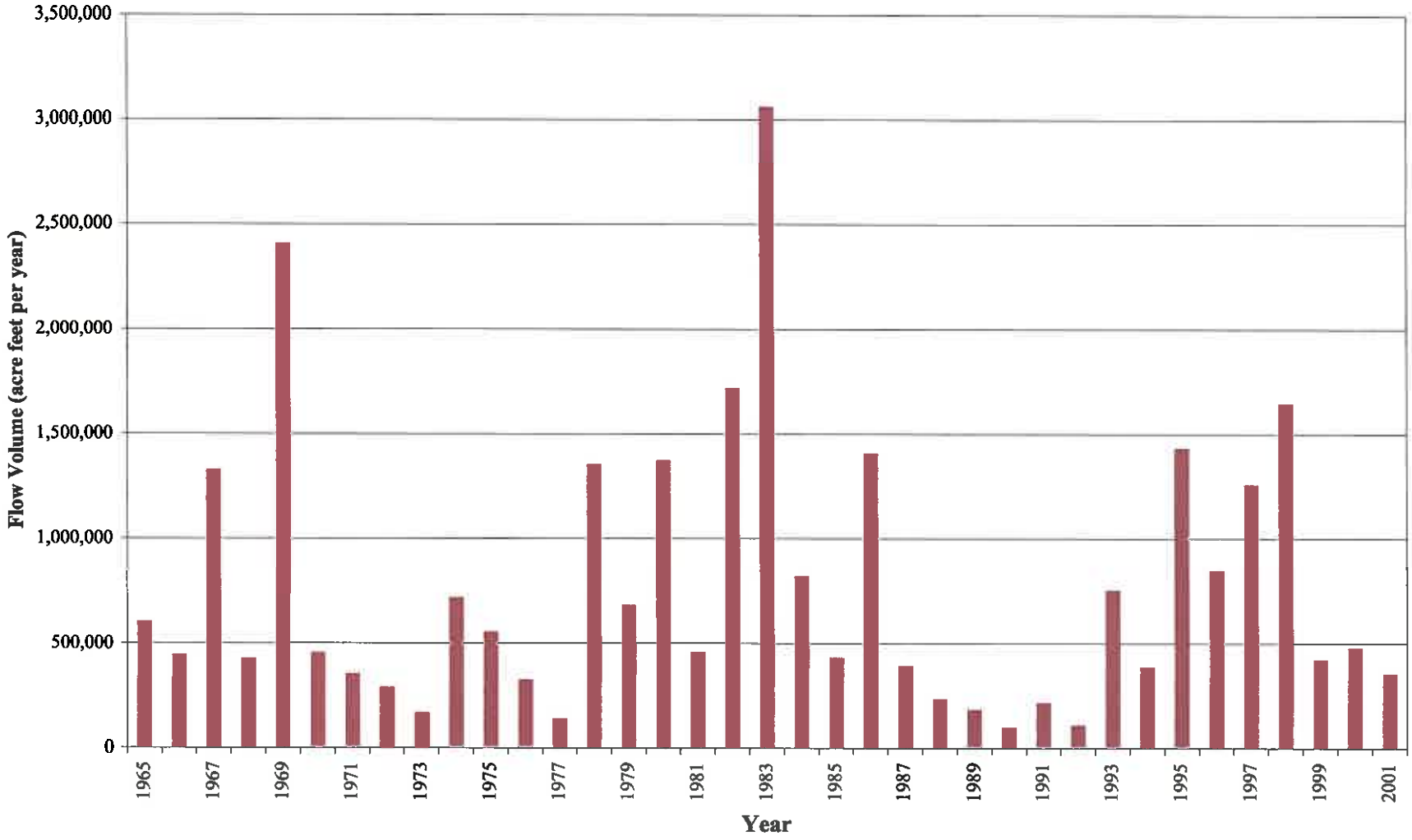
KINGS RIVER SUPPLY AND DELIVERY FACILITIES IN THE LOWER KINGS BASIN

Surface water supply in the Lower Kings Basin is diverted through head gates at a series of weirs (see Figure 2.21). Surface water that has historically been available to the Lower Kings Basin is best represented by the flow below Peoples Weir. Figure 2.22 shows the annual flow volume of Kings River below Peoples Weir from 1965 through 2001. Kings River flow that is measured at James Weir represents water that is lost to the Lower Kings Basin. Figure 2.23 shows the hydrograph of James Weir flow. The figure demonstrates that flow at this location is infrequent and when flows do occur, it is during flood releases from Pine Flat Reservoir. The flows at James Weir provide the opportunity for further conjunctive use projects that would capture water that would otherwise be discharged from the Lower Kings Basin and leave the planning area.

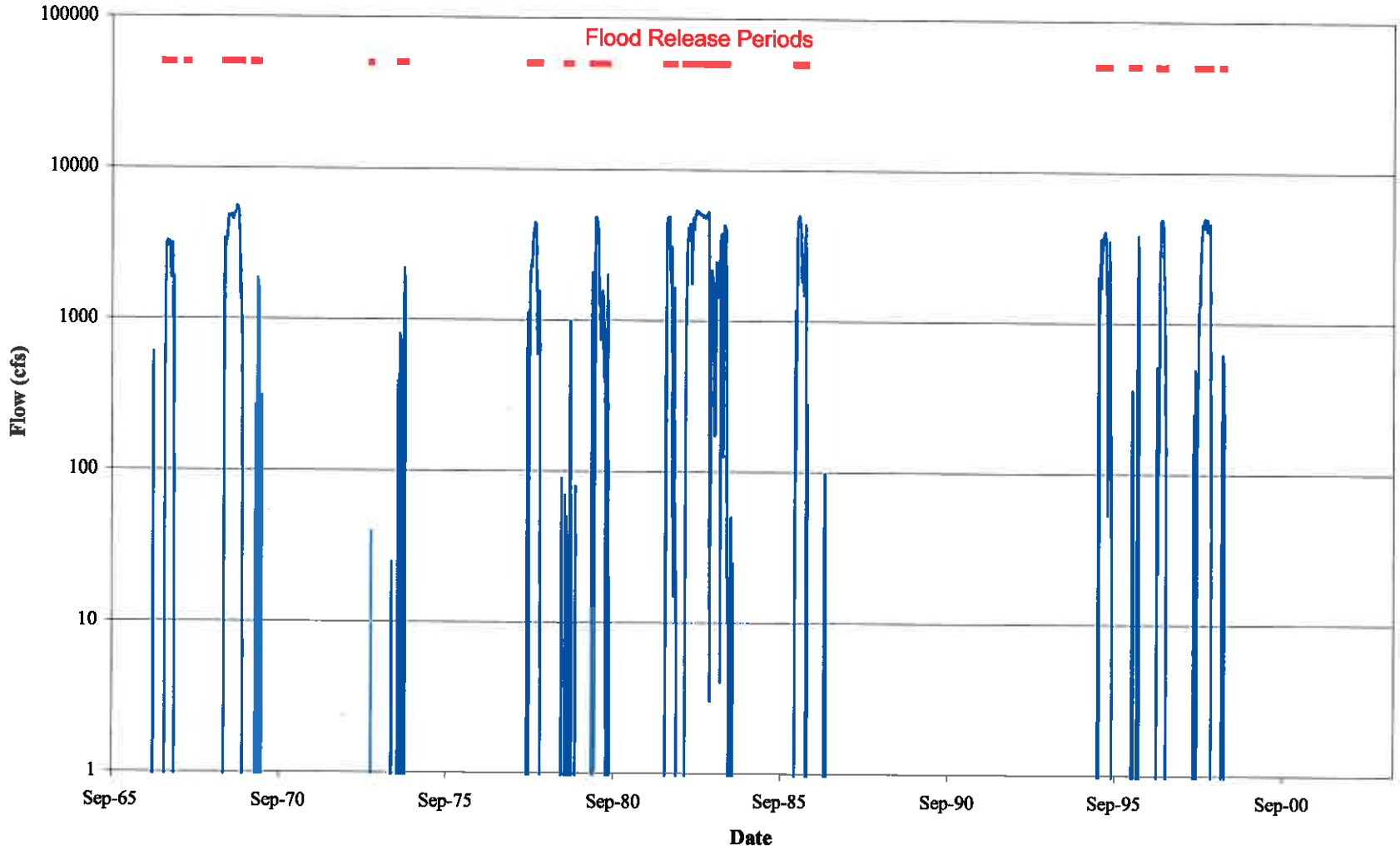
The flood flows measured at James Weir were ranked according their daily flow rate, and a flow frequency analysis was conducted to determine the availability of water for diversion at times when flow are observed at this location. Figure 2.24 shows the frequency or percent of



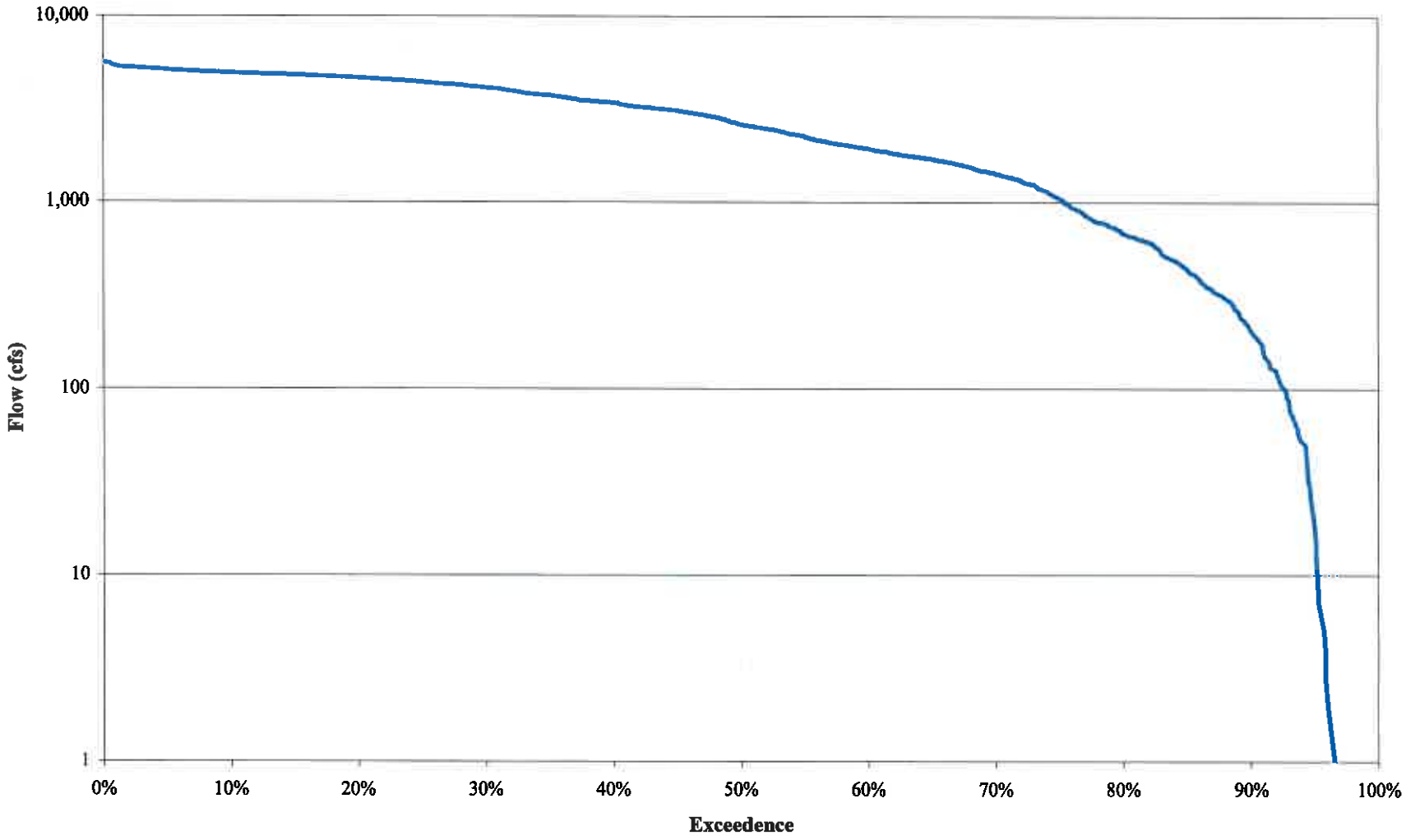
WRIME	Lower Kings Basin GWMP Update **Diversion Weirs**	April 2005 Figure 2.21



RIME	Lower Kings Basin GWMP Update	April 2005
	Annual Flow Volume Below Peoples Weir	FIGURE 2.22



RIME	Lower Kings Basin GWMP Update	April 2005
	Kings River Flow Below James Weir	FIGURE 2.23



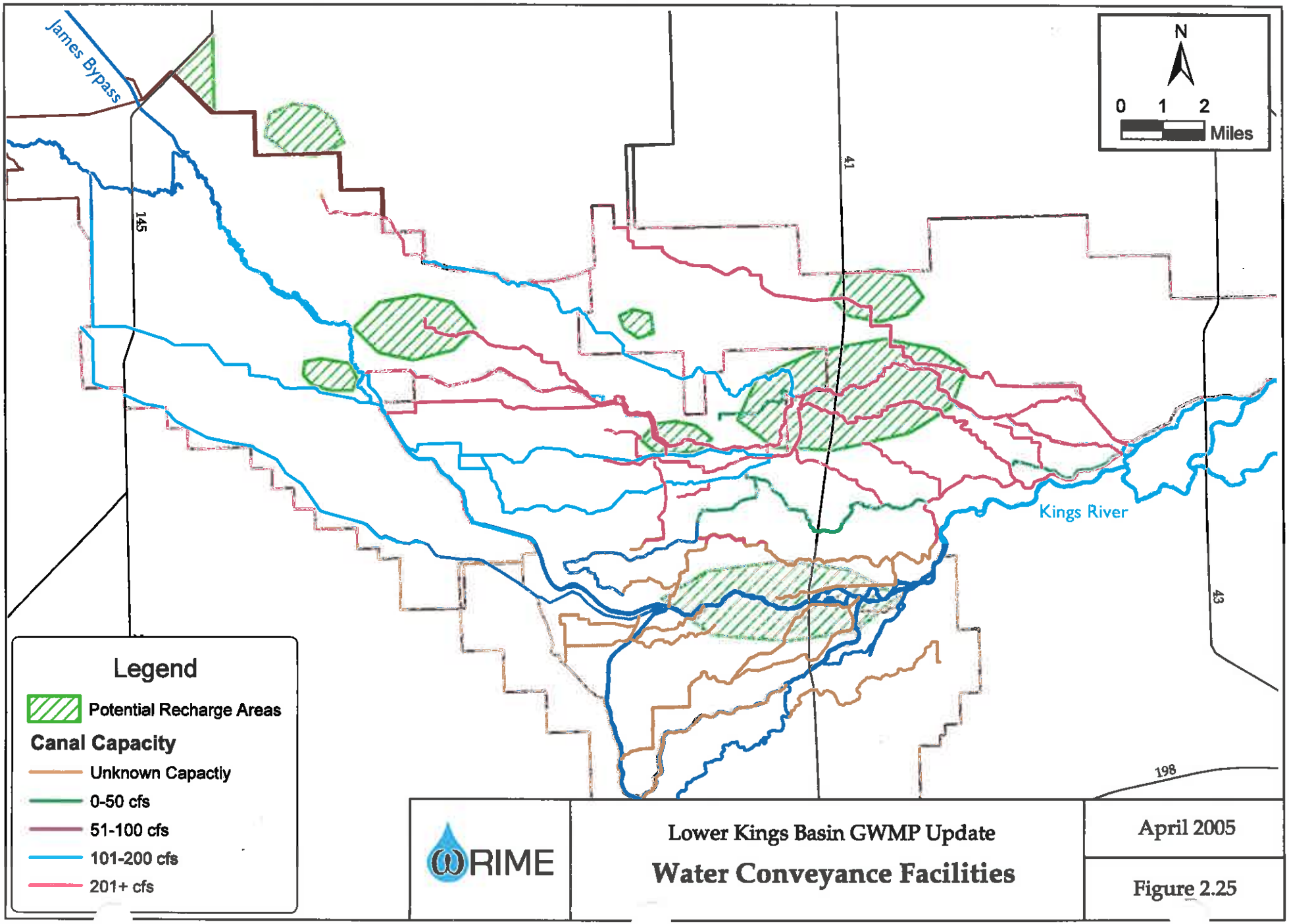
PRIME	Lower Kings Basin GWMP Update	April 2005
	Kings River Exceedence Curve Below James Weir during Flood Release Periods	FIGURE 2.24

time that a certain flow was exceeded at James Weir. When flood flows are observed at James Weir, the flow rates are greater than or equal to 125 cubic feet per second (cfs) approximately 82% of the time, and flow rates are greater than or equal to 500 cfs approximately 72% of the time. This indicates that when flows are occurring at James Weir, there is a high probability that the flow is greater than 125 cfs. A 125 cfs flow rate has been used as a design threshold for purposes of planning and sizing facilities by KRCD (KRCD, 1999).

The previous GWMP found that groundwater recharge in a number of areas was constrained by lack of water conveyance facilities. Figure 2.25 graphically shows the relative facility constraints based on the presence of existing conveyance facilities and rights-of-way. A consolidated map of existing facilities was not available for the area. Although information resides with the water district, the ditch companies, and engineering support contractors, it is relatively inaccessible. Evaluation of constraints did not include detailed analysis of capacity, loss rates, or condition of the infrastructure.

Within WMA A, there are almost no facilities for moving surface water supplies and replace groundwater pumping. WMA A1 includes James ID and Tranquility ID and these districts have well developed water distribution systems. WMA B also has limited facilities but is less constrained than WMA A because of Stinson and Crescent Canals. There are no conveyance facilities in the western part of WMA B outside of the Stinson WD. The eastern part of WMA B includes the Murphy's Slough Association; there are a number of canals and conveyance facilities that are privately maintained and operated by overlying water districts. There are some conveyance facilities owned and operated by the local ditch companies in the western part of WMA B2, near Liberty WD, but there are no surface water delivery facilities in the eastern part of the WMA B2 (the portion of WMA B2 that as previously included in WMA A). WMA B1 is composed primarily of the NFG members with water rights and an adequately developed distribution network that is capable of taking advantage of available flood and entitlement flows.

An analysis was conducted to determine whether there was available canal capacity to divert the flood water or entitlement water during flood release (see Appendix E). The results of the analysis indicate that, for at least 70% of the months with flood releases (e.g., flow at James Weir), additional water could have been diverted through existing facilities without exceeding the canal capacities in the Lower Kings Basin. Canal capacities do not limit the ability to deliver the available water for diversion until flow rates are very high or within the 90th percentile exceedance probability.


James Bypass
Kings River
145
41
43
198
N
0 1 2
Miles
Legend
Potential Recharge Areas
Canal Capacity
Unknown Capactiy
0-50 cfs
51-100 cfs
101-200 cfs
201+ cfs
RIME
Lower Kings Basin GWMP Update
Water Conveyance Facilities
April 2005
Figure 2.25

2.6 WATER QUALITY

This section briefly reviews current surface water and groundwater quality conditions, known problems, and surface water and groundwater quality management programs. Site specific review of water quality issues and data would be conducted as part of any detailed feasibility study or environmental review of a proposed project. Monitoring is discussed in subsequent sections of the GWMP, along with the GWMP approach to further water quality protection.

The quality of the available surface water and groundwater supplies influences the ability to put the water to use. If the quality of the water is degraded beyond the ability to put the water to the intended use, overall supply is limited or the costs for additional treatment is increased. To improve groundwater management through conjunctive use, surface water of appropriate quality must be available either for direct use in lieu of a groundwater supply or for storage in the groundwater basin. State policy prevents water of poor quality to be put into the groundwater basin if the quality of the underlying groundwater would be degraded. Conversely, if clean sources of surface water are to be stored in a groundwater basin for subsequent withdrawal, the underlying groundwater quality must be such that the quality of the stored surface water would not be impaired.

There are two major types of water quality monitoring programs that produce data, ambient and regulatory. Ambient monitoring can be designed to track long-term regional water quality trends or to provide a snapshot of current conditions. This latter type of ambient monitoring is typically associated with a special study or investigation conducted for a limited duration and for a well defined purpose. Regulatory monitoring is to ensure compliance and is usually very focused on a limited number of parameters and specific circumstances. There is a wide array of regulatory programs in the basin; however, data are widely scattered and hard to collect. There are no dedicated ambient monitoring programs for the Lower Kings Basin. Available data and studies were researched and summarized for purposes of the GWMP.

SURFACE WATER QUALITY

The 1972 Clean Water Act (CWA) requires states to develop water quality control plans and meet federal requirements to protect surface water and groundwater quality. The State of California implements its requirements under the federal CWA through the Porter Cologne Water Quality Control Act. Administrative policies, procedures, and requirements for protecting waters in California are contained in water quality control plans, also known as Basin Plans. The Lower Kings Basin is covered by the Water Quality Control Plan for the Tulare

Lake Basin (Basin Plan) [Central Valley Regional Water Quality Control Board (CVRWQCB) 2004].

SWRCB develops a list of water quality limited segments, known as a 303(d) list. The 303(d) list indicates whether the water source is meeting the needs of the designated beneficial use as a result of some water quality problems. The latest available 303(d) list was prepared by SWRCB and Regional Water Quality Control Board (RWQCB) in 2002, and includes the segments of the Lower Kings River from Island Weir to the Stinson and Empire Weirs. The Kings River in this reach has elevated levels of electrical conductivity, molybdenum, and toxaphene. The 303(d) list gives the reach a low priority for the development of a total maximum daily load (TMDL).

Mendota Pool is also listed in the 303(d) list and has been defined as impaired by elevated selenium levels, potentially because of agriculture, groundwater withdrawal, or other sources. The 303(d) list gives Mendota Pool a low priority for the development of a TMDL. The Lower Kings Basin is not likely a significant contributor to the issues at Mendota Pool, but could be affected by water quality issues should Mendota Pool water be considered as a source of water for recharge.

The Basin Plan addresses the surface water quality issues of the Lower Kings River, indicated by the listing on the 303(d) list, stating that the likely sources of the contaminants are either surface or subsurface agricultural drainage, and declaring that additional on-farm management practices may be necessary as the levels of boron, molybdenum, sulfates, and chlorides become high enough to affect agricultural uses and aquatic resources. A number of best management practices have been recommended.

The Basin Plan also recommends a surface water monitoring network selected from existing DWR monitoring points. Samples will be taken to monitor for the mineral character of the stream, occurrence of toxic substances, general levels of nutrients and biological responses, and common physical characteristics. In addition, the Basin Plan calls for continued monthly monitoring by KRCD of the Lower Kings River for electrical conductivity, pH, and temperature; continued monitoring by CVRWQCB for constituents and areas of special concern; and monitoring by RWQCB of storm discharges from Naval Air Station Lemoore for hydrocarbons.

The U.S. Geological Survey (USGS) has done water quality work in the San Joaquin-Tulare Basins through the National Water Quality Assessment (NAWQA) program. The bulk of readily available data has been concentrated in the San Joaquin River and in the areas closer to the Sacramento-San Joaquin Delta, and there are few data points for the Lower Kings Basin. Other available USGS information was collected during studies to describe water quality associated with various land uses, rather than identifying local or regional water quality trends and conditions. There is some USGS information on surface water quality, including a bed sediment and tissue sampling event in 1992. Results of bed sediment sampling in 1992 showed

levels below detection limits for 16 organochlorine pesticides in the Kings River bed sediments below Pine Flat Dam and below Empire Weir 2 near Stratford. Three sites in the Lower Kings Basin were sampled for 14 organochlorine pesticides in tissue of fish below Pine Flat Dam, at Peoples Weir near Kingsburg, and below Empire Weir 2 near Stratford. Detections were made for P, P'-DDD (6µg/kg below Empire Weir 2 near Stratford) and P, P'-DDE (16 µg/kg at Peoples Weir near Kingsburg and 95 µg/kg below Empire Weir 2 near Stratford); all other locations showed no detections. (USGS 2004)

KRWA and KRCD are participating in the Southern San Joaquin Valley Water Quality Coalition (SSJVWQC). The mission of SSJVWQC is to develop plans and implement practices that address water quality issues and concerns affecting the Tulare Lake Basin as part of the agricultural waster discharge permit waiver program. SSJVWQC participating agencies believe that they will be better served approaching these and other water quality issues on a regional basis rather than individually, and will implement monitoring plans to detect problems and management plans should problems be identified.

GROUNDWATER QUALITY

Groundwater in the San Joaquin Valley has often been divided into three zones—the east side, the central part, and the west side. Generally, groundwater on the east side is of the bicarbonate type and has low to moderate concentrations of dissolved solids. Groundwater in the central part differs greatly in chemical types and generally contains higher concentrations of dissolved solids than does groundwater on the east side, and groundwater on the west side is typically a sulfate or bicarbonate type and contains higher concentrations of dissolved solids than does groundwater on the east side (Bertoldi et al, 1991). The Lower Kings Basin lies predominantly within the central part of the valley where groundwater is a combination of water from the east side and water from the west side. Because the area is east of the central part of the valley, water from the east side predominates. The California Department of Health Services (DHS) and USGS have or continue to conduct groundwater quality monitoring programs.

California Department of Health Services

Records of drinking water purveyors and regulators are considered the best available source of information regarding groundwater quality. There are few water quality measurements available from the agricultural wells in the Lower Kings Basin. The DHS is the repository for the drinking water systems data; DHS records were reviewed for this study. It should be noted that water purveyors may relocate or deepen wells to improve water quality. This results in a break in the data and inability to evaluate trends.

DHS established the Drinking Water Source Assessment and Protection Program (DWSAPP) to provide information so that communities can develop programs to protect drinking water sources. As part of DWSAPP, source water assessments are conducted to provide information on a well's vulnerability to contamination.

A review of a number of the results for water purveyors in the Lower Kings Basin was selected to obtain a general picture of the water quality issues facing the drinking water industry in the groundwater basin. The purveyors included Caruthers Community Service District, Caruthers Raisin Packing Company, City of Kerman, City of Lemoore, City of San Joaquin, Lemoore Mobile Home Park, Lemoore Naval Air Station, Raisin City School, and Tranquility ID. Detected contaminants by one or more of these purveyors include dibromochloropropane (DBCP), hydrogen sulfide, 1, 1, 2, 2-tetrachloroethane, nitrates, and naturally occurring arsenic, fluoride, chromium, and radioactivity (DHS 2004). Potential sources of contamination include above ground storage tanks, agricultural and irrigation wells, automobile body and repair shops, automobile gas stations, dry cleaners, fertilizer/pesticide/herbicide application, home manufacturing, grazing, irrigated crops, metal plating/finishing/fabricating, septic systems, sewer collection systems, underground storage tanks, and naturally occurring arsenic, chromium, fluoride, and uranium.

United States Geological Survey

USGS has done extensive water quality work in the San Joaquin–Tulare Basins through the NAWQA program. Unfortunately, the bulk of readily available information has been concentrated in areas closer to the Sacramento–San Joaquin Delta, with little data in the Lower Kings Basin. Other available information is intended to describe water quality at various land uses, rather than identifying local water quality conditions, or is so regional in scale that only one sampling location falls within the Lower Kings Basin.

Lower Kings Basin Growers

Growers in the Lower Kings Basin monitor groundwater quality to ensure productivity. The monitoring results are used privately and are not released to the public. No data were provided to indicate that agricultural beneficial uses are significantly impaired by current surface water or groundwater quality conditions.

Groundwater management involves understanding the available groundwater resources in order to make informed decisions and meet existing and future water needs. Section 2 presented the current and historical conditions and documented the nature and extent of the problems. This section defines the goals and objectives established to address the identified problems. Once the broadest goals were established, qualitative objectives were set, and Basin Management Objectives were developed to help measure progress. The goals and objectives established by the BAP are intended to help define and priorities the GWMP actions, plans and strategies to be implemented. KRCD and Lower Kings Basin water districts worked together to develop the goals and objectives and demonstrate how local water interests can work cooperatively and speak with one voice to support groundwater banking and conjunctive use projects in the Lower Kings Basin.

3.1 GOALS AND OBJECTIVES

As presented in Section 2, overdraft of the groundwater basin is the primary problem in the Lower Kings Basin, affecting both overlying users and surrounding areas. The groundwater level hydrographs for Lower Kings Basin demonstrate overdraft conditions and the chronic depletion of groundwater storage. In general, local water demands exceed local surface water and groundwater supplies under current modes of management and with existing facilities for storage and distribution of the available surface water supply. In its most simplistic view, there is a need to either increase the supply or decrease the demand.

This GWMP is a local plan to be implemented by local interests and it clearly states goals and objectives for the Lower Kings Basin. The goals and objectives were established by the BAP early in the process to help establish and prioritize actions to solve the problems described in Section 2.

The GWMP goal is a broad statement of the intent and purpose established by the local stakeholders. During early meetings of the BAP in November and December 2004, the group identified the primary issues and concerns and the anticipated benefits that were to be realized by the GWMP. These were then used by the BAP to shape the GWMP goal and the more-specific objectives statements. The overall goal of the GWMP adopted by the BAP at the February 2005 meeting is:

> *To document the local approach to stopping overdraft, sustaining the local economy, and ensuring a sustainable groundwater system through development of specific projects and facilities*

to capture unallocated floodwater for groundwater storage and conjunctive use, whenever and wherever such water is available consistent with existing agreements, rights, and entitlements.

The objectives were crafted to reflect the community's values and priorities for meeting the GWMP goal. The BAP expressed a strong desire to set objectives that would support developing feasible projects with reasonable costs and financial plans that provide equitable distribution of both the costs and benefits. One primary underlying planning principle is to solve problems without litigation. The proposed GWMP objectives are to:

1. Identify and build near-term groundwater recharge projects within each WMA to capture flood flows; begin to stabilize the basin; and demonstrate project feasibility, benefits, and cost effectiveness;
2. Establish rational and attainable BMOs, both regionally and for specific WMAs, to measure and track progress;
3. Formulate long-term regional strategies to take advantage of groundwater storage space in the Lower Kings Basin;
4. Maintain local control of the groundwater basin by developing agreements and institutional arrangements that promote the responsible management of groundwater resources by overlying cities, water districts, agencies, companies, and landowners;
5. Continue to coordinate the BAP to track progress, coordinate GWMP implementation;
6. Research and define financing strategies and program oversight to implement the GWMP projects and programs;
7. Implement monitoring programs that increase the understanding of Lower Kings Basin operations, track progress toward meeting goals, and evaluate and forecast conditions; and
8. Prevent degradation of groundwater quality.

3.2 BASIN MANAGEMENT OBJECTIVES

The nature and scope of the overdraft problem varies within each of the defined WMAs in the Lower Kings Basin and, depending on the Area's hydrogeology and water management infrastructure, the problem is experienced differently by the overlying users.

There is no single set of management objectives that will be successful in all areas. Groundwater management must be adapted to an Area's political, institutional, legal, and technical constraints and opportunities. Groundwater management must be tailored to each Area and WMA's conditions and needs. Even within a single basin, the management objectives may change as more is learned about managing the resource within that basin. Flexibility is the

key, but that flexibility must operate within a framework that ensures public participation, monitoring, evaluation, feedback on management alternatives, rules and regulations, and enforcement (DWR, 2003).

The State advocates the concept of local BMOs. BMO's allow for more generalized objectives that are quantitative and measurable so that progress can be tracked and monitored. The BMO concept was also developed to meet the groundwater management needs within a basin that has different groundwater users and/or overlapping jurisdictional agencies. The BMOs for the Lower Kings Basin are specific to the management and groundwater conditions found in each Area.

Coupled with dedicated monitoring and reporting of the groundwater basin conditions, the BMOs will be used by the BAP to gauge the progress in meeting the GWMP goals and objectives, and determine whether the anticipated benefits of the GWMP are being achieved. In the future, the BMOs may be used by the BAP or KRCD to "trigger' subsequent management actions or respond to changing circumstances and new knowledge.

METHOD AND APPROACH

Since overdraft is a primary problem in the Lower Kings Basin, groundwater levels provided the basis for setting BMOs.

Composite hydrographs were developed for each WMA using the available groundwater level data from representative wells within the individual WMA. Groundwater levels were projected using the data in the composite hydrograph. A planning period of 25 years to 2030 was assumed. For the purpose of projecting groundwater levels into the future, it was also assumed that groundwater operations and pumping would remain unchanged. This assumption is based on the land use and water demand analysis described in Section 2.

The composite hydrographs were used to develop groundwater level thresholds for the two primary types of BMOs established in consultation with the BAP. **Groundwater Stabilization** BMOs have been set for Areas A, B, and C using the average hydrograph and forecasted future water levels to establish target Operating Zones. Near-term projects are intended to help stabilize the groundwater levels in the Operating Zone by 2015. **Project Development** BMOs were also established by the BAP to provide preliminary engineering design targets and size potential recharge and banking project facilities. An Opportunity Zone based on groundwater levels was also identified when appropriate for the Area. The purpose of the Opportunity Zone is to define a target groundwater basin storage capacity that could be locally developed, managed, and controlled to provide long-term benefit to the overlying water users and the region.

Figures 3.1 through 3.3 present the BMOs and concepts as applied to each of the Areas. Figure 3.1 is for area WMA A. Figure 3.2 presents the aggregated hydrograph for WMA B and was used to establish BMOs for all of Area B. Figure 3.3 is for Area C and uses the hydrograph from WMA C. These figures were used to establish Groundwater Stabilization BMOs and Project Development BMOs s and thresholds. Figures for the individual WMAs are included in Appendix D. Table 3.1 summarizes the measurable components of the BMOs for each Area established by the BAP at the March 2004 meeting.

Table 3.1. BMO Measurable Components

Area	Groundwater Stabilization BMOs		Project Development BMOs	
	Range of Operating Zone Levels (ft at msl)	Range of Opportunity Zone Levels (ft at msl)	Range of Diversion and Conveyance (cfs)	Range of Potential Recharge (taf/yr)
A	20 to 55	55 to 90	125 to 250	7.5 to 20
B	5 to 40	40 to 75	125 to 500	7.5 to 42
C	73 to 108	108 to 143	0 to 125	0 to 7.5

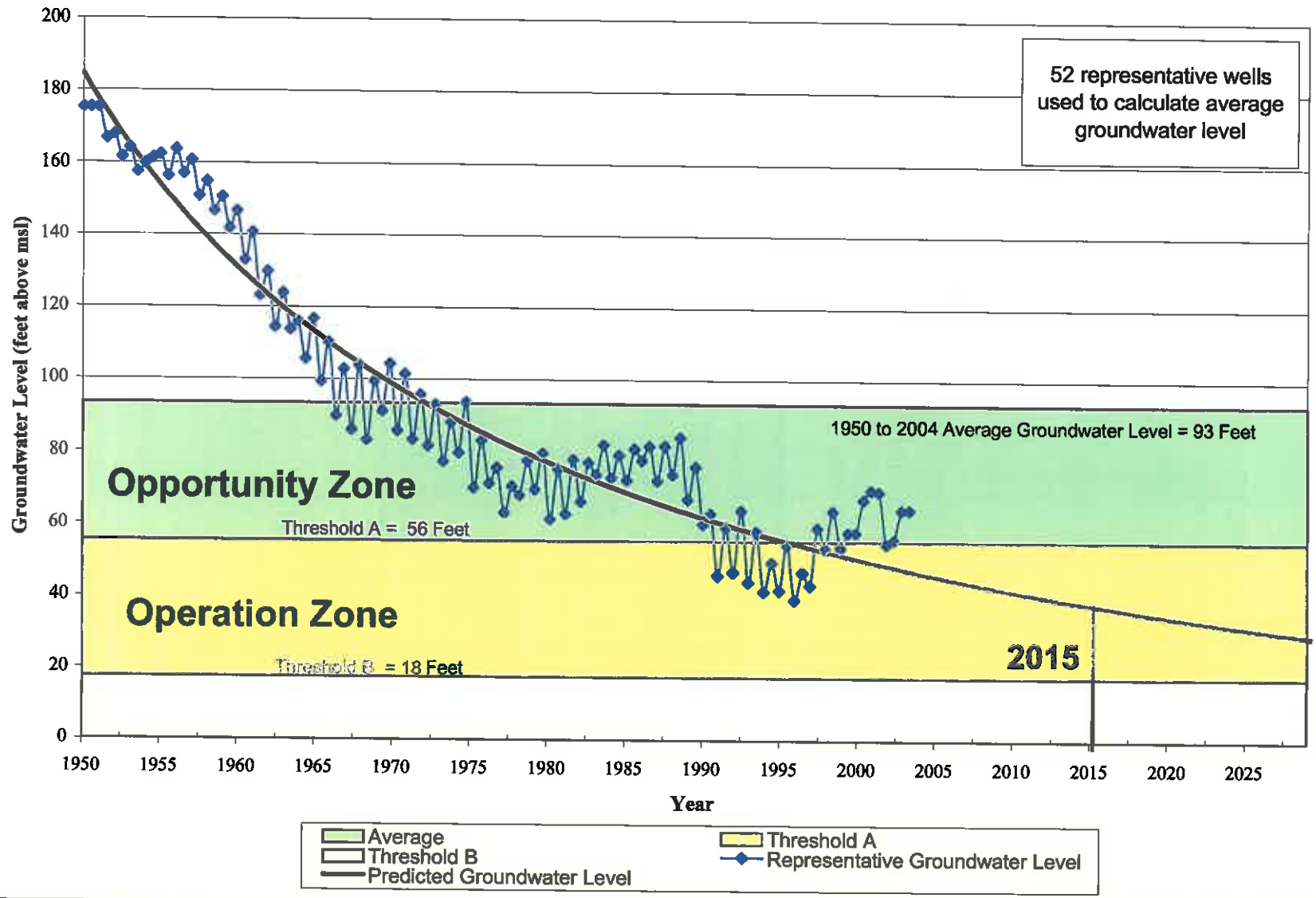
GROUNDWATER STABILIZATION BMO

Without additional projects, groundwater levels for all three Areas continue to fall past the 2015 target data for stabilizing groundwater levels in the Operating Zone. Area C is relatively stable and would appear to operate within the defined operating zone without other major actions being required. The Operating Zone sets target groundwater level ranges. Near-term, locally developed projects are proposed that will begin stabilizing groundwater levels in the Operating Zone by 2015. In other words, the 2015 forecasted level will serve as the target for the average future water level, recognizing that hydrologic variability (wet, normal, dry) would result in variations in water level within the target Operating Zone.

The Opportunity Zone is the groundwater levels range that could be achieved in the long term. It is generally recognized by the BAP that it will take larger projects and a longer time frame to overcome technical and institutional issues and develop projects that would bring water levels into this range of groundwater levels.

PROJECT DEVELOPMENT BMO

Project Development BMOs were established to provide preliminary engineering design targets for sizing recharge and banking project facilities. Since surface water availability from local



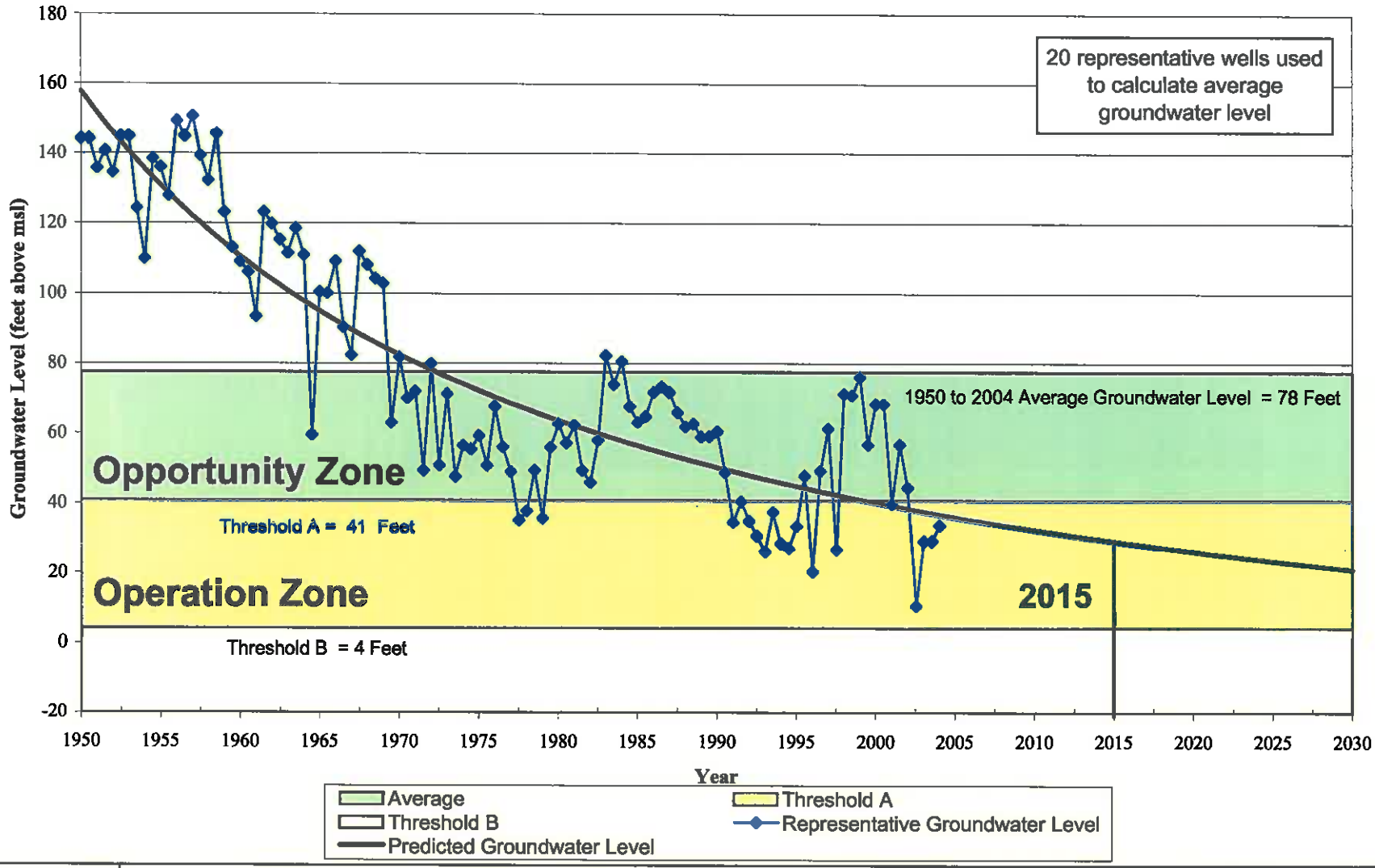
ORIME

Lower Kings Basin GWMP Update

Groundwater Trends for Area A

April 2005

FIGURE 3.1



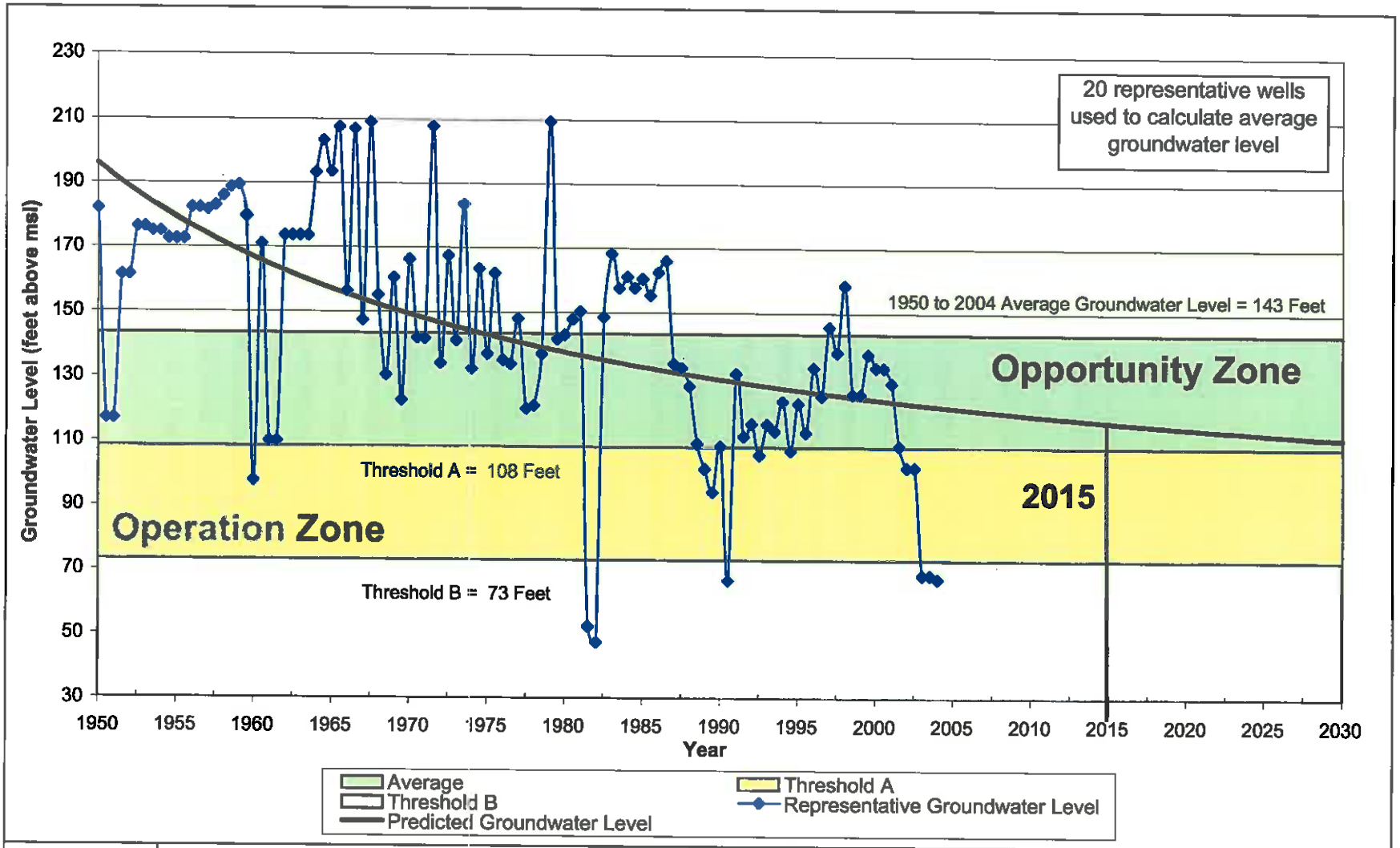
RIME

Lower Kings Basin GWMP Update

Groundwater Trends for Area B

April 2005

FIGURE 3.2



PRIME

Lower Kings Basin GWMP Update

Groundwater Trends for Area C

April 2005

FIGURE 3.3

sources is a limiting design constraint, flow rates were set to provide target design capacities. The GWMP proposes both near- and the long-term actions to implement and construct capital facilities. In the near-term, these facilities would be associated with projects to supplement natural recharge in the Lower Kings Basin and stay within the Operating Zone for the Area. In the longer term, projects may be considered that include regional partners and broader participation to use the Opportunity Zones.

Near-term groundwater recharge projects in Area A would be constructed so that groundwater levels could be stabilized by 2015 and maintained within the Operational Zone. This would entail designing, financing, and building locally sponsored projects, such as those investigated and proposed by the McMullin Group and by the Raisin City WD. The BAP established a target design capacity for near term projects in Area A as between 125 and 250 cfs, and a target design recharge capacity of between 7,500 and 20,000 af/yr. The source of the water would be flood flows and other contracted water.

Near-term groundwater recharge projects in Area B are similar to those in Area A. Projects are being investigated by the North Fork Group. The design capacity of the projects is targeted to be between 125 and 500 cfs, using at least four of the seven potential recharge sites that have been identified. The source of water would be NFG entitlements and flood flow water.

Water levels in Area C are relatively stable and expected to remain within their operating zone in the future. The BMO is established in the event that circumstances change. As such, the BMO defines a management trigger.

It is expected that recovering groundwater levels to take advantage of groundwater storage space in the Opportunity Zone of Areas A and B may require regional cooperation, identification of additional sources of surface water or imported water, and a longer time frame for project development.

Longer term projects might include the development of banking and exchange programs with other Kings Basin agencies, CALFED Environmental Water Account (EWA), other water districts, and Central Valley Project and/or State Water Project contractors. These banking and exchange programs could involve storing water in the Raisin City cone of depression, where a certain volume of water would be stored in the recharge portion of the program with some of the stored water left behind for local use as part of any extraction portion of the program. The long-term, regional objective is to seek cooperation to develop regional groundwater recharge and banking programs to utilize the Opportunity Zones in Areas A and B. That program would include a comprehensive monitoring program that would allow for the evaluation of costs and benefits.

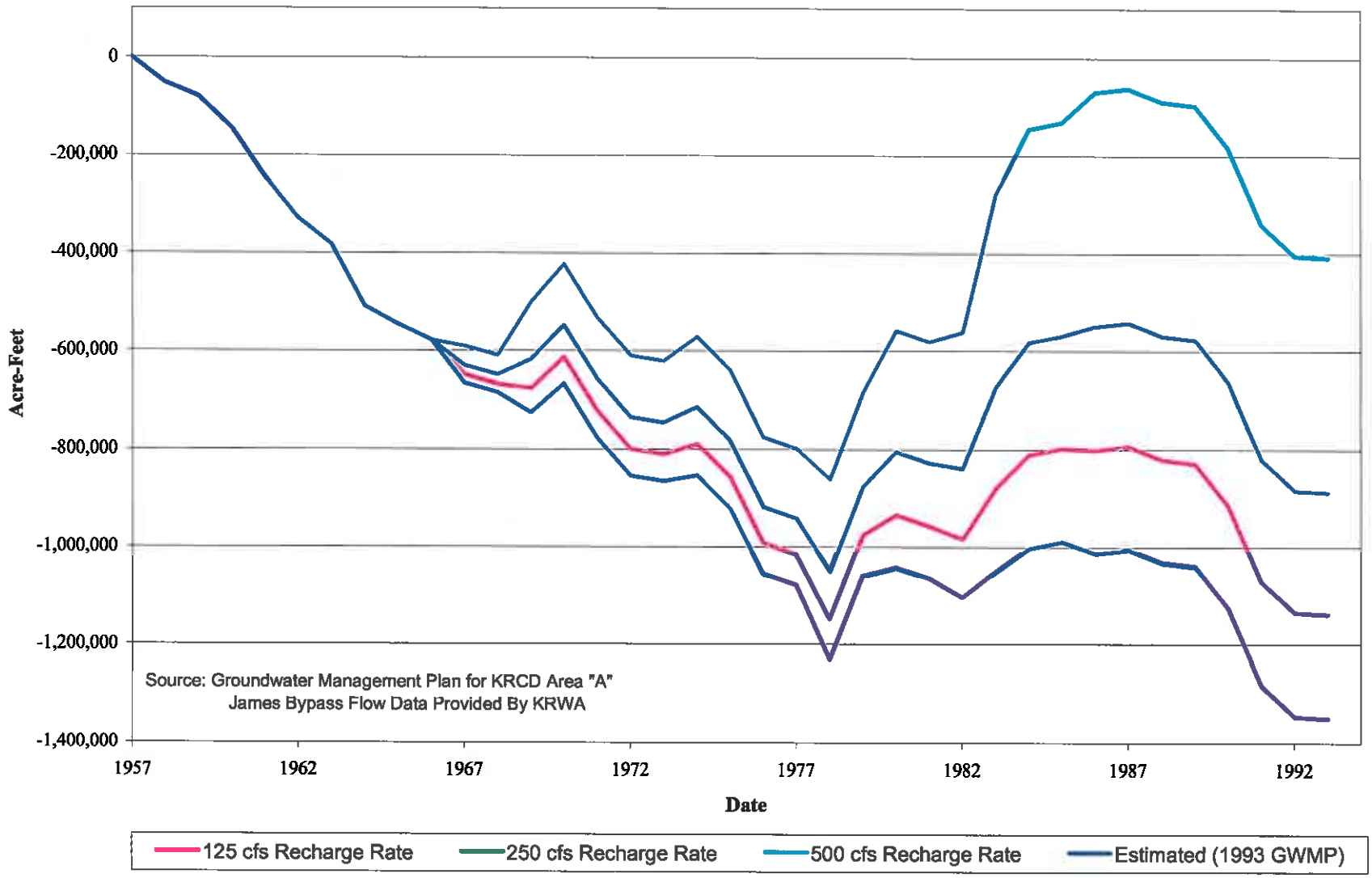
POTENTIAL BENEFITS OF MEETING THE BMOS AND PROPOSED PROJECTS

The potential benefits of the project design BMOS capacities were analyzed. The benefits of different project sizes were evaluated using the groundwater budgets from the previous GWMP, historical hydrographs, and an analysis of theoretical project yields. Potential project design capacities were assumed based on the frequency analysis of the James Weir flows and project design BMOs. To be consistent with previous reports and make use of the water budgets that were calculated, the analysis was conducted for the period from 1957 through 1993 and a baseline case for this period was developed to allow comparison of different project sizes.

The cumulative change is storage from the previous water budgets analysis was determined. Figures 3.4 and 3.5 show the results of the cumulative mass balance analysis for Areas A and B, assuming three recharge rate scenarios of 125, 250, and 500 cfs. Area C was not evaluated because the water budget did not indicate a cumulative loss of groundwater storage. The cumulative change lines show a running storage balance indicating how much water went into or was removed from storage over a specific time period. A downward trend represents depletion in storage and an upward trend indicates water going into storage.

To evaluate the potential project yields, it was assumed that the proposed project would begin operations in 1964. The amount of water available for recharge was based on the flow hydrographs at James Weir, assuming that the projects would operate only when there was at least 75 cfs. The operating rules also assumed that a recharge rate of 50 cfs would be initiated when flow reached 75 cfs, and that the recharge rate would then increase until the maximum recharge rate assumed for the scenario was achieved. To be conservative, it was also assumed that only 80% of the recharged water was stored and would be recoverable.

These figures show that groundwater storage steadily decreased from 1957 through 1964 under a no-project assumption, and that depletion of storage would continue through 1993. The analysis assumed that recharge projects with the indicated design capacities would have become operational in 1965. No other changes in Kings River operations were assumed. The benefits of the recharge projects are apparent. As shown in the figures, it is expected that the projects would serve to increase storage and reduce or reverse the storage depletion.



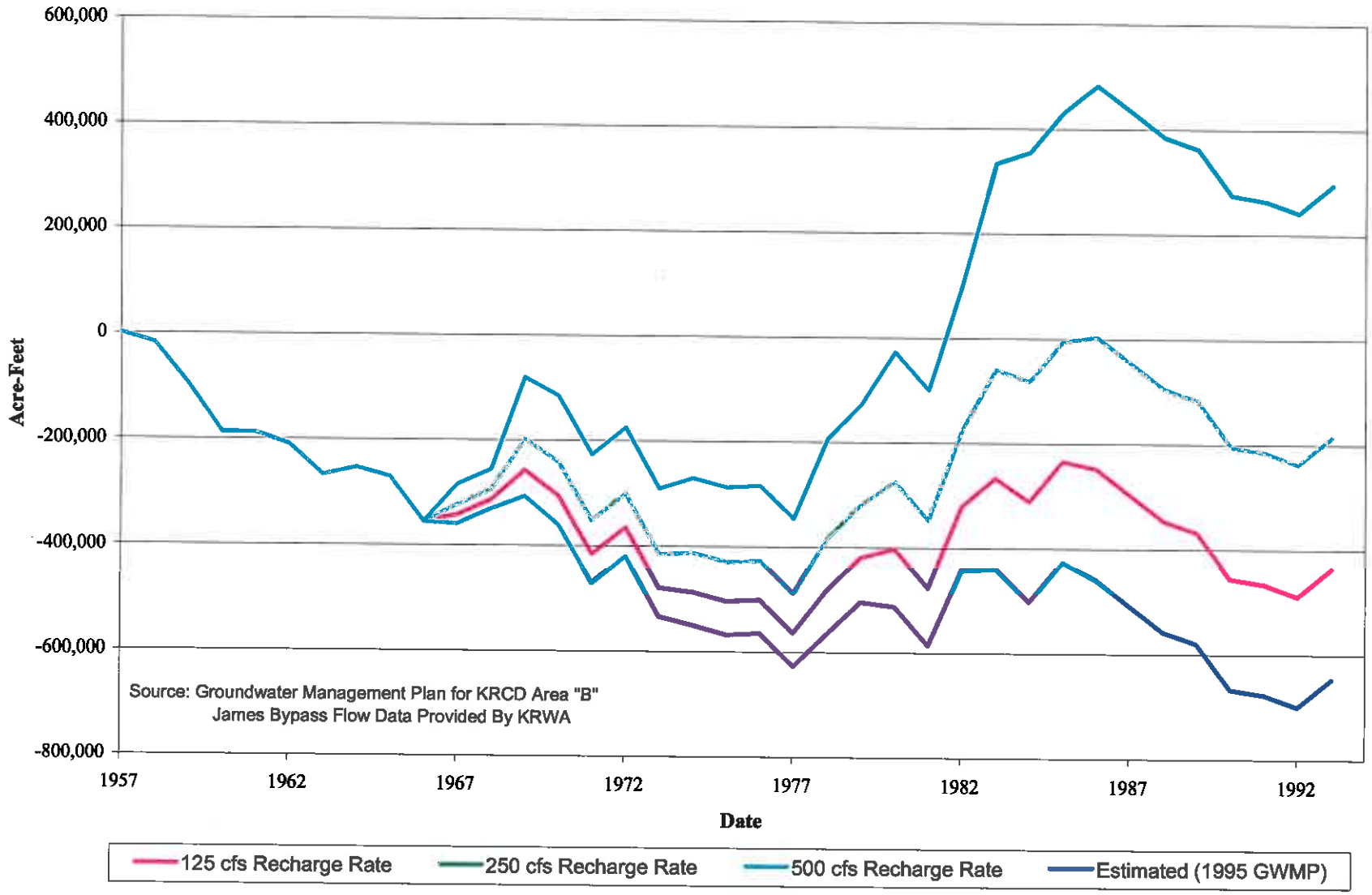
RIME

Lower Kings Basin GWMP Update

Cumulative Change in Groundwater Storage for WMA A
Cumulative Mass Balance Analysis

April 2005

FIGURE 3.4



RIME	Lower Kings Basin GWMP Update **Cumulative Change in Groundwater Storage for WMA B** **Cumulative Mass Balance Analysis**	April 2005 FIGURE 3.5

SECTION 4 GROUNDWATER MANAGEMENT OPTIONS

This section describes both the general and specific groundwater management options that were considered and discussed by the BAP. Early in the planning process, conjunctive use was recognized as the prevailing groundwater management theme. Conjunctive use is generally defined as (DWR, 2003):

> *The coordinated and planned management of both surface water and groundwater systems in order to maximize the efficient use of the resource; that is, the planned and managed operation of a groundwater basin and a surface water storage system combined through a coordinated conveyance infrastructure. Water is stored in the groundwater basin for later and planned use by intentionally recharging the basin during years of above-average water supply.*

The Kings River area provides a prime example of conjunctive use and growers have been actively managing surface water and groundwater throughout the history of the area. KRCD has been actively promoting cooperative efforts for conjunctive use and groundwater recharge within since 1989 when the Board updated a resolution directing staff to prepare GWMPs (KRCD, 1999) for WMAs A, B, and C.

This section discusses the options for further conjunctive use in the Lower Kings Basin that were considered by the BAP. It generally describes each option and then evaluates how it is related to the Lower Kings Basin. It evaluates surface water, groundwater, "other" management and water quality options, and describes issues and constraints associated with each option and Area. Based on discussions with the BAP, some of the options were not carried forward for further considerations based on the extent of the technical or policy constraints. This includes projects that would not be eligible for funding; faced serious environmental or regulatory challenges; or would take excessive amounts of time to plan and construct.

Options which were not screened were carried forward would be combined or included as a GWMP component. Surface water and groundwater management options were also characterized in terms of whether they could be implemented within the near-term or long-term planning timeframe. Near-term actions are those intended to help meet the BMOs to stabilize groundwater levels and develop projects that could be implemented by 2015. Longer term options that were carried forward are those that have greater constraints but no fatal flaws, and are expected to take more time or study, or require wider involvement to resolve the issues and implement a project.

4.1 SURFACE WATER OPTIONS

NEW KINGS RIVER SURFACE WATER STORAGE

Capturing flood flows is usually associated with new or expanded reservoir storage in off-stream or on-stream facilities. Managing flood flows with additional surface water storage would enhance conjunctive use operations and provide the best engineering solution for reducing the volume of flow out of the Kings River Basin.

A number of large-scale surface water--storage projects for the Kings River Basin have been previously evaluated, including Dinky Creek and Rogers Crossing Reservoir. Additional large-scale surface water storage could increase flood storage, provide flood control, and increase supply reliability, but these projects were eliminated from further consideration in the GWMP because they had already been set aside due to cost, regulatory compliance constraints, and limited probability of project development in a reasonable timeframe. As the California and the regional water picture change, these large-scale projects may be reevaluated in the future.

SMALL-SCALE SURFACE WATER STORAGE

Small-scale storage ponds may be constructed for purposes of regulating deliveries, retaining floodwaters, providing habitat, and improving conjunctive use opportunities. The concept is to use low-lying areas in the Lower Kings Basin along the Kings River floodway or other major conveyance to construct temporary storage in areas where recharge may be limited. This does not include ponds that are constructed specifically for purposes of recharge, but would include ponds in areas where the presence of clays or other impermeable strata would limit recharge, but would allow for short-term storage of water before spreading or percolation into other facilities more appropriately designed for recharge. Such short-term flood storage could be accomplished and provide multiple benefits related to creation of habitat, settling of sediments, detention storage, and regulatory storage to optimize water delivery infrastructures. When not fully used for water storage, the property could be used for specific types of farming operations.

Short-term storage and retention of flood flows are practiced in the Tulare Lake Basin. A local example of one type of small-scale surface storage project can be found in the northern part of Area B at Gragnani Farms. This is a showcase project developed to meet multiple objectives under the Wetlands Reserve Program (WRP) of the U.S. Department of Agriculture with support provided by NRCS. The constructed wetland is on a 6,000-acre piece of land that was converted to seasonal wetlands through purchase of conservation easements. The project was designed to provide habitat, but the facility also provides conjunctive use benefits by capturing and storing between 12,000 and 18,000 af of floodwater from Stinson or Crescent Canal. It can

be filled from or discharged to the James Bypass (Gragnani, 2005). Stored water in the wetland area can be subsequently drained and diverted for use on irrigated lands in lieu of groundwater pumping. Since there is less land to be irrigated, there is less groundwater pumping and a reduction in groundwater overdraft. Also, land that does require irrigation can use some of the stored floodwater instead of groundwater.

There are other areas where this type of project could be developed in the Lower Kings Basin; however, there are some constraints, such as acquiring land, finding willing sellers, procuring funding, and negotiating agreements for storage and project operations. Small-scale surface storage could be a design element for any regional recharge facility, or may be pursued by individual growers or water districts in the Lower Kings Basin.

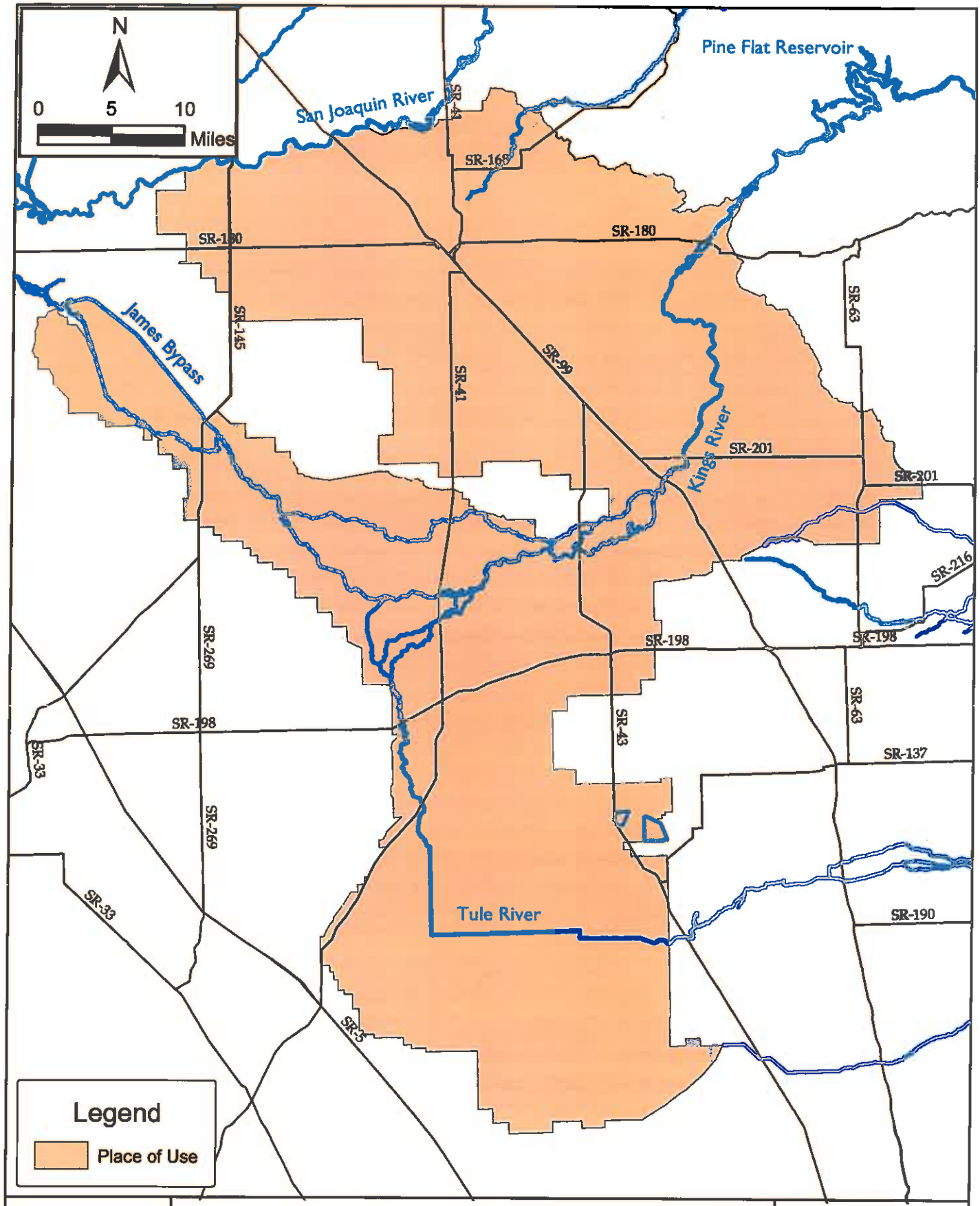
IN-BASIN SURFACE WATER AND FLOOD FLOWS

Consistent with the previous GWMPs, this analysis concluded that the amount of water available from the Kings River is expected to remain essentially the same as historical amounts, and any water available for further conjunctive use is associated with floodwater that flows past the James Bypass. The Kings River has been declared fully appropriated by SWRCB, and KRWA members have the full rights and entitlements to the available flows. Rights and entitlements, settlement agreements, and operating plans are specified in the KRWA "Blue Book", which directs nonflood operations of Pine Flat Reservoir and the diversions from the Kings River. Included in the Blue Book is the 1992 Flood Water Agreement by which all KRWA members agreed that when flood releases from Pine Flat Reservoir exceed the total demand of all KRWA members within the Kings River Place-of-Use (POU) (Figure 4.1), permitted uses of otherwise unused water is prioritized as follows:

1. By KRWA members for use outside the Kings River POU but within Fresno, Kings, or Tulare County to facilities owned by KRWA members;
2. By KRWA members for use outside the Kings River POU but within Fresno, Kings, or Tulare County to facilities not owned by KRWA members; and
3. By anyone else with the written consent of all KRWA members.

Flood operations are coordinated by the Corps. Both the KRWA and Corps operations manual dictate how, when, and what type of floodwater would be available for recharge. Section 2 documented the flow frequency and volumes of floodwater available but did not characterize the rights or entitlements to the water. The floodwater that flows out of the planning area is either

a. Entitlement water released as part of the flood operations but that is not diverted by the entity with an entitlement (commonly referred to as "refused water"), or



RIME

Lower Kings Basin GWMP Update

Kings River Place of Use

April 2005

Figure 4.1

b. Uncontrolled and unallocated flood flows that are beyond any entitlement or any organization's ability to make claim to the flow.

Competition for the available floodwaters could delay project development. In addition, unless locally developed, the water leaving the area could be subject to claim by downstream interests.

Developing cost-effective engineering solutions to capture and store floodwater is challenging because of the intensity and infrequency of major storm/runoff events. None of the engineering constraints provide fatal flaws. The technical engineering constraints to develop floodwaters vary by location in the Lower Kings Basin and are associated primarily with limitations on conveyance systems to move the water to recharge areas. Institutional issues provide constraints on development of the available floodwater as a source of surface supply for recharge.

In developing recharge and banking proposals in Area A, the McMullin Group encountered issues associated with diverting floodwaters for recharge. KRCD staff drafted a number of agreements with KRWA seeking to develop a long-term agreement for floodwater to be utilized for recharge. In March 2000, the McMullin Group made a formal request to the KRWA for a 40-year agreement for a peak diversion of 125 cfs. The KRWA responded and indicated a willingness to work with the group to develop a 25-year plan. (McMullin Group Minutes 1999-2003). Ultimately, only short-term agreements and pricing arrangements were made to conduct pilot and demonstration projects, and the issues surrounding the definition of firm supply, water pricing, and contractual agreements are not resolved.

Defining the rights and entitlements to floodwaters that move past the James Bypass is needed to fully develop the floodwaters, and agreements with KRWA are needed for areas not currently in the POU or which do not currently have defined entitlements. Without some certainty regarding the availability of water for diversion and recharge, the economic investments in conveyance and recharge facilities are hard to justify, and return on investment cannot be easily demonstrated.

Hypothetically, if a portion of Kings River floodwater could be identified as not part of an entitlement, that portion of the floodwater could be moved from the Kings River POU and into Area A; however, this issue is still subject to legal interpretation and would need to be resolved as part of project development. There remain a number of regulatory hurdles associated with water rights and environmental compliance on the Kings River regarding using floodwater outside the POU. SWRCB would most likely need to approve a diversion for recharge that is not part of an existing entitlement or is a change in the POU and all KRWA members would need to agree to the change.

There are less institutional constraints in WMA B, B1, and B2 because most of these are within the KRWA boundary and the overlying water district and ditch companies have existing water rights and entitlements. These entitlements provide a source of recharge without encountering many of the issues described above. Most of Area C has access and entitlement to Kings River water and facilities to move the water.

It does not appear that there are any fatal flaws to developing in-basin floodwater and the institutional constraints do not appear to be insurmountable. However, substantive legal (e.g., SRWCB change of use hearing), political, and regulatory issues will need to be discussed and resolved before the opportunities and benefits of this option can be realized in the Lower Kings Basin.

WATER TRANSFERS

Water-transfer are becoming part of the water management landscape in California and the source of much discussion and controversy (DWR 2004, SWRCB, 2002). Water transfers are defined in the California Water Code as a temporary or long-term change in the point of diversion, place of use, or purpose of use as a result of a transfer or exchange of water or water rights[1]. Transfers are a business deal among willing participants. The Lower Kings Basin could be involved in both in-basin and out-of-basin transfers. In-basin transfers would essentially imply operational changes to maximize existing conjunctive use opportunities. Out-of-basin transfers into the Lower Kings Basin would create a new source of water, and could also be linked to operation of surface water and groundwater facilities within the Lower Kings Basin.

Water transfers may increase the flexibility of the system and be linked to other water-management strategies, including surface water and groundwater storage, conjunctive management, conveyance efficiency, water-use efficiency, water-quality improvements, and planned crop shifting or crop idling. Multiple agencies could be involved and transfers and exchanges can be quite complex. Generally, water for transfer is made available for transfer by five major sources (DWR, 2000; SWRCB 2003):

- Transferring water from storage that would otherwise have been carried over to the following year. The expectation is that the reservoir will be refilled during the wet season. This would be coupled with a groundwater-banking program.
- Pumping groundwater in lieu of historically used surface water delivery and transferring the surface water rights to a third party.

[1] Temporary water transfers are defined in Section 1728 of the California Water Code as any change of point of diversion, place of use, or purpose of use involving a transfer or exchange of water or water rights for a period of one year or less. Long-term water transfers are defined in Section 1735 of the California Water Code as a transfer of water or water rights involving a change of point of diversion, place of use, or purpose of use for any period in excess of one year.

- Transferring previously banked groundwater, either by directly pumping and transferring groundwater or by pumping groundwater for local use, and transferring surface water rights.
- Reducing the existing consumptive use through crop idling or crop shifting or by water use–efficiency measures.
- Reducing return flows or seepage losses in conveyance systems that would not otherwise be recoverable for reuse.

In-basin and out-of-basin water transfers are discussed below, though no specific transfer opportunities were identified by the BAP at this time, and transfers both within and from outside the basin were only generally discussed as options. However, each of the transfer option listed above may provide an opportunity. Future transfers could be negotiated by specific individual districts within KRWA, the groups of districts and ditch companies that have formed (e.g., North Fork Group, McMullin Group), or a new Lower Kings Basin Group put together to represent common Lower Kings Basin interests and further develop transfer options as part of a longer term component of the GWMP.

In-Basin Water Transfers and Purchases

Agencies with surface water rights to Kings River could make water available to other agencies with limited water rights through willing buyer/seller agreements. To avoid any potential loss of water rights through nonuse, water districts and agencies could transfer their rights to other in-basin users for exchange and/or banking. Such water transfers or exchanges have occurred in the past among KRWA members. Water held by KRWA members can be readily moved, transferred, and exchanged within the KRWA boundary (Figure 4.1); SWRCB review is not required for such in-basin transfers. Much of Area A is not within the Kings River POU; consequently, potential transfers to Area A are subject to KRWA review, encounter a range of regulatory and political hurdles, and may require SWRCB review. Water-rights issues would need to be resolved by KRWA and SWRCB to facilitate transfers or exchange outside of the Kings River POU.

In-basin transfers have constraints and there do not appear to be any fatal flaws. As such, the option is carried forward for further review as part of both the near- and long-term GWMP.

Out-of-Basin Water Transfers or Exchange

Out-of-basin water transfers have become a key component in water-resources planning throughout the state. Water agencies and purveyors routinely import water from willing sellers to supplement their supplies. Water transfers often benefit both parties—sellers recover water-development costs because prices are often far below the cost of developing new supplies, and

seller's water rights are not affected by water transfers. This provides an incentive to promote conservation and water-use efficiency by the transferring party (Hanak, 2003). Water transfers are subject to approval by SWRCB, except in the case of transfer of pre-1914 water rights.

Out-of-basin water transfers would be a new source of surface supply. Both short-term, "spot" transfers of an existing water right, and any long-term water rights transfers would occur within an increasingly competitive market, where price is high and being driven by municipal demands.

Transfers with state or federal water contractors can be expedited, although competition is stiff and limited to those entities with facilities to deliver and wheel water between contractors. Water transfers to non- contract parties are more constrained, complex, and subject to regulatory issues. James ID and Tranquility ID are CVP exchange contractors (within Area A) and could participate in transfers within the federal project. This also could provide and opportunities to support transfers with state contractors.

Lack of existing facilities limits the ability to import or transfer state- or federal-project water into the area, but transfers or exchanges may still be possible and could provide opportunities to increase surface water sources for Lower Kings Basin. Specific new facilities, or plans to access existing facilities, would need to be identified and evaluated to transfer water from out-of-basin sources, change existing points of diversion or places of use, and provide a source of recharge the Lower Kings Basin.

KRCD is the manager for the Mid-Valley Water Authority (MVWA). A Mid- Valley Canal was previously considered to bring federal contract water into the Lower Kings Basin via Mendota Pool. The Mid- Valley Canal facilities were not constructed and this limits access to CVP water, or other water that could be transferred and wheeled through CVP facilities and enter the Lower Kings Basin planning area through the Mendota Pool. A Mid- Valley or similar facility would be needed to transfer water from sources in Northern California that would rely on CVP facilities, or from sources on the San Joaquin that would also move water through the Mendota Pool into Area A.

The Friant Kern Canal is a point of entry and potential point of departure for use in any transfer or exchange. Transfers or exchanges along the Friant Kern Canal of CVP Friant Unit water and Lower Kings Basin interests could be possible and should be considered for further evaluation as part of any long-term, regional solution that considers groundwater banking and use of Lower Kings Basin groundwater-storage space. The City of Fresno has rights and entitlements to Class I water from the CVP Friant Unit and could be part of a transfer involving Lower Kings Basin parties.

Both short-term and long-term water transfers to obtain out-of-basin water are possible and are carried forward for further consideration. Such transfers would be subject to regulatory, economic, and political hurdles and these would need to be resolved. Specific water transfer opportunities have not been identified, and are thus not considered for inclusion in any of the near-term GWMP project components. Out-of-basin water-transfer options are carried forward and should be considered and as a potential source of water and for integration into the long-term GWMP component.

Out-of-Area Surface Water Rights or Storage

Methods to acquire new surface water rights are very limited in California and are not viable because of intense competition, cost, and regulatory constraints. Water agencies and organizations within a stream system (areas of origin of a surface water) closely protect any undeveloped or unclaimed rights that might exist.

Within the San Joaquin region, SWRCB has designated most of the rivers as generally fully appropriated in summer months, when demands for water are at their peak. No water is known to be available or subject to appropriation in any of the surrounding areas. No further consideration is given to acquiring outside surface water rights.

The CALFED Bay–Delta Program includes evaluation of additional surface water storage in the upper San Joaquin River Basin. In the long term, surface water–storage projects on the San Joaquin River could be developed, which would increase the number of water supply and flood storage options in the San Joaquin region; however, these options are not practical or considered available within a realistic timeframe. Increased surface water supplies could reduce the reliance on groundwater supplies, boost additional conjunctive use opportunities, and encourage exchanges that improve supply reliability and quality; however, these benefits would primarily be targeted to existing contracts on the Friant–Kern and Madera Canals. There are no other surface water storage projects that were identified in which Kings Basin interests could participate.

Outside sources of surface water, with the exception of San Joaquin flood flows, and outside sources of surface water storage were eliminated from further consideration for inclusion in the GWMP.

Out-of-Basin Flood Flows

Flood flows, or unregulated flows, are defined as either releases made from upstream storage reservoirs to maintain adequate flood storage capacity or flows in excess of in-stream flow requirements. The San Joaquin River is the only likely source of floodwater from outside the

Kings River watershed that could be readily available to the Lower Kings region. The Kings River water districts and ditch companies take San Joaquin CVP flood releases (215 water) when they it is available.

The opportunities to purchase 215 water are often not taken advantage of in the Lower Kings Basin since there are large stream losses along the Kings River that make it difficult to justify the expenditure. Such losses might also occur if water is wheeled down FID facilities or through other water districts for Area A, or through ditch-company conveyance in Area B for use in Area B, or wheeled through Area B to reach Area A. Wheeling water through Area B or FID facilities to get to Area A for recharge would require agreements. Under current state law, access to the conveyance facilities of one public agency by another public agency must be granted if there is capacity available, but the cost for wheeling water is subject to negotiations and contractual agreement. Limitations include price and lack of facilities to transfer or percolate the water when it is available. Additional 215 water could be purchased and used for recharge if there were additional facilities to deliver, spread, or percolate this water in either Area A or B. The facility constraints are discussed further below.

This is a viable source that merits further consideration in both near-term and long-term GWMP components. Water could be diverted along the Friant-Kern Canal or at the lower end of the Lower Kings Basin in the area of James ID and Tranquility ID. This latter option would require additional facilities to move water into Area A.

REOPERATION OF PINE FLAT RESERVOIR

Pine Flat Reservoir is well sized and operated for the Kings River watershed, and the historical operations have provided maximum water-supply benefits. A reoperations study was not conducted and was beyond the scope of this work; however, the reoperation of the reservoirs could include intentional drawdown of stored water below the minimum capacity required for flood-control purposes. In the context of a conjunctive use program, reservoir reoperation potentially utilizes a reservoir's carryover storage for groundwater recharge, allowing for greater flood-control capacity and a reduction in the foreseeable frequency of reservoir spills. Changes in the mode of operation would need to be carefully reviewed to avoid a detrimental effect on other reservoir benefits, such as hydropower, water supply, temperature control, and recreation. Potential impacts in these areas could limit the reservoir's ability to be reoperated to increase conjunctive use benefits.

A reoperations study should be considered to evaluate whether, in concert with additional groundwater-recharge facilities, would improve supply reliability and conjunctive use opportunities.

4.2 GROUNDWATER RECHARGE OPTIONS

The following discusses groundwater recharge options, describes existing facilities, and notes where there are ongoing feasibility studies and investigations. Issues, constraints, and opportunities are identified.

DIRECT RECHARGE TO GROUNDWATER

Surface Spreading (Field Flooding)

Surface spreading, also known as "field flooding", has been a historical practice in the Lower Kings Basin and consists of ponding surface water on seasonally fallowed agricultural areas in late fall, winter, and early spring months for the purpose of recharging the groundwater basin. This practice has been implemented primarily in Areas B and C, using existing water rights and conveyance facilities. Increased spreading might be possible with additional distribution infrastructure and other agreements to gain access to land through easements or other incentives. Historical records to document current practices and the benefits of spreading operations in the Lower Kings Basin are not readily available, although diversion records indicate that the practice is widely applied in late winter and early spring, when water is available.

In general, this option could be used in fields having permeable soils with little or no vertical impediments. Very few minor site preparations are necessary to percolate substantial amounts of water in Areas A and B, making this method relatively economical. Recharge efficiencies can be increased by adding internal berms and check structures to create recharge cells so that water would not drain too quickly. Spreading is not effective on permanent crops such as orchards, but is feasible on vineyards, forage, and specific row crops. There could be additional environmental benefits to this approach, such as providing seasonal habitat to migratory waterfowl. Constraints include lack of surface water rights and delivery facilities in some areas, water rights POU issues, potential for loss of crops, need for "recharge" easements or other agreements, and other pricing and cost considerations.

None of these issues are fatal flaws, and the concept is carried forward as part of the near-term and long-term GWMP components for further consideration.

Recharge Basins and Ponds

Unlike field flooding, spreading basins or recharge ponds are dedicated facilities constructed solely for recharge purposes. There are a number of existing ponds in the Lower Kings Basin in

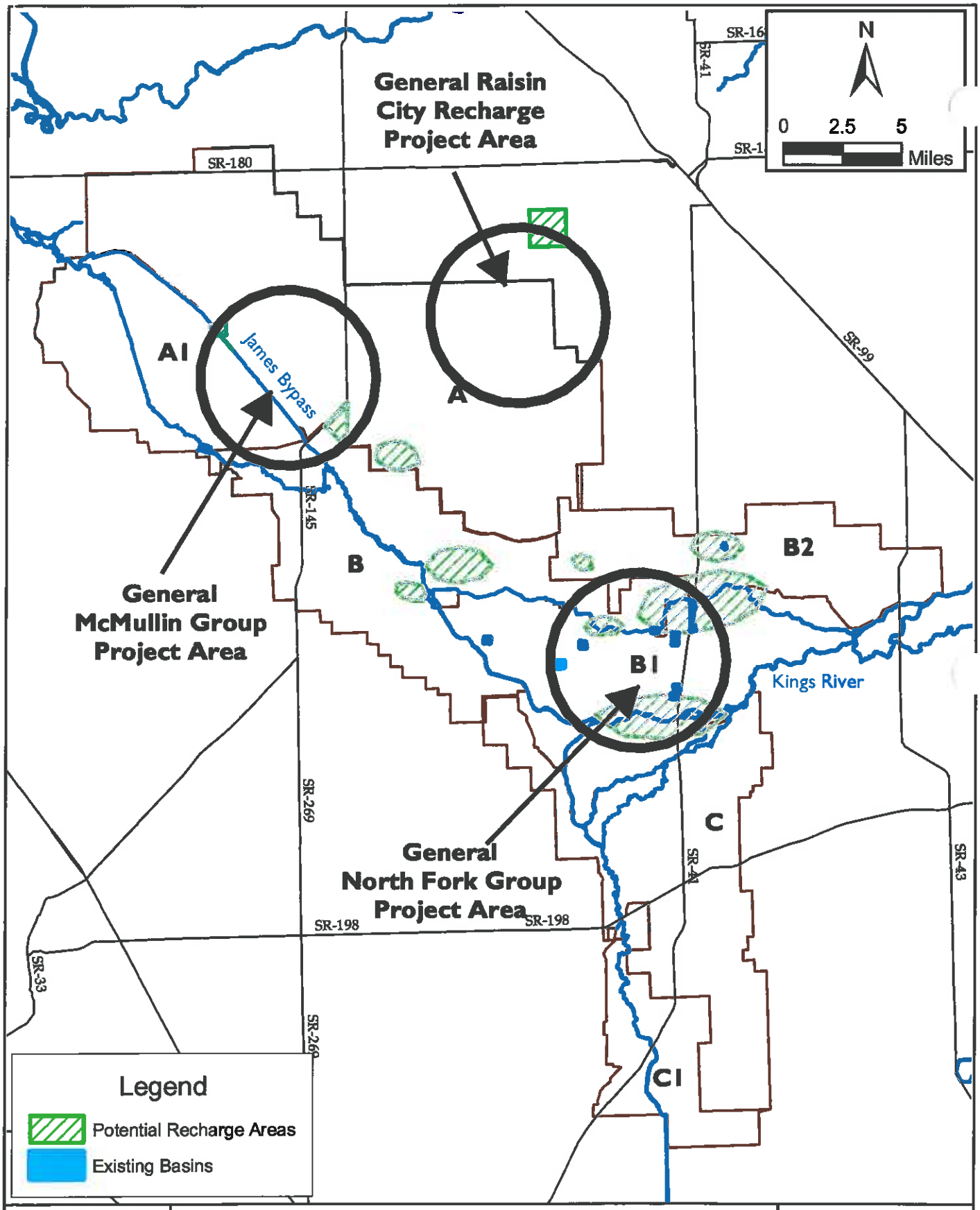
both the Laguna and Riverdale IDs, and others are proposed by The McMullin Group and Raisin City for Area A, and by the North Fork Group for Area B. No new facilities are currently proposed for Area C. Figure 4.2 shows the location of current or proposed recharge facilities. Current project concepts include the McMullin Recharge Program, Raisin City Recharge Pond, and North Fork Group Recharge Program. Each of these project concepts are considered near-term actions to meet the BMOs and are further described below. The actions to implement the propose projects are described in more detail in Section 6 as part of the GWMP components and implementation plan.

Spreading basins are not typically rotated into production during the growing season. They consist of relatively shallow basins that are excavated to a depth of several feet. Less-permeable layers consisting of shallow, fine-grained sediment, hardpan, or clay may be excavated to provide more favorable recharge conditions in recharge ponds. Ponds may also be constructed to provide habitat value or include different habitat features, providing multiple benefits.

Recharge pits are similar to spreading basins and recharge ponds but are generally deeper and may be located in an existing natural or human-made depression, such as a gravel quarry or flood-control detention basin. Recharge pits require extensive excavation, making them well-suited for areas with a clay (aquitard) or hardpan layer. Although not as cost effective as field flooding or spreading basins, existing quarries and flood-control detention basins could serve as seasonal recharge pits with minor site improvements and minor changes in operation. Some areas in the Lower Kings Basin may be constrained by clay layers and could make use of recharge pits; however, the application of this concept is not thought to be cost effective and is more suited to urban areas having combined flood-retention basins, such as Clovis or Fresno. Recharge ponds are viable options and are carried forward as near-term and long-term components.

Operational Examples

Laguna Irrigation District (LID) has six recharge ponds located along Highway 41 between Murphy Slough and North Fork Canal and named (from north to south): Zonneveld Pond, Dias Pond, Coelho Pond, Higdon Pond, Vaz Pond, and Everett Pond. All six ponds have good percolation; however, no official monitoring has been performed to characterize the performance of the ponds, to determine direction of flows once in the groundwater system, or to determine what effect these ponds have on increasing groundwater levels. LID also has one regulation pond along Murphy Slough about 2 miles west of Highway 41 that can function as a recharge basin, if needed. LID produced a feasibility study report in 1990 that identified seven potential recharge sites and included preliminary designs for the recharge ponds, estimates of the amount of water that could be delivered and recharged in each pond, and a cost-benefit analysis for the ponds' construction and operation.



Lower Kings Basin GWMP Update

Existing Recharge Facilities and Conceptual Layout of Potential Recharge Projects

April 2005

Figure 4.2

Riverdale Irrigation District (RID) has a limited artificial recharge program consisting of three basins that cover a combined area of approximately 40 acres. The use of the basins is sporadic because of the unpredictable supply of recharge water. When available, RID delivers Kings River flood flows and surplus CVP Friant Unit water to the basins. Two of the basins have been in existence since RID's formation in 1923 and the third was constructed in 1985. The basins are also used for systems regulation, function as storage facilities, and can be pumped out if needed. RID is looking to expand its recharge operations in cooperation with the North Fork Group.

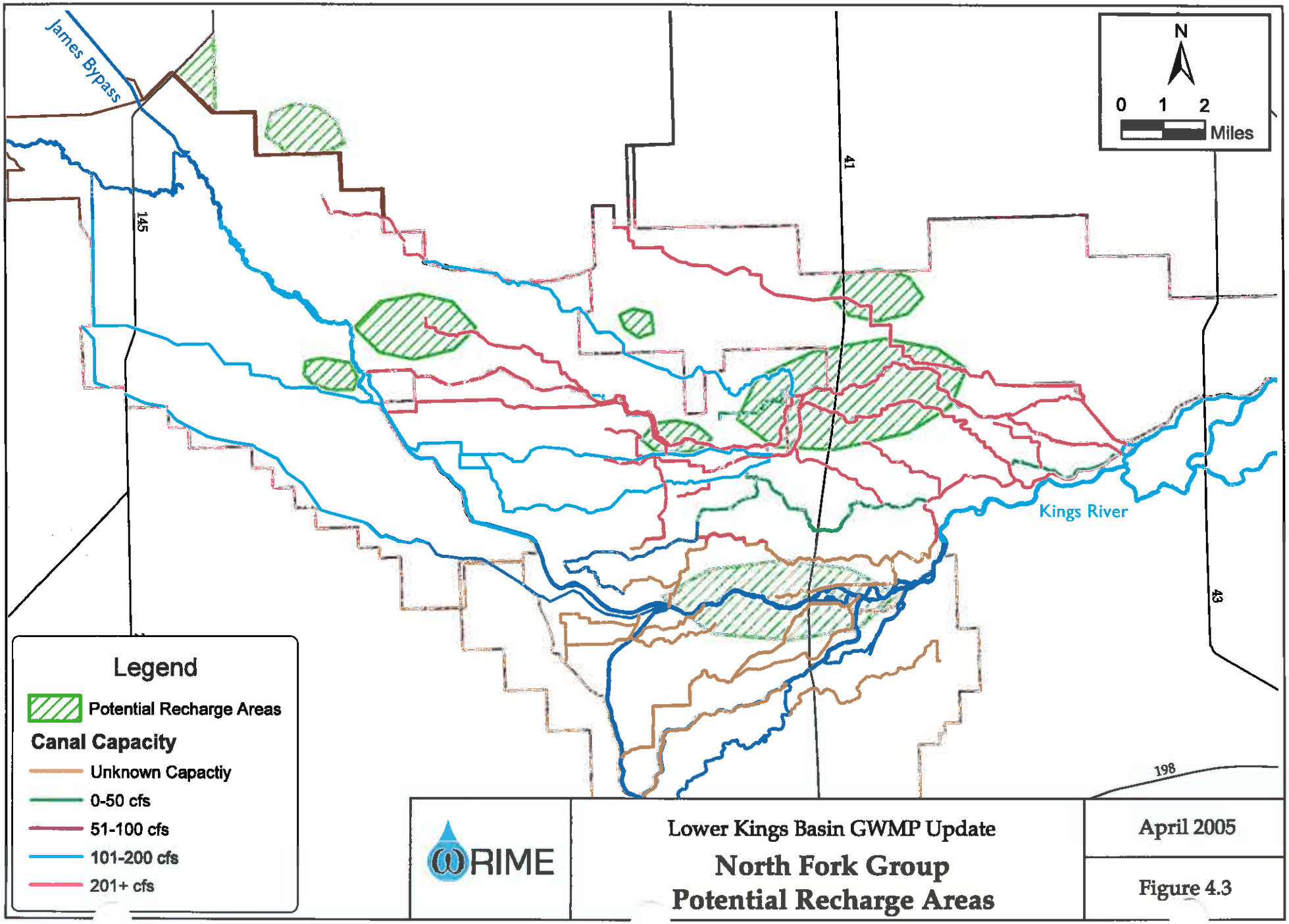
North Fork Group Program

The program elements of the North Fork Group have been identified as shown previously in Figure 2.25. The recharge areas are shown as general locations and additional feasibility and site-reconnaissance work is planned to select specific project locations and design work. The facilities would be operated by the NFG through an agreement among the members. Surface water (flood, entitlement) would be taken when it is available and would keep the ditch systems full to maximize the percolation of water to the groundwater basin. In addition, growers along the canals take water for spreading and pre-irrigation to enhance deep percolation and storage in the groundwater basin. Spreading easements and agreements with individual owners may be needed to expand the program. These practices have been standard operating procedures for years, although there has been no detailed accounting of the water recharged and the benefits provided.

There are seven potential recharge areas that have been identified by the NFG for further evaluation and feasibility studies and site review (Figure 4.3). State and local funding sources are available for these types of projects. The NFG projects are carried forward for incorporation into a GWMP component.

McMullin Recharge Ponds

The proposed McMullin Group recharge project would use flood flows to recharge the groundwater system. The project, which includes a series of ponds and canals, was investigated and a draft feasibility study was completed in April 2000 (KRCD, 2000). At that time, two sites in the McMullin Recharge Project area were considered. Site 1 consists of two phases. Phase 1, a 75-acre parcel of land that will provide approximately 67 acres of recharge area, is located on the southeast side of McMullin Road, approximately 1 mile northeast of the Kings River. Phase II consists of two 80-acre basins approximately ¼ mile east of the Phase 1 site. These additional basins provide approximately 138 acres of recharge area. A turnout structure on


James Bypass
Kings River
145
41
43
198
N
0 1 2
Miles
Legend
Potential Recharge Areas
Canal Capacity
Unknown Capactiy
0-50 cfs
51-100 cfs
101-200 cfs
201+ cfs
WRIME
Lower Kings Basin GWMP Update
North Fork Group
Potential Recharge Areas
April 2005
Figure 4.3

James Bypass, a road crossing, approximately 300 feet of pipeline, 4,300 feet of canal, and a pumping plant will be constructed to convey water from James Bypass to the recharge basins. Site 2 includes a channel and regulation basin to be constructed within the James Bypass. The cannel will be constructed along the east side of the channel and from Manning Avenue to Adams Avenue, a distance of approximately 14,500 feet, terminating in a regulating basin constructed on 20 acres of land. The basin will include a check structure and an overflow structure. In addition to serving as direct recharge facilities, both sites have the capability to deliver in-lieu recharge water.

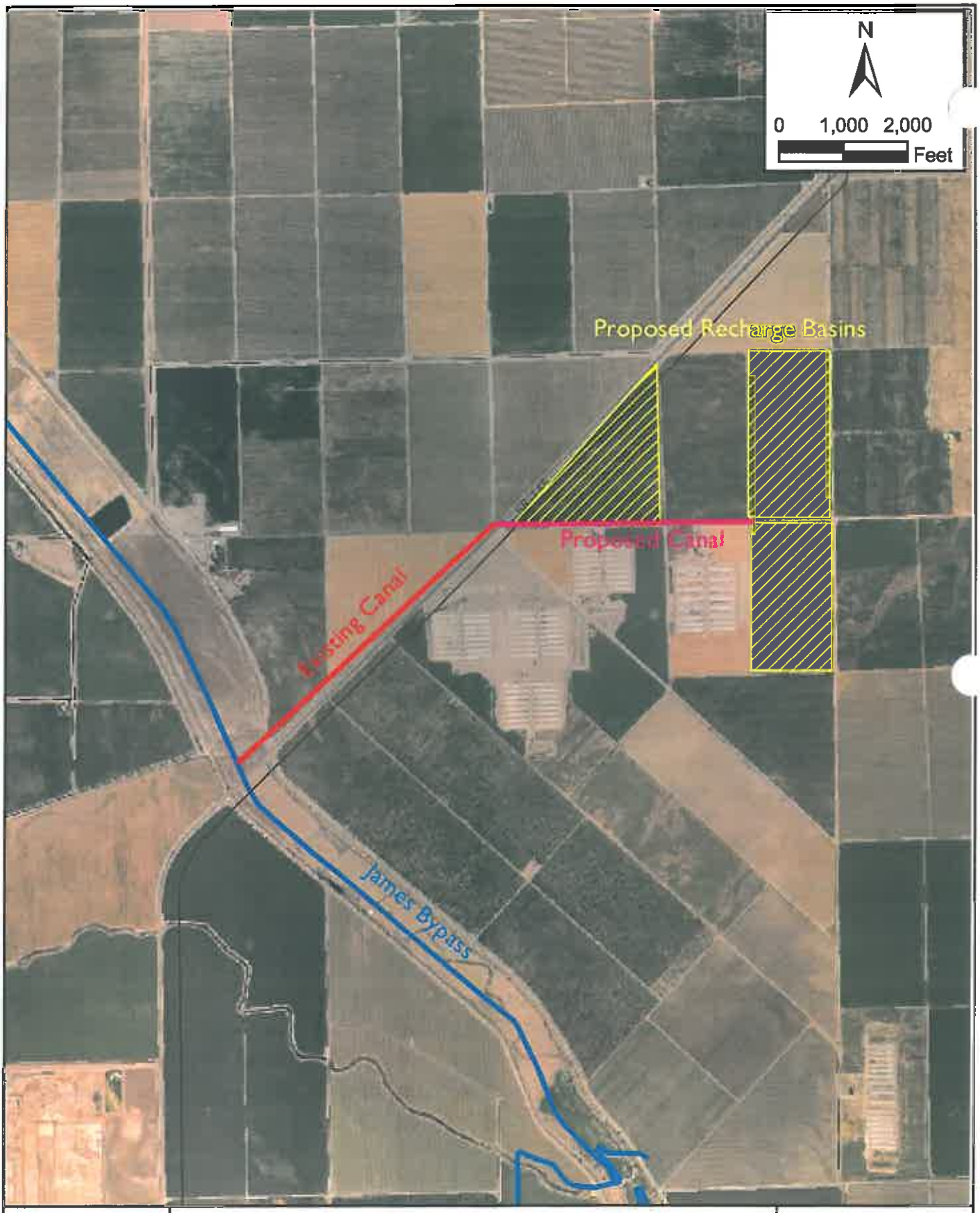
With support from DWR grant funding, additional hydrogeologic evaluations have been made of the sites since the completion of the draft feasibility study. In response to interpretation of the hydrogeologic evaluations, several recharge ponds have been proposed for development, as shown in Figure 4.4. These ponds can be operated using available floodwater. The proposed ponds are carried forward for inclusion in the GWMP components.

Raisin City Recharge Pond

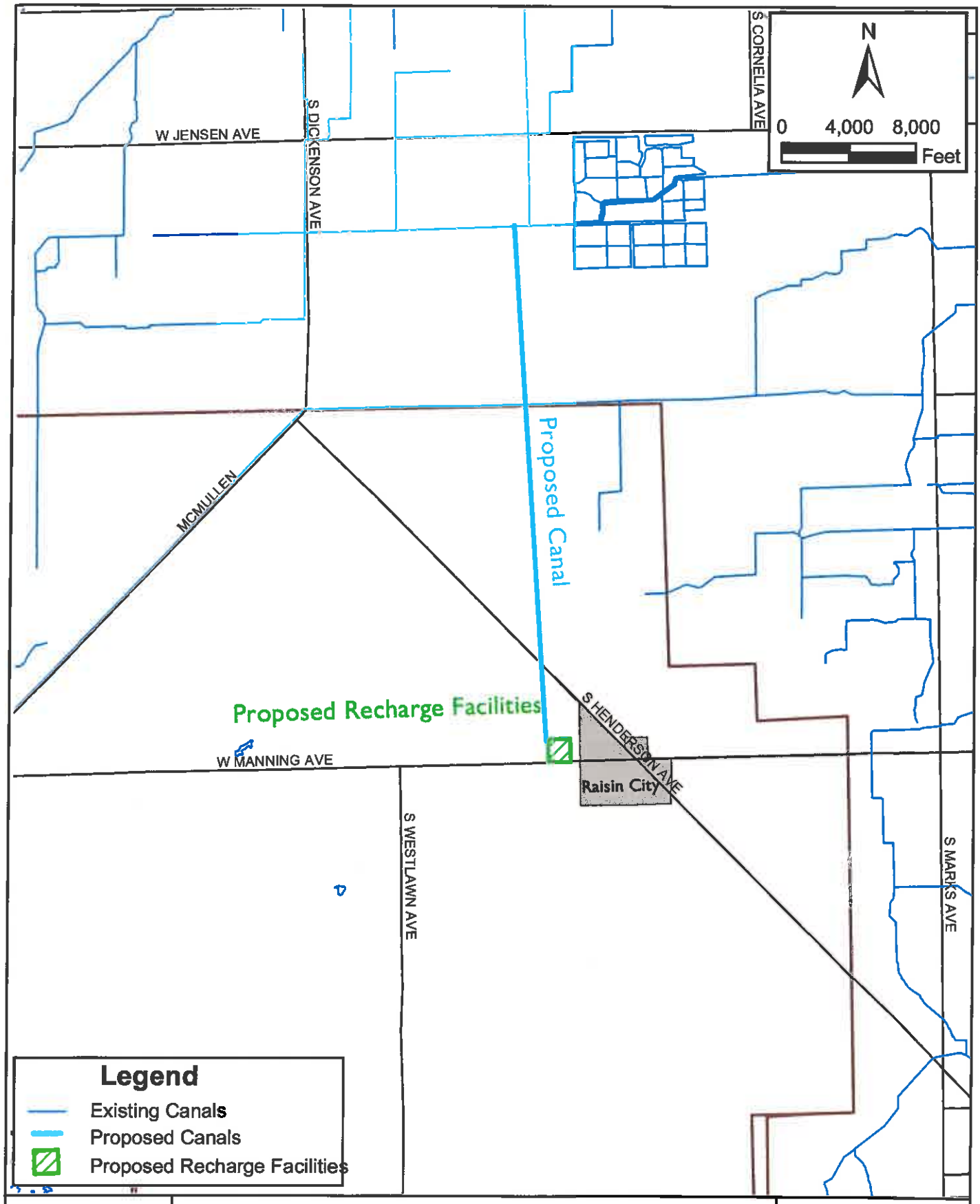
For the Raisin City Recharge Project, Section 215 and other flood flow-related water would be routed through the Fresno ID canal system to Dry Creek Canal. Water in the Dry Creek Canal would then be piped to the Fresno ID/Raisin City WD border and then discharged into a canal. The canal delivers the water to an 80-acre groundwater-recharge basin constructed on land owned by the Raisin City WD. Figure 4.5 shows the conceptual design of the project. Water stored in the reservoir could be delivered to area growers for consumptive purposes or could remain in the reservoir to recharge the groundwater system.

Injection Wells

Injection wells pump water directly into the groundwater basin and are used primarily in urban areas, where land is at a premium, or in areas to provide hydraulic control in well-defined hydrogeologic and hydraulic conditions. Aquifer storage and recovery (ASR) projects can be quite complex and include multiple injection/extraction well systems. ASR systems often use treated water sources, such as municipal supplies meeting safe drinking water requirements, although, recently, the issue of disinfected byproducts has arisen as a constraint. The CVRWQCB regulates injection wells. Recently they denied projects that propose the injection of treated drinking water that meets standards due to issues associated with disinfection byproducts. Capital costs are high and include conveyance, treatment, and well construction. Given the high cost of ASR, the Lower Kings Basin hydrogeology, regulatory hurdles, and the presence of more viable and low cost options for increasing recharge, this option was removed from further consideration.



WRIME	Lower Kings Basin GWMP Update **McMullin Recharge Project Area**	April 2005 Figure 4.4



WRIME	Lower Kings Basin GWMP Update **Raisin City Recharge Project with Water from FID Canals**	April 2005 Figure 4.5

IN-LIEU RECHARGE

In-lieu recharge is the direct substitution of surface water or recycled water for groundwater. Groundwater not pumped and that remains in storage can be regarded as carryover storage, similar to the operations of a surface water reservoir. Surface water or recycled water can be substituted for groundwater in both urban and agricultural areas. Use of surface water in-lieu of groundwater pumping is a common practice in the Lower Kings Basin, but the accounting of pumping and in-lieu benefits has not been tracked and no management systems or criteria have been developed related to basin operations.

Agricultural In-Lieu Projects

In-lieu recharge is part of the Lower Kings Basin history of irrigation. The basin has successfully maximized agricultural in-lieu recharge opportunities that resulted from construction of Pine Flat Reservoir, as evidenced by the fact that there are no additional firm entitlements available for diversion during the irrigation season to meet the additional grower demands. The reliability and availability of additional surface water is the limiting variable for increasing agricultural in-lieu recharge within the Lower Kings Basin. Delivery, spreading, and recharge of floodwaters were previously discussed and are a GWMP component. New infrastructure for distribution and delivery of surface water to areas without existing infrastructure is not possible as a stand-alone program because new or existing surface water entitlements are not available for irrigation.

Additional in-lieu opportunities could be realized as part of a regional groundwater-banking and exchange project and a multiyear operating criteria designed to increase groundwater storage and levels. Successful in-lieu programs are often incentive based and would require the financial and political support of the community to construct additional distribution and/or to transfer or purchase water from other areas. In-lieu agricultural water supplies could be provided using recycled water from the City of Fresno, as further discussed below. In-lieu agricultural use is carried forward for further consideration as part of the GWMP long-term component and in context of regional banking and recharge.

Urban In-Lieu Projects

Urban in-lieu recharge consists of using surface water to meet municipal and industrial (M&I) demands and reduce reliance on groundwater. In-lieu benefits could be achieved through urban use of recycled water to meet nonpotable water demands. This is becoming an important option in the Upper Kings Basin, but has limited applicability in the Lower Kings Basin, where the urban areas are relatively small, not growing as rapidly, and in-lieu opportunities are not

currently economical because of treatment and conveyance costs. Even though urban areas, such as Lemoore, have existing distribution facilities or the means by which to construct them through connection and development fees, the cost of treatment and construction of large-scale conveyance to take surface water and treatment facilities are a major constraint.

Current participants in the GWMP planning effort did not identify any near-term needs or opportunities for taking surface water in-lieu of groundwater for urban in-lieu projects; therefore, this option was eliminated from further consideration.

REGIONAL GROUNDWATER BANKING

Groundwater depletion has created a potential reservoir of underground storage in the Lower Kings Basin. Other in-basin (within KRWA) or outside interests having surplus water could store water in the underlying basin during wet years for use in subsequent dry years. Groundwater-banking options could include regional partnerships with entities that would share in the financing of infrastructure improvements and projects and provide a portion of the project yield in return for use of the storage space.

Engineering constraints are similar to those of the local recharge ponds and include firmly defining sources of water; access to, or the need for, new or resized conveyance facilities; and acquisition of land for construction of large-scale spreading ponds. Institutional constraints are more restrictive and related to regulatory compliance, legal agreements and need for contractually binding assurances, lack of desire to open up the water rights to state hearings, need for operating and accounting methods to track and allocate banked water, and equitable cost sharing. Because storage space in the Lower Kings Basin is available, regional banking is feasible; therefore, the concept is carried forward for further consideration. Regional groundwater banking as part of an integrated long-term strategy is viable, and carried forward for inclusion as part of the long-term GWMP component.

Recycled Water

Recycled water can be a new source of in-lieu supply for direct use on crops, or may be recharged directly into the groundwater basin for storage. The regulations related to direct use of recycled water for agricultural irrigation are different from those currently being proposed for direct recharge of groundwater with recycled water. The level of treatment is the most important factor determining what type of uses can be accommodated (DHS 2001, RWQCB, 2004). Recycled water has a long history in California. The development of treatment technologies has improved the quality of recycled water and protected public health. The improved quality and the increasing need for new water sources have resulted in increases in recycled-water use.

State policies strongly support recycled-water use where it is cost effective, and recycled water is becoming an important component of an area's water portfolio. In addition, state funding through grants and loans also supports recycled-water use (Recycled Water Task Force 2003, SWRCB 2001, RWQCB 2004, SWRCB 2004).

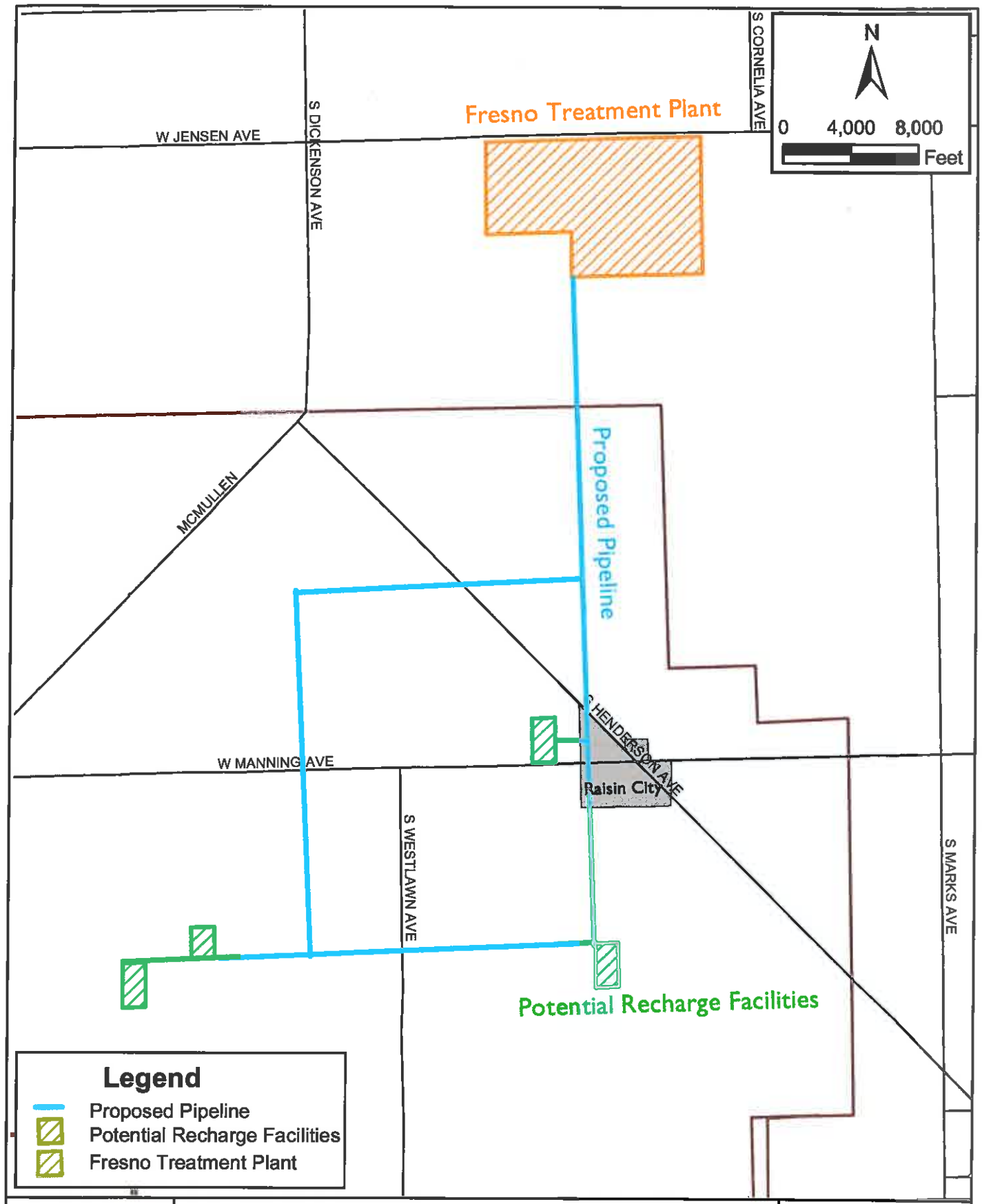
Opportunities exist for the use of recycled water from the Fresno/Clovis Regional Water Reclamation Facility (FCRWRF), located at Jensen and Cornelia in southwest Fresno. The FCRWRF treats 68 million gallons per day (mgd) (with a capacity of 80 mgd) (City of Fresno, 2005). The secondary treated water is directed to 1,660 acres of percolation ponds or to nearby farms for irrigation of fodder and fiber crops (City of Fresno 2005); the water is not disinfected. The current arrangement of percolation ponds has resulted in an undesirable mounding of groundwater that requires active management. At the same time, it is necessary to put as much treated wastewater to beneficial reuse as possible to balance the water budget and prevent regional overdraft (CH2M Hill 1992).

The feasibility of potential reuse projects for agricultural purposes in the Raisin City area has been previously evaluated (Provost and Prichard 1995) and four project concepts were developed. Figure 4.6 shows the conceptual layout and location of the proposed facilities. Table 4.1 shows the range of size and costs in 1995 dollars.

Table 4.1. Summary of Pipeline and Reservoir Options

	Description	Inflow (af/yr)	Recharge (af/yr)	Irrigation (af/yr)	Total Cost	Annual Cost (af/yr)	Overall Cost (af/yr)
#1	Pipeline & 1 Pond – 80 ac	7,728	3,205	4,521	$2,952,650	$37	$67
#2	Pipeline & 3 Ponds – 160 ac	17,708	6,405	11,301	$7,539,500	$37	$67
#3	Pipeline & 4 Ponds – 200 ac	28,667	8,004	20,661	$12,352,025	$37	$67
#4	Pipeline & 3 Ponds – 960 ac	51,971	38,409	13,561	$13,640,150	$23	$53

Both direct recharge and irrigation uses of recycled, secondary treated water were evaluated. The different scenarios put different emphasis on utilization of direct recharge (larger or more reservoirs), in-lieu usage (more turnouts and pipelines), or aerial extent of the program (loop layouts). Costs in 1995 dollars ranged from $3 million to more than $13 million. Along with design considerations for the pipelines and ponds, Provost and Pritchard also looked at groundwater mitigation (new basins in FID to offset exportation of recycled water), crop requirements (salinity levels and regulatory issues), and potential problems with existing agreements regarding the use of pumped reclamation water. Use of recycled water in lieu of groundwater pumping in Area A would leave water in storage in the groundwater basin and



WRIME	Lower Kings Basin GWMP Update **Raisin City Recharge Project with Water from Fresno Treatment Plant**	April 2005 Figure 4.6

provide for some water-level recovery, potentially reducing underflow from upgradient areas to the east. Such a project would also provide a consistent source of new water to the Lower Kings Basin, while also helping to reduce the undesirable mounding problems under the FCRWRF.

The opportunities for reuse of reclaimed wastewater in small cities within the Lower Kings Basin are limited because economies of scale limit the cost effectiveness of such projects. Additional treatment costs would be high, and distribution infrastructure to move the recycled water to areas of use is cost prohibitive.

A large-scale recycled-water project using FCRWRF water is feasible from an engineering standpoint, but institutional and economic issues are constraints to implementation. Regional and local costs and benefits require more detailed review. State funding is more readily available for such programs (SWRCB 2004) than in the past and may help offset costs associated with capitalizing such a project, especially because this type of multi-benefit, multi-participant project is a statewide priority. In addition, overdraft is being more widely recognized as a regional problem, and the current political climate may allow for a regional perspective toward recycled-water projects. The City of Fresno is in the process of updating its water master plan, urban water management plan, and groundwater management plan. Recycled water will be evaluated as part of this work, and Lower Kings Basin interests should be regarded as stakeholders in the process.

A recycled-water option as an in-lieu source of water or for direct groundwater recharge does not have any currently identifiable fatal flaws and is carried forward for further consideration as a long-term GWMP component.

4.3 OTHER POTENTIAL PLAN ELEMENTS

Additional program options were considered, including land acquisition, conveyance facilities, water conservation, groundwater monitoring, and data management.

LAND ACQUISITION

Access to land for construction of spreading ponds and recharge operations was identified as a constraint to development of recharge facilities. Land acquisition costs are relatively high, ownership of property changes quickly, and ready access to capital to purchase land when it is on the market has prevented some projects from moving forward. The ditch companies and water districts do not have capital reserves that would allow them to respond quickly. Land in the Lower Kings Basin tends to be in large parcels that infrequently come to market. Acquired

land could be leased back to a grower to continue production until final engineering and plans for needed improvements are completed. Condemnation of agricultural land for recharge purposes is also not politically desirable. A land-acquisition program could be localized within one irrigation district or ditch company, or encompass a larger area to achieve a more regional benefit. The concept is to have capital available to acquire property or easements for subsequent development as a recharge or spreading operation. Constraints to such a program include political acceptability, lack of funding capacity of the public water districts, lack of management structure to make quick decisions, high land costs and low property turnover rates.

A dedicated land-acquisition program, with a funding source and capital reserve element, would allow Lower Kings Basin interests to respond when opportunities for land comes on the market. The option has been carried forward for further consideration.

CONVEYANCE FACILITIES

As discussed in Section 2 and in the previous GWMPs, there are constraints associated with conveyance of water to lands were the water could be used or directly recharged. The purpose of improving existing conveyance structures or building new structures is to provide operational flexibility and improve conjunctive use opportunities. More or better conveyance would give greater access to alternative sources of water and allow water to be moved around the area for in-lieu or direct recharge.

Near-term water projects will resolve the conveyance capacity or wheeling issues for the proposed project. This includes completion of the feasibility study for the North Fork Group Recharge Project concepts, and upon final design for McMullin Group and Raisin City Recharge Projects. During final design, using existing canals, resizing canals for the final project, and identifying piped reaches will be considered. Agreements for use or improvements of existing facilities owned by other ditch companies or districts may be needed, or new rights-of-way and easements procured.

Conveyance issues and needs for longer term projects will require further evaluation for the specific projects, including those associates with development of in- or out-of-basin surface water and flood flows, and for in- or out-of-basin regional recharge, transfer, exchange, or banking. Additional large-scale conveyance facilities or major improvements to existing facilities would be considered as part of the project feasibility study.

Potential large-scale conveyance concepts were discussed by the BAP in general terms. The engineering issues surrounding the design of pipelines or conveyance facilities are relatively easy to resolve. Once the specific source and volumes of water is identified and lands for

application or percolation of the water are defined, designing the pipelines or canals to convey the water is relatively straightforward. Substantive constraints are more likely to be related to negotiating wheeling arrangements, cost sharing, procuring easements and rights-of-way, finding the land and water, and environmental compliance.

Concepts for large-scale projects discussed by the BAP and in previous evaluations were related to the following:

- Developing a Mid-Valley Canal or similar facility whose purpose would be to convey water from the Mendota Pool or the San Joaquin River to WMA A, WMA B, and/or WMA B2;
- Developing new facilities (lined canal or pipeline) or lining existing canal facilities to convey Kings River floodwater or Friant 215 water from Upper Kings Basin areas through FID or CID; and
- Developing new facilities (lined canal or pipeline) or improving existing canal facilities in the Lower Kings Basin to accommodate larger recharge projects.

One of the primary constraints to purchasing 215 water when it is available is related to the systems losses between the available points of diversion and point of delivery to the Lower Kings Basin. Lower Kings Basin stakeholders have been reluctant to pay for this water because losses in the upper Kings River reaches can limit delivery efficiency. A conveyance facility to transfer 215 floodwaters would make purchase of the water more attractive because a facility would reduce conveyance losses and ensure delivery of water to the place of use or recharge. The cost for improved or new facilities would add to the cost of the water; therefore, the cost effectiveness of new facilities or improvement to existing facilities needs further analysis and comparison. A more detailed evaluation of existing and proposed facilities should be part of any proposed engineering feasibility study; such work is proposed for inclusion in the GWMP implementation effort.

WATER CONSERVATION

Water conservation could allow a water supplier (e.g., water district, city, ditch company) to delay or reduce capital investments required for expansion of water supply facilities. Before seeking to develop additional supplies or obtaining funding from state or federal sources, water-conservation programs are needed to demonstrate that existing water uses are efficient. It is important to note that in the Lower Kings Basin, in the area where clay layers are not present, the water that is applied in excess of crop water requirements percolates to the groundwater basin and is stored for subsequent use. Intentional spreading and over application of surface water at times when it is available is part of the conjunctive use program and is a beneficial use. The benefits of water conservation are related primarily to leaving water in groundwater storage, and reducing stream diversion or releases from reservoir storage when

such actions could have a negative impact. In addition, water conservation that increases the efficiency of applied water may reduce diversion requirements and allow more water to be conveyed to another place in the basin for exchange, banking, use, or transfer. Water conservation is an option that will continue to be part of the GWMP and overall water management strategy in the Lower Kings Basin.

GROUNDWATER MONITORING

Groundwater levels in the Lower Kings Basin have steadily declined since the 1950s. Local agencies, KRCD, DWR, and USBR have measured and/or are currently measuring groundwater levels as part of existing monitoring programs. DWR has aggregated some of the measurements and makes them publicly available at the State Water Data Library[2]. KRCD uses the available data from DWR and local sources to prepare its annual report.

The current groundwater level monitoring program includes semiannual groundwater level measurements of over 50 wells (exact number varies from year to year). Water level measurements are typically taken in October and April to measure the range of groundwater levels occurring after and before the irrigation season. It is not clear whether the data (i.e., both the frequency of measurement and the spatial adequacy of the monitoring-well network) are sufficient to determine project benefits that may be accrued as a result of GWMP project implementation. There may be opportunities to increase the information value and decrease the monitoring program cost.

The sufficiency of monitoring-well networks has not been evaluated in detail. A quantitative approach in which numerical ratings are assigned to monitoring wells on the basis of data uncertainties (e.g., availability of well construction information) and as used by USGS, could be used to evaluate the Lower Kings Basin monitoring-well network. This type of analysis could be expanded to include aspects of how the data are collected and used. Well ratings should be spatially evaluated so that potential data redundancies and adequate distribution can be determined. The groundwater monitoring network could also be evaluated using an integrated groundwater and surface water model. An integrated model currently proposed for development in the region. Since the model will achieve many objectives of KRCD in the Lower Kings Basin, criteria for evaluating and designing the network should include evaluation of whether the network provides optimal data for verifying model accuracy and using the model sensitivity (or lack thereof) to determine the number of groundwater wells needed in a particular area.

[2] http://www.well.water.ca.gov

Water Resources Data Management System

The efficiency of the process by which KRCD obtains groundwater level data can be improved and standardized by developing a data-management system for groundwater and water-resources data. A Kings River Basin Groundwater Data Center (GDC) could provide for a centralized interactive groundwater information resource that provides access to groundwater data collected and shared by agencies throughout the Kings River Basin. The Kings River Basin GDC is viewed as the foundation for groundwater management efforts to be implemented in this GWMP and is recommended to support the groundwater management activities of the Kings River Basin.

Currently, there is no centralized groundwater information source that is locally operated and maintained. Monitoring efforts undertaken by the agencies within the Kings River Basin generate data that are stored in separate databases or hardcopy format. The GDC would become the repository for groundwater data and other water-resources information, and would facilitate groundwater analyses essential to the groundwater management objectives of the Lower Kings Basin. The GDC could assist in public outreach because it could be designed as an Internet-based tool. Water agency staff, industry professionals, decision makers, and the general public could have access to groundwater data and historical semiannual reports.

4.4 GROUNDWATER QUALITY PROTECTION OPTIONS

The GWMP must contain components related to a) groundwater-quality degradation and b) changes in surface flow and surface water quality that directly affect groundwater levels or quality or are caused by groundwater pumping in the basin (CWC 10753.7. [a]).

In addition, a groundwater management plan may include water-quality options (CWC 10753.8) relating to: a) control of saline-water intrusion, b) identification and management of wellhead-protection areas and recharge areas, c) regulation of the migration of contaminated groundwater, d) administration of a well-abandonment and well-destruction program, e) identification of well-construction policies, and f) construction and operation by the local agency of groundwater-contamination cleanup.

The mandatory and voluntary options were evaluated by the BAP in developing the final GWMP water-quality component. The BAP considered the overall review of water-quality options as falling into three categories that included programs to: 1) develop new regulatory programs to protect water quality, 2) develop new voluntary and cooperative efforts to protect water quality, or 3) work to better integrate and improve existing programs and interagency relationships.

The policy direction provided by the BAP was to define the programs where ongoing activities met the requirements, and to focus on programs where existing land use and water-related agencies were already working. The intent is to avoid duplication of effort, increase efficiency, and avoid cost increases. The opportunities for further coordination are identified, and KRCD and the BAP will continue to identify opportunities to obtain funding or technical support for programs that would assist agriculture in complying with existing requirements instead of developing additional regulatory burdens or new programs. Program integration and interagency cooperation is an option carried forward. The justification and support for the BAP decision is presented below, along with how the options would be integrated to meet the water-quality protection objective of the GWMP.

Existing regulatory programs are briefly described below to assist Lower Kings Basin stakeholders in understanding the complex regulatory compliance requirements that would serve to both protect local GWMP recharge projects once built, and constrain implementation of locally sponsored projects. Current programs for water-quality protection are managed primarily by Fresno County, Kings County, RWQCB, DHS, and the California Department of Pesticide Regulation (DPR).

PREVENT GROUNDWATER QUALITY DEGRADATION

The GWMP must contain components related to groundwater-quality degradation (CWC 10753.7. [a]). The BAP decided to eliminate from further consideration any new regulatory programs for control of saline migration, the migration of contaminated groundwater, well drilling or construction, or wellhead protection and protection of recharge areas. Such regulation may be considered at a future time to protect water quality and any investments in recharge projects. KRCD is not a regulatory agency and is not tasked by the Board with regulating contaminants or land uses that could cause contamination. None of the other participating water districts or ditch companies has land use or contaminant control responsibilities or regulatory powers. These agencies are reliant on other local, state, and federal programs to ensure protection of water quality. Neither KRCD nor any of the GWMP participants seek to develop new regulations or requirements in context of the GWMP. Emphasis is placed on ensuring GWMP proposed projects would comply with existing local, state, and federal regulations and would not impair surface water or groundwater quality. The GWMP also will seek to integrate local efforts with existing programs to control contaminants.

CHANGES IN SURFACE WATER OR GROUNDWATER FLOW AND QUALITY

The GWMP must contain components related to changes in surface water flow and surface water quality that directly affect groundwater levels or quality or are caused by groundwater

pumping in the basin (CWC 10753.7. [a]). In addition, one of the voluntary components is associated with regulation of the migration of contaminated groundwater. These requirements are met through program integration. KRCD and local stakeholders will also ensure evaluation of any potential impacts during the feasibility study or when complying with the California Environmental Quality Act (CEQA).

There are a number of GWMP options that could change the surface water flow regime to enhance groundwater recharge and conjunctive use. None of the proposed options are anticipated to influence surface water quality. It should be noted that some of the proposed GWMP options could result in increased flows down the Kings River and provide ancillary environmental flow benefits to the fisheries management program. The benefits are related to the volume, timing, and quality (temperature) of the flow.

The purpose of some of the GWMP options is to positively affect groundwater level by increasing storage in the groundwater basin. This is considered a project purpose and benefit. Increased water levels as a result of intentional recharge are not anticipated to have any negative impacts to groundwater quality because the quality of existing surface water is good and the surface water is suitable for both direct agricultural use or for beneficial use as a source of groundwater recharge. Initially, percolation could mobilize salts and nutrients and this would be evaluated based on site-specific conditions. It is expected that the recharge operations, as currently conceived under any of the GWMP options, would provide benefits related to recharge of clean surface water, which would improve baseline groundwater quality in areas with high total dissolved solids (TDS) or nitrates.

Changes in groundwater levels could result in changes to groundwater flow rates and directions and this could cause migration of poor-quality water, although such effects could result in either negative impacts or benefits. In Area A, the BAP identified that there is some migration of high TDS water from the west into the planning area. Raising groundwater table elevations in Area A would serve to reduce or reverse the migration of poor-quality water into the planning area.

No known plumes of poor-quality water have been identified that would be affected by groundwater recharge for near-term projects as currently proposed, but this would need to be further evaluated based on more specific project operations and in more detailed environmental review. CEQA review would be conducted when more detailed project proposals are prepared and projects are ready for decision. When specific projects are put forth, the KRCD or designated lead agency will be required to coordinate with other responsible and trustee agencies, including the local cities, counties, and state agencies, to ensure that impacts are avoided, minimized, and mitigated to the degree possible.

Feasibility studies of the specific projects are being conducted or are proposed. Future review will be needed to ensure that any of the proposed changes in the recharge or discharge of surface water and groundwater, changes to operations of existing facilities, or construction of new facilities will not cause negative affects to existing water quality, water users, or the environment. Such studies, when completed, will also help the lead agency comply with CEQA, obtain any needed permits, and obtain voter approvals for funding.

The water level–monitoring component of the GWMP, coupled with the KRCD annual report, will assist the KRCD Board and BAP in tracking the occurrence and movement of flow and how it may affect the migration of poor-quality water.

AB 3030 Water Quality Related Options and Program Integration

To meet the intent of AB 3030 and SB 1938, the following voluntary elements were considered for inclusion in the GWMP. These areas are identified as opportunities for program integration between the local and state agencies and the Lower Kings Basin stakeholders, and KRCD will continue work cooperatively with other public entities that have jurisdiction and authority. The elements considered are as follows:

- Control and monitoring of land subsidence,
- Control of saline-water intrusion,
- Identification and management of recharge areas and wellhead-protection areas,
- Well drilling and construction, and
- Construction and operation by the local agency of groundwater contamination cleanup.

Land Subsidence Management Options

Land subsidence is an irreversible occurrence and can adversely affect infrastructure throughout a region (e.g., cracking and breaking pipes, separating wellheads from the ground surface, cracking canal channel bottoms). The optimal management practice for land subsidence is to prevent it from happening by sustaining water levels. Further land subsidence can prevented in the Lower Kings Basin by increasing the amount of stored groundwater, maintaining water levels, and manage its extraction. This can be accomplished by implementing management options that are to be included in GWMP components. All of the near- term and long- term actions that are being proposed that are part of the conjunctive use program will also benefit the basin by reducing he potential for land subsidence.

The overall monitoring program should include land subsidence elements. KRCD should work with other interests in the San Joaquin Valley and surrounding groundwater subbasins to

monitor regional subsidence by installing extensometers. An extensometer is an instrument that measures changes in land surface elevation due to the compression of clay layers in the groundwater system. USGS and DWR measures land subsidence in areas west and south of the Lower Kings Basin using extensometer. The Lower Kings Basin BAP could approach USGS and DWR about the installation of extensometers in the Lower Kings Basin. Other actions related to monitoring subsidence are discussed in the Implementation Plan.

Control of Saline Water Intrusion and Regulation of the Migration of Contaminated Groundwater

There are potential issues with water in the western part of the Lower Kings Basin that has elevated concentrations of TDS, but the BAP did not identify any insurmountable constraints to beneficial use. The mound of water under the FCRWRF also has elevated concentrations of TDS. In the southern part of the Kings River Basin, growers reported high levels of alkalinity in the groundwater. Both situations require ongoing monitoring but no major new programs or regulations are proposed to further control the migration or buildup of salts because beneficial uses have not been impaired. Additional monitoring to identify long-term trends and problems is recommended for inclusion in the GWMP. Existing Drinking Source Water Protection Programs and associated monitoring of urban water and domestic wells will also provide data to aid in reviewing the need for further action.

Management of Recharge Areas and Wellhead Protection Areas

Regional recharge characteristics were evaluated as part of this study. Management and development of recharge areas is part of the GWMP, and the GWMP identifies potential recharge areas for project development. Land acquisition is one of the options discussed in this GWMP for protecting these recharge areas and land acquisition by Lower Kings Basin stakeholders would protect recharge areas from future development.

DHS has established the Drinking Source Water Assessment and Protection Program (DSWAPP) to provide information so that communities can develop programs to protect drinking-water sources. The DHS DSWAPP is intended to implement federal wellhead-protection requirements, which includes identifying the wellhead protection zone. The wellhead protection zone is the area that contributes water to a municipal well. The program includes identifying and managing potential contaminants from land uses that are above the wellhead protection zone area. DHS has worked with local water purveyors to map and identify risks to sources of drinking water. The DHS program, in concert with local well-drilling and construction regulations and the existing land use plans, serves to implement wellhead protection at the local level and no further programs are included in the Lower Kings

GWMP. As previously cited, other state agencies with authority to control actual or potential sources of contamination are DPR, RWQCB, and SWRCB.

Land Use Controls to Protect Recharge Areas

Controlling and managing land use is important for protecting recharge areas, wellhead-protection zones, and water quality. The state does not have land use planning authority and therefore cannot control land use. Land use controls and decisions are the responsibility of cities and counties. At the local level, the cities and counties use their land use planning authorities, police powers, and local codes and regulations to protect water quality and recharge zones.

Fresno County Programs

The Fresno County General Plan (Fresno County, 2000) guides land use and development and contains the County water-quality protection goals. The Open Space and Conservation Element defines County goals, policies, and programs to protect water quality and groundwater resources. The Fresno County General Plan contains important policies for protecting recharge zones. Any new development, including any proposed Lower Kings Basin recharge and conjunctive use facilities, would be interpreted by Fresno County under these goals and policies.

The County also has a range of ordinances and local regulations to support water-quality protection and implement the General Plan. Fresno County Public Works and Planning Department is the local agency with responsibility for land use planning and environmental protection. The agency supports the Fresno County Board of Supervisors in setting and enforcing land use and contaminant-source control policies of the County General Plan and the various County Codes and Ordinances.

The Fresno County Health and Safety (Title 8) contains numbers chapters to regulate potentially contaminating activities and waste products, also defining the health authorities and permitting process[3]. The Resources Division is tasked with oversight of disposal sites, solid waste, recycling, and coordination of special districts. Fresno County Department of Planning and Public Works, Development Services Division, coordinates building permits, code enforcement, environmental analysis, General Plan, inspection, plan checks, planning, site plan review, zoning, and water/geology programs.

[3] Chapter 8.20 Garbage and Rubbish Disposals; Chapter 8.22 Unauthorized Dumping; Chapter 8.24 Waste Disposal; Chapter 8.28 Industrial Wastes; Chapter 8.30 Land Application of Biosolids; Chapter 8.50 Environmental Health Permits and Inspection Fees; Chapter 8.60 Storage of Hazardous Substances In Underground Tanks

Kings County Programs

Within Kings County, the local Planning Department directs the preparation and implementation of the County General Plan (Kings County 2004), adopted in 1993 by the Kings County Board of Supervisors and most recently amended in January 2004. The resource-protection element of the General Plan states that the objective of the County is to protect groundwater quality by applying development standards that seek to prevent pollution of surface water or groundwater and net loss of natural water features (Objective 11.2). Specific policies are established to protect groundwater by requiring the installation of wells in conformity with the California Water Code, the Kings County Well Ordinance, and other pertinent state and local requirements (Policy 11d). These policies and regulations would affect conjunctive use projects proposed in Kings County.

Continued coordination with the County is needed to ensure compliance with the County General Plan and ordinances. No additional options or components are to be included in the GWMP.

Well Drilling and Construction

The voluntary options that may be included in the GWMP include programs for administration of a well-abandonment and well-destruction program and for identification of well-construction policies. Within Fresno County, the Department of Planning and Public Works, Development Services Division, also coordinates building codes and the water/geology programs, including the well-drilling and permitting process. Codes pertaining to water and sewage (Title 14) contain the County well regulation (Chapter 14.04) and well-construction and destruction standards (Chapter 14.08), which implement the state well standards at the local level and define well development, sealing of wells, sampling, and permitting requirements. The County Code defines the County's role and responsibility in groundwater management (Title 14, Chapter 14.03), which is limited primarily to control of groundwater exports from the County.

Kings County also has well-drilling and construction standards. Continued coordination with the Counties is needed to ensure compliance with the County ordinances and requirements. No additional options or components are to be included in the GWMP.

SECTION 5 FINANCING AND GOVERNANCE OPTIONS

This section provides and overview of funding and governance options that were discussed by the BAP at the March 2004 meeting. In the past, the Lower Kings Basin stakeholders worked cooperatively with others in the regional to fund and construct Pine Flat Reservoir. The cooperative approach to the management of the surface water resources and Pine Flat Reservoir continues through the KRWA. More recent history related to groundwater management demonstrates the independent nature and spirit of the water agencies, land owners, and ditch companies, and the tendency to work within their own jurisdictions to fund and to resolve problems. The independent character of the agricultural community and agencies is part of the cultural, economic, and political heritage of the region. The independent nature has also created fragmented governance and management of the groundwater resources and has been a contributing factor in the basin overdraft.

Within the latter half of the 1990s and with support of KRCD, the different agencies began to take steps to work together and resolve groundwater problems by preparing groundwater management plans for their respective areas. The independent plans have not resulted in approval, funding, or construction of any large scale conjunctive use projects, or in resolution of institutional issues that constrain conjunctive use. To update the GWMP, the BAP decided to prepare an integrated GWMP in recognition that the groundwater basin is integrally connected, and that the previous fragmented approach to managing groundwater has not produced a consensus or a solution. The BAP also recognized that to effectively solve overdraft, a different approach to management and governance of the groundwater basin should be considered.

This section evaluates alternative funding and management approaches. The GWMP is a step toward greater collaboration and cooperation among the Lower Kings Basin agencies and agricultural interests, and is step towards developing a broader base of political and financial support. Increased cooperation, alternative institutional arrangements, and a different organizational model may be needed to implement local projects, improve groundwater management, prevent conflicts, and meet the GWMP goals and objectives. To be effective and minimize costs, management of the groundwater basin will require efficient and equitable administration of the GWMP.

5.1 BAP ISSUES AND PLANNING PRINCIPLES

At the first BAP meeting on November 15, 2004, issues and concerns related to the groundwater management plan and conjunctive use program were identified. Issues were identified and characterized as Policy or Management, Technical/Engineering, and/or Economic. Table 5.1

presents the list of issues and concerns. It is clear that many of the issues surround costs, economics, and management of the groundwater.

Table 5.1. Issues and Concerns

ISSUES AND CONCERNS	Policy	Technical	Economic
Lack of faith and uncertainty in the ability of the legal system to protect overlying and agricultural water rights	X		
Agricultural versus urban interests—agricultural areas have a limited ability to compete with urban areas because urban areas have a high ability to pay and a large voting block	X		X
Need to preserve local control, fear loss of control, locals must lead the effort	X		
Agriculture economic and limited ability to pay higher water rates			X
High water levels in upper Kings River Basin around the Fresno wastewater plant	X	X	X
Reclaimed water costs for agriculture are unrealistic			X
Low water levels in the area of Raisin City and underflow to the area impacts surrounding area		X	
Potential for litigations is high. Resolving groundwater issues with lawsuits would cost a lot of money, take a lot of time, and should be avoided	X		
Limited understanding on how the groundwater basin works, water budget, and flow between areas		X	
Overdraft in capital letters		X	
Reluctance to consider "regional" solutions	X	X	
Limitations in the amount of "free" or "unallocated" water to solve the problem and provide additional recharge	X	X	
Adequacy of existing facilities to move water to areas for use or recharge		X	
Increasing pumping costs and depth to water			X
Relationship between levels and quality needs analysis—migration of poor-quality water from the west and south		X	
Available recharge water comes in big floods of short durations—"trying to manage a fire hose with a thimble"	X	X	
Infrastructure constraints, lack of capacity, need for wheeling agreements to move water	X	X	
Competition for available supply—everyone is fighting for flood flows	X		
Underflow from other areas to overdrafted in Raisin City area creates political issues with neighbors	X	X	
Avoid state intervention and court proceedings—costly and slow process for solving problems	X		
Seek a physical solution instead of lawsuits	X		
Prevent interference with overlying rights	X		
Need for adequate technical information and data to locate and design projects		X	
Suspicion of government's ability to provide solutions	X		

In terms of financing, the BAP consensus was that any project costs should be borne by the entities that receive the benefit, and benefits should be quantified and demonstrated through engineering and economic analyses before anyone is asked to pay or bear increased costs.

Regarding governance, the BAP clearly stated that local control must be preserved, but it was generally recognized that there needs to be some type of institutional arrangements and a management structure to fund and implement the GWMP projects.

5.2 FINANCING

Current funding approaches for the overlying irrigation districts are briefly discussed to identify funding and financing opportunities. The GWMP includes monitoring, feasibility studies, design efforts, and other management actions that represent on- time, up front cost. The development of new water supplies and the necessary infrastructure is a major financial undertaking that will require debt service. The GWMP provides a general overview of potential funding sources, programs, and project partnerships available from federal, state, and local sources

Local resources need to be dedicated to implement projects and programs identified in the GWMP. State and federal grants may provide one opportunity to fund some activities, such as planning, feasibility study, and design work, but some programs such as monitoring and annual reporting require ongoing, stable funding from local sources.

Low-interest loans may be available for capitalizing new facilities, acquiring land, and constructing projects but local money would still be needed to retire debt and for operations and maintenance. It is necessary for the BAP and its member agencies to identify local revenue to leverage outside funding from state and federal programs. Once the capital facility project costs are more firmly defined, the distribution of costs to local interests will need to be established based on the distribution of the anticipated benefits. The distribution of costs and benefits will need to be documented through engineering and economic evaluations. The information will be needed before holding an election to seek approval of proposed assessments or fees. Increasing benefits assessments or fees by any of the overlying water or irrigation districts will likely require further studies and a special election pursuant to state law as defined by Proposition 218.

FUNDING SOURCES

Federal Funding

Federal funds can be made available to KRCD and KRWA member agencies through a variety of mechanisms, including subsidies, appropriations, in-kind services, grants, loans, and cost-sharing agreements. The following processes described how to securing these funds.

Legislative Approach

Federal funding can be secured through the legislative process to directly fund an approved project. KRCD and/or KRWA, working with a local congressional representative, can begin this process. The project may require the establishment of federal interest through an act of Congress and then be funded in subsequent years. An appropriation can be made the same year if the project is consistent with the goals and objectives of an existing federal program. Competition for Congressional funds is formidable and requires broad support of local, regional, and state interests for projects to be successful in obtaining funding.

Federal Agency Interest

Funding can also be secured for projects directly from federal agencies. Local projects may be consistent with the goals and objectives of an agency and eligible for funds and in-kind services through directed actions and partnerships. Federal agencies commit to projects during their respective internal budgeting processes and have the flexibility to disperse funding over several years. KRCD had several partnerships with the U.S. Bureau of Reclamation (USBR) and the Corps. Both agencies have experienced funding reductions in recent years so the ability to partner with local agencies has been limited.

Federal Assistance Programs

A third option is to apply for project funding under an existing federal agency grant, loan, or assistance program. Potential partnering agencies include the USBR, U.S. Environmental Protection Agency (EPA), the Corps, United States Department of Agriculture (USDA), U.S. Fish and Wildlife Service (USFWS), and USGS. Eligibility, cost sharing, and application requirements vary among the programs.

State Funding

State funds are similar to the federal funding mechanisms. The availability of state funds for water-resources projects is a reflection of the current fiscal climate. Propositions 13 and 204 have demonstrated the state and voter commitment to supporting locally sponsored groundwater recharge facilities and studies. Voter approval of Proposition 50, the $3.4 Billion Water Security, Clean Drinking Water, and the Coastal and Beach Protection Act of 2002, is funding a variety of water resources–development programs. These programs include CALFED, Integrated Storage Investigations, and other grants and loans for groundwater recharge construction projects.

Legislative Approach

Although the dollar amounts available from the state are usually not as substantial as federal funding opportunities, the state legislative process is somewhat more straightforward. Appropriating funds through the state legislature is extremely competitive and subject to the state budget conditions.

State Agency Interest

Discretionary funds may be available in the form of directed action assistance or in-kind services. Partnerships with agencies such as the DWR Division of Planning and Local Assistance (DPLA), Department of Fish and Game, and CALFED may yield monies and services. The current MOU for the NFG is an example.

State Assistance Programs

Finally, a third option is to apply for project funding under an existing grant, low-interest loan, or assistance program administered by any of the various state agencies. Under Proposition 13, the Safe Drinking Water, Clean Water, Watershed Protection, and Flood Protection Act of 2000, approximately $200 million statewide for groundwater management and recharge projects was provided through the DWR DPLA. Similarly, Proposition 13 provided a major source of funding for the CALFED Bay-Delta Program and other such programs administered by SWRCB. Proposition 50 provides an opportunity for funding groundwater recharge related capital facilities and both Planning and Implementation grant funds are available for project development and construction, respectively.

Local Funding

Local funds are available to city and county governments from a variety of sources including general funds, water rates, developer fees, connection fees, capital improvement programs, acreage or *ad valorem* assessments, and taxes. Local funds can be raised by individual water agencies and districts, or by the counties for more regional efforts. These funds could be generated by assessment, sales taxes, water service fees, developer fees, and by groundwater banking and transfer-related contracts. It is important to note that Proposition 218 creates specific procedural requirements for special districts related to generating fees and assessments, and that any efforts to generate new charges and assessments would be subject to voter approval. Planning or construction of new facilities requires additional evaluation of benefits and costs and an electoral process, as defined by the proposition and amendments to state law. Private ditch companies can generate local matching funds directly from their shareholders without an election.

Funding Trends

A number of key trends can be observed related to state and federal funds and these will most likely influence local access to outside sources of funds.

- State and federal deficits. Deficits have reduced the availability of general-fund revenues to the agencies that previously provided technical support and funds for water-project development.
- Reduced state and federal grant and loan funding. Many state and federal programs for grant and loan funding have been curtailed as more pressing social needs redirect funds.
- Bond funding of studies and planning. Previously, Propositions 204 and 13 provided a source of money for groundwater investigations, project construction, and groundwater management plans. These funding sources have been depleted. Proposition 50 is a source of funds for continued support but contains unique and new requirements.
- Local and special district budgets redirected by the state. The state budget deficit has led to the state diverting funds from both local city and county governments and, more recently, from special districts.
- Increased requirements for generating special district fees and assessments. Proposition 218 did for special districts what Proposition 13 did to local government *ad valorem* taxes. Any new fee or assessment requires voter approval and compliance with legislative and constitutional mandates to conduct the election, and engineering studies to prove benefits and distribute costs.
- State move toward fee-based revenue for service. Reduced general-fund revenues have put the burden on state agencies to increase fees for service such

as water-rights permits, dam safety, and other payments by the regulated community.

- Increased competition for grant and loan funds. Reduced local government revenues increase competition for any sources of non-local funds.
- Beneficiary pays principal. Large state and federal programs, such as CALFED, are requiring detailed economic analyses that document who receives project benefits and how payment for program implementation is to be distributed.

5.3 MANAGEMENT AND GOVERNANCE

METHODS OF GROUNDWATER MANAGEMENT IN CALIFORNIA

DWR has identified six methods of groundwater management in California. They are listed below along with the identification of management authority and extent (***parenthesis***) in the chronological order in which they have been developed:

- Overlying Property Rights (***property owner***)
- Statutory Authority (***legislatively defined local agency or district***)
- Adjudicated Groundwater Basins (***groundwater basin, water master or court***)
- Groundwater Management Districts or Agencies (***legislatively defined local agency or district***),
- Groundwater Management Plan (AB 3030, SB 1938) (***local agency or district***),
- City and County Ordinances (***city or county***).

Based on this list, it is apparent that there can be overlapping jurisdictions and approaches to groundwater management. If groundwater management is not developed appropriately, the presence of multiple jurisdictions can lead to complicated and potentially conflicting groundwater management approaches within a basin.

In California, surface water and groundwater rights are separate and distinct. This has an influence on how the resources are governed and managed at the local level. A permit application process for appropriating surface water in California is contained in the California Water Code. The California Water Code does not authorize the State of California to manage groundwater; therefore, groundwater rights have evolved through a series of court decisions dating back to the late 1800s. Recently, through legislation and as supported by bond funding, DWR has helped local entities develop local groundwater management plans, groundwater related projects, and conjunctive use strategies. These are discussed further below.

KINGS BASIN GROUNDWATER MANAGEMENT

Although there is currently no groundwater management authority in the Kings Basin, groundwater management is practiced primarily through exercise of the overlying property rights and through development of local groundwater management plans by the local water districts individually or working through KRCD. Small groundwater recharge projects and conjunctive use of surface and groundwater sources is being practiced by individual districts and mutual water/ditch companies, or groups of districts within the basin through cooperative agreements such as the McMullin Group and NFG.

Local surface water is managed under a system of agreements and entitlements coordinated by the Kings River Water Associations (KRWA). KRWA demonstrates that local entities can resolve long standing disputes and there is a history of surface water management, but no similar institutional arrangements are in place to locally manage groundwater resources.

KRCD does not have legislative groundwater management authorities and provides services and support only when requested. Their role has been primarily one of coordination rather than of active governance or management of the groundwater basin. KRCD has been very active in supporting local water management districts and ditch companies to obtain state funding and develop local GWMPs, conduct technical studies, and construct groundwater recharge projects when opportunities have arisen.

Groundwater management of the Lower Kings Basin has been primarily through development of AB 3030-related GWMPs covering independent parts of the region that were developed under a number of cooperative efforts implemented through MOUs or agreements. In general, water interests in the Lower Kings Basin have not historically governed, managed, and operated the groundwater basin in an integrated manner.

POTENTIAL APPROACHES FOR THE LOWER KINGS BASIN

Management opportunities and constraints in the Lower Kings Basin GWMP are discussed below, along with potential approaches to improve collaboration and cooperation. The GWMP and BAP recognize that projects developed by consensus through a collaborative process have the potential to both retain local control of the groundwater basin, and to increase the likelihood of success for project implementation. Implementation of the GWMP and local control can best be achieved by continuing to develop a broad base of political and financial support. In the near-term, existing structures of governance and management are to be used to pursue local projects within each of the WMAs. In the long-term, more formalized agreements between existing management entities will be further considered by the BAP and local stakeholders to

fund and implement regional facilities, should such facilities prove to be cost effective and provide benefits to the Lower Kings Basin.

The GWMP outlines the goals and objectives for managing groundwater resources in the Lower Kings Basin and addresses how individual stakeholders will work with each other to meet regional objectives. The BAP did not want the GWMP to include or address new rules, procedures, and regulations on water and land owners overlying the basin, or any mandatory measure to ensure that individual groundwater management efforts are also beneficial to the groundwater basin as a whole.

This discussion outlines possible collaborative processes and organizational structures to allow all individual users and districts the authority to implement the GWMP and meet the BMOs. A longer term strategy for governance should be considered so that work is done collaboratively to meet the regional goals outlined in this GWMP while, at the same time, allowing stakeholders to meet their individual groundwater needs.

Two major management processes are outlined below—the **individual interest–based model** and the **mutual interest–based model**. The individual interest–based model represents the historical management of groundwater in the Lower Kings Basin. The following text describes the two models in more detail and the advantages and disadvantages of each model. A governance model can be combination of the two so that the advantages of regional water management are realized without individuals feeling a loss of control over local management.

INDIVIDUAL INTERESTED–BASED MODEL

Under the individual interested–based model, stakeholders would govern and develop water resource projects individually. This is the current model for the BAP. This model would continue to served as a voluntary outreach approach, and meetings would hosted by KRCD, where representatives from each stakeholder group could get together to discuss and seek to resolve regional groundwater issues. At these meetings, agreements can be made if multiple groups would like to contribute to the development of regional projects outlined in this GWMP; however, the ultimate project-making authority would remain within the entity that is sponsoring the project. Financing would also be the responsibility of the sponsoring agency or group. The individual groups could also enter into to guide subsequent actions and provide funding. Advantages to this approach are as follows:

- Allows agencies to focus their resources on projects that are specific to their needs,
- No loss of control over management of individual groundwater resources, and

- Easiest to implement because it is a continuation of the current approach to groundwater management in the region.

Disadvantages to this approach are:

- More difficult to pursue regional projects that would benefit the entire Lower Kings Basin;
- Confusion over who coordinates projects and what role each agency plays during regional project planning, construction, operation, and maintenance;
- Inability to generate economies of scale for large projects;
- Projects that benefit only individual entitles are less likely to receive state funding;
- Nothing to prevent individual stakeholders from undertaking actions that are not complementary to the BMOs; and
- No framework to resolve conflicts among individuals.

MUTUAL INTEREST–BASED MODEL

Under the mutual interested–based model, a group of stakeholders in the Lower Kings would form an institutional framework to undertake the specific GWMP projects. The stakeholders would enter into more formal arrangements such as 1) joint-power agreements (JPA), 2) coalitions, or 3) regional groundwater improvement districts. The new institution would have representation from each stakeholder in the region and would act as the governing body and funding mechanism for development of groundwater and conjunctive use projects in the region.

A MOU is a relatively informal agreement between individual public agencies to pursue a common purpose or goal. The organization formed does not have any formal power and it cannot undertake projects or enforce regulations. In effect, a MOU is basically a "gentlemen's agreement" between all the agencies involved.

The JPA provides a formal contract among individual public agencies to jointly exercise the powers of each public agency. The JPA can be organized in any way the members wish. Most JPAs have a governing board made up of elected or appointed members of each participating entity. This can include funding authorities. The governing board sets the policy direction for the JPA and coordinates the means by which to enforce the policy.

The mutual interest–based approach would help ensure that GWMP actions are carried out and provide stable funding and institutional mechanisms for implementing projects. In the longer term, a set of regulations could be developed that would ensure local interest control and

manage the resources. For example, regional banking would require rules and regulations to protect local interests and maintain local control.

The institution or organization would be responsible for planning, construction, operation, and maintenance of projects outlined in the GWMP, and for establishing any operating rules or regulations designed to protect and preserve local authority. It could have the power to raise money for projects and could also employ its own staff to ensure that its objectives are met. Advantages to this approach are:

- Ensures that the BMOs are met and that the regional benefits from following the BMOs are realized;
- Projects proposed by the governing body are much more likely to receive state funding; and
- Easier to resolve individual conflicts internally.

The obstacles that must be overcome to make this approach work are:

- Overcoming historical disputes between individuals, groups, or organizations in the region;
- Ensuring that every stakeholder has fair representation in the governing body. (For example, have each stakeholder's vote weighted by a factor of acreage, water use, population, monetary contribution, etc.);
- Ensuring that the institution formed is perceived as legitimate by both the locals and the state government;
- Obtaining funding for the institution;
- Ensuring that the institution does not threaten the development of individual projects as long as they still meet the regional BMOs;
- Ensuring that disadvantaged communities, special-interest groups, and new stakeholders have a means by which to be included and represented in the governing body; and
- Agreeing on regulations that must be easily understood and easy to enforce and on penalties if the regulations are not followed.

The BAP was not able to achieve a consensus on the approach do to limited time for further negotiation and for more consideration of the issues and opportunities. Section 6 contains further steps to continue to the dialog and develop a final approach to oversight, management and governance of the GWMP and development of capital facilities.

SECTION 6 MANAGEMENT AND IMPLEMENTATION PLAN

6.1 GWMP COMPONENTS

The GWMP components were built from the options identified and carried forward from the evaluation in Section 4. The GWMP components were specifically configured to meet local groundwater planning and management objectives presented in Section 3. The final components were also configured to conform to the BMOs. These GWMP components establish priorities for:

1. Development of Near- Term Local Recharge Projects;
2. Development of Long-Term Groundwater Recharge and Banking;
3. Stakeholder Involvement, Plan Oversight and Management;
4. Monitoring and Analysis Program;
    a. Monitoring;
    b. Development of Integrated Hydrologic Planning Tools; and
5. Groundwater Resource Protection.

The GWMP components are described along with the specific GWMP objective that are addressed by the component. Actions that are specific to the individual Areas are presented along with a listing of actions common to all of the Areas where this is appropriate. The responsible party is presented where this has been determined.

6.2 COMPONENT 1 - DEVELOPMENT OF NEAR TERM LOCAL RECHARGE PROJECTS

This component defines actions to meet the GWMP objectives defined in Section 3, including;

> Objective 1: Identify and build near- term groundwater recharge projects within each Area to capture flood flows; begin to stabilize the basin; and to demonstrate the feasibility, benefits and cost effectiveness of recharge projects.
>
> Objective 2: Establish rational and attainable Basin Management Objectives both regionally and for specific Areas to measure and track progress.

The near- term project options identified in Section 4 are carried forward for action and are integrated into this GWMP component. The Near- Term Local Recharge Projects provide an

integrated approach to addressing overdraft problems. These projects will help to reduce or avoid conflicts; provide multiple, regional benefits; protect the Lower Kings Basin during droughts; protect and improve water quality through recharging surface water; and improve local water supply security. The Lower Kings BAP will preserve local control of the groundwater basin through the active participation of the stakeholders in efforts to obtain funding and political support for the proposed projects. The integrated approach is needed to increase the probability of obtaining funding to implement the GWMP projects by demonstrating regional cooperation in physical solutions to overdraft.

KRCD and the BAP worked to identify potential projects that were ready to proceed and had minimal technical constraints. The BAP identified four local recharge projects that could be developed in the near term including the McMullin Recharge Ponds, the Raisin City Recharge Pond, Raisin City Recycled Water Program, and the North Fork Group Recharge Projects. The projects are recommended for inclusion in a joint Lower Basin Near- Term Groundwater Recharge Program so that they may be pursued as part of an integrated strategy to reduce overdraft.

PROJECT ACTIONS IN AREA A

The actions are intended to stabilize groundwater levels and implement near-term groundwater recharge projects. The stakeholders in Area A, with support and coordination of the BAP, will take the following actions.

1. The McMullin Group will promote, develop, and operate the McMullin Recharge Ponds with staff support provided by KRCD. The goal is to have the projects operational by 2010.
    a. Complete the feasibility study.
    b. Negotiate water agreement with KRWA.
    c. Evaluate project benefits and costs.
    d. Define local funding agreements and work with KRCD to obtain funding from state grants where available.
    e. Obtain needed permits and environmental clearances.
    f. Develop engineering plans, specification.
    g. Develop project monitoring plan to document benefits.
    h. Bid, construct and operate the project.

    The feasibility study is nearing completion. Additional project costs are associated with permitting, design, construction, and engineering administration. The McMullin Recharge Ponds construction cost are estimated as $1,063,800 for Site 1 (Phases 1 & 2) and $ 1,039,800 for Site 2 based on the

original estimates that were made in 2000 (KRCD, 2000) and brought forward to current dollars for purposes of planning and budgeting. Final engineering, project permitting, and engineering administration is estimated (for purposes of preparing a planning level budget) at 10% of the capital costs, or $210,000.

2. The Raisin City WD District will seek to develop the Raisin City Recharge Pond. KRCD will help to facilitate the dialog between Raisin City WD and FID. The Raising City WD will closely coordinate with the other Lower Kings Basin Interests through the BAP. The source of the water is flood water or purchased water to be wheeled through FID facilities to a canal to convey water to recharge ponds constructed on the land currently owned by the District. The goal is to have operational projects by 2010.

   a. Promote and actively seek to develop the Raisin City Recharge Pond using existing District property. This will include close coordination with FID to existing FID facilities to convey water.

   b. Negotiate any wheeling agreements with FID.

   c. Complete the project design, develop final project costs.

   d. Define local funding agreements, local assessments, and obtain approval from local land owners in the District.

   e. Work with KRCD to obtain funding from state grants or low interest loans.

   f. Obtain needed permits and environmental clearances.

   g. Develop project monitoring plan to document benefits.

   h. Bid, construct and operate the project.

   The costs associated with Raisin City WD groundwater recharge project are estimated at $3,350,000 (Provost and Prichard, April 2005). Engineering administration was estimated at 10% of the capital costs, or $335,000 for purposes of budgeting and planning.

3. KRCD will help the Raisin City WD open a dialog and pursue development of a Raisin City Recycled Water Program, in cooperation with the City of Fresno and FID. The Raising City WD will also coordinate with the other Lower Kings Basin Interests through the BAP. The goal is to phase the recycled water program to expand the freshwater recharge project discussed above to include percolation and reuse of recycle water from the FRWTP by 2015.

   a. Initiate a dialog with the City of Fresno, FID, and other stakeholders in the FRWTP to further develop support and agreements for "in-lieu" recycled water use and recharge projects that benefit all parties.

   b. Raisin City WD will track the process to update the City of Fresno Water Master Plan and be an active stakeholder.

   c. Seek to include the Raisin City recycled water program in the regional strategy for development and use of reclaimed wastewater.

d. Begin an internal dialog to evaluate and resolve issues related to use of recycled water for irrigation and recharge.

e. Initiate discussions with the RWQCB to resolve regulatory issues.

The Raisin City Recycled Water Projects project is estimated to cost between $4,538,700 and $23,734,000 to complete. These costs were based on prior estimates for the water recycling project (Provost and Prichard, 1995) but were brought forward to current dollars. The project is more complex and faces much more complex regulatory and institutional hurdles than the other near-term actions. For purposes of planning, it is assumed the entire project is to be developed in context of a regional recycled water program targeted at resolving regional overdraft issues and providing multiple benefits to the participants. Engineering administration costs for the largest of the project configurations are estimated at 10%, or $2,370,000 for purposes of planning and budgeting.

4. KRCD will work with overlying land owners and water districts, including Raisin City WD, to promote the consideration of an improvement district for all of Area A for the following purposes;

   a. Generating revenue dedicated to capital projects, achieving greater economies of scale and cost effectiveness, and to equitably distribute project benefits and costs.

   b. Jointly fund planning, preliminary design, environmental compliance, and project development activities.

   c. Purchase water for the Area.

   d. Provide for local match funding requirements to state or federal programs to increase funding opportunities and recapture local tax dollars.

   e. Build a project development capital reserve for project construction or land acquisition for development of recharge facilities.

   f. Fund the proportional share of other basin management activities or common elements such as monitoring, data management, water conservation, or other programs.

PROJECT MANAGEMENT ACTIONS IN AREA B

Work within Area B will be coordinated through the North Fork Group. The North Fork Group will closely coordinate with the other Lower Kings Basin Interests through the BAP. The NFG will take the following actions by 2010.

1. Develop North Fork Group local recharge projects.

   a. Obtain local and/or grant funding and complete North Fork Group groundwater recharge project feasibility investigations, and define local project priorities and costs.

b. Evaluate hydraulic effects of put and take operational scenarios and recharge/discharge operations.

c. Evaluate project benefits and costs.

d. Negotiate cost sharing and management agreements for project construction within the NFG to complete the work and/or provide a local match for state or federal funds

e. Initiate project design work upon completion of the feasibility study, develop engineering plans and specification.

f. Obtain needed permits and environmental clearances.

g. Develop project monitoring plan to document benefits.

h. Construct and operate the project.

An AB 303 grant was submitted in 2004-2005 funding cycle to obtain support for a feasibility study and site characterization work. If the state funding is provided the project would be expedited. If a grant is not awarded local funds would be needed to keep the project moving forward, or the grant could be revised to address any issues and increase the competitiveness, and could be resubmitted in later funding cycles. Subsequent construction costs will be evaluated in detail once the feasibility work and preliminary engineering are complete, but a range of costs was estimated based on the cost of similar project an unit cost of other projects in the area. Using costs developed as part of the Raisin City WD Groundwater Recharge Project, in particular land acquisition cost of $4,000 per acre, excavation to a depth of 3 feet, and excavation cost of $2.50 cubic yard. The land acquisition and excavation costs to develop recharge ponds of 250 acres is approximately $10,780,000. An additional 20% is added on to estimate the conveyance facility improvements for a total project cost were rounded to $13,000,000. Engineering administration at 10% of the capital costs are estimated at $1,300,000.

2. Document current operations through improved monitoring of deliveries, spreading and recharge project operations.

   a. Develop a consolidated map of existing canal facilities. Inventory existing delivery and distribution infrastructure to identify constraints, needed improvements and operational requirements for conjunctive use.

   b. Conduct a surface water study similar to the work conducted by KRCD for AID (KRCD, 1991) and CID (KRCD, 1993) to define opportunities to optimize system performance for conjunctive use.

   c. Promote additional monitoring and measurements of canal operations to better document canal loses, water spreading benefits, and groundwater recharge from the canals.

   d. Promote the restoration of canals to design capacities.

3. Consider development of an improvement district in Area B based on the North Fork Group members for the following purposes;

a. Achieve greater economies of scale, cost effectiveness, and equitably distribute project benefits and costs.

b. Jointly fund planning, preliminary design, environmental compliance, and project development activities.

c. Purchase water for the Area.

d. Provide for local match funding requirements to state or federal programs to increase funding opportunities and return state and federal taxes to the local community.

e. Build a project development capital reserve for project construction or land acquisition

f. Acquire land for recharge purposes or to fallow the land to reduce pumping in times of drought and conserve water. Develop and initiate land acquisition program.

MANAGEMENT ACTIONS IN AREA C

There were no major near term project actions identified by Area C stakeholders or determined necessary to stabilize groundwater levels. The Lower Kings BAP and KRCD staff will continue to work with interests in Area C to help monitor conditions, document problems, establish objectives and support projects. Near term actions include:

1. KRCD will develop a plan to work with local districts to operate canals to optimize retention in areas that are conducive to groundwater recharge. This includes working with local districts to identify project facilities and improvements that would allow for increased recharge.

2. Identify mitigation efforts for area growers that could be adversely impacted by recharge projects. This could include:

   a. the construction of bentonite clay cut-off walls in areas that subject to high water levels during recharge operations;

   b. purchase water level easements in areas that are subject to high water levels during recharge operations; and

   c. outright purchase of lands subject to high water levels during recharge operations.

FUNDING FOR NEAR-TERM PROJECTS

1. Establish near 2005/2006 AB 303 grant project priorities for the Lower Kings Basin. Funding priorities need to be set the end of the August 05 to allow time to prepare applications to be submitted in early winter 05. KRCD will track grant timelines and keep the BAP informed.

2. Develop costs and priorities for a Lower Kings Basin capital facilities plan that could be considered for inclusion in the more regional Integrated Regional Water Management Plan (IRWMP). Such projects could become candidates for funding in context of Proposition 50, Chapter 8 Implementation Grant program. Project concepts must be ready to proceed to meet funding criteria and local resources would be needed for project planning and engineering. In addition, any projects to be funded must be part of an IRWMP.

   The potential costs are summarized in Table 6.1 for purposes of planning and budgeting. Actual costs may vary depending final work plans and any firm construction bids or responses to proposals.

Table 6.1. Summary of Estimated Costs for Near-Term Lower Kings Basin Groundwater Recharge Projects

Project	Size (ac)	Capital Cost ($, millions)	Annual Cost ($)		
			Debt Service[1]	*O & M*[2]	*Total*
Raisin City – FID	80	3.350	222,600	17,700	240,300
Raisin City – WWTP	80	4.539	301,600	22,600	324,200
Raisin City – WWTP	960	23.734	1,577,400	118,300	1,695,700
McMullin (Site 1)	205	1.064	70,700	5,300	76,000
McMullin (Site 2)	15	1.040	69,100	5,200	74,300
North Fork Group[3]	250	13.000	716,400	53,700	770,100
Lower Kings Basin Near-Term Total	**1,590**	**46.727**	**2,957,800**	**222,800**	**3,180,600**

1. Debt service was determined for 40 year payment schedule at 6% per annum
2. O&M was calculated as 7.5% per annum of capital costs
3. Land acquisition and excavation costs only

6.3 COMPONENT 2 - LONG-TERM GROUNDWATER RECHARGE AND BANKING

Objectives 3: Formulate long- term regional strategies to take advantage of groundwater storage space in the Lower Kings Basin.

Conjunctive use management options that were carried forward from Section 4 for further development into a long term GWMP components included;

- In-basin water transfers;
- Out-of-basin transfers;
- Out-of-basin flood flows;
- Regional recharge basins and spreading;
- Regional groundwater banking;

- Regional recycled water; and
- Regional conveyance systems.

To take advantage of the storage space in the Lower Kings Basin and begin to develop a strategy using the Opportunity Zone identified in the BMOs, these concepts should be further evaluated from both an engineering and institutional standpoint.

In contrast to all of the near-term individual projects that are relatively well defined and sponsored by local water districts, the long term GWMP components will require closer coordination and greater collaboration between all of the Lower Kings Basin stakeholders, and other interests outside of the planning area.

This GWMP Component is included to document progress in developing long-term, regional strategies to solve overdraft. The most important thing that the Lower Kings Basin can do to support local control is to further the current level of cooperation in the planning area and develop the institutional arrangements and management structures needed to promote a long-term solutions.

A first priority would be to achieve a consensus at the policy level between all of the interests in the Lower Kings Basin. To overcome institutional constraints, principles of agreement could be defined that provide a basis for discussion and negotiation surrounding any joint conjunctive use/groundwater banking project. During the GWMP development there was a general consensus that the priority of any regional groundwater banking project would be to;

- Reduce or eliminate overdraft of the underlying basin;
- Restore basin levels to a specified groundwater level;
- Supply the water needs of Lower Kings Basin; and
- Meet the needs of project partners.

The BMOs concepts was designed by the BAP to allow for consideration of long- term opportunities to recover the groundwater basin and help local Lower Kings Basin interests develop operating criteria, rules and thresholds that could be perfected in legal agreements and operating guidelines to manage the Opportunity Zone. Groundwater banking and operating criteria would be established and perfected in appropriate legal agreements between Lower Kings Basin interests and other potential participants. Institutional structures would also need to be put in place to regulate, monitor, and manage large-scale regional banking.

Developing the long-term options will likely require support and cooperation of outside interests, whether this support is through water transfers or exchanges, or in the form of financing. The interests outside the planning that could be participants in a more large scale venture include the other water districts and land owners overlying the Kings Groundwater

Subbasin, and/or those interests outside of the area entirely. Regional groundwater banking with outside partners has been discussed previously within the Kings Groundwater Subbasin, but no agreements have ever come to fruition due to cost, legal and political constraints. Agreements would need to insure that local costs would not be increased unreasonably, and any adverse impacts to local groundwater users would be need to be fully mitigated.

A regional banking option will face considerable challenges. However, it is a viable option for helping solve overdraft and providing benefits to the Lower Kings Basin, and the concepts should be further developed. Costs and schedules for the long-term program cannot be determined at this time. Evaluation of specific projects beyond the concepts carried forward is premature until such time as the management and institutional plan is developed, and greater level of involvement at a policy level is achieved. The next section discusses organizational and management in more detail.

6.4 COMPONENT 3 - STAKEHOLDER INVOLVEMENT, PLAN OVERSIGHT AND MANAGEMENT

The principals for GWMP implementation, roles and responsibilities, approaches to governance, plan oversight and organizational structure, and strategy to procure funding are discussed below. The GWMP related objectives from Section 3 that are to be met by this component are;

> Objective 4: To maintain local control of the groundwater basin through development of agreements and institutional arrangements that promote the responsible management of groundwater resources by overlying cities, water districts, agencies, companies and landowners.
>
> Objective 5: To continue to coordinate the Basin Advisory Panel to track progress, coordinate GWMP implementation.
>
> Objective 6: To research and define financing strategies and program oversight to implement the GWMP projects and programs.

Not all of the issues regarding financing, governance, or management of the GWMP were fully resolved during development of the GWMP, and it is anticipated that there will be an ongoing dialog regarding how to fund, manage, govern and implement the program and obtain long term financing for capital projects.

PRINCIPLES FOR PLAN MANAGEMENT AND IMPLEMENTATION

The following principals for plan implementation are put forth for further discussion and development. KRCD Board, working with the other stakeholders in the Lower Kings Basin,

will need to take further action to establish policies and approaches for management and implementation of the GWMP. The concepts are put forth for further discussion are listed below.

1. Consensus on governance and funding will be sought through ongoing dialog and discussion of the BAP as the near-term GWMP Components are implemented.
2. BAP will work to set local funding priorities for competitive grants. The BAP should seek to set project priorities for local projects to avoid internal competition and ensure that Lower Kings GWMP requests are competitive with other areas and have a high probability of success.
3. Capital facility costs must be born by the entities that receive the benefit and benefits should be quantified and demonstrated through engineering and economic analysis before anyone is asked to pay or incur increased costs associated with long term financing.
4. Regarding governance, local control must be preserved, but it is generally recognized that there needs to be some type of institutional arrangements and a management structure within the Lower Kings Basin to implement the GWMP programs.
5. Local management requires finding local match funding for grants to conduct planning, project engineering, and for ongoing services that are requested by the BAP or any stakeholder group.
6. Project planning and non- structural program costs for such things as local match for grant funds, data collection, grant funding requests, and feasibility studies will be through KRCD as prioritized by the Board on an annual basis.
7. Regional projects must provide regional benefits and economies of scale must be documented. The funding mechanism for assuming debt for capital facilities has not been established.
8. No new agency is needed, instead, if contractual arrangements or agreements are needed, and this could be through JPA or other contractual agreements between existing parties to the plan to implement any of the action being considered.

SUPPORT AND COORDINATION

KRCD will provide staff support and coordination to the BAP, NFG, and McMullin group, and will also support the following actions or assume the following roles.

1. Serve as lead agency for GWMP implementation and update in the Lower Kings Basin.
2. Coordinate the BAP and area stakeholder groups and provide staff support.

3. Continue to collect groundwater data, manage the monitoring program, and prepare the annual groundwater report. The groundwater report will provide aggregated hydrographs to document progress towards meeting the BMOs.
4. Prepare an annual GWMP implementation plan status report to the KRCD Board and BAP to document GWMP related actions and progress in each of the areas.
5. Continue to track grant funding and loan opportunities to meet GWMP objectives in the Lower Kings Basin and notify the KRCD Board and BAP as to the probability, cost, and work plan to seek and obtain support.
6. Provide grant writing, technical support and project management services to the stakeholder groups for projects within each of the Areas.
7. Utilize existing KRCD community affairs programs to report on GWMP progress as it occurs, describe problems, present opportunities, and gain political support for the program.
8. Seek to expand participation in the Area stakeholder groups (McMullin, NFG) by actively working with land owners and water agencies to broaden the awareness and participation.
9. Track staff and other direct costs for services provided to the Lower Kings Basin.

GOVERNANCE, PLAN OVERSIGHT AND ORGANIZATIONAL STRUCTURE

Appropriate institutional structures are needed to manage the basin, develop and fund projects, and coordinate to protect local interests. Plan oversight and organizational principals for GWMP implementation are presented below to further discussions on how to best manage local groundwater supplies.

1. The KRCD Board will continue to direct and prioritize KRCD staff involvement in the Lower Kings Basin GWMP implementation.
2. The KRCD Division 4 and 5 representatives should serve as Chair and Vice Chair for the Lower Kings Basin Advisory Panel to ensure that there is continuity and a high level of policy support for further development of conjunctive use and implement of the GWMP.
3. The McMullin Group will be the stakeholder group for coordinating outreach, programs and project priorities within Area B, with emphasis on implementing the near term projects.
4. The North Fork Group will be the stakeholder group for coordinating outreach, programs and project priorities within Area B, with emphasis on implementing the near term projects.
5. BAP participation should be voluntary and open to all property owners or stakeholders with a vested interest in the Lower Kings Basin.
6. The BAP should continue to meet to;

a. Serve as the vehicle for Lower Kings Basin stakeholder involvement, promote the GWMP, provide a forum for discussion;

b. Coordinate Lower Kings Basin involvement in regional water planning efforts and track programs with potential affects to the Lower Basin interests, including the work associated with the Upper Kings Water Forum;

c. Hold regulator meetings, at least semi-annually, to review progress towards meeting the BMOs, coordinate actions in the Lower Kings Basin, and to distribute information and results in each of the Areas;

d. Distribute information on regional water issues and projects that could affect Lower Kings Basin interests;

e. Identify and provide Lower Kings Basin representatives to regional efforts or programs;

f. Resolve conflicts internally;

g. Develop agreements and local funding strategies and sources for ongoing programs, KRCD staff support, or shared engineering services;

h. Discuss regional projects and define preferred project alternatives that should move forward

i. Coordinate formation of a Joint Powers Authority or more formalized mechanism to developed and finance regional projects.

FUNDS AND FUNDING

1. One time costs for feasibility studies, project engineering, environmental compliance or other needs associated with the near term local projects priorities contained in the GWMP plan or its subsequent updates, will be negotiated and money provided within each of the Areas.

2. Grant funding opportunities will be identified and grants sought whenever possible for the priority studies needed to support GWMP Near-Term Component (local projects).

3. Long term debt financing for GWMP Near-Term Component (local projects) will also be negotiated and subject to agreements within each of the individual Areas and participants in the project.

4. Funding for large regional projects anticipated as part of the Long- Term GWMP component would be the basis for formation of a JPA, new district, or other contractual mechanisms and agreements to support, planning, engineering, and environmental compliance, local match share contribution to any grant or loan, and for obtaining long term financing of any debt.

5. The BAP should continue to evaluate long-term, stable funding for ongoing programs (e.g.; project planning, engineering services, monitoring, reporting,

staff support to the BAP), and to further investigate capital requirements as the long term, regional projects are evaluated.

CONFLICT RESOLUTION

The BAP has served as the Lower Basin planning body and a forum for member agencies and land owners to share their groundwater management plan issues and expectations. It is anticipated that this group can grow and continue the management efforts, build awareness and political support, and ensure that the GWMP implementation does not detrimentally affect other local stakeholders. In order to avoid serious disputes the following points on conflict resolution are made.

1. Litigation over groundwater should be avoided and used only as a last resort. Mediation services should be attempted prior to litigation when ever possible.
2. Expand the membership to ensure all parties in the Lower Kings Basin are informed regarding the GWMP program. Create awareness through outreach and expanded community affairs efforts to promote the GWMP. Identify the BAP as the opportunity for input and to resolve or prevent disputes.
3. Lower Kings Basin representatives should seek to be actively engaged and track other regional planning efforts such as the Upper Kings Integrated Regional Water Management Plan to ensure that their voice is heard, interests are protected, and avoid surprises. Other contemporary efforts with regional implications are related to the City of Fresno Water Master Plan and Upper Kings Water Forum.
4. Attempts to resolve conflicts internal to the Lower Kings Basin should through consensus and dialog within the Areas, and between water management agencies and land owners within each of the Areas.
5. Conflicts within the Lower Basin should seek to involve the BAP and KRCD Board members for Regions 4 and 5. Conflict between the Lower Kings Basin and any other interests within the region should seek to be resolved through the KRCD and KRWA Boards.

6.5 COMPONENT 4 - MONITORING AND ANALYSIS PROGRAM

Objective 7: Implement monitoring programs that increase the understanding of Lower Kings Basin operations, track progress towards meeting goals, and evaluate and forecast conditions.

The monitoring and technical support component of the GWMP needs to be able to assess the current condition of the Lower Kings Basin, forecast future conditions, and tracking the basin response to management actions. Monitoring is needed to document that the anticipated benefits of a project are actually being delivered, and that any impacts that were anticipated are being avoided. The Lower Kings Basin monitoring program includes provisions for

groundwater level and quality, land surface elevation or land subsidence, and surface water and groundwater interaction. Protocols for collection of data are an important part of the data collection effort. In addition, further technical support and analysis are recommended to development of a model of the groundwater basin. The GWMP Component 4 covering the monitoring and technical support program will include the following elements;

- Groundwater Level Monitoring;
- Groundwater Quality Monitoring;
- Land Surface Elevation Monitoring;
- Protocols For Collection of Groundwater Data;
- Monitoring Surface Water-Groundwater Interaction;
- Development of Kings Basin Groundwater Data Center; and
- Development of a Regional Integrated Hydrologic Model.

Groundwater level data from wells in the Lower Kings Basin has been collected from before 1950 to present. This data was collected by DWR, KRCD, and Lower Kings Basin water agencies. The number of wells in the networks have varied over time as wells were deleted and added. As such, the Lower Kings BAP is considering a standardized network of groundwater wells that combines the wells that are monitored by DWR, KRCD, and Lower Kings water agencies. The evaluation of the monitoring well network will cost approximately $75,000 and should be considered for grant funding.

Actions

The following actions will be taken by in the Lower Kings Basin:

1. KRCD will coordinate with DWR and Lower Basin water agencies to identify wells to be included in a long-term monitoring network.
2. Coordinate with DWR, KRCD, and Lower Basin water agencies to undertake a network evaluation.

GROUNDWATER QUALITY MONITORING

Most of the wells in the Lower Kings Basin are used for agricultural purposes. These wells have been monitored by the well operators to ensure crop productivity. These monitoring records are typically kept private and are not public information. Water quality monitoring of drinking water sources has been performed by municipalities in the Lower Kings Basin as required by DHS under Title 22. Sources of water quality data include DWR, KRCD, Lower Kings Basin member water agencies and local growers, USGS, and Local municipalities.

The BAP determined that the current level of water quality monitoring is sufficient to support the existing land use and beneficial uses of the Lower Kings Basin. It may be important to have a network of dedicated monitoring wells to track regional trends and to serve as a warning system for changes in water quality.

Actions

1. KRCD will track the Groundwater Ambient Monitoring and Assessment (GAMA) that the state is implementing with support from the USGS. This program is scheduled to begin in January 2006.
2. KRCD will evaluate the development of a groundwater quality network of wells as part of the efforts to evaluate the overall monitoring program and network.
3. Collect privately maintained water quality data from willing providers for purposes of project feasibility analysis. Confidentiality of original data must be maintained.
4. Coordinate with member agencies so that uniform monitoring protocols are used.
5. Identify potential wells that USGS could incorporate into NAWQA well network and determine timing and frequency of monitoring.
6. Promote the creation of groundwater quality monitoring well network.

LAND SURFACE ELEVATION MONITORING

Land subsidence can result from compaction of underlying formations that are affected by water level decline. Land subsidence is well documented in Areas west of the Lower Kings Basin. Land subsidence is a result of elastic and inelastic compression in the underlying basin. Elastic subsidence results from the reduction of pore fluid pressures in the aquifer and typically rebounds when pumping stops. Inelastic subsidence occurs when pore fluid pressures decline to a point where sediments collapse and results in permanent compaction. The extent of land subsidence in the Lower Kings Basin has been minimal and as such, land subsidence is not actively monitored in the Lower Kings Basin.

Actions

The Lower Kings Basin, through support provided by KRCD, will undertake the following actions.

1. Promote the surveying of selected wells in the western portion of Lower Kings Basin.

2. Coordinate with Lower Kings Basin stakeholders to determine if there are suitable benchmark locations to assist in determining and measuring land subsidence.
3. Educate Lower Kings Basin water agency members of the potential for land subsidence and signs that could be indicators of subsidence.
4. Contact USGS and DWR for potential partnering opportunities for extensometer installation and monitoring.

PROTOCOLS FOR COLLECTION OF GROUNDWATER DATA

KRCD, DWR, and several Lower Kings Basin water agencies collect groundwater data. There is probably a significant range of techniques, frequency of measurements, and documentation methods for the collection of groundwater level and quality by the aforementioned agencies. The lack of consistency between the agencies may provide an incomplete vision of basin-wide groundwater conditions.

Actions

The Lower Kings BAP, with support of KRCD will improve the utility of collected groundwater data by implementing the following:

1. Develop standard procedures for collection of groundwater level and quality data.
2. Provide training regarding standard procedures.

MONITORING SURFACE WATER-GROUNDWATER INTERACTION

The interaction between groundwater and surface water has not been extensively evaluated in the Lower Kings Basin. Lower Kings Basin member agencies and KRWA measure streamflow at weirs and head gates. The difference in flow between successive weirs is approximately the gain from or loss to groundwater. These measurements of gain or loss are approximations and have not examined closely.

Actions

The Lower Kings BAP will pursue actions that increase the knowledge regarding the relationship between surface water and groundwater in the Lower Kings Basin:

1. Compile data regarding unmeasured riparian diverters and develop estimates of diversion amounts.

2. Correlate groundwater levels from wells in the vicinity of the Kings River and stream flow data to study the hydraulic connection between the river and the groundwater system.
3. Coordinate and develop relationships with local, state, and federal agencies to investigate the interaction of the Kings River with the groundwater system.
4. Develop the data necessary to improve the evaluation of groundwater and surface water interaction.

SUPPORT DEVELOPMENT OF KINGS BASIN GROUNDWATER DATA CENTER

The efficiency of the process by which KRCD obtains groundwater level and water resources data can be improved and standardized by developing a data management system for groundwater and water resources data. A Kings Basin Groundwater Data Center (GDC) should be developed by KRCD to support the capture, processing, storage, retrieval and reporting of groundwater data. The estimated range of costs of developing a GDC is $50,000 to $100,000 and should be considered a candidate for grant funding.

Actions

The Lower Kings BAP will support KRCD in developing a database to track and manage groundwater level data. It is recommended that the KRCD Board establish a priority to support development of a GDC.

1. Finalize the business needs and requirements of a GDC and investigate opportunities to share and publish the data in web accessible formats.
2. Ensure the proposed system is compatible with existing technology and the KRCD information systems policies and/or strategic plan.
3. Develop alternatives including costs for initial set up, ongoing maintenance, and training and prepare a final recommendation.
4. Develop and test a prototype that would expedite the annual report production and publication.
5. Develop and install the system and provide staff with the appropriate training and documentation.
6. Compile historical data, conduct quality control, and upload data into the system.
7. Correlate groundwater levels from wells in the vicinity of the Kings River and stream flow data to study the hydraulic connection between the river and the groundwater system.

8. Coordinate and develop relationships with local, state, and federal agencies to ensure that data can be electronically exchanged to save money and improve data quality.

SUPPORT DEVELOPMENT OF A REGIONAL INTEGRATED HYDROLOGIC MODEL

Currently DWR and KRCD are in the initial planning steps of developing a regional integrated hydrologic model for the area overlying the Kings River groundwater basin, as identified in the DWR Bulletin 118, and the closely related areas based on hydrology, hydrogeology and water supply facilities. This model area will include all of the Lower Kings Basin as well as the Upper Kings Basin (AID, FID, and CID). The detailed extent of the model boundaries have not yet been determined and would be established after further review of the data, aquifers, geology and input from the technical analysis work group. The development of this model is to be funded by DWR, KRCD, and other Upper Kings Basin Stakeholders. Lower Kings Basin has not been requested to support this model at this time, with the exception of Raisin City WD who has chosen to help fund model development.

The purpose of the Kings Basin model is to support planning and decision making, to create a shared understanding of how the Kings Basin operates, and to reduce the uncertainty when selecting between alternative solutions. Using analysis of the model's result, water planners in the lower Kings Basin can make better decisions about public and private investments in conjunctive use water projects. Some of the anticipated benefits of an integrated model include:

- Developing a shared database with aggregated data from a wide range of sources and formats;
- Evaluating and reviewing historical data and making explicit decisions on data quality and usefulness;
- Improving the understanding of basin operations and water budget;
- Creating a shared consensus on water supply and overdraft problems;
- Testing a wide range of planning assumptions;
- Comparing alternatives and analyzing a wide range of "what-if" scenarios;
- Helping answer Kings Basin–specific questions on technical and policy issues;
- Supporting economic and environmental analysis and comparing impacts and benefits; and
- Improving the defensibility and technical credibility of the analysis results.

Information from the stakeholders in the Lower Kings Basin will be necessary to aid in the model development. Model development is a very data-intensive process and requires many time series and physical characteristics data. Local engineers, scientists, and stakeholders from

member districts will be needed to assist in data collection, to review of model input data and results, and to share their local knowledge with KRCD and DWR as the model is developed.

Actions

The Lower Kings BAP will pursue actions that increase the knowledge regarding model development and analysis of the relationship between surface water and groundwater in the Lower Kings Basin:

1. Support the compilation data and development of the model.
2. Support the model development by using existing staff or engineering support contractors to exchange data and review model calibration results.
3. Make existing water delivery and operations data available to the development team.

6.6 COMPONENT 5 - COMMON ELEMENTS FOR GROUNDWATER RESOURCE PROTECTION

The Lower Kings BAP considers groundwater resource protection a critical component for ensuring recovery of the basin and improving its sustainability. Groundwater resource protection includes basin recovery and sustainability, and prevention of contamination. Prevention measures include well construction, abandonment, and destruction, wellhead protection, and control of contaminated and saline groundwater.

WELL CONSTRUCTION POLICES

Currently, Fresno County regulates well construction policies for wells in management Area A and Area B. The Kings County Public Works Department regulates well construction policies for wells in management Area C. Only persons who possess an active C-57 Water Well Contractors License may perform construction work on wells. The California Well Standards Ordinance requires that all abandoned wells must be destroyed. Wells that are improperly abandoned could lead to the contamination of the groundwater, and inter-aquifer mixing. Following the rules and regulations explained in DWR bulletins 74-81 and 74-90, Fresno County Department of Community, Environmental Health System and Kings County Public Works Department are responsible for administration and enforcement of a well abandonment and destruction program for the management Area A and Area B, and for the management Area C, respectively.

Actions

The Lower Kings BAP will do the following:

1. Ensure that member agencies and Lower Kings Basin growers have access to county well construction ordinances and understand proper well construction procedures.
2. Coordinate with Lower King Basin water agencies to provide guidance on well construction.
3. Provide data to support revision to well standards should agricultural beneficial uses or urban uses be impaired due to groundwater contamination or should changes in standards become needed.
4. Ensure that member agencies and Lower Kings Basin growers have access to county well abandonment and destruction ordinances and understand proper well abandonment and destruction procedures.
5. Coordinate with Lower Kings member agencies on the reporting of abandoned and destroyed wells to confirm that information has been collected by DWR.
6. Coordinate with Lower King Basin water agencies to provide guidance on well abandonment and destruction.

PROTECTION OF RECHARGE AREAS

The surficial geology of the Lower Kings Basin has been evaluated to determine the areas with high recharge potential. These areas are important in the development of recharge projects in the lower basin. These areas are primarily used for agricultural purposes and could be at risk for contamination.

Actions

The Lower Kings BAP will do the following:

1. Further delineate areas with high recharge potential.
2. Identify growers that overlie areas with high recharge potential.
3. Work with those growers to protect recharge areas through voluntary water conservation and nutrient management programs.

CONTROL OF THE MIGRATION OF CONTAMINATED GROUNDWATER

The migration of contaminated groundwater is secondary concern for the Lower Kings BAP. Contaminated groundwater plumes are relatively small and localized in the Lower Kings Basin. Regulatory agencies such as the State Water Resources Control Board or Environmental

Protection Agency are responsible for the regulation of the migration of contaminated groundwater. KRCD's role is to cooperate with the regulatory agencies to aid in maintaining the best practical quality water supply for the management Area A, Area B, and Area C.

Actions

The Lower Kings BAP will do the following:

1. Promote the development of a monitoring well network to serve as an early warning system for public water supply wells.
2. Provide information to all Lower Kings BAP member agencies and companies regarding the location of contaminant plumes and Leaking Underground Storage Tank (LUST) locations.

MONITORING OF SALINE WATER INTRUSION

Overall, there are no known occurrences of saline water intrusion within the management Area A, Area B, and Area C. Saline water intrusion from the west side of the San Joaquin Valley (particularly from Westlands WD) is a concern for Lower Kings BAP. Although currently not a problem, there are hydraulic conditions (e.g., depressed groundwater levels) present that would allow saline water intrusion to occur in the future. In addition, a shallow perched saline water table exists mainly in the southern portion of management Area C. However, this is not considered to be saline water intrusion.

With the establishment of a monitoring program, any saline water intrusion can be identified. If an intrusion is identified, then at that time a plan can be developed to deal with the problem.

Actions

The Lower Kings BAP will do the following:

1. Track the progression of saline water moving from west through the biennial monitoring of TDS.
2. Coordinate with BAP member agencies the evaluation of saline water intrusion.

Bertoldi, G. L., R. H. Johnson, and K. D. Evenson. 1991. *Groundwater in the Central Valley California—A Summary Report*. US Geological Survey Professional Paper 1401-A.

California Data Exchange Center (CDEC) accessed December 2004 at http://cdec.water.ca.gov.

California Water Code, Section 10750, *Groundwater Management*.

CH2M Hill, 1992. *Fresno/Clovis Metropolitan Water Resources Management Plan, Phase II Report, Water Supply Alternative*. May 1992.

CVRWQCB, 2003. Central Valley Regional Water Quality Control Board, 2003. *2002 CWA Section 303(d) List of Water Quality Limited Segment*. Accessed online on 1/3/2005 at http://www.swrcb.ca.gov/tmdl/docs/2002reg5303dlist.pdf).

CVRWQCB, 2004. Central Valley Regional Water Quality Control Board. *Water Quality Control Plan for the Tulare Lake Basin (Basin Plan)*. Last revised January 2004.

DHS, 2001. California Department of Health Services, 2001. *California Health Laws Related to Recycled Water*.

DHS, 2004. DWSAP Source Water Assessments. Accessed online at http://swap.ice.ucdavis.edu/TSinfo/TSsearch.asp on 12/30/2004).

DWR, 2004. *The California Water Plan Volume 2 – Resource Management Strategies Advisory Committee Review Draft*. http://www.waterplan.water.ca.gov/b160/B160.Draft.June.7.2004/Vol_2/watertrans.pdf

Fresno, City of. *About Wastewater Management*. Accessed 3/30/2005 online at http://www.fresno.gov/public_utilities/wastewater/ww_about.asp

Fresno, County of, 2000. *Fresno County General Plan Policy Document*, October 3, 2000.

Hanak, 2003. *California Water Market, by the Numbers*. Public Policy Institute. Prepared for DWR, October 2003.

Ireland, R.L., et al. 1984. *Land Subsidence in the San Joaquin Valley, as of 1980*. USGS Professional Paper 437-1.

Kings County Planning Agency. *Personal Communication with Greg Gatzka*. January 2005

KRCD, 1991. *Alta Irrigation District Surface Water Study.* Kings River Conservation District. December 1991.

KRCD, 1993. *Consolidated Irrigation District Surface Water Study.* Kings River Conservation District. June 1993.

KRCD, 1995. *Groundwater Management Plan for Kings River Conservation District Area A.* March 1995. Adopted April 1995.

KRCD, 1996. *Groundwater Management Plan for Kings River Conservation District Area B.* February 1996. Adopted March 1996.

KRCD, 1998. *Groundwater Management Plan for Kings River Conservation District Area C.* June 1998. Adopted August 1998.

KRCD, 1999. *Artificial Recharge in the Kings River Service Area.* Kings River Conservation District, 1999.

KRCD, 2000. *Feasibility Study Report. Preliminary Design and Estimate of Costs for Two Potential Groundwater Recharge Sites Within the McMullin Recharge Project Area.* Kings River Conservation District, April 2000.

KRCD, 2004. *Unpublished City Limit Data.* December 2004.

KRCD, 2005. *Unpublished data regarding Kings River streamflow below Lower Kings Basin Weirs.*

KRWA, 2005. *Unpublished Kings River Flow Data Measured Below Weirs Data.* February 2005.

Kings County, 2004. *Kings County General Plan,* as updated and amended January 2004.

Provost and Pritchard, 1995. *Feasibility of Utilizing the City of Fresno's Wastewater for Raisin City Water District.*

Provost and Pritchard, 2005. *Unpublished Canal Characteristic Data.* February 2005.

Recycled Water Task Force, 2003. *Water Recycling 2030.* June 2003.

SWRCB, 2001. *Strategic Plan.* Accessed 3/30/2005 online at http://www.waterboards.ca.gov/strategicplan/index.html

SWRCB, 2002. *Water Transfer Issues in California, Final Report to the California State Water Resources Control Board by the Water Transfer Workgroup.* June 2002

SWRCB, 2004. *Water Recycling Funding Program Guidelines.* Accessed 3/30/2005 online at http://www.waterboards.ca.gov/recycling/docs/finalwrcpguidelines_oct2004.pdf

USGS, 2004. Data accessed on- line at:
http://ca.water.usgs.gov/sanj/data_sw/bedsed1.s2501.html;
http://ca.water.usgs.gov/sanj/data_sw/bedsed2.s2501.html;
http://ca.water.usgs.gov/sanj/data_sw/tissue1.s2101.html and
http://ca.water.usgs.gov/sanj/data_sw/tissue2.s2101.html.

WRIME, 2003a. *Basin Assessment Report for the Upper Kings Basin.* Prepared for the Upper Kings Basin ISI Participants in Coordination with The California Department of Water Resources.

WRIME, 2003b. *Preliminary Conjunctive Use Assessment Report.* Prepared for the Upper Kings Basin ISI Participants in Coordination with The California Department of Water Resources.

APPENDIX A LOWER KINGS BASIN GWMP RESOLUTION

BEFORE THE BOARD OF DIRECTORS
OF THE KINGS RIVER CONSERVATION DISTRICT
FRESNO, CALIFORNIA

RESOLUTION NO. 03-02

AUTHORIZING THE PREPARATION AND EXECUTION OF DOCUMENTS WITH THE CALIFORNIA DEPARTMENT OF WATER RESOURCES.

BE IT RESOLVED by the Board of Directors of the Kings River Conservation District that application be made by this District to the California Department of Water Resources to obtain a Local Groundwater Assistance grant pursuant to the Local Groundwater Management Assistance Act of 2000 (Water Code Section 10795 *et seq.*), and to enter into an agreement to receive a grant for the development of the Kings Basin Coordinated Groundwater Management Plan, the General Manager of the District is hereby authorized and directed to prepare the necessary data, make investigations, execute and file such application and execute an agreement with California Department of Water Resources to accept the grant.

THE FOREGOING RESOLUTION was passed and adopted by the Board of Directors of the Kings River Conservation District at its regular meeting this 12th day of November 2002, by the following vote:

AYES: Director Quist, Howe,Johns,McKean,Waldner, White,Yoshimoto
NOES: None

ABSENT: None

President

ATTEST:

Secretary

SECRETARY'S CERTIFICATE

I, David L. Orth, Secretary of Kings River Conservation District, hereby certify that the foregoing is a full, true and correct copy of a resolution duly adopted at a regular meeting of the Board of Directors of said District duly and regularly held at the regular meeting place thereof on the 12th day of November, 2002, of which meeting all of the members of said Board of Directors had due notice and at which a majority thereof were present.

WITNESS my hand and the seal of Kings River Conservation District this 12th day of November, 2002.

Secretary

(Seal)

res 03-02

APPENDIX B DRAFT GWMP ADOPTION RESOLUTION

BEFORE THE BOARD OF DIRECTORS OF THE
Kings River Conservation District

RESOLUTION -__

RESOLUTION OF INTENT TO ADOPT
THE LOWER KINGS RIVER BASIN GROUNDWATER MANAGEMENT PLAN

WHEREAS, in 1992, the State Legislature enacted Assembly Bill 3030, declaring groundwater to be a valuable natural resource, and encouraging local agencies to work cooperatively to manage groundwater resources and to adopt and implement groundwater management plans.

WHEREAS, in 2002, the State Legislature also enacted Senate Bill 1938 which further encourages local agencies to coordinate the development and implementation of groundwater management plans.

WHEREAS, the Kings River Conservation District Board of Directors supports local management and control of local groundwater.

WHEREAS, the Kings River Conservation District (KRCD) has been the local agency for supporting the development of the Lower Kings Basin Groundwater Management Plan (GWMP), and has worked with numerous public and private entities through the Lower Kings Basin Advisory Panel (BAP).

WHEREAS, land owners, water agencies, and stakeholders within the Lower Kings Basin share a common groundwater basin and have participated in the Lower Kings Basin Advisory Panel (BAP) to provide input to the Lower Kings Basin GWMP and anticipate seeking funding for groundwater projects from the state.

WHEREAS, the Board of Directors of the Kings River Conservation District, with the advise and input of the BAP has defined the Lower Kings Basin planning area (Figure 1.1), located in all of, or portions of KRCD Divisions 4 and 5, and within the Kings River Groundwater Basin as identified in the California Department of Water Resources Bulletin 118-10; and has further identified specific GWMP Areas A, B, and C (Figure 1.2) which also include the water districts and ditch companies in the region (Figure 1.3); and,

WHEREAS, the Lower Kings Basin GWMP contains components as required by the California Water Code Sections (Sections 10753.7), which include:

1. Basin Management Objectives (BMOs);
2. Monitoring and management of groundwater levels;
3. Groundwater quality degradation;
4. Inelastic land surface subsidence;
5. Changes in surface flow and surface water quality that directly effect groundwater levels or quality or are caused by groundwater pumping in the basin;
6. Local agency plan to involve other agencies that enables the local agency to work cooperatively with other public entities whose service area or boundary overlies the groundwater basin; and,

7. A map showing the California Department of Water Resources designated groundwater basin (Bulletin 118), also showing the area of the local agency subject to the plan, and boundaries of other local agencies that overlie the basin to be included in the groundwater management plan.

WHEREAS, the GWMP also evaluates voluntary components relating to all of the following areas (CWC 10753.8):

a) The control of saline water intrusion.
b) Identification and management of wellhead protection areas and recharge areas.
c) Regulation of the migration of contaminated groundwater.
d) The administration of a well abandonment and well destruction program.
e) Mitigation of conditions of overdraft.
f) Replenishment of groundwater extracted by water producers.
g) Monitoring of groundwater levels and storage.
h) Facilitating conjunctive use operations.
i) Identification of well construction policies.
j) The construction and operation by the local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects.
k) The development of relationships with state and federal regulatory agencies.
l) The review of land use plans and coordination with land use planning agencies to assess activities which create a reasonable risk of groundwater contamination.

WHEREAS, nothing in the state law (CWC 10753.9) shall be construed as authorizing the Kings River Conservation District to make any binding determination of the water rights of any person or entity, and nothing in the state law (CWC 10753.1), or in the Lower Kings Basin GWMP adopted pursuant to this part, affects surface water rights or the procedures under common law or local groundwater authority, or any provision of law other than this part that determines or grants surface water rights.

WHEREAS, state law does not allow an agency to obtain certain funds without being covered by or in a GWMP that meets state requirements.

WHEREAS, coverage by the GWMP is voluntary and only to be provided to those agencies and organizations in the Lower Kings Basin that officially seek coverage by Resolution of the Board or decision making authority, with could include the city council or Board of Supervisors if the incorporated cities or county, respectively, that are included in the Lower Kings Basin Areas A, B, and C.

NOW, THEREFORE, BE IT RESOLVED as follows:

1. This KRCD Board of Directors, acting as the local agency, hereby accepts the draft Lower Kings Basin GWMP.

2. It is the Board of Director's intent that the public and agencies in the Lower Kings Basin be provided time for review, comment and input on the Lower Kings Basin GWMP prior to the adoption of the GWMP by the Board of Directors.

3. The Board will consider the input of other public or private agencies overlying in the Lower Kings Basin or affected by GWMP at a regularly scheduled public hearing no

later than 60 days from the date of approval of this Resolution in order to receive comment and consider adopting the plan.

4. Prior to adopting the GWMP, this Board of Directors shall further notice the hearing to receive public comment and to determine whether to adopt the Plan. Landowners may file written protests to the adoption of the Lower Kings GWMP, and if the written protests represent more than fifty percent of the assessed value of the land within the District subject to groundwater management, the Plan shall not be adopted and the District shall not consider adopting a plan for that area for a period of one year after the Hearing.

5. Following adoption of the Lower Kings Basin GWMP by the KRCD Board of Directors, each of the management entities within the area, as represented by the local water district or ditch company, shall not be covered until coverage under the GWMP is approved by resolution of the appropriate decision making body, and the resolution is provided to KRCD and filed with the Lower Kings Basin GWMP.

PASSED AND ADOPTED _____, by the following vote of the Board of Directors, to wit:

AYES:

NOES:

ABSENT:

_____
XXXXX, Chairman
Board of Directors of the
Kings River Conservation District

_____
ATTEST: XXXXXX
Secretary of the Kings River Conservation District

C.1 LAND AND WATER USE

This appendix documents the land and water use analyses conducted as part of the development of the Groundwater Management Plan for the Lower Kings Basin. Current and future land use patterns in the Lower Kings Basin where analyzed using GIS. Land use is a direct determinant of water use. Land use mapping of the current and future land use allows for estimates of the current and projected water demand.

CURRENT LAND AND WATER USE

Water demand can be estimated by the unit water demand associated with a particular land use type. Unit water demand or annual water duty is defined as the amount of water used per acre per year. Table C.1 presents water duties used in estimating water demand as part of this analysis (KRCD, 1993). These water duties are based on applied water requirements.

The current (1999-2000) land use in the Lower Kings Basin is shown in Figure C.1. As shown in Figure C.1, agriculture is the predominant land use in the study area. Urban areas are the cities of San Joaquin (A1), Riverdale (B1), Lemoore (C), Raisin City (A), Lanare (B1), Laton (B1), and Tranquility (A1). The acreages and water demand for each WMA and land use type is shown in Table C.1.

The data shown in Figure C.1 was obtained from DWR, and is based on land use surveys conducted for Fresno County in 2000, Tulare County in 1999, and Kings County in 2003. The land use summary included in Table C.2 are based on a GIS analysis of the most current land use. Most of the study area is located within Fresno and Kings Counties, thus the estimates of land use acreage are representative of the 1999/2000 land use conditions.

PROJECTED LAND AND WATER USE

Land use is expected to convert from agricultural uses to urban uses near or adjacent to existing cities and towns over the next 20 to 30 years. In addition, it is expected that cropping patterns/crop mix will change over the next 20 to 30 years and that undeveloped area will be developed for urban use.

Figure C.2 shows the projected land use for the year 2030. Projected land use was based on information obtained from local land use planning agencies (i.e., Fresno County Local Agency

Table C.1. Current Land Use Summary

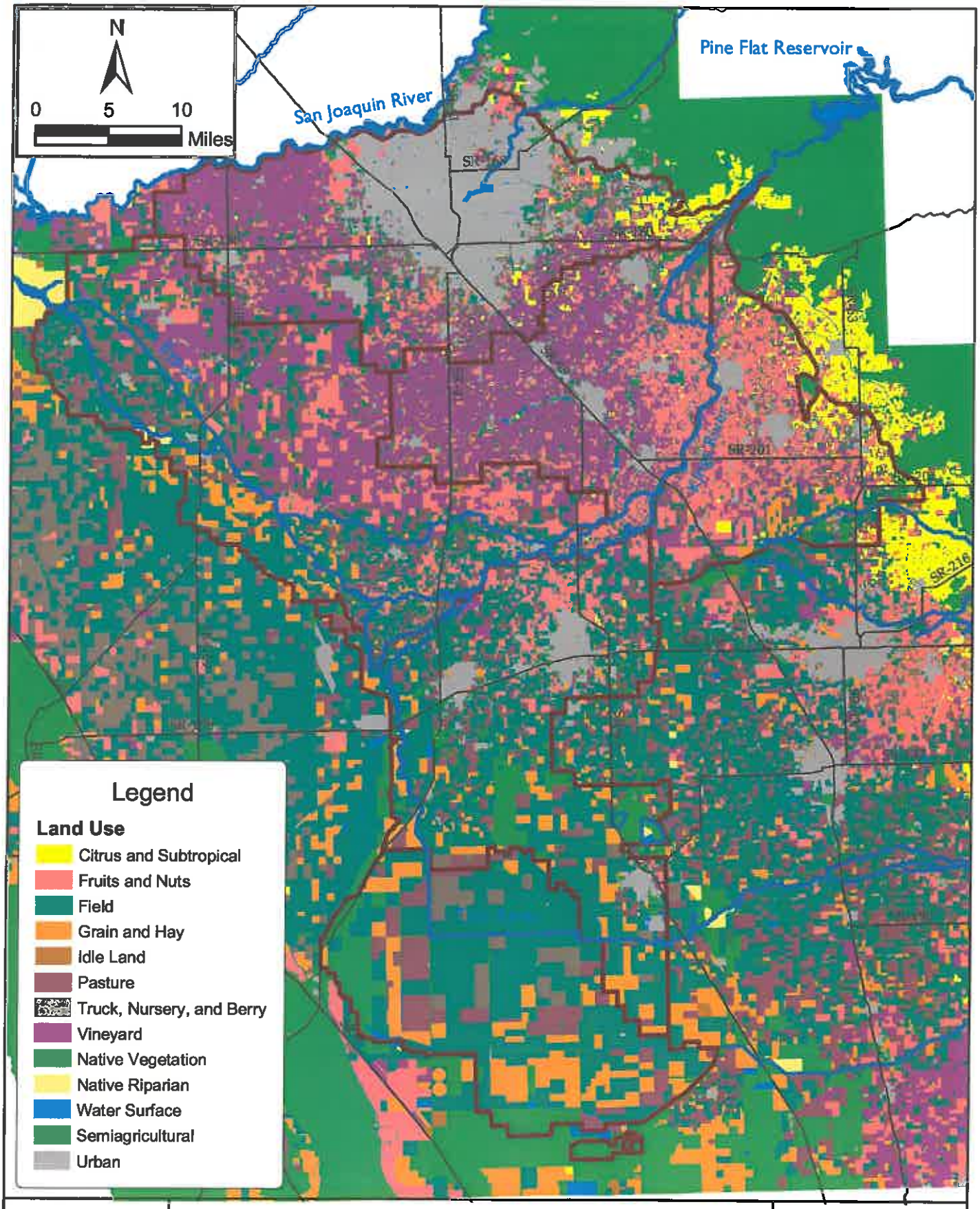
		WMA A		WMA A1		WMA B		WMA B1		WMA B2		WMA C		WMA C1	
	Water Duty	Area	Water Demand	Area	Water Demand	Area	Water Demand	Area	Water Demand	Area	Water Demand	Area	Water Demand	Area	Water Demand
	AF/ac	ac	AF	ac	AF	ac	AF	ac	AF	ac	AF	ac	AF	ac	AF
Agriculture		**104,960**	**318,081**	**36,644**	**117,255**	**56,533**	**160,661**	**48,796**	**155,736**	**33,800**	**107,849**	**46,542**	**140,253**	**18,641**	**49,676**
Citrus and Subtropical	3.5	36	128	0	0	0	0	23	79	47	164	76	266	15	54
Deciduous	4.0	19,197	76,790	912	3,646	4,490	17,959	6,993	27,973	13,080	52,319	1,547	6,187	0	0
Field Crops	2.5	17,946	44,864	21,392	53,479	24,579	61,447	22,177	55,443	3,194	7,984	27,066	67,665	8,830	22,075
Grain	1.5	2,157	3,236	298	446	9,199	13,799	2,712	4,068	85	127	4,134	6,201	4,971	7,457
Idle	0.0	463	0	0	0	570	0	609	0	353	0	0	0	0	0
Pasture and Alfalfa	5.1	15,945	81,320	10,332	52,694	9,823	50,099	11,363	57,949	3,020	15,402	10,339	52,731	3,436	17,525
Semi Ag	2.0	2,689	5,378	463	926	841	1,682	3,106	6,213	1,066	2,132	1,373	2,746	334	669
Truck and Nursery	1.8	1,289	2,321	2,817	5,070	989	1,780	318	573	159	285	319	575	1,054	1,897
Vineyards	2.3	45,237	104,045	432	993	6,041	13,895	1,495	3,439	12,798	29,435	1,688	3,883	0	0
Other		**4,899**	**0**	**1,275**	**0**	**2,600**	**0**	**3,493**	**0**	**283**	**0**	**6,100**	**0**	**2,070**	**0**
Native Vegetation	0.0	4,562	0	564	0	394	0	2,475	0	214	0	4,625	0	1,491	0
Native Riparian	0.0	122	0	448	0	1,698	0	369	0	7	0	712	0	270	0
Water Surface	0.0	215	0	263	0	509	0	648	0	63	0	764	0	309	0
Municipal		**2,408**	**3,051**	**788**	**1,392**	**725**	**1,237**	**1,810**	**3,143**	**375**	**584**	**4,686**	**7,602**	**372**	**511**
Developed	2.0	1525	3052	696	1392	620	1237	1572	3144	292	585	3801	7601	256	511
Vacant	0.0	883	0	91	0	106	0	239	0	83	0	885	0	117	0
Average Water Duty		**2.9**		**3.1**		**2.7**		**2.9**		**3.1**		**2.6**		**2.4**	
TOTAL		**112,268**	**321,133**	**38,707**	**118,647**	**59,858**	**161,898**	**54,099**	**158,880**	**34,459**	**108,433**	**57,328**	**147,854**	**21,083**	**50,187**

Table C.2. Projected Land Use Summary

		WMA A		WMA A1		WMA B		WMA B1		WMA B2		WMA C		WMA C1	
	Water Duty	Area	Water Demand	Area	Water Demand	Area	Water Demand	Area	Water Demand	Area	Water Demand	Area	Water Demand	Area	Water Demand
	AF/ac	ac	AF	ac	AF	ac	AF	ac	AF	ac	AF	ac	AF	ac	AF
Agriculture		**104,552**	**317,011**	**36,197**	**115,683**	**56,414**	**160,364**	**45,061**	**143,697**	**33,800**	**107,849**	**39,757**	**116,613**	**18,641**	**49,676**
Citrus and Subtropical	3.5	36	128	0	0	0	0	23	79	47	164	71	249	15	54
Deciduous	4.0	19,132	76,527	872	3,486	4,490	17,959	6,611	26,445	13,080	52,319	1,160	4,639	0	0
Field Crops	2.5	17,919	44,796	21,138	52,844	24,460	61,150	20,440	51,100	3,194	7,984	23,629	59,071	8,830	22,075
Grain	1.5	2,157	3,236	298	446	9,199	13,799	2,536	3,804	85	127	3,914	5,871	4,971	7,457
Idle	0.0	463	0	0	0	570	0	485	0	353	0	0	0	0	0
Pasture and Alfalfa	5.1	15,938	81,285	10,181	51,922	9,823	50,098	10,311	52,586	3,020	15,402	7,863	40,103	3,436	17,525
Semi Ag	2.0	2,675	5,350	461	921	841	1,682	2,885	5,770	1,066	2,132	1,122	2,244	334	669
Truck and Nursery	1.8	1,289	2,321	2,817	5,070	989	1,780	318	573	159	285	319	575	1,054	1,897
Vineyards	2.3	44,943	103,369	432	993	6,041	13,895	1,452	3,340	12,798	29,435	1,679	3,861	0	0
Other		**4,899**	**0**	**1,269**	**0**	**2,600**	**0**	**3,158**	**0**	**283**	**0**	**4,480**	**0**	**2,070**	**0**
Native Vegetation	0.0	4,562	0	558	0	394	0	2,182	0	214	0	3,018	0	1,491	0
Native Riparian	0.0	122	0	448	0	1,698	0	327	0	7	0	699	0	270	0
Water Surface	0.0	215	0	263	0	509	0	648	0	63	0	764	0	309	0
Municipal		**2,816**	**3,867**	**1,241**	**2,327**	**844**	**1,475**	**5,880**	**11,363**	**375**	**584**	**13,091**	**25,904**	**372**	**511**
Developed	2.0	1525	3052	696	1392	620	1237	1572	3144	292	585	3801	7601	256	1525
Vacant	0.0	883	0	78	0	106	0	199	0	83	0	139	0	117	0
Average Water Duty		**3.0**		**3.0**		**3.0**		**3.0**		**3.0**		**2.0**		**2.0**	
TOTAL		**112,268**	**320,878**	**38,707**	**118,010**	**59,858**	**161,839**	**54,099**	**155,060**	**34,459**	**108,433**	**57,328**	**142,517**	**21,083**	**50,187**

Formation Commission (LAFCO) and individual cities)(Kings Co. Planning Agency, 2005; KRCD, 2004). The Fresno County LAFCO is responsible for managing growth in urban areas within Fresno County. Each city within Fresno County has a sphere of influence (SOI) that defines a boundary for projected urban growth.

The purposes of analyzing projected land use, it was assumed that the crop mix for agricultural areas remained unchanged (except in those areas converted to urban land use). Table C.2 shows the projected agricultural, urban, and other land use areas and their associated demands for each WMA in the Lower Kings Basin.



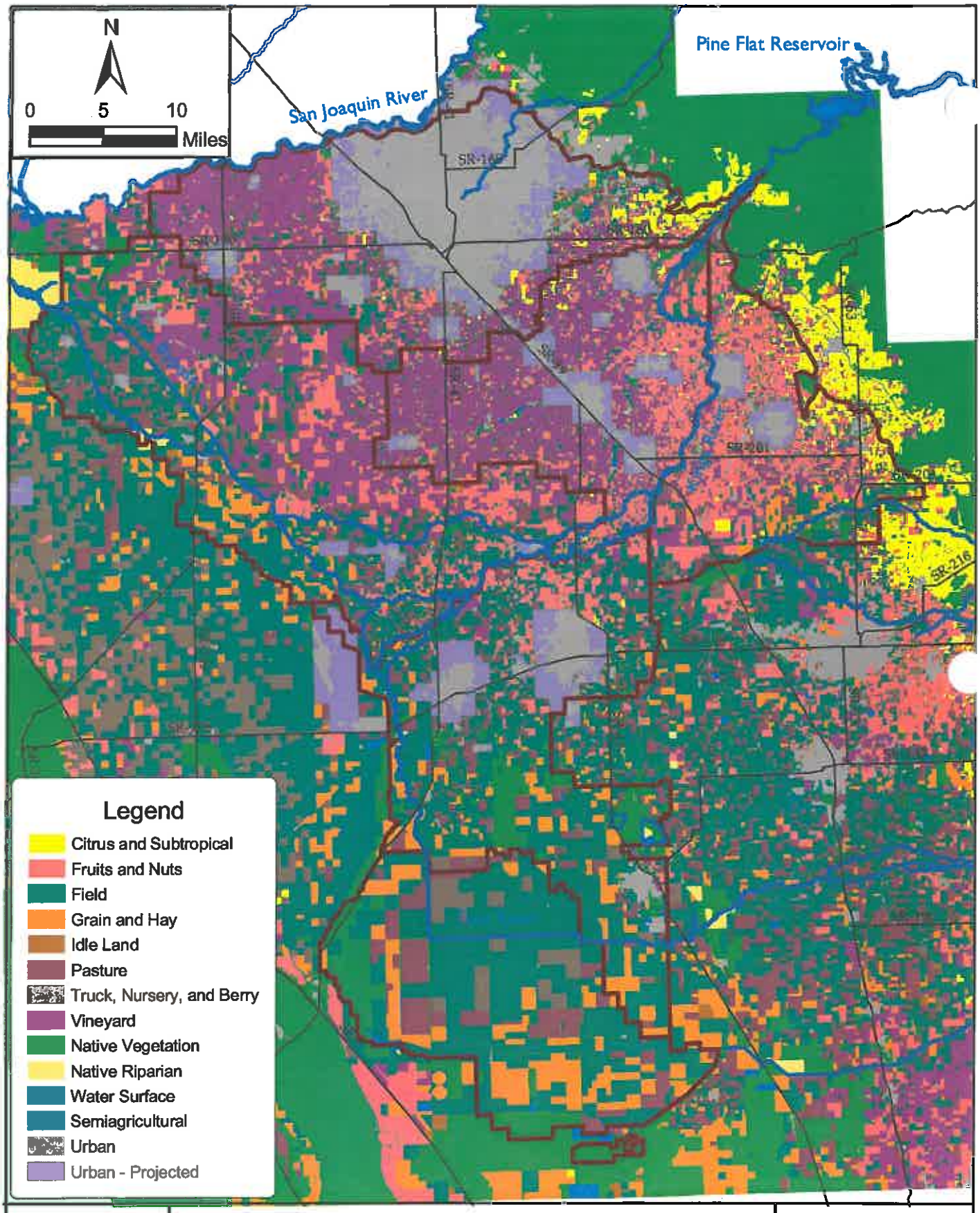
WRIME

Lower Kings Basin GWMP Update

Detailed Land Use

April 2005

Figure C.1



WRIME

Lower Kings Basin GWMP Update

Detailed Projected Land Use

April 2005

Figure C.2

D.1 GROUNDWATER OCCURRENCE AND MOVEMENT

This appendix documents the analysis of groundwater resources in the Lower Kings Basin. Evaluations were made of hydrographs, groundwater trends, and changes in groundwater storage. The analyses were used to support the conclusions and management actions made in the Lower Kings Basin GWMP and during review of the previous groundwater management plans. The analyses were also used to establish Basin Management Objectives, action thresholds, and management criteria in the latest Lower Kings Basin groundwater management plan. All referenced figures are included at the end of the appendix.

Groundwater is generally unconfined within the alluvial fan deposits (older and younger alluvium). Groundwater in the deeper continental deposits is unconfined to semiconfined with the degree of confinement generally increasing with depth. Groundwater conditions at specific locations vary from regional patterns because of localized hydrogeologic conditions and groundwater pumping. Figure D.1 shows depth to groundwater contours in the Lower Kings Basin for spring 2003. Data to develop groundwater related contours were obtained from DWR (California Water Data Library). The depth to groundwater in spring 2003 varies from less than 40 feet near the Kings River at the eastern edge of the basin to more than 200 feet at several different locations. West in the Lower Kings Basin, the depth to groundwater near Mendota Pool is less than 20 feet.

Groundwater moves from sources of recharge to sources of discharge and/or withdrawal. Thus, recharge areas generally have higher groundwater elevations than do discharge areas or areas with high volumes of withdrawal. Figure D.2 shows groundwater elevation contours for spring 1950. Figure D.2 show that the regional groundwater flow pattern is from east to west. Figures D.3 through D.7 show groundwater level contours in subsequent years. The highest groundwater levels are located along the eastern boundary of the Lower Kings Basin. The lowest groundwater elevations are located at the Raisin City.

Groundwater pumping has altered the natural flow of the groundwater system and cones of depression have formed in areas that don't have sufficient recharge. The most pronounced of these areas is in Raisin City WD. Additionally, there are several smaller cones of depressions in and near the Lower Kings Basin due to smaller scale withdrawals of groundwater. There are few groundwater mounds and they are associated with areas of recharge.

Since 1989, KRCD has used groundwater level data, both from their monitoring efforts and from DWR, to produce annual groundwater reports. These reports include regional water level maps showing historical and existing groundwater levels. Figure D.2 shows groundwater conditions before significant groundwater pumping occurred in the basin. The spring 1950 groundwater levels were compared with the spring 2000 groundwater levels (Figure D.7) and the difference between groundwater levels is shown in Figure D.8. Figure D.8 shows that there has been significant reduction in groundwater levels in the Lower Kings Basin

Figure D.9 shows the location of 965 wells in the Lower Kings Basin. These wells represent the number of wells with water level measurement data. Of the 965 wells in the Lower Kings Basin, 566 of them do not have measurement more recent than 2000 and 590 of them do not have more than ten recorded measurements.

D.2 ANALYSIS OF GROUNDWATER LEVELS

The purpose of this analysis was to evaluate the groundwater conditions in the Lower Kings Basin. The process for conducting the analysis included:

1. Locating wells within the different planning areas within the Lower Kings Basin;
2. Identifying groundwater wells with a record of water level measurements;
3. Applying selection criteria;
4. Obtaining well construction logs for selected wells;
5. Calculating the average water level measurements using wells located within a specific planning area. Two averages per water year were calculated. An average water level was calculated for measurements taken between January and June (referred to as Spring average). The Fall average water level was calculated from measurements taken between July and December;
6. Preparing hydrographs of average groundwater levels were developed for planning area; and
7. Developing trend lines of average groundwater levels and forecast future groundwater levels.

DETAILS OF ANALYSIS

Groundwater level data were obtained the 965 wells listed above. The periods of record for these extended from the 1920s to present. Criteria were applied to determine which wells would be selected for additional analysis. These criteria were:

- The wells needed to have been measured for at least thirty years;

- Groundwater levels need to have been measured at least 40 times during the 30 year period; and
- Groundwater levels need to have been measured since 1999.

136 wells satisfied the aforementioned criteria and were used for additional analysis and evaluation. It was assumed that these 136 wells are representative of the groundwater conditions in their respective WMA. Well construction logs were obtained from DWR and the well construction depth and perforation intervals for the selected wells were recorded. Figure D.10 shows the location of the wells used in the analysis. Figures D.11 through D.25 show groundwater level hydrographs for the highlighted wells shown on D.10.

Figure D.26 through E.32 shows the resulting average groundwater level hydrograph for each area. The hydrographs, which start in 1950, are used to show the predominant trends in the groundwater system. A trend line was calculated based on the average groundwater levels. The trend lines were projected out to 2030 to provide a forecast of future groundwater levels. The figures also show features associated with the BMOs.

WMA A hydrograph shows that the average groundwater levels has declined from approximately 180 feet above mean sea level (msl) in 1950 to 60 feet in 2005. The groundwater level trend for WMA A indicates that groundwater levels will continue to decline into the future with groundwater levels of 30 feet above msl by the year 2030.

WMA A1 hydrograph shows that the average groundwater levels has declined from approximately 100 feet above mean sea level (msl) in 1950 to 80 feet in 2005. The groundwater level trend for WMA A1 does not appreciably decline into the future.

WMA B hydrograph shows that average groundwater levels has declined from 160 feet msl in 1950 to 20 feet msl in 2005. The groundwater level trend for WMA B indicates that groundwater levels will continue to decline into the future with groundwater levels of 30 feet below msl by the year 2030.

WMA B1 hydrograph shows that there has been 30 feet decline in groundwater levels since 1950. The groundwater level trend for WMA B1 indicates that groundwater levels will continue to decline another 5 to 10 feet by the year 2030.

WMA B2 hydrograph shows that the average groundwater level has declined from 230 msl feet in 1950 to 170 feet msl in 2001. The groundwater level trend for WMA B2 indicates that groundwater levels will continue to decline 10 feet by 2030.

WMA C hydrograph shows that the average groundwater level has declined over 100 feet since 1950. The hydrograph shows that the greatest decrease in groundwater levels has occurred in the last 15 years.

WMA C1 hydrograph shows an increase in groundwater level of over 150 feet when current levels are compared with 1960 groundwater levels. The hydrograph shows that groundwater levels are highly sensitive to groundwater pumping during drought conditions with groundwater levels declining nearly 200 feet during the 1976-77 drought. Groundwater levels nearly recovered to pre-1976 levels by 1978. Groundwater levels during the 1987-1992 drought decreased over 225 feet and then subsequently rebounded 200 feet by 2000.

The trend lines are linear statistical fits to the hydrograph data. It was assumed as part of developing the trend lines that historical pumping trends and water management practices do not change in the future. More extensive hydrologic modeling of the groundwater system would be a better method for evaluating future trends.

Review of the well description files and well logs associated with 136 wells was conducted to better document well completion depth and perforation intervals for each well, and so water levels could be interpreted in context of Lower Kings Basin hydrogeology. This information was used to determine which aquifer or aquifers the water levels represent. Well log and construction data were poor and records were incomplete.

Groundwater levels have continued to decline since the construction of Pine Flat Dam and the reoperation of the reservoir in 1964. Groundwater levels are responsive to flow conditions in the Kings River and the overall hydrology of the basin and the reservoir has improved groundwater conditions. The declining water levels indicate that groundwater is pumped at a faster rate than the naturally occurring groundwater recharge rate. It can interpreted from the groundwater level trend lines that groundwater levels will continue to decline into the future should there be no changes in current operation. Future groundwater levels are predicted to continue along historical patterns.

D.3 ANALYSIS OF GROUNDWATER STORAGE

The purpose for determining the change in groundwater storage was to provide a baseline condition for the groundwater system and to provide design targets for future groundwater recharge projects. The process for determining the change in groundwater storage was to:

- Determine the area, average specific yield, 1950, and 2005 average groundwater levels for each Water Management Area; and
- Multiply the difference in groundwater levels by area and specific yield.

Specific Yield data was obtained from KRCD (KRCD, 2005) and the distribution of specific yield in the Lower Kings Basin is shown in Figure D.33. Table D.1 shows the results of the analysis.

Table D.1. Summary of Groundwater Overdraft Evaluation

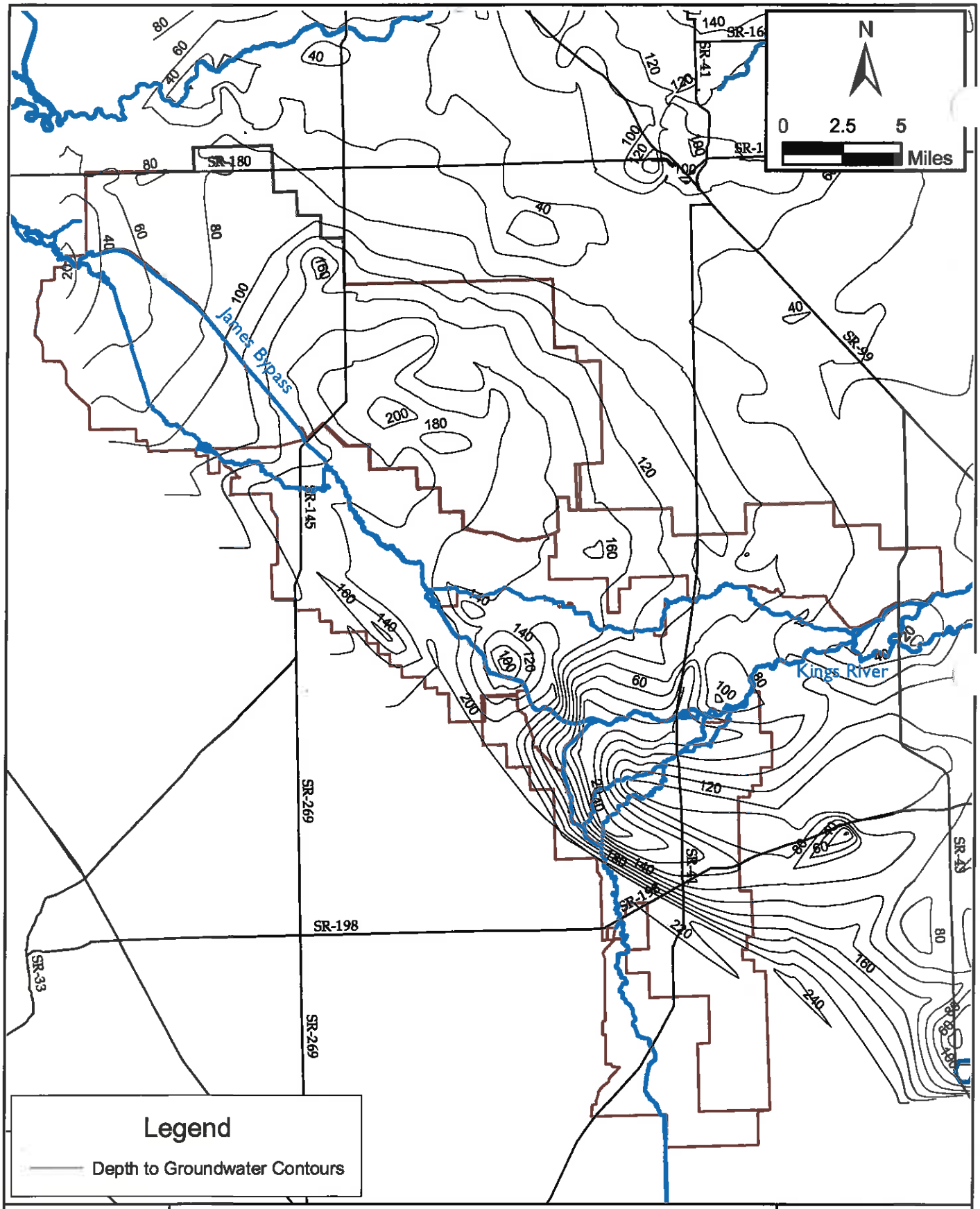
WMA	Area (acres)	Average Specific Yield (%)	Trend Line GW Level in 1950 (ft above msl)	Trend Line GW Level in 2005 (ft above msl)	Estimated Change in Storage (acre-feet)	Annual Change in Storage (Acre-feet/year)
A	112,268	12.0	184	47	-1,857,000	-34,000
A1	38,707	11.3	96	77	-82,000	-1,000
B2	34,459	15.5	215	168	-249,000	-5,000
B	59,858	11.5	158	36	-838,000	-15,000
B1	54,099	13.4	215	188	-194,000	-4,000
C	57,328	11.6	196	121	-501,000	-9,000

The negative change in storage indicates that groundwater was been removed from the groundwater system in excess of recharge. The change in storage also represents the potential volume of water that could be stored as part of future groundwater recharge programs. These potential programs will be evaluated using the integrated groundwater and surface water model planned for development by KRCD in conjunction with DWR.

D.4 SUMMARY OF FINDINGS

The following are findings from the conducted analyses:

1. Groundwater levels have declined steadily since 1950;
2. The construction and operation of Pine Flat Reservoir has not mitigated overdraft conditions in the Lower Kings Basin;
3. Groundwater levels are expected to decline in the future if current groundwater management practices remain unchanged;
4. Over 2 MAF of groundwater has been taken from storage and not recharged; and
5. The average annual rate of groundwater overdraft in the Lower Kings Basin 68 TAF/yr.

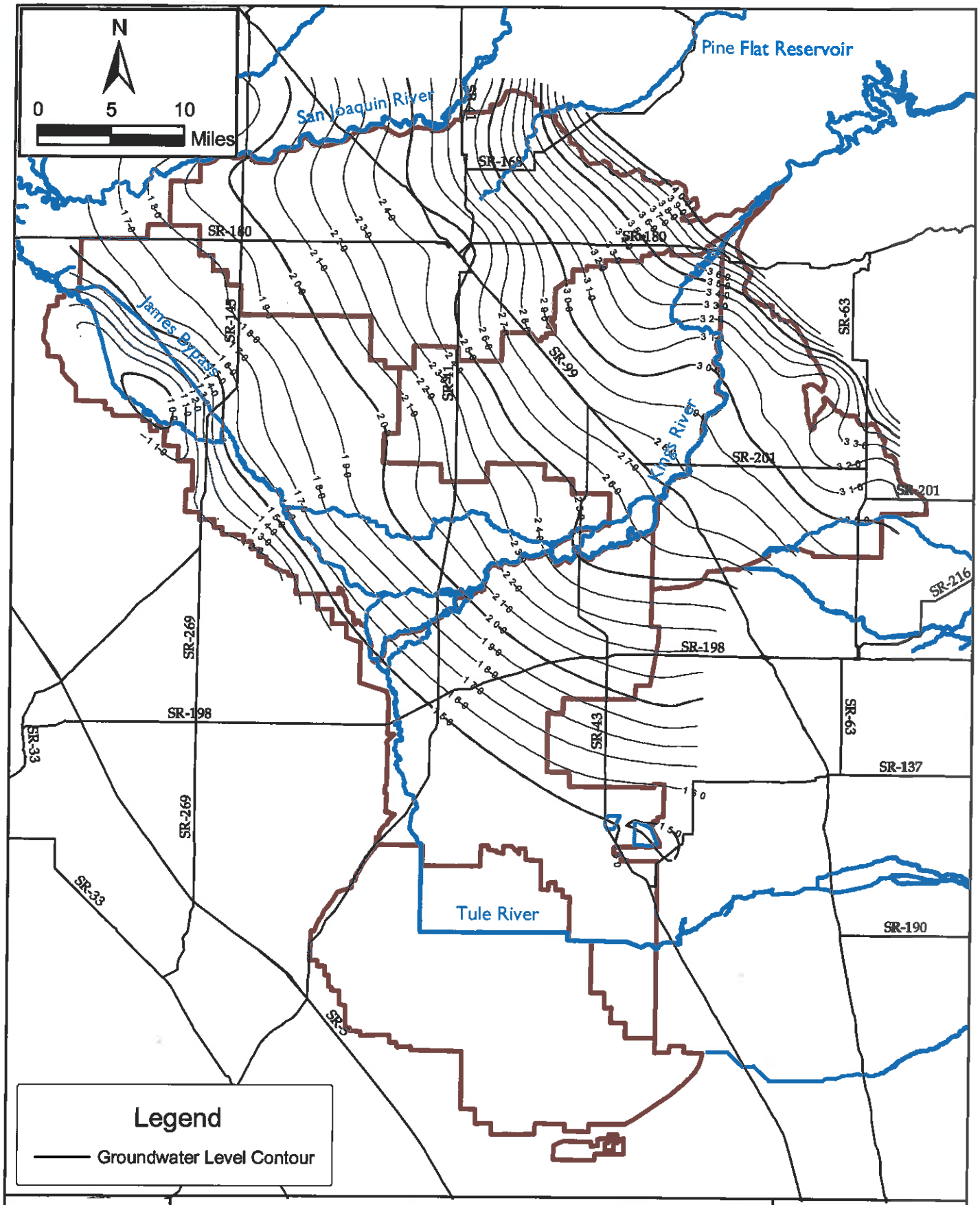


Lower Kings Basin GWMP Update

Depth to Groundwater Contours
Spring 2003

April 2005

Figure D.1

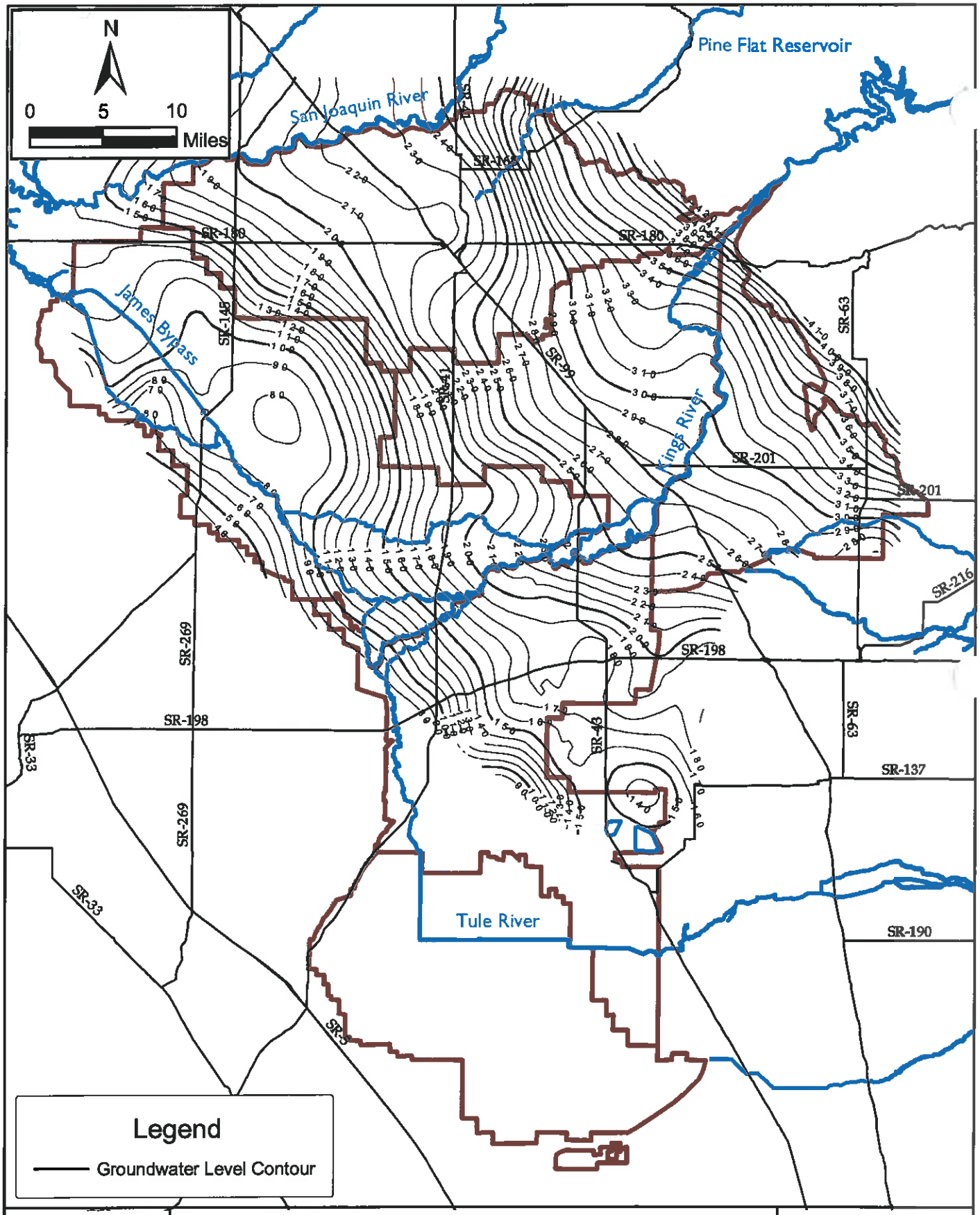


Lower Kings Basin GWMP Update

Groundwater Level Contours
Spring 1950

April 2005

Figure D.2

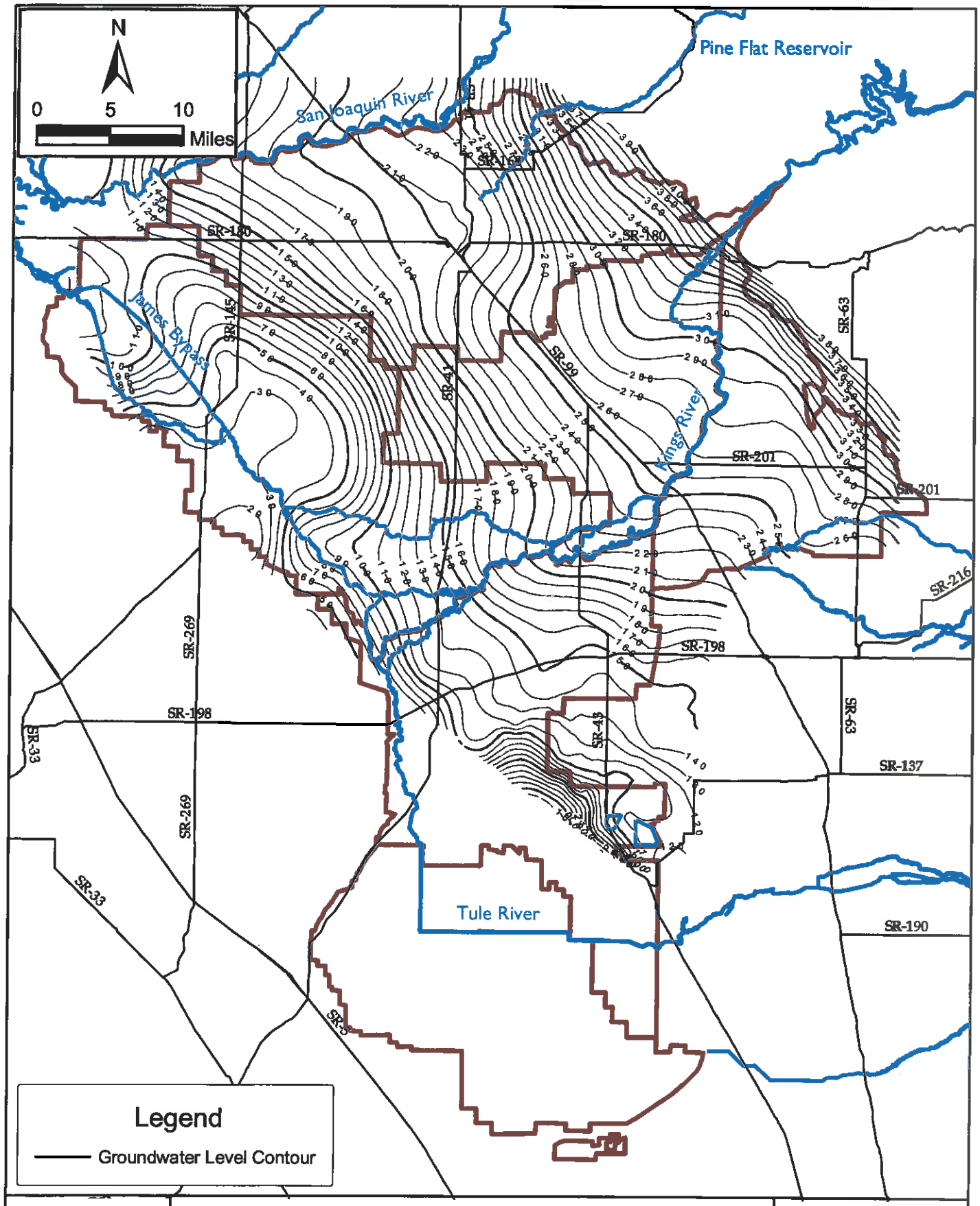


Lower Kings Basin GWMP Update

Groundwater Level Contours
Spring 1970

April 2005

Figure D.3

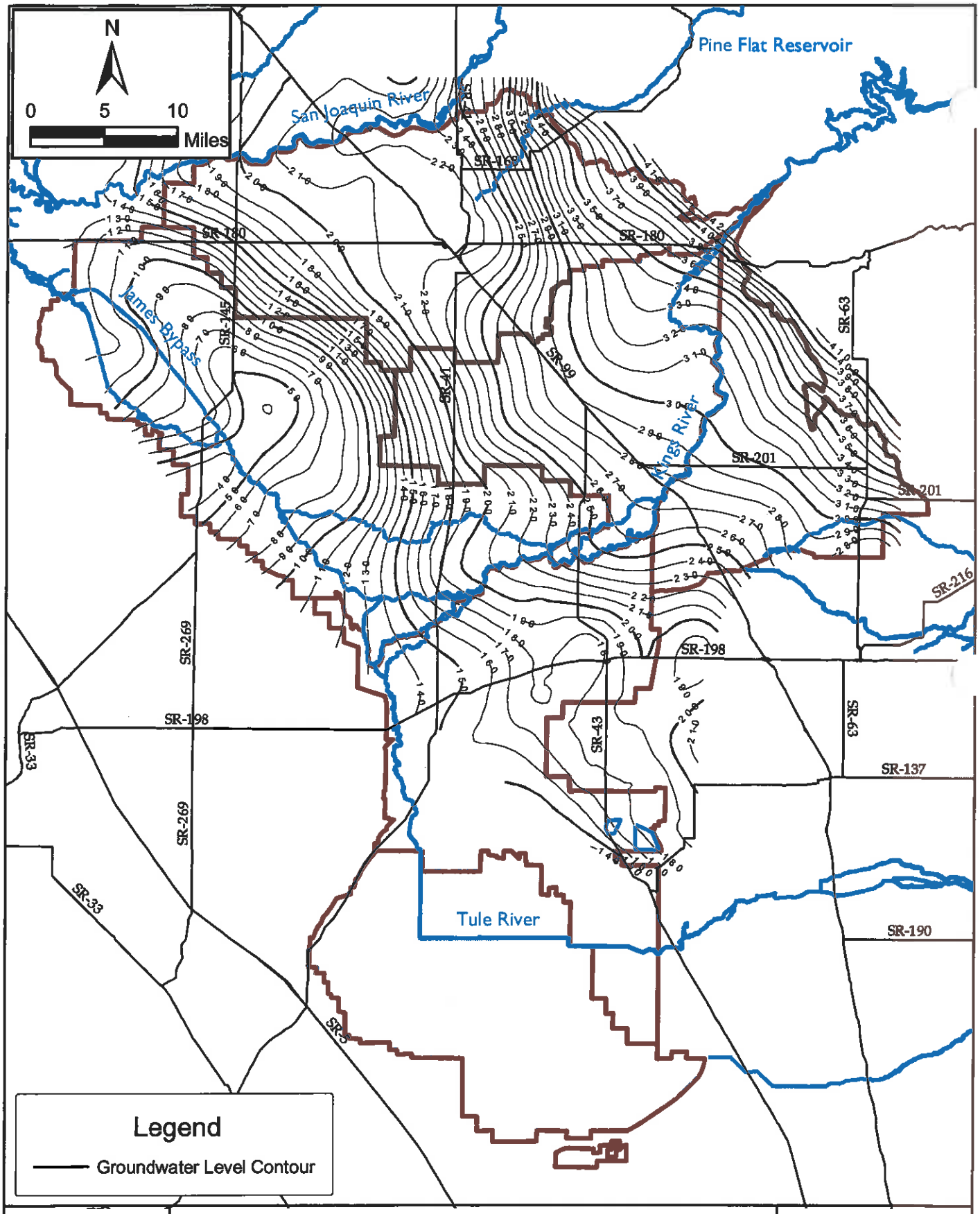


Lower Kings Basin GWMP Update

Groundwater Level Contours
Spring 1978

April 2005

Figure D.4

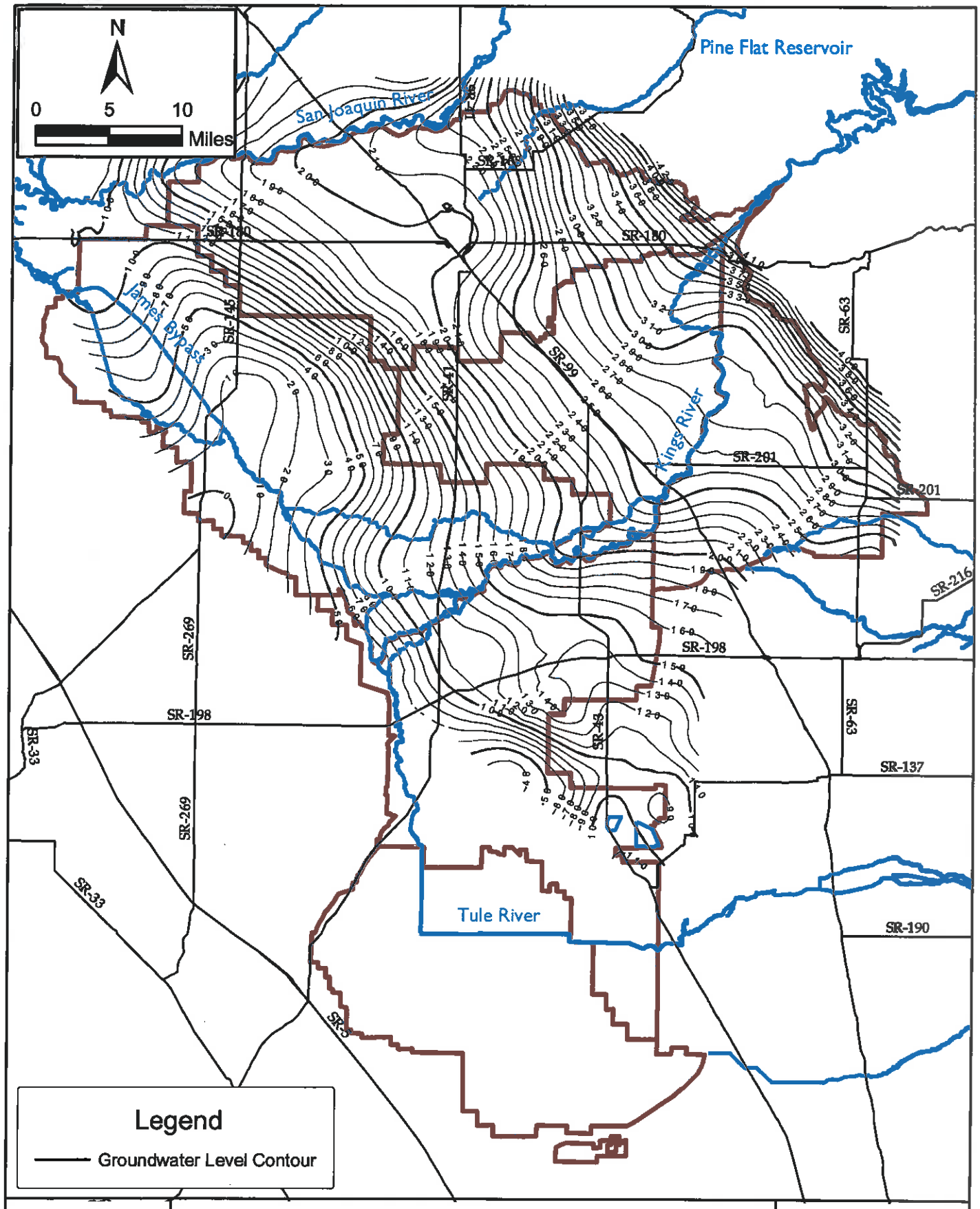


Lower Kings Basin GWMP Update

Groundwater Level Contours
Spring 1984

April 2005

Figure D.5

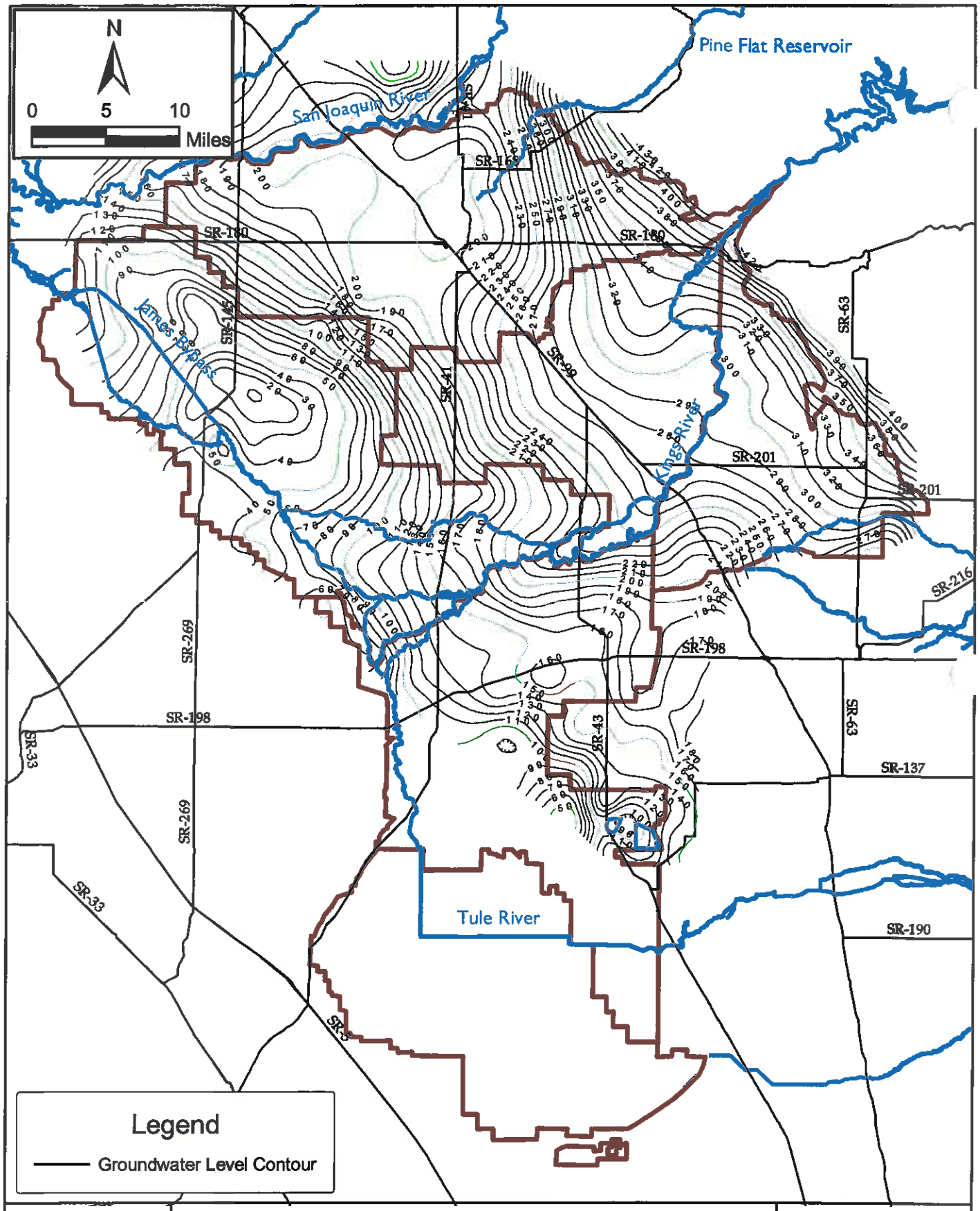


Lower Kings Basin GWMP Update

Groundwater Level Contours
Spring 1995

April 2005

Figure D.6

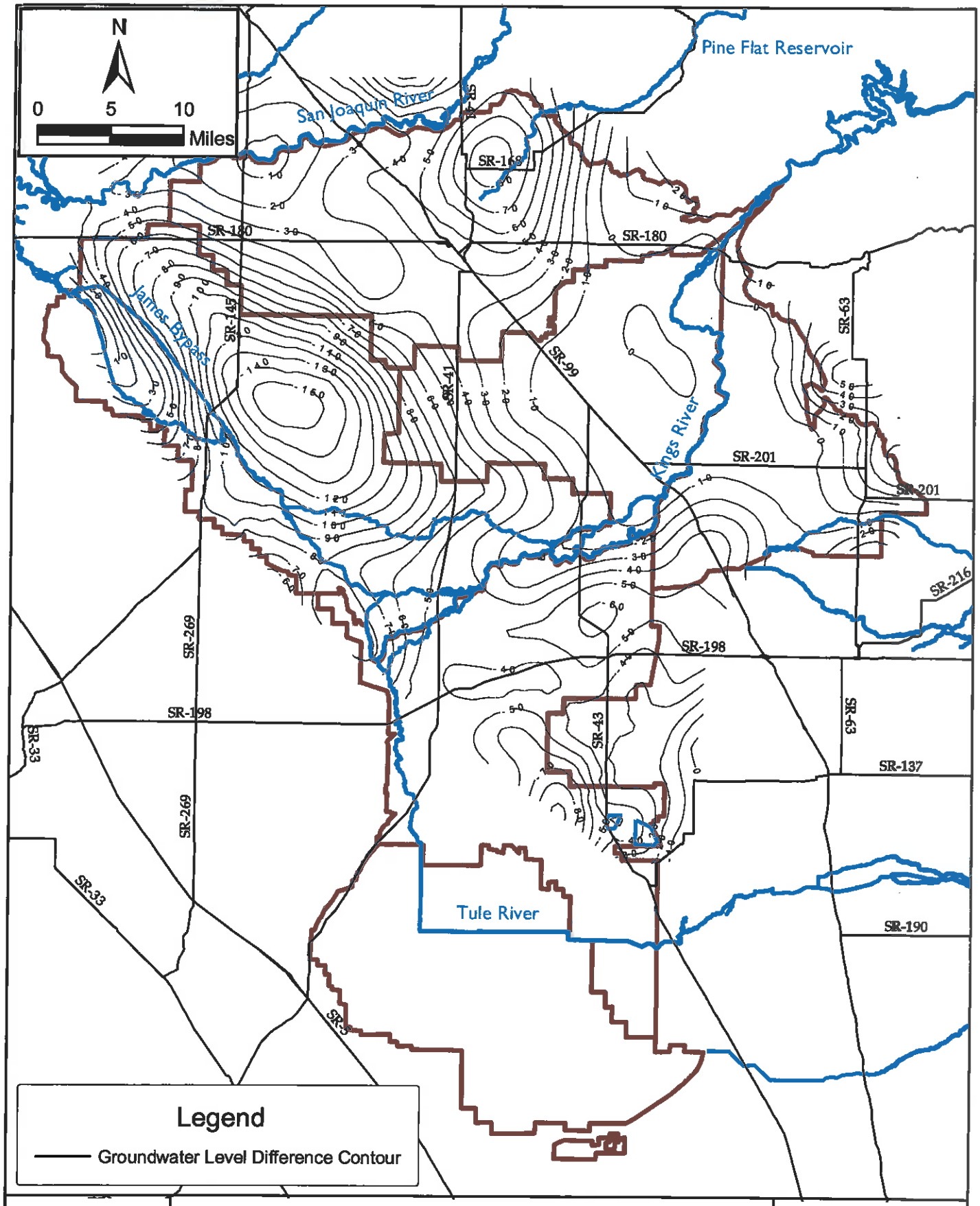


Lower Kings Basin GWMP Update

Groundwater Level Contours
Spring 2000

April 2005

Figure D.7

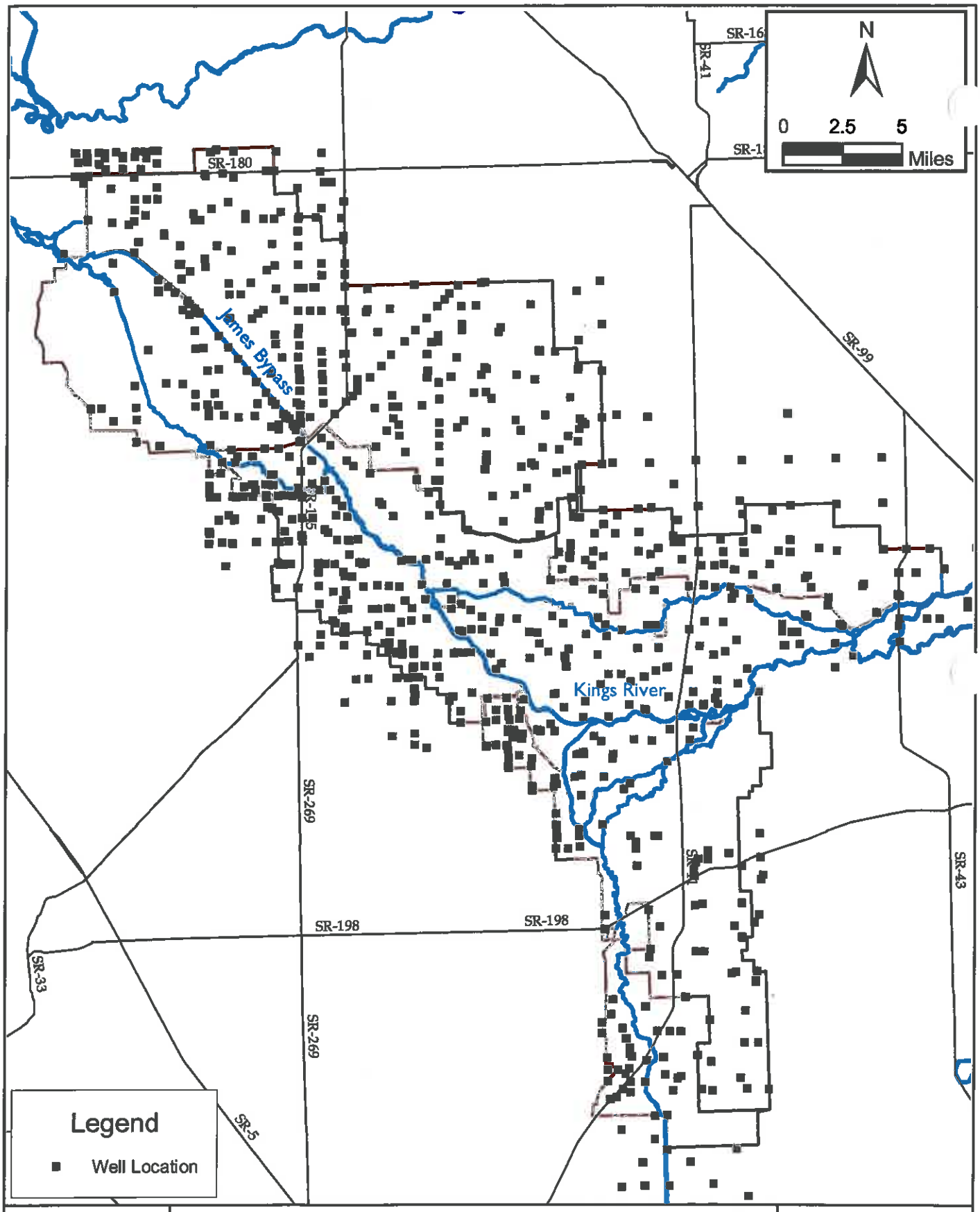


Lower Kings Basin GWMP Update

Change in Groundwater Levels Between Spring 2000 and Spring 1950

April 2005

Figure D.8

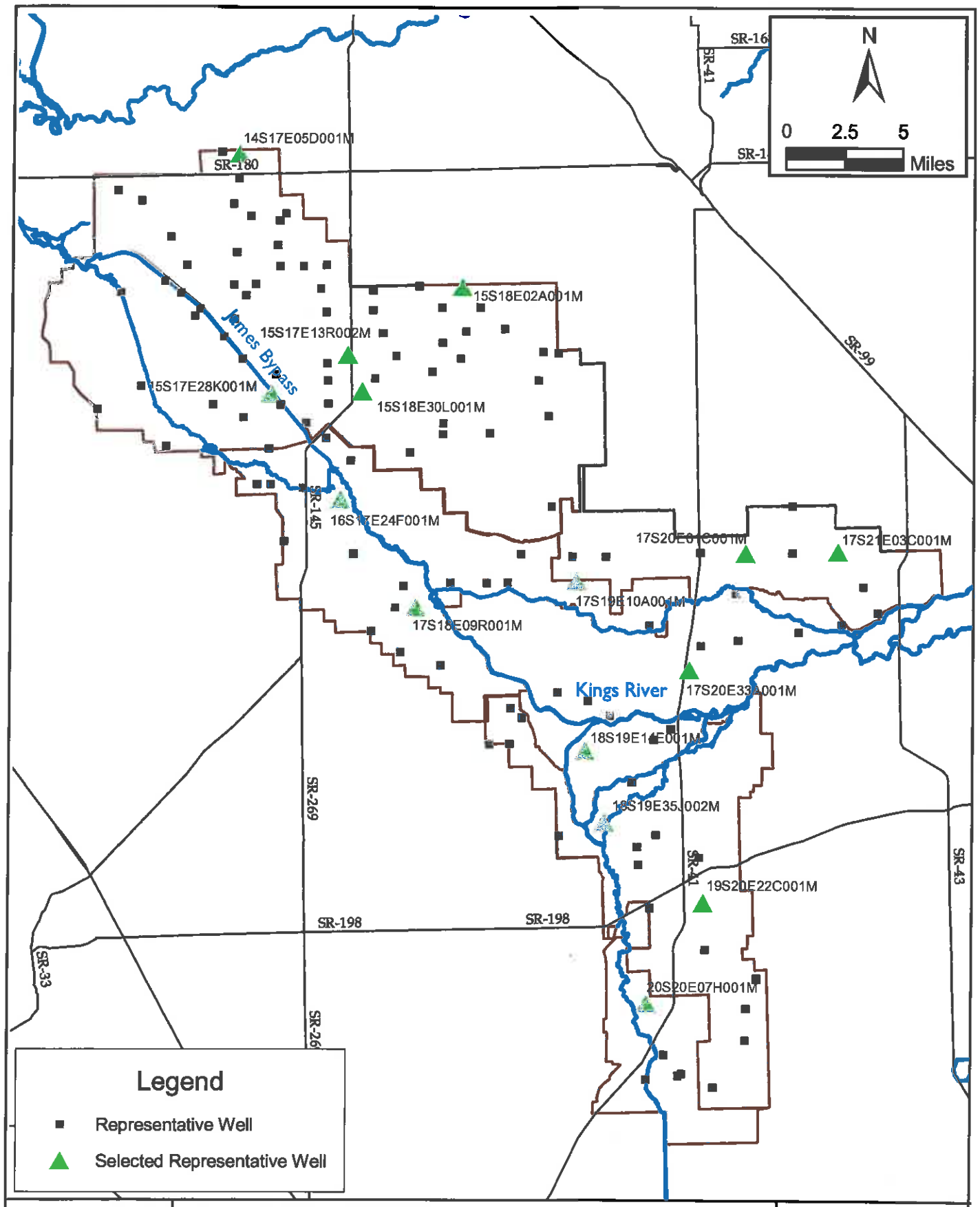


Lower Kings Basin GWMP Update

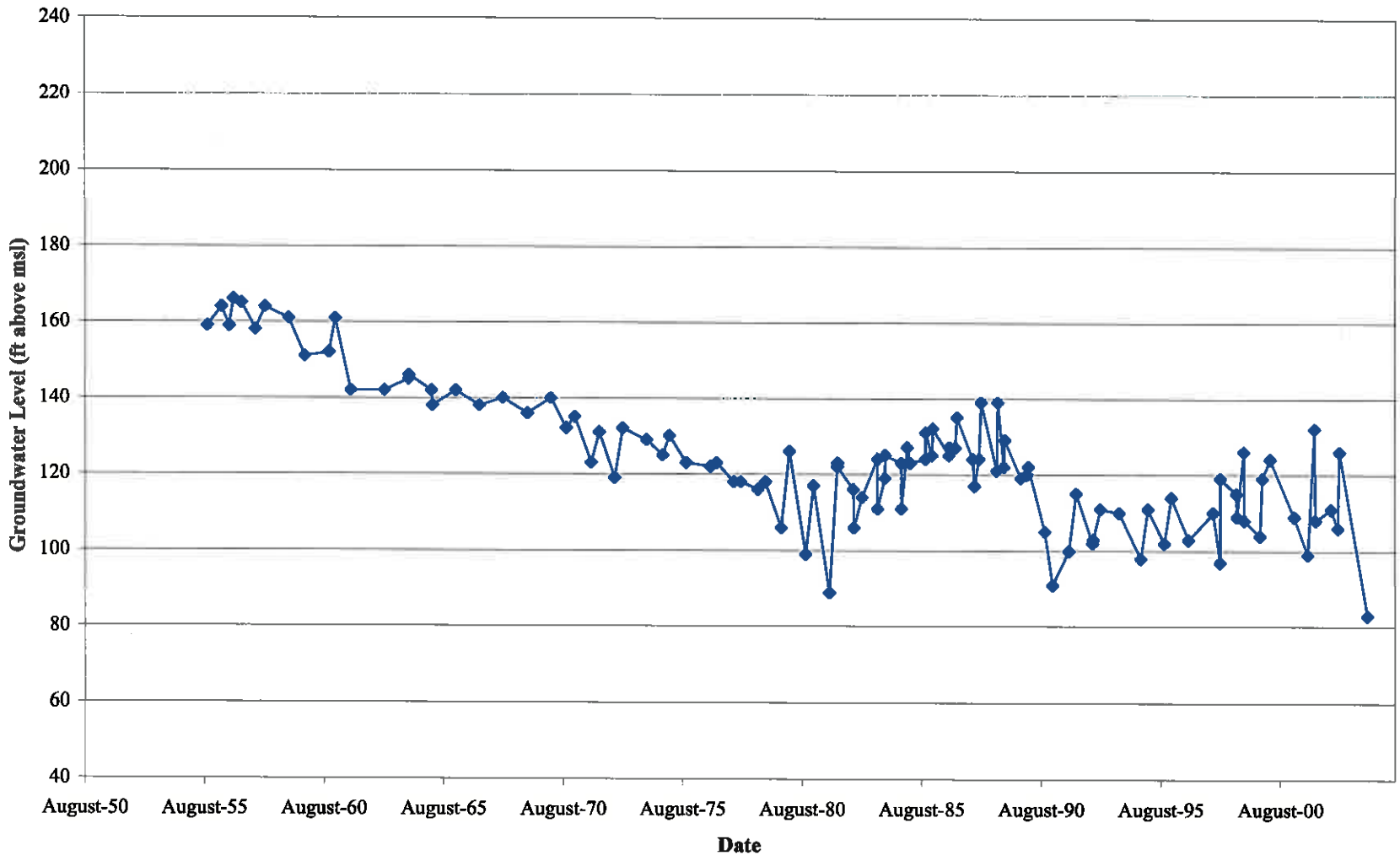
Location of Monitored Groundwater Wells

April 2005

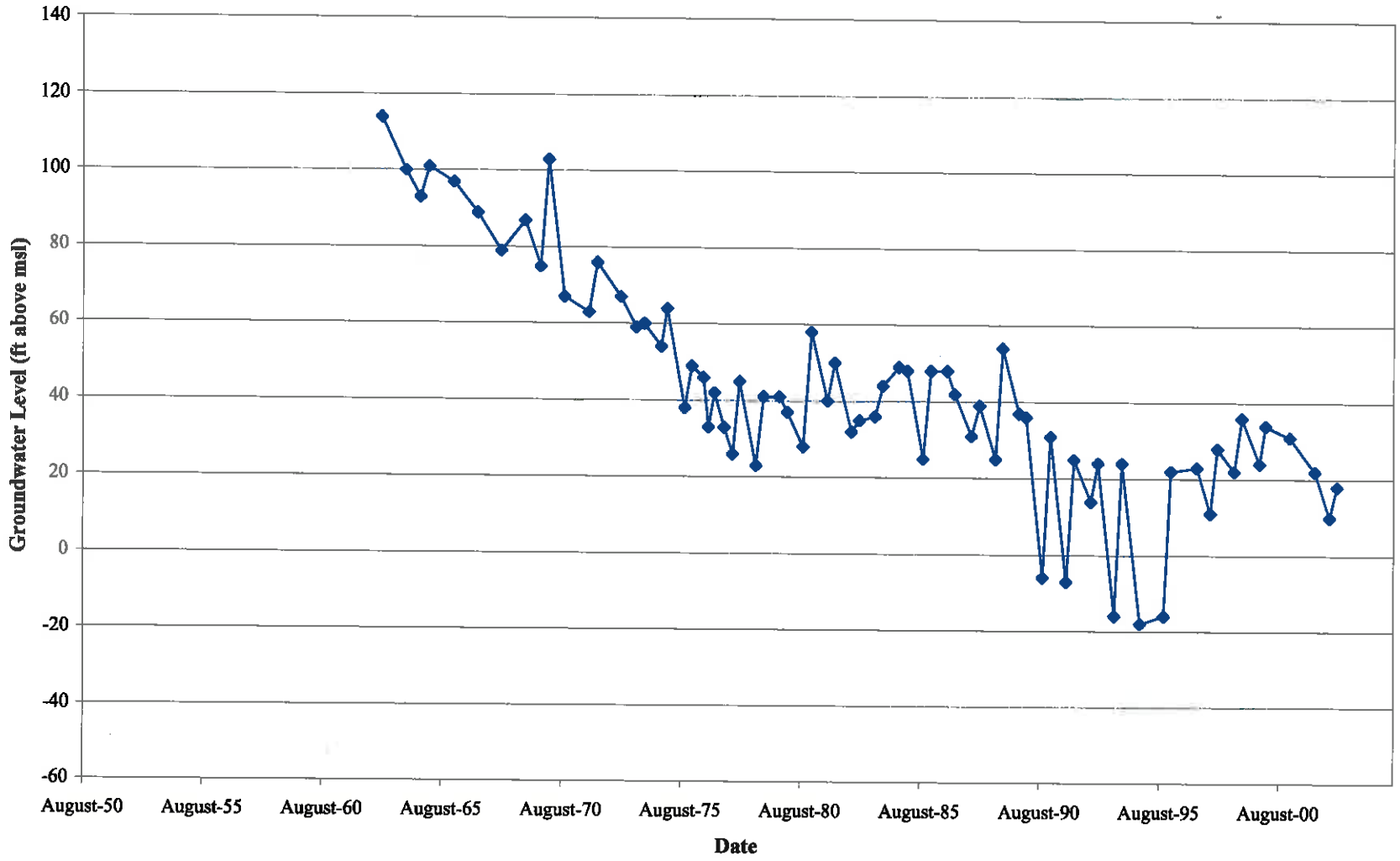
Figure D.9



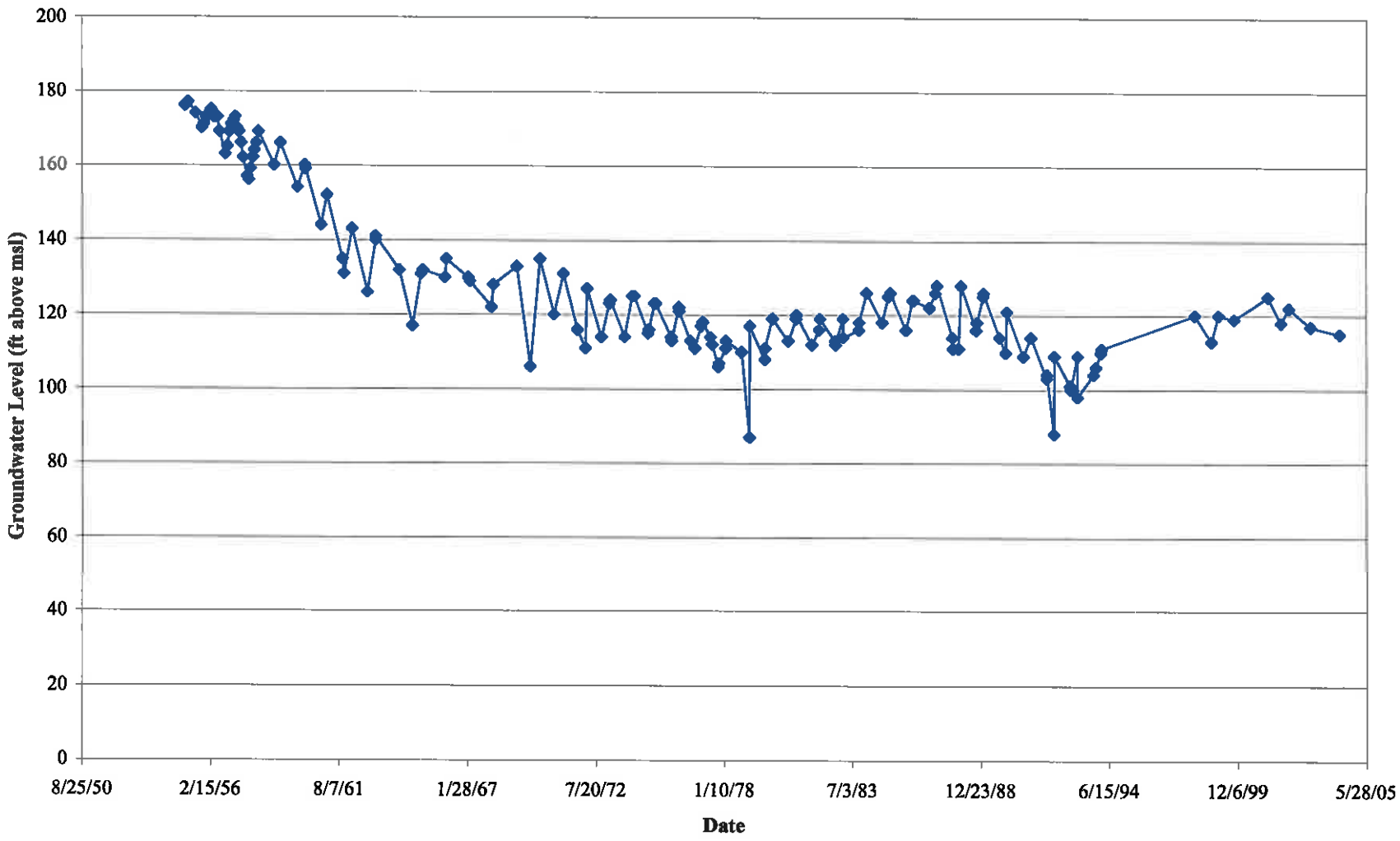
WRIME	Lower Kings Basin GWMP Update **Location of Representative Groundwater Wells**	April 2005 Figure D.10



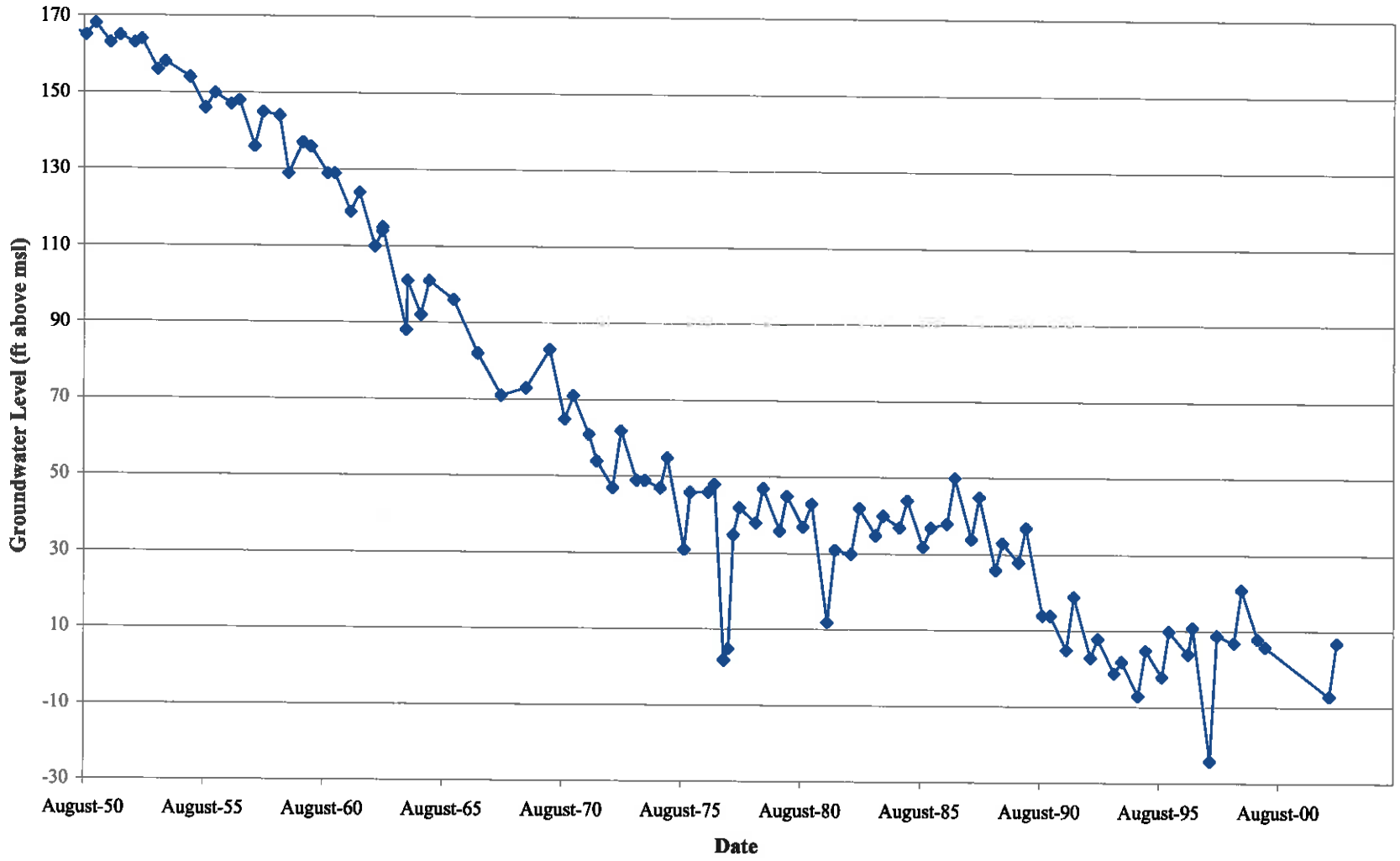
RIME	Lower Kings Basin GWMP Update	April 2005
	Groundwater Hydrograph for Well 14S17E05D001M in WMA A	FIGURE D.11



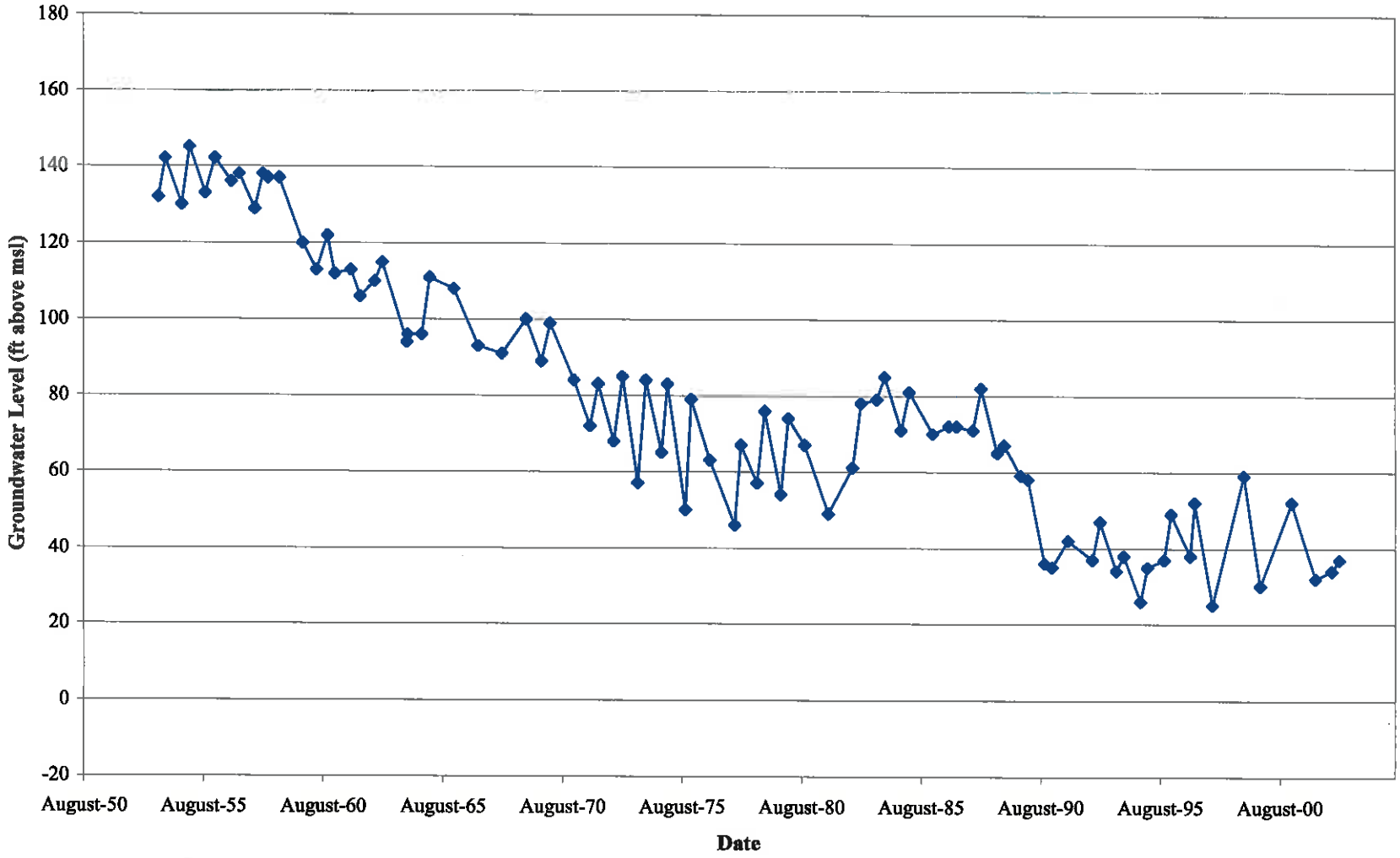
RIME	Lower Kings Basin GWMP Update	April 2005
	Groundwater Hydrograph for Well 15S17E13R002M in WMA A	FIGURE D.12



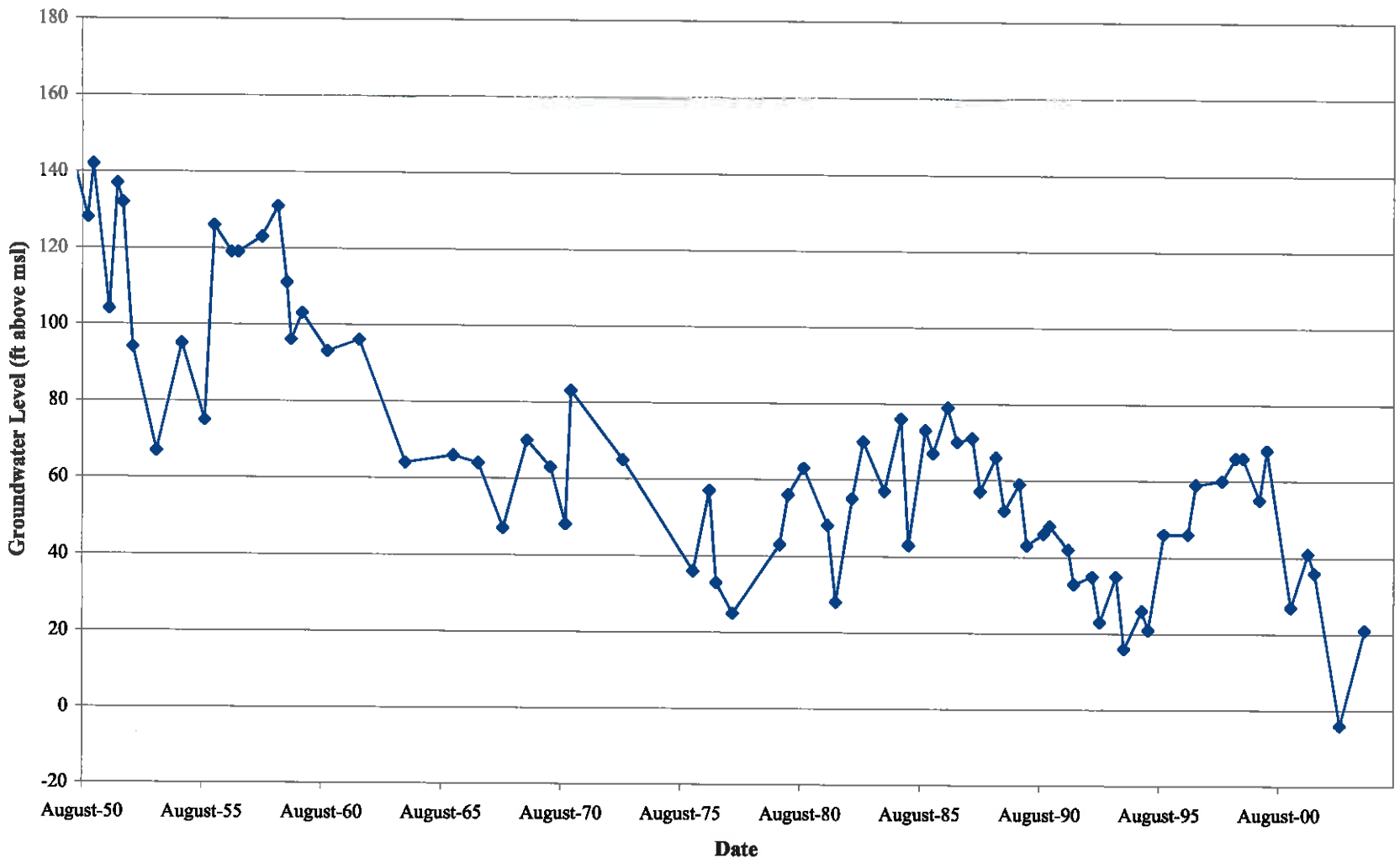
RIME	Lower Kings Basin GWMP Update	April 2005
	Groundwater Hydrograph for Well 15S18E02A001M in WMA A	FIGURE D.13



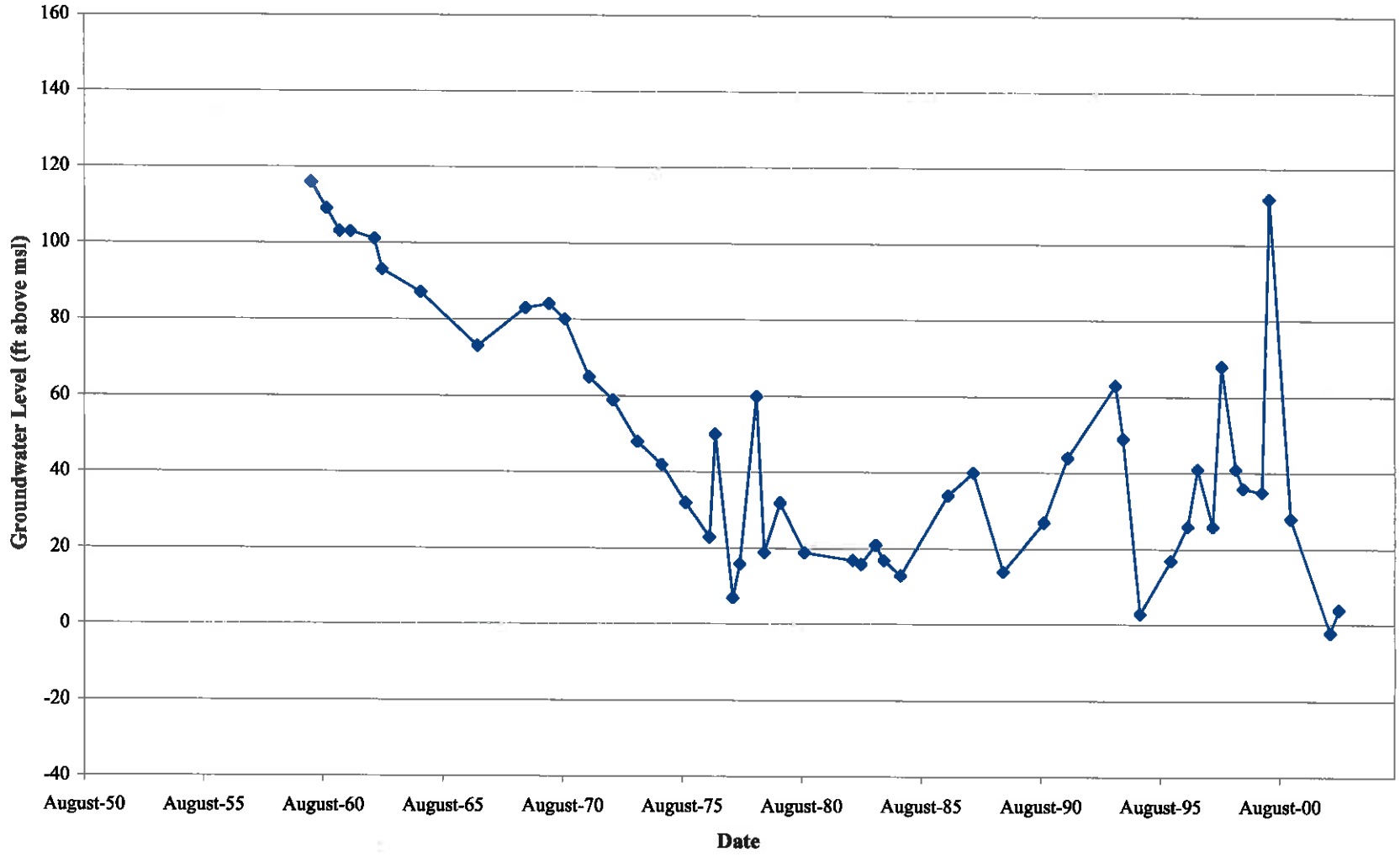
PRIME	Lower Kings Basin GWMP Update	April 2005
	Groundwater Hydrograph for Well 15S18E30L001M in WMA A	FIGURE D.14



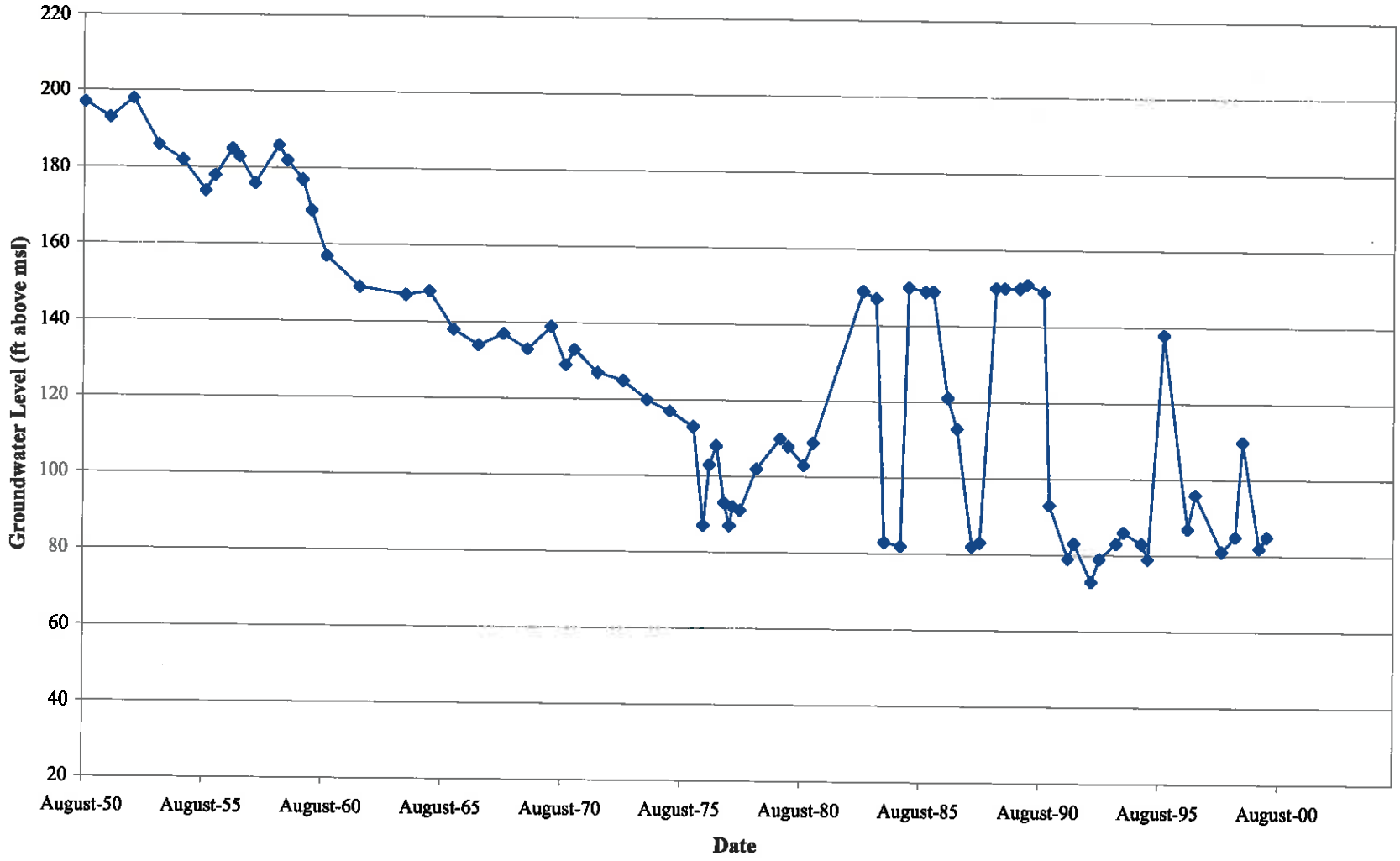
WRIME	Lower Kings Basin GWMP Update	April 2005
	Groundwater Hydrograph for Well 15S17E28K001M in WMA A1	FIGURE D.15



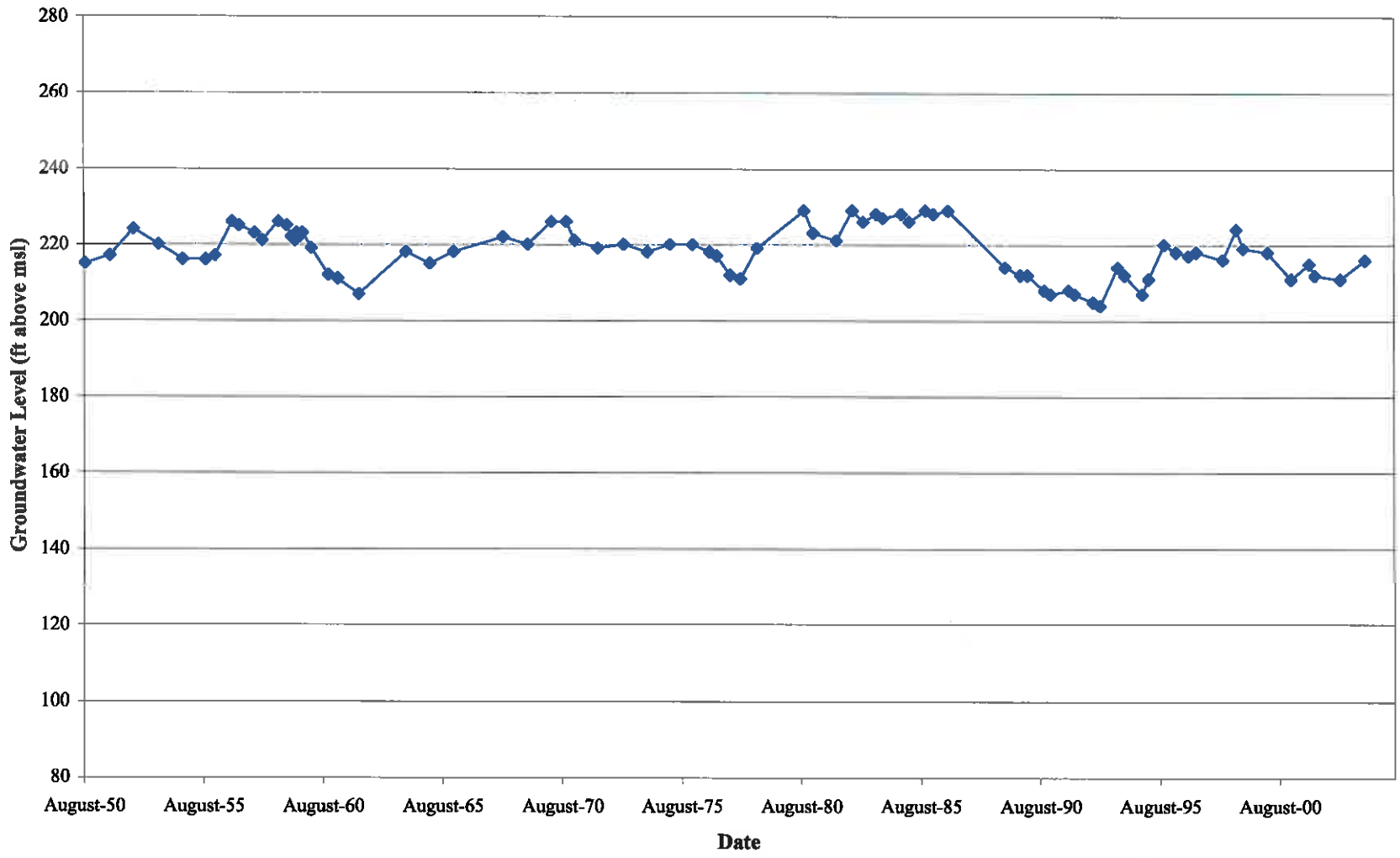
RIME	Lower Kings Basin GWMP Update	April 2005
	Groundwater Hydrograph for Well 17S18E09R001M in WMA B	FIGURE D.16



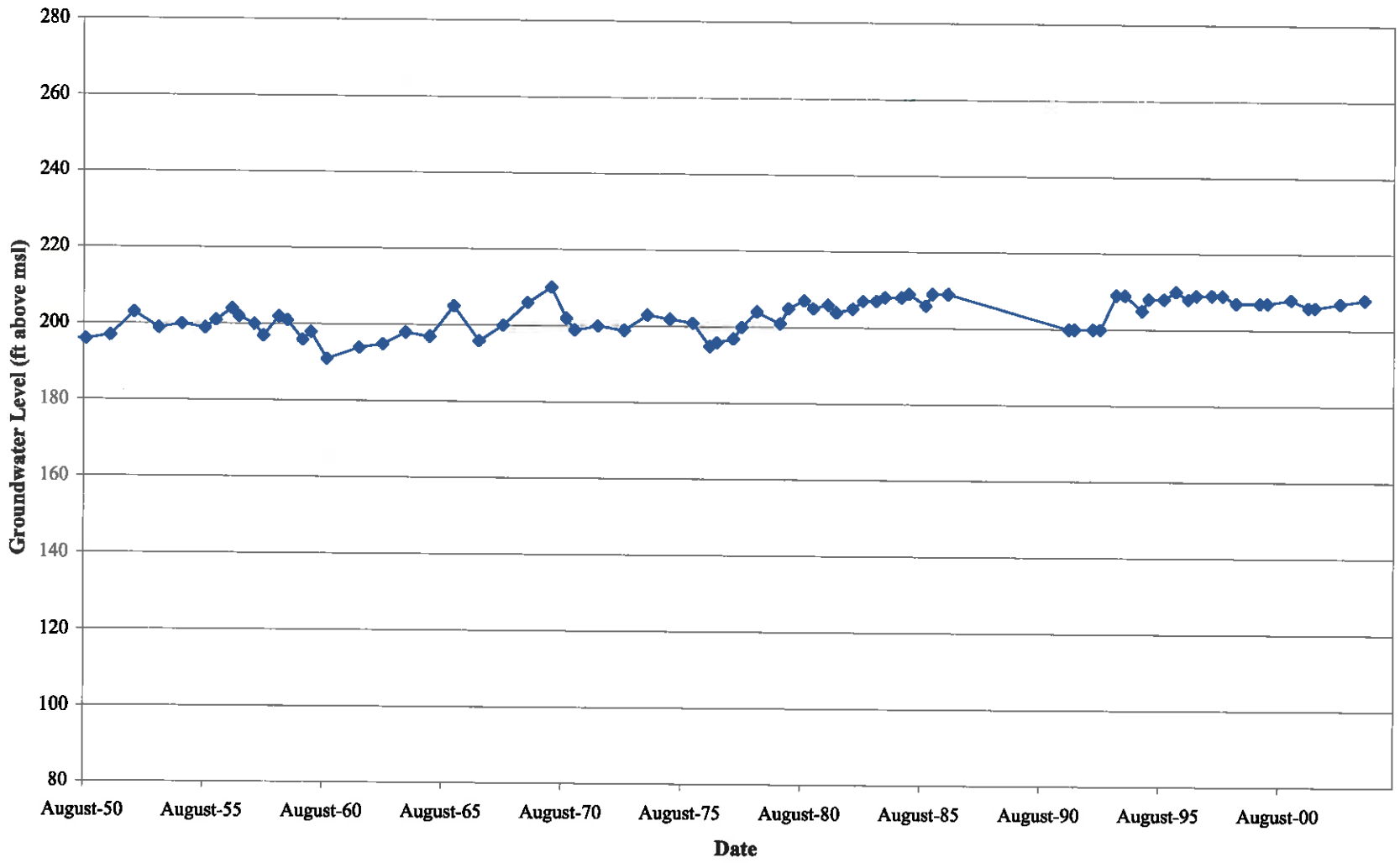
RIME	Lower Kings Basin GWMP Update	April 2005
	Groundwater Hydrograph for Well 16S17E24F001M in WMA B	FIGURE D.17



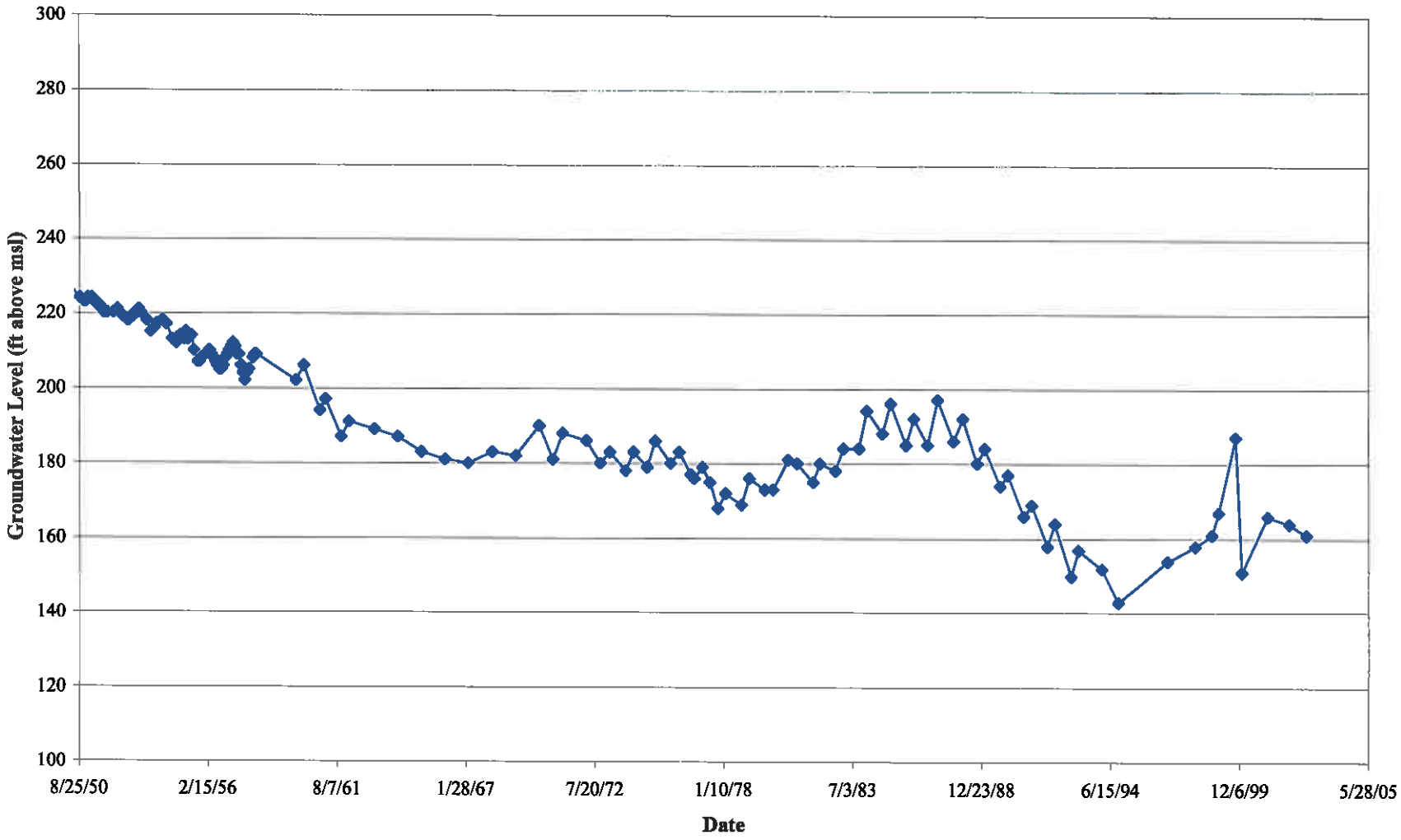
RIME	Lower Kings Basin GWMP Update	April 2005
	Groundwater Hydrograph for Well 17S19E10A001M in WMA B	FIGURE D.18



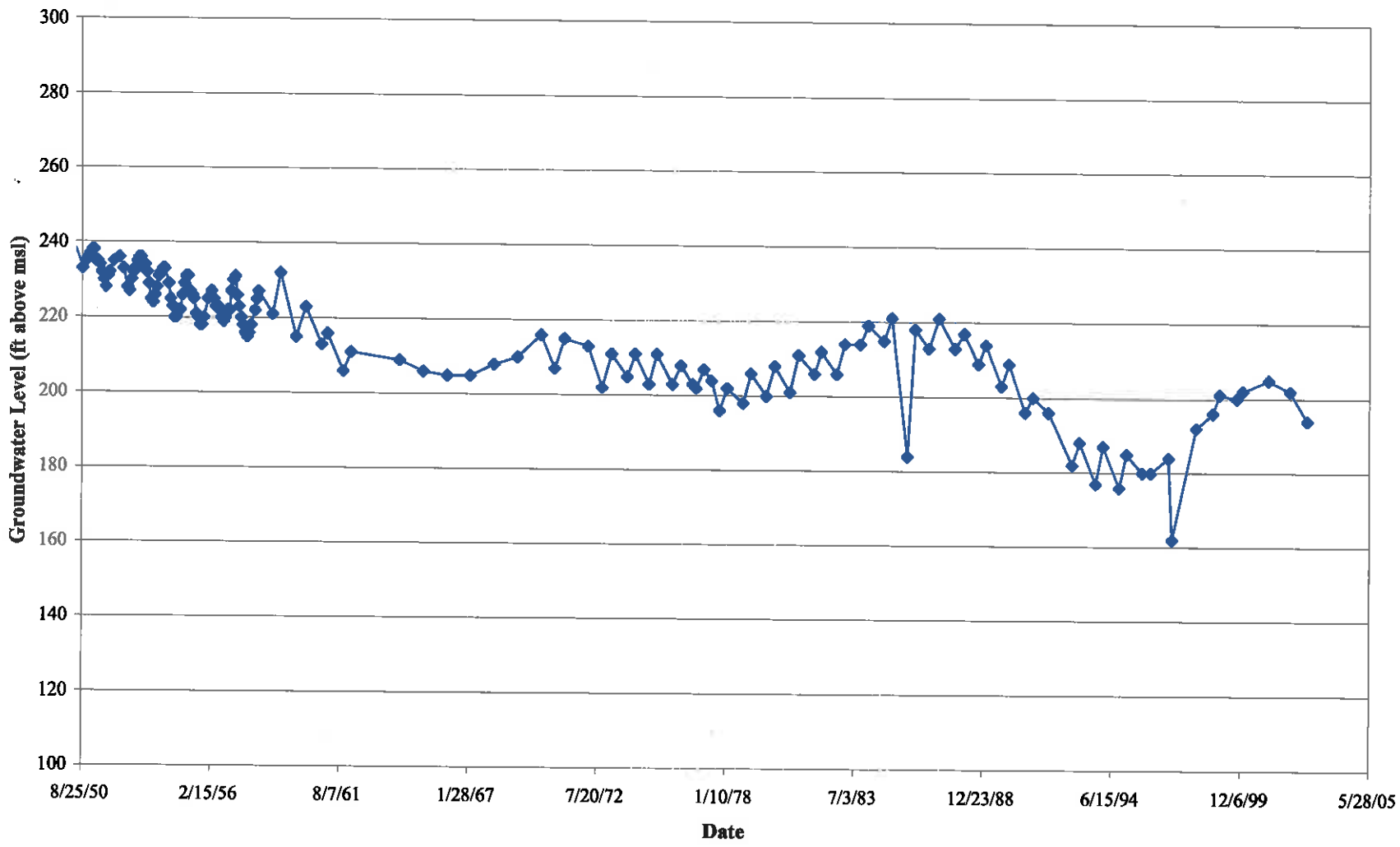
RIME	Lower Kings Basin GWMP Update	April 2005
	Groundwater Hydrograph for Well 17S20E33A001M in WMA B1	FIGURE D.19



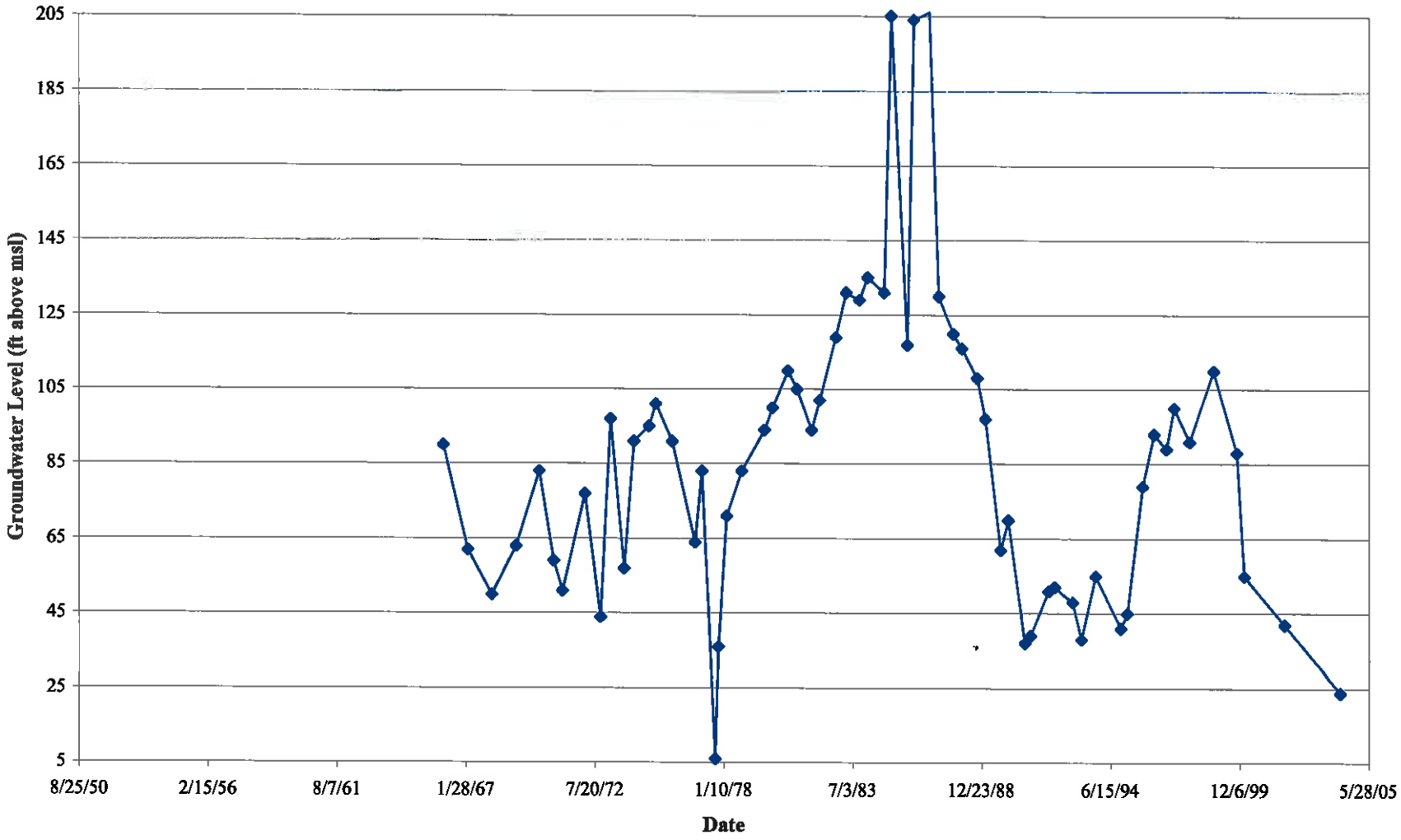
RIME	Lower Kings Basin GWMP Update	April 2005
	Groundwater Hydrograph for Well 18S19E14E001M in WMA B1	FIGURE D.20



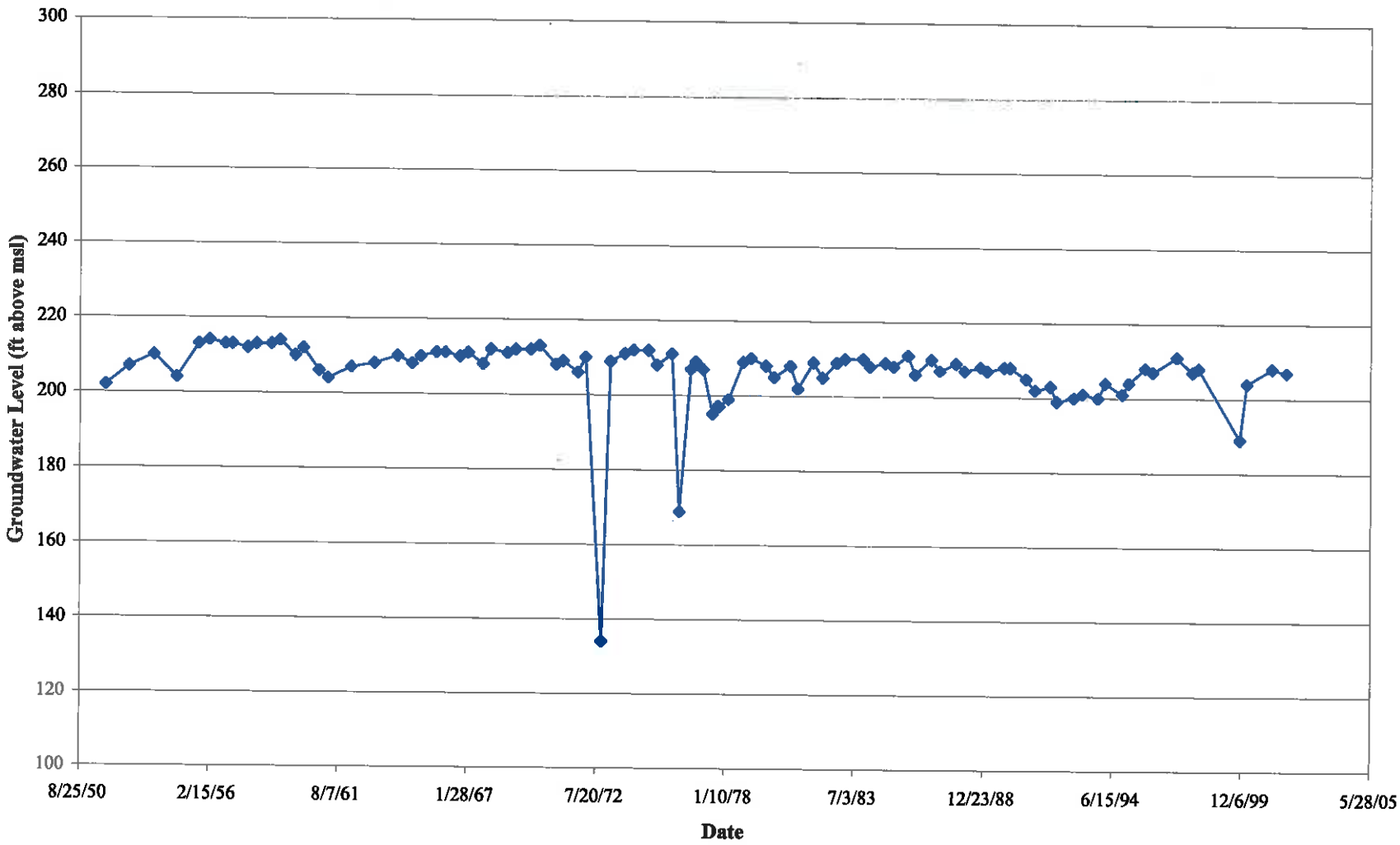
RIME	Lower Kings Basin GWMP Update	April 2005
	Groundwater Hydrograph for Well 17S20E01C001M in WMA B2	FIGURE D.21



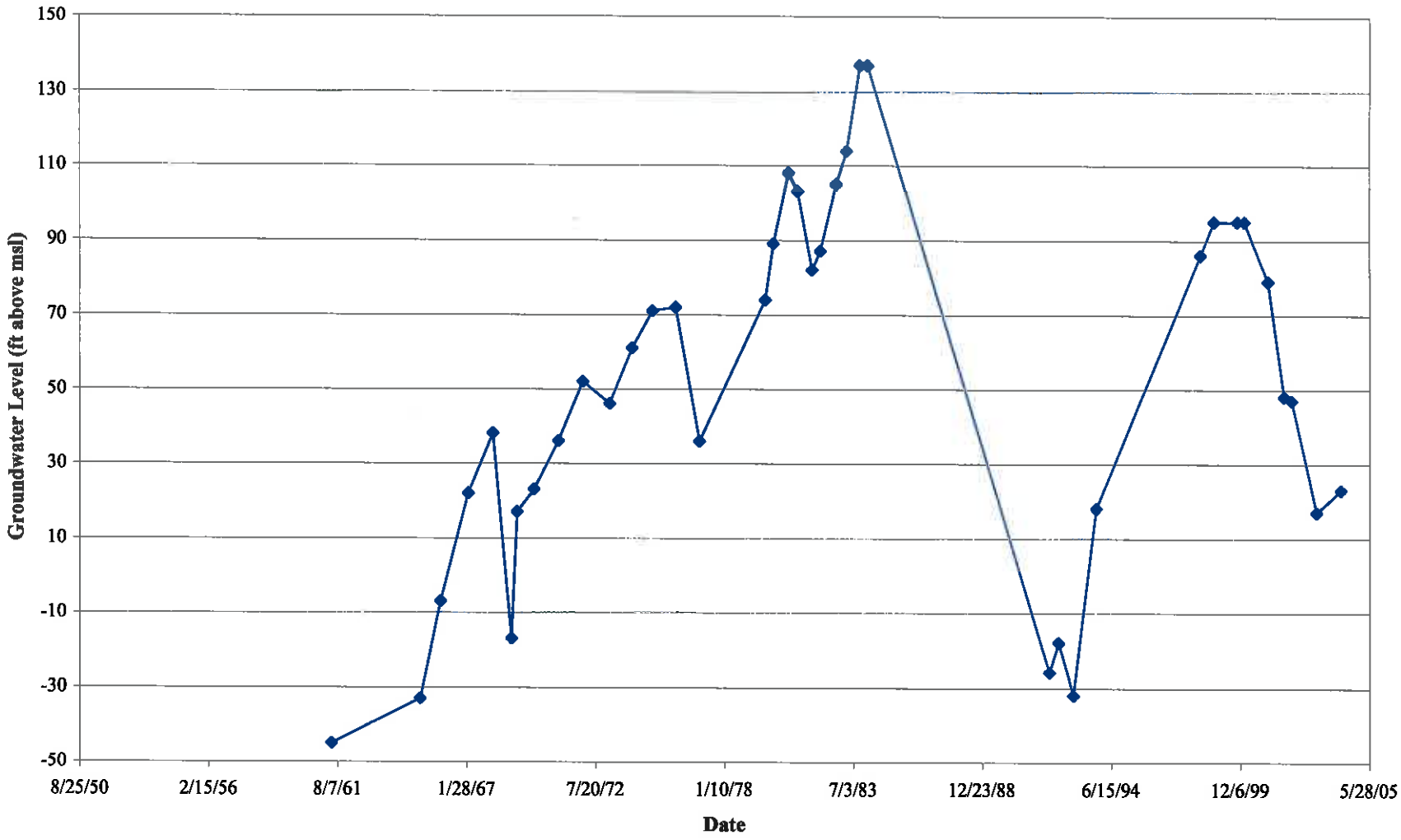
RIME	Lower Kings Basin GWMP Update	April 2005
	Groundwater Hydrograph for Well 17S21E03C001M in WMA B2	FIGURE D.22



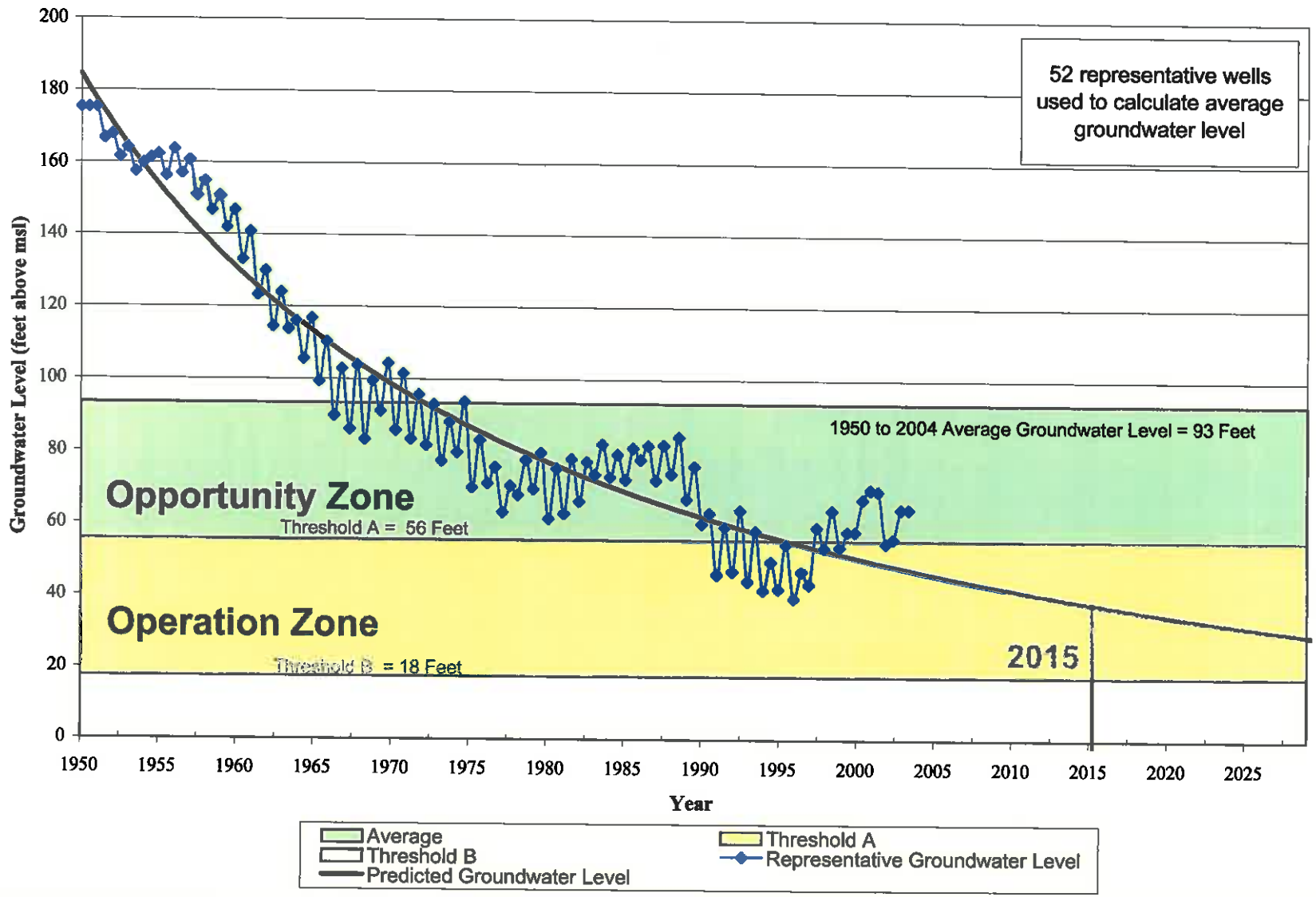
RIME	Lower Kings Basin GWMP Update	April 2005
	Groundwater Hydrograph for Well 18S19E35J002M in WMA C	FIGURE D.23



RIME	Lower Kings Basin GWMP Update	April 2005
	Groundwater Hydrograph for Well 19S20E22C001M in WMA C	FIGURE D.24



RIME	Lower Kings Basin GWMP Update	April 2005
	Groundwater Hydrograph for Well 20S20E07H001M in WMA C1	FIGURE D.25



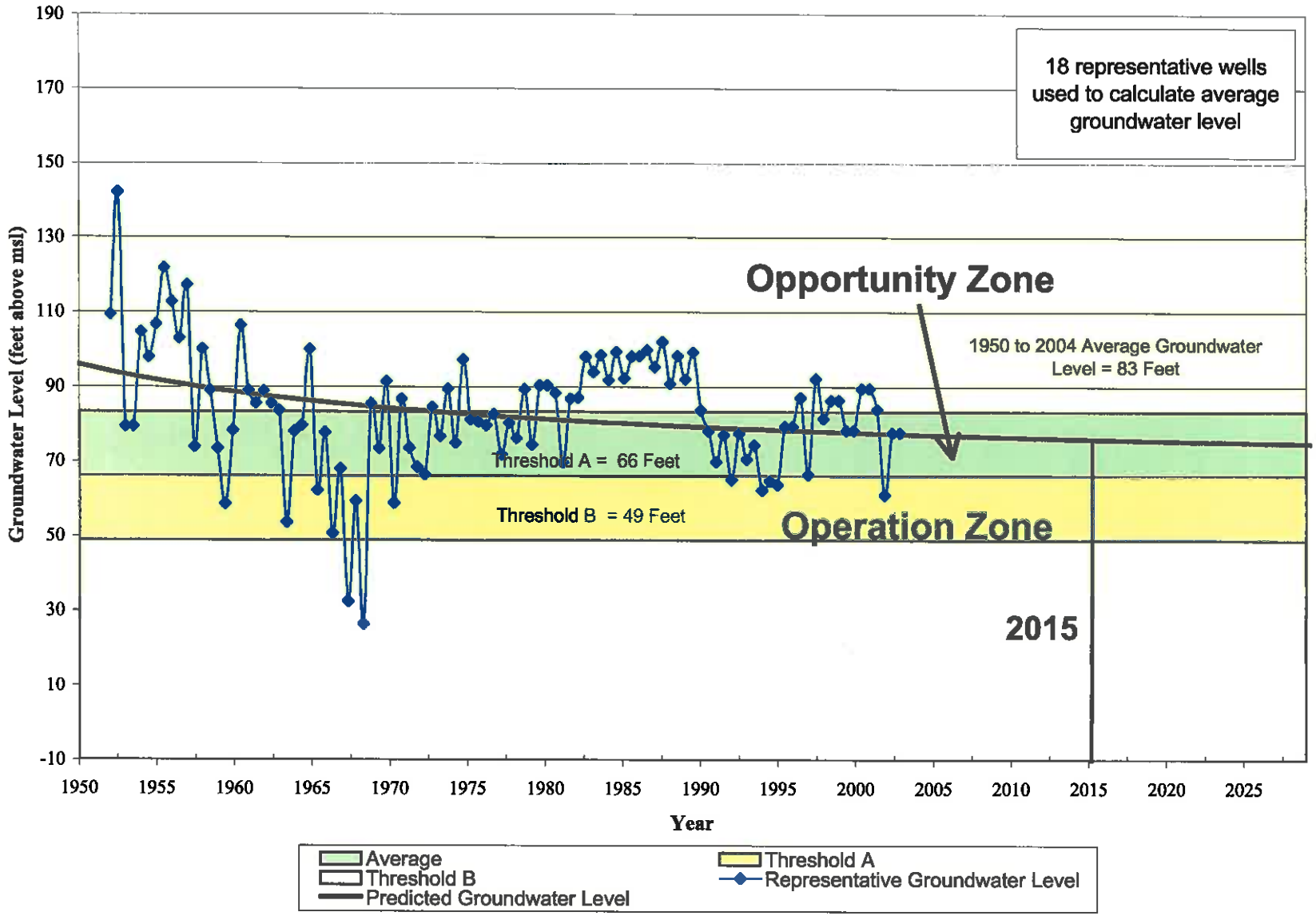
ORIME

Lower Kings Basin GWMP Update

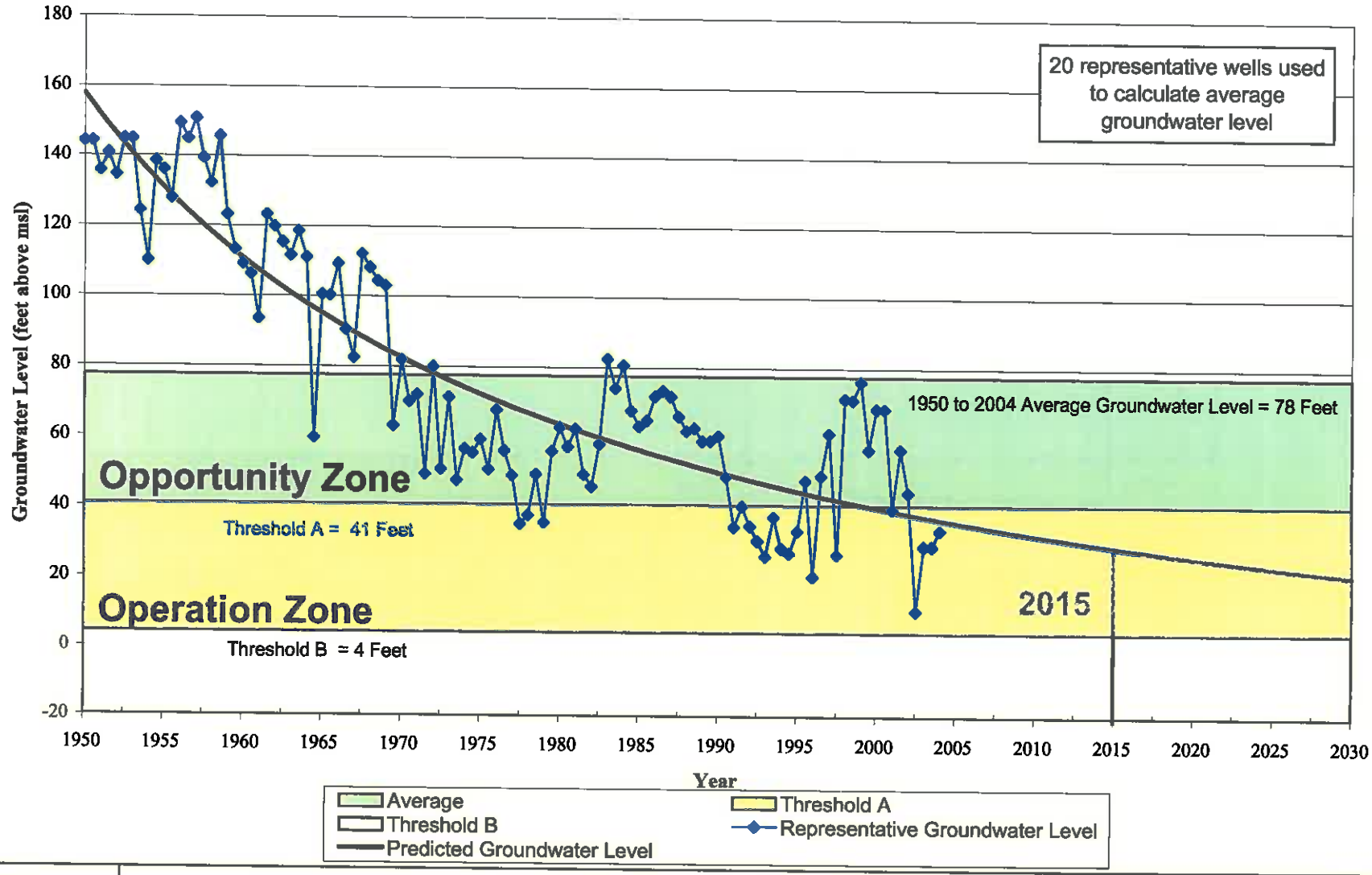
Groundwater Trends for WMA A

April 2005

FIGURE D.26



RIME	Lower Kings Basin GWMP Update **Groundwater Trends for WMA A1**	April 2005 FIGURE D.27



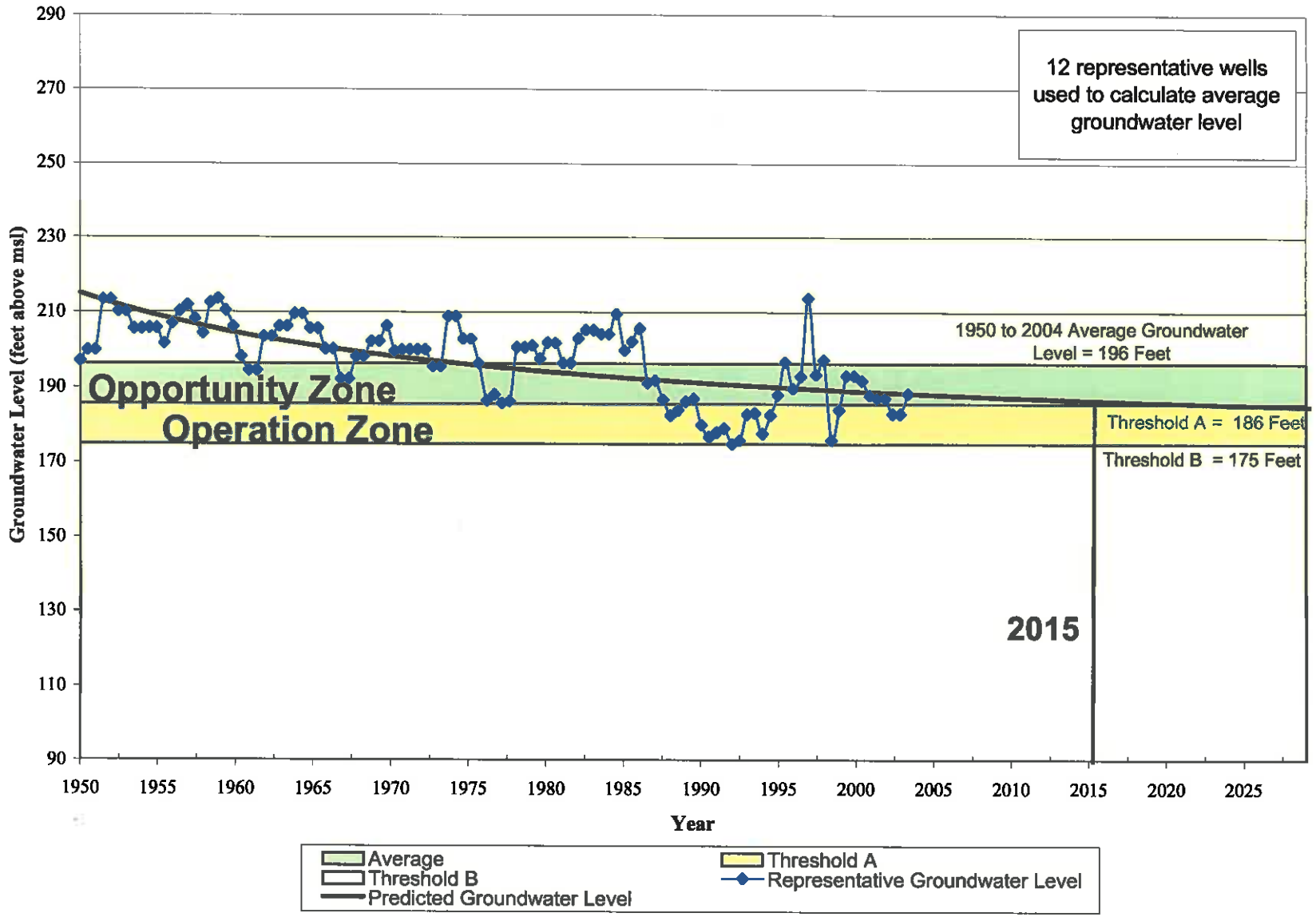
RIME

Lower Kings Basin GWMP Update

Groundwater Trends for WMA B

April 2005

FIGURE D.28



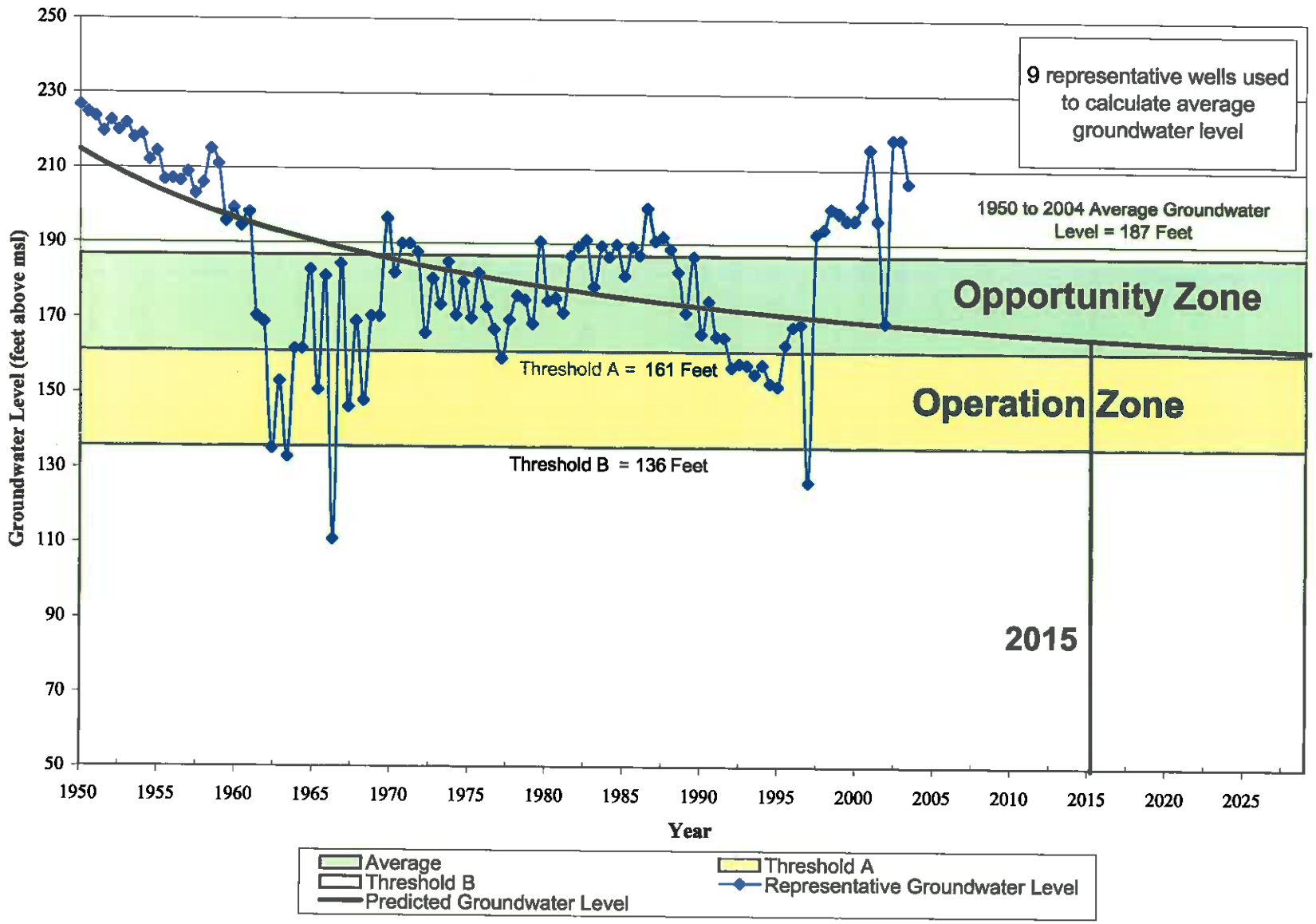
WRIME

Lower Kings Basin GWMP Update

Groundwater Trends for WMA B1

April 2005

FIGURE D.29



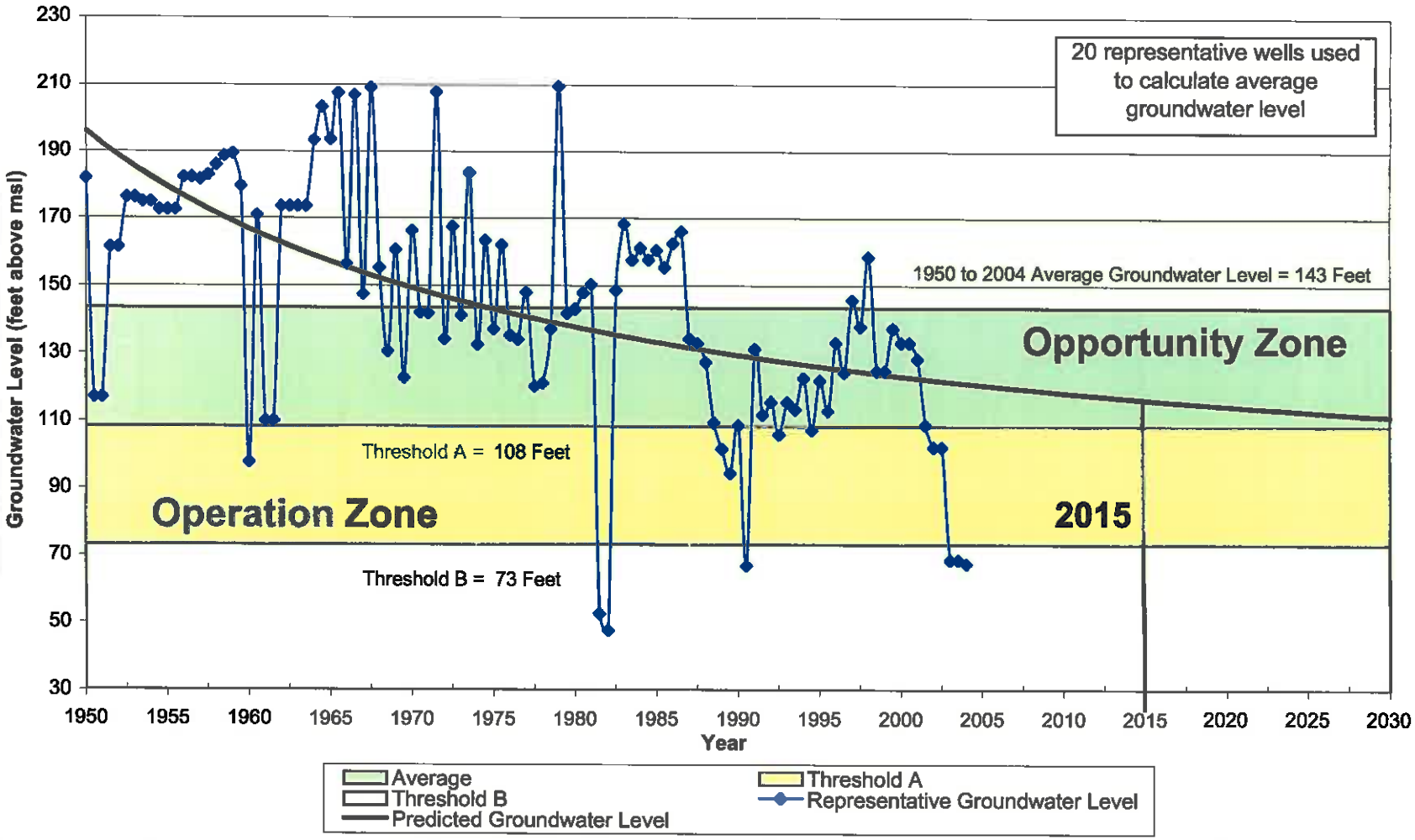
RIME

Lower Kings Basin GWMP Update

Groundwater Trends for WMA B2

April 2005

FIGURE D.30



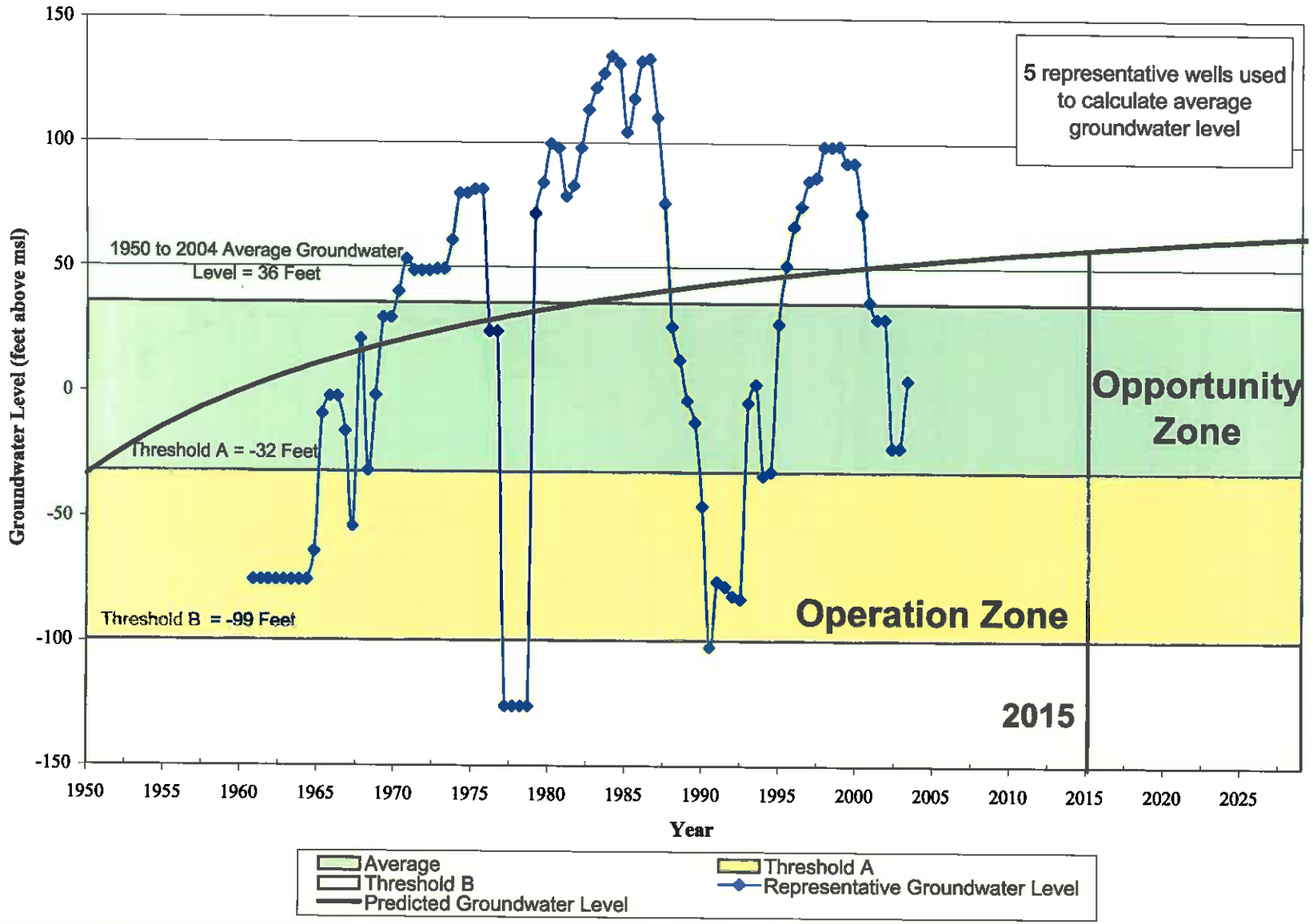
RIME

Lower Kings Basin GWMP Update

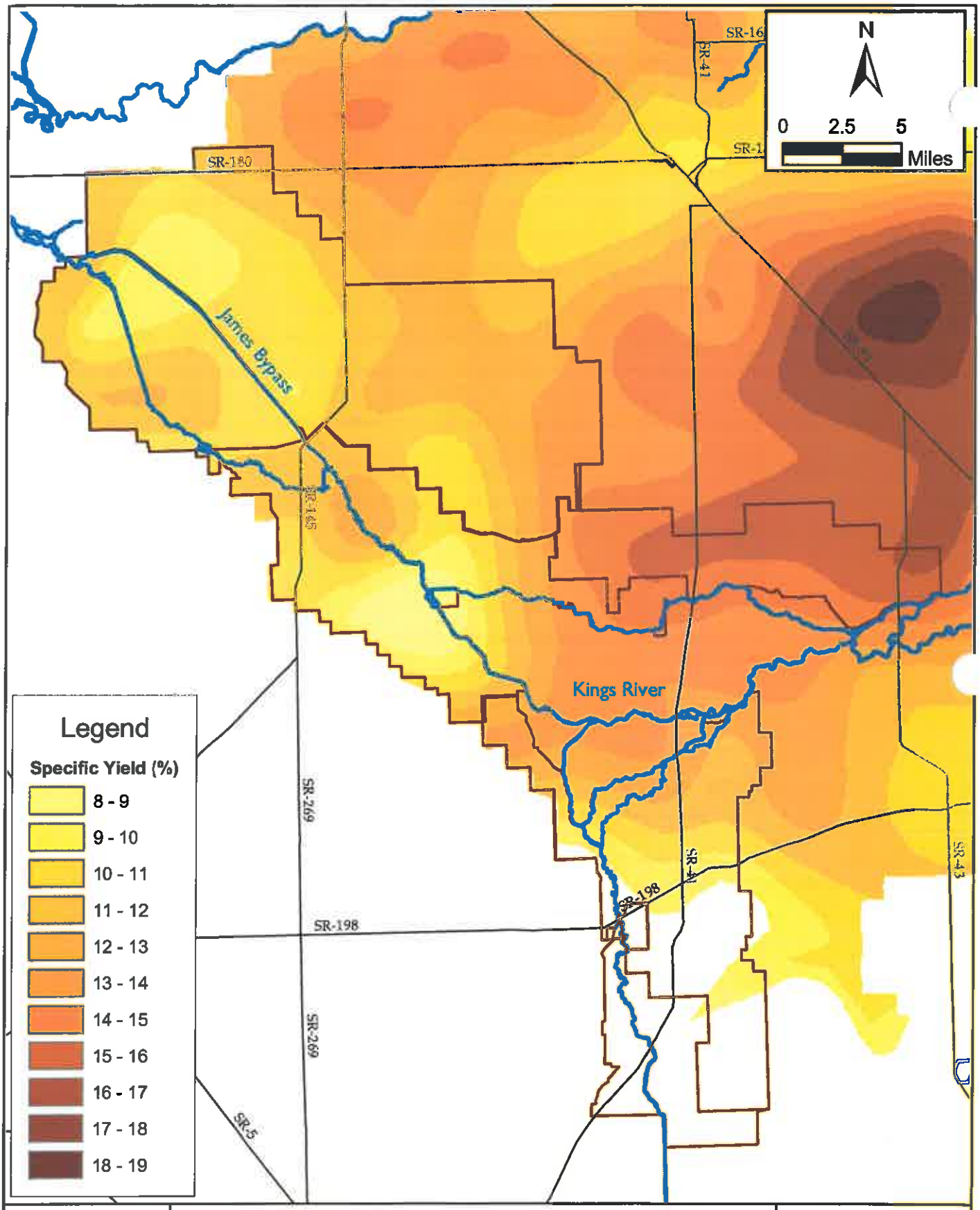
Groundwater Trends for WMA C

April 2005

FIGURE D.31



PRIME	Lower Kings Basin GWMP Update **Groundwater Trends for WMA C1**	April 2005 FIGURE D.32



WRIME

Lower Kings Basin GWMP Update

Distribution of Specific Yield in Lower Kings Basin

April 2005

Figure D.33

E.1 SURFACE WATER AVAILABILITY

The purpose of this analysis was to determine if: 1) there is surface water available from the Kings River for groundwater recharge, 2) if existing facilities have sufficient diversion capacity, and 3) if there is available water, do Lower Kings Basin KWRA member have sufficient entitlement. The process to evaluate surface water conditions included:

1. Obtaining stream flow at James Bypass, headgate diversion, canal capacity, and entitlement data;
2. Sorting and ranking entitlement and diversion data; and
3. Evaluating data for the 1964 through present and only for flood periods only.

It can be concluded for the analysis that there is additional water available to divert from the Kings River in the Lower Kings Basin. Diversions during flood release periods are less than entitlements amounts at the head gates and quite often, less than the design capacity of the canal. This indicates that water is available for diversion during flood period using available canal capacity and under existing entitlement.

E.2 BACKGROUND

The Kings River flows are measured several along the Kings River. The Pine Flat Dam gage (KFG) streamflows are shown on Figure E.1 for the 1945 to 2000 period and demonstrate the hydrologic variability of the basin (CDEC, 2004). The annual KFG flow ranges from a minimum of 359 thousand acre-feet (TAF) in 1977 to a maximum of 4.476 TAF in 1983 and with an average of 1,730 TAF. KFG flows within 25% of the 1945-2000 (long-term) average KFG flow are considered normal year flows. Years with flows exceeding the long-term average by more than 25% are considered wet. Years with flows falling below the long-term average by more than 25% are considered dry. Based on this classification, there are 15 years that can be classified as normal, 14 years that can be classified as wet and 27 years than can be classified as dry. All years considered wet have occurred since 1964.

E.3 KINGS RIVER SURFACE WATER SUPPLY SYSTEM

PINE FLAT RESERVOIR

Pine Flat Reservoir is the primary control of the Kings River. The US Army Corps of Engineers operates the reservoir during flood release periods and the Kings River Water Association operates the reservoir for conservation releases. Kings River is operated in accordance with the terms and conditions of water rights and entitlements, the provisions of State Water Resources Control Board Decision 1290, and a series of agreements and water entitlement schedules (referred to as the "Blue Book Agreements"). KRWA determines each member's entitlement to Kings River water, coordinates water orders placed by its members, executes delivery of water at each member's respective points of diversion, and accounts for any water losses or gains during conveyance (KRWA, 2000).

DIVERSION AND CANAL SYSTEM

Figure E.2 shows the weir and head gate locations associated with the principal canals used to divert water from the King River in the Lower Kings Basin. Historical diversion data was used to evaluate water availability. Table E.1 lists the characteristics of canals (and their associated weirs) that are used in diverting water from the Lower King River and on the North Fork of the Kings River (Provost and Pritchard, 2005). These weirs are a subset of the total number of weirs on the Kings River. It should be noted that Laguna ID diverts water from three locations on the Kings River.

Table E.1. Summary of Lower King Basin Canal Characteristics

Canal/Weir Name	Length (ft)	Estimated Capacity (cfs)
Liberty	84,700	60
A Canal (Laguna ID)	16,200	50
Grant (Laguna ID)	63,200	300
Island (Laguna ID)	46,000	100
Murphy Slough	120,900	550
Crescent	88,500	200
Stinson	59,200	120

E.4 ANALYSIS

The purpose of this analysis was to determine the availability of flood water for recharge in the Lower Kings Basin. The streamflow hydrographs at weir locations on the Kings River are shown in Figures E.3 through E.8 include periods of flood releases from Pine Flat Reservoir.

The streamflow hydrograph at James Weir was used in the analysis to determine the amount of food flows that are available for recharge. The streamflow hydrograph for James Weir is shown in Figure E.8. The location of James Weir is shown in Figure E.1. The average annual streamflow at James Weir is 280 cfs which equates to 200 TAF per year (TAF/yr). The flow discharged to the Mendota Pool occurs in short durations and high flow rates. During the flood period release periods, the average flow rate was 2,130 cfs at James Weir.

Streamflow exceedence charts at the different weir locations are shown in Figures E.9 through E.14 (KWRA, 2005). The figures show the probability of stream flow being equal or exceeded. For example, measured streamflow at Peoples Weir (Figure E.9) was equal to or greater than 500 cfs, 50% of the time when flow was observed. Streamflow at Peoples Weir was equal to or greater than 20 cfs approximately 90% of the time. Figure E.15 shows a stream flow exceedence chart for James Weir during flood release periods only. The figure shows that that 55% of daily James Weir flows were greater than 1,500 cfs and 75% of daily James Weir flows were greater than 300 cfs during flood release periods. Streamflow measured at James Weir is represents water that is lost to the Kings Basin. This flood flow, with proper facilities in place, could be used for groundwater recharge purposes.

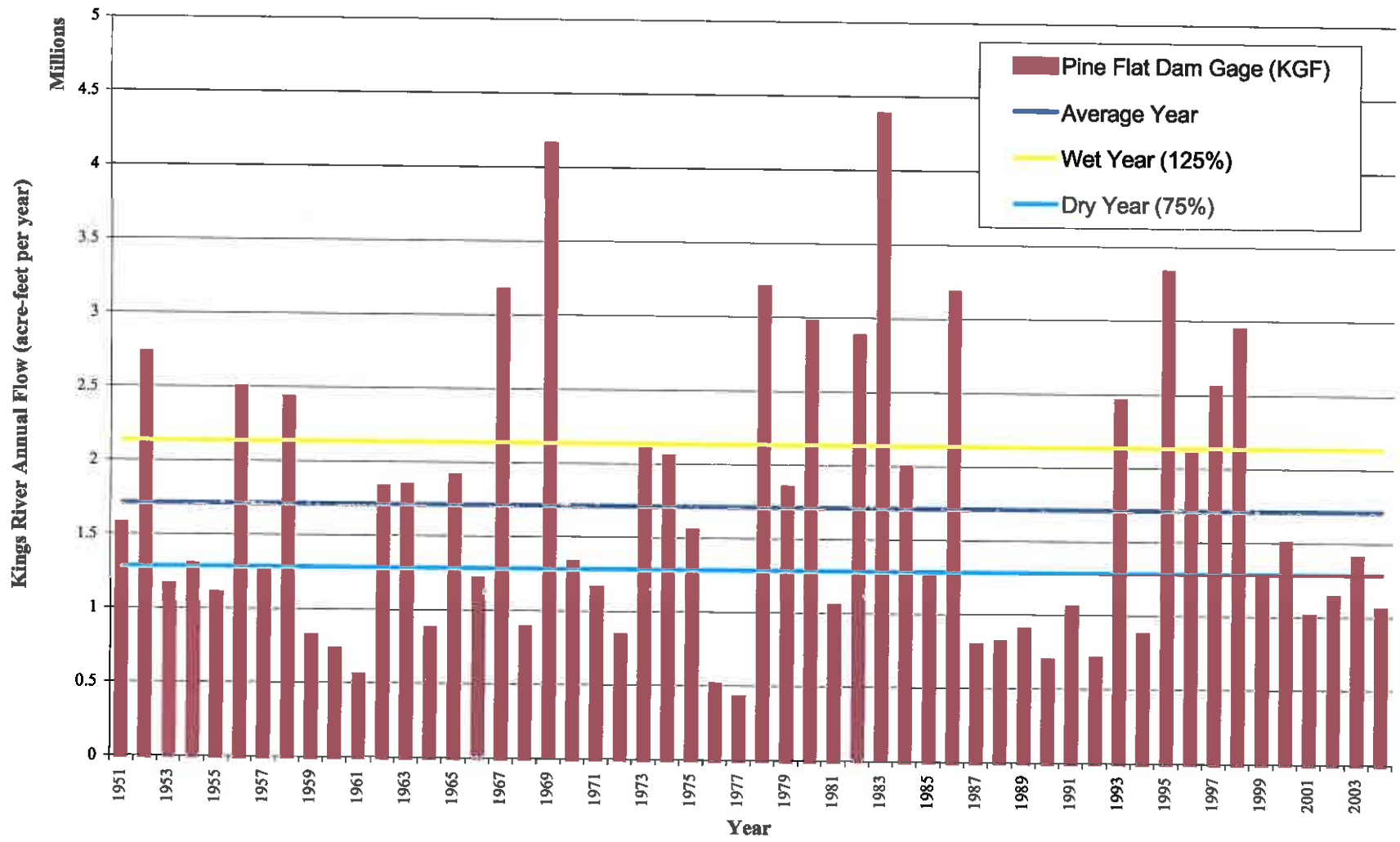
Additional analysis was conducted to determine if additional water could have been diverted during flood conditions using existing structures and entitlements. Diversion and entitlement data were collected for each weir location. Canal capacity data was also obtained. KRWA member entitlements, KWRA member head gate diversion data, and canal capacities are shown at each weir location in Figures E.16 through E.20. Since multiple KRWA members divert water from the same weir and members will divert from multiple weirs, the individual member entitlements have been aggregated into a single value representing the total KWRA member entitlement at the weir. KWRA diversions were aggregated in the same manner.

Figures E.16 through E.20 show monthly data for the 1964 through 2004 period (Provost and Pritchard, 2005). The periods when there were flood releases are indicated, but it is not clear from the figures how much additional water could have been diverted during flood release periods. The following process was followed to determine how much additional water could have been diverted:

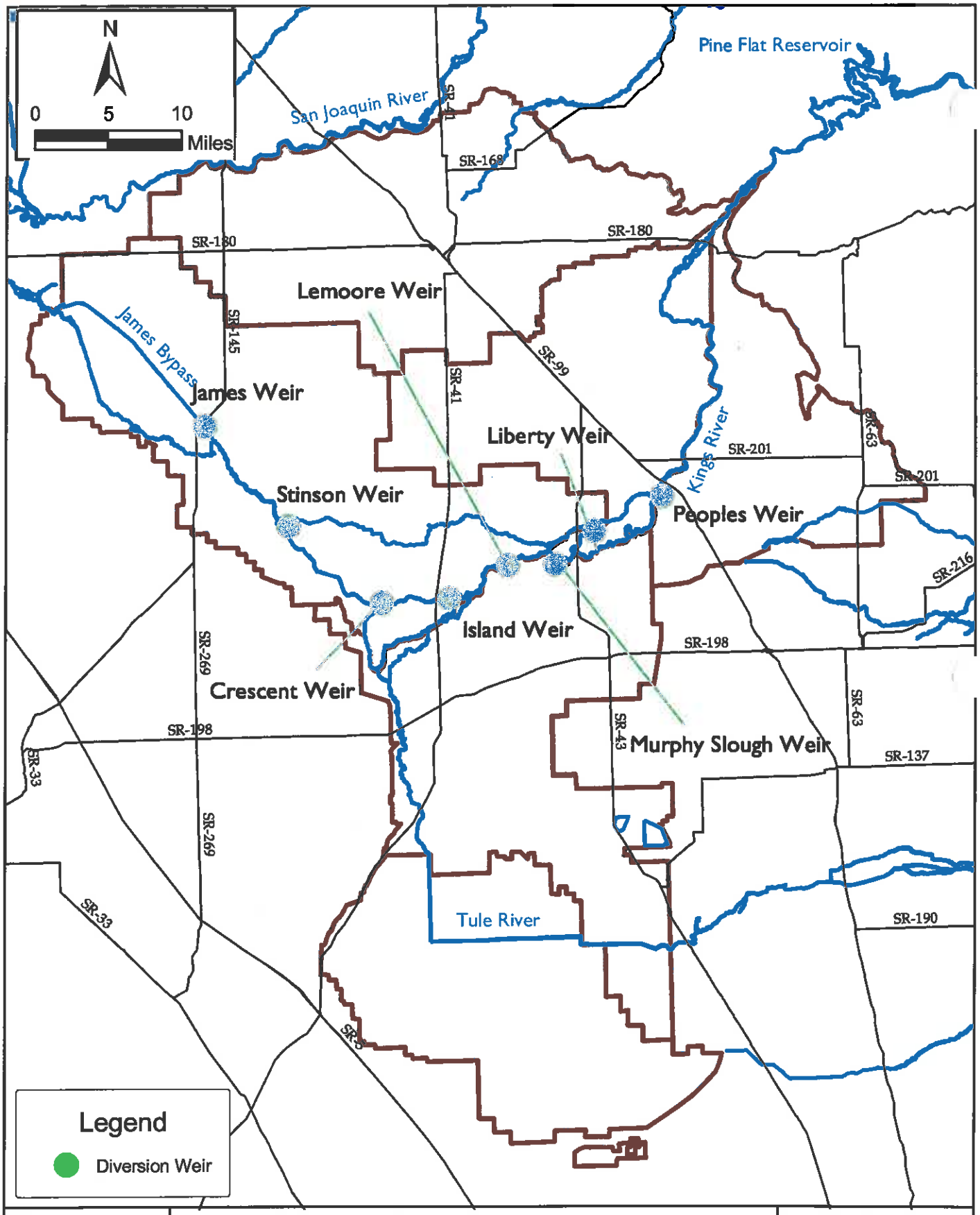
1. Monthly data associated flood release months was identified and used for further analysis;
2. The difference between entitlement and diversion amount was calculated; and
3. The difference was ranked and a percent exceedence was determined.

Figures E.21 through E.15 show the results of this analysis for each weir location. It can interpreted from the figures that for at least 70% of the months with flood releases, additional

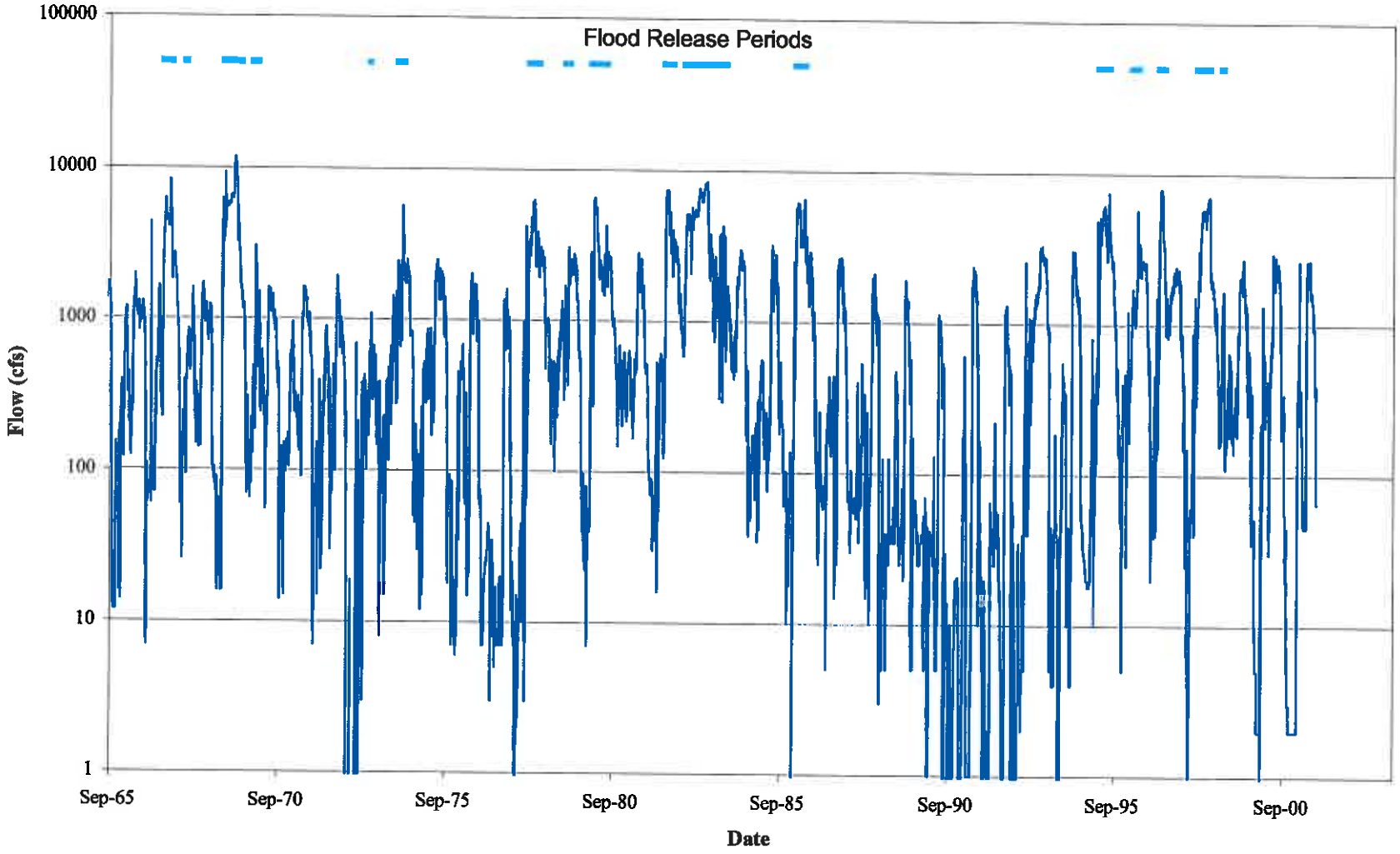
water could have diverted under existing entitlement and canal capacities. Canal capacities do not limit the available water for diversion until flows rates are 10% exceedence.



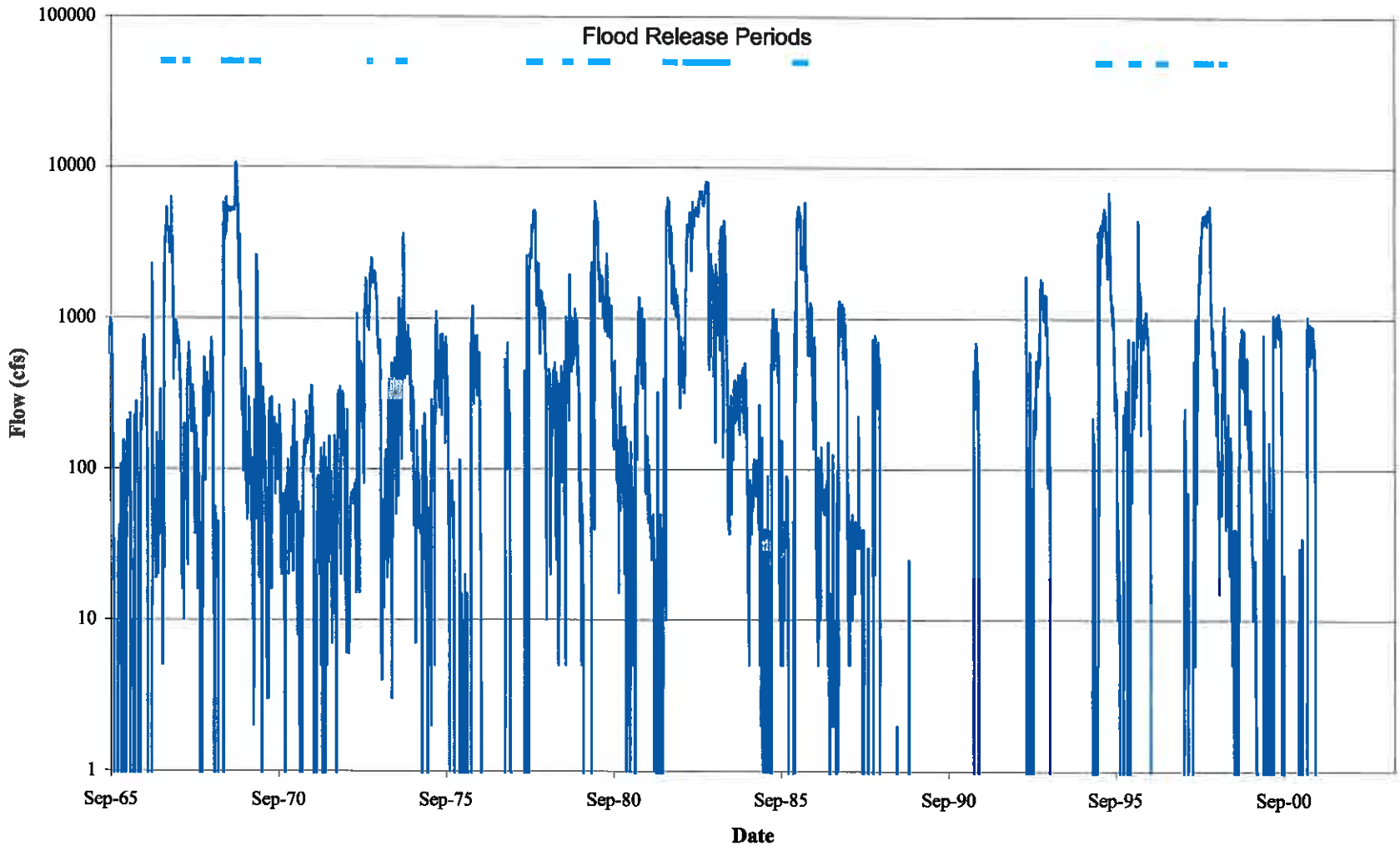
PRIME	Lower Kings Basin GWMP Update	April 2005
	Kings River Annual Streamflow	FIGURE E.1



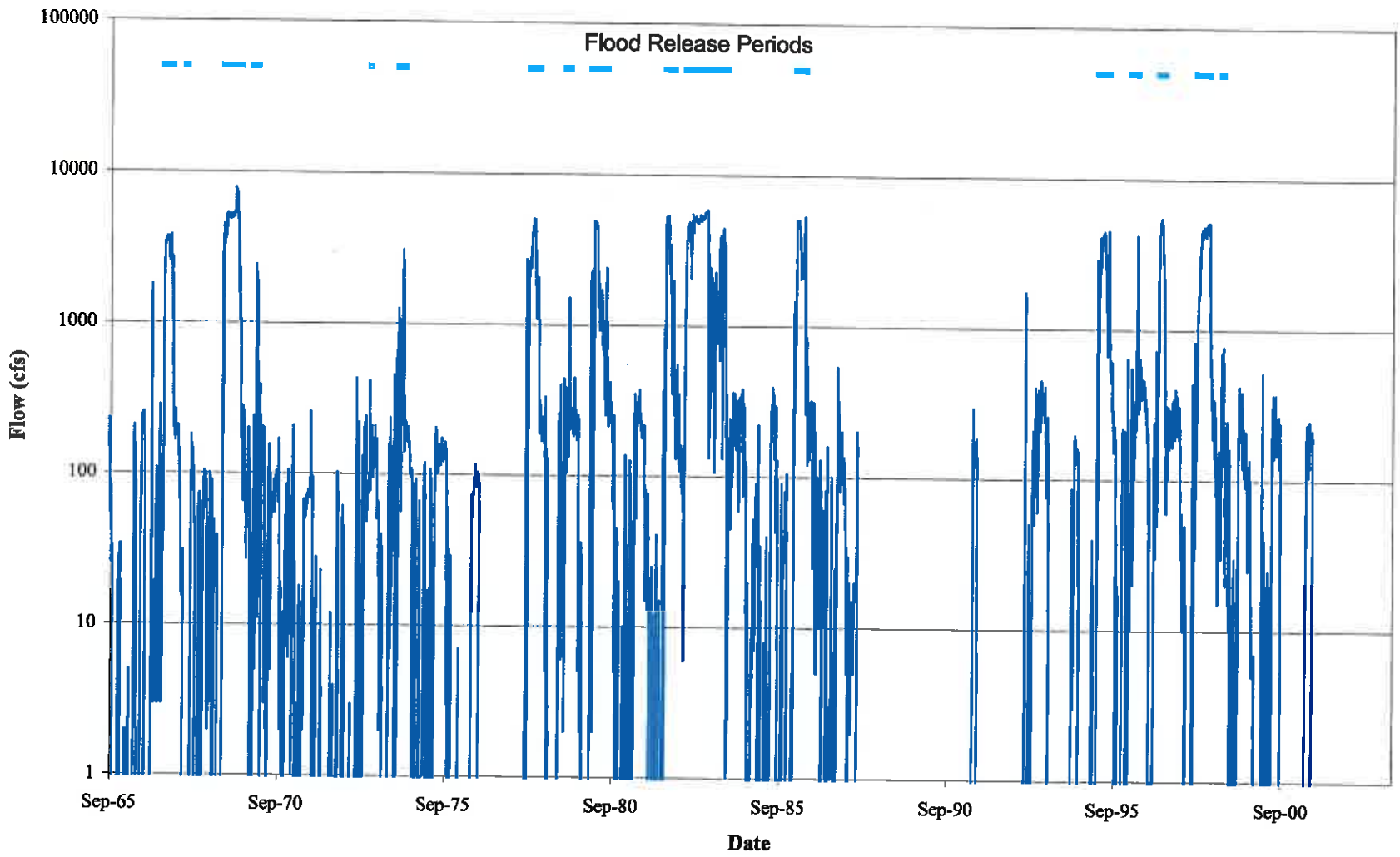
WRIME	Lower Kings Basin GWMP Update **Diversion Weirs**	April 2005 Figure E.2



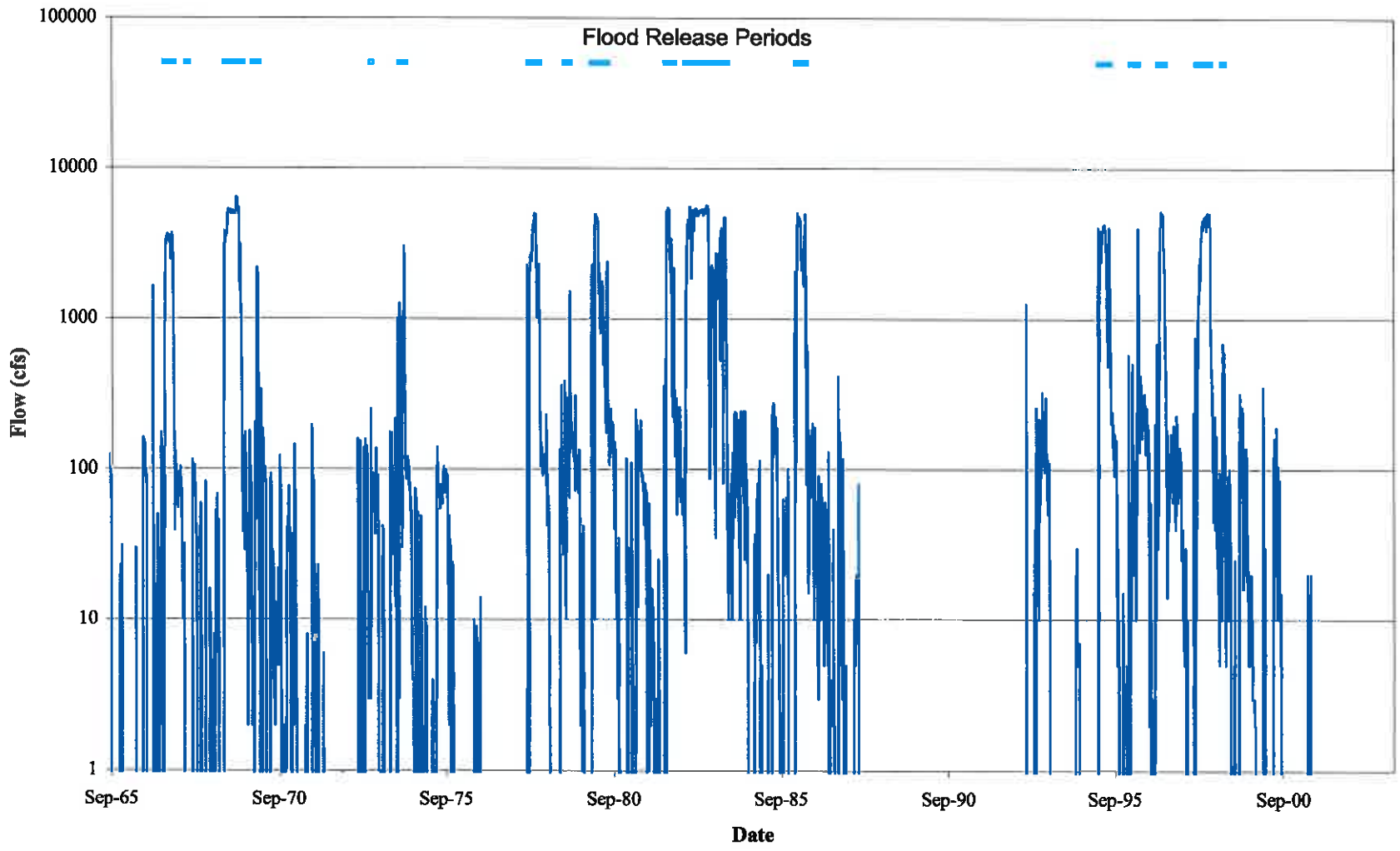
RIME	Lower Kings Basin GWMP Update	April 2005
	Kings River Flow Below Peoples Weir	FIGURE E.3



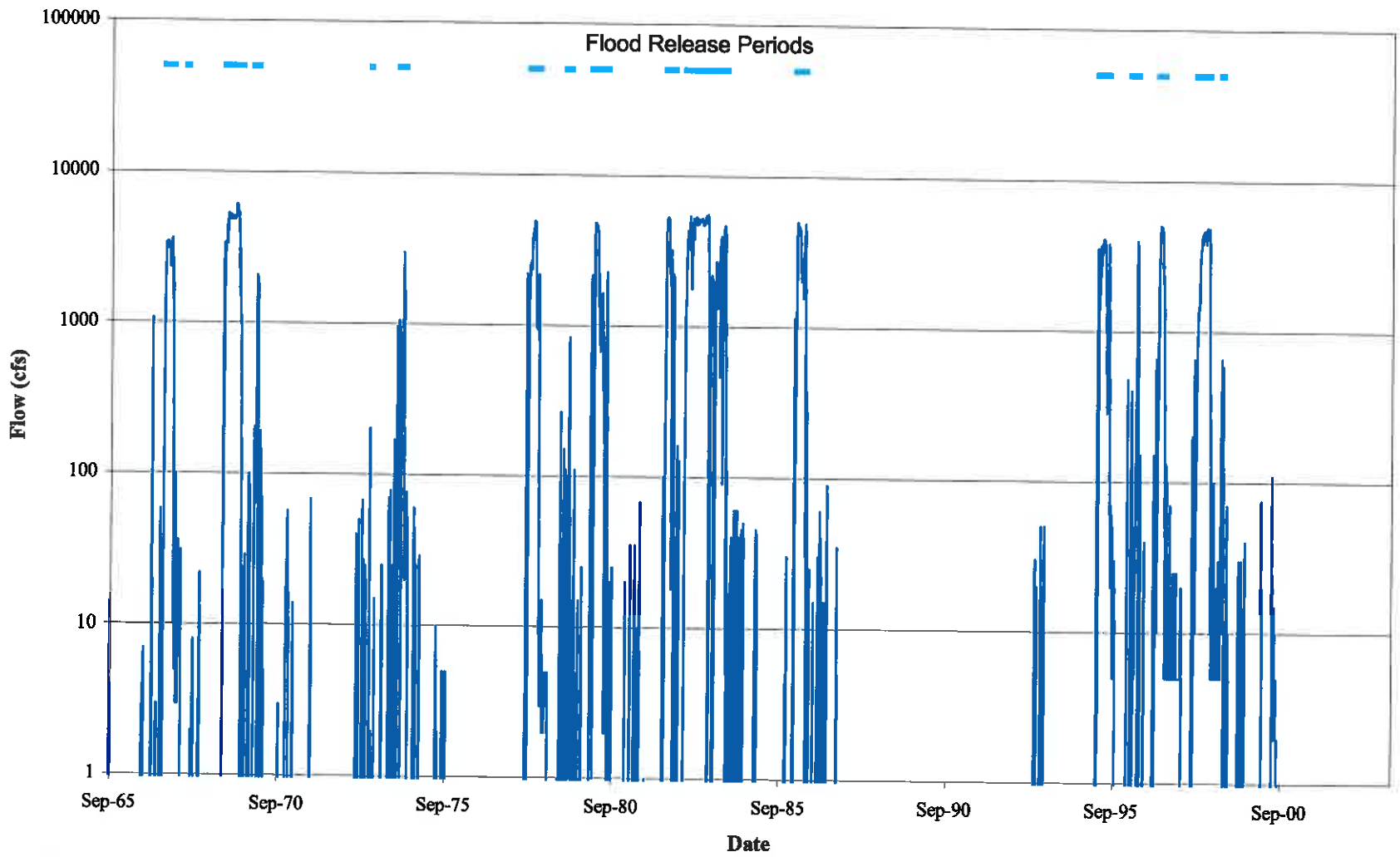
WRIME	Lower Kings Basin GWMP Update	April 2005
	Kings River Flow Below Lemoore Weir	FIGURE E.4



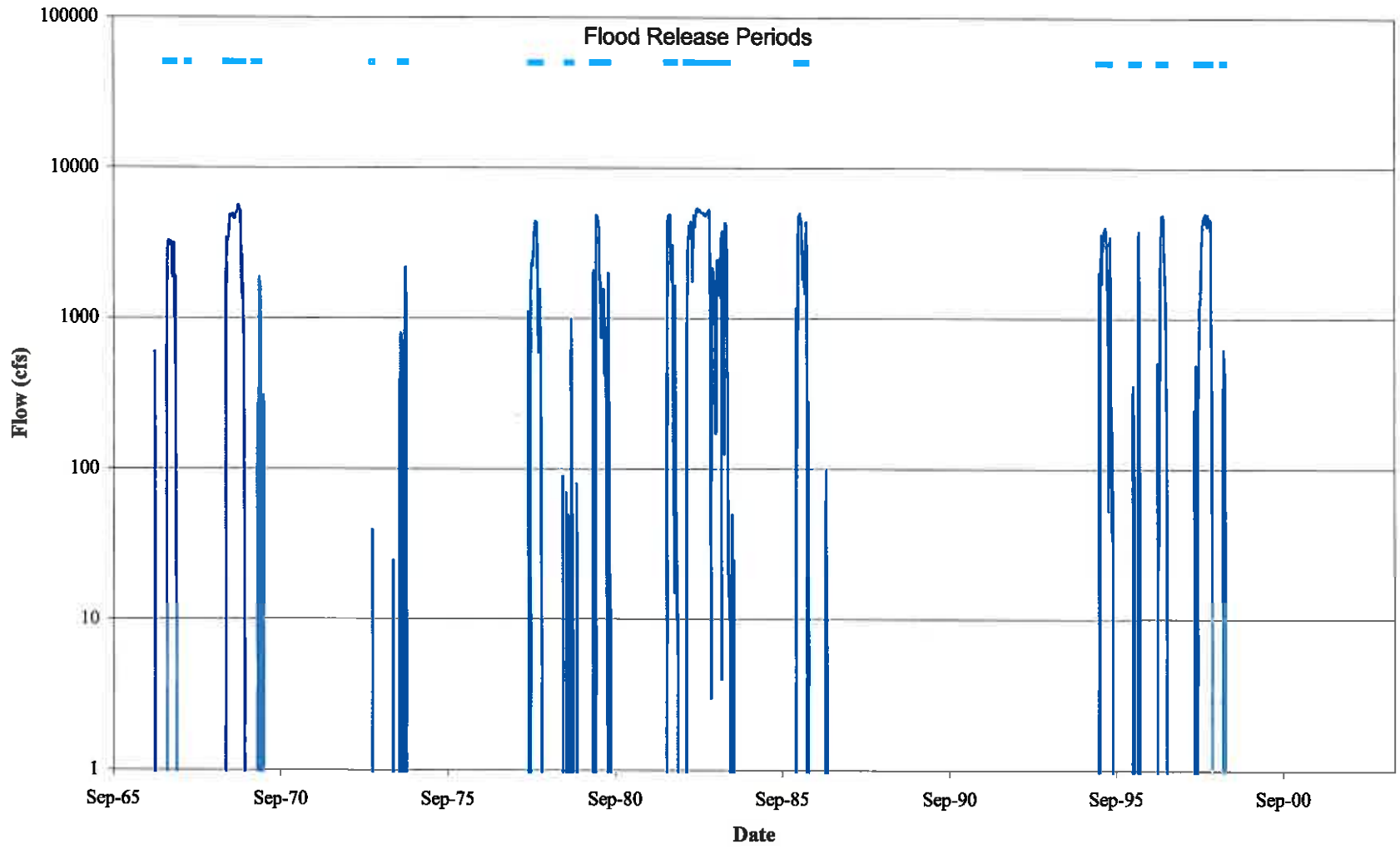
RIME	Lower Kings Basin GWMP Update	April 2005
	Kings River Flow Below Island Weir	FIGURE E.5



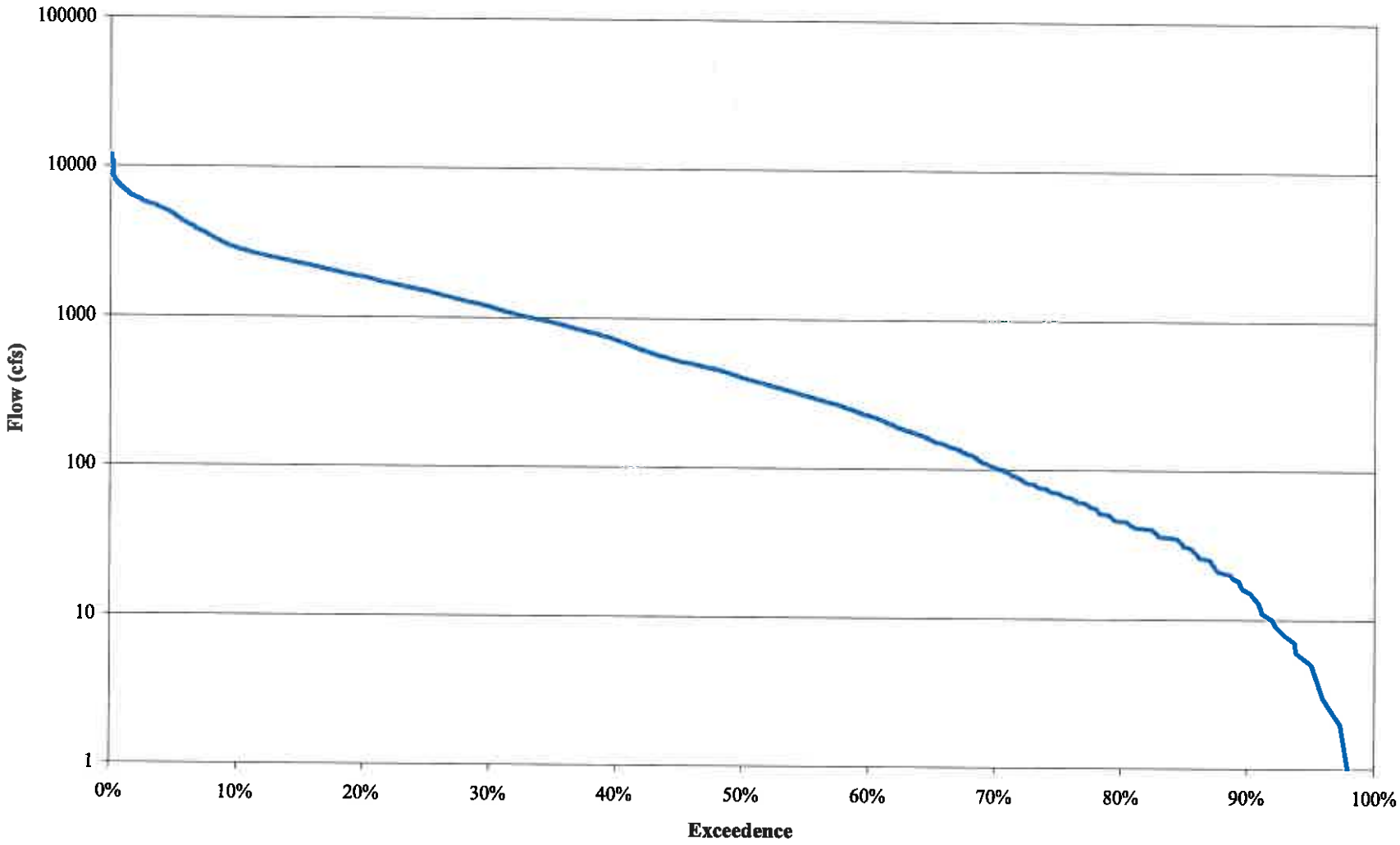
RIME	Lower Kings Basin GWMP Update	April 2005
	Kings River Flow Below Crescent Weir	FIGURE E.6



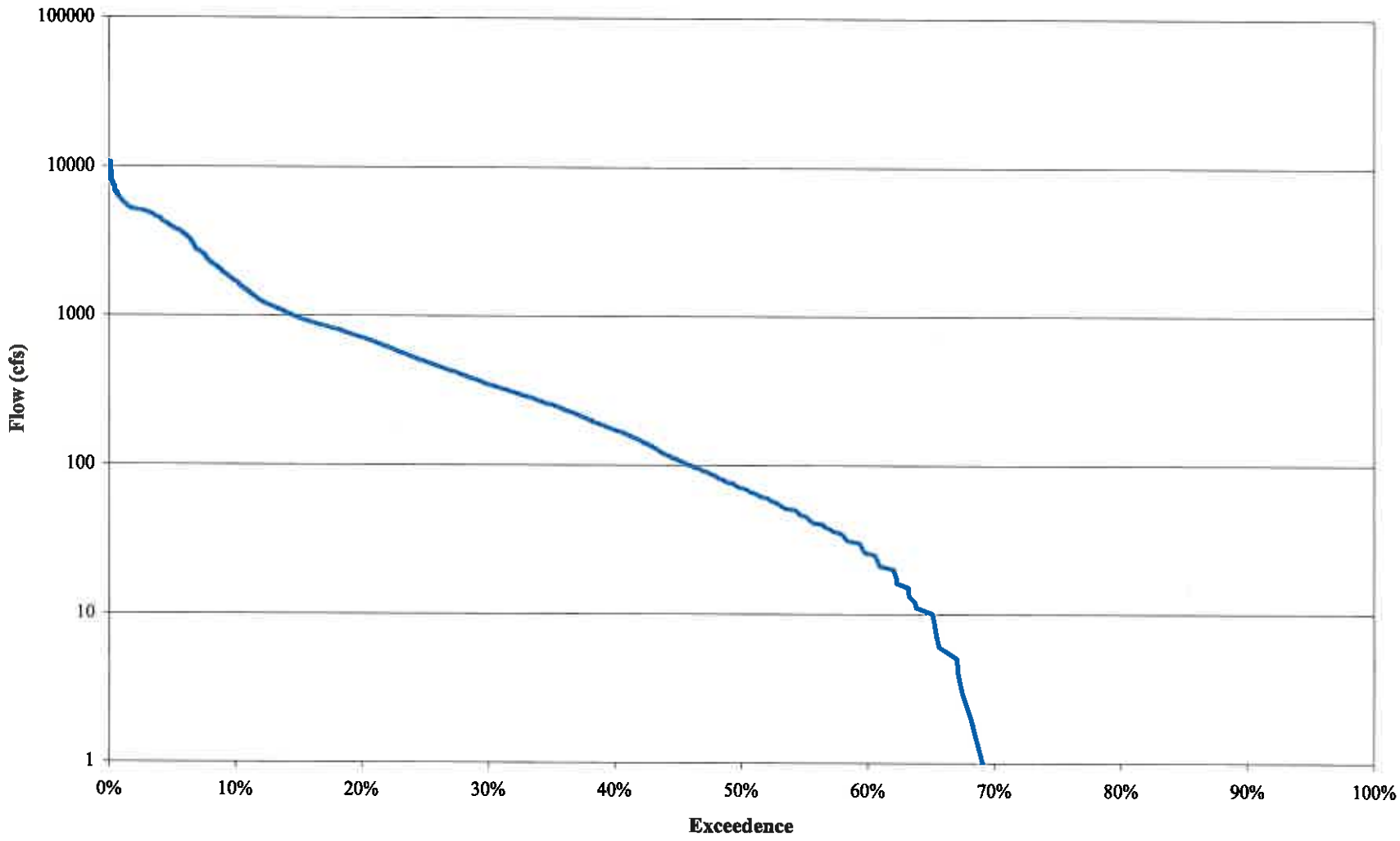
RIME	Lower Kings Basin GWMP Update	April 2005
	Kings River Flow Below Stinson Weir	FIGURE E.7



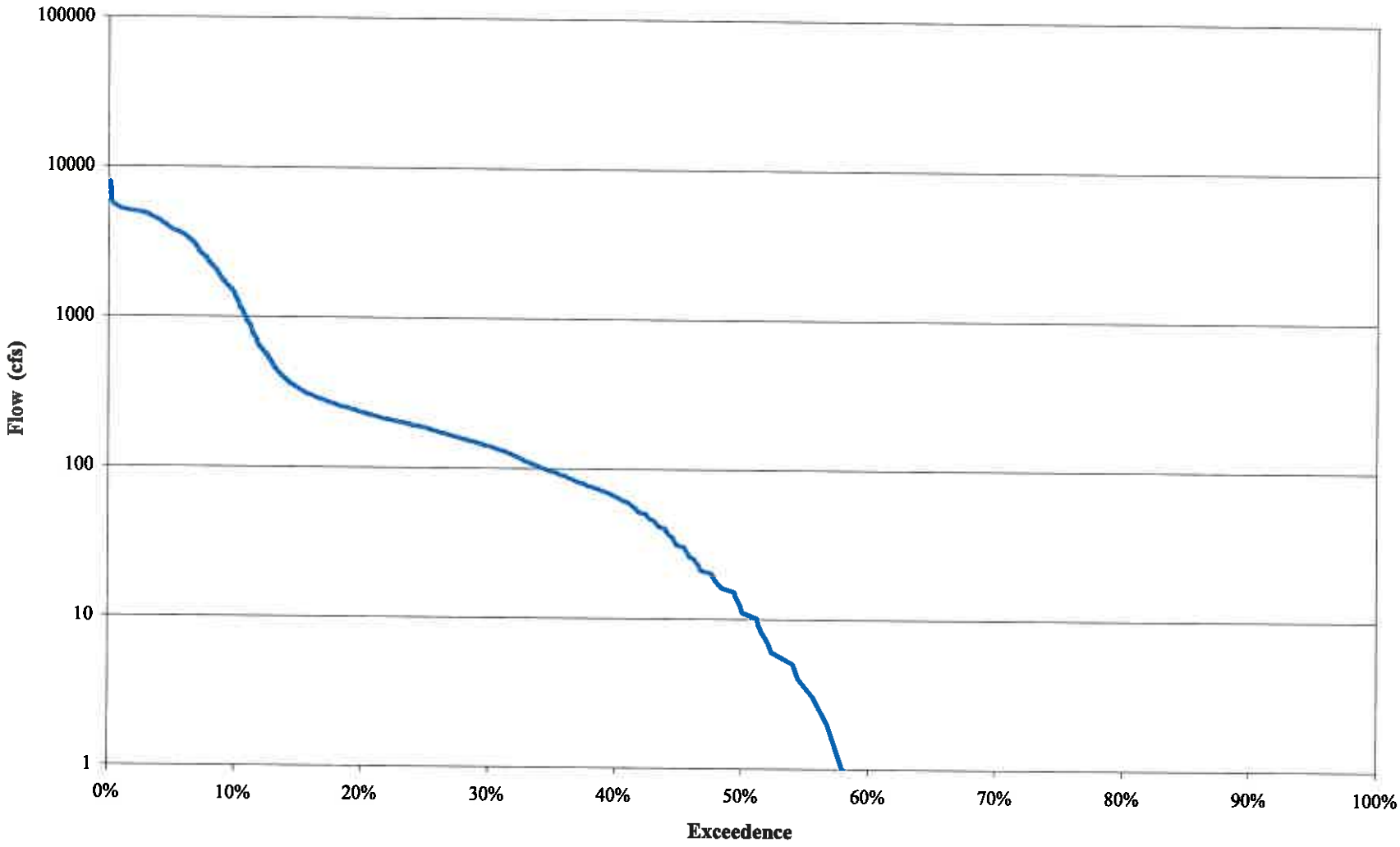
RIME	Lower Kings Basin GWMP Update	April 2005
	Kings River Flow Below James Weir	FIGURE E.8



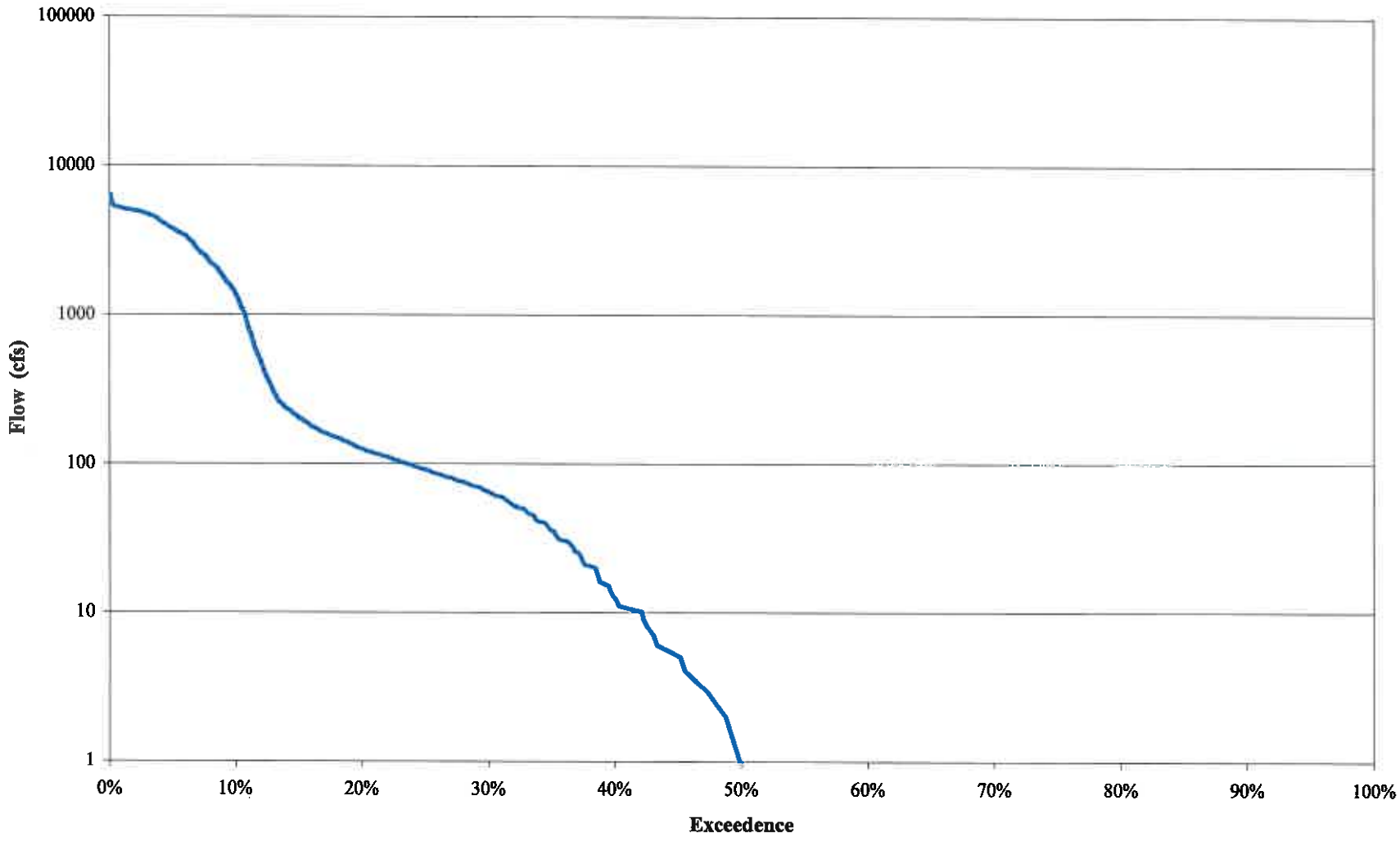
PRIME	Lower Kings Basin GWMP Update	April 2005
	Kings River Exceedence Below Peoples Weir	FIGURE E.9



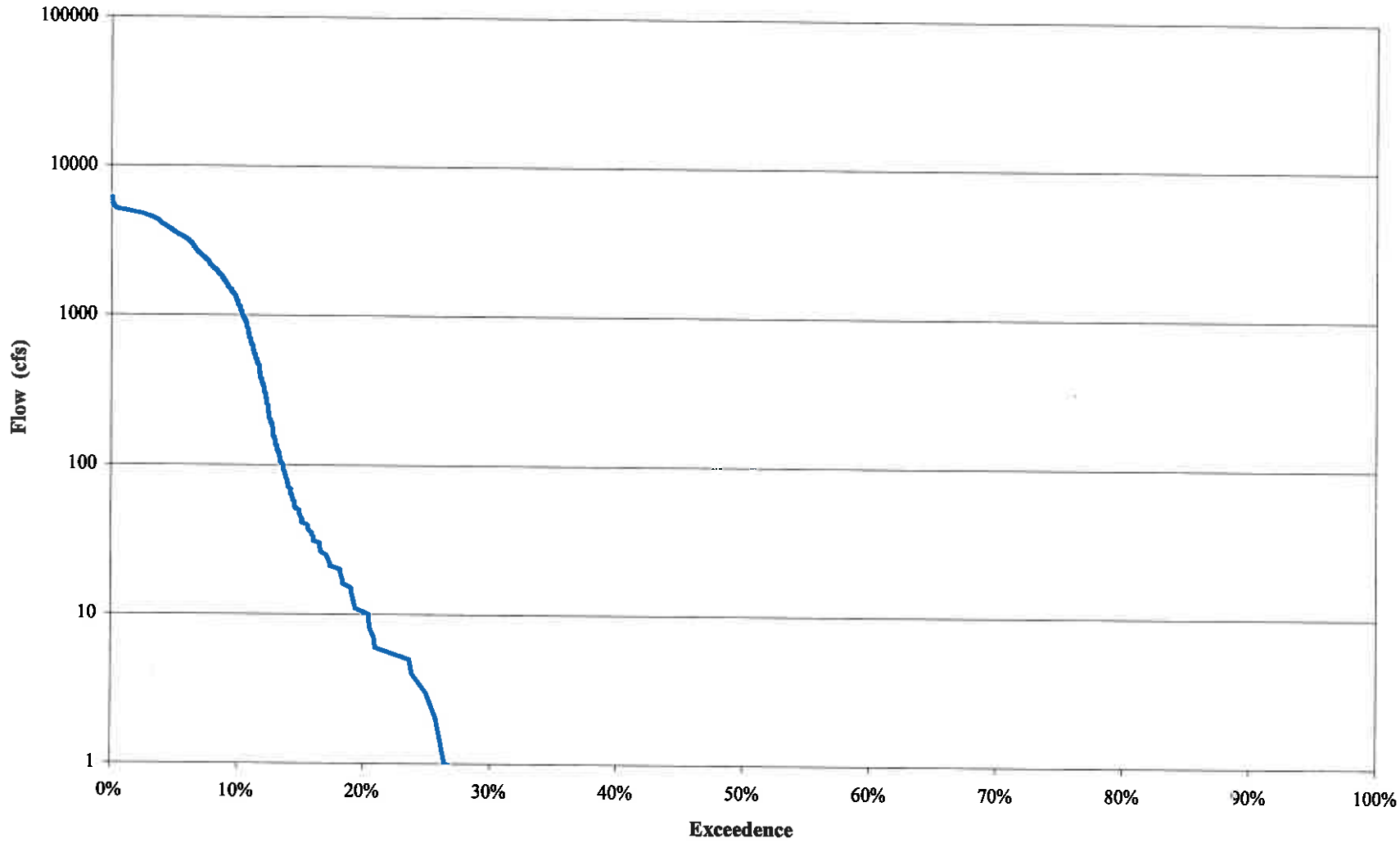
PRIME	Lower Kings Basin GWMP Update	April 2005
	Kings River Exceedence Below Lemoore Weir	FIGURE E.10



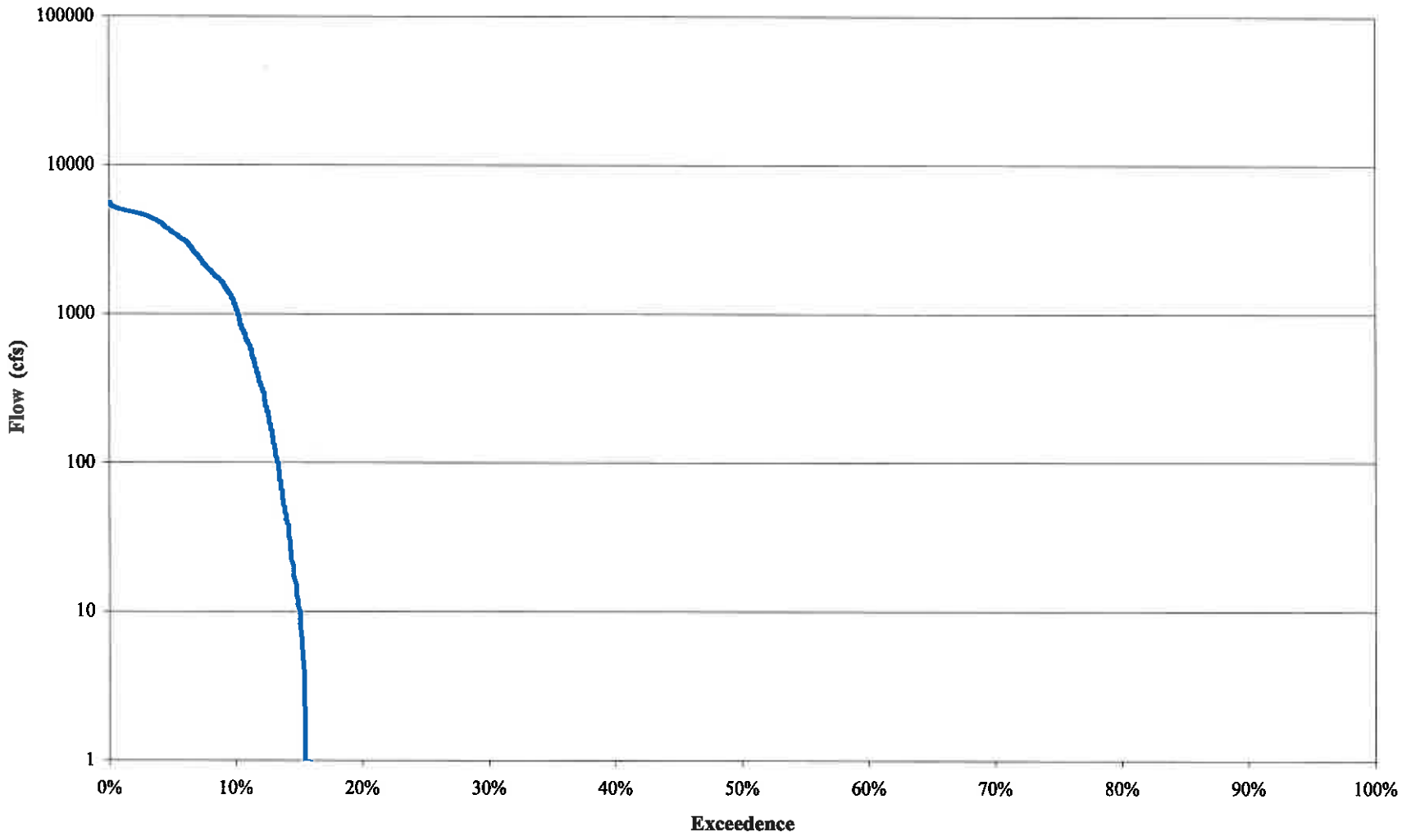
WRIME	Lower Kings Basin GWMP Update	April 2005
	Kings River Exceedence Below Island Weir	FIGURE E.11



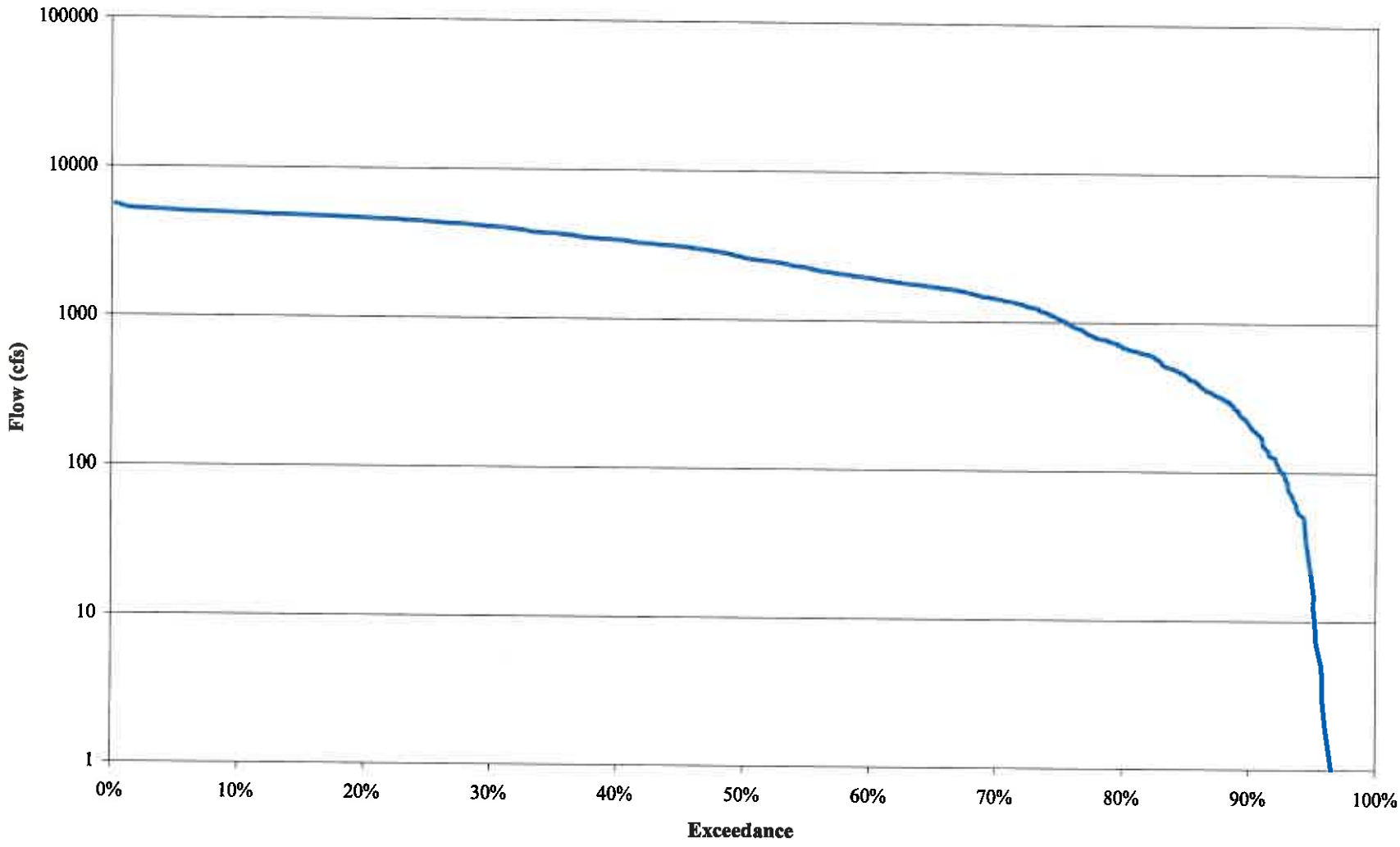
PRIME	Lower Kings Basin GWMP Update	April 2005
	Kings River Exceedence Below Crescent Weir	FIGURE E.12



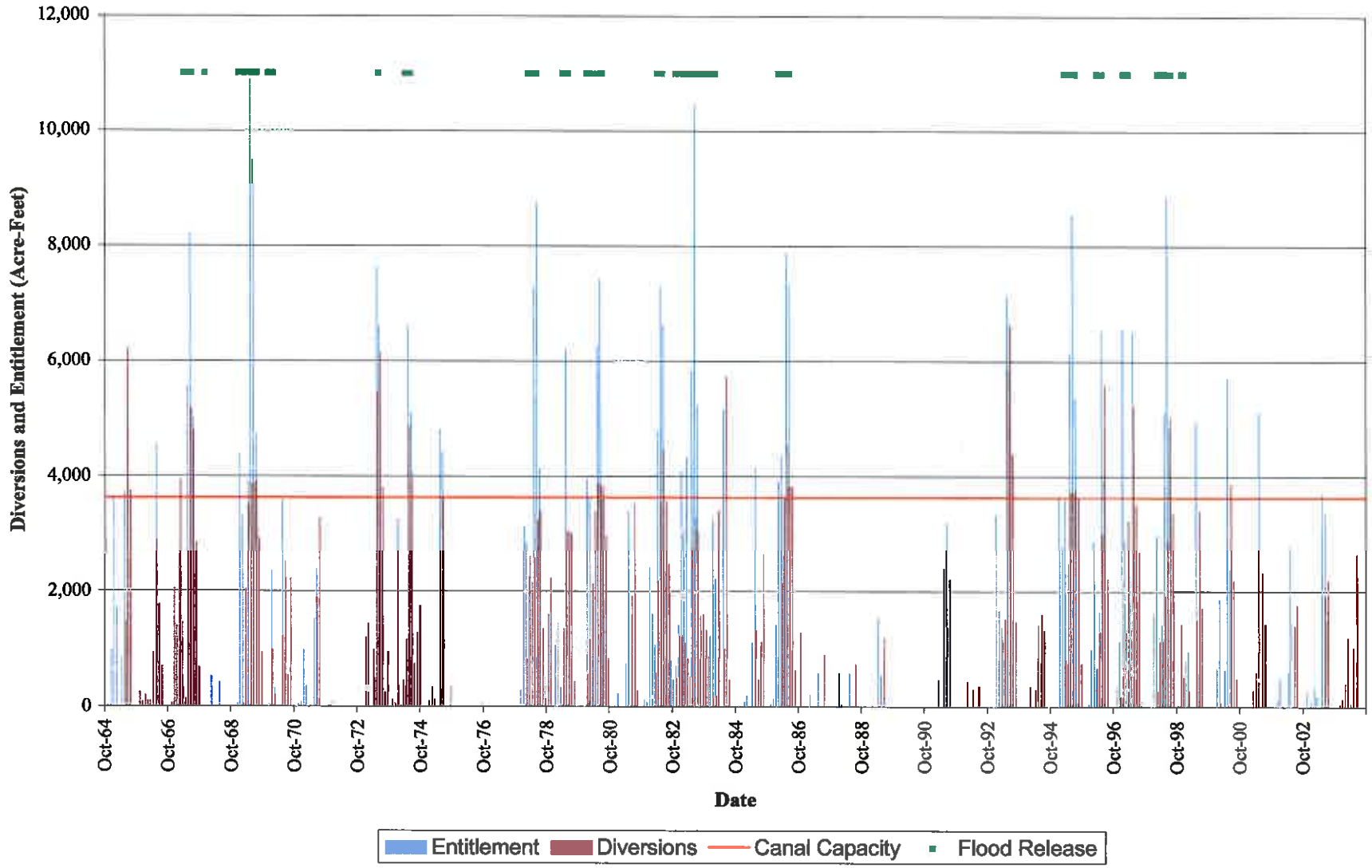
PRIME	Lower Kings Basin GWMP Update	April 2005
	Kings River Exceedence Below Stinson Weir	FIGURE E.13



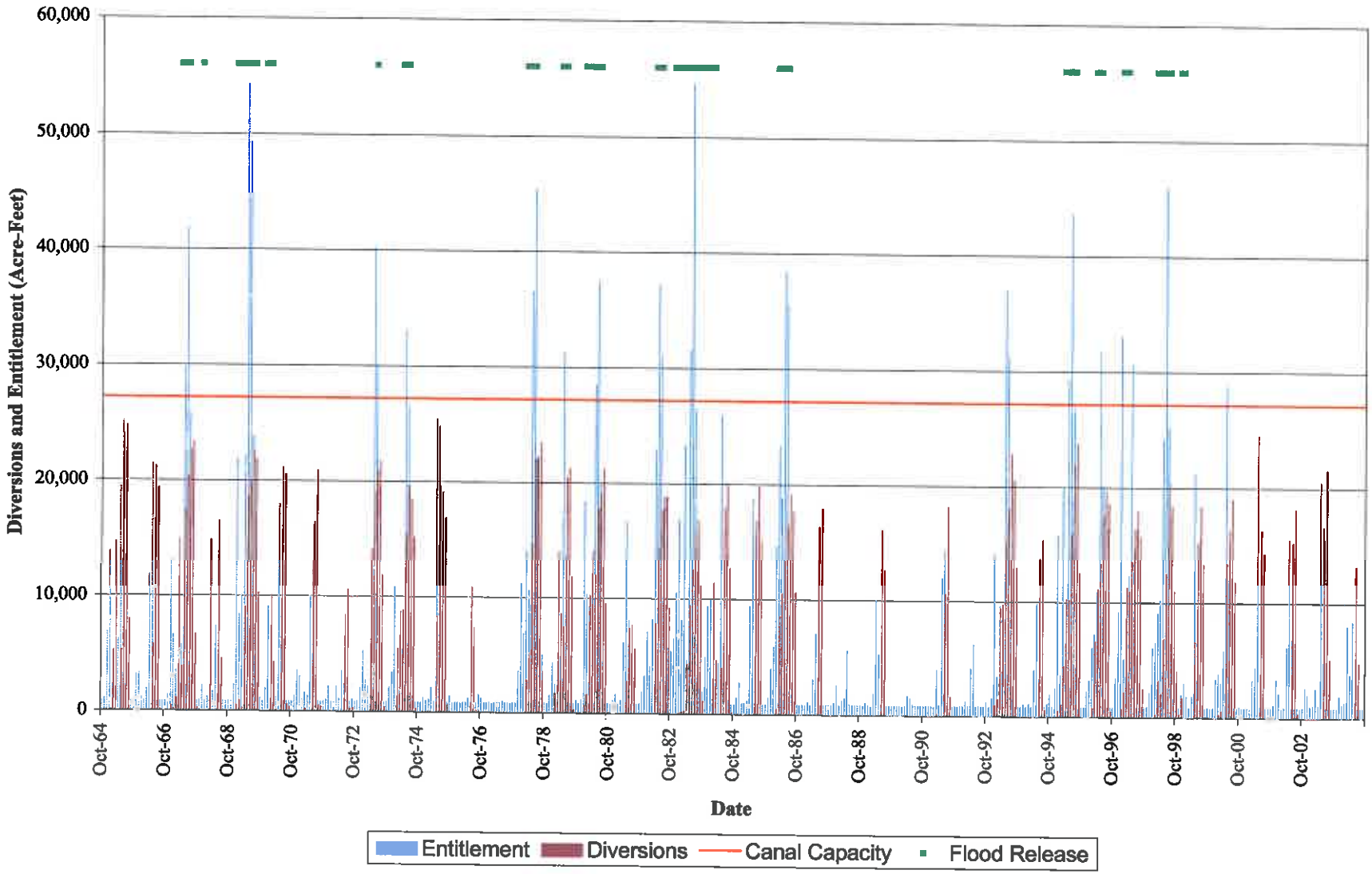
PRIME	Lower Kings Basin GWMP Update	April 2005
	Kings River Exceedence Below James Weir	FIGURE E.14



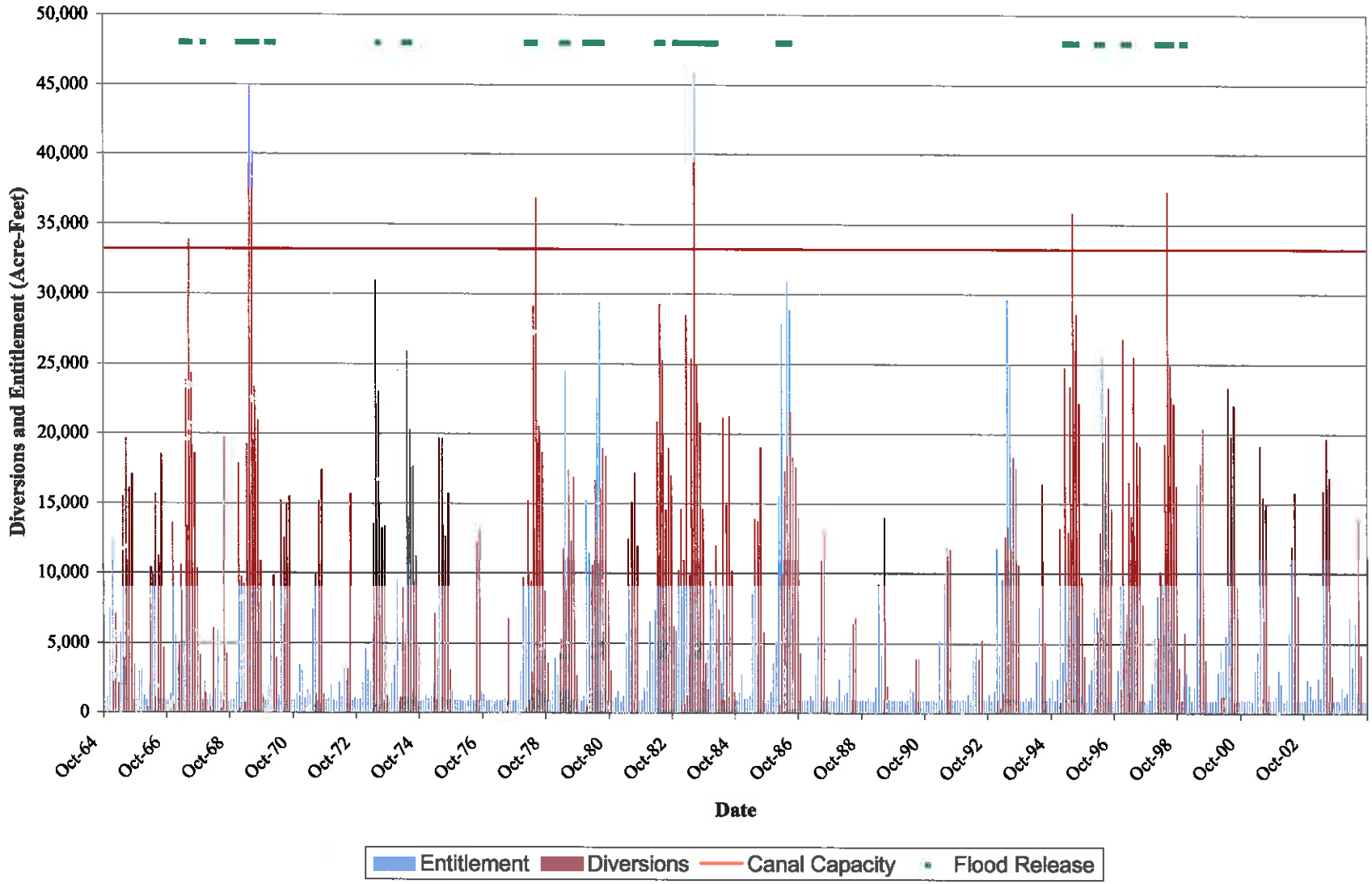
PRIME	Lower Kings Basin GWMP Update	April 2005
	Kings River Exceedence Below James Weir during Flood-Release Periods	FIGURE E.15



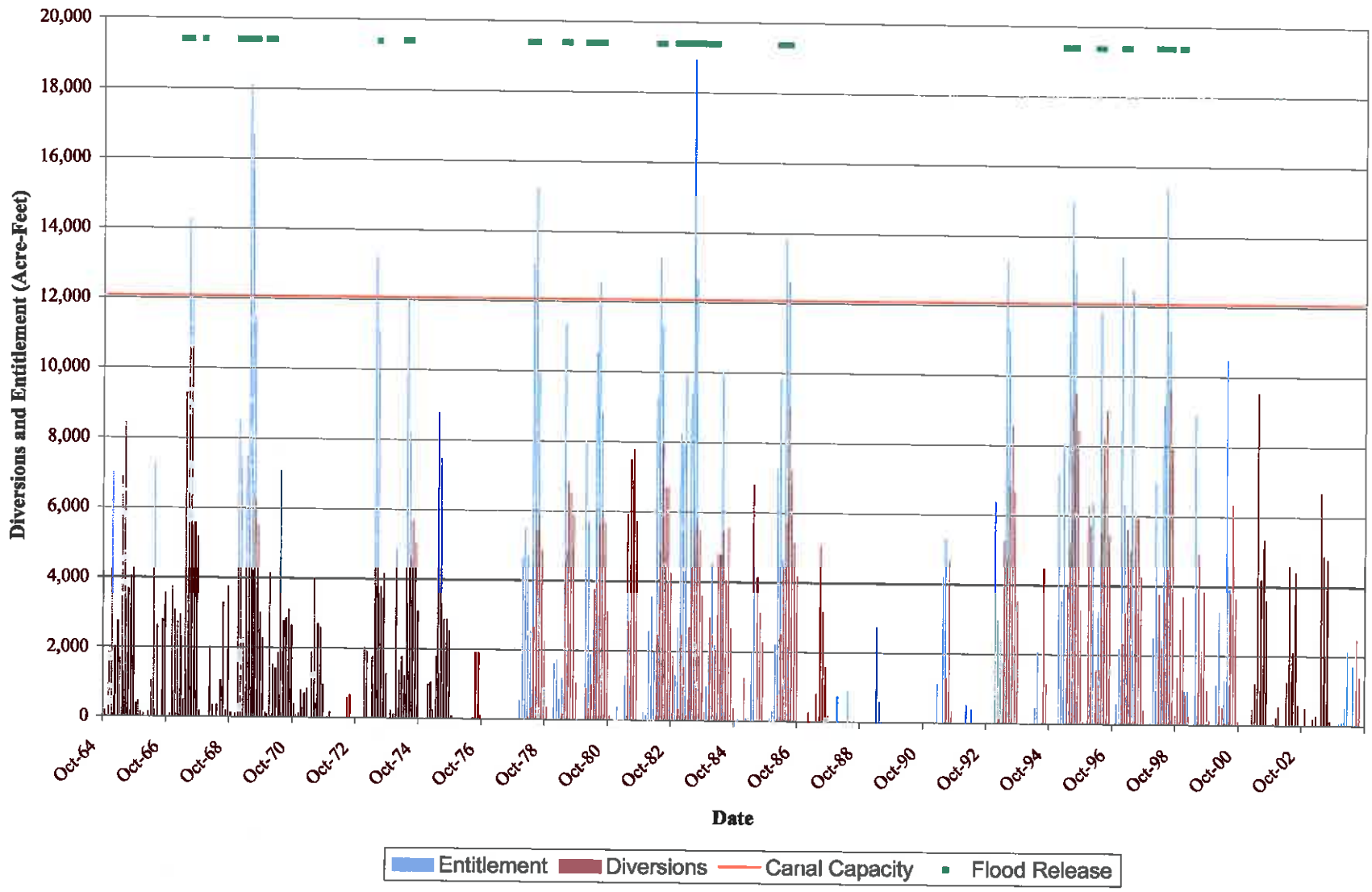
RIME	Lower Kings Basin GWMP Update	April 2005
	Liberty Canal Diversions and Entitlements	FIGURE E.16



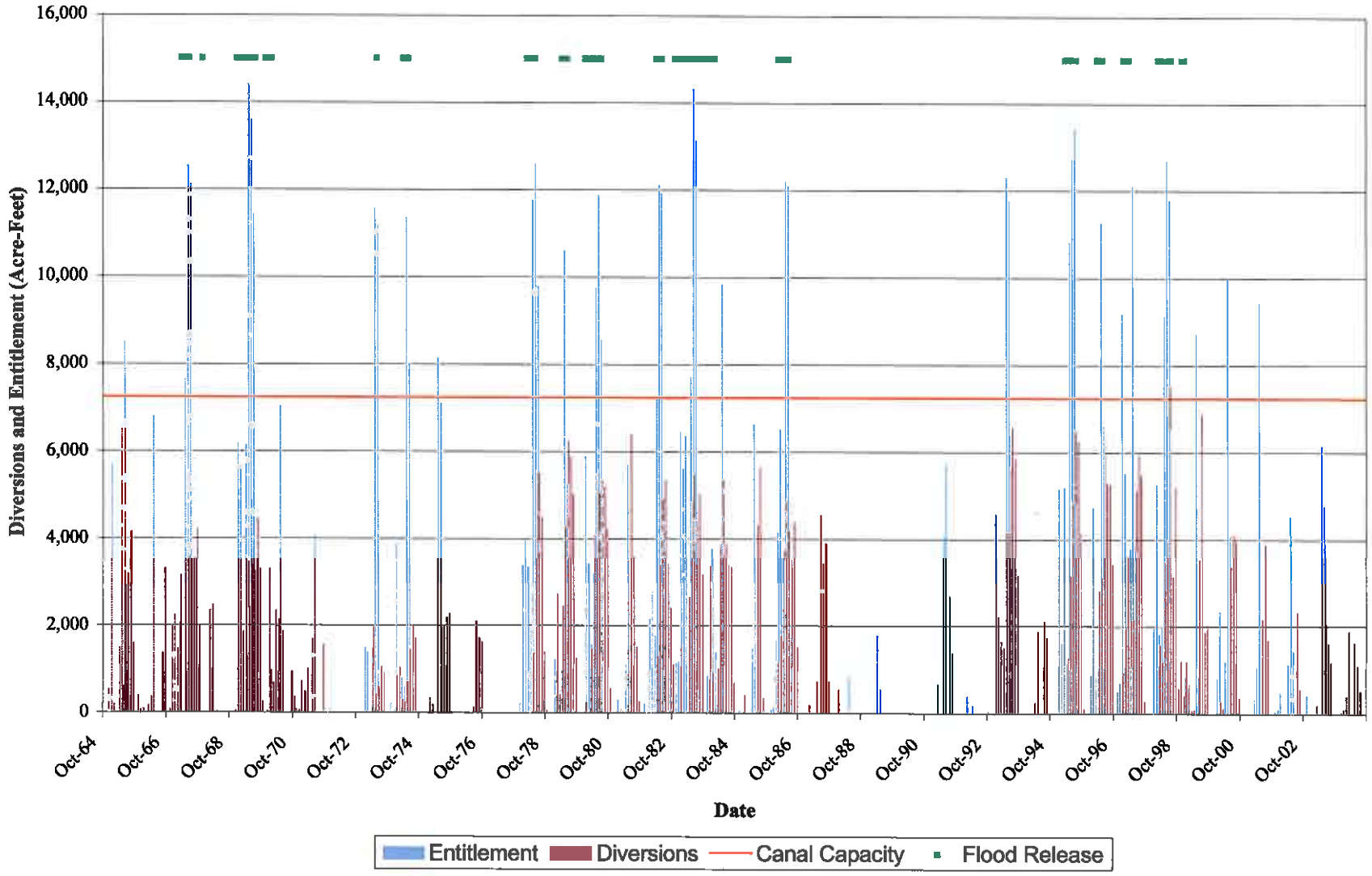
RIME	Lower Kings Basin GWMP Update	April 2005
	Laguna I.D. Diversions and Entitlements	FIGURE E.17



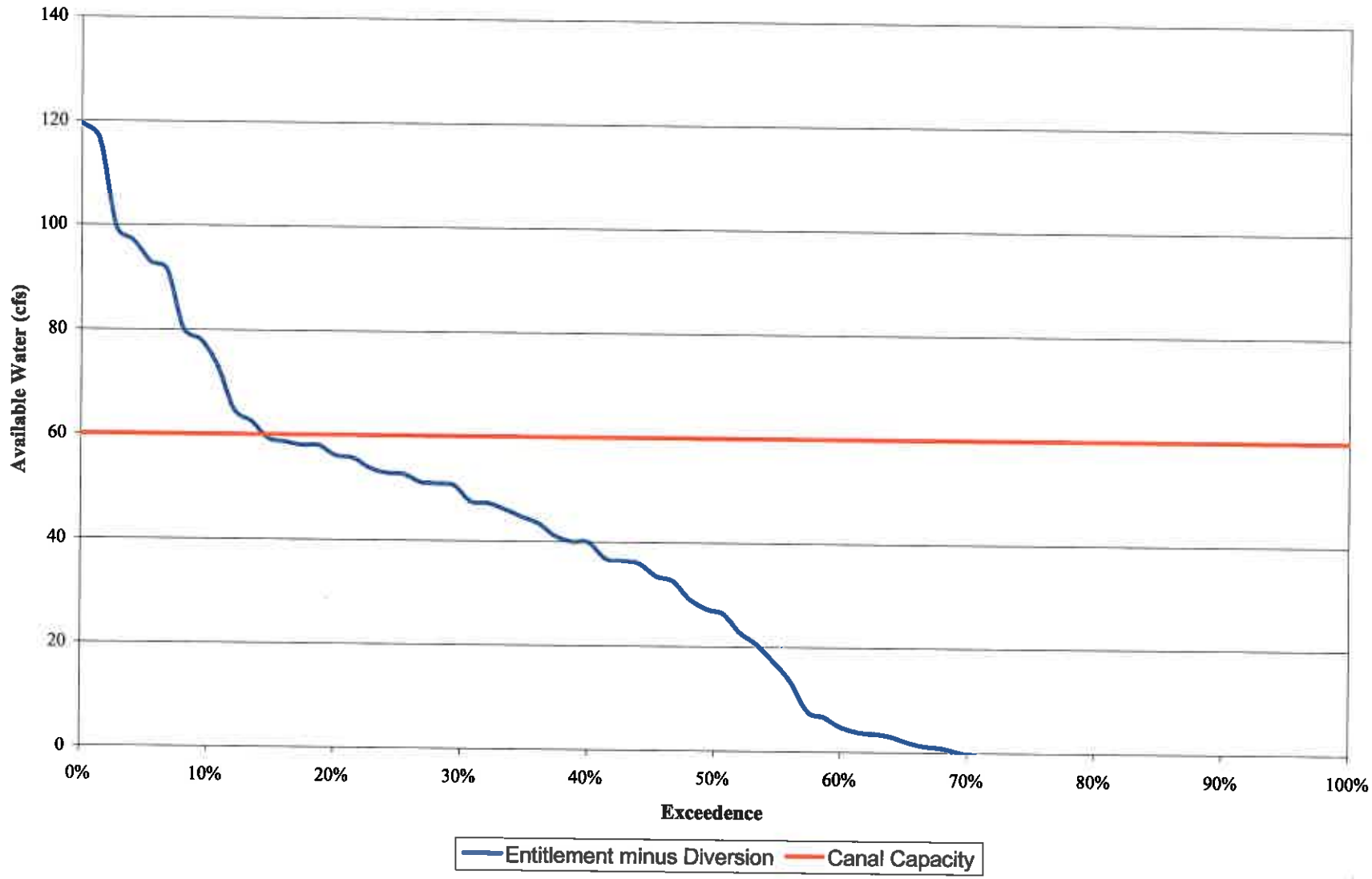
PRIME	Lower Kings Basin GWMP Update	April 2005
	Murphy Slough Diversions and Entitlements	FIGURE E.18



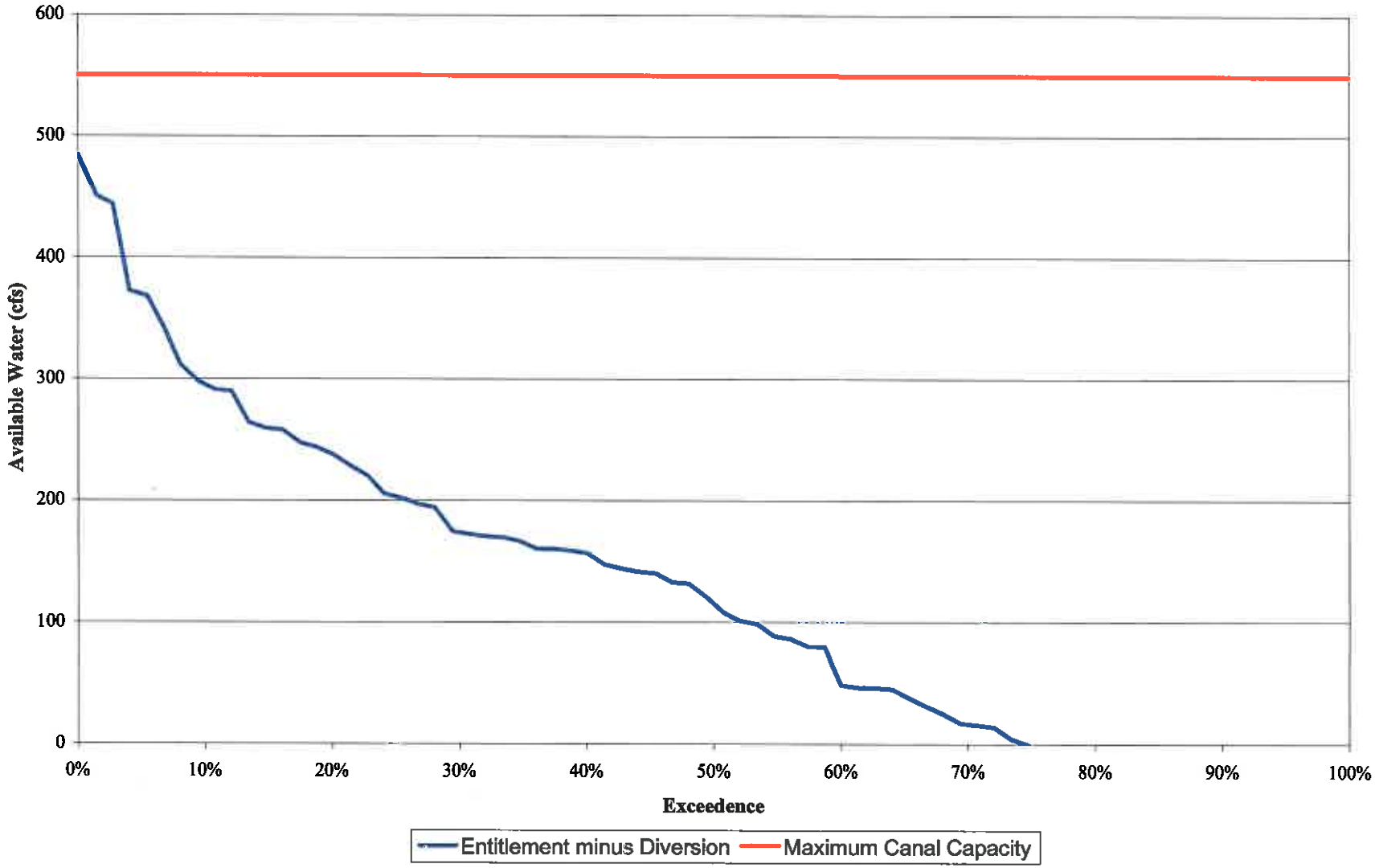
RIME	Lower Kings Basin GWMP Update	April 2005
	Crescent Canal Diversions and Entitlements	FIGURE E.19



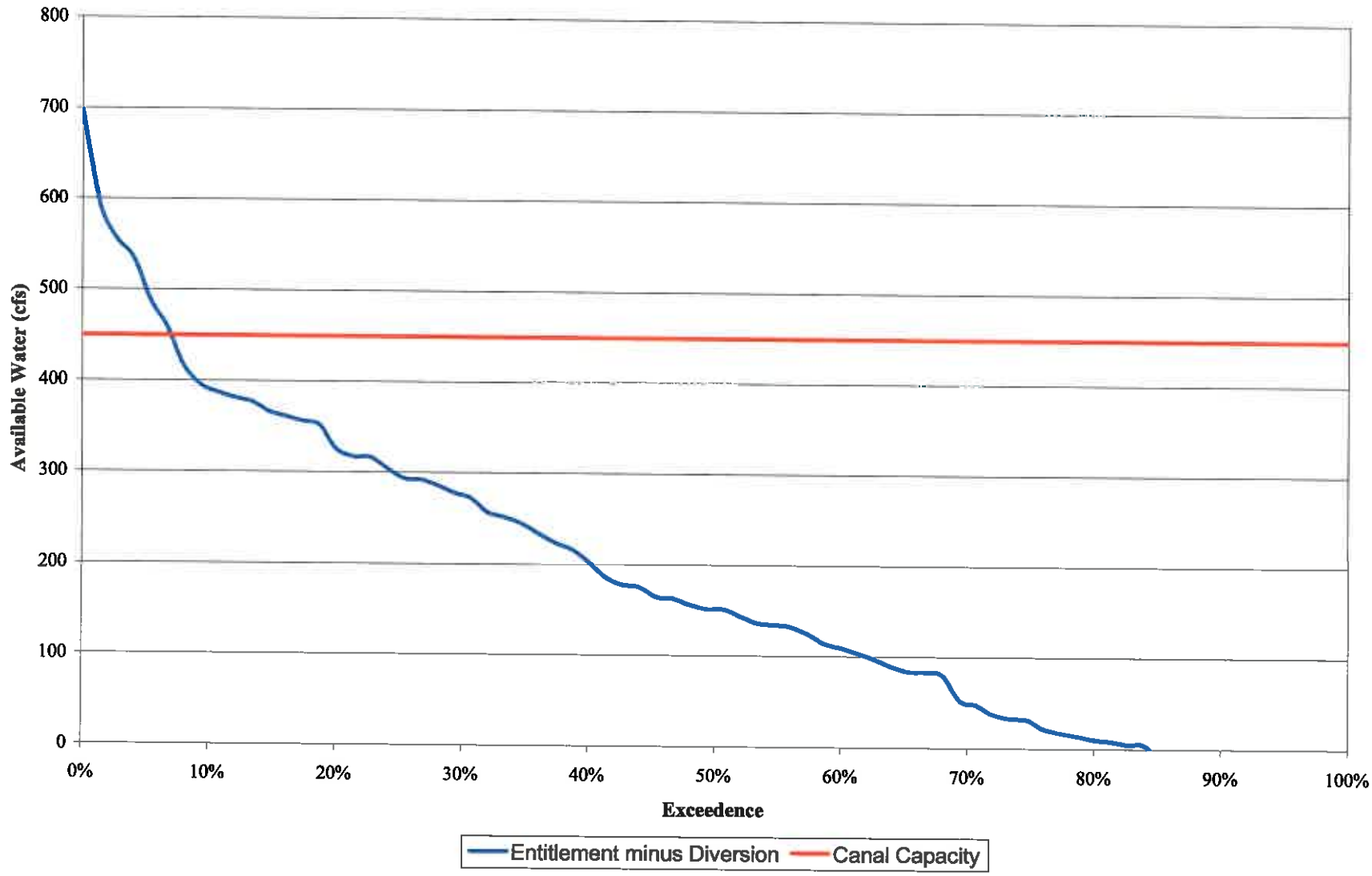
RIME	Lower Kings Basin GWMP Update	April 2005
	Stinson Canal Diversions and Entitlements	FIGURE E.20



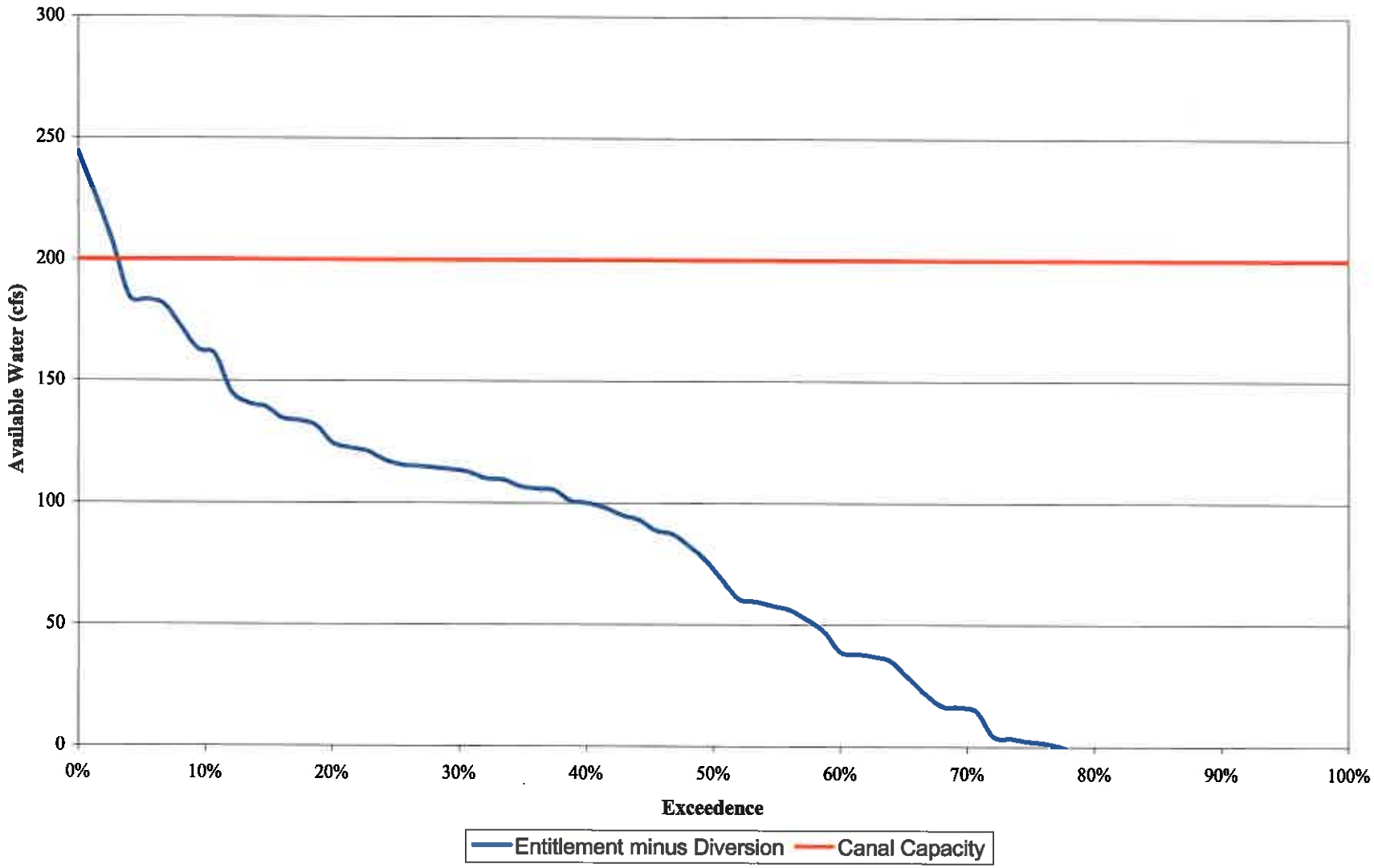
RIME	Lower Kings Basin GWMP Update **Available Water for Diversions Under Entitlement at Liberty Weir during Flood Release Periods**	April 2005 FIGURE E.21



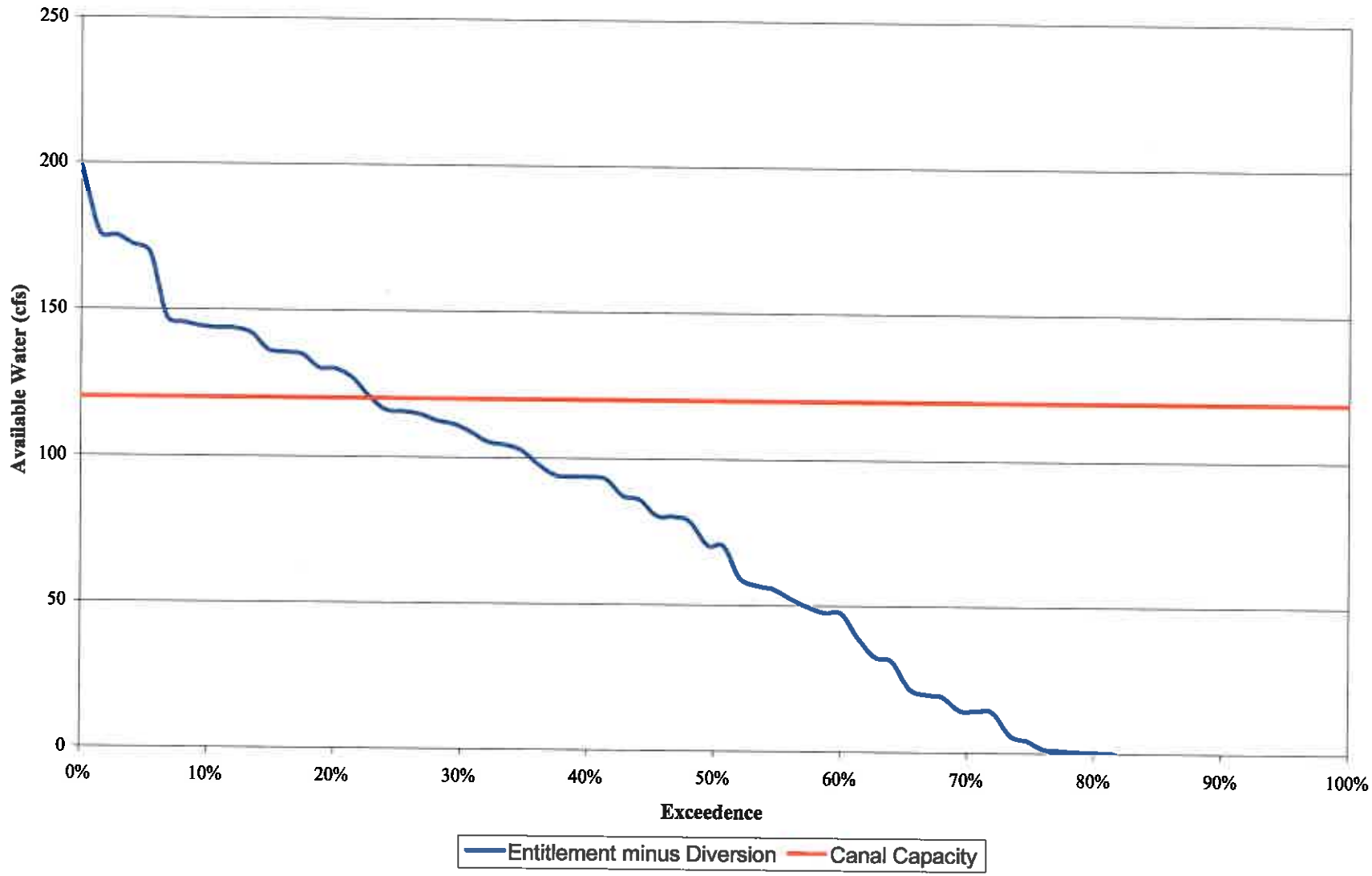
RIME	Lower Kings Basin GWMP Update **Available Water for Diversions Under Entitlement at Murphy Slough Weir during Flood Release Periods**	April 2005 FIGURE E.22



PRIME	Lower Kings Basin GWMP Update **Available Water for Diversions Under Entitlement for Laguna I.D. during Flood Release Periods**	April 2005 FIGURE E.23



RIME	Lower Kings Basin GWMP Update **Available Water for Diversions Under Entitlement at Crescent Weir during Flood Release Periods**	April 2005 FIGURE E.24



RIME	Lower Kings Basin GWMP Update **Available Water for Diversions Under Entitlement at Stinson Weir during Flood Release Periods**	April 2005 FIGURE E.25

GROUNDWATER MANAGEMENT PLAN

JAMES IRRIGATION DISTRICT AND THE CITY OF SAN JOAQUIN

REGISTERED PROFESSIONAL ENGINEER
OWEN KUBIT
No. C66552
Civil
STATE OF CALIFORNIA

DATE SIGNED: 11-1-10

NOVEMBER 2010

PREPARED BY:

EST. 1968
PROVOST& PRITCHARD
CONSULTING GROUP
An Employee Owned Company

TABLE OF CONTENTS

1 - INTRODUCTION 1
1.1 - Background Information on Plan Participants 1
1.2 - Goals and Objectives of Groundwater Management Plan 6
1.3 - Statutory Authority for Groundwater Management 7
1.4 - Lower Kings Basin Groundwater Management Plan 7
1.5 - Groundwater Management Plan Components 7
1.6 - Adoption of Plan 8
2 - GEOLOGY AND HYDROGEOLOGY 10
2.1 - Regional Geology 10
2.2 - Groundwater Basin 13
2.3 - Stratigraphy 15
2.4 - Aquifer Characteristics 18
2.5 - Groundwater Levels 21
2.6 - Groundwater Quality 22
3 - BASIN MANAGEMENT OBJECTIVES 24
4 - STAKEHOLDER INVOLVEMENT 26
4.1 - Groundwater Advisory Committee 26
4.2 - Relationships with Other Agencies 26
4.3 - Plan to Involve the Public and Other Agencies 29
5 - MONITORING PROGRAM 31
5.1 - Groundwater Level Monitoring 31
5.2 - Groundwater Quality Monitoring 32
5.3 - Groundwater Monitoring Protocols 33
5.4 - Surface Water Monitoring 34
5.5 - Land Surface Subsidence Monitoring 34
6 - GROUNDWATER RESOURCES PROTECTION 36
6.1 - Well Abandonment 36
6.2 - Wellhead Protection 36
6.3 - Saline Water Intrusion 37
6.4 - Migration of Contaminated Groundwater 38
6.5 - Groundwater Quality Protection 39
7 - GROUNDWATER SUSTAINABILITY 40
7.1 - Issues Impacting Groundwater Sustainability 40
7.2 - Overdraft Mitigation 41
7.3 - Groundwater Replenishment 44
7.4 - Conjunctive Use of Water Resources 46

7.5 - Water Conservation and Education 48
7.6 - Water Recycling 50
8 - GROUNDWATER OPERATIONS 51
8.1 - Well Construction Policies 51
8.2 - Operation of Facilities 51
9 - GROUNDWATER PLANNING AND MANAGEMENT 53
9.1 – Land-Use Planning 53
9.2 - Groundwater Reports 53
9.3 - Plan Implementation 54
9.4 - Plan Re-evaluation 55
9.5 - Dispute Resolution 55
9.6 - Program Funding and Fees 56
10 - REFERENCES 58

Figures

1 - Location Map
2 - Groundwater Sub-Basins Map
3 - James Irrigation District Facilities Map
4 - Soils Map and Locations of Subsurface Geologic Cross Sections
5 - Easterly Extent of E-clay
6 - Regional Extent of A-clay
7 - Regional Groundwater Contours (2003) – Depth to Groundwater
8 - Generalized Regional Cross Section through James Irrigation District and the City of San Joaquin

Attachments

1 - Cropping Data
2 - Summary of Production Well Attributes
3 - 2009 Water Delivery Report
4 - Sampling Instructions for Aqueous Samples
5 - Annual Groundwater Report Outline
6 - Implementation Schedule

Tables

1.1 - City of San Joaquin Water Usage
1.2 - Location of Groundwater Management Plan Components
1.3 - Public Participation in Groundwater Management Plan Adoption
2.1 - City of San Joaquin Wells
7.1 - James Irrigation District Surface and Groundwater Use (2000-2009)

Appendices

A - Public Participation
B - Geologic Cross Sections
C - Well Hydrographs
D - Groundwater Quality Data
E - Memorandum of Understanding between James Irrigation District and City of San Joaquin
F - Groundwater Quality Monitoring and Mitigation Plan
G - Groundwater Monitoring Protocols

List of Abbreviations

AB	Assembly Bill
ACWA	Association of California Water Agencies
AF	Acre-feet
AWMC	Agricultural Water Management Council
bgs	below ground surface
BMO	Basin Management Objective
CVP	Central Valley Project
DBCP	dibromochloropropane
DTSC	Department of Toxic Substances Control
DWR	Department of Water Resources
EC	Electrical Conductivity
EPA	Environmental Protection Agency
ET	evapotranspiration
EWMP	Efficient Water Management Practices
FKC	Friant-Kern Canal
FWA	Friant Water Authority
FWUA	Friant Water Users Authority
GAC	Groundwater Advisory Committee
GMP	Groundwater Management Plan
GPS	Global Positioning System
HSA	Hydrologic Study Area
ID	Irrigation District
IRWMP	Integrated Regional Water Management Plan
JID	James Irrigation District
KRCD	Kings River Conservation District
KRWA	Kings River Water Association
MOU	Memorandum of Understanding
MVWD	Mid Valley Water District
NRCS	Natural Resources Conservation Service
RCWD	Raisin City Water District
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SCADA	Supervisory Control and Data Acquisition
SCIC	Stinson Canal and Irrigation Company
SCS	Soil Conservation Service
SLDMWA	San Luis and Delta-Mendota Water Authority
TDS	total dissolved solids
TID	Tranquillity Irrigation District
USBR	United States Bureau of Reclamation
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WHPA	Wellhead Protection Area
WWD	Westlands Water District

1 - INTRODUCTION

This Groundwater Management Plan (GMP or Plan) is a joint effort between the City of San Joaquin (San Joaquin or City) and the James Irrigation District (JID or District). The two agencies are preparing this integrated GMP to better coordinate efforts, share data, and improve regional management of groundwater resources. Hereafter, the two agencies will be called the 'Plan Participants' and the area covered by the GMP will be called the 'Plan Area'. This Plan is the first effort by the City of San Joaquin to develop a GMP. This Plan is also an update to JID's GMP prepared in 2001, and this GMP satisfies new requirements for GMPs created by the September 2002 California State Senate Bill No. 1938, which amended Sections 10753 and 10795 of the California Water Code. This Plan also addresses recommended components for a Groundwater Management Plan described in Appendix C of Department of Water Resources Bulletin 118 (2003 Update).

1.1 - Background Information on Plan Participants

Following is general information on the Plan Area, followed by specific information on the City of San Joaquin and James Irrigation District.

Climate

The climate in the Plan Area is characterized by cool, mild winters and hot dry summers. Temperatures in the summer often exceed 100 degrees F. Fog occurs for long periods in the winter, with low temperatures typically in the mid 30's F; occasionally dropping into the 20's F. Average annual precipitation is about 7 inches, with 80 percent of the rainfall occurring from December through April. Precipitation is inadequate to meet crop water needs, except during the rainy season for some crops. Crops are sustained by irrigation during the summer. The growing season is typically 250 days per year.

Topography

Land in the Plan Area is relatively flat. It generally slopes westward and northward at a rate of about 3 to 4 feet per mile towards the topographic axis of the San Joaquin Valley, with local variations caused by remnants of slough channels. Elevations range from 160 to 180 feet above sea level.

City of San Joaquin

Below is a summary of the geography, demographics, water demands and water facilities in the City of San Joaquin.

Geography and Demographics

The City of San Joaquin was founded in 1920. The City is located in Western Fresno County about 11 miles southwest of the City of Kerman (see **Figure 1**). The City is an enclave in James Irrigation District. The City currently covers approximately 1 square mile. In 2010, the City had a population of 4,166. The population growth is expected to

be 2.6% per year for the next ten years. Most of the population is employed in the agricultural industry.

Currently, rural dwellings in JID are not commonly being built. Old houses are being torn down and people are moving to San Joaquin or other urban areas. This could lead to more growth in San Joaquin. San Joaquin plans to expand to the east with an area of about one square mile. Specifically, San Joaquin expects to see the construction of about 300 new homes in the next five years.

Water Demand

Water usage in San Joaquin from 2005 to 2009 is summarized in Table 1.1.

Table 1.1 – City of San Joaquin Water Usage

Year	Volume	
	Million gallons	Acre-feet
2005	222	681
2006	221	678
2007	242	742
2008	259	795
2009	257	789

In 2008, the City's per capita water usage was 181 gallons per capita per day (gpcpd), which is close to the national average (ConSol 2009). About 60% of the water is used for outdoor landscaping. Fluctuations in gpcpd from year to year can be explained by a variety of economic, demographic, and climate factors. The per capita water use is not expected to increase, but may reduce with the implementation of conservation measures.

Facilities

The City is serviced by three groundwater wells. Combined, these wells have a maximum capacity of 3,500 gallons per minute (gpm) and 5 million gallons per day (gpd). In 2008, 49% (1,723 gpm) of the maximum groundwater well capacity was used during peak consumption for the City. The City hopes to construct one well in the near future to replace one of the older existing wells. The City does not use or import any surface water. The City also operates three stormwater basins that provide stormwater retention and incidental groundwater recharge. The City has no recharge basins or reservoirs, but has plans to construct a reservoir tank within the next few years.

Based on current analysis, the City is not expected to outstrip its supply capacity or lose ability to meet peak demands over the next ten years, unless one of the wells ceases to operate. This is a concern for the City since some of their wells are old.

The City has about 950 service accounts. Residential accounts are not metered. About 5 percent of the accounts are commercial, and about 20% of the commercial accounts are metered.

James Irrigation District

Below is a brief description of the origin, physiography, geology, water supplies and facilities in JID.

Location

The James Irrigation District (JID or District) was organized in 1920 under the California Water Code. The District covers 26,392 acres wholly within Fresno County, California. The San Joaquin Valley Farmlands Company, successor to the James Ranch, granted to JID a perpetual right to pump and import groundwater from beneath lands east of the District, up to 200 cfs in capacity. This GMP covers the area within the JID boundaries and deeded groundwater area, but the physiography and geology of neighboring lands are also discussed. The District is situated in the central San Joaquin Valley of California and is approximately thirty miles southwest of the City of Fresno. The City of San Joaquin lies near the middle of the District, but is excluded from the District's boundary. State Highways 145, 180 and 33 are in close proximity. Adjacent agricultural water agencies include the Tranquility Irrigation District (TID), Westlands Water District (WWD), Stinson Canal and Irrigation Company (SCIC), Mid Valley Water District (MVWD), Reclamation District 1606, and the Raisin City Water District (RCWD). A location map for the District is included as **Figure 1**, and a vicinity map of the District within the Kings Groundwater Basin is included as **Figure 2**.

Land Use

When JID was formed in 1920, agricultural development of its lands was well underway. As irrigation facilities were constructed, use of the land gradually converted from grasslands to cultivated crop land. District lands are now essentially fully developed for agriculture. Cropping data for 1993 to 2007 is included on **Attachment 1**. Typically, about 23,000 acres are irrigated and prevalent crops include cotton, wine grapes, corn, almonds and seed alfalfa. Other significant crops include tomatoes, sugar beets, wheat, and onions. Currently, the principal irrigation method is furrow irrigation, with smaller amounts of drip, level basin, and micro-sprinkler irrigation. There is a trend towards planting permanent crops and converting to modern irrigation methods.

Facilities

Figure 3 is a map illustrating the major facilities in the District. JID's conveyance system consists of three major components: Eastside Canals, the Main Canal, and the Lateral Canals. The Eastside Canals consist of two canals, the Kerman Line Pump Canal (a.k.a. Lassen Canal) and the Coalinga Line Pump Canal (a.k.a. McMullin Grade Canal). These canals collect and convey groundwater pumped from about 35 JID wells, which lie outside of the District's boundaries, into the district. The Eastside Canals merge together and connect near the south end of the Main Canal by flowing through twin 60-inch diameter reinforced concrete pipelines that cross under the Fresno Slough

Bypass (also called the James Bypass). These 60-inch pipelines are called 'the siphon'. In 1992, 3.25 miles of the Eastside Canals were piped with smooth interior corrugated polyethylene pipe, and the remaining 12.25 miles were concrete lined; the pipeline and canal lining were financed through a DWR sponsored loan and JID bonds.

The JID Main Canal operates as a lift canal for surface water that is pumped from the Mendota Pool. Groundwater and diverted Kings River flood releases feed by gravity into the Main Canal from the south and flow northwesterly. The system also includes 17 lateral canals that are mostly unlined earthen ditches.

The District also has about 63 groundwater extraction wells and about 20 monitoring wells. A summary of well attributes is provided as **Attachment 2**. In 2004, JID completed construction of the 220-acre K-Basin Recharge Project. The project includes six wells to recover some of the recharged water.

The proposed JID Water Augmentation Project will include new facilities for storing and recharging water, with the goal of reducing JID's dependence on surface water. The project will include improvements to basins and construction of new recovery wells and conveyance facilities. The project will provide facilities for regulation storage, floodwater storage, groundwater recharge, and groundwater banking. These facilities will be located just north of the James Weir in the Fresno Slough Bypass, about 3 miles southeast of the City of San Joaquin. It is estimated that the project will allow JID to capture and recharge an average of 4,740 AF/year of Kings River floodwater. Five recovery wells will have the capacity to extract 30 AF/day. Other details on the project are not provided as the design continues to evolve. The project is currently being permitted and designed, and construction is expected to be completed by the end of 2011 or possibly 2012.

JID has also prepared a Water Banking Prospectus for the Water Augmentation Project. JID is actively seeking an agency that wants to bank water in JID using the proposed facilities. As a condition of any banking agreement at least 10% of the banked water must be left behind. This will contribute to local recharge and higher groundwater levels while the water is banked. The volume of water that will be banked still has to be negotiated with a potential banking partner.

<u>Groundwater Supplies</u>
The District owns and operates about 63 irrigation wells. The well locations are shown on **Figure 3**. About 28 of these are within the District boundary and about 35 are east of the District boundary within their deeded groundwater easement area. The current estimated yield for each well is shown on **Attachment 2**. Well yields range from 950 to 3,400 gpm, with an average of about 1,500 gpm. The total well pumping capacity is about 210 cfs. Most of JID's wells are between 500 and 600 feet deep, and extend to the top of the Corcoran Clay (a local confined aquifer). A few of JID's older wells are 700 to 900 feet deep and penetrate the confined aquifer. Two privately owned irrigation wells are inside of JID's boundary.

An enormous aquifer system lies beneath the Kings Groundwater Sub-basin and extends the length and breadth of the San Joaquin Valley. The valley is a broad structural trough, with the Sierra Nevada mountains on the east and the Coast Range mountains on the west. The Sierra basement rock extends from the foothills on the east, sloping downward to the southwest at 4° - 6°. Consolidated and unconsolidated continental and marine deposits from both the Sierra and the Coast Range mountains overlie this basement complex. Unconsolidated alluvial deposits make up most of the basin's freshwater aquifer (Croft, 1972).

Interspersed within the unconsolidated deposits that comprise the usable aquifer in the region are a number of clay layers that can act as confining beds. The confining bed that has greatest significance to the District is known as the Corcoran Clay, or E-clay. The E-clay underlies the entire District. Two other clay layers also partially underlie the District.

JID now primarily uses the unconfined aquifer lying above the E-clay. The top of this clay occurs at a depth of around 500 feet below ground level within the District. Originally, most District wells constructed in the 1910's and 20's tapped the aquifer below the E-clay. Many of these wells initially exhibited artesian flow.

Surface Water Supply

CVP Schedule 2 water (informally called 'Riparian water') is delivered without charge as a settlement of the District's water rights claims in Fresno Slough – during normal and wet years 9,700 acre-feet is available, during dry years 7,600 acre-feet is available. The contract requires that the District take delivery of this water according to a predetermined schedule. In practice, the United States Bureau of Reclamation has allowed some flexibility on when this water is taken.

In addition, JID has a Central Valley Project (CVP) contract (No. 14-06-200-700L) for up to 35,300 acre-feet of water each year. Other water used by the District includes spillwater from the Fresno Irrigation District and Kings River floodwater.

In the past during wet years the USBR has made surplus water available to JID, which is above its normal contract deliveries. The source of this water may be either imports from the Delta via the Delta Mendota Canal, or San Joaquin River flood releases (called Section 215 water by the USBR).

Water Demands

Water demand in the District slowly increased over the years as land was brought into production. Since full agricultural development has now occurred, change in demand is largely the result of changing cropping patterns. **Attachment 3** is a 2009 Water Delivery Report for JID. The table also provides general water supply data for 1994 to 2009. Between 1994 and 2009, JID pumped an average of 29,500 AF/year of groundwater (39% of total supply), and imported an average of 46,600 AF/year of surface water (61% of total

water supply). JID has a goal to reduce their overall water demands through water conservation and water management efforts.

For more general information on JID refer to the James Irrigation District Water Conservation Plan – 2009 Update.

1.2 - Goals and Objectives of Groundwater Management Plan

The overall purpose of this GMP is to develop a coordinated and comprehensive approach to the evaluation and management of groundwater resources within the City of San Joaquin, James Irrigation District, and the James Irrigation District "East Side Wellfield" which is outside the District boundaries. Specific goals of this plan include the following:

1. Develop a consensus among agency staff and stakeholders on the current groundwater conditions, need for proactive groundwater management, and problems that need to be addressed.
2. Document goals and objectives for sustaining existing efforts and improving groundwater management.
3. Develop practical solutions for addressing groundwater issues, especially groundwater overdraft.
4. Improve communication between the City of San Joaquin and JID, and increase awareness of each agencies groundwater management concerns, programs and goals.
5. Provide a realistic and feasible implementation plan for short-term and long-term groundwater management efforts.

This GMP documents the existing groundwater management efforts in the Plan Area and planned efforts to improve groundwater management. Specific groundwater management goals documented in this GMP include:

1. Preserve and enhance the existing quality of the area's groundwater.
2. Preclude surface or ground water exports that would reduce the long-term supply of groundwater.
3. Coordinate groundwater management efforts between regional water users.
4. Maintain local management of the groundwater resources.
5. Implement a groundwater-monitoring program to provide an "early warning" system to future problems.
6. Stabilize groundwater levels in order to minimize pumping costs and energy use, and provide groundwater reserves for use in droughts.
7. Maximize the use of surface water, including available flood water, for beneficial use.

In addition, the Plan Participants will take a proactive role in the legislative process, participate in developing sound legislation concerning groundwater management if it

becomes necessary, and take an active role in opposing any legislation that is detrimental to local groundwater management efforts.

1.3 - Statutory Authority for Groundwater Management

The City of San Joaquin and James Irrigation Districts are both public agencies with the authority to manage groundwater and prepare Groundwater Management Plans. California Assembly Bill 3030, as chaptered, (California Water Code, Division 6, Part 2.75, SEC. 10750-10753.9) grants specified "local agencies" authority to undertake groundwater management. AB 3030 also confers upon local agencies the powers of a water replenishment district. These authorities remained unchanged with the amendments to the law provided by California Senate Bill No. 1938, which was passed in 2002 and outlines additional requirements for GMPs. Agencies adopting a GMP are authorized to enter into agreements with other local agencies or private parties to manage mutual groundwater supplies, including those existing in overlapping areas.

1.4 - Lower Kings Basin Groundwater Management Plan

The Kings River Conservation District has developed a regional GMP that includes the area covered by James Irrigation District and the City of San Joaquin. The GMP is called the '*Lower Kings Basin Groundwater Management Plan*' (Regional GMP) and was prepared in April 2005. The GMP is compliant with Senate Bill 1938 and discusses regional geography, geology and hydrogeology, regional groundwater problems, and regional basin management objectives. The Regional GMP includes several study areas and JID and the City are included in study 'Area A'. One important goal in the Regional GMP is the development of an improvement district for all of Area A to jointly fund regional studies, projects and monitoring.

JID and the City did not participate in the development of the Regional GMP. However, JID found many of the goals and objectives in the regional GMP to be compatible with their needs and beneficial for JID and the region. As a result, JID passed a District Resolution (No. 2007-03) supporting the Regional GMP. As a result, JID will have two GMPs: this document and the Regional GMP. This document will help guide local and regional groundwater management, and the Lower Kings Basin GMP will help guide regional groundwater management.

1.5 - Groundwater Management Plan Components

This GMP includes the required and voluntary components for a GMP as identified in California Water Code Section 10753, et. seq. This Plan is also consistent with the recommended elements for a GMP as identified in DWR Bulletin 118 (2003), Appendix C. **Table 1.2** identifies the location within this document where each of the components is addressed.

Table 1.2 – Location of Groundwater Management Plan Components

Description	Plan Section(s)
California Water Code Mandatory Requirements (10750 et seq.)	
1. Documentation of public involvement	1.5, Appendix A
2. Groundwater basin management objectives	1.2, 3
3. Monitoring and management of groundwater elevations, groundwater quality, land subsidence, and surface water	5
4. Plan to involve other agencies located in the groundwater basin	4.3
5. Monitoring protocols	5.3
6. Map of groundwater basin and agencies overlying the basin	**Figure 2**
California Water Code Voluntary Components (10750 et seq.)	
7. Control of saline water intrusion	6.3
8. Identification and management of wellhead protection areas and recharge areas	6.2, 7.2
9. Regulation of the migration of contaminated groundwater	6.3, 6.4
10. Administration of well abandonment and well destruction program	6.1
11. Mitigation of overdraft conditions	7.1, 7.2
12. Replenishment of groundwater extracted by water users	7.2
13. Monitoring of groundwater levels and storage	5.1, 9.2
14. Facilitating conjunctive use operations	7.3
15. Identification of well construction policies	8.1
16. Construction and operation by local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects	6.4, 7, 8.2
17. Development of relationships with state and federal regulatory agencies	4.2, 4.3
18. Review of land use plans and coordination with land use planning agencies	9.1
Additional Components Recommended by DWR (App. C of Bulletin 118)	
19. Advisory committee of stakeholders	4.1
20. Description of the area to be managed under the Plan	1.1, 2
21. Descriptions of actions to meet management objectives and how they will improve water reliability	4 - 9
22. Periodic groundwater reports	9.2
23. Periodic re-evaluation of Groundwater Management Plan	9.4

1.6 - Adoption of Plan

Refer to **Appendix A** for documentation on the adoption of the GMP and the public process that was followed.

Public Participation in Plan Development
The public was invited to participate in the development of the updated GMP through newspaper notices and public hearings described below.

Preparation of Integrated Plan with City and JID
JID began to update their GMP in 2009. JID contacted several local agencies to solicit their input on the GMP. The City of San Joaquin was the only agency that expressed interest in the local groundwater management, and requested that the two agencies prepare a joint integrated Groundwater Management Plan. In April 2010, the two agencies signed a Memorandum of Understanding to cooperate on local groundwater management (see **Appendix E**) and prepare a joint GMP.

Groundwater Advisory Committee
The City of San Joaquin and JID used their City Council and Board of Directors, respectively, as groundwater Advisory Committees during preparation of this GMP. The two agencies plan to form a joint GAC for implementing the GMP after it is adopted. The joint GAC will include representatives from JID and the City that can represent and speak for the local interests. Several special sessions on groundwater issues were held at JID Board of Directors and City Council meetings. The GAC were also given a draft copy of the GMP to review. The GAC provided several insightful and useful comments for managing groundwater that were incorporated into the GMP.

As required by the California Water Code Section 10753.2 (a), JID and the City published a series of public notices, held public meetings, and adopted resolutions required for preparing and adopting this GMP. No comments were received from the public other than those offered by the Groundwater Advisory Committees. These public outreach efforts are summarized in Table 1.3 below.

Table 1.3 – Public Participation in Groundwater Management Plan Adoption

Phase of Public Noticing	Description	James Irrigation District	City of San Joaquin
Intent to prepare GMP	Notice of hearing published	12-31-08/1-7-09	4-10/5-10
	Hearing held. Resolution adopted.	1-13-09	5-12-10
	Resolution published	4-8-09/4-15-09	7-7-20/7-14-09
GMP Adoption	Notice of hearing published	9-29-10/10-6-10	9-29-10/10-6-10
	Hearing held. Resolution adopted.	10-19-10	10-13-10

The hearing at JID was advertised for October 12, 2010, but JID was forced to reschedule their Board meeting to October 19, 2010. However, no one appeared at the JID office for the October 12 meeting, and no comments were received at the October 19 Board meeting.

2 - GEOLOGY AND HYDROGEOLOGY

This section discusses the geology and hydrogeology of the City of San Joaquin, JID, JID eastside well field, and the surrounding area. The purpose of this section is to provide general background information on the local geology, hydrogeology and water chemistry that will aid in selecting and implementing groundwater management programs. Most of the information in this section was derived from City of San Joaquin records, JID records, USGS Professional Paper 1401-C, USGS Water Supply Paper 1999-H, and a report prepared by the United States Bureau of Reclamation for Tranquillity Irrigation District.

The following sections include technical discussions on the plan area's groundwater. These are intended to provide geologists, engineers, and water managers a greater understanding of the area's stratigraphy, groundwater conditions, and hydrogeologic parameters. Less technical discussions on groundwater management programs are provided in Sections 3-9 of this document.

2.1 - Regional Geology

The San Joaquin Valley is the southern part of a large, northwest-to-southeast trending asymmetric trough of the Central Valley, which has been filled with up to six vertical miles of sediment. This sediment includes both marine and continental deposits ranging in age from Jurassic to Holocene (recent). The San Joaquin Valley lies between the Coast Ranges on the west, the Sierra Nevada on the east, and extends northwestward from the San Emigdo and Tehachapi Mountains to the Delta near the City of Stockton. The San Joaquin Valley is 250 miles long and 50 to 60 miles wide. The relatively flat alluvial floor is interrupted occasionally by low hills.

The San Joaquin Valley is divided into several geomorphic land types including dissected uplands, low alluvial fans and plains, river floodplains and channels, and overflow lands and lake bottoms. The alluvial plains cover most of the valley floor and comprise some of the most intensely developed agricultural lands in the San Joaquin Valley. In general, alluvial sediments of the western and southern parts of the San Joaquin Valley tend to have lower permeability than eastside deposits. The lower permeability in material along the western and southern portions of the valley is mainly attributed to the fine-grained nature of the parent material from which the alluvium is derived. The sediments are predominately marine in origin and consist of the thick sequences of mudstone, claystone, and siltstone that make up the Coast Ranges. Upon weathering and transport down slope along alluvial fans, these sediments readily decrepitate into fine-grained materials consisting mainly of silt and clay found along the axis of the valley trough.

Near the valley trough, fluvial deposits of the east and west sides grade into fine-grained deposits termed Flood-basin deposits by Page (1986) or Basin Sediments by USBR (1955). The San Joaquin Valley has several thick, fine-grained, lacustrine

deposits. The Corcoran Clay Member of the Tulare Formation is the most notable fine-grained deposit in the San Joaquin Valley affecting groundwater quality and creates confined groundwater conditions below. The Corcoran Clay was deposited about 600,000 years ago in the Tulare Lake. This clay bed, which is found in the western and southern portions of the valley, separates the upper semi-confined to unconfined aquifer from the lower confined aquifer. The clay bed covers approximately 5,000 square miles and is up to 160 feet thick beneath the present bed of Tulare Lake and thins with distance from the center of origin.

Regional Hydrogeologic Setting

An enormous aquifer system lies beneath the Kings Basin and extends the length and breadth of the San Joaquin Valley. The valley is a broad structural trough, with the Sierra Nevada Mountains on the east and the Coast Range mountains on the west. The Sierra basement rock extends from the foothills on the east, sloping downward to the southwest at 4° - 6°. Consolidated and unconsolidated continental and marine deposits from both the Sierra and the Coast Range mountains overlie this basement complex. Unconsolidated alluvial deposits make up most of the basin's freshwater aquifer (Croft, 1972).

Interspersed within the unconsolidated deposits that comprise the useable aquifer in the region are a number of clay layers that can act as confining beds or perching layers. The confining bed that has greatest significance to the Plan Area is known as the Corcoran Clay, or 'E' Clay. The 'E' Clay underlies the entire Plan Area (**Figure 5**). **Figure 9** is a generalized cross section of the Plan Area. Two other significant clay layers also partially underlie the Plan Area. However, neither the 'C' Clay on the extreme northern edge of the District, nor the 'A' Clay have as a significant impact on the Plan Participants use of the aquifer as the Corcoran clay. However, recent studies completed by JID for the K-Basin recharge project indicates that there, the ‘C’ Clay may be present, extending the ‘C’ Clay several miles southeast as mapped by USGS (1972).

JID wells primarily tap the unconfined aquifer lying above the 'E' Clay. The top of this clay occurs at a depth of around 500 feet below ground level within the District. Originally, most District wells constructed in the 1910's and 20's tapped the aquifer below the E-clay. Many of these wells initially exhibited artesian flow, reflecting the confined groundwater conditions below the Corcoran clay. The use of wells within District boundaries which tap the confined aquifer below the E-clay was slowly phased out due to its poorer water quality, generally lower yields, and more expensive well construction costs. However newer wells are constructed on a case by case basis, and built to recover the highest quality water at a given location, whether that is above or below the Corcoran clay. As a result, some wells tapping the confined aquifer are now constructed.

Groundwater in the plan area is divided into three separate non-marine, water bearing zones. These include the lower water-bearing zone, upper water-bearing zone, and the perched or shallow zone, as discussed below.

- The **lower water-bearing zone** contains fresh water in the lower section of the Tulare Formation from the base of the E-clay (Corcoran Clay) to the base of fresh water or the top of connate, saline marine water. USBR (1955) terms the base of the fresh water aquifer as the base of the effective ground-water reservoir. The depth to the base of fresh water is from about 1,000 feet to 1,400 feet beneath the Plan Area (Page, 1973).

- The **upper water-bearing zone** is from the top of the Corcoran Clay to the upper sections of the Tulare Formation, often considered the bottom of the A-clay.

- The **shallow or perched zone** underlies the portion of the Plan Area from the City of San Joaquin and northward, from the top of the A-clay, if it is present, to the perched groundwater table which is often within 10 feet or less of the ground surface. DWR Bulletin 118-03 uses 25 feet below ground surface (bgs) as a general vertical depth limit for the base of the perched zone.

Subsidence

Land subsidence in the San Joaquin Valley has been studied extensively in the past by the USGS and DWR. A State-Federal committee on subsidence was formed in the early 1950's and performed research and measured subsidence until 1970. By 1970, 5,200 square miles in the Valley had subsided more than 1 foot. Land subsidence of up to 16 feet has been experienced in the southern portions of the San Joaquin Valley basin. Between 1926 and 1970, a maximum of 29.7 feet of subsidence was measured at a point southwest of Mendota. The compacting forces caused by groundwater level decline squeezed more than 15.6 million AF of water storage space out of valley sediments during the same period.

There are two types of land subsidence due to groundwater withdrawals; elastic and inelastic. Elastic subsidence is not permanent and is largely reversible, if water levels recover to above historic lows. Recent studies indicate that current subsidence west of the plan area is primarily elastic in nature, and will likely not be inelastic until water levels fall below historic lows. Inelastic subsidence is permanent and occurs when water is removed from a confined aquifer for the first time, and is sometimes referred to as virgin subsidence. Between the mid-1920's to about 1980, the San Joaquin Valley experienced inelastic, non-recoverable subsidence.

The most recent reports on land subsidence in the San Joaquin Valley were completed by R. L. Ireland of the USGS in 1986 and Arvey A. Swanson of DWR in 1995. Ireland (1986) states that "*Land subsidence to groundwater withdrawal in the San Joaquin Valley that began in the mid-1920's and reached a maximum of 29.7 feet in 1981 has been halted by the importation of surface water through major canals and the California Aqueduct in the 1950's through 1970's*." This was generally true at the time, because large scale regional subsidence had halted, but smaller-scale local subsidence continued in many areas.

Poland et al. (1975) estimated that cumulative non-recoverable land subsidence from 1926 to 1972 in the vicinity of the Plan Area was on the order of 4 feet. A land subsidence contour map shows lowering of the land surface due to land subsidence was exacerbated west of the Plan Area and cumulatively, for the period of record, was as much as 8 feet in this area.

As land subsidence is a function of groundwater pumpage and recharge, it is linked to drops in groundwater levels. **Appendix C** shows hydrographs for wells monitored by DWR in the Plan Area. The DWR hydrographs show periodic increases in water levels, but the overall trend is a steady decline in water levels from the 1960's to today. Other hydrographs in the area prepared for KRCD's 2005 Lower Kings Basin Groundwater Management Plan Update and JID's 2001 GMP show continued decreases in water levels. Recent drops in groundwater levels are likely a result of low precipitation years, and the increased reliance on groundwater in the area to supplement surface water supplies.

Poland et al. (1975) show a direct correlation between subsidence and pumpage. In a 1996 draft memo, DWR indicated that from 1975 to 1992 subsidence occurred primarily in drought years when groundwater supplies replaced surface water supplies. The most recent record of land subsidence in the area is from Swanson (1995), were he indicates that 2 feet of subsidence occurred along the Outside Canal near Mendota Dam between the years of 1970 and 1994. However, it is not known how much of the 2 feet of subsidence reported by Swanson was residual subsidence, continued from pre-surface water delivery pumpage west of the Plan Area. Data from 6 extensometers located west of the Plan Area indicates that subsidence there has been elastic since about 1977.

With the recent reductions in surface water supplies for CVP contractors, the demand on the regional aquifer system's groundwater will likely increase. A link between land subsidence and pumpage is well established west of the District. Therefore, studies should be conducted to determine the susceptibility of subsurface deposits to land subsidence with increasing groundwater demand, especially if newly constructed wells tap the confined aquifer.

2.2 - Groundwater Basin

The James Irrigation District and City of San Joaquin are in the Kings Groundwater subbasin (Kings Basin) in the San Joaquin Valley Groundwater basin of the Tulare Lake Hydrologic Region (DWR 2003). See **Figure 2** for a map of the regional groundwater sub-basins. The Kings subbasin has been identified by the DWR as a basin with boundaries appropriate for ground water management purposes (DWR Bulletin 118-80). These boundaries were identified on the basis of geological and hydrological conditions, as well as political boundary lines. There are 19 court adjudicated basins in California, most of them in Southern California or coastal regions of California. The Kings Groundwater Subbasin is not included in the list of adjudicated basins, however DWR Bulletin 118-03

identifies eleven basins in California as being in critical conditions of over draft and the Kings Basin is included on the list.

Geography

The Kings Basin covers 976,000 acres. The Kings Basin extends from the Sierra Nevada foothills on the east to the San Joaquin Valley trough on the west, and from the San Joaquin River on the north to roughly the Fresno County line on the south. The Kings Basin also includes small portions of Kings and Tulare counties. The Plan Participants lie in the northwest portion of the Kings Basin and is bounded to the west by the southern extension of Delta-Mendota subbasin (**Figure 2**). The Westside Groundwater Subbasin borders the southwest portion of the District. The San Joaquin and Kings Rivers are the two principal rivers within or bordering the Kings Basin. There are no hydrogeologic features that would prevent groundwater from flowing between the Kings Basin to the Delta-Mendota or Westside Sub-basins, located to the west.

Tulare Lake Hydrologic Region

The Kings Basin (DWR subbasin No. 5-22.08) lies within the Tulare Lake Hydrologic Region, which covers approximately 10.9 million acres (17,000 square miles) and includes all of the Kings and Tulare Counties and most of Fresno and Kern Counties. The region has 12 distinct groundwater basins and 7 sub-basins of the San Joaquin Valley Groundwater Basin.

Groundwater has historically been important to both urban and agricultural uses, accounting for 41 percent of the Hydrologic Region's total annual supply and 35 percent of all groundwater use in the State. The aquifers are generally quite thick in the San Joaquin Valley subbasins with groundwater wells commonly exceeding 1,000 feet in depth. The base of fresh groundwater in the region, at an average of about 1,200 feet below ground surface, is considered to be the maximum effective depth of the basin in terms of pumping and recharge. According to Bullettin118-2003, well yields average 500 to 1500 gpm, with a maximum of 3,000 gpm (this agrees with data for JID wells).

Groundwater Quality for the Tulare Lake Hydrologic Region

In general, groundwater quality throughout the region is suitable for most urban and agricultural uses with only local impairments. The primary constituents of concern are high total dissolved solids (TDS), nitrate, gross alpha, arsenic and organic compounds. The areas of high TDS content are primarily along the west side of the San Joaquin Valley and in the trough of the valley. High TDS content of west-side water is due to recharge of stream flow originating from marine sediments in the Coast Range. High TDS content in the trough of the valley, especially in water close to the surface, is the result of concentration of salts because of evaporation and poor drainage. According to DWR Bulletin 18-2003, TDS in groundwater in the Kings Basin ranges from 40 to 2,000 mg/L with an average of 200-700 mg/L. Groundwater quality specific to JID and the City of San Joaquin is discussed in detail in Section 2.6 below.

Groundwater Budget

According to the DWR Bulletin 118-03, in the Tulare Lake Hydrologic Region the San Joaquin Valley Basin only has two subbasins ranked as a Type "C" groundwater budget; Kings and Westside. A Type C budget indicates that there are not enough data to provide either an estimate of the basin's groundwater budget or groundwater extraction from the basin. This suggests a low level of knowledge exists on groundwater inflow, outflow, or storage information in the Kings basin. The C budget type is for the whole subbasin, not just the Plan Area, so it will take collaboration to get information needed to bring the subbasin to a budget type classification of A, which is based on actual groundwater budgets or models, or B which is a use-based estimate of groundwater extraction (using evapotranspiration demand). The Kings Subbasin was determined in DWR Bulletin 118-80 to be a "*critically overdrafted*" basin. This designation was not reevaluated when the bulletin was updated in 2003.

2.3 - Stratigraphy

The following discussion focuses on significant hydrogeologic units that have an impact on the groundwater resources within the Plan Area. From the surface to the base of the effective groundwater reservoir, about 1,200 feet bgs, important hydrogeologic units are topsoil, alluvial fan deposits of eastside origin, basin sediments, the A-, C-, and E-(Corcoran) clays, and alluvial deposits below the E clay, and to a lesser extent alluvial deposits of Westside origin. Depth to bedrock is too deep under the Plan Area to impact groundwater conditions and therefore will not be discussed here.

Topsoils

Soils in the District and vicinity range from coarse sands to heavy clays. In the middle and western portions of the Plan Area the soils generally have a higher clay content. These soils developed on sediments deposited in the valley trough during flood periods. The parent material of these soils is flood basin deposits and fine-grained alluvium of mixed granitic and sedimentary origin from both the Sierra Nevada and Coast Range Mountains. Soils in the eastern portion of the Plan Area and the JID eastside wellfield generally have higher sand content and are derived mostly from granitic Sierra Nevada sediments deposited on alluvial fans. The increase in sandier materials to the east extends into the subsurface and partially explains why more wells are located in the eastern side of JID than the western side. Soils throughout the vicinity of the Plan Area are stratified, with interspersed sandy and clayey streaks. **Figure 4** is a composite of United Stated Department of Agriculture soil survey maps which cover the Plan Area.

Subsurface Geology

The USBR (1955) provides the most focused and detailed descriptions of the subsurface geology in the Plan Area. While the USBR report was prepared for Tranquillity Irrigation District, it also covers the Plan Areas and east to R.17E/R.18E section line (approximately 2 miles east of the eastern JID border). The following discussion on subsurface geology is based on the descriptions found in USBR's report. Surface deposits, as mapped by the USBR, include eastside inactive alluvial fan deposits that cover the Plan Area east of James Bypass. From about the James Bypass

westward surface deposits are composed of Basin Sediments deposited in the axis of the valley during wet climatic cycles. Beneath these sediments lies the Corcoran clay, a regional lacustrine clay that causes confined groundwater conditions below it. Below the Corcoran clay, Sierran alluvial sediments dominate to depths greater than 3,000 feet bgs. These sediments are considered part of the Tulare Formation and are discussed in further detail below. Within the Tulare Formation seven lacustrine clays are mapped to varying extent in the San Joaquin Valley. In the Plan Area the A-clay, C-clay and E-clay or Corcoran clay are the most important of the mapped clay lacustrine clays. Several geologic cross sections passing through JID, the JID Eastside Wellfield, and the City of San Joaquin are included in **Appendix B**. The locations of the cross sections are shown on **Figure 4**.

Alluvial Fan Deposits of Eastside (Sierran) Origin

Surficial deposits of eastside origin are roughly found east of the James Bypass. The alluvial fan deposits above the Corcoran clay are predominately of eastside (Sierran) origin and comprise lenticular beds of sands and silts derived primarily from granitic rocks with rare clay laminae. These sediments probably represent deposits of former Kings River and San Joaquin River distributaries and are geographically higher than alluvium deposits of the active fans. They are slightly wind modified and soils that form on them tend to be saline; developed under conditions of high water table and little sedimentation. USDA-SCS soil classification for soils that formed on the inactive alluvial fans are sandy loam to fine sandy loam, with the finer grained soils dominating near James Bypass (**Figure 4**). Beneath the topsoil the sands vary from fine to medium-grained sizes and coarse sands and gravels are rare. The deposits generally become finer westward; grading into the Basin sediments discussed below. Fine-grained deposits dominate in the western portion of the area where they finger into the Basin sediments. This alluvial sequence occurs from the surface to depths of 500-550 feet bgs. Most of the wells in the JID eastside well field are completed in these deposits. These sediments, while all Sierran fluvial, represent three distinct environments of deposition. Clays and silt/clay mixtures represent deposition in lakes or marshes, well sorted sands and silts represent deposition in water with current such as streambeds or lake beaches, and poorly-sorted silt and clay fractions indicate floodplain origins.

Basin Sediments

West of the alluvial fan deposits of eastside origin (roughly James Bypass) surface deposits are comprised of Basin sediments. The Basin sediments are along the trough of the valley and consist of material of mixed Sierran and Coast Range origin. The Basin sediments are fine sands, silts, and clays. Soils that formed on the Basin Sediments are classified by the USDA-SCS as clay loam and clay. Under natural conditions these deposits are poorly drained, frequently flooded, and ponded or marshy. These sediments grade westward into inactive alluvial fan deposits of Westside (Coast Range) origin.

The A-clay is one of seven recognized lacustrine clay beds in the San Joaquin Valley (**Figure 6**). It was deposited in a widespread lake and is found almost continually beneath the topographic axis of the valley. While not comprised of alluvium of eastside origin or Basin Sediments, stratigraphically it is located within these units, and thus is discussed here. The top of it is often the base of the perched or shallow ground water zone. The A-clay, as mapped by Croft (1972), extends under the Plan Area from the City of San Joaquin northwestward (**Figures 6**). The base is about 60 to 75 feet beneath the land surface and generally it is between 5 to 70 feet thick. Structure contours drawn on the base of the A-clay indicate that it is relatively flat beneath the northern portions of JID. The A clay is an aquitard, not yielding significant water to wells, and in fact is a perching layer stopping the downward migration of water from the surface.

The C-clay is another of one of the seven recognized lacustrine clay beds in the San Joaquin Valley. In the JID area its extent is similar to the A-clay, but it was not mapped with the same level of certitude by Croft (1972) as the overlying A clay or the underlying E-clay. Recent subsurface investigations by JID for the K-Basin recharge project indicate that the C-clay is likely present there at a depth of 235 to 253 feet bgs. These depths correspond to Croft's mapping of the C clay where, in the northern portions of the District, it is roughly 240 to 260 feet bgs. The Report of Findings for Potential Banking Facilities (Provost and Pritchard, 2005) indicates that, based on the results of pump tests at the Lateral K Basin, there is only a small hydraulic connection between groundwater in strata above and below the C-clay.

Alluvial Deposits Beneath The Corcoran Clay

Beneath the Corcoran clay a series of granitic sands, silts, and occasional clays extends to depths greater than 1,200 feet. These sediments were deposited by alluvial fans debauching from the Sierra Nevada Mountains and resemble beds of similar origin above the Corcoran clay, but are texturally coarser grained. While most of the recently built wells, as of 2003, are completed in the alluvial deposits above the Corcoran, two wells built around 1950 were completed to depths below the Corcoran clay. Of these two wells one is abandoned and records indicate that the other is no longer in use. This unit contains the base of the effective groundwater reservoir, as described below. Water quality in this zone is discussed below but generally is of much better quality than water above the Corcoran clay. Currently the District designs and constructs wells based on site specific conditions and wells may be perforated above or below the Corcoran clay.

Corcoran Clay

The Corcoran Clay, also known as the E-clay, is a lacustrine clay bed of lake or swamp origin that effectively underlies the entire Plan Area. The Corcoran clay has long been recognized as the most significant subsurface deposit in the San Joaquin Valley confining water beneath it. It is the upper most boundary of the confined aquifer and the lower most boundary of the unconfined aquifer. The easterly extent of the E-Clay is shown on **Figure 5**. Structure contours drawn on the bottom show it to be about 560 to

620 feet beneath the surface in the plan area (Croft, 1972). Page (1986) provides structure contours to the top of the Corcoran clay. Based on Page's interpretation, the depth to the top is between 500 to 550 feet over the majority of the area with a thickness of 20-40 feet. The structure contours reveal the structure of the clay as a southerly dipping anticline with about 50 feet of relief from the north to south beneath the JID area. On well completion reports it is commonly described as blue or green clay, claystone, or siltstone. The Corcoran Clay has also been described as greenish-grey, dense, compact, and non-laminated claystone or siltstone. The bottom 20 feet is usually silty and it is a characteristic marker on E logs. A few scattered sand lenses exist and in the eastern portions of the area can make up as much as 30 percent of the clay sequence.

Alluvial Deposits of Westside Origin

The Plan Area, being near but east of the axis of the valley, has for the most part been dominated by deposition from the Sierra Nevada. However, there is some indication that subsurface deposits west of JID originated from the Coast Ranges. Contemporaneous deposition from eastside and westside sources is shown in a drill hole located in 15S/16E, Section 17E (about 1 mile west of the Plan Area) at depths of 22 feet where westside deposits overlie eastside deposits. This indicates that the sediments from the two sources occur and overlap west of the Plan Area. USBR (1955) indicates that the westside deposits thin and pinch out easterly. While these sediments probably form a minor component of the area's useable aquifer, water originating from these sediments to the west could have a great impact on water quality.

2.4 - Aquifer Characteristics

Specific Yield

In order to establish the storage capacity of the underground reservoir it is necessary to derive estimates of the specific yield of the sediments. USBR (1955) derived estimates of specific yield for the upper water-bearing zone within JID. These values are based on specific yield estimates from two separate studies done in similar geologic settings. The USBR report defined the upper water-bearing zone as the depth interval between the 1948 static water level in shallow wells and the top of the Corcoran clay (about 30 feet to 500 to 550 feet bgs). USBR computations show specific yield for JID ranges from as high as 22 percent to as low as 6 percent for the sediments above the Corcoran clay. Specific yield contours show a tongue of higher specific yield extends southwestward across the northern portions of the JID area corresponding to eastside alluvial sediments. The higher specific yields are associated with this tongue of coarser grained sediments of Sierran origin.

Based upon estimates of specific yield by the USGS and the DWR, the average specific yield of the unconfined aquifer was estimated to be about 11 percent for the District and about 12 percent for the Eastside well field area. Findings from the KRCD Groundwater Management Plan Update (2005) indicate that specific yield in JID is 11.3 to 12 percent.

Safe Yield

Safe yield, or perennial yield, is difficult to quantify because of the shared nature of the aquifer and uncertainty in defining the term. In this analysis perennial yield is defined as the amount of pumping that can be supported over an average hydrologic base period that will not result in a long-term decline in water levels. The base period must be long enough to include both wet and dry hydrologic cycles.

One factor complicating the estimate of perennial yield for JID is that the District and Eastside well field region is not a "closed" ground water basin. That is, groundwater in the region is hydraulically connected to groundwater in adjacent areas within both the "Kings Basin" and the "Tulare Lake Hydrologic Region". If groundwater management activities substantially raised static water levels subsurface inflow would decrease, subsequently decreasing perennial yield.

A previous analysis performed by Provost & Pritchard Consulting Group, Inc. investigated the safe yield using the hydrology from 1975 to 1993. The analysis concluded that the perennial yield for JID is approximately 1,000 AF per year less than the District's estimated average annual pumping of 12,500 AF from within the District, and about 2,700 AF per year less than the average annual pumping from the Eastside well field. This results in an estimate of perennial yield of 11,500 AF per year for JID. Total average annual pumping for the Eastside well field area is unknown as the District's wells account for just a portion of the region's pumpage. Private irrigation wells pump an unknown additional amount. However, the total average annual amount pumped in the study period (1975-1993) appears to be around 2,700 AF per year more than the perennial yield.

Storage Capacity

If it is assumed that the useable ground water reservoir is the unconfined aquifer lying above the E-clay, an estimated ground water storage capacity can be calculated. The elevation of the base of the E-clay averages about 400 feet below sea-level within the District, with an average thickness of around 80 feet. The average ground surface elevation in the District is about 175 feet, resulting in an average total depth for the unconfined aquifer of about 495 feet. Assuming that it is undesirable to have the water table less than ten feet from the ground surface, the average thickness of the useable aquifer is around 485 feet. Applying an average specific yield of 0.11, and multiplying by the total District area of 26,392 acres results in an estimate of total unconfined aquifer storage capacity of 1,400,000 AF.

Groundwater Quantity

The entire District and surrounding lands overlie portions of an enormous aquifer. For water quality reasons most of the ground water pumping occurs along the Fresno Slough and eastward. The District currently operates about 60 turbine pumps which tap this aquifer.

The combined capacity of the wells in 2008 was approximately 93,310 gallons per minute (gpm), or around 208 cubic feet per second (cfs). The locations of the District wells are shown on **Figure 3**. As of 2007 there were only two known private in JID wells being used to supplement District water supplies.

Under the authority of a groundwater deed recorded on September 1, 1920, JID pumps a large portion of their ground water supply from outside the District. The area encumbered by the ground water deed is shown on **Figure 3**. The District operates a wellfield east of the Fresno Slough Bypass consists of about 35 wells feeding two canals; the Lassen Avenue Canal and the McMullin Grade Line (**Figure 3**). From 1986 to 1994, which was largely a drought period, the eastside wells supplied an average annual supply of about 21,000 AF. This was a little more than half of the District's total ground water pumping, which averaged around 42,000 AF per year through the same period.

JID generally uses surface water to the extent it is available and supplements it as necessary with groundwater. In years of average surface water supply total ground water pumping can be expected to be around 25,000 to 35,000 AF, with 15,000 to 20,000 AF coming from the eastside wellfield.

Transmissivity

Transmissivity data for the Plan area is sparse. Schmidt (2004) derived transmissivity values from a 5-day pumping test performed on Well C-81 at the K Basin. Schmidt notes that the transmissivity values are valid for the aquifer below the C-clay at that location. The perforated interval of the well from 250 to 500 feet bgs indicates that this well taps the aquifer between the C-clay and the Corcoran clay. Transmissivity values from that pumping tests ranged from 73,000 gpd/ft to 48,000 gpd/ft.

A study by Davis et al., (1964) summarized numerous regional specific capacity values from Pacific Gas & Electric pump tests performed across the San Joaquin Valley. Using data from field tests in the JID area, they calculated specific capacities ranging from 57 to 85 gpm per foot. Driscoll (1986) provides an approximate relationship between specific capacity data and transmissivity. Using this method, transmissivity values for the northern part of JID range from 106,500 to 127,500 gpd/ft, and range from 85,500 to 86,000 gpd/ft in the southern portion of the District. These values of specific capacity and transmissivity are probably valid for the unconfined aquifer, as at the time of the report most wells drilled in the area were most likely completed above the E-clay.

The City of San Joaquin performed pump tests in their Well No. 5 in July 2003. Estimated specific capacities ranged from 10.7 to 11.0 gpd/ft. Drawdown measurements from a step-drawdown test indicated a transmissivity of 43,000 gpd/ft, and for a constant discharge test indicated 39,000 gpd/ft.

Wells Yields and Depths
Well yields in JID range from around 400 to 2,000 gallons per minute (gpm), with most around 1,000 to 1,500 gpm (**Attachment 2**). Wells in the east side wellfield have yields ranging from about 800 to 2,300 gpm, with the typical well producing about 1,500 gpm. Well depths in the East-Side Well Field and along the James Bypass average about 500 feet deep ranging from 365 to 808 feet.

The characteristics of the three wells in the City of San Joaquin are shown in **Table 2.1** below.

Table 2.1 – City of San Joaquin Wells

Description	Well No. 3	Well No. 4	Well No. 5
Total Depth	510 ft	500 ft	495 ft
Perforated Interval	210-510 ft	300-500 ft	300-435 ft
Year Constructed	1968	1978	2003
% of City water in 2009	50	8	42
Yield	1,200 gpm	1,200 gpm	1,100 gpm

2.5 - Groundwater Levels

Regional Groundwater Levels
Figure 7 is a map showing regional groundwater levels (this map represents the best available depiction of regional groundwater depth, despite being slightly dated). Groundwater depths range from about 40 to 150 feet bgs in the Plan Area. Groundwater generally flows from northwest to southeast, and there is a considerable groundwater depression east of the Plan Area in the Raisin City Water District.

Historical Ground Water Levels
Appendix C includes a collection of hydrographs for indicator wells in JID. Groundwater level data is not available for the City of San Joaquin, but groundwater levels in the City are assumed to be similar to those shown on regional map (**Figure 7**).

Prior to development of JID, regional groundwater levels were typically within ten feet of the ground surface, and wells tapping the aquifer below the E-clay initially exhibited artesian flow. As land was brought into agricultural production, and with the advent of deep well turbine pumps, groundwater levels began to decline. By about 1950 water levels had begun a sharp decline that continued into the mid-1970's. In this period a significant portion of the unconfined aquifer was dewatered, and a large cone of depression developed outside of JID in the Raisin City area.

Beginning in the mid-1970's and continuing to the present, is a trend of much slower ground water decline. Water levels have continued to fluctuate in response to drought and

flood years but have not exhibited nearly as strong a downward trend. This slowing in groundwater level decline probably resulted from increased groundwater inflow induced by the large cone of depression that has formed in the region, as well as groundwater recharge projects implemented by JID.

Water levels in wells tapping the confined aquifer in the region west of JID, (below the E-clay) also declined precipitously through the 1950's and 60's. However, due to the confined nature of the aquifer, these declines track the piezometric or pressure surface of the ground water, and therefore do not indicate a physical reduction of water in storage in the confined aquifer. This downward trend reversed dramatically in the mid-1960's in response to initiation of delivery of imported surface water from the USBR's Central Valley Project (CVP). This surface water supply resulted in decreased pumping from beneath the E-clay in regions west of JID. Water levels in wells pumping from the confined aquifer once again began to decline steeply in the early 1990's when imported water supplies declined as a result of an extended drought.

The Lower Kings Basin GMP provided an evaluation of regional groundwater levels in the Kings Basin. The GMP concluded that there has been a significant regional decline in groundwater levels between 1950 and 2000 and estimate a continued decline. The construction and operation of Pine Flat Dam, while helping to address groundwater issues by providing surface water, has not completely mitigated overdraft conditions in the Lower Kings Basin. According to the GMP, the average annual rate of groundwater overdraft in the Lower Kings Basin is 68,000 AF/year. Groundwater levels are expected to decline in the future if current groundwater management practices remain unchanged.

2.6 - Groundwater Quality

Overall ground water quality has not appeared to change significantly over the years. Ground water quality is generally better on the east side of the District, although salt plumes caused by the unregulated discharge of oil-field brines have degraded ground water in the District's east side wellfield. The poorer quality ground water on the west side of the District is apparently now advancing further into JID.

Ground water pumped by the District is generally of poorer quality (higher salt content and more sodic) than its surface water supply. However, most of the ground water supply is still of good to fair quality for irrigation. The relatively high sodium content of the water has caused infiltration problems in some areas of the District. **Appendix D** includes total dissolved solids measurements for wells in JID from 1977-2009. **Appendix F** includes groundwater quality graphs and a summary of groundwater quality in different regions on JID. In general, groundwater quality is the best in the southern part of JID, and northern parts of the eastside well field, and is worst in the central part of the wellfield. Refer to the groundwater quality maps and tables in **Appendices D** and **F** for more detail.

Oil wells in the area have always brought up brackish water (exceeding 60,000 ppm in salts) with the oil. Prior to the mid-1950's this brackish water was disposed in unlined pits

and was allowed to percolate into the ground water. This led to degradation of groundwater in the Eastside well field due to disposal of saline waters in the Raisin City Oilfield. Unlined pits are now illegal, and deep well injection is used to dispose of the brackish water.

Surface Water Quality

Surface water in JID comes primarily from the Kings River and Delta Mendota Canal (through Fresno Slough and Mendota Pool, respectively). Kings River water is of excellent quality for irrigation. Salt content, measured as total dissolved solids (TDS), typically runs around 50 parts per million (ppm) and boron content is generally less than 0.1 ppm. Infiltration problems sometimes occur due to the purity of the water. Beneficial calcium ions tend to be leached from the soil, reducing permeability. Water supplied from the Delta-Mendota Canal to the District is of good quality for irrigation. TDS for the water is generally around 400 ppm and boron content is typically less than 0.5 ppm.

City of San Joaquin

Groundwater quality in the City is very good, possibly as a result of JID importing significant quantities of pure surface water into the area. Surface water treatment is currently limited to wellhead treatment with chlorine. However, the City is concerned about the migration of poorer quality groundwater from outlying areas, and would like to monitor the encroachment of these water sources.

3 - BASIN MANAGEMENT OBJECTIVES

The Plan Participants have adopted the following five Basin Management Objectives:

1. **Stabilize Water Levels.** Stabilize average long-term groundwater levels by 2015 to prevent the loss of groundwater reserves, and prevent the need for well deepening, and reduce the new for installing new wells.

2. **Increase Groundwater Storage.** Increase groundwater storage capabilities through the development of groundwater banking projects including the JID Water Augmentation Project.

3. **Prevent Further Land Subsidence.** Prevent further land subsidence that can cause a reduction in groundwater storage space and damage water infrastructure. Prevent land subsidence caused by groundwater withdrawals through efficient use of groundwater supplies and full utilization of surface supplies.

4. **Prevent Groundwater Degradation.** Prevent groundwater degradation by protecting groundwater through proper well construction and abandonment, proper use of agricultural amendments, importing clean high quality surface water, and preventing intrusion of poor quality groundwater from neighboring areas.

5. **Improve Coordination between the City of San Joaquin and James Irrigation District.** Improve integrated groundwater management between the City and JID through better coordination, data sharing, joint projects, and annual coordination meetings.

6. **Improve Water Conservation.** Improve water conservation as an alternative to developing new water supplies or increased groundwater pumping. Conservation measures include urban and agricultural best management practices such as metering, plumbing retrofits, efficient irrigation systems, and educational programs.

7. **Increase Knowledge of Local Geology and Hydrogeology.** Increase knowledge of the local geology and hydrogeology through technical studies, and subsurface investigations. Gain a better understanding of regional groundwater quality and flow conditions, and potential impacts from surrounding water sources with poor water quality. Seek funding for these investigations through State and Federal grant programs.

More specific goals related to these BMOs are found in following sections. All existing and on-going activities described in Sections 4-9 will be maintained, unless stated

otherwise. (In Sections 4-9 the Existing Activities are not repeated under Planned Actions, even though they will be continued in the future). All new policies and projects described in Sections 4-9 will be pursued, but their implementation will be subject to available funding and staff time.

4 - STAKEHOLDER INVOLVEMENT

4.1 - Groundwater Advisory Committee

The purpose of a Groundwater Advisory Committee (GAC) is to oversee the creation, updating and implementation of a Groundwater Management Plan. Preferably, the Committee should be comprised of a broad cross section of interests in the Plan Area. James Irrigation District initially invited the public to participate but no local residents expressed interest. JID also invited several local agencies to participate in the Groundwater Advisory Committee but the City of San Joaquin was the only party showing interest. Eventually, JID and the City agreed to jointly prepare a GMP. As a result, both the San Joaquin City Council and JID Board of Directors served as temporary Groundwater Advisory Committees for overseeing the development of the GMP. These two GACs offered several useful and insightful comments that were incorporated into this GMP. After adoption of this GMP, a GAC comprising members of both agencies will be formed to assist with implementing the GMP. The GAC will include two to three members from each agency and will meet annually.

Existing Activities

Assisted with the development of this GMP.

Planned Actions

The Committee will attempt to meet annually, or more frequent if deemed appropriate, and will have the following responsibilities:

- Review trends in groundwater levels and available information on groundwater quality;
- Evaluate the effectiveness of current groundwater management policies and facilities;
- Discuss the need for new groundwater supply/enhancement facilities;
- Educate landowners on groundwater management issues;
- Assess the overall progress in implementing the programs outlined in the Groundwater Management Plan;
- Recommend updates or amendments to the Groundwater Management Plan;
- Identify regional and multi-party groundwater projects; and
- Review and comment on Annual Groundwater Reports.

4.2 - Relationships with Other Agencies

The Plan Area is located in the Kings Groundwater sub-basin and San Joaquin Valley Groundwater basin, which extend beyond many political boundaries and includes other municipalities, irrigation districts, water districts, private water companies, and private water users (see **Figure 2**). This emphasizes the importance of inter-agency cooperation, and the District and City have historically made efforts to work conjunctively with many other water management agencies.

The City of San Joaquin and James Irrigation District have strengthened their working relationship by collaborating on this GMP and signing a Memorandum of Understanding (MOU). The MOU outlines a plan for the two agencies to share information, meet regularly, and collaborate on groundwater management and water conservation projects (see **Appendix E**).

Below is a list of some other agencies that the District or City have worked with in managing local groundwater resources**:**

- Kings River Conservation District
- Kings River Water Association
- United States Bureau of Reclamation
- Department of Water Resources
- McMullin Recharge Group
- San Luis and Delta-Mendota Water Authority
- Association of California Water Agencies
- Agricultural Water Management Council
- Tranquillity Irrigation District
- Mid-Valley Water District

Following is a brief discussion on the relationships between these agencies and the Plan Participants.

Kings River Conservation District
KRCD is a legislatively defined special district that supports local interests in water planning and management, develops projects, collects groundwater data, and prepares an annual report of groundwater conditions; however, KRCD does not have the legislative authority to manage groundwater. The District has recently passed a resolution in support of the KRCD's *"Lower Kings Basin Groundwater Management Plan Update"*.

Kings River Water Association
JID is a member of the Kings River Water Association (KRWA), a 28-member group of water agencies that was formed in 1927 to administer and manage water uses on the Kings River. The benefits of KRWA membership include conflict resolution mechanisms and improved coordination among member agencies. The KRWA opens lines of communication so that members can work together effectively to utilize, trade, and transfer waters from the Kings River.

USBR/DWR
JID currently participates in the Semi-annual Groundwater Measurement Program administered by the USBR. This program requires JID to take water level measurements from specified wells two times a year and share the data with USBR. USBR shares this data with the DWR.

McMullin Recharge Group

The McMullin Recharge Group (Group) is comprised of James Irrigation District, Mid-Valley Water District, Raisin City Water District, Tranquillity Irrigation District, Terranova Management Co, LLC., and Kings River Conservation District. The Group works cooperatively to investigate groundwater recharge projects in the area of the McMullin Grade, just east of the James Irrigation District, adjacent to the Eastside Well Field. The group members share information and JID has acquired valuable knowledge of the local geology as a consequence of their participation.

San Luis and Delta-Mendota Water Authority

James Irrigation District is a member agency of the San Luis and Delta-Mendota Water Authority (SLDMWA), an umbrella organization for 32 water agencies in the Central Valley. The SLDMWA was established in 1992 and represents approximately 2,100,000 acres of federal and exchange water service contractors within the western San Joaquin Valley, San Benito and Santa Clara Counties. The JID General Manager is on the Board of Directors at SLDMWA and is a member of its Water Resources Committee.

The SLDMWA serves the information and representation needs of its members by developing, providing, and disseminating information to legislative, administrative and judicial bodies concerning a variety of issues such as: Sacramento and San Joaquin Delta exports, water supply, water quality, water development, conservation, distribution, drainage, contractual rights, surface and groundwater management, and any other common interest of the member agencies. The SLDMWA also works with other governmental and public agencies to promote the common welfare of the landowners and member water agencies.

The SLDMWA prepared a regional water management plan in 2005 entitled "*Westside Integrated Water Resources Plan*". The Plan provides guidance for JID and other water agencies on regional priorities and multi-agency projects.

Association of California Water Agencies

JID is an active member of the Association of California Water Agencies (ACWA). ACWA fosters cooperation among all interest groups concerned with stewardship of the state's water resources. JID attends the ACWA annual meeting and benefits from the educational and informational services that ACWA offers.

Agricultural Water Management Council

JID is a member of the Agricultural Water Management Council (AWMC or Council). The AWMC was formed in 1996, following the work of an advisory committee formed by Assembly Bill (AB) 3616, Agricultural Efficient Water Management Act of 1990. The

Council consists of members of the agricultural and environmental communities and other interested parties with the expressed goal for water suppliers to voluntarily develop Water Management Plans and implement Efficient Water Management Practices (EWMPs) to further advance water use efficiency while maintaining and enhancing economic, environmental and social viability and sustainability of soil and crop production. Members sign a Memorandum of Understanding that includes a comprehensive methodology by which each and every Efficient Water Management Practice is analyzed and provides a consistent analysis by all participating water suppliers.

Tranquillity Irrigation District
JID had a long-term relationship with the neighboring Tranquillity Irrigation District. The two Districts have collaborated on SCADA monitoring projects in the Fresno Slough, and have discussed developing interties between the districts to provide better service to their growers.

Mid-Valley Water District
In 1999 and 2000, the Mid-Valley Water District, with the cooperation of James Irrigation District and Reclamation District No. 1606, evaluated the feasibility of a groundwater recharge basin near the James Bypass between Manning Avenue and American/Placer Avenues.

Existing Activities

- On-going involvement with the agencies and associations listed above.

Planned Actions

- When relevant to JID, implement the multi-agency projects identified in the Westside Integrated Water Resources Plan.

4.3 - Plan to Involve the Public and Other Agencies

The District and City of San Joaquin are already involved with many neighboring and regional agencies on groundwater management projects. Nevertheless, the Plan Participants are always interested in building new relationships with other agencies that share the same groundwater basins, and will also strive to involve the public in groundwater management decisions. Additional cooperative relationships can be achieved through the data sharing, inter-agency committees, interagency meetings, memorandums of understandings, formal agreements, and collaborations on groundwater projects. Furthermore, the development of this integrated GMP will foster cooperation between the City and JID.

Existing Activities

- Conducted public hearings to discuss the content of this GMP prior to its adoption.

Planned Actions

- Hold annual Groundwater Advisory Committee meetings with representatives from JID and the City.
- Provide copies of the JID annual groundwater reports to the public at their request. Notify the public of the availability of the annual reports in the JID District newsletter.
- Publish information on groundwater management accomplishments in the JID newsletter and City website.

5 - MONITORING PROGRAM

This section discusses monitoring of groundwater levels, groundwater quality, land surface subsidence, and surface water. Monitoring is considered critical to future management decisions, and the proposed monitoring program is intended to:

1. Provide warning of potential future problems;
2. Use data gathered to generate information for water resources evaluations;
3. Develop meaningful long-term trends in groundwater characteristics; and
4. Provide data comparable from place to place in the Plan Area.

JID prepared a Groundwater Quality Monitoring and Mitigation Plan in 2010 (see **Appendix F**). The plan includes a discussion on the District's existing groundwater quality, monitoring well network, groundwater level and monitoring program, and recommendations for protecting and mitigating groundwater quality. The plan enhances the discussion provided below on groundwater monitoring in JID.

5.1 - Groundwater Level Monitoring

The District regularly measures spring and fall water levels in District wells and a few private wells in cooperation with a valley-wide monitoring program coordinated by the USBR and the DWR. In addition, groundwater levels are monitored monthly in some shallow wells. **Figure 3** illustrates the location of wells that are monitored. **Attachment 2** includes a list of attributes for these wells. The City of San Joaquin does not regularly measure groundwater levels in their wells, but relies on the regional data collected by JID. However, the City will be installing three monitoring wells at their wastewater treatment plant in 2010 or 2011, which will be monitored on a regular basis.

The purpose of a groundwater level monitoring program is to provide information that will allow computation of the change in ground water storage. Contour maps depicting groundwater levels in the District and surrounding area will be prepared annually, along with estimates of changes in groundwater storage.

Existing Activities

- Measurement of groundwater levels in shallow monitor wells each month
- Measurement of groundwater levels each spring and fall in active and abandoned JID production wells
- Share groundwater level data with USBR and DWR

Planned Actions

- Periodically review the monitoring network to determine if it provides sufficient areal coverage to evaluate groundwater levels.
- Protect wells in monitoring program from being abandoned.
- Encourage landowners and developers to convert unused wells to monitoring wells.
- Prepare annual groundwater reports, which will include groundwater contour maps and detailed evaluations of groundwater level trends (see Section 9.2).
- Work with KRCD in the development of a Kings Basin Groundwater Data Center
- Perform a Well Canvass to collect detailed information and precise coordinates on each production well, monitoring well and abandoned well in the Plan Area (see **Appendix F** for more details on the proposed well canvass).
- Investigate the feasibility of installing a SCADA/telemetry system to monitor and operate production wells in JID. If available seek funding to assist with expenses.

5.2 - Groundwater Quality Monitoring

The City performs groundwater quality monitoring as required by the State of California. JID test each well for electrical conductivity annually and performs agricultural suitability analyses on all new wells.

The aforementioned groundwater quality monitoring efforts have one or more of the following objectives:

1) Spatially characterize water quality according to soils, geology, surface water quality, and land use;
2) Establish a baseline for future monitoring;
3) Compare constituent levels at a specific well over time (i.e. years and decades);
4) Determine the extent of groundwater quality problems in specific areas;
5) Identify groundwater quality protection and enhancement needs;
6) Determine water treatment needs;
7) Identify impacts of recharge and banking projects on water quality;
8) Identify suitable crop types that are compatible with the water characteristics; and
9) Monitor the migration of contaminant plumes.

Existing Activities

- Measure electrical conductivity in JID production wells on an annual basis.
- Perform agricultural suitability analysis on all newly constructed wells.

Planned Actions

- Regularly collect new water quality information from other agencies and review it to identify any impending groundwater quality problems.
- Protect wells in monitoring program from being abandoned.

- Prepare groundwater quality maps when sufficient information is available with the aid of a qualified hydrogeologist. Attempt to characterize groundwater quality with depth and provide the information to growers so they can use it when designing and installing wells.
- Work with KRCD in the development of a Kings Basin Groundwater Data Center.
- Perform Agricultural Suitability Analysis every 5 years (2015, 2020, 2025, etc.) in selected wells in areas of concern. This will be timed with the submission of 5-Year Water Management Plans to the USBR.
- Test for Additional Constituents in wells near the City of San Joaquin. If funding from the City of San Joaquin is available, perform more detailed water quality sampling in JID wells near the City of San Joaquin. This information could be useful in determining the quality of groundwater that may be migrating toward the City. Constituents that could be tested include arsenic, gross alpha, Total Organic Carbon, and other constituents important to drinking water quality.
- Regularly calibrate the hand-held TDS meter used to test wells each year, to help ensure that measurements are accurate and trends are properly identified.

5.3 - Groundwater Monitoring Protocols

Monitoring protocols are necessary to ensure consistency in monitoring efforts and are required for monitoring evaluations to be valid. Consistency should be reflected in factors such as location of sample points, sampling procedures, testing procedures, and the time of year when the samples are taken. Without such common ground, comparisons between reports must be carefully considered. Consequently, uniform data gathering procedures will be practiced by the Plan Participants.

The District has developed new water level and water quality monitoring protocols, which can be found in **Appendix G**. The District has also adopted protocols prepared by a local laboratory, Fruit Growers Laboratory of Visalia, California. These are included as **Attachment 4** and supplement the protocols described above. The City has not adopted specific protocols, but will follow JID's protocols until they adopt their own.

Existing Activities

None

Planned Actions

- The District will work with KRCD to establish uniform protocols that are used basin wide.
- The City will review JID's protocols and adopt them or develop their own protocols.

5.4 - Surface Water Monitoring

Surface water sources in the Plan Area include the Fresno Slough and Fresno Slough Bypass. In addition, the Mendota Pool is located near JID and is a source of surface water.

Existing Activities

- Monitor flowrates in the Fresno Slough Bypass.
- Monitor surface water quality in the Mendota Pool at P Booster.

Planned Actions

None

5.5 - Land Surface Subsidence Monitoring

Land subsidence results from excessive groundwater pumping beneath laterally extensive confining clay layers. The removal of groundwater from a confined aquifer causes increased pressure on the aquifer skeletal system below the confining layer. This causes compaction of the fine-grained layer at depth, and is evident at the ground surface as land subsidence. Land subsidence has been monitored throughout the San Joaquin Valley. The most serious subsidence occurred north of the Districts and monitoring efforts have declined in recent years.

A State-Federal committee on subsidence was formed in the early 1950's and performed research and measured subsidence until 1970. By 1970, 5,200 square miles in the Valley had subsided more than 1 foot. Between 1926 and 1970, a maximum of 28 feet of subsidence was measured at a point southwest of Mendota. The compacting forces caused by groundwater level decline squeezed more than 15.6 million acre-feet of water storage space out of the sediments during the same period. From 1975 to 1992, subsidence occurred mostly in drought years when groundwater pumping replaced unavailable surface water supplies. The Department of Water Resources has continued to measure subsidence along the California Aqueduct in the winter of 1993-1994. Very little quantitative data has been collected since 1970 by others. In neighboring Tranquillity Irrigation District, there is a benchmark on Lift Station No. 1 that is periodically resurveyed to check for land subsidence.

It is likely that some of the local land subsidence has been arrested with the importation of large volumes of surface water since the District established its surface water contracts. However, there is often a time delay in subsidence after groundwater withdrawals, so the Plan Area may still be experiencing residual subsidence. In addition, groundwater levels can drop appreciably in extended droughts, which could also lead to further subsidence. Lands within the Plan Area will be observed for land

subsidence, and, if land subsidence becomes a problem, this Plan will be amended to include preventative and mitigative measures.

Existing Activities
None

Planned Actions
- Periodic resurvey of control points and local benchmarks to check for land subsidence. The control points and local benchmarks will be checked relative to High Precision Geodetic Network benchmarks.

6 - GROUNDWATER RESOURCES PROTECTION

6.1 - Well Abandonment

Existing State and Fresno County law requires that owners or lessees properly destroy their abandoned wells. Proper destruction of abandoned wells is necessary to protect groundwater resources as abandoned or improperly destroyed wells can result in water of different chemical qualities from different strata mixing, and useable groundwater being degraded. This is especially important because part of the Plan Area has a confined aquifer.

The administration of a well construction, abandonment and destruction program has been delegated to the Counties by the State legislature. Fresno County has adopted a permitting program consistent with Department of Water Resources Bulletin 74-81 for well construction, abandonment, and destruction.

The Plan Participants will properly abandon their own wells when they are no longer useful. In addition, they will encourage landowners and developers to properly abandon their own wells, or preferably, convert unusable wells to monitoring wells so that they can become a part of JID's groundwater monitoring program.

Existing Activities

None

Planned Actions

- When possible, convert unusable production wells to monitoring wells.
- Destroy any District or City owned wells that have no use according to County and State standards.
- Seek funding to perform a survey of all inactive wells and properly abandon those that have no potential for rehabilitation or use them as monitoring wells.

6.2 - Wellhead Protection

The Federal Wellhead Protection Program was established by Section 1428 of the Safe Drinking Water Act Amendments of 1986. The purpose of the program is to protect groundwater sources of public drinking water supplies from contamination, thereby eliminating the need for costly treatment to meet drinking water standards. The program is based on the concept that the development and application of land use controls, usually applied at the local level in California, and other preventative measures can protect groundwater.

A Wellhead Protection Area (WHPA), as defined by the 1986 Amendments, is "the surface and subsurface area surrounding a water well or wellfield supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or wellfield." The WHPA may also be the recharge area that provides the water to a well or wellfield. Unlike surface watersheds that can be easily determined from topography, WHPA's can vary in size and shape depending on subsurface geologic conditions, the direction of groundwater flow, pumping rates and aquifer characteristics.

Under the WHPA, States are required to develop an EPA-approved Wellhead Protection Program. To date, California has no state-mandated program, but instead relies on local agencies to plan and implement programs. This is one of the factors that prompted the State Legislature to enact AB 3030. Wellhead Protection Programs are not regulatory in nature, nor do they address specific sources. They are designed to focus on the management of the resource rather than control a limited set of activities or contaminant sources.

Essential to any wellhead protection program are proper well design, construction, and site grading to prevent intrusion of contaminants into the well from surface sources. Wells constructed by the Plan Participants will be designed and constructed in accordance with DWR Bulletin 74-81. In addition, landowners will be encouraged to follow the same standards for privately owned wells. DWR Bulletin 74-81 provides specifications for the following:

- Methods for sealing wells from intrusion of surface contaminants;
- Covering or protecting the boring at the end of each day from potential pollution sources or vandalism;
- Site grading to assure drainage is away from the well head; and
- Set-back requirements from known pollution sources.

Existing Activities

- Provide wellhead protection on all newly constructed wells according to County and State standards.

Planned Actions

- Encourage local growers to incorporate proper wellhead protection into all new wells, and retrofit old wells with proper wellhead protection.

6.3 - Saline Water Intrusion

Saline water intrusion is a concern in two portions of the Plan Area. The first is a generalized condition on the west side of JID. The groundwater in the western portion of the District is significantly saltier than in the eastern portion. Additionally, given the

direction of ground water flow is in a southeasterly direction, this poorer quality water is encroaching on many of the District's wells.

The second area of concern, the Raisin City Oil Field salt plumes, lies outside the District boundaries but affects the District's east-side wellfield. These plumes formed when brines pumped from oil wells were disposed in surface ponds. It is believed that these plumes currently impact JID wells, even though the practices that created them were halted over three decades ago.

Currently, the District strives to prevent the importation of saline surface waters that could ultimately degrade the groundwater. When alternative water sources are available for importation, the District considers not only the cost but also the quality, including salinity, of the water. The District will evaluate all possible alternatives, and, when practical and feasible, select water sources with acceptable levels of salinity.

Existing Activities
None

Planned Actions
- Review available water quality data to identify areas with the potential for saline water intrusion.

6.4 - Migration of Contaminated Groundwater
Ground water contamination can originate from many sources or activities. Groundwater contamination can be human induced or caused by naturally occurring processes and chemicals. Sources of groundwater contamination can include irrigation, dairies, improper application of agricultural chemicals, septic tanks, industrial sources, stormwater runoff, and disposal sites.

Clean-up of contaminated ground water is a complex and expensive task generally involving a number of organizations. Agencies with roles to play in mitigating ground water contamination include the California Regional Water Quality Control Board (RWQCB), the California Department of Toxic Substances Control (DTSC) and the U.S. Environmental Protection Agency (EPA). Each agency has its own set of regulatory authorities and expertise to contribute. The degree to which they participate depends on the nature and magnitude of the problem. If JID or the City identify a ground water contamination problem, they will refer the information to the appropriate regulatory agency.

According to the Lower Kings Basin GMP, the migration of contaminated groundwater is a secondary concern for the area. Contaminated plumes are relatively small and localized in the Lower Kings Basin. Furthermore, the Plan Participants do not know of

any contaminant plumes in their service area, aside from salinity from the Raisin City Oilfields. Nevertheless, the Plan Participants recognize that migration of contaminated groundwater is always possible. The City and District will continue to monitor groundwater quality and remain cognizant of the possibility of contaminated groundwater migration into the Plan Area.

Existing Activities

- Regularly review data and reports from regulatory agencies on contaminant plumes to provide warning of potential future problems.
- Construct wells with adequate seals between the formations to prevent the downward migration of poor quality water.

Planned Actions

- Seek to locate recharge basins next to areas with water quality problems to blend water supplies and create a hydraulic barrier to impede movement of contaminant plumes.

6.5 - Groundwater Quality Protection

The City relies exclusively on groundwater and JID cannot support all of their crop demands with their surface water supplies. Clearly, groundwater is a very important resource in the area. The groundwater, however, will have limited or no use if it has poor quality. Therefore, protecting the quality of the groundwater is a cardinal component of this GMP. Groundwater quality can be protected through proper use of pesticides, herbicides and fertilizers, stormwater quality management, septic system management, and water vulnerability planning and management.

JID has outlined several existing and proposed methods for protecting and mitigating groundwater quality. These are document in their Groundwater Quality Monitoring and Mitigation Plan (**Appendix F**)

Existing Activities

- Educate staff on proper use of herbicides used in JID canals.

Planned Actions

- Seek funding to improve security at water facilities and reduce the potential for contamination from acts of vandalism or terrorism.
- Educate growers on the proper use of pesticides, herbicides and fertilizers in the District newsletter.
- Implement groundwater mitigation methods documented in **Appendix F**.

7 - GROUNDWATER SUSTAINABILITY

Between 2000 and 2009, groundwater has comprised about 45% of the water used in JID in a typical year, but has comprised up to 78% of water supplies. During years with low surface water allocations, groundwater is essential to prevent the loss of permanent crops. The City of San Joaquin relies exclusively on groundwater and has no surface water rights or facilities to accept surface water. Therefore, preserving the sustainability of groundwater is essential for the economic well being of the District growers and City residents.

7.1 - Issues Impacting Groundwater Sustainability

The James Irrigation District relies on both surface and groundwater for irrigation demands. **Table 7.1** shows surface and groundwater usage from 2000-2009.

Table 7.1 – James Irrigation District Surface and Groundwater Use (2000-2009)

Year	Surface Water		Groundwater	
	Volume (AF)	%	Volume (AF)	%
2009	15,900	22	55,100	78
2008	21,300	27	56,900	73
2007	34,300	42	48,200	58
2006	67,400	91	6,300	9
2005	50,300	69	22,500	31
2004	38,600	47	43,000	53
2003	39,000	51	37,400	49
2002	37,400	43	48,700	57
2001	26,400	35	48,600	65
2000	35,400	49	36,400	51
Avg	36,600	48	40,300	52

Table 7.1 shows that for typical years, groundwater constitutes about 50% of the District's water use. In almost all years the District's surface water supply is fully utilized, and groundwater is pumped to supplement the surface water. Typically, groundwater pumping begins in the middle of the irrigation season and groundwater is often the only water source available at the end of the irrigation season (August to October).

2005 and 2006 were not typical years since flood waters were released down the Kings River. When this was available JID used the flood water instead of their CVP supply,

and saved their CVP supply for a later date. This permitted for a larger and longer supply of surface water which allowed for decreased groundwater pumping, and groundwater recharge as a result of diverting flood flows. A two year supply of flood water only occurs occasionally and cannot be relied upon.

The District's surface water supplies are sporadic, unreliable and unpredictable. In addition, due to recent regulatory actions, surface water supplies from the Central Valley Project have become less dependable and shortages occur more frequently. This has caused the District's available surface supplies to be reduced causing more reliance on pumping groundwater. Furthermore, the acquisition of new water contracts or substantial water transfers in the future is unlikely. In summary, groundwater supplies are vital to the JID and consequently the District considers the proper management of their groundwater resources to be imperative.

The City of San Joaquin relies exclusively on groundwater. When local and regional groundwater supplies are stressed, such as during droughts, this can impact groundwater supplies in the City. It is unlikely that the City can secure a long-term surface water contract, and therefore they must protect and preserve the local groundwater resources.

7.2 - Overdraft Mitigation

Overdraft of the groundwater supply can lead to a variety of problems, including subsidence and increased pumping costs. Additionally, if overdraft continues unchecked, the groundwater supply may be unreliable when surface water is scarce, as in a time of extended drought. Groundwater overdraft is considered the principal groundwater problem in the Plan Area.

Groundwater Overdraft Estimates

JID estimates overdraft using historical groundwater levels during a hydrological base period. This base period must extend for a long enough time that both wet periods and droughts are covered, and the water supply conditions approximate the average. The term overdraft is used here to indicate a long-term water-level decline in an area during an average hydrologic base period. It is not used to describe short-term water-level declines during droughts.

The procedure to estimate overdraft from groundwater levels uses many measurements over a long period of time. In the Plan Area, measurements are made in the winter or early spring, following a period of minimal pumping, and again in the fall, following a period of heavy pumping. The complete water-level data record can be used to prepare well water-level hydrographs and to determine long-term water level changes. A well water-level hydrograph is a plot of depth to water versus time for a particular well.

After the well water-level hydrographs are prepared, the trends in the water levels in the base period are closely examined. In most agricultural areas the annual low values are in the late summer or early fall, at the end of a long irrigation season, and annual high values are in the winter or early spring, just before pumping begins for the next growing season. Linear regressions are then performed on the data within the base period that appear valid and representative of the water-level conditions. The slope of these "best-fit" lines are then used as the long-term average annual changes in ground water level.

JID calculated overdraft during the period from 1975 to 1993, but has not performed any more recent analyses. The hydrographs created indicate gradual long-term water-level declines in both the District and the east side wellfield for the chosen hydrologic base period. In order to determine the change in ground water storage, a parameter known as the "specific yield" was multiplied by the average water-level change during the period evaluated. Specific yield is the ratio of the volume of water which will drain freely from a material to the total volume of the formation. Based upon estimates of specific yield by the USGS and the DWR, the average specific yield of the unconfined aquifer was estimated to be about eleven percent for the District and about twelve percent for the east side wellfield area. Using these specific yields, the ground water overdraft was calculated to be about 1,000 AF per year for the District, and around 2,700 AF per year for the eastside wellfield for the chosen hydrologic base period.

Overdraft could be a significant concern if the Plan area experiences increased pumping, reduced recharge, and/or increased ground water outflow. Periodic analyses of ground water overdraft, perhaps every five years, are needed to reassess the need for overdraft mitigation.

Mitigation Measures

Groundwater overdraft is due to an imbalance in the rates of extractions and replenishment. There are several methods to correct this imbalance. The first is to decrease the extraction to match the rate of replenishment. The second is to increase groundwater replenishment to match the extraction rate. The third method is a combination of the first two, to balance replenishment and extraction. Each of the methods are applied over an extended period, making use of the storage capacity of the aquifer. Extractions can exceed replenishment in drought periods as long as replenishment equally exceeds extractions in wetter periods.

Factors that will affect the future rate of overdraft include surface water supplies available to JID through the Central Valley Project and future water demands in the District.

The District utilizes both surface water and groundwater conjunctively to meet the water needs of its growers. The Plan Participants understand that the existing condition of overdraft is regional in nature and correction and mitigation of the problem will need to be addressed not only by the District and City, but also by neighboring agencies.

Groundwater Recharge

Mitigation measures to negate current overdraft and contribute to lessening future overdraft conditions rely on the importation of additional surface supplies. Increasing JID's surface water supply would rely on improving the District's ability to use excess Kings River flows. Flood water appears adequate on the Kings River to mitigate the overdraft condition if sufficient recharge capacity can be developed. JID already recharges water in the K-Basin Recharge Project and plans to recharge additional flood waters with their proposed Water Augmentation Project (see Section 7.4).

Mitigative measures to reduce demands can include conversion to more efficient irrigation systems, and urban conservation measures discussed in Section 7.5. Demand reduction can also be achieved by cropping changes or land fallowing, but these would have adverse economic impacts and therefore are not considered.

Water Transfers

In 2001 the JID Rules and Regulations were amended to restrict the transfer of surface and groundwater supplies outside of the District. The purpose of this amendment was to prevent further groundwater overdraft. Specifically, the Rules and Regulations state:

> "*Any transfer of surface water which is replaced by increased groundwater pumping would therefore exacerbate groundwater overdraft....Similarly, if a Water User were to pump groundwater within the District and export it, the same effect would occur.*" (pg 8)

Such exports are only allowed under certain circumstances; for example, surface water exports are allowed if the land that would have used the water is fallowed. Refer to the Rules and Regulations for more details on this policy. Clearly, the District recognizes the gravity of their groundwater overdraft problem and this amendment illustrates their commitment towards preserving their groundwater resources.

Limitations on Pumping

The California Water Code gives water and irrigation districts the power to limit or suspend groundwater extractions. However, such limits will only be implemented if the Plan Participants determine through study and investigation that groundwater replenishment programs, or other alternative sources of water supply, have proved insufficient or infeasible to lessen impacts to groundwater. In the unlikely event that it becomes necessary to reduce groundwater extractions, the District intends to accomplish such reductions under a voluntary program, which would include suitable incentives to compensate users for reducing their groundwater pumping. The District will not attempt to restrict or otherwise interfere with any landowner or water user exercising a valid right to pump and utilize groundwater.

Economic Inducements
The District recognizes that management of water supplies should reflect water conservation and the protection of groundwater resources. The District currently provides an indirect economic inducement by establishing water rates high enough to promote water conservation yet low enough to compete with groundwater pumping costs. This pricing system encourages the use of surface water to meet irrigation demands when available, thereby preserving the underlying groundwater resource.

Existing Activities

- Restrict groundwater exports from the District.
- Set surface water rates low enough to be competitive with groundwater pumping costs.

Planned Actions

- Urban water conservation measures (see Section 7.5)
- Seek funding to prepare a Drought Preparedness Plan that will identify triggers and response measures for droughts.

7.3 - Groundwater Replenishment

Replenishment of ground water is an important technique to manage a groundwater supply and mitigate a condition of overdraft. The estimated overdraft for the Plan Participants and the east side wellfield can probably be offset with recharge projects that would use excess Kings River flows (flood releases from Pine Flat Reservoir).

The types of groundwater replenishment include the following:

- Direct groundwater recharge
- Incidental groundwater recharge
- Injection wells
- In-lieu recharge
- Groundwater banking
- Canal seepage
- Pipeline seepage
- Flood flow seepage
- Deep percolation from precipitation
- Deep percolation from irrigation

Direct Groundwater Recharge. Two recharge projects are currently in operation in JID. The first involves the diversion of Kings River flood water from the Fresno Slough Bypass (James Bypass) into basins in the upland areas of the Bypass between the two outer flood channels. The Bypass area has fairly permeable soils and provides a modest opportunity for ground water replenishment. This project may have potential for expansion. The second project includes the 220-acre K-Basin Project. Some of this water is recovered with wells and some of the water remains underground for recharge. The District is also

developing recharge capability with the Water Augmentation Project, described in Section 7.4

Incidental Groundwater Recharge. Incidental groundwater recharge occurs in the three stormwater basins operated by the City of San Joaquin, located at Colorado Avenue, California Avenue and Cherry Lane. Flows to these basins are not measured and there are no current estimates of the volume of incidental recharge.

Injection Wells. Injection wells pump water directly into the groundwater basin and are primarily used in urban areas, where land is at a premium. Capital costs are high and include conveyance, treatment and well construction. Some injection well projects have been denied by the Regional Water Quality Control Board due to water quality issues, especially disinfection byproducts in the source water. Given the high cost of injection wells, regulatory hurdles and the presence of more viable and lower costs options for recharging water, this option was removed from further consideration.

In-lieu recharge. The District views in-lieu deliveries as the most practical and effective means of groundwater replenishment. In-lieu deliveries, also called indirect deliveries, involve the delivery of surface water to landowners and water users who would otherwise have pumped groundwater, thus leaving water in the aquifer for future use. From 2000 to 2006, JID imported between 26,000 and 67,000 AF/year of surface water, and, as a result, JID is performing a significant amount of in-lieu recharge.

Groundwater banking. Groundwater banking agreements often require that a portion of the banked water be left in the aquifer as a payment to the banking agency. JID is planning to develop a groundwater bank through the Water Augmentation Project. Water banking partners will be required to leave 10% of their water behind for District recharge.

Canal seepage. Canal seepage in JID is estimated to be about 12,300 AF in a typical year.

Pipeline Seepage. Seepage from City of San Joaquin pipelines, and JID's Lateral G pipeline, help to recharge the groundwater. No estimates of the seepage are currently available.

Flood flow seepage. Natural seepage occurs in the District from flood flow waters in the Fresno Slough and the James Bypass channel. However, this seepage volume has not been measured or estimated.

Deep percolation from precipitation. In JID, deep percolation from normal rainfall events is probably negligible. Some deep percolation occurs during exceptionally long and heavy storms. However, such storms are infrequent.

Deep percolation from irrigation. Deep percolation occurs when some of the water applied for irrigation percolates beyond the crop root zone and accumulates in the aquifer. The extent of deep percolation varies with the irrigation method, irrigation efficiency, and antecedent moisture condition. During 2002 and 2003, deep percolation from local irrigation was estimated to be from 8,000 to 10,000 AF/year, but was only estimated to be about 2,000 AF in 2009.

Existing Activities

- Groundwater recharge in the 220-acre K-Basin recharge project.
- Groundwater recharge in the Fresno Slough and Fresno Slough Bypass
- Measure the volume of water delivered to groundwater recharge basins.
- Periodically remove sediment and rip the soils in recharge basins to maintain recharge rates.

Planned Actions

- Work cooperatively to minimize development on lands that are favorable for artificial recharge.
- Design and construct the Water Augmentation Project, which will increase recharge capabilities in the District
- Estimate seepage from City of San Joaquin pipelines either from water balance calculations or through field tests.
- Install staff gauges in City of San Joaquin stormwater basins so incidental recharge can be estimated.

7.4 - Conjunctive Use of Water Resources

Conjunctive use of water is defined as the coordinated use of both subsurface and surface water sources so that the combination will result in optimum benefits. Conjunctive operation of a ground water basin is defined in DWR Bulletin 118-80 as:

> *"Operation of a ground water basin in coordination with a surface water reservoir system. The basin is intentionally recharged in years of above average precipitation so ground water can be extracted in years of below average precipitation when surface water supplies are below normal."*

Such management results in the groundwater storage being reduced in dry periods and increased in wetter periods. To avoid a condition of overdraft, replenishment must balance extraction over the long-term.

A conjunctive use program requires:

- A source of surface water in years of high surface water supply.
- Recharge facilities.
- Conveyance facilities to import and export water to and from the ground water storage area.

- Available storage capacity in the aquifer.
- Extraction facilities.
- Distribution facilities for surface and ground water.

Existing conjunctive use operations can be expanded by adding interconnections and promoting water supply exchanges between districts that allow for more flexibility in the region's water supply. The region's assets of federal, state, and local water supplies, dewatered groundwater storage, numerous interconnected conveyance facilities, and significant irrigation demand make it an ideal location to regulate surface and groundwater supplies conjunctively.

The region must absorb wet year water supplies in order to maintain a reliable and economical water supply. Wet year water is available on short notice and not always at times when the water can be delivered for an irrigation demand. Therefore, it is important that the region work cooperatively to increase its ability to absorb surface water when available. Regional Water Management Plans, including the 'Westside Integrated Water Resources Plan', can help identify viable regional projects.

Regional Conjunctive Use Projects

In 2004, JID completed construction of the 220-acre K-Basin Recharge Project. The project includes several wells to recover some of the recharged water.

The JID Water Augmentation Project will include new facilities for storing and recharging water, with the goal of reducing JID's dependence on surface water. The project will include improvements to basins and construction of new recovery wells and conveyance facilities. The project will provide facilities for regulation storage, floodwater storage, groundwater recharge, and groundwater banking. These facilities will be located just north of the James Weir in the Fresno Slough Bypass, about 3 miles southeast of the City of San Joaquin. It is estimated that the project will allow JID to capture and recharge an average of 2,100 AF/year of Kings River floodwater. Five recovery wells will have the capacity to extract 30 AF/day. JID will work with the City in locating the wells and will keep the City apprised of progress on the project. The project is currently being designed and construction is expected to be completed by the end of 2011 or 2012.

JID has also prepared a Water Banking Prospectus for the Water Augmentation Project. JID is actively seeking an agency that wants to bank water in JID using the proposed facilities. As a condition of any banking agreement at least 10% of the banked water must be left behind. This will contribute to local recharge and higher groundwater levels while the water is banked. The volume of water that will be banked still has to be negotiated with a potential banking partner.

One example of a 'regional' groundwater recharge project is the proposed McMullin Group recharge project. This project would use flood flows to recharge the groundwater system. The project, which includes a series of ponds and canals, was investigated and

a draft feasibility study was completed in April 2000. At that time, two sites in the McMullin Recharge Project area were considered covering 138 acres. With support from DWR grant funding, additional hydrogeologic evaluations have been made of the sites since the completion of the draft feasibility study. In response to interpretation of the hydrogeologic evaluations, several recharge ponds have been proposed for development. These ponds can be operated using available floodwater. This project was identified as a regional goal in the Lower Kings Basin GMP with estimated costs of $2.2 million and a completion date of 2010.

The City of San Joaquin does not have a surface water supply, but does divert stormwater to basins where some is percolated, thereby recharging the groundwater.

Existing Activities

- Continue groundwater recharge and banking in the K-Basin Recharge Project.

Planned Actions

- Support the development of new surface storage and water supply projects that would permit the participants to better utilize surface water supplies.
- Investigate additional groundwater banking projects and facilities.
- When transferring surface water, attempt to transfer it to neighboring agencies so it benefits local groundwater levels.
- Design and construct the JID Water Augmentation Project.
- Construct four production wells in JID as part of a Federal Drought Relief grant.
- Actively recruit regional water agencies to store water in JID's groundwater banking facilities.
- Discuss options with the Fresno Irrigation District to purchase surplus surface water to reduce demand on local groundwater resources.

7.5 - Water Conservation and Education

City of San Joaquin

The City of San Joaquin prepared a Water Conservation Plan in 2009. The plan identified several measures that can help reduce water consumption. The Plan outlined two general conservation strategies:

1) **Twenty Percent Reduction in Water Use.** A citywide reduction in water use of 20% by the year 2011 (to mirror the reduction goals of the current California Green Building Standards Code). These savings will be accomplished through equipment upgrades and a targeted education and community outreach program. Showerhead and faucet replacements are planned to be part of the upgrades installed as part of the city's low income housing rehabilitation program. Beginning in the 2010-2011 academic year, students at San Joaquin Elementary school will receive water conservation training.

2) **Water Meters.** Install water meters on all service accounts by the year 2020. California state law requires meters on all service accounts by the year 2025. Installing meters can also lead to reduced water use, and will enable to city to charge residents based on actual water usage. Studies show that cities with metered water use up to 15% less water than cities without meters. When meters are used to institute a tiered pricing structure, another 10% savings occurs. In addition to providing customers with feedback on their consumption levels, service meters in conjunction with supply meters, enable a system to better account for leaks in the system, The guidance from the EPA estimates that by installing meters water use can be reduced by 20%. Currently, only some commercial and industrial accounts are metered. Residential meters are planned for the future as required by the State. In the Water Conservation Plan, meters were not found to be the most economical alternative for conserving water, so the City will seek funding to assist with their purchase and installation.

The City's current ordinance that allows landscape watering only on certain days is also a fairly effective method in preventing over watering. The City will include inserts in water bills reminding residents of these landscape watering rules.

James Irrigation District

The District considers water conservation and education important aspects of their overall groundwater management efforts. All water deliveries are metered and billed based on the volume used. Therefore, all customers have an incentive to minimize water usage. Water conservation education is achieved through the annual grower's meeting and district newsletter. JID has also constructed several regulation reservoirs, that help to reduce operational spills and thus conserve water.

Existing Activities

- JID's monthly water statements include water use information for each customer. In addition, the District maintains historic water use by turnout. This data is available to water users on request as it could be beneficial in making on-farm water management decisions.
- The District holds an annual grower's meeting and publishes a semi-annual newsletter to help educate local growers on important issues such as water conservation and water quality protection.

Planned Actions

- Evaluate the feasibility of a grey water system in the City of San Joaquin.
- Seek funding to install water meters in the City of San Joaquin
- Implement the City of San Joaquin's water conservation education program.

7.6 - Water Recycling

The City does not currently recycle any of their water. Wastewater effluent is currently discharged to aerated lagoons at the western end of JID for evaporation and percolation. The annual volume of water treated is about 121 million gallons. The City plans to improve their wastewater treatment system to include advanced secondary treatment with activated sludge, nitrogen removal, and sludge handling. Construction of the new facilities is expected in 2010 or 2011. The effluent will have better quality that is suitable for non-edible crops. The City has held discussions with farmers to use the effluent, and also plans to meet with JID to discuss delivery of the water into the JID distribution system. No other urban agencies are located in the area that could feasibly deliver recycled water to the Plan Area.

The City has noticed some high salt contents in their wastewater. They are investigating whether a commercial or industrial entity is dumping wastewater with high salt loads.

Existing Activities

None

Planned Actions

- Remain cognizant of opportunities to purchase recycled water from other municipalities.
- Hold a joint meeting with the City and JID to discuss beneficial use of recycled WWTP water on JID crops. Discuss the merits of performing a feasibility study on importing recycled water to JID.
- Investigate the source of saline water in the San Joaquin wastewater.

8 - GROUNDWATER OPERATIONS

8.1 - Well Construction Policies

Proper well construction is important to ensure reliability, longevity, and protection of groundwater resources from contamination. Department of Water Resources Bulletin 74-81 provides useful guidelines for the construction of groundwater wells. In addition, Fresno County has enacted and is responsible for enforcing a County Well Ordinance that regulates well construction. Proper wellhead protection is essential to ensure that contaminants do not inadvertently enter a well. Well construction policies that are intended to ensure proper wellhead protection are discussed in Section 6.2 – Wellhead Protection.

In addition, the following quality assurance procedures will be followed when constructing District or City owned wells. Landowners are also encouraged to follow these procedures when constructing private wells:

1. Well construction will be performed under contract by a licensed and experienced well driller, in accordance with specifications prepared by a licensed engineer or geologist, and reviewed by legal counsel.
2. A licensed engineer or geologist will oversee construction of the wells.
3. A licensed land surveyor will oversee survey of any newly constructed wells.
4. Wells will be constructed according to guidelines in DWR Bulletin 74-81.

Existing Activities

- Construct wells according to DWR Bulletin 74-81.
- Construct wells using qualified and licensed contractors, engineers, geologists and land surveyors.
- Use plastic well casings in areas where the groundwater and soils are highly corrosive.

Planned Actions

None

8.2 - Operation of Facilities

The City currently has three productions wells but has an immediate need for one more wells due to the age and condition of their current wells (the three wells are 10, 30 and 40 years old). The City is concerned about how they will pay for a new well and are seeking funding opportunities.

The City will be installing three monitoring wells at the water treatment plant expansion in 2010 or 2011. The wells are expected to have depths ranging from 50 to 80 feet deep.

Groundwater facilities in JID include the K-Basin Recharge Project, about 65 extraction wells and about 20 monitoring wells. Proper construction, operation, and maintenance of these groundwater facilities is an important part of groundwater management.

The District normally constructs two new irrigation supply wells each year and subsequently retires two older wells that have a combination of the lowest efficiencies and poorest water quality. This helps to ensure the District's water reliability (by retiring older wells), and ensuring higher water quality. This also expands the grid of available testing points.

JID will also strive to provide the best facilities for delivery of surface water supplies, since they are used conjunctively with groundwater. JID realizes that the success of conjunctive use programs is often contingent on the quality of surface water conveyance systems.

Existing Activities

- Development of a groundwater bank as part of the JID Water Augmentation Project
- Maintenance and upgrading of conveyance facilities for capacity and stability.
- Maintenance of recharge facilities including de-vegetation, disking, deep ripping, and de-silting, as necessary to improve recharge potential.
- Replace at least two wells each year to help ensure the wells are efficient and have suitable water quality.

Planned Actions

None

9 - GROUNDWATER PLANNING AND MANAGEMENT

9.1 – Land-Use Planning

An important component of developing a Groundwater Management Plan is the review of land-use plans for the surrounding area or basin, and coordinating efforts with regional and local land-use planning agencies. Land-use planning activities in unincorporated areas of Fresno County are performed by the County of Fresno's Department of Public Works planning department, and overseen by the Fresno County Planning Commission. Responsibility for land-use planning in incorporated areas lies with each city's planning staff. The City of San Joaquin is the only urban development within the Plan Area, and its staff is responsible for land-use planning within its Sphere of Influence.

The intent of this Plan is not to dictate land-use planning policies, but rather to establish some land-use planning goals that can aid in protecting and preserving groundwater resources. The Plan Participants will comment on environmental documents for land-use related activities that may impact groundwater. They will also work cooperatively with other agencies to minimize adverse impacts to groundwater supplies and quality as a result of proposed land-use changes. Some specific land-use planning goals include: (1) preserving areas with high groundwater recharge potential for recharge activities; (2) protecting areas sensitive to groundwater contamination; (3) requiring hydrogeologic investigations, water master plans, and proven and sustainable water supplies for all new developments; and (4) requiring appropriate mitigation for any adverse impacts that land-use changes have on groundwater resources.

Existing Activities

- Notify residents and agencies of projects that have the potential to impact groundwater within their sphere of influence.
- When appropriate, comment on environmental documents and land-use plans that have the potential to impact groundwater.

Planned Actions

None

9.2 - Groundwater Reports

The City of San Joaquin has not historically prepared Annual Groundwater Reports, primarily due to their small size, limited water use, limited water supply data, and lack of available staff. However the City plans to improve groundwater monitoring and data collection, and develop an outline for a brief groundwater report or groundwater memorandum consistent with their needs. This groundwater memorandum will be completed prior to the Annual Groundwater Advisory Committee meeting and used during discussions with JID. The City will consider preparing a comprehensive Groundwater Report as they expand.

JID has a goal to prepare groundwater reports every year to document groundwater levels, available groundwater storage, historical trends, and other important groundwater related topics. This information will be used to forecast future problems, plan future groundwater projects, and develop new groundwater policies. The annual report will cover the prior calendar year and will be completed each year by April 30th. See **Attachment 5** for a report outline.

Existing Activities

- JID prepares a Water Management Plan every five years for the United States Bureau of Reclamation as a requirement to maintain their Central Valley Project water supply. The Water Management Plan includes sections on groundwater usage and groundwater projects.

Planned Actions

- Prepare an annual Groundwater Memorandum documenting the City's groundwater efforts and statistics including groundwater pumping, well construction, groundwater studies, groundwater quality data, and other pertinent information. As the City expands their groundwater monitoring and management efforts, the memorandum would evolve into an annual report as described below for JID.
- Prepare an annual JID Groundwater Report that will include the following:

  1. Groundwater level data;
  2. Groundwater contour maps and groundwater flow directions;
  3. Groundwater storage calculations;
  4. Evaluation of one-year and five-year historical trends in groundwater levels, contours, and storage, and perceived reasons for any changes;
  5. Evaluate the adequacy of monitoring efforts and monitoring protocols.
  6. Estimates of deliveries to recharge basins;
  7. Summary of important groundwater management actions;
  8. Discussion on whether management actions are meeting the management objectives;
  9. Summary of proposed management actions for the future;
  10. Summary of groundwater related actions taken by other regional groups;
  11. Recommendations for changes in the content or format of the annual report;
  12. Recommendations for updates to the GMP.

9.3 - Plan Implementation

Implementation of this updated GMP is expected to result in significant amounts of new knowledge and an achievable improvement in groundwater management in JID and the City of San Joaquin. **Attachment 6** includes an implementation schedule for this GMP from 2010-2015. The schedule does not include existing activities that will be continued, but rather documents new projects.

The goals listed in this GMP are considered reasonable and within the capabilities of the District and City. However, most of the goals will require some funding or staff time to achieve. Since staff time and funding are only available in finite quantities, and can often fluctuate, the Plan Participants must by necessity prioritize efforts and cannot guarantee that all of the goals will be accomplished. The Plan Participants recognizes the importance of groundwater management, and will make their best efforts to meet the goals outlined in this plan. If staff or funds are limited, then the projects in the implementation schedule will be prioritized. Plan implementation for the City will rely largely on grant funding.

9.4 - Plan Re-evaluation

The Groundwater Advisory Committee will be responsible for monitoring the progress in implementing the GMP objectives. Refer to Section 4.1 for more information on the membership, policies, and procedures of the Committee. The Committee will attempt to meet at least once a year to review and evaluate groundwater conditions as well as evaluate the effectiveness of the GMP. As new policies, practices, and ordinances become necessary or desirable to enhance the management of the local groundwater supply, this Plan will be amended as necessary.

Existing Activities

None

Planned Actions

- Update the GMP at least every five years, or more frequently if deemed appropriate.
- Evaluate the effectiveness of the GMP and need for an update at the annual Groundwater Advisory Committee meetings.
- Document recommendations for improving or updating the GMP in each annual Groundwater Report.

9.5 - Dispute Resolution

Dispute resolution is addressed in JID through the District's *Rules and Regulations Governing Water Distribution and Canal Maintenance* as follows:

> "*When Landowners/Water Users cannot resolve differences or controversies with the Ditchtender, the Superintendent or Assistant Superintendent, they are expected to discuss the problem with the Manager prior to asking the Board of Directors for final determination. Unresolved disputes must be presented in writing to the Board of Directors. The Board of Directors will take no action until a written complaint is received. The Board of Directors reserves the authority to act as the final level of appeal on differences and controversies between Water Users and District employees.*" (pg 9-10)

If necessary, the District Manager may also use legal counsel or technical consultants to assist in addressing disputes. In addition, the Districts participation in numerous multi-agency organizations (see Section 4.2 - Relationships with Other Agencies)

provides several forums and dispute resolution mechanisms when issues arise between different agencies. No groundwater disputes have occurred in JID in recent years.

The City of San Joaquin does not have special procedures for groundwater disputes, but rather they would be handled through standard dispute resolution processes. These would involve contacting the Department of Public Works, and if necessary meeting with the City Manager or the City Council.

Several mechanisms are also available for resolving regional groundwater disputes through agencies such as KRCD, KRWA, and SLDMWA. The Lower Kings Basin Groundwater Management Plan Update also includes a discussion on the resolution of regional groundwater disputes.

Existing Activities

- Resolve groundwater disputes through general dispute resolution procedures.

Planned Actions

- Discuss issues of concern at the annual GAC meetings in an effort to prevent future disputes.

9.6 - Program Funding and Fees

Several alternatives are available to the City and JID for funding groundwater projects, and are described below:

Water Replenishment Fees

Under AB3030, local agencies have the authority to limit groundwater extractions and implement water replenishment fees based upon the amount of water extracted (extraction based fees must first be approved by majority vote of impacted landowners). Inherent in these powers is the authority to implement metering of private wells. These are considered measures of last resort and the Plan Participants will make any and all efforts to ensure the private, non-metered use of groundwater by the local growers.

Capital Improvement Fees

The District has the authority to finance capital improvement projects and collect repayment charges from the benefited parties. This process would require a favorable vote from the constituency, and is considered a realistic alternative for large capital projects, such as groundwater recharge or banking projects. The City also has several mechanisms to finance long-term capital projects, and collect revenue through water user fees.

Grants and Loans

The Plan Participants will pursue available grants and low-interest loans from the Department of Water Resources as well as other State and Federal agencies. The District and City will also seek opportunities to jointly submit grant and loan applications.

The District and City realizes that funding from State and Federal agencies for groundwater projects will be partially based on their progress in implementing this GMP.

Groundwater Banking Fees
JID is currently developing a groundwater bank that will be partially used to store water for other agencies. The revenue generated from operating the bank could be reinvested into other groundwater projects.

Other Revenue Sources
Groundwater projects can also be financed through water user fees and assessments that are collected regularly from all landowners.

Exiting Activities

- Regularly research grant and loan opportunities from the State and Federal government.

Planned Actions

- Identify beneficial groundwater projects that become economically feasible when costs are shared among two or more participants.
- Seek funding for projects that could benefit both the City and District.

10 - REFERENCES

1. Belitz, K. and Phillips, S. P., *Alternatives to Agricultural Drains in California's San Joaquin Valley: Results of a Regional-scale Hydrogeologic Approach*, August 1995.

2. Burt, Charles M., Irrigation Training and Research Center, *Rapid Appraisal Site Visit to JID*, October 24, 2000.

3. *California Department of Water Resources, Bulletin No. 74-81 – Water Well Standards: State of California,* 1981.

4. *California Department of Water Resources, California's Ground Water, Bulletin 118 (Update 2003),* 2003.

5. California Department of Water Resources, *Groundwater Basins in California, Bulletin 118-80*, January 1980.

6. California Department of Water Resources, *San Joaquin Valley Drainage Monitoring Program 2000, District Report*, September 2003.

7. California State Senate, *Senate Bill No. 1938: Groundwater Management*, 2002.

8. ConSol, *City of San Joaquin Water Conservation Strategy*, October 2009.

9. Croft, M. G., United States Geological Survey, *Water Supply Paper 1999-H Subsurface Geology of the Late Tertiary and Quaternary Water-Bearing Deposits of the Southern Part of the San Joaquin Valley, California*, 1972.

10. Davis, G. H., Lofgren, B. E. and Mack, S., *Use of Ground-water Reservoirs for Storage of Surface Water in the San Joaquin Valley, California, US Geological Survey Water-Supply Paper 1618*, 1964.

11. Division of Water Resources, *Oil Field Waste Water Disposal, Raisin City Oil Field, Fresno County*, March 1955.

12. Ireland, R. L., *Land Subsidence in the San Joaquin Valley, California, as of 1983,* USGS Water-Resources investigations Report 85-4196, 1986.

13. James Irrigation District, *Rules and Regulations Governing Water Distribution and Canal Maintenance*, July 13, 2004.

14. Page, R. W., *Base of Fresh Water (Approximately 3,000 Micromhos) in the San Joaquin Valley, California*. Hydrologic Investiagtions, Atlas HA-489, 1973.

15. Page, R. W., *Geology of the Fresh Ground-Water Basin of the Central Valley, California, with Texture Maps and Sections.* U.S. Geological Survey, Professional Paper 1401-C, 1986.

16. Page and LeBlanc, *U.S.G.S, Open File Report: Geology, Hydrology and Water Quality in the Fresno Area*, 1969.

17. Poland, J. F., Lofgren, R. L., Ireland, R. L., and Pugh, R. G., *Land Subsidence in the San Joaquin Valley, California, USGS Professional Paper 437-H, Studies of Land Subsidence prepared in cooperation with the California Department of Water Resources*, 1975.

18. Provost and Pritchard Engineering Group, Inc., *Amended Groundwater Management Plan for James Irrigation District*, February 14, 2001.

19. Provost and Pritchard Engineering Group, Inc., *Application for a Construction Loan for Dedicated Groundwater Recharge Basin for James Irrigation District*, February 2001.

20. Provost and Pritchard Engineering Group, Inc., *Application for a Construction Loan for Agricultural Water Conservation Projects for James Irrigation District*, February 16, 2001.

21. Provost & Pritchard Engineering Group, Inc., *Application for a Local Groundwater Assistance Fund Grant (AB303) for Groundwater Management Program*, December 2007.

22. Provost and Pritchard Engineering Group, Inc., *James Irrigation District 5-Year Water Conservation Plan, 1993-2004*, December 2005.

23. Provost and Pritchard Engineering Group, Inc., *Report of Findings for Potential Banking Facilities in James Irrigation District*, November 2005.

24. Provost and Pritchard Engineering Group, Inc., *McMullin Recharge Feasibility Study*, January 2006.

25. San Joaquin Valley Drainage Program*, Assessment of Groundwater Pumping as a Management Strategy in Drainage Problem Areas of the Western San Joaquin Valley,* 1990.

26. San Luis Delta and Mendota Water Authority, *2005 Westside Integrated Water Resources Plan*, 2005.

27. State of California Resources Agency, Department of Water Resources - San Joaquin District, *Water Quality Investigation, Groundwater Quality Investigation, Raisin City Oil Field, Fresno County*, February 20, 1967.

28. Swanson, A. A., *Land Subsidence in the San Joaquin Valley, Updated to 1995,* in: J. W. Borcers, ed: *Land Subsidence Case Studies and Current Research: Proceedings of the Dr. Joseph F. Poland Symposium on Land Subsidence,* Assoc. of Engineering Geologists, Sp. Pub. 8, 1995.

29. Thomson and West, *California Water Code, 2003 Desktop Edition*, 2003.

30. U.S. Department of Agriculture - Soil Conservation Service, *Soil Survey, Eastern Fresno Area*, October 1971.

31. United Stated Geologic Survey, *Distribution of Wells in the Central Part of the Western San Joaquin Valley*, *California, Water-Resources Investigations Report 89-4158*, 1990.

32. United States Bureau of Reclamation, *A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside of the San Joaquin Valley*, September 1990.

33. United States Bureau of Reclamation, *Tranquillity Irrigation District, Geology, Chapter III*, prepared by Dan Sokol, 1955.

34. URS Corporation, *San Luis Drainage Feature Re-evaluation*, January 2004.

35. Villarejo, Don, *93640 at Risk: Farmers, Workers and Townspeople in an Era of Water Uncertainty*, March 1996.

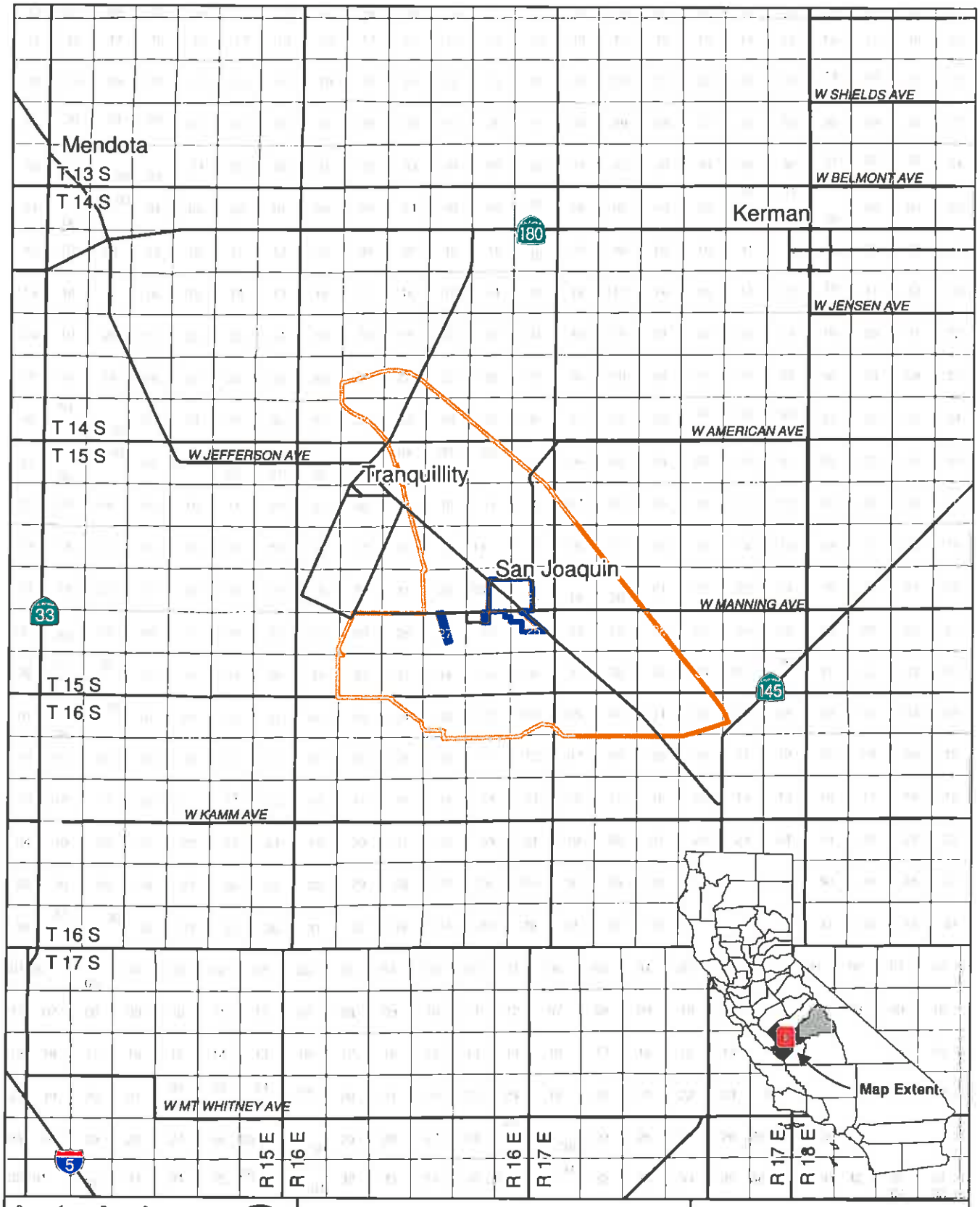
36. Water Resources and Information Management Engineering, Inc., *Lower Kings Basin Groundwater Management Plan Update*, April 2005.

JAMES IRRIGATION DISTRICT

CITY OF SAN JOAQUIN

GROUNDWATER MANAGEMENT PLAN

FIGURES AND ATTACHMENTS



0 1 2 3 Miles

EST 1968
PROVOST & PRITCHARD CONSULTING GROUP
An Employee Owned Company

286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

Legend

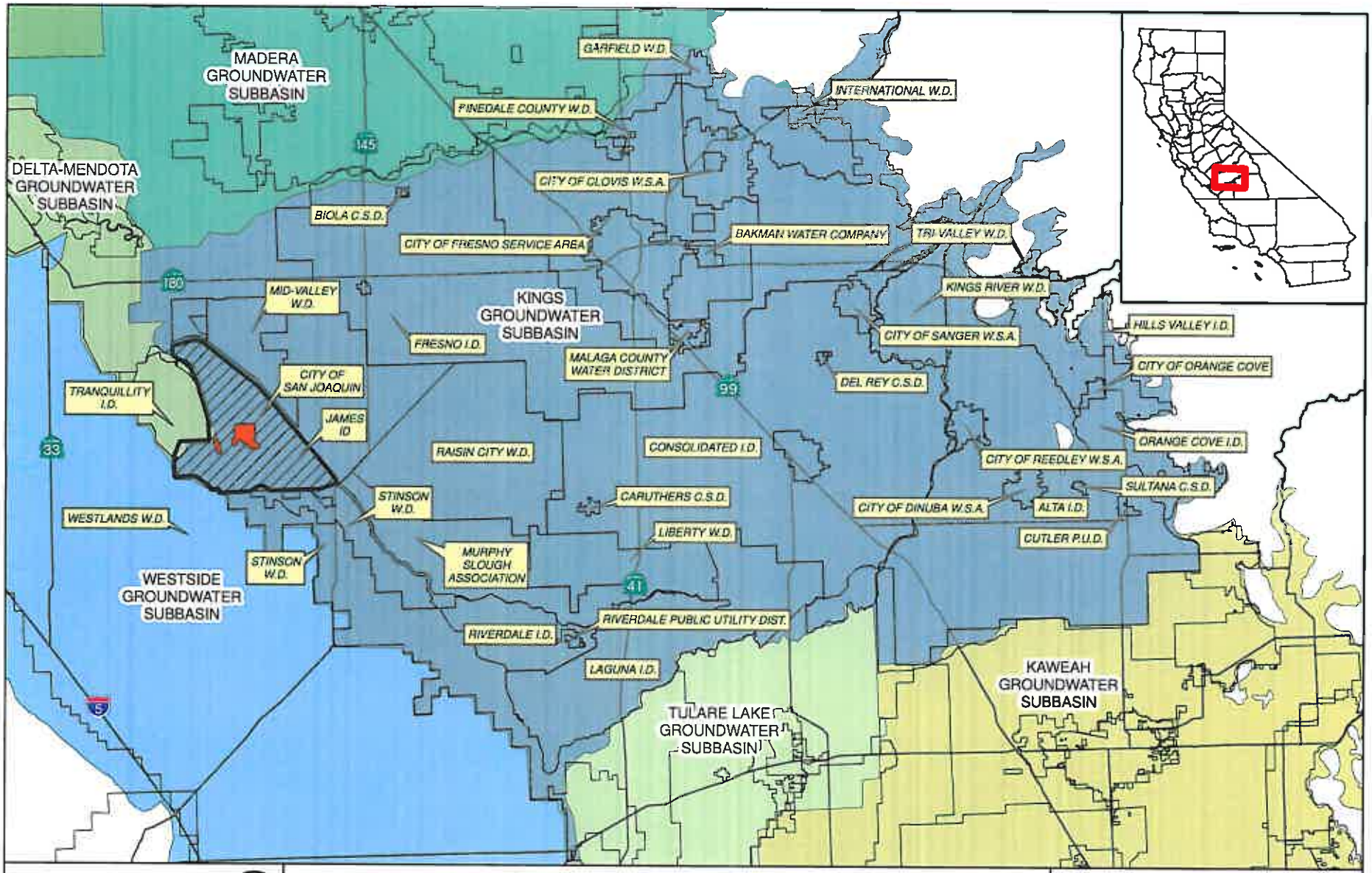
- Fresno County - Major Road
- City Of San Joaquin
- James ID
- Section
- Township/Range

James Irrigation District
City of San Joaquin

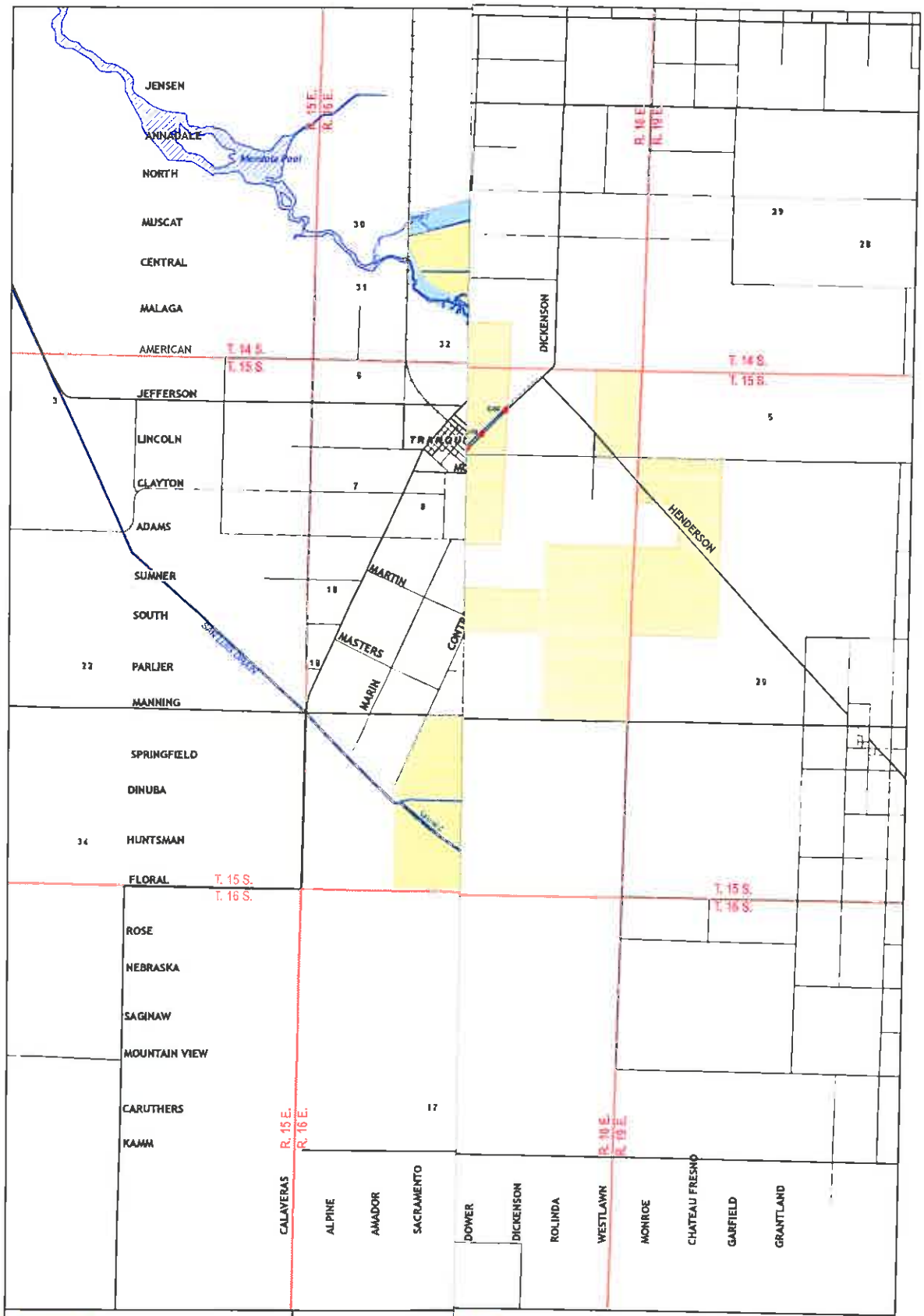
Location Map

FIGURE 1

2/2/2009 \\pnefla\dwg_dgn\Clients\James ID-1051\Projects\105108C1-AB303 Study\GIS\Map\Figure1_location.mxd



8/5/2010 \\Evolution\civ_clients\Clients\James ID-1051\Projects\105108C1-AB303 Study\GIS\Map\groundwaterbasins_revised.mxd



EST. 1968
PROVOST & PRITCHARD
CONSULTING GROUP
An Employee Owned Company

266 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

MAJOR ROAD
STREET
RAILROAD
TOWNSHIP/RANGE
SECTION

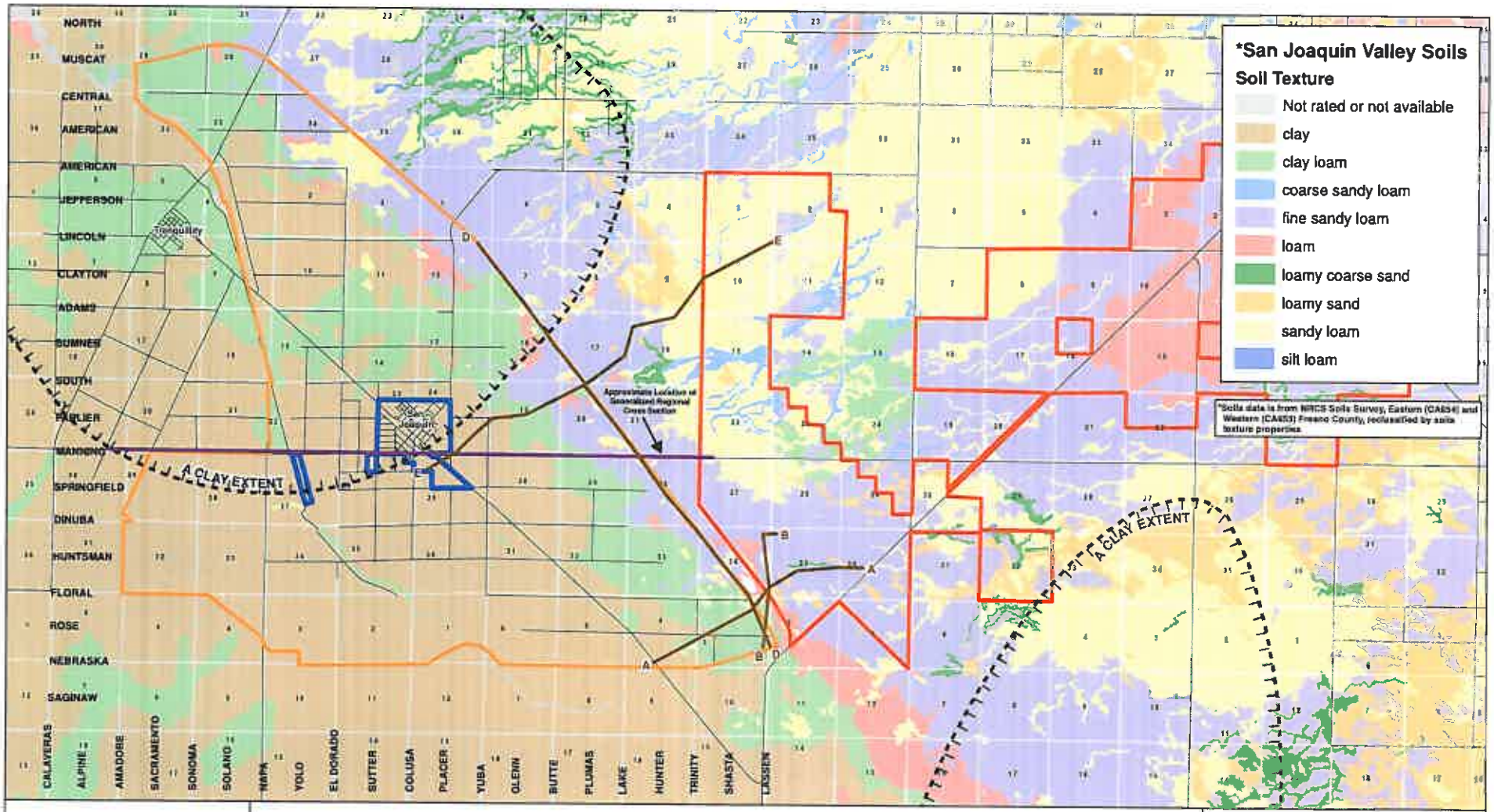
James Irrigation District

Fresno County, CA (June 2010)

Facilities Map

FIGURE 3

8/5/2010 \\Evolution\civ_clients\Clients\James ID-1051\Projects\105108C1-AB303 Study\GIS\Map\Figure3_JI



0 0.5 1 1.5 Miles

PROVOST & PRITCHARD
CONSULTING GROUP
286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

Legend

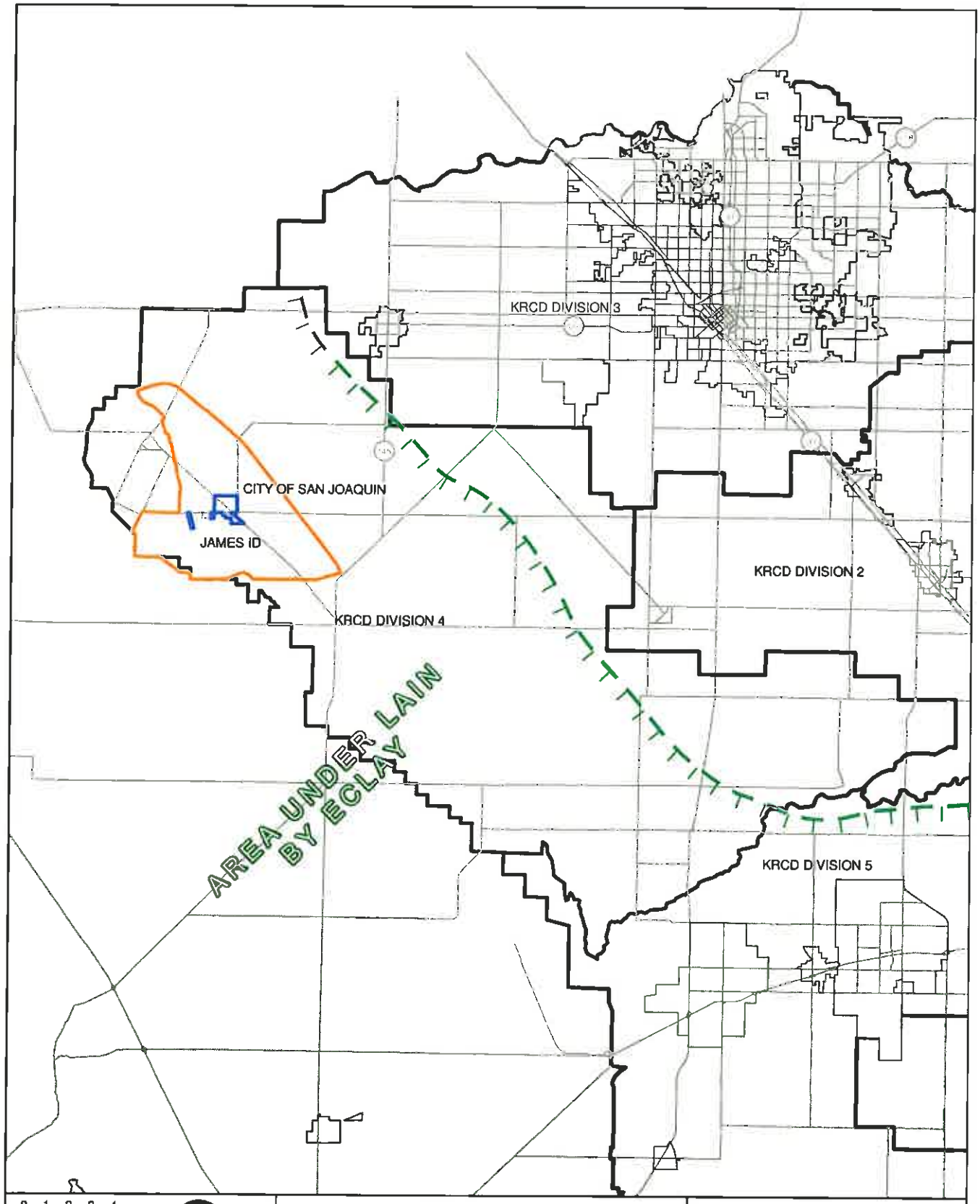
- A Clay Extent
- Generalized Regional Cross Section
- Geologic Layers From USGS Water Supply Paper 1988-H
- Cross Section
- James ID Wellfield
- City Of San Joaquin
- James ID
- Street
- Section

James Irrigation District
City of San Joaquin

Top Soils and Locations of Subsurface Geologic Cross Sections

FIGURE 4

6/29/2010 \\Evolution\cv_clients\Clients\James ID-1051\Projects\105108C1-AB303 Study\GIS\Map\soils_clay_crosssections.mxd



PROVOST & PRITCHARD CONSULTING GROUP
EST 1968
An Employee Owned Company
286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

Legend

Boundary of E Clay

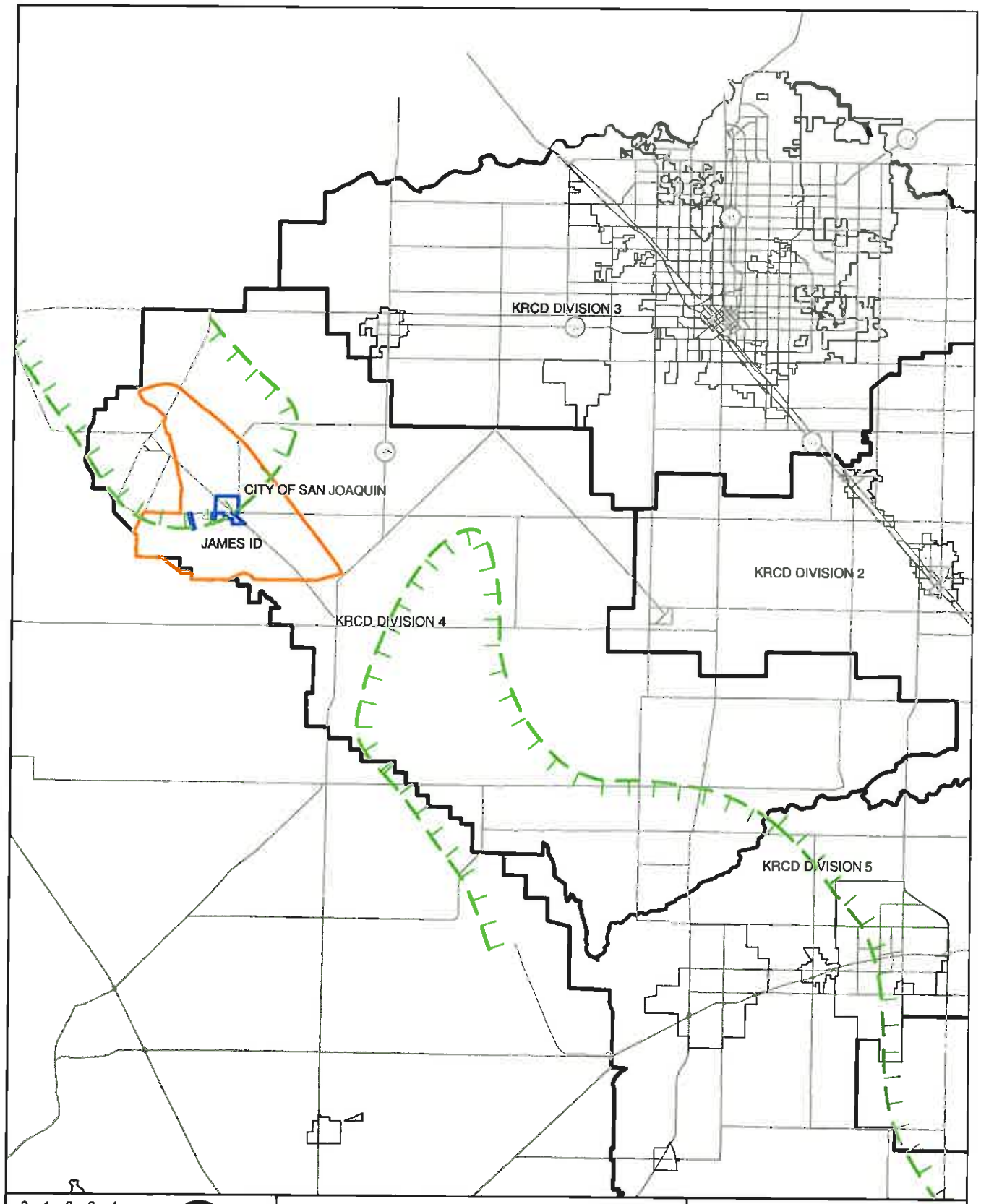
* Source: Plate 4, USGS Water Supply, Paper 1999-H

James Irrigation District
City of San Joaquin

Easterly Extent of E Clay

FIGURE 5

6/30/2010 \\Evolution\civ_clients\Clients\James ID-1051\Projects\105108C1-AB303 Study\GIS\Map\Figure5_Eclay.mxd



0 1 2 3 4 Miles

EST 1968
PROVOST & PRITCHARD
CONSULTING GROUP
An Employee Owned Company

286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

Legend

Boundary of A Clay

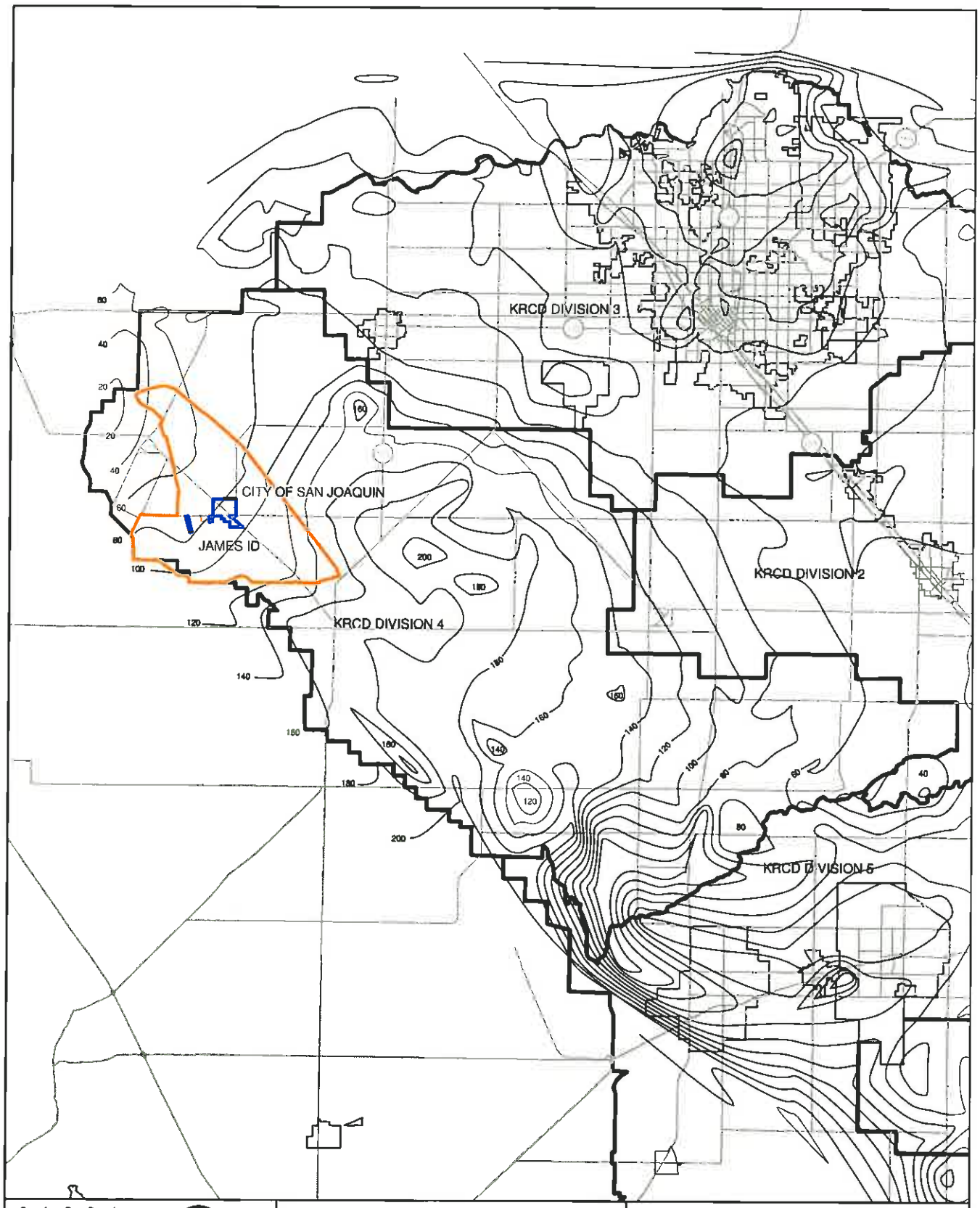
* Source: Plate 6, USGS Water Supply, Paper 1999-H

James Irrigation District
City of San Joaquin

Easterly Extent of A Clay

FIGURE 6

6/30/2010 \\Evolution\cv_clients\Clients\James ID-1051\Projects\105108C1-AB303 Study\GIS\Map\Figure6_Aclay.mxd



EST. 1958
PROVOST & PRITCHARD
CONSULTING GROUP
An Employee Owned Company

286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

Legend

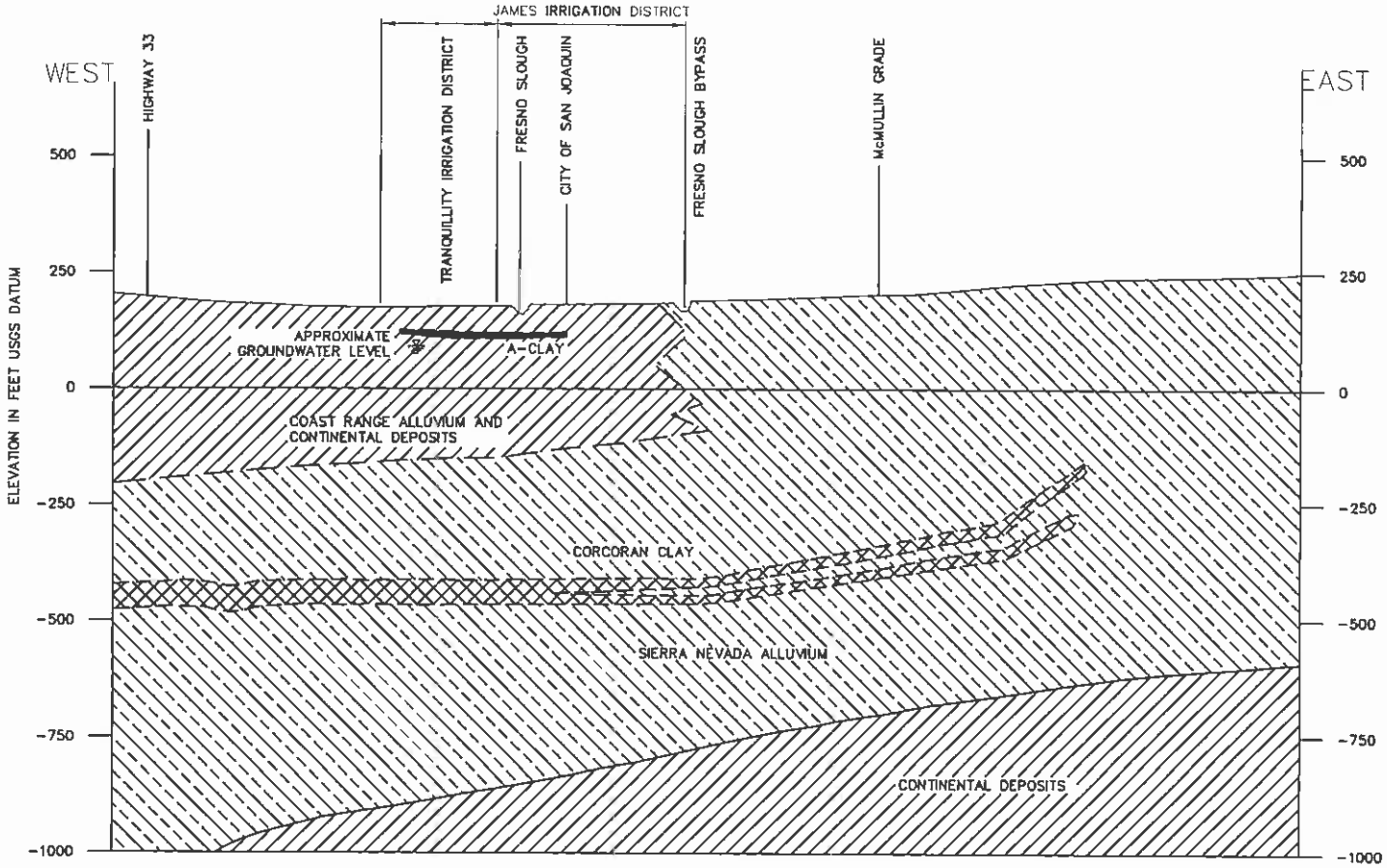
Line of Equal Depth (ft)

* Source: Figure 3, 2001-2003 Groundwater Report, Kings River Conservation District, Feb. 2004

James Irrigation District
City of San Joaquin
Regional Groundwater Contours 2003
Depth To Groundwater
FIGURE 7

6/30/2010 \\Evolution\civ_clients\Clients\James ID-1051\Projects\105108C1-AB303 Study\GIS\Map\Figure6_Ac/ay.mxd

FIGURE 8



GENERALIZED REGIONAL GEOLOGIC CROSS SECTION
THROUGH JAMES IRRIGATION DISTRICT AND THE
CITY OF SAN JOAQUIN

HORIZONTAL SCALE IN MILES

3 0 3 6

MODIFIED FROM
USGS WATER SUPPLY PAPER 1999-H

NOTE: GROUNDWATER LEVELS **VARY** THROUGHOUT THE AREA **AND OVER TIME**

PROVOST & PRITCHARD

James Irrigation District
CROPPING DATA

ATTACHMENT 1

CROP ACREAGE HISTORY

CATEGORY: CROP	2009 ACRES	2008 ACRES	2007 ACRES	2006 ACRES	2005 ACRES	2004 ACRES	2003 ACRES	2002 ACRES	2001 ACRES	2000 ACRES	1999 ACRES	1998 *(2) ACRES	1997 ACRES	1996 ACRES	1995 ACRES	1994 ACRES	1993 ACRES	HISTORICAL AVERAGE
FIELD: COTTON	5,814	6,550	11,090	12,683	14,321	14,390	12,766	12,648	13,135	10,707	10,896	10,541	14,905	15,761	15,200	13,755	14,173	12,314
FIELD: SUGAR BEETS		548	795	764	504	237	399	574	264	381	734	382	219	90	449	920	589	491
FRUITS: POMEGRANATES	597	526	514	157														449
GRAIN: BARLEY	112	114	171	137	161	213	214	144	0	12	0	12	100	134	380	426	296	154
GRAIN: CORN / HUMAN CONSUMPTION	225	1,676	2,039	119	1,099	1,051	932	1,021	74	119	195	0	0	0	0	0	0	503
GRAIN: OATS						100	230	281	90	0	0	0	0	0	43	247	0	83
GRAIN: WHEAT	1,378	1,947	801	328	671	952	3,029	1,024	764	212	691	583	184	462	109	275	426	814
GRAPES: WINE / BEARING	1,253	1,253	1,253	1,253	721	458	383	383	383	383	382	190	114	114	114	114	114	521
GRAPES: WINE / NON-BEARING			incl	incl	incl	150	0	0	0	0	0	192	268	86	0	0	0	58
HAY: ALFALFA	151	108	190	40	165	84	147	448	876	140	120	120	56	126	69	147	165	185
HAY: BARLEY			0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	1
HAY: GRASS (Var. Love)	56		48		56	0	0	0	0	0	0	0	0	0	0	0	0	11
HAY: GRASS (Var. Sudan)		160	84		80	80	0	0	0	0	0	260	0	0	0	0	0	44
HAY: OAT	38	8	92	92		64	262	575	280	216	111	103	53	0	0	0	0	118
MELONS: CANTALOUPE						0	0	0	0	5	0	375	65	0	0	60	424	77
MELONS: HONEYDEW						0	0	0	0	0	140	0	57	0	0	0	0	16
NUTS: ALMONDS / BEARING	2,428	2,320	2,108	1,886	1,514	991	615	842	438	695	635	280	80	40	40	20	20	880
NUTS: ALMONDS / NON-BEARING			incl	incl	incl	179	320	37	367	138	134	240	360	400	140	20	20	196
PASTURE (PERMANENT)	58	58	14	15	16	10	16	11	7	11	11	5	9	63	59	68	69	29
SEED: ALFALFA	6,005	4,099	3,127	2,604	2,407	2,321	1,772	2,256	4,632	6,942	8,194	7,405	5,568	5,320	5,663	5,562	5,116	4,647
SEED: BROCCOLI				54	54	0	0	0	0	0	0	0	0	0	0	0	0	8
SEED: CARROT					12	12	0	0	0	0	0	0	0	0	0	0	0	2
SEED: CORN	30	16	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
SEED: LETTUCE	115	13	37	38	38	42	40	39	0	42	36	75	0	0	0	0	0	30
SEED: MUSTARD		1		26	51	25	0	0	0	5	0	0	0	0	0	0	0	7
SEED: ONION	2	2																2
SEED: RADISH				5	5													5
SEED: SPINACH (Var. Komatsuna)				8	8													8
SEED: SUDAN GRASS						0	0	156	0	0	0	0	0	0	0	0	0	13
SILEAGE: CORN	773	2,320	254	499	573	410	351	640	391	269	264	764	431	167	173	186	230	511
SILEAGE: OATS	80					321	0	0	0	0	0	0	0	0	0	0	0	31
SILEAGE: WHEAT	48	160	148	140	142	69	0	0	0	25	57	0	0	0	0	0	0	46
TREES: EUCALYPTUS	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
VEG: ONIONS/DEHYDRATED	333	401	523	504	486	226	145	144	0	0	0	0	0	0	0	0	0	162
VEG: SQUASH	7																	7
VEG: TOMATOES (CANNING)	2,938	1,796	844	570	703	801	820	1,240	902	2,185	1,250	1,133	673	586	608	620	514	1,070
TOTAL	22,442	24,077	24,183	21,923	23,788	23,187	22,442	22,464	22,604	22,488	23,863	22,881	23,143	23,350	23,048	22,421	22,156	22,954
SET-ASIDE					0	0	0	0	0	0	0	0	0	0	0	0	0	0
FALLOW / IDLE, IRRIGATED	504	62	306	1,611	187	178	362	369	290	40	197	0	14	0	0	1,008	0	302
FALLOW, GRAZED				0	0	0	0	0	0	0	0	0	0	0	0	76	0	5
LESS MULTIPLE CROPS	-174	-1,304	-1,383	-924	0	-1,048	-319	-821	-388	-278	-426	-193	-327	-117	-43	-580	-155	-498
GRAND TOTAL	22,772	22,835	23,086	22,610	23,975	22,317	22,475	22,032	22,508	22,250	23,834	22,488	22,930	23,233	23,005	22,924	22,001	22,752

*(1) 1998 - INCLUDES ADJUSTMENT (131.24) ACFT / ALMONDS FOR ERRONEOUS METER READINGS/PRIOR YEAR
*(2) 1999 - COTTON: ABANDONED 402 ACRES

JAMES IRRIGATION DISTRICT
SUMMARY OF PRODUCTION WELL ATTRIBUTES

ATTACHMENT 2

Well No.	Type	State ID #	Location	Casing Diameter (in)	Depth (ft)	Perforated Interval (ft)	Date Constructed	Capacity (gpm)	Notes
C-49	Agricultural		Coalinga Alignment (McMullin Grade)						ABANDONED
C-53	Agricultural		Coalinga Alignment (McMullin Grade)						ABANDONED
C-54	Agricultural		Coalinga Alignment (McMullin Grade)						ABANDONED
C-55	Agricultural		Main Canal Alignment	16	500	275 to 496	*	1621	DIFFICULT TO READ
C-56	Agricultural		Main Canal Alignment	18	484	218 to478	6/12/1959	1661	
C-57	Agricultural	15/18-30F2	Coalinga Alignment (McMullin Grade)	16	365	167 to 361	3/16/1960	-	MULTIPLE C-57'S
C-58	Agricultural	15/17-2	Kerman Alignment (Lassen Avenue)	16	382	148 to 376	6/5/1960	1786	
C-59	Agricultural	15/17-23	Kerman Alignment (Lassen Avenue)	16	416	154 to 408	11/29/1960	-	Abandoned as of 2008
C-60	Agricultural	15/17-3	Kerman Alignment (Lassen Avenue)	16	405	148 to 400	2/16/1961	1490	
C-61	Agricultural	15/18-10	Coalinga Alignment (McMullin Grade)	16	418	163 to *	2-8-*	1190	
C-62	Agricultural	15/17-14	Kerman Alignment (Lassen Avenue)	16	430	168 to 410 410 to 427	6/18/1962	1197	
C-63	Agricultural	15/17-34	Main Canal Alignment	16	477	220 to 470	4/31/1963	-	ABANDONED
C-64	Agricultural	15/16-2	Main Canal Alignment	16	492	212 to 485	6/20/1963	-	ABANDONED
C-65	Agricultural	15/16-1	Main Canal Alignment	16	496	200 to 488	7/6/1961	1032	
C-66	Agricultural		Main Canal Alignment						ABANDONED
C-67	Agricultural	15/17-3	Kerman Alignment (Lassen Avenue)	16	414	200 to 400	2/3/1966	926	
C-68	Agricultural	15/16-12	Main Canal Alignment	16	494	250 to 488	6/8/1967	1149	
C-69	Agricultural	15/18-10	Coalinga Alignment (McMullin Grade)	16	417	200 to 411	1/22/1963	975	
C-70	Agricultural	15/18-30	Coalinga Alignment (McMullin Grade)	16	458	230 to 452	4/28/1969	1225	
C-71	Agricultural	15/18-20	Coalinga Alignment (McMullin Grade)	16	422	230 to 415	6/25/1969	1110	
C-72	Agricultural	15/18-16	Coalinga Alignment (McMullin Grade)	16	424	230 to 404, 412 to 418	12/9/1969	1491	
C-73	Agricultural	15/17-28D	Main Canal Alignment	16	490	250 to 284; 308 to 484	4/24/1972	1362	
C-74	Agricultural	-	Coalinga Alignment (McMullin Grade)	16	442	235 to 437	5/9/1972	1470	
C-75	Agricultural	15/16-12	Main Canal Alignment	16	499	250 to 494	5/30/1972	-	
C-76	Agricultural	16/17-3	Main Canal Alignment	16 @ 0 to 386 14 @ 315 to 515	515	260 to 380; 330 to 511	5/24/1974	1058	
C-77	Agricultural	15/18-16	Coalinga Alignment (McMullin Grade)	16	458	245 to 454	6/21/1974	1311	
C-78	Agricultural	15/18-2	Coalinga Alignment (McMullin Grade)	16	518	280 to 345; 375 to 512	12/20/1976	1906	
C-79	Agricultural	15/17-36A	Coalinga Alignment (McMullin Grade)	16		250 to 520; 520 to 528	12/16/1979	1454	
C-80	Agricultural	-	Coalinga Alignment (McMullin Grade)	16	576	250 to 504	3/17/1981	2086	

JAMES IRRIGATION DISTRICT
SUMMARY OF PRODUCTION WELL ATTRIBUTES

ATTACHMENT 2

Well No.	Type	State ID #	Location	Casing Diameter (in)	Depth (ft)	Perforated Interval (ft)	Date Constructed	Capacity (gpm)	Notes
C-81	Agricultural	15/17-7	Main Canal Alignment	16	504	250 to 500	3/30/1982	1655	
C-82	Agricultural	15/17-36L	Coalinga Alignment (McMullin Grade)	16	533	270 to 282, 292 to 302; 310 to 322; 330 to 380; 384 to 420; 434 to 464; 506 to 524	11/16/1989	1379	
C-83	Agricultural	15/18-2	Coalinga Alignment (McMullin Grade)	16	511	253 to 265; 280 to 300; 324 to 330; 360 to 370; 380 to 422;446 to 450, 470 to 500	4/19/1997	2008	
C-84	Agricultural	15/17-26	Kerman Alignment (Lassen Avenue)	16	500	340 to 476	4/29/1998	1670	
C-85	Agricultural	15/18-30	Coalinga Alignment (McMullin Grade)	16	532	340 to 320; 370 to 520	6/17/1998	1430	
C-86	Agricultural	15/16-36	Main Canal Alignment	16	500	330 to 420	5/24/2000	1211	Abandoned in 2010
C-87	Agricultural	15/17-7	Main Canal Alignment	16	492	330 to 484	10/25/2001	1391	
C-88	Agricultural	15/18-10	Coalinga Alignment (McMullin Grade)	16	500	335 to 406; 424 to 460; 480 to 490	10/29/2002	1419	
C-89	Agricultural	15/18-10	Coalinga Alignment (McMullin Grade)	16	500	300 to 306; 326 to 335; 368 to 376, 398 to 448; 469 to 483	7/19/2003	-	
D-04	Agricultural		Main Canal Alignment						ABANDONED
D-06	Agricultural		Kerman Alignment (Lassen Avenue)						ABANDONED
D-08	Agricultural	-	Main Canal Alignment	-	-	-	-	-	LIMITED LOG INFO
D-09	Agricultural		Main Canal Alignment						ABANDONED
D-10	Agricultural	15/17-28	Main Canal Alignment	18	808	208 to 808	1948	-	LIMITED LOG INFO
D-15	Agricultural	-	Main Canal Alignment	-	-	-	3/16/1950	-	LIMITED LOG INFO
D-16	Agricultural	-	Kerman Alignment (Lassen Avenue)	16	811	257-807	3/14/1952	-	ABANDONED
D-17	Agricultural		Kerman Alignment (Lassen Avenue)						ABANDONED
D-21	Agricultural		Main Canal Alignment						ABANDONED
D-22	Agricultural		Kerman Alignment (Lassen Avenue)						ABANDONED
D-23	Agricultural		Kerman Alignment (Lassen Avenue)						ABANDONED
D-24	Agricultural	-	Main Canal Alignment						MISSING
D-25	Agricultural		Main Canal Alignment						ABANDONED
D-29	Agricultural	-	Main Canal Alignment						MISSING
D-30	Agricultural	16/17-3	Main Canal Alignment	16	550	240 to 540	4/28/1972	1390	
D-31	Agricultural	15/17-35N	Kerman Alignment (Lassen Avenue)	16	520	240 to 510	4/18/1977	1345	

JAMES IRRIGATION DISTRICT
SUMMARY OF PRODUCTION WELL ATTRIBUTES

ATTACHMENT 2

Well No.	Type	State ID #	Location	Casing Diameter (in)	Depth (ft)	Perforated Interval (ft)	Date Constructed	Capacity (gpm)	Notes
D-32	Agricultural	15/17-35K	Coalinga Alignment (McMullin Grade)	16	525	270 to 510	9/15/1977	1399	
D-33	Agricultural	15/18-30	Coalinga Alignment (McMullin Grade)	16	495	270 to 480	9/17/1977	950	
D-34	Agricultural	15/17-36F	Coalinga Alignment (McMullin Grade)	16	575	270 to 540	11/17/1978	971	
D-35	Agricultural	15/17-35J	Coalinga Alignment (McMullin Grade)	16	550	270 to 540	1/24/1979	1267	
D-36	Agricultural	15/18-10	Coalinga Alignment (McMullin Grade)	16	543	270 to 540	2/2/1980	-	
D-37	Agricultural	-	Inside JID Boundary	16	520	270 to 480	11/13/1980	-	
D-38	Agricultural	15/16-1	Main Canal Alignment	16	515	270 to 510	11/12/1981	1157	
D-39	Agricultural	15/16-1	Main Canal Alignment	16	525	240 to 480	11/7/1984	1008	
D-40	Agricultural	15/17-20	Main Canal Alignment	16	525	270 to 510	5/3/1985	1349	
D-41	Agricultural	15/17-22	Kerman Alignment (Lassen Avenue)	16	520	270 to 510	4/30/1987	1319	
D-42	Agricultural	15/17-10	Kerman Alignment (Lassen Avenue)	16	520	270 to 510	5/9/1987	1343	
D-43	Agricultural	15/17-27	Kerman Alignment (Lassen Avenue)	16	525	270 to 510	5/20/1987	1199	
D-44	Agricultural	16/16-1	Inside JID Boundary	16	520	240 to 510	4/29/1989	-	ABANDONED
D-45	Agricultural	15/16	Inside JID Boundary	16	495	240 to 480	5/25/1990	-	ABANDONED
D-46	Agricultural	16/17-9	Inside JID Boundary	16	540	280 to 520	4/3/1991	-	
D-47	Agricultural	15/16-36	Inside JID Boundary	16	538	280 to 520	4/12/1991	-	
D-48	Agricultural	15/17-34	Main Canal Alignment	18	480	240 to 480	5/15/1992	1470	
D-49	Agricultural	15/17-27	Kerman Alignment (Lassen Avenue)	18	480	240 to 480	-	1355	Date Completed not given. Date of permit is 12/1/92
D-50	Agricultural	15/17-35D	Kerman Alignment (Lassen Avenue)	18	480	240 to 480	12/23/1992	1590	
D-51	Agricultural	15/16-20	Coalinga Alignment (McMullin Grade)	16	500	240 to 500	1/28/1994	1754	
D-52	Agricultural	15/17-22	Kerman Alignment (Lassen Avenue)	16	500	260 to 500	2/7/1995	1465	
D-53	Agricultural	-	Coalinga Alignment (McMullin Grade)	-	-	-	-	1625	No Info
D-54	Agricultural	15/17-34	Main Canal Alignment	16	480	240 to 480	7/12/1996	1248	
D-55	Agricultural	7/16/1996	Main Canal Alignment	16	480	240 to 480	7/16/1996	1523	
D-56	Agricultural	15/16-36	Inside JID Boundary	16	520	260 to 520	6/22/2000	-	
D-57	Agricultural	15/17-2	Kerman Alignment (Lassen Avenue)	16	520	280 to 520	3/24/2004	1750	
D-58	Agricultural	15/17-28	Main Canal Alignment	16	520	280 to 520	6/23/2005	2103	

JAMES IRRIGATION DISTRICT

WATER DELIVERY REPORT

CALENDAR YEAR 2009

ATTACHMENT 3

SOURCE / LOSS REPORT - CURRENT YEAR

SOURCE >>	SJQN RVR Schedule 2	CENTRAL VALLEY PROJECT				JAMES	KINGS RIVER						FRESNO IRRIGATION DISTRICT				TRANSFERRED / WHEELED										
POINT OF ENTRY >>	BOOSTER P	BOOSTER P 1/1/2009				BOOSTER P	JID WEST WEIR	JID EAST WEIR	BOOSTER P	BOOSTER P		MUD DAM	DRY CREEK	LINCOLN AVE			BOOSTER P										
PERIOD / CONTRACT	100% RIPARIAN WTR RTS 9,700	10% USBR CONTR ENTITLE 36,300	USBR RESCHED/ CARRYOVR 6,169	USBR SEC 215	TOTAL CVP	MENDOTA POOL +RECD -5% LOSS	WEST WEIR	REG BASIN #1	BOOSTER P	SPILL BACK	TOTAL KINGS RIVER			FRESNO IRR INFLOW	SPILL BACK EASTSIDE CHANNEL	TOTAL FRESNO IRR	TRANQ IRR DISTR	RECL 1606 YRIBARREN	SAN LUIS WATER DISTR	MENDOTA POOL (BANKED)	INFLOW SUB-TOTAL	JID WELL PUMPS	INFLOW GRAND TOTAL	TOTAL (DELIV)	OUTFLOW TOTAL (SPILLED)	RECOVERED (RECHARGED)	(LOSS) SURPLUS	LOSS %
JAN		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1656	1656	-826	0	142	972	59%
FEB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-405	-405	3599	3194	-2230	0	123	1087	34%
MAR	0	0	0	0	0	176	0	0	0	0	0	0	0	0	0	0	0	0	0	0	176	5218	5394	-4213	0	131	1311	24%
APR	495	0	0	0	0	209	0	0	0	0	0	0	0	138.8	0	138.8	0	0	0	0	843	5133	5976	-4872	0	193	1296	22%
MAY	963	0	0	0	0	472	0	0	0	0	0	0	0	109.1	0	109.1	54	0	0	0	1598	8788	10386	-8136	0	438	2689	26%
JUN	5642	0	137	0	137	0	0	0	0	0	0	0	0	93.2	0	93.2	417	0	0	0	6289	7182	13471	-11360	0	89	2201	16%
JUL	2000	0	2939	0	2939	0	0	0	0	0	0	0	0	41.6	0	41.6	160	0	0	0	5141	9289	14430	-12163	-86	442	2643	18%
AUG	400	0	152	0	152	0	0	0	0	0	0	0	0	63.5	0	63.5	0	0	0	0	616	6555	7171	-5878	-60	259	1502	21%
SEP	200	0	105	0	105	0	0	0	0	0	0	0	0	5.9	0	5.9	0	0	0	0	311	3388	3699	-2654	-32	101	1114	30%
OCT		0	319	0	319	0	0	0	0	0	0	0	0	0	0	0	140	0	0	0	459	2051	2510	-1722	-88	76	766	31%
NOV		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2234	2234	-1351	-731	46	198	9%
DEC		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-28	-28	0	-28	0	0	0	-28	100%
TOTALS	9700	0	3652	0	3652	857	0	0	0	0	0	0	0	452.1	0	452.1	771	0	0	-433	14999	55093	70092	-55403	-977	2039	15751	22%
2008 CONTRACT YR / JAN-FEB	0	0	0	0	0	*Note 3																						
2009 CONTRACT YR / MAR-DEC	9700	3530	6169	0	9699																							
TOTAL ENTITLEMENT	9700	3530	6169	0	9699	<< TOTAL ENTITLEMENT																						
PAPER TRANSFERS OUT																												
JAN		0	0	0	0																							
FEB		0	-1200	0	-1200																							
MAR		0	0	0	0																							
APR		0	0	0	0																							
MAY		0	0	0	0																							
JUN		0	0	0	0																							
JUL		0	0	0	0																							
AUG		0	0	0	0																							
SEP		0	0	0	0																							
OCT		0	0	0	0																							
NOV		0	0	0	0																							
DEC		0	0	0	0																							
TOTAL PAPER TRANSFERS		0	-1200	0	-1200								DETAIL - PAPER TRANSFERS>>						0									
JID ENTITLEMENT REMAINING	0	3530	1317	0	4847																							
	*Note 1	*Note 2																										

HISTORICAL

YEAR: RIPARIAN / CVP % ALLOCTN	SJQN RVR Schedule 2	USBR CONTRACT	USBR RESCHED/ CARRYOVR	USBR SEC 215	TOTAL CVP	MENDOTA POOL	JID WEST WEIR	JID EAST WEIR	BOOSTER P	SPILL BACK	TOTAL KINGS RIVER	MUD DAM	DRY CREEK	LINCOLN AVE	SPILL BACK EASTSIDE	TOTAL FRESNO IRR	TRANQ IRR DISTR	RECL 1606 YRIBARREN	SAN LUIS WATER DISTR	MENDOTA POOL (BANKED)	INFLOW SUB-TOTAL	JID WELL PUMPS	INFLOW GRAND TOTAL	TOTAL (DELIV)	OUTFLOW TOTAL (SPILLED)	RECOVERED (RECHARGED)	(LOSS) SURPLUS	LOSS %
2009: 100% RIP / 10% CVP	9700	0	3652	0	3652	857	0	0	0	0	0	0	0	452	0	452	771	0	0	-433	14999	55093	70092	-55403	-977	2039	15751	22%
2008: 100% RIP / 40% CVP	9700	7951	2579	0	2579	0	0	0	0	0	0	0	1618	801	0	2419	0	0	2897	28	21286	56886	78142	-63323	-410	0	14408	18%
2007: 100% RIP / 50% CVP	9700	16571	3500	0	20071	28	0	0	0	0	0	0	0	355	0	355	0	0	9421	-28	39547	48713	82976	-63435	-383	877	20037	24%
2006: 100% RIP / 100% CVP	9700	23866	0	0	23866	0	14159	2461	4419	0	21039	0	831	2519	0	3349	0	0	9452	0	67406	6282	73688	-47949	-344	-8610	16785	23%
2005: 100% RIP / 85% CVP	9700	28343	0	2477	30820	0	5870	482	2227	0	8578	0	63	1149	0	1212	0	0	0	0	50310	22537	72847	-55419	-247	-2288	14892	20%
2004: 100% RIP / 70% CVP	9700	27077	0	1690	28767	0	0	0	0	0	0	0	0	589	0	589	0	0	1200	0	38565	42983	81549	-63109	-137	-934	17370	21%
2003: 100% RIP / 75% CVP	9700	26475	1945	0	28420	0	0	0	0	0	0	0	0	906	0	906	0	0	0	0	39026	37352	76378	-57544	-86	N/A	18748	25%
2002: 100% RIP / 70% CVP	9700	24710	1488	0	26198	0	0	0	0	0	0	0	0	1467	0	1467	0	0	0	0	37365	48653	86018	-61695	-128	N/A	24196	28%
2001: 100% RIP / 49% CVP	9700	15809	97	0	15906	3110	0	0	0	0	0	0	0	771	0	771	0	0	0	-3110	28377	48640	75017	-57516	-97	N/A	17403	23%
2000: 100% RIP / 65% CVP	9700	22945	948	0	23893	0	0	0	0	-63	-63	0	133	1803	0	1936	0	0	0	0	36465	36416	71764	-55023	UNK	N/A	16761	23%
1999: 100% RIP / 70% CVP	9700	23442	10000	0	33442	0	111	0	0	0	111	0	107	1356	0	1464	0	0	0	0	44717	33812	78529	-60294	UNK	N/A	18234	23%
1998: 100% RIP / 100% CVP	1128	13142	0	0	13142	0	31242	0	7061	-153	38150	786	797	1979	-103	2673	0	0	0	0	55879	1916	57795	-42851	UNK	N/A	14944	26%
1997: 100% RIP / 90% CVP	9700	31770	0	0	31770	0	13142	0	2377	-18	15501	0	280	1525	0	1805	0	0	0	0	58775	26484	85259	-66551	UNK	N/A	18708	22%
1996: 100% RIP / 95% CVP	9700	27354	10000	0	37354	0	21302	0	2372	0	23674	0	286	1456	0	1741	-584	0	0	0	71685	7235	79120	-61085	UNK	N/A	18035	23%
1995: 100% RIP / 100% CVP	3317	8126	0	0	8126	0	31413	0	12298	0	43711	0	0	1434	0	1434	0	0	0	0	56688	11326	67913	-54130	UNK	N/A	13783	20%
1994: 75% RIP / 35% CVP	7600	12351	2655	0	15006	0	0	0	0	0	0	0	0	752	0	752	-200	-48	0	-254	22856	59802	82657	-59713	UNK	N/A	22944	28%
1993:																												
1992:																												
																												24%
AVERAGES	8388.076923	21955	2087	321	24362	239	9018	2943	2366	-18	11592	60	192	1362	8	1546	-60	-4	819	259	46555	29495	76043	57145	173	-3944	17908	24%

*Note 1: San Joaquin Riparian: FEB-JUN Schedule must be taken by June 30; JUL-SEP / Fixed Schedule must be taken by September 30; JAN, OCT-DEC No Deliveries

*Note 2: USBR CVP Contract Total Entitlement allocation reflects 14-month period

*Note 3: Mendota Pool Received: Includes 5% loss

Sampling Instructions for Aqueous Samples

FGL provides the appropriate containers, labels, chain of custodies, ice chests and blue ice at no charge. All samples should be cooled to approximately 4° C prior to shipping to the laboratory. A list of proper holding times and preservation techniques is available upon request. **If you have any questions concerning the containers or sampling techniques please call.** Please do not rinse out containers provided by FGL prior to filling. The containers are labeled as to the type of sampling.

Type 1 - Semi-volatile Organics, Inorganics, and Radio Chemistry (except Radon):

1) Fill the sample container to the top and cap.

Type 2 - Volatile Organics:

1) Fill the sample containers (two VOA vials) until there is a raised portion of water above the rim of the vial and cap carefully. It helps to run the water very slowly.
2) After capping, invert the sample vial, tap the vial, then check for bubbles (headspace).
3) If bubbles are present repeat sampling until no bubbles are observed. Having no headspace is very important to the overall quality of the analytical results.

Type 3 - Bacteriology:

Source sampling (testing the well) -

1) Selecting a spigot closest to the well and run the water for approximately 5 minutes. If only air is vented, turn on spigots after the holding tank to drop the holding tank pressure which should turn on the pump. The well pump should turn on and run through at least one cycle.
2) If the spigot is not frequently used it should be flamed with a propane torch or wiped with bleach and run the water again for 1 minute (longer for very contaminated spigots).
3) Please take care opening the sample container and do not remove the powder or pill inside. Permit only the water sample to contact the inside of the bottle and cap.
4) Fill the sample container to slightly more than the 100 mL line. This will insure adequate sample volume and enough headspace for mixing.
5) Because the analysis needs to be started as soon as possible (maximum time is 30 hours). Please keep the samples cool and ship or deliver to the lab as soon as possible.

System sampling (testing plumbing and faucets away from the well) -

1) If possible, select a tap in frequent use. If the tap has an aerator screen it will need to be removed.
2) Turn on the faucet and allow the water to run for approximately 5 minutes.
3) If the spigot is not frequently used it should be flamed with a propane torch or wiped with bleach and run the water again for 1 minute (longer for very contaminated spigots).
4) Please take care opening the sample container and do not remove the powder or pill inside. Permit only the water sample to contact the inside of the bottle and cap.
5) Fill the sample container to slightly more than the 100 mL line. This will insure adequate sample volume and enough headspace for mixing.
6) Because the analysis needs to be started as soon as possible (maximum time is 30 hours). Please keep the samples cool and ship or deliver to the lab as soon as possible.

Reservoir and stream sampling -

1) Tilt the bottle approximately 45 degrees and hold at the base. In a scooping motion, move the bottle away from you, mouth first, as you fill the bottle.
2) Please take care opening the sample container. Permit only the water sample to contact the inside of the bottle and cap.
3) Fill the sample container to slightly more than the 100 mL line. This will insure adequate sample volume and enough headspace for mixing.
4) Because the holding time is 30 hours please ship or deliver to the lab as soon as possible.

Type 4 - Radon:

Radon is a gas and emanates quickly from agitated water. The hold time for regulated water is 4days. (8d for non-Reg.) Proper collection techniques and handling of the Radon sample is critical for valid data to be obtained. For best results follow the instructions listed below:

1) Sample by slowly run water from a hose into a 2 liter container until it overflows for 5 minutes. The water entering the container should be as free as possible of bubbles.
2) Fill 2 x 125 mL Boston round or 2 x 40 mL VOA vials under water by placing the hose into the bottle, taking care to release all of the air bubbles. Cap tightly under water.
3) Take the sample from container and turn it upside down to check for bubbles. If necessary, repeat sampling until no bubbles are observed.
4) Dry sample container and place electrical tape around cap.
5) Record time and date of the duplicate samples.
6) Pack in a cool ice chest and ship NEXT DAY AIR to the laboratory for analysis.

Other considerations for proper sampling:

- Make an accurate record on the chain of custody of every sample collected. Identify every container by attaching an appropriately inscribed tag or label which corresponds to the record on the chain of custody.

- Before collecting samples from a distribution system, be sure to flush lines sufficiently to insure that the sample is representative of the supply.

- Before sampling from a well, be sure to run the pump long enough to insure that the sample represents the groundwater source.

- When samples are collected from a river or stream, analytical values may vary with depth, stream flow, and distance from shore and channel width. If equipment is available, take and "integrated" sample from top to bottom in the middle of the stream in such a way that the sample is composited according to time or flow. If only a grab or catch sample can be collected, take it in the middle of the stream and, if possible, at mid-depth.

- Lakes and reservoirs are subject to considerable variations from normal influences such as seasonal stratification, rainfall, runoff, and wind. Choose the location, depth and frequency of sampling based on local conditions and the purpose of the investigation. Avoid surface scum.

Well Cleanup Procedure for Bacterial Contamination:

- FGL has a written procedure to help you through the well cleanup process. Please call to obtain a copy of this procedure.

JAMES IRRIGATION DISTRICT
ANNUAL GROUNDWATER REPORT

Table Of Contents

EXECUTIVE SUMMARY

1. INTRODUCTION
- 1.1 - District Overview
- 1.2 - Report Objectives

2. GROUNDWATER MONITORING
- 2.1 - Groundwater Levels
- 2.2 - Groundwater Flow
- 2.3 - Groundwater Storage
- 2.4 - Groundwater Quality
- 2.5 - Monitoring Protocols

3. GROUNDWATER MANAGEMENT
- 3.1 - Groundwater Advisory Committee
- 3.2 - Groundwater Ordinances and Policies
- 3.3 - Groundwater Management Plan
- 3.4 - Groundwater Banking and Recharge
- 3.5 - Groundwater Studies and Investigations
- 3.6 - Regional Groundwater Management

4. CONCLUSIONS AND RECOMMENDATIONS
- 4.1 - Conclusions
- 4.2 - Recommendations

Tables
Groundwater Elevations
Depth to Groundwater

Figures
District Map
Well Location Map
Groundwater Elevation Contours
Depth to Groundwater Contours

APPENDICES
A - Well Hydrographs
B - Groundwater Quality Data
C - Groundwater Banking Operations Data

ATTACHMENT 6

James Irrigation District and City of San Joaquin
Groundwater Management Plan
Implementation Schedule (2010-2015)

Task No.	Task[1]	2010				2011				2012				2013				2014				2015			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
James Irrigation District																									
1	Prepare Annual Groundwater Reports					■	■			■	■			■	■			■	■			■	■		
2	Well Canvass									■	■	■	■												
3	Well SCADA/Telemetry							■	■																
4	Water Augmentation Project					■	■	■	■	■	■	■	■												
5	Federal Drought Relief Well Construction				■	■																			
6	Construct Replacement Wells				■				■				■				■				■				■
7	Well Abandonment Program													■	■	■	■								
8	Recruit Groundwater Banking Partner					■	■	■	■																
9	Negotiate Surface Water Purchases with Fresno Irrigation District							■	■																
10	Evaluate Feasibility of Purchasing Wastewater Effluent from Fresno									■	■	■	■												
11	Drought Preparedness Plan																	■	■	■	■				
City of San Joaquin																									
12	Seek Funding for Water Meters, a New Production Well and Storage Tank			■	■	■	■	■	■																
13	Water Meter Installation									■	■	■	■	■	■	■	■	■	■	■	■				
14	Construct 0.7 MG Storage Tank					■	■	■	■																
15	Construct New Production Eell					■	■	■	■																
16	Update Groundwater Management Plan																					■	■		

Notes:

1 - Only proposed new projects are shown in this schedule. Existing and on-going projects are not shown. Also, new policies and guidelines that will be implemented on a continuous basis are not shown.

2 - Implementation of these projects will depend on the results of current feasibility studies and the availability of funding.

JAMES IRRIGATION DISTRICT

CITY OF SAN JOAQUIN

GROUNDWATER MANAGEMENT PLAN

APPENDIX A

PUBLIC PARTICIPATION

RESOLUTION 2010-05

RESOLUTION
OF THE
BOARD OF DIRECTORS
JAMES IRRIGATION DISTRICT

TO ADOPT A GROUNDWATER MANAGEMENT PLAN

At a meeting of the Board of Directors of the JAMES IRRIGATION DISTRICT, a public Irrigation District organized and existing under the Irrigation District Law (California Water Code, Division 11, Section 20,500 *et seq.*) of the State of California, held on the 19th day of October, 2010, the following resolution was adopted:

WHEREAS, the California Water code permits the adoption and implementation of Groundwater Management Plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, the JAMES IRRIGATION DISTRICT (JID) and CITY OF SAN JOAQUIN (CITY) have entered a Memorandum of Understanding (MOU) to improve coordination of water management activities in their local area;

WHEREAS, in accordance with the MOU, JID and the CITY have collaborated in the preparation of an integrated Groundwater Management Plan; and

WHEREAS, adoption of a Groundwater Management Plan is in furtherance of and consistent with the District's goals and objectives and will be in the best interests of the District's landowners and water users; and

WHEREAS, a public hearing was held on October 12, 2010, to consider adoption of the Groundwater Management Plan which is attached as Exhibit A and incorporated herein by reference;

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the JAMES IRRIGATION DISTRICT as follows: The Groundwater Management Plan prepared in compliance with Senate Bill No. 1938 and attached as Exhibit A is hereby adopted.

The foregoing Resolution was introduced and adopted at a Regular Meeting of the Board of Directors of the JAMES IRRIGATION DISTRICT conducted October 19th, 2010, on motion of Director Kenneth Hale, and seconded by Director Thomas Chaney, was hereby authorized by the following vote, to wit:

AYES:	5	(Hale, Chaney, Ayerza, Motte, Carvalho)
NOES:	0	
ABSTAIN:	0	
EXCUSED:	0	
ABSENT:	0	

Michael A. Carvalho, President
BOARD OF DIRECTORS
JAMES IRRIGATION DISTRICT

ATTEST:

Donna Y. Hanneman, Secretary
BOARD OF DIRECTORS
JAMES IRRIGATION DISTRICT

CERTIFICATION OF SECRETARY

The undersigned certifies that she is the Secretary of JAMES IRRIGATION DISTRICT and that the foregoing Resolution was adopted by the Board of Directors of said District at a meeting thereof, duly and regularly held on October 19th, 2010, at which meeting a quorum of the Board of Directors was at all times present and acting.

IN WITNESS WHEREOF, I have set my hand and seal of the Board of Directors this 19th day of October, 2010 .

{ SEAL }

Donna Y. Hanneman, Secretary
BOARD OF DIRECTORS
JAMES IRRIGATION DISTRICT

RESOLUTION NO. 10-38

RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SAN JOAQUIN ADOPTING A GROUNDWATER MANAGEMENT PLAN

WHEREAS, the California Water Code permits the adoption and implementation of Groundwater Management Plans to encourage authorized local agencies to manage groundwater resources within their services areas; and

WHEREAS, the City of San Joaquin and the James Irrigation District (JID) have entered a Memorandum of Understanding (MOU) to improve coordination of water management activities in their local area;

WHEREAS, in accordance with the MOU, the City and JID have collaborated in the preparation of an integrated Groundwater Management Plan; and

WHEREAS, adoption of a Groundwater Management Plan is in furtherance of an consistent with the City's goals and objectives and will be in the best interests of the City's landowners and water users; and

WHEREAS, a public hearing was held on October 13, 2010, to consider adoption of the Groundwater Management Plan, this is attached as Exhibit A and incorporated herein by reference;

NOW THEREFORE BE IT RESOLVED, by the City council of the City of San Joaquin as follow: The Groundwater Management Plan prepared in compliance with Senate Bill No. 1938 and attached as "Exhibit A" is hereby adopted.

The foregoing resolution was adopted at a special meeting of the City Council of the City of San Joaquin the 13th Day of October 2010 and passed at said meeting the following vote:

Amarpreet Dhaliwal, Mayor

ATTEST:

I Lupe Estrada, Deputy City Clerk of the City of San Joaquin, do hereby certify that the foregoing resolution was duly adopted and passed by the City Council at a special Council, held at the San Joaquin Council Chambers on October 13, 2010, by the following vote:

AYES:	-3-	Hernandez, Lua, Vallejo
NOES:	-0-	
ABSENT:	-2-	Dhaliwal, Reynaga
ABSTAIN:	-0-	

Lupe Estrada, Deputy City Clerk
City of San Joaquin

WEST SIDE ADVANCE
14693 W. Whitesbridge Ave.
P.O. Box 336
Ke n, CA 93630
Te one: 559-846-6689

This space is for the County Clerk's Filing Stamp

PROOF OF PUBLICATION
(2015.5 C.C.P.)

STATE OF CALIFORNIA
County of Fresno,

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the principal clerk of the printer of the **West Side Advance**, a newspaper of general circulation, printed and published weekly in the City of Kerman, County of Fresno, and which newspaper has been ad ed a newspaper of general circulation by the Superior Court of the County of Fresno, State of California, under the date of February 9, 1956, Case Number 45745; that the notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following date, to-wit:

September 29, Oct. 6

all in the year 20 10. I Certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated at Kerman, California this 6th

day of October 2010

Kathy A Matth

Signature

Proof of Publication
Notice of Hearing

NOTICE OF HEARINGS TO ADOPT AN INTEGRATED GROUNDWATER MANAGEMENT PLAN FOR THE JAMES IRRIGATION DISTRICT AND CITY OF SAN JOAQUIN

NOTICE IS HEREBY GIVEN that public hearings will be held at the James Irrigation District Office and the City of San Joaquin Veterans Memorial Hall to consider adoption of an Integrated Groundwater Management Plan to be in compliance with California Senate Bill No. 1938.

The hearing for James Irrigation District will be held at James Irrigation District office, 8749 9th Street, San Joaquin, CA 93660 on October 12, 2010 at 10:00 a.m. The hearing for the City of San Joaquin will be held at the City of San Joaquin Veterans memorial Hall, 22001 Manning Avenue, San Joaquin, CA 93660 on October 13, 2010 at 6:00 p.m. or as soon thereafter as may be heard.

Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of Groundwater Management Plans to encourage authorized local agencies to manage groundwater resources within their service areas.

Property owners within the James irrigation District, property owners and residents of San Joaquin, and other interested parties are invited to attend the hearings. copies of the Groundwater management Plan and a proposed resolution to adopt it will be available for review by the public at the hearings or may be viewed before the hearings at the San Joaquin City Hall or James irrigation District office. members of the public will have an opportunity to ask questions and to provide input at the hearings.

John Mallyon
James Irrigation District Manager
Cruz Ramos
City of San Joaquin City Manager
3916-w39-40c

WEST SIDE ADVANCE
14693 W. Whitesbridge Ave.
P.O. Box 336
Kerman, CA 93630
Telephone: 559-846-6689

This space is for the County Clerk's Filing Stamp

PROOF OF PUBLICATION
(2015.5 C.C.P.)

STATE OF CALIFORNIA
County of Fresno,

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the principal clerk of the printer of the **West Side Advance**, a newspaper of general circulation, printed and published weekly in the City of Kerman, County of Fresno, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Fresno, State of California, under the date of February 9, 1956, Case Number 45745; that the notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following date, to-wit:

Dec. 31, Jan 7

all in the year 20 09. I Certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated at Kerman, California this 7th

day of January, 20 09

Kathy A. Matthews

Signature

Proof of Publication

Notice of Hearing on Intention To Update Groundwater

NOTICE OF HEARING ON INTENTION TO UPDATE GROUNDWATER MANAGEMENT PLAN FOR JAMES IRRIGATION DISTRICT NOTICE IS HEREBY GIVEN that at 10:00 a.m on January 13, 2009, at 8749 9th Street San Joaquin CA, a public hearing will be held to discuss whether or not the James Irrigation District should update their Groundwater Management Plan to be in compliance with California Senate Bill No. 1938.

Part 2.75 of Division 6 of the California Water Code permits the adoption and implementation of Groundwater Management Plans to encourage authorized local agencies to manage groundwater resources within their service areas.

Landowners within the agency boundaries and other interested parties are invited to attend the hearing. Opportunity for public questions and input will be provided at the hearing. In compliance with Water Code § 10753.4 (b), landowners and other interested parties who wish to participate in preparing the Groundwater Management Plan may do so by attending the hearing and indicating their interest or by submitting a written letter to John Mallyon, General Manager, James Irrigation District, 8749 9th Street, San Joaquin, CA 93660.

John Mallyon
District Manager
Dated December 22 2008

5311-w53-1c

RESOLUTION 2009-01

RESOLUTION
OF THE
BOARD OF DIRECTORS

JAMES IRRIGATION DISTRICT

INTENTION TO UPDATE GROUNDWATER MANAGEMENT PLAN

At a meeting of the Board of Directors of the JAMES IRRIGATION DISTRICT, a public Irrigation District organized and existing under the Irrigation District Law (California Water Code, Division 11, Section 20,500 *et seq.*) of the State of California, held on the 13th day of January, 2009, the following resolution was adopted:

WHEREAS, the JAMES IRRIGATION DISTRICT adopted a Groundwater Management Plan in 2001 that is in accordance with Assembly Bill 3030; and

WHEREAS, the California Water Code permits the adoption and implementation of Groundwater Management Plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, updating the District's Groundwater Management Plan is in furtherance of and consistent with the District's goals and objectives and will be in the best interests of the District's landowners and water users; and

WHEREAS, a public hearing was held on January 13, 2009, to discuss updating the Groundwater Management Plan;

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the JAMES IRRIGATION DISTRICT that it is the intention of the District to update their Groundwater Management Plan in accordance with Senate Bill No. 1938, that this resolution shall be deemed a resolution of intention in accordance with California Water Code Section 10753.2 and that the Board hereby authorizes its officers to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.

The foregoing Resolution was introduced and adopted at a Regular Meeting of the Board of Directors of the JAMES IRRIGATION DISTRICT conducted January 13th, 2009, on motion of Director Robert Motte, and seconded by Director Thomas Chaney, was hereby authorized by the following vote:

AYES:	5	(Motte, Chaney, Ayerza, Carvalho, Hale)
NOES:	0	
ABSTAIN:	0	
EXCUSED:	0	
ABSENT:	0	

Kenneth R. Hale, President
BOARD OF DIRECTORS
JAMES IRRIGATION DISTRICT

ATTEST:

Donna Y. Hanneman, Secretary
BOARD OF DIRECTORS
\MES IRRIGATION DISTRICT

CERTIFICATION OF SECRETARY

The undersigned certifies that she is the Secretary of JAMES IRRIGATION DISTRICT and that the foregoing Resolution was adopted by the Board of Directors of said District at a meeting thereof, duly and regularly held on January 13th, 2009, at which meeting a quorum of the Board of Directors was at all times present and acting.

IN WITNESS WHEREOF, I have set my hand and seal of the Board of Directors this 13th day of January, 2009.

{ SEAL }

Donna Y. Hanneman, Secretary
BOARD OF DIRECTORS
JAMES IRRIGATION DISTRICT

WEST SIDE ADVANCE
14693 W. Whitesbridge Ave.
P.O. Box 336
Kerman, CA 93630
Telephone: 559-846-6689

This space is for the County Clerk's Filing Stamp

PROOF OF PUBLICATION
(2015.5 C.C.P.)

STATE OF CALIFORNIA
County of Fresno,

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the principal clerk of the printer of the **West Side Advance**, a newspaper of general circulation, printed and published weekly in the City of Kerman, County of Fresno, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Fresno, State of California, under the date of February 9, 1956, Case Number 45745; that the notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following date, to-wit:

April 8, 15

all in the year 20 09. I Certify (or declare) under penalty of perjury that the foregoing is true and correct.

Dated at Kerman, California this 15th

day of April, 20 09

Signature

Proof of Publication
Resolution 2009-01
Resolution of James Irrigation District

RESOLUTION 2009-01

RESOLUTION OF THE BOARD OF DIRECTORS JAMES IRRIGATION DISTRICT

INTENTION TO UPDATE GROUNDWATER MANAGEMENT PLAN

At a meeting of the Board of Directors of the JAMES IRRIGATION DISTRICT, a public Irrigation District organized and existing under the Irrigation District Law (California Water code. Division 11, Section 20,500 et seq.) of the State of California, held on the 13th day of January, 2009, the following resolution was adopted:

WHEREAS, the JAMES IRRIGATION DISTRICT adopted a Groundwater Management Plan in 2001 that is in accordance with Assembly bill 3030; and

WHEREAS, the California Water Code permits the adoption and implementation of Groundwater management Plans to encourage authorized local agencies to manage groundwater resources within their service areas; and

WHEREAS, updating the District's Groundwater Management Plan is in furtherance of an consistent with the District's goals and objectives and will be in the best interests of the District's landowners and water users; and

WHEREAS, a public hearing was held on January 13, 2009, to discuss updating the Groundwater management Plan'

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the JAMES IRRIGATION DISTRICT that it is the intention of the District to update their Groundwater Management Plan in accordance with Senate Bill No 1938, that this resolution shall be deemed a resolution of intention in accordance with California Water Code Section 10753.2 and that the Board hereby authorizes its officers to execute all documents and take any other action necessary or advisable to carry out the purposes of this resolution.

The foregoing Resolution was introduced and adopted at a Regular Meeting of the Board of Directors of the JAMES IRRIGATION DISTRICT conducted January 13th, 2009, on motion of Director Robert Motte, and seconded by Director Thomas Chaney, was hereby authorized by the following vote:

AYES: 5 (Motte, Chaney, Ayerza, Carvalho, Hale)
NOES: 0
ABSTAIN:0
EXCUSED:0
ABSENT: 0

Kenneth R. Hale, President
BOARD OF DIRECTORS JAMES IRRIGATION DISTRICT
ATTEST:

Donna Y. Hanneman, Secretary
BOARD OF DIRECTORS JAMES IRRIGATION DISTRICT

CERTIFICATION OF SECRETARY

The undersigned certifies that she is the Secretary of JAMES IRRIGATION DISTRICT and that the foregoing Resolution was adopted by the Board of Directors of said District at a meeting thereof, duly and regularly held on January 13th, 2009, at which meeting a quorum of the Board of Directors was at all times present and action

IN WITNESS WHEREOF, I have set my hand and seal of the Board of Directors this 13th day of January, 2009.

Donna Y. Hanneman, Secretary
BOARD OF DIRECTORS JAMES IRRIGATION DISTRICT

1405-W14-15C

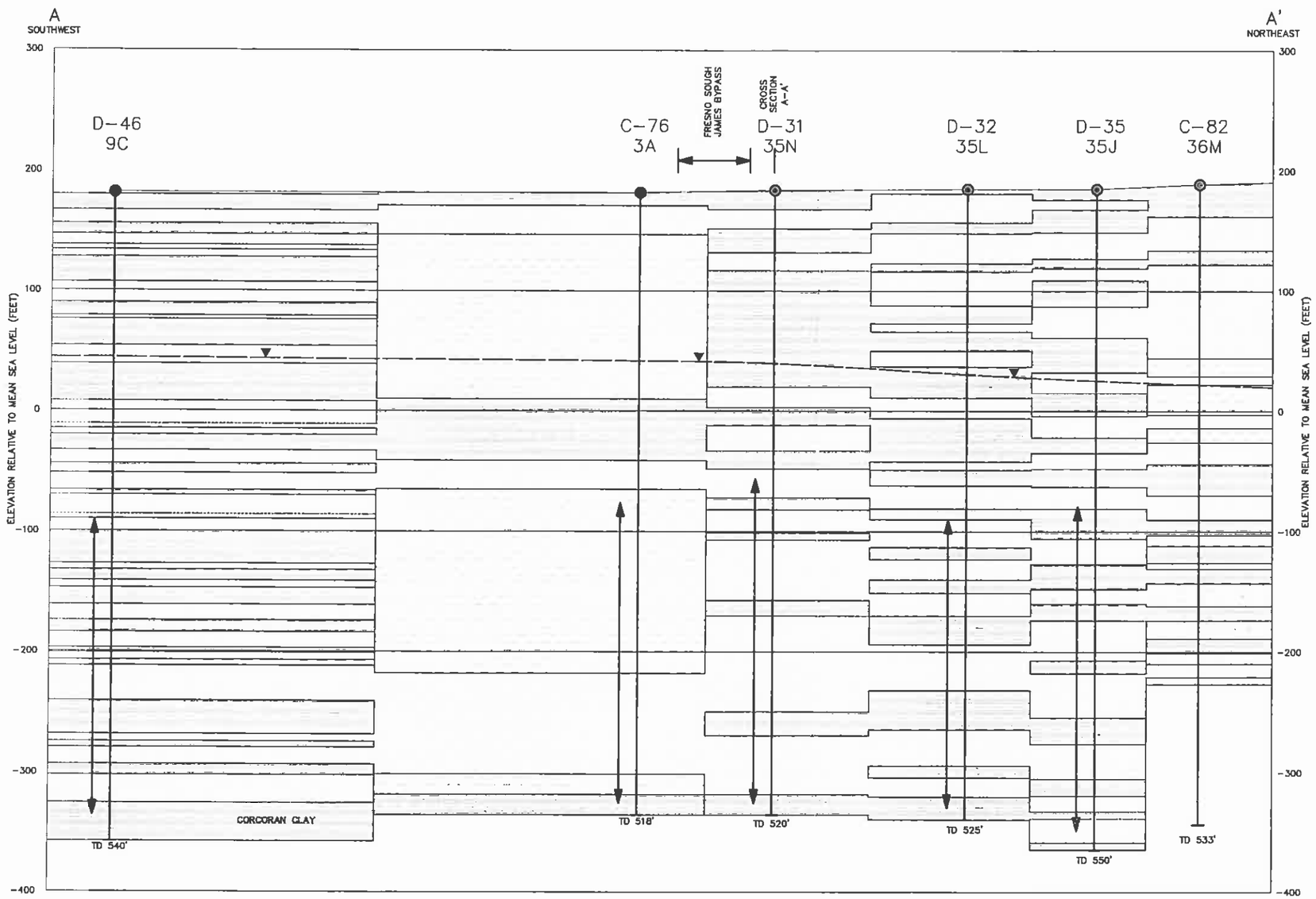
JAMES IRRIGATION DISTRICT

CITY OF SAN JOAQUIN

GROUNDWATER MANAGEMENT PLAN

APPENDIX B

GEOLOGIC CROSS SECTIONS



EXPLANATION

- NO INFORMATION
- SAND, GRAVEL, OR COBBLES
- SAND, SILTY SAND
- CLAY, SILTY CLAY
- SANDY CLAY, CLAYEY SAND, AND SAND AND CLAY MIXTURES
- 3G — WELL IDENTIFICATION
- PERFORATED INTERVAL
- TD 215 — TOTAL DEPTH (FEET)
- PIEZOMETRIC WATER 01/98

HORIZONTAL SCALE IN FEET
0 1000 2000

Kenneth D. Schmidt & Associates

PROVOST & PRITCHARD ENGINEERING GROUP
EST. 1968
286 WEST CROMWELL AVENUE
FRESNO, CALIFORNIA 93711-6162
559/448-2700 FAX 559/449-2715
www.provostandpritchard.com

James Irrigation District
Fresno County, CA

Subsurface Geologic
Cross Section A-A'

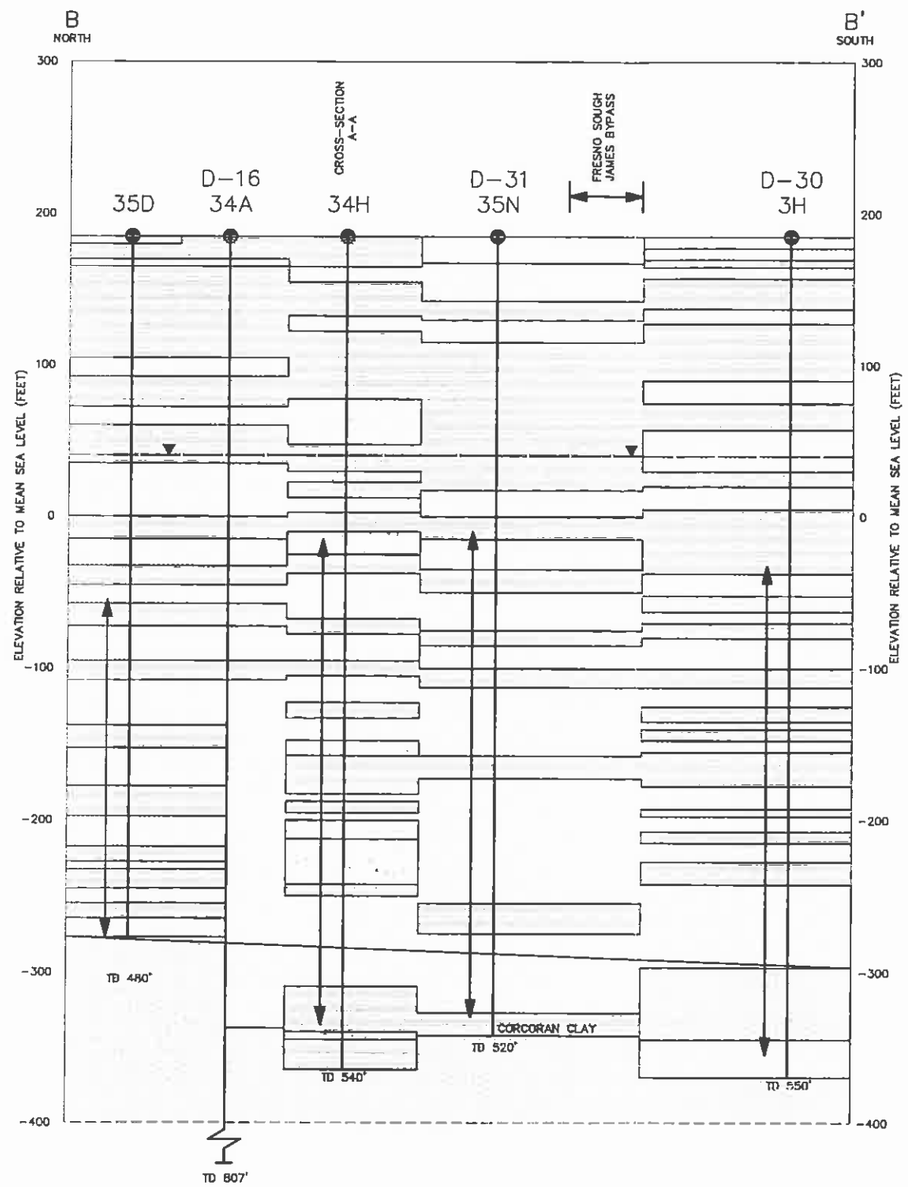
SCALE AS SHOWN
DRAWN BY ARM
REVISED

DESIGN ENGINEER
DATE 2-13-01 C.E. LICENSE NO.

SHEET 1 OF 1 SHEETS

Job No. 10510801
Dwg. No.
Date Revised
Approval

d:\pdfiles\James 13-1801\Projects\10510801-AB303 Study\DWG\DX9801\10510801-CS- BED A.dwg



EXPLANATION

- NO INFORMATION
- SAND, GRAVEL, OR COBBLES
- SAND, SILTY SAND
- CLAY, SILTY CLAY
- SANDY CLAY, CLAYEY SAND, AND SAND AND CLAY MIXTURES
- BLUE CLAY
- 3G — WELL IDENTIFICATION
- PERFORATED INTERVAL
- TD 800' — TOTAL DEPTH (FEET)
- PIEZOMETRIC LEVEL 01/99

HORIZONTAL SCALE IN FEET
0 1000 2000

Kenneth D. Schmidt & Associates

PROVOST & PRITCHARD ENGINEERING GROUP
EST. 1919
286 WEST CENTRAL AVENUE
FRESNO, CALIFORNIA 93271-0152
559/446-2700 FAX 559/446-2715
www provostandpritchard com

James Irrigation District
Fresno County, CA

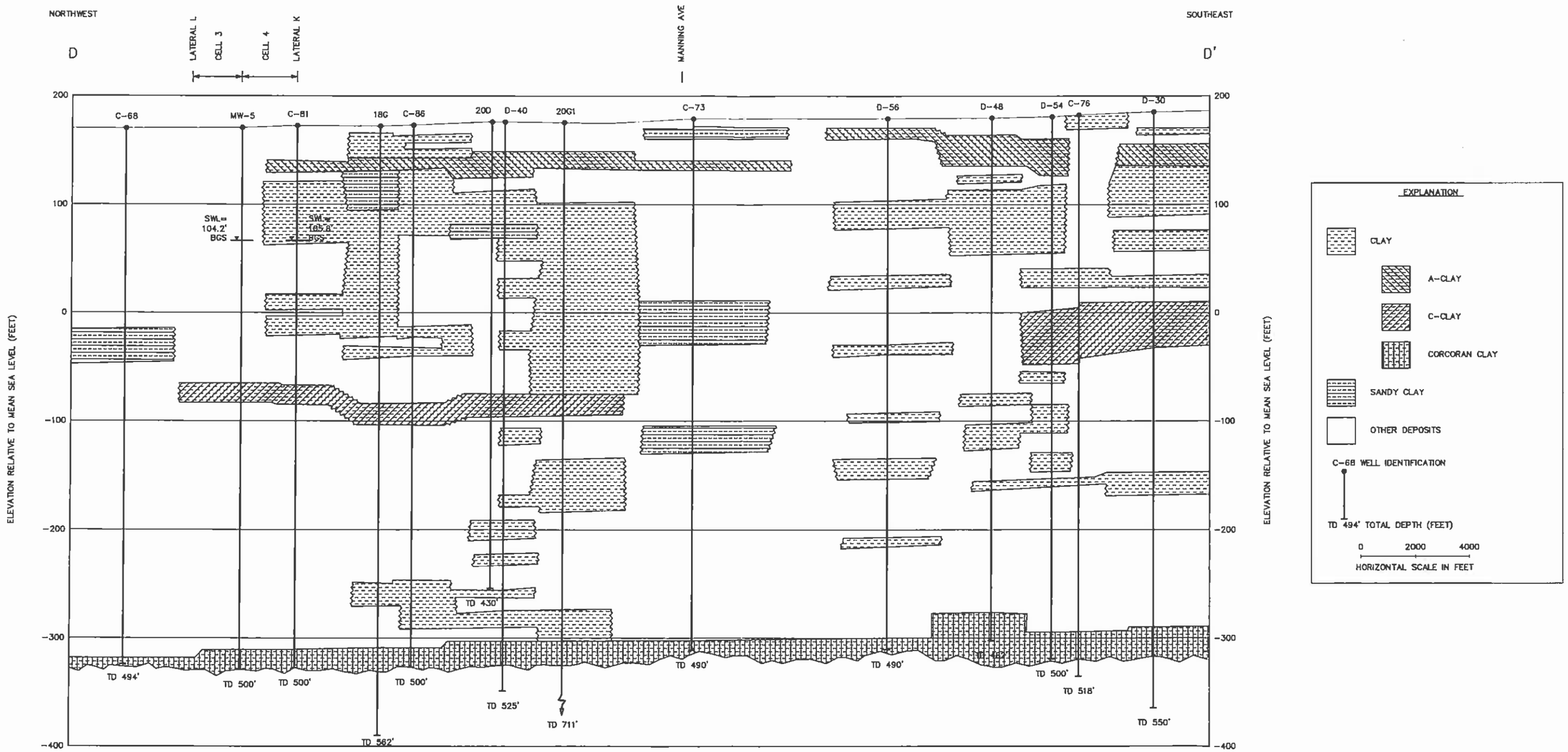
Subsurface Geologic
Cross Section B-B'

DESIGN ENGINEER
DATE 2-13-01 C.E. LICENSE NO.

Job No. 105108C1
Dwg. No.
Date Revised
Approval

SCALE AS SHOWN
DRAWN BY AWC
REVISED
SHEET 1 OF 1 SHEETS

G:\Clients\James ID-1021\Projects\105108C1-ASR\03 Study\DWG\CHART\105108C1-E2-GEO B.dwg



Kenneth D. Schmidt & Associates

EST. 1919
PROVOST & PRITCHARD
ENGINEERING GROUP
286 WEST CENTRAL AVENUE
FRESNO, CALIFORNIA 93771-0162
559/449-2700 FAX 559/449-2715
www.provostandpritchard.com

James Irrigation District
Fresno County, CA

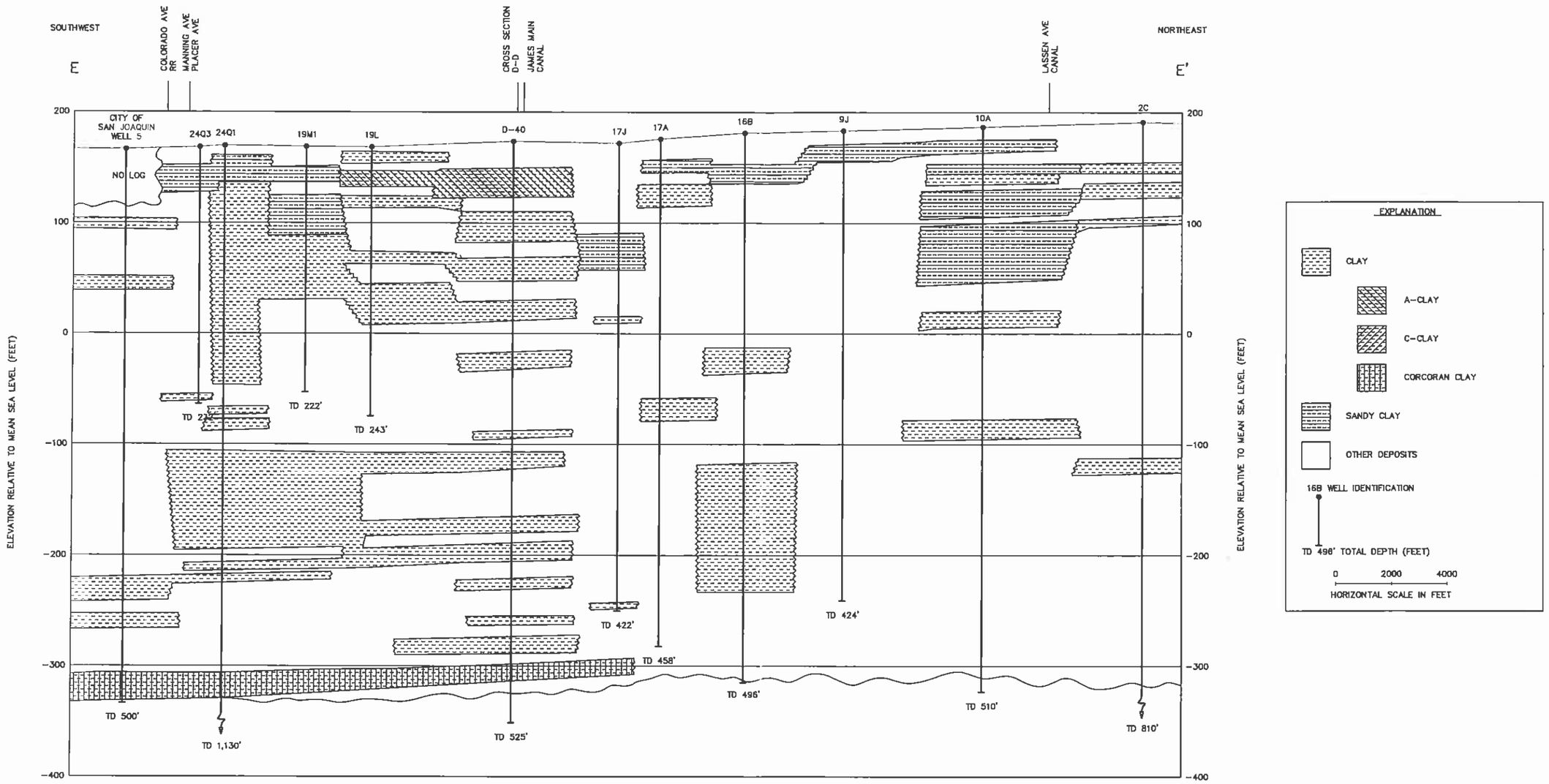
Subsurface Geologic Cross Section D-D'

DESIGN ENGINEER _____
DATE 3/8/2005 C.E. LICENSE NO. _____

Job No.
Dwg. No.
Date Revised
Approved

SCALE: as shown
DRAWN BY: DVS
REVISED
SHEET 1 OF 1 SHEETS

G:\Clients\James ID-1601\Projects\16016001-AB303 Study\DWG\20160001-02- SEC D.dwg



Kenneth D. Schmidt & Associates

EST. 1955
PROVOST & PRITCHARD
ENGINEERING GROUP
220 WEST CONEJO AVENUE
FRESNO, CALIFORNIA 93701-2157
559/448-2700 FAX 559/449-2775
www.provostandpritchard.com

James Irrigation District
Fresno County, CA

Subsurface Geologic Cross Section E–E'

SCALE: as shown
DRAWN BY: DVS
REVISED:

DESIGN ENGINEER
DATE 3/8/2005 C.E. LICENSE NO.

SHEET 1 OF 1 SHEETS

Job No. 105108C1
Dwg. No.
Date Revised
Approved

JAMES IRRIGATION DISTRICT

CITY OF SAN JOAQUIN

GROUNDWATER MANAGEMENT PLAN

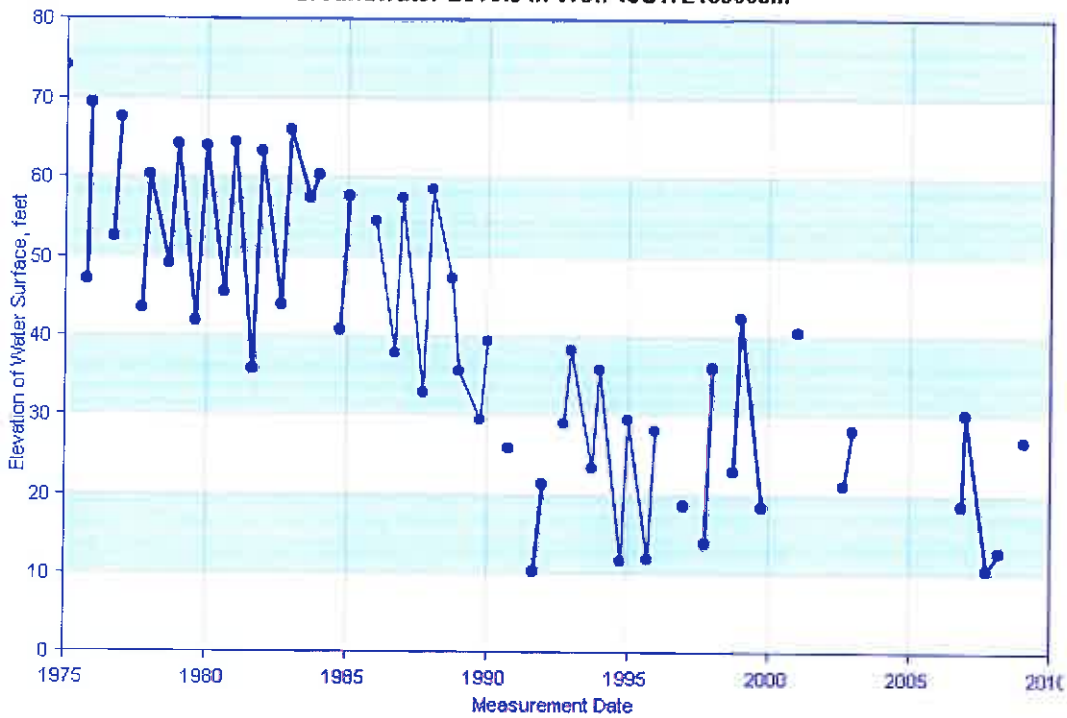
APPENDIX C

WELL HYDROGRAPHS

JAMES IRRIGATION DISTRICT
APPENDIX C - INDICATOR WELL HYDROGRAPHS

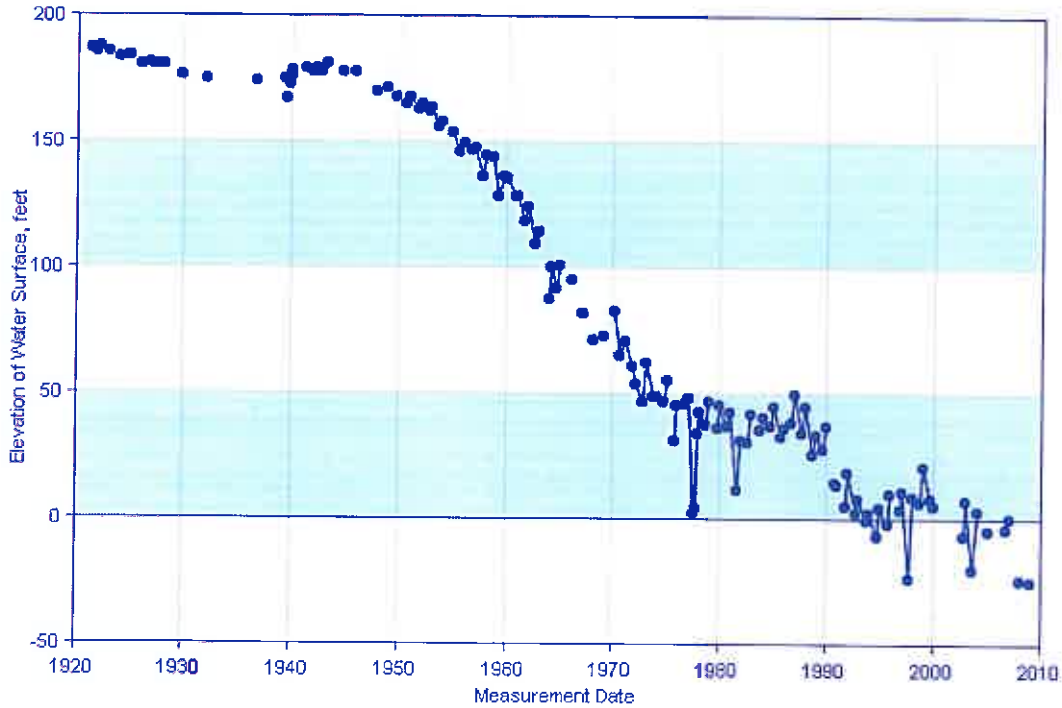
Kerman Line of Eastside Wellfield

Groundwater Levels in Well 15S17E15J003M



Along McMullin Grade in Eastside Wellfield

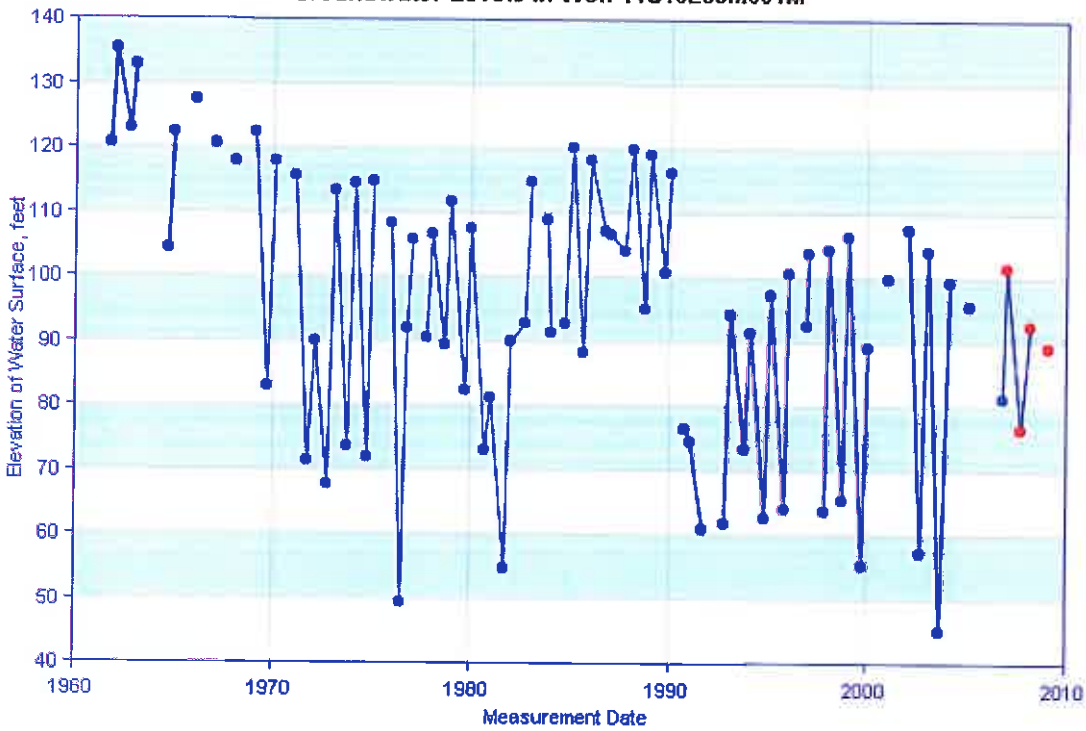
Groundwater Levels in Well 15S18E30L001M



JAMES IRRIGATION DISTRICT
APPENDIX C - INDICATOR WELL HYDROGRAPHS

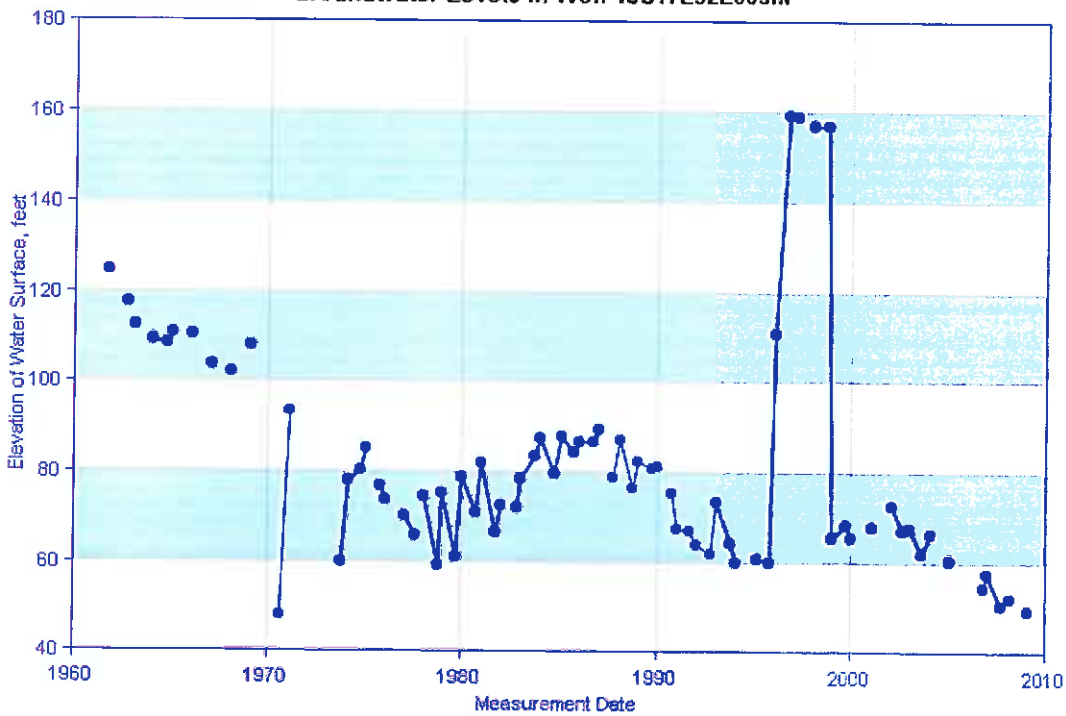
Northern Part of James Irrigation District

Groundwater Levels in Well 14S16E35M001M



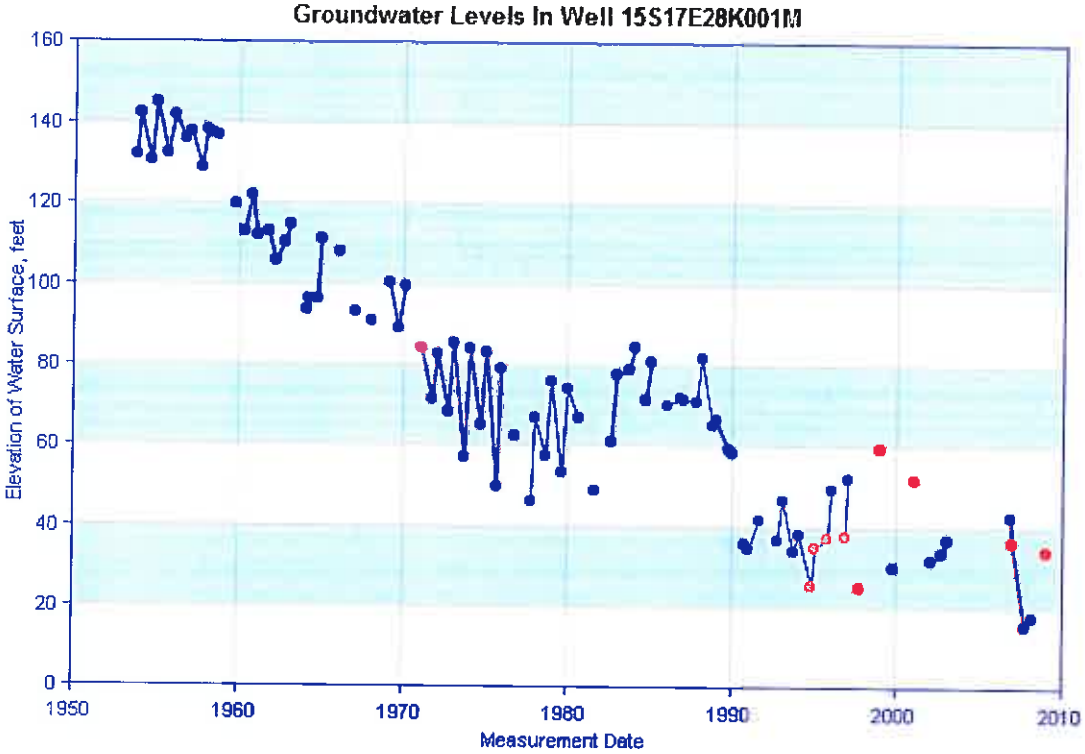
Southeast of the City of San Joaquin

Groundwater Levels in Well 15S17E32L003M

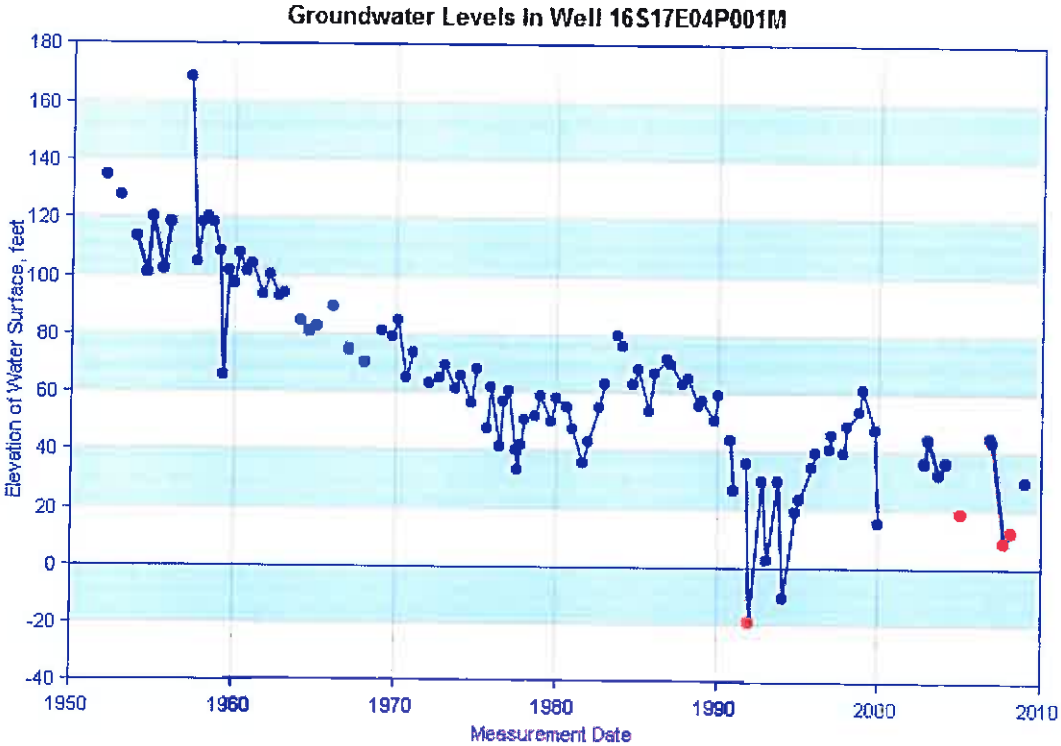


JAMES IRRIGATION DISTRICT
APPENDIX C - INDICATOR WELL HYDROGRAPHS

Along James Irrigation District Main Canal



Southern Boundary of James Irrigation District



JAMES IRRIGATION DISTRICT

CITY OF SAN JOAQUIN

GROUNDWATER MANAGEMENT PLAN

APPENDIX D

GROUNDWATER QUALITY DATA

JAMES IRRIGATION DISTRICT WELL PUMPS REPORT

WELL WATER QUALITY TESTS

TOTAL DISSOLVED SOLIDS / PARTS PER MILLION

LOCATION	STATUS	YEAR >> WELL #		August 2009 PPM	2009 PPM	2008 PPM	2007 PPM	2006 PPM	2005 PPM	2004 PPM	2003 PPM	2002 PPM	2001 PPM	2000 PPM	1999 PPM	1998 PPM	1997 PPM	1996 PPM	1995 PPM	1994 PPM	1993 PPM	1992 PPM	1991 PPM	1990 PPM	1989 PPM	1988 PPM	1987 PPM	1986 PPM	1985 PPM	1984 PPM	1983 PPM	1982 PPM	1981 PPM	1980 PPM	1979 PPM	1978 PPM	1977 PPM	AVG
COALINGA	ABANDONED	C-49	C-49																					A	1,025	1,000	800		775	700		700	625	650				784
COALINGA	ABANDONED	C-53	C-53													A	350	350				400		350	325	300	250		200	400		300	250	250				310
COALINGA	ABANDONED	C-54	C-54																		A	300		250		250	200		175	300		200	200	225				233
MAIN CANAL		C-55	C-55		1,200	1,275	1,200		1,325	1,200	1,100	1,300	1,200	1,300	1,300		1,300	1,275			1,100	1,200	1,150	1,225	1,250	1,250	1,000		1,100	1,050		1,100	1,125	1,150			1,250	1,197
MAIN CANAL		C-56	C-56		1,100	1,100	1,075		1,150	1,100	1,000	1,150	1,100	1,150	1,200		1,200	1,125			1,000	1,100	1,100	1,075	1,050	1,075			950	900		1,000	975	1,000			1,050	1,072
COALINGA	ABANDONED	C-57	C-57								A	1,275	1,300	1,400	1,500		1,000	550				450		425		500			300	300		225	250	225				693
KERMAN		C-58	C-58	820	650	650	575	900	800	575	550	575	625	625	650		900	850			250	575		525	550	775			800	800		800	500	900				670
KERMAN	ABANDONED	C-59	C-59			A	1,600	1,450	1,675	1,400	1,400	1,600	1,700	1,700	1,800		1,750	1,750			700	1,250		1,300	1,200	1,250	1,000		980	1,100		1,100	9,000	1,000				1,714
KERMAN		C-60	C-60	975	825	900	850	850	900	750	700	700	825	850	850		850	850			650	750		700	675	750			575	600		600	550	800				746
COALINGA		C-61	C-61		725	800	800	850	800	675	800	800	825	850	850		750	750			600	550		750	725	600	500		400	300		350	275	275				650
KERMAN		C-62	C-62	1,850	1,750	1,825	1,875	2,000	2,000	1,750	1,500	1,700	1,800	2,050	1,950		2,000	2,150			1,500	1,450		1,725	1,500	1,650			1,300	1,300		1,325	1,300	1,550				1,693
MAIN CANAL	ABANDONED	C-63	C-63														A	350			350	350		325	300	300	250	225	225	250		250	260	300			275	286
MAIN CANAL	ABANDONED	C-64	C-64																										A	1,400		1,400	1,380	1,380			1,200	1,352
MAIN CANAL		C-65	C-65		950	1,000	950		1,050	1,000	950	900	1,000	1,050	1,075		1,050	1,075			1,000	1,025		1,175	1,200	1,250			1,100	1,100		1,200	1,000	1,025				1,051
MAIN CANAL	ABANDONED	C-66	C-66																														A	1,090			1,025	1,058
KERMAN		C-67	C-67		850	1,100	850	1,225	1,000	850	1,250	825	1,100	1,350	1,300		1,500	1,500				975		950	925	1,300			925	1,200		1,275	1,000	1,300				1,116
MAIN CANAL		C-68	C-68		1,000	1,050	1,000		1,100	1,000	900	1,050	950	1,000	1,050		1,000	1,000			1,100	950		1,000	1,000	1,000	800					900	920	950			1,000	987
COALINGA		C-69	C-69		400	400	300	350	350	325	300	325	350	325	300		300	250			300	300		275	225	250	200		150	250		175	175	175				281
COALINGA		C-70	C-70	2,150	2,400	2,900	2,800		2,750	2,500	1,350	2,700	2,700	2,800	2,700		2,450	2,400				1,650		1,450		1,500			1,000	1,000		700	600	625				1,946
COALINGA		C-71	C-71	523	475	525	425		550	475	450	450	500	450	450		400	350				350		325		250	200		175	200		175	200	200				381
COALINGA		C-72	C-72	585	500	575	475		650	550	525	550	550	525	500		450	475				450		375		300	250		175	200		200	225	225				415
MAIN CANAL		C-73	C-73	544	500	500	375	500	550	450	450	475	475	500	500		550	600			600	500		475	500	450	400	350	400	400		400	400	425			450	468
COALINGA		C-74	C-74		575	575	450	500	525	450	500	500	500	450	450		400	375				400		300		850	800		150	250		175	200	180				434
MAIN CANAL	ABANDONED	C-75	C-75									A	750	1,000	1,025		1,000	1,025			900	900		900	650	850	800		700	700		700	800	780			900	846
MAIN CANAL		C-76	C-76		400	450	225	400	425	400	400	375	375	350	350		350	325			350	350		300	450	300	250	230	250	250		250	250	300			300	333
COALINGA		C-77	C-77		525	550	450		500	450	475	450	450	400	400		350	325			300	325		250	250	250	200		125	250		200	200	200				342
COALINGA		C-78	C-78		275	300	150	175	225	225	200	225	200	200	200		200	200			250	225		200	200	200			150	250		175	175	175				208
COALINGA		C-79	C-79	989	925	900	750	800	875	675	650	700	725	650	700		600	650				550		450	425	400	350		300	300		325	325	325				580
COALINGA		C-80	C-80	359	275	275	175	200	200	225	200	150	250	200	200		200	175			200	225		200	175	200			125	250		175	200					203
MAIN CANAL		C-81	C-81		1,000	1,025	950	1,000	1,100	950	900	1,000	950	950	900		850	850			600	900		900	900	850	800		875	700		700						893
COALINGA		C-82	C-82	782	675	700	575	600	650	625	550	600	600	525	500		500	475				450		350														558
COALINGA		C-83	C-83		300	375	250	200	225	275	250	250	250	200	225																							255
KERMAN		C-84	C-84		450	425	300	400	450	400	400	400	400	375	375																							398
COALINGA		C-85	C-85	469	750	900	650	750	750	500	400	375	350	275	275																							543
MAIN CANAL	ABANDONED	C-86	C-86		750	800	625	675	800	750		750	775	750																								742
MAIN CANAL		C-87	C-87		850	875	750		850	850	800	800																										825
COALING		C-88	C-88	431	375	350	200	250	225	275	200																											268
COALINGA		C-89	C-89		200	250	125	175	180	200																												188
MAIN CANAL	ABANDONED	D-04	D-04																				A	450	450	350	400	275	325	350		400	375	500			475	395
KERMAN	ABANDONED	D-06	D-06																		A	400		375	350	400	300		300	400		400	350	475				375
MAIN CANAL	ABANDONED	D-08	D-08						A	500	450	475	500	475	500		450	450			450	450		400		400	300	250	325	300		300	300	300			300	394
MAIN CANAL	ABANDONED	D-09	D-09														A	525			400			425	875	400	300	300	325	300		350	325	300			350	398
MAIN CANAL	ABANDONED	D-10	D-10						A	500	400	450	450	450	500		500	450				450		400	450	400	300	280	325	400		350	350	375			375	408
MAIN CANAL		D-15	D-15		900	900	850	850	950	850	700	800	850	850	900		950	900			800	750		750	750	700	700		625	700		700	600	690			650	787
KERMAN	ABANDONED	D-16	D-16													A	350	375			400	450		375	950	950	900		225	250		300	300	300				471
KERMAN	ABANDONED	D-17	D-17																									A	550	800		700	500	625				635
MAIN CANAL	ABANDONED	D-21	D-21																										A	1,000		1,000	900	980			900	956
KERMAN	ABANDONED	D-22	D-22																									A	825	800		800	1,000	850				855
KERMAN	ABANDONED	D-23	D-23																									A	875	850		900	750	875				850
MAIN CANAL	ABANDONED	D-24	D-24										A	850	900		1,000	1,050				1,300		975	1,200	900	900		825	1,000		1,100	850	1,150			925	995
MAIN CANAL	ABANDONED	D-25	D-25																													A	700	750			800	750
MAIN CANAL		D-29	D-29		1,200	1,250	1,250		1,400	1,250		1,400	1,350	1,400	1,400		1,400	1,400			1,300	1,300	1,400	1,350	1,350	1,375			1,200	1,200		1,200	1,225	1,250			1,350	1,313
MAIN CANAL		D-30	D-30		450	450	300		475	400	400	400	400	400	400		400	500				400		350	350	300	300	230	250	225		250	250	275			275	351
KERMAN		D-31	D-31	434	325	325	275	325	350	250	300	300	325	300	300		300	350				300		250	250	250	200		175	200		225	250	250				277
COALINGA		D-32	D-32		500	550	700	450	525	500	450	525	500	500	450		450	650				475		400	375	350	300		225	200		250	250	275				428
COALINGA		D-33	D-33	1,420	1,625	1,600	1,475		1,275	1,125	1,050	1,025	950	850	1,000		700	800				650		550	500	450	350		275	300		250	250	225				785
COALINGA		D-34	D-34	732	625	750	575	650	650	600	550	600	600	575	600		550	600				525		450	450	450	400		350	350		350	400	400				524
COALINGA		D-35	D-35	811	675	900	575	675	675	650	600		675	650	625		600	625				575		475	500	450	400		325	300		350	350	375				547
COALINGA	ABANDONED	D-36	D-36									A	400	350	400		350	275			300	300		300	225	250			200	250		175	175	200				277
INSIDE		D-37	D-37	1,210	1,000	1,075	1,100	1,100	1,250	1,150	1,050	1,050	1,050	1,000	1,000		850	950				950	775	725	700	1,200			900	600		1,200	675					975
MAIN CANAL		D-38	D-38		1,000	1,025	975		1,050	1,025	1,000	1,100	1,100	1,100	1,125		1,100	1,150			1,000	1,050	1,125	1,100	1,100	1,100			900	1,000		1,000						1,054
MAIN CANAL		D-39	D-39		1,000	1,050	1,000		1,075	1,025	1,000	1,150	1,100	1,125	1,175		1,200	1,200			1,400	1,175		1,425		1,700	1,500		1,500									1,211
MAIN CANAL		D-40	D-40		900	950	875	900	1,125	950	1,000	950	950	950	1,025		1,000	1,000			900	850		875	850	850			850									934
KERMAN		D-41	D-41	1,450	1,450	1,400	1,450	1,750	1,650	1,450	1,300	1,500	1,550	1,500	1,550		1,450	1,700			1,200	1,150		1,100	1,050	1,000	900											1,374
KERMAN	ABANDONED	D-42	D-42		A	1,225	1,000	900	975	950	850	925	1,050	1,000	1,050		1,000	1,000			900	975		900	875	1,175	700											969
KERMAN		D-43	D-43	1,150	1,100	1,075	950	900	1,100	1,025	1,050	1,100	1,075	975	800		750	750			700	750		600	550	550	500											858
INSIDE	ABANDONED	D-44	D-44											A	1,500		1,750	1,775				1,500	1,275	1,150	1,025													1,425
INSIDE	ABANDONED	D-45	D-45													A	2,500	2,500				1,725	1,675	1,725														2,025
INSIDE		D-46	D-46	413	325	375	275	325	325	325	300	300	300	350	350		350	350				350																329
INSIDE		D-47	D-47	900	900	750	650	700	900	650	600	650	600	600	625		600	800				500																680
MAIN CANAL		D-48	D-48		325	350	225	300	325	300	275	300	300	300	325		300	300			300	300																302
KERMAN	PENDING	D-49	D-49		P	P	1,250	1,200	1,425	1,300	1,300	1,325	1,325	1,250			1,100	1,225			1,250																	1,268
KERMAN		D-50	D-50		375	350	375	325	350	325	300	325	350	350	350		350	350			400																	348
COALINGA		D-51	D-51	408	350	400	250		350	325	300	325	325	300	300		300	275																				317
KERMAN		D-52	D-52	1,140	1,100	1,100	1,000	1,175	1,225	1,000	1,000	1,100	1,100	1,200			1,050	1,100																				1,096
COALINGA		D-53	D-53	1,090	1,200	1,450	1,350		1,550	1,000	1,250	725	750	900	1,000		600	400																				1,015

WELL WATER QUALITY TESTS

TOTAL DISSOLVED SOLIDS / PARTS PER MILLION

LOCATION	STATUS	YEAR >> WELL #		August 2009 PPM	2009 PPM	2008 PPM	2007 PPM	2006 PPM	2005 PPM	2004 PPM	2003 PPM	2002 PPM	2001 PPM	2000 PPM	1999 PPM	1998 PPM	1997 PPM	1996 PPM	1995 PPM	1994 PPM	1993 PPM	1992 PPM	1991 PPM	1990 PPM	1989 PPM	1988 PPM	1987 PPM	1986 PPM	1985 PPM	1984 PPM	1983 PPM	1982 PPM	1981 PPM	1980 PPM	1979 PPM	1978 PPM	1977 PPM	AVG
MAIN CANAL		D-54	D-54		375	350	225	325	425	350	300	325	325	325	350		400																					340
MAIN CANAL		D-55	D-55		400	400	275	325	375	350	300	350	350	350	375		400																					354
INSIDE		D-56	D-56		725	800	675	725	900	700	800	700	650																									742
KERMAN		D-57	D-57	577	525	575	450	500	650																													540
MAIN CANAL		D-58	D-58		375	400	300	350	375																													360
KBSN RECOVRY		D-59			350																																	350
KBSN RECOVRY		D-60			800	850																																825
COALINGA		D-62		562	575																																	575
COALINGA		D-63			525																																	525
		16-16-3E1		8,490																																		
AVERAGE					739.407	807.456	731.466	690.476	833.28	736.776	691.364	770.089	772.8	784.1	793.8		817.2	824.8			710.6	713	1214	686.8	697.2	702.9	519.4	267.5	541.1	569.5		580.9	689.7	689.8			728.9	
TOTAL WELLS TESTED					59	57	58	42	58	58	55	56	58	58	56	0	58	58	0	0	33	54	7	53	44	51	36	8	50	50	0	51	50	49	0	0	19	
LEGEND:																																						
A = ABANDONED	28				1	1	0	0	2	0	1	2	1	1	0	1	2	0	0	0	2	0	1	1	0	0	0	3	2	0	0	1	1	0	0	0	0	28

JAMES IRRIGATION DISTRICT

CITY OF SAN JOAQUIN

GROUNDWATER MANAGEMENT PLAN

APPENDIX E

MOU BETWEEN JAMES IRRIGATION DISTRICT AND CITY OF SAN JOAQUIN

MEMORANDUM OF UNDERSTANDING
BETWEEN
JAMES IRRIGATION DISTRICT
AND
THE CITY OF SAN JOAQUIN

This Memorandum of Understanding (MOU) between the JAMES IRRIGATION DISTRICT, a California Irrigation District ("District") and the City of San Joaquin ("City") is intended to introduce a cooperative set of guidelines for the District and City to improve coordination of water management activities in the local area.

PURPOSE

The main objectives of this MOU is to introduce a set of guiding principles by which the District and City can more effectively manage water resources in the local area. This will be accomplished through the following general tasks:

- Identify common interests and goals
- Discuss and coordinate multi-agency projects of mutual benefit
- Work to understand the perspectives of the other parties
- Provide a more comprehensive view and approach towards water management in the area
- Improve overall water reliability and water quality in the area
- Attempt to reach consensus on water management issues wherever possible

GROUNDWATER MANAGEMENT PLAN

The District created a Groundwater Management Plan (GMP) in 1992. The District is currently updating the GMP to be compliant with California Senate Bill No. 1938 and California Water Code Section 10750 et. seq. The City and the District believe it is in their mutual interests to prepare a joint GMP covering both agencies. The GMP shall include specific provisions regarding the City's inclusion and role in the Groundwater Advisory Committee. In that regard Section 4 of the current Draft GMP shall be amended to reflect the City's position and role in the Groundwater Advisory Committee. After the GMP is completed, the District and City will work cooperatively to implement the goals and objectives outlined in the GMP.

WATER MANAGEMENT EFFORTS

The two agencies shall agree to cooperate on the following water management efforts to the benefit of both agencies:

1. The agencies shall share groundwater level and groundwater quality data. Copies of the data will be brought to an annual coordination meeting.
2. The agencies shall work to better understand the regional groundwater quality and

its potential for impacting local groundwater supplies.

3. The agencies shall cooperate to protect the groundwater quality for domestic, industrial and agricultural use.
4. The agencies shall work to find beneficial use for wastewater generated in San Joaquin, preferably within the boundaries of the James Irrigation District
5. The agencies shall work cooperatively to implement both urban and agricultural water conservation measures.
6. The agencies shall work to develop groundwater recharge basins in James Irrigation District and the City of San Joaquin using surplus water, floodwaters and stormwater runoff.
7. The agencies shall collaborate on water resources studies and planning documents and search for water resources projects that mutually benefit both agencies
8. The agencies shall work to develop consistent land use planning ordinances that are favorable to groundwater usage, groundwater quality protection, groundwater recharge, and surface water usage and quality and shall comment on land use plans and environmental documents that impact groundwater resources.
9. The agencies shall work to prevent groundwater adjudication by establishing local control of groundwater and work towards matching groundwater pumping, over the long term, with the groundwater safe yield.

FUNDING

The District and City have a joint interest in improving the water resources in the local area, and therefore shall work cooperatively to secure grants and low interest loans to fund water resources projects for both agencies. This shall be accomplished by notifying the other agency of funding opportunities, writing letters of support for applications, and, when feasible, teaming on funding applications for projects that will benefit both agencies.

ANNUAL COORDINATION MEETING

The City and District will meet annually and as needed to coordinate efforts and discuss relevant water management issues. The meeting shall be held in November of each year beginning in 2010. The District shall contact the City each year in October to discuss the agenda arrangements for the next meeting.

AREA OF PLAN

This MOU shall be effective in all areas within the City of San Joaquin, James Irrigation District, and District eastside well field. The MOU shall also be effective in any areas newly annexed by the agencies.

OBLIGATIONS

The participants in this MOU understand that final decisions in regard to any agreement or decision made as a result of this MOU, or efforts arising from coordination efforts, will be subject to approval by the James Irrigation District Board of Directors and San Joaquin City Council. The District and City expressly state herein that this MOU does not

constitute a joint powers agreement.

TERM

The initial term of the MOU shall commence on the date signed by both agencies, and continue for five (5) years, and shall continue year to year thereafter. This MOU can be terminated by either agency at any time including the initial term for any reason with 30 days written notice to the other party.

The City and District hereby acknowledge the potential benefits of pursuing the aforementioned water management actions and agree to work together to implement such actions. In WITNESS WHEREOF, the parties have executed this MOU as of the effective date.

JAMES IRRIGATION DISTRICT	CITY OF SAN JOAQUIN
By:	By:
Title: GENERAL MANAGER	Title: City Manager
Date: APRIL 13, 2010	Date: 4-21-2010
By:	By:
Title:	Title:
Date:	Date:

JAMES IRRIGATION DISTRICT

CITY OF SAN JOAQUIN

GROUNDWATER MANAGEMENT PLAN

APPENDIX F

GROUNDWATER QUALITY MONITORING AND MITIGATION PLAN

JAMES IRRIGATION DISTRICT

GROUNDWATER QUALITY MONITORING AND MITIGATION PLAN

JULY 2010

PREPARED BY:

EST. 1968
PROVOST& PRITCHARD
CONSULTING GROUP
An Employee Owned Company

TABLE OF CONTENTS

1 - INTRODUCTION **1**
1.1 - Overview 1
1.2 - Purpose of Monitoring Plan 1
1.3 - Exiting Groundwater Quality 1
2 - MONITORING WELL NETWORK **4**
3 - GROUNDWATER LEVEL MONITORING **5**
4 - GROUNDWATER QUALITY MONITORING **6**
5 - MITIGATION RECOMMENDATIONS **7**
6 - REFERENCES **10**

Attachment 1 – Groundwater Quality Map

Attachment 2 – Groundwater Quality Graphs by Region

List of Abbreviations

AF	Acre-feet
DWR	Department of Water Resources
gpm	gallons per minute
JID	James Irrigation District
MP	Monitoring Plan
PVC	Poly-vinyl chloride
TDS	total dissolved solids

1 - INTRODUCTION

1.1 - Overview

This monitoring plan (MP) provides guidelines for monitoring the groundwater supply in the James Irrigation District.

This monitoring plan addresses the following topics:

- Monitoring well network
- Groundwater levels
- Groundwater quality
- Mitigation recommendations
- Annual monitoring reports

The following sections provide details of the monitoring plan including monitoring locations, monitoring frequency, water quality constituents, etc.

1.2 - Purpose of Monitoring Plan

The objectives of the monitoring plan are to provide the District with documented information to accomplish the following:

1. Evaluate short-term and long-term changes in groundwater levels to determine the extent of groundwater overdraft, or impact from groundwater recharge facilities.
2. Monitor western JID for shallow groundwater and characteristics typical of drainage impacted lands.
3. Evaluate groundwater quality in western JID for encroachment of poor water quality waters from the west.
4. Evaluate groundwater quality in the Eastside Wellfield for encroachment of saline waters from the Raisin City Oilfield.
5. Identify and monitor measures to mitigate the groundwater quality.

1.3 - Exiting Groundwater Quality

The groundwater quality in JID was evaluated through an analysis of long-term trends and spatial characteristics in total dissolved solids. Total dissolved solids (TDS) is often used as a general indicator of groundwater quality, and it is the only parameter that was consistently monitored in JID for the past 30 years. The analysis did not include a statistical evaluation because most wells lack a sufficient number of data points for a meaningful analysis. Rather, the evaluation is based on visual examination of TDS graphs. The TDS data and graphs used in the analysis can be found in **Appendix A**. The District was separated into six different areas based on 'Area B', thought to be impacted by the Raisin City Oilfield, and 'Area A', an area with little groundwater quality data that is experiencing growth in irrigation well development. These areas are shown

on the attached Groundwater Quality Map (**Attachment 1**). There is insufficient long-term data in Area C to form any conclusions. Note that not all District wells were used in the analysis, but instead representative wells with long-term data in each area were used. The results are summarized in **Table 1** below.

Table 1 – Groundwater Quality Evaluation for James Irrigation District (TDS)

Area	Average*	Range*	Long-Term trend		GW Quality vs. Perforated Interval
			ppm/year*	Remarks	
A	700	300-1,000	+10	Mixed	All perforations similar (~260 to 500 feet)
Vicinity of Area A	375	325-500	Stable	Stable except for slight increase in last 2 years	All perforations similar (~250 to 500 feet)
Area B	1,200	500-2,500	+30	Wells used to have similar water quality but now there is a wide range. All wells increasing in TDS. Well C-70 went up 2,000 ppm in 17 years.	Improves with depth. Wells perforated from 360 to 780 feet have best water quality.
North of Area B	1,100	500-1,750	+2	Mixed but overall slight increase.	Most wells perforated in the same interval but there appears to be a slight improvement with depth
West of Area B	650	375-1250	+10	Most wells increasing each year	Wells perforated in approximately the same depths
East of Area B	400	200-750	+ 7	Wells used to have similar water quality but now there is a wide range. Big jump in 2007 to 2008. Worst near Well C-62 with water quality improving north and south.	No pattern of water quality with depth.

* The average, range and long term trend (ppm/year) were based on a visual examination of graphs and are considered approximate.

2 - MONITORING WELL NETWORK

The monitoring network will include a combination of JID recovery wells (operational and abandoned), JID monitoring wells, and some private wells (operational and abandoned).

Due to a constantly evolving well network a thorough well canvass is recommended to inventory all existing wells. A well canvass would provide helpful information for planning new well sites and evaluating impacts to wells from existing and new JID wells. The well canvass would document the following information for each well:

- Well location (address and section, township and range)
- Well ID number
- Well owner
- Type of well
- Well status (active, abandoned, etc.)
- Well casing diameter
- Well depth
- Perforated interval
- Foundation
- Power supply
- Horsepower
- Discharge pipe diameter
- Discharge direction
- PG&E Tag No.
- Ground surface elevation
- Reference point elevation
- Digital image of well site

3 - GROUNDWATER LEVEL MONITORING

Existing Groundwater Level Monitoring
Groundwater level monitoring in JID includes the following:

Bi-annual Monitoring. PG&E pump tests are performed at each production well every other year, and water levels are measured as part of the tests.
Semi-annual Monitoring. Seventeen production and monitoring wells scattered throughout the District are monitored semi-annually (January and October) and the data is reported to DWR.
Monthly Monitoring. Five monitoring wells scattered throughout the District are monitored monthly.
Weekly Monitoring. Several monitoring and recovery wells at the Lateral K Recharge Basin are monitored weekly. In addition, several wells have data loggers for collecting continuous data.

A thorough well canvass (see Section 2) is recommended to list and inventory all the wells that are monitored.

Monitoring Recommendations for New Wells
The following recommendations are provided for monitoring new wells:

New production wells. Any new production well should be monitored semiannually.
New shallow monitoring wells in Westside of JID. New shallow wells on the Westside of JID should be monitored monthly.
New deep monitoring wells in Central Portion of JID. New deep monitoring wells should be monitored at least semiannually.

4 - GROUNDWATER QUALITY MONITORING

The purpose of groundwater quality monitoring is to identify impacts to the local groundwater supply, and characterize the quality of the water that is pumped and delivered to local growers.

The following recommendations are provided for monitoring groundwater quality in JID

1. Continue to test each new well for an Agricultural Suitability Analysis.

2. Perform Agricultural Suitability Analysis every 5 years (2015, 2020, 2025, etc.) in selected wells in areas of concern. This will be timed with the submission of 5-Year Water Management Plans to the USBR.

3. Test for Additional Constituents in Wells near the City of San Joaquin. If funding from the City of San Joaquin is available, perform more detailed water quality sampling in JID wells near the City of San Joaquin. This information could be useful in determining the quality of groundwater than may be migrating toward the City. Constituents that could be tested include arsenic, gross alpha, Total Organic Carbon, and other constituents important to drinking water quality.

4. Continue to measure Total Dissolved Solids in each well annually. Perform the testing during the same month each year, and document the month in the summary spreadsheet.

5. Regularly calibrate the hand-held TDS meter used to test wells each year, to help ensure that measurements are accurate and trends are properly identified.

Testing Laboratory

Water quality testing should preferably be performed by the same laboratory each sampling period for consistency. Samples will be collected by JID staff or their engineering consultant. In the past, JID has typically used Fruit Grower's Laboratory of Visalia, California.

Modifications to Water Quality Monitoring

Overtime, there may be a need to add or remove sampling sites and to adjust the timing of the sampling events. This monitoring plan will be updated with changes to the locations and schedule as needed. If more sampling sites are needed then monitoring wells can be purged and samples collected, or the District could seek permission to collect water quality samples from private agricultural or domestic wells in the area.

5 - MITIGATION RECOMMENDATIONS

The following measures are recommended to mitigate groundwater quality problems in the James Irrigation District.

WELL DRILLING

Continue Drilling Test Holes. Currently, before production wells are drilled, a test hole is installed to determine the lithology and perform en E-log. The E-log is used as a relative measure of groundwater salinity. These test holes have shown that groundwater quality is usually, but not always, better beneath the Corcoran Clay. Continued use of test holes will help to identify the best depth for groundwater quality in new JID wells.

Drill New Wells in Areas with Low TDS. New wells can be drilled in areas that have historically had low TDS values and/or are not showing a temporal increase in TDS. *Currently, the best location for groundwater quality is the northeast portion of the JID wellfield easement.*

Install Wells in Undeveloped Portion of JID Wellfield. A portion of the JID eastside wellfield remains undeveloped with no canals or wells, in particular the area east of Dickenson Avenue on alignments along Bishop Avenue and Adams Avenue. No information is readily available on the groundwater quality in this area, but just to the west the wells produce the best groundwater quality of any JID wells.

Install New Wells in Groundwater Recharge Areas. New production wells can be installed in or near groundwater recharge areas so they can extract some of the lower TDS surface water that was recharged.

GROUNDWATER RECHARGE

Increase Groundwater Recharge. An increase in groundwater recharge, either through construction of new facilities or diversion of more surface water, will help to improve the groundwater quality by diluting the lower TDS surface water with the higher TDS groundwater. Hence, groundwater recharge can be an effective form of salt management.

Install Injection Wells for Groundwater Recharge. Install injection wells (also known as aquifer-storage-recovery wells) in areas that do not have suitable soils for surface infiltration. This will also help to improve groundwater quality.

Groundwater Recharge along McMullin Grade. JID has numerous wells along McMullin Grade, but no dedicated recharge basins are operated in the area. JID's

groundwater recharge facilities are all located long the Fresno Slough Bypass. The McMullin Recharge Group has investigated potential recharge sites in the area, but no good sites were identified. Due to the potential benefits to the groundwater quality, JID should continue to investigate potential recharge sites along McMullin Grade.

WATER MANAGEMENT AND USAGE

Blend Water Supplies to Improve Water Quality. Blend surface water and groundwater supplies so the water delivered to farms is not too high in salts or other constituents. This could be maximized by extending surface water deliveries as long as possible during the irrigation season (i.e. avoid groundwater only periods). This goal can be met with development of additional surface and subsurface storage, and delaying use of surface water when practical.

Pump Lower TDS Wells when Feasible. When feasible, particularly when only some of the District wells are being used, pump water from wells with the best water quality.

Purchase Surface Water Supplies. JID can purchase surplus or unused water supplies from other water agencies, such as the Fresno Irrigation District, and use the water in-lieu of groundwater pumping. The surface water would have better water quality than the groundwater, and any water that percolates will help to improve the groundwater quality.

OTHER

Reduce Seepage in Westside of District. Minimize seepage from conveyance facilities to prevent buildup of shallow groundwater on the Westside of the District. This can be accomplished by compacting canal banks, lining canals, or pipelining canals. The amount of seepage on the District's west side is not accurately known. Therefore, a study and field tests may be needed to evaluate the merits and economics of any seepage control measures. Shallow monitoring wells constructed in 2010 showed groundwater levels were about 80 feet below ground surface, indicating there were no drainage problems. These wells should continue to be monitored.

Prepare a Salt Management Plan. Salt levels in JID area steadily rising, as evidenced from 30 years of continuous groundwater quality data. Under current practices, salts will continue to accumulate in the groundwater and soil, and reduce the beneficial use of the groundwater for crop irrigation. JID should prepare a Salt Management Plan as the initial step in identifying the salt loading sources as well as remedial and preventative measures. The State Water Resources Control Board is encouraging every region in California to develop salt/nutrient management plans by 2014, and it is possible that Salt Management Plans or salt monitoring will be required in the future.

Reformed Land Practices. Groundwater quality generally declines with an increase in pumping. Therefore, water conservation efforts can help to preserve the groundwater quality. Water usage can be reduced by shifting to less thirsty crops, and improving irrigation efficiencies with the installation of drip and micro-irrigation systems. JID will encourage growers to take these steps and will facilitate efforts to secure grants and low interest loans on behalf of the growers.

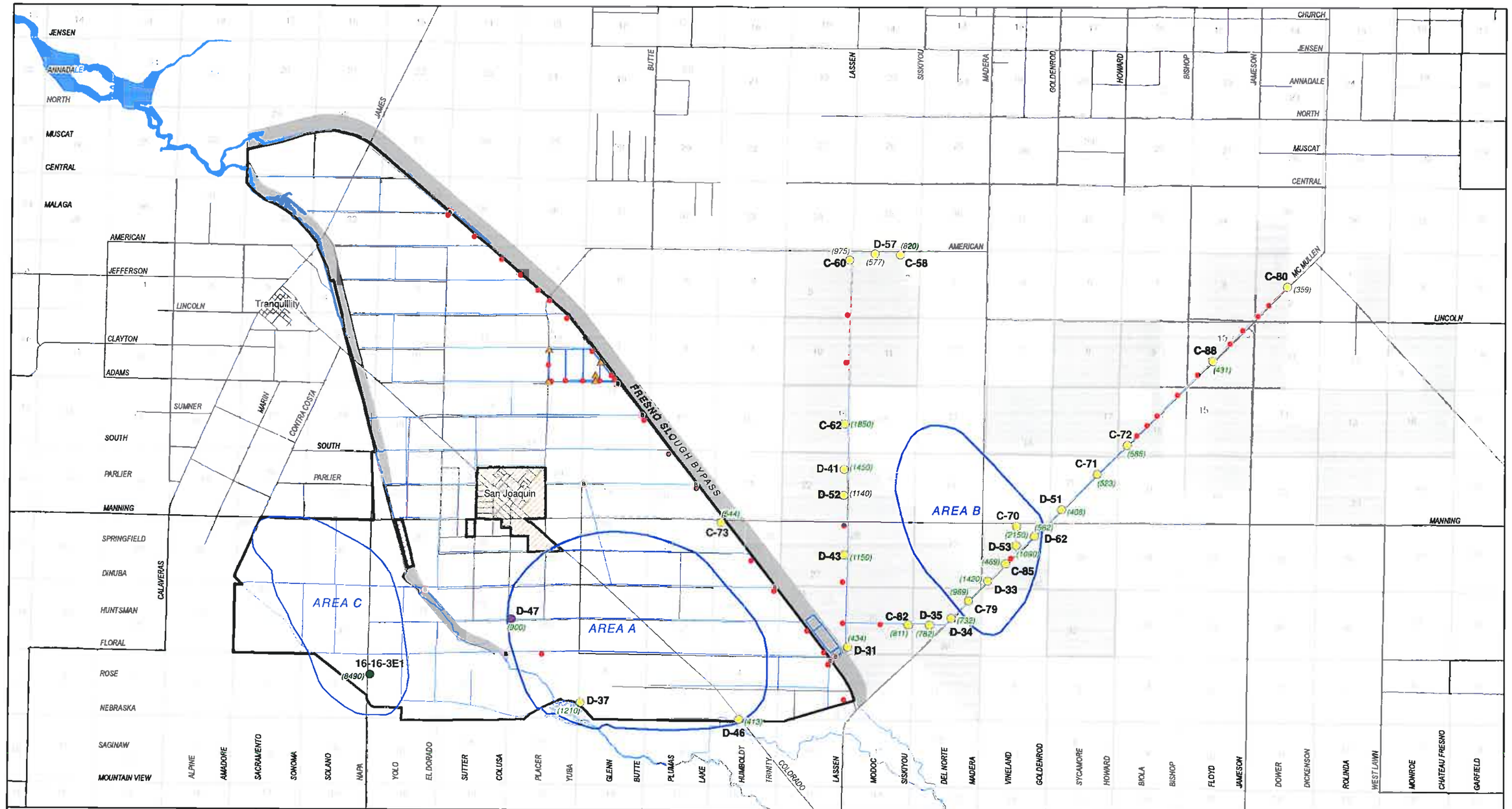
- REFERENCES

Vater Resources, *San Joaquin Valley Drainage strict Report*, September 2003.

s, *Oil Field Waste Water Disposal, Raisin City Oil* 1955.

eering Group, Inc., *James Irrigation District 5-Year 93-2004*, December 2005.

ineering Group, Inc., *Groundwater Management or Local Groundwater Assistance Grant*, December



0 1 2 Miles

EST. 1988
PROVOST & PRITCHARD
CONSULTING GROUP
An Employee Owned Company

286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

Legend

- James ID
- Reclamation District 1606
- James ID Well Field
- Section

Boosters, Lifts, and Wells

- BOOSTER
- MONITOR WELL
- PRODUCTION WELL

Wells Samples in August 2009

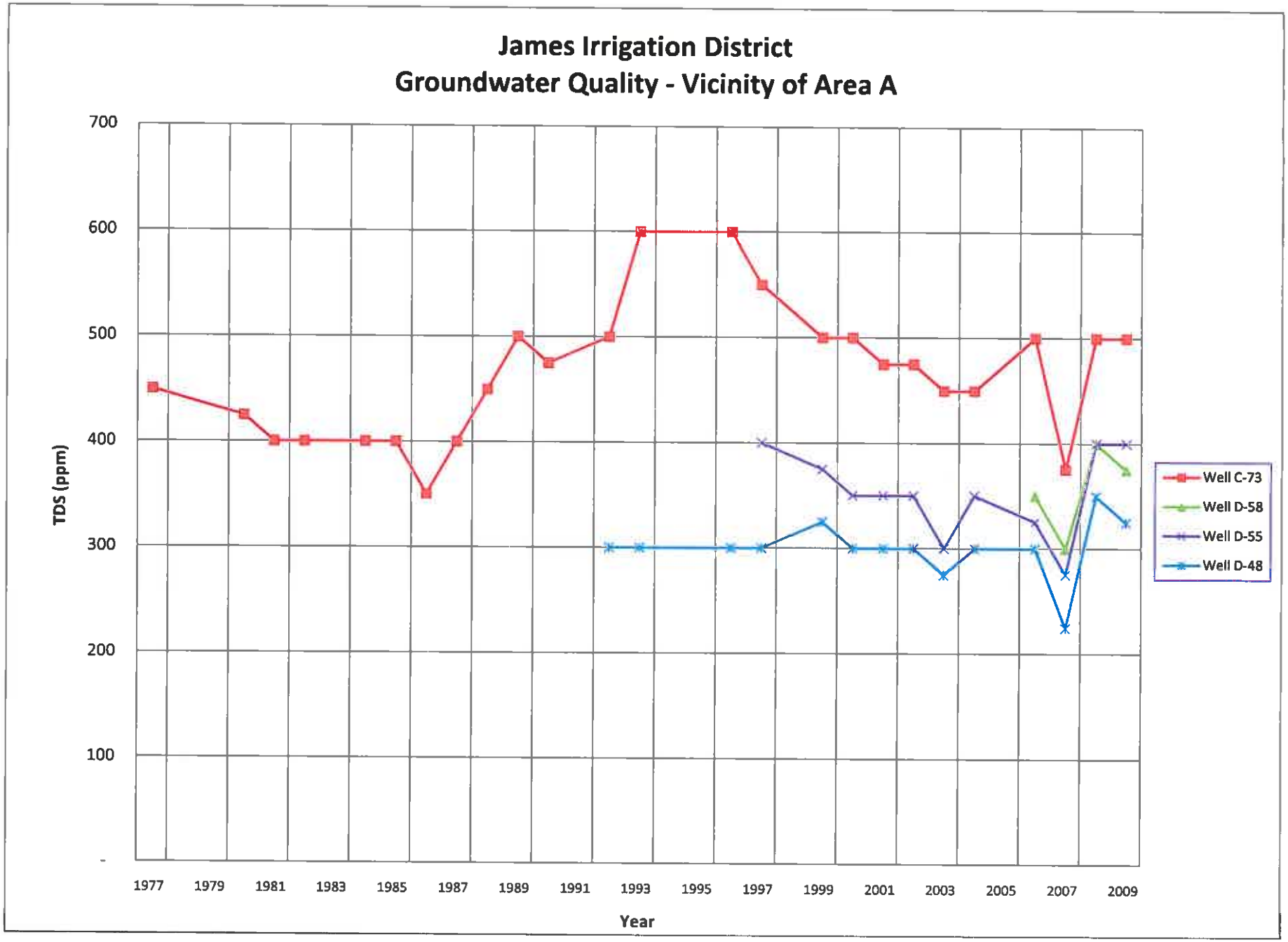
Labeled With Total Dissolved Solids *(ppm)*

- Irrigation Suitability Analysis
- Selenium and Irrigation Suitability Analysis
- Selenium, Arsenic, TOC, Gross Alpha and Irrigation Suitability Analysis

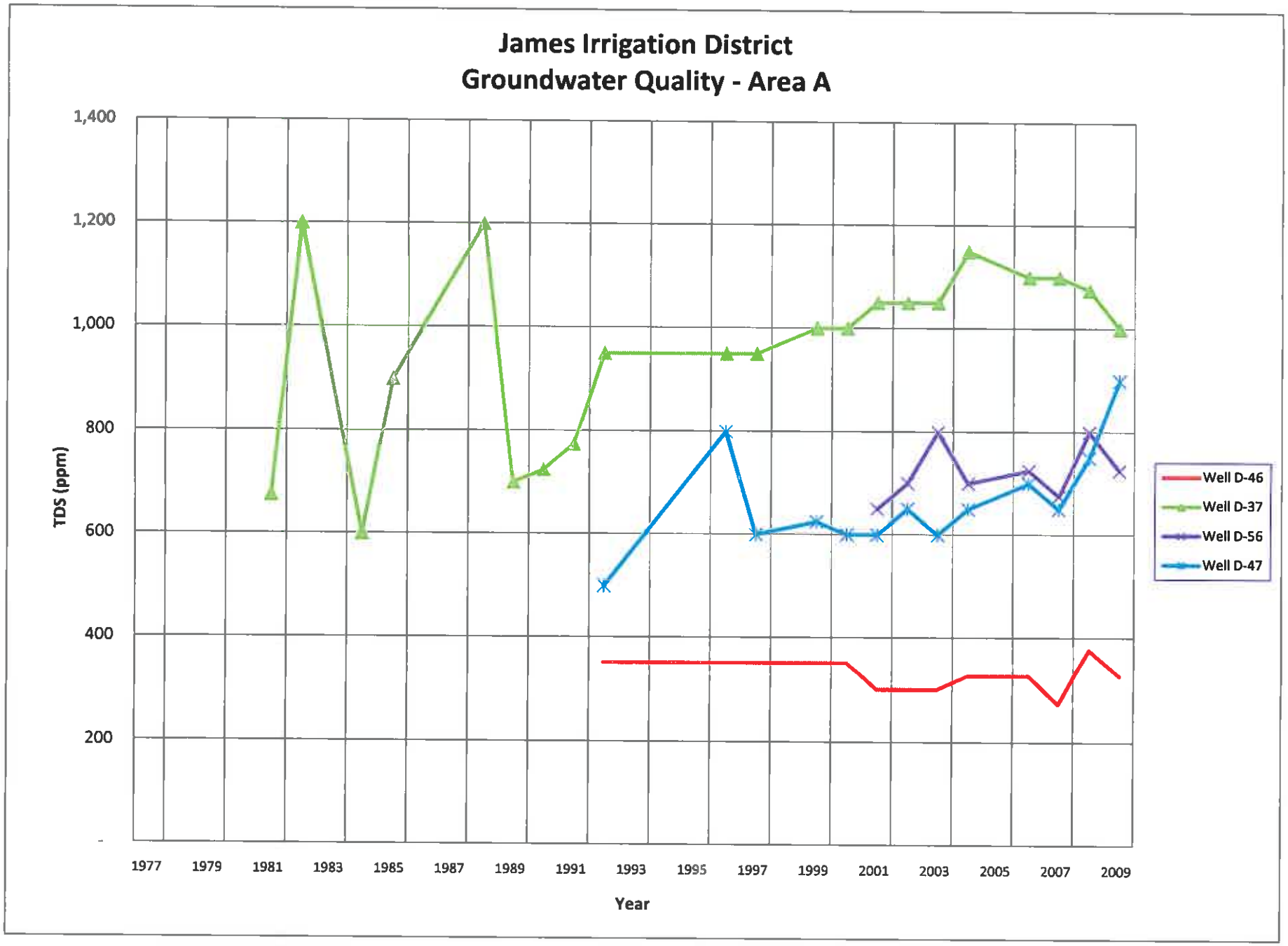
JAMES IRRIGATION DISTRICT

Local Groundwater Assistance Fund Grant
Groundwater Quality Testing

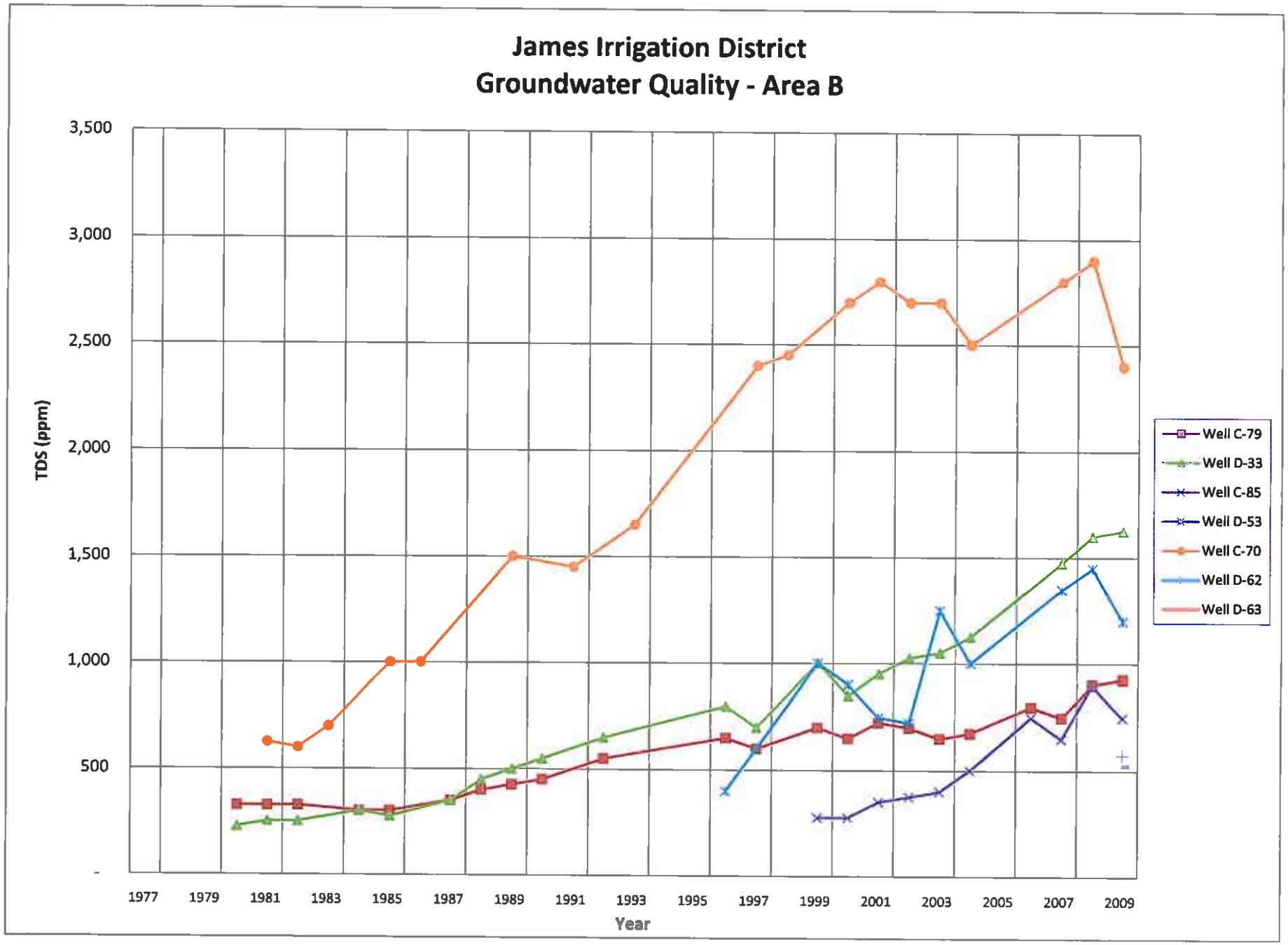
10/7/2009 \\Evolution\civ_clients\Clients\James ID-1051\Projects\105108C1-AB303 Study\GIS\Map\waterquality_wells.mxd



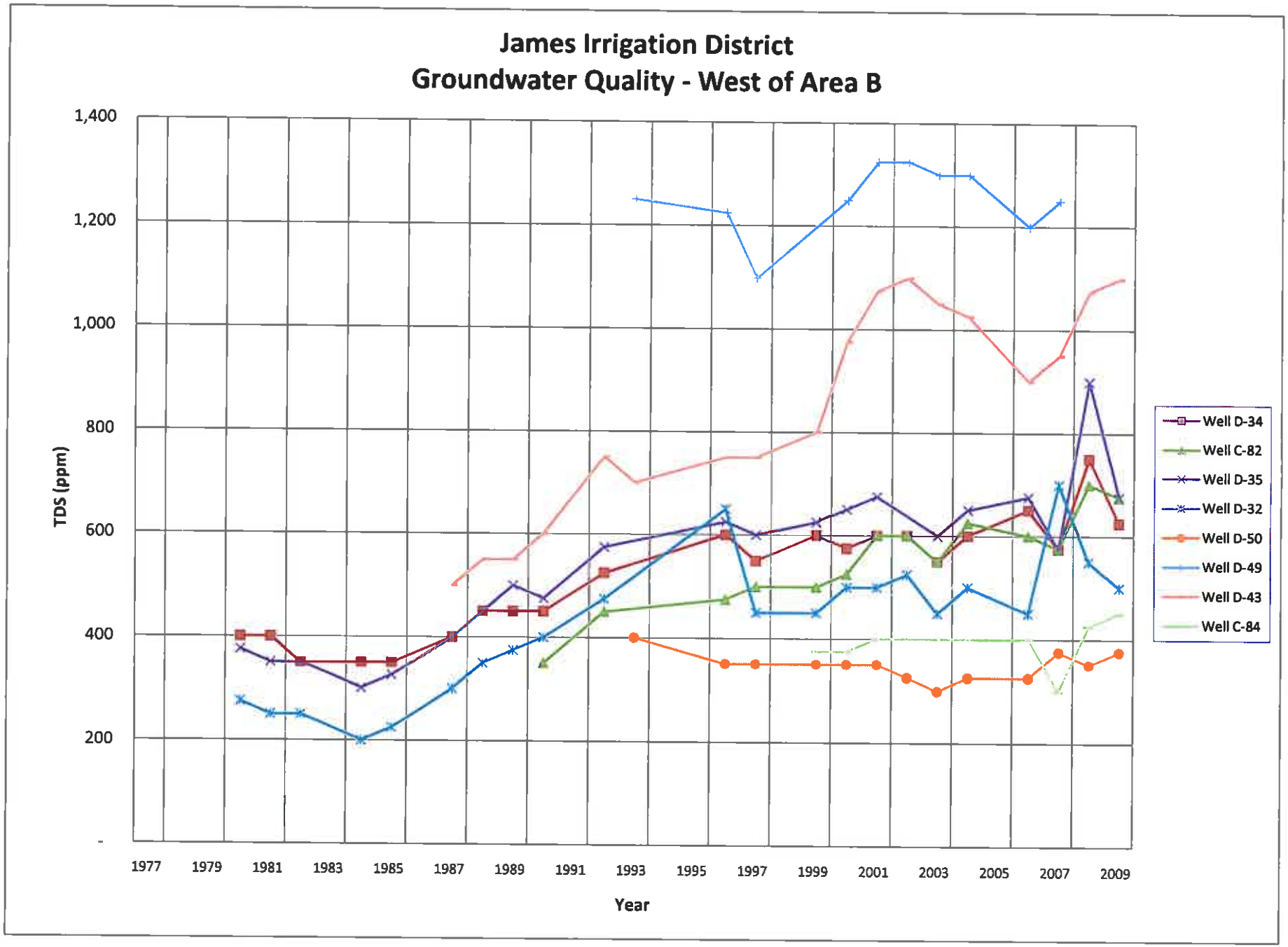
G:\Clients\James ID-1051\Projects\105108C1-AB303 Study_DOCUMENTS\Background Info\Literature Review\TDS Yearly Record_Study Wells.xlsx



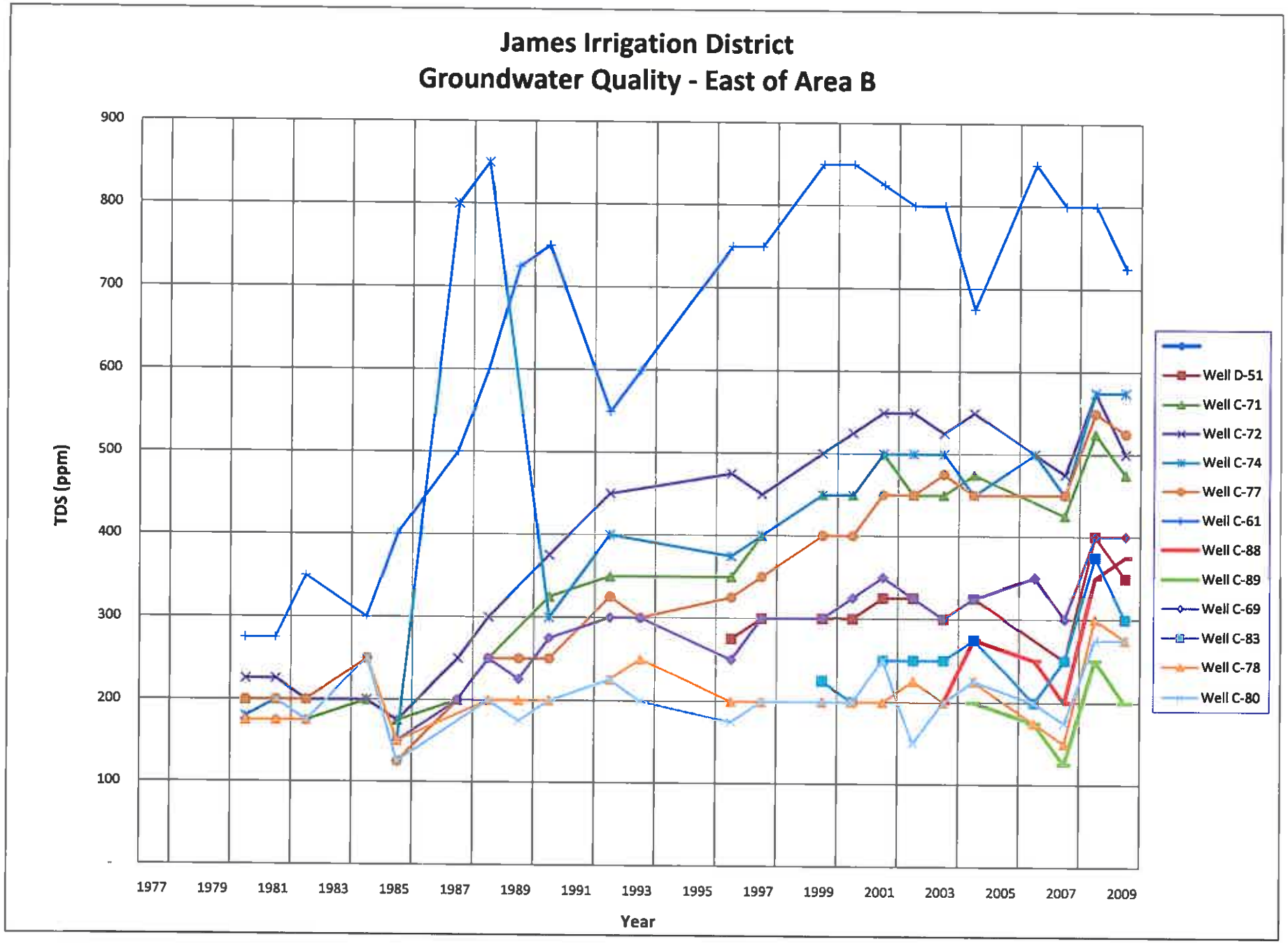
G:\Clients\James ID-1051\Projects\105108C1-AB303 Study_DOCUMENTS\Background Info\Literature Review\TDS Yearly Record_Study Wells.xlsx



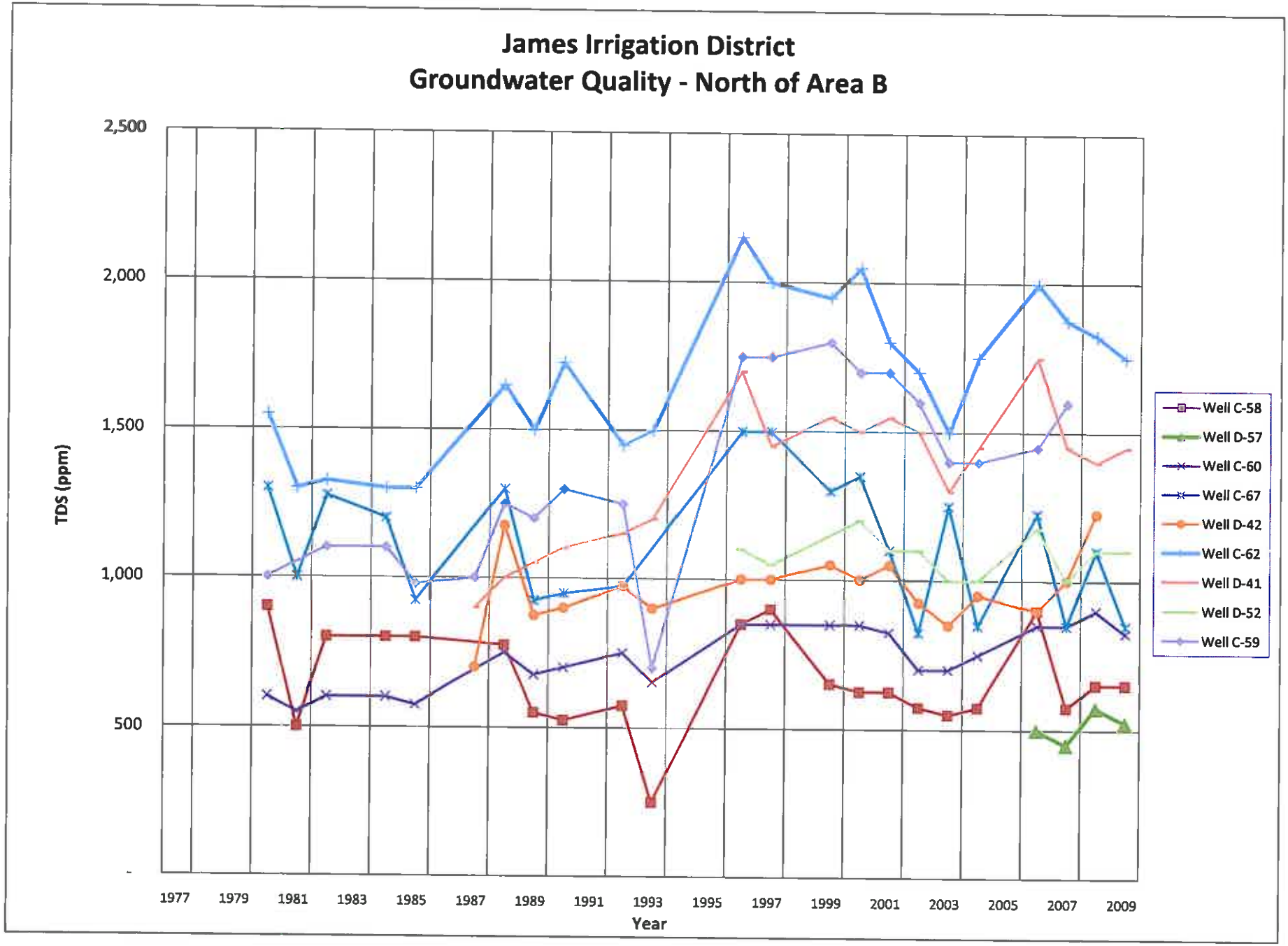
G:\Clients\James ID-1051\Projects\105108C1-AB303 Study_DOCUMENTS\Background Info\Literature Review\TDS Yearly Record_Study Wells.xlsx



G:\Clients\James ID-1051\Projects\105108C1-AB303 Study_DOCUMENTS\Background Info\Literature Review\TDS Yearly Record_Study Wells.xlsx



G:\Clients\James ID-1051\Projects\105108C1-AB303 Study_DOCUMENTS\Background Info\Literature Review\TDS Yearly Record_Study Wells.xlsx



G:\Clients\James ID-1051\Projects\105108C1-AB303 Study_DOCUMENTS\Background Info\Literature Review\TDS Yearly Record_Study Wells.xlsx

JAMES IRRIGATION DISTRICT

CITY OF SAN JOAQUIN

GROUNDWATER MANAGEMENT PLAN

APPENDIX G

GROUNDWATER MONITORING PROTOCOLS

GROUNDWATER MONITORING PROTOCOLS

GENERAL SCOPE

The purpose of this document is to insure that the sampling and analytical methods are adequately documented and appropriate for the project scope and purpose by individuals responsible for implementing the monitoring program. Examples of all required forms are presented at the end of this section.

In general, measurements of the static water level will be taken from the top of each casing, and then the monitoring wells will be purged and sampled. A detailed description of these procedures follows.

EQUIPMENT USED DURING SAMPLING

Water level sounding equipment and field meter probes (pH, dissolved oxygen, conductivity, temperature, and turbidity) will be thoroughly rinsed with de-ionized/distilled water before and after each reading. All field meters will be calibrated according to manufacturer's guidelines and specifications before and after every day of field use.

The monitoring wells will be equipped with a dedicated sampling well pump or sampling activities will utilize disposable bailing equipment. All non-dedicated sampling equipment (in contact with sample) shall be thoroughly cleaned prior to each sampling event to prevent cross-contamination between samples and to ensure accurate representation of analytes of interest in each sample. All sample containers and sampling equipment shall be sterilized and transported to the field under conditions to preserve its sterility. Personnel performing decontamination shall wear gloves, eye-protection, and such other safety equipment as needed. The analytical laboratory as part of their agreement shall provide all sample containers, container preparation services, preservatives, and field blanks.

EQUIPMENT DECONTAMINATION PROCEDURES

All equipment that comes into contact with potentially contaminated water will be decontaminated. Disposable equipment intended for one-time use will not be decontaminated, but will be packaged for appropriate disposal. Decontamination will occur prior to and after each use of a piece of equipment. The following, to be carried out in sequence, is the recommended procedure.

- Non-phosphate detergent and tap water wash, using a brush if necessary;
- Tap water rinse; and

- Deionized/distilled water rinse.

WATER LEVEL MEASUREMENT PROCEDURES

Water levels will be measured in wells that have the least amount of known contamination first. Wells with known or suspected contamination will be measured last.

If wellheads are accessible, all wells will be sounded for depth to water from top of casing and total well depth prior to purging. An electronic sounder, accurate to the nearest +/- 0.01-ft, will be used to measure depth to water in each well. When using an electronic sounder, the probe is lowered down the casing to the top of the water column, the graduated markings on the probe wire or tape are used to measure the depth to water from the surveyed point on the rim of the well casing. Total well depth will be sounded from the surveyed top of casing by lowering the weighted probe to the bottom of the well. The weighted probe will sink into silt, if present, at the bottom of the well screen. Total well depths will be measured by lowering the weighted probe to the bottom of the well and recording the depth to the nearest 0.1-ft. Depth to water and total well depth will be recorded on a Monitoring Well Purging and Sampling Record as presented at the end of this section.

WELL PURGING

The wells will be sampled no sooner than 48 hours after well development. All wells will be purged prior to sampling. If the well casing volume is known, a minimum of three casing volumes of water will be purged using the dedicated well pump, if present, or a bailer, hand pump, or submersible pump depending on the diameter and configuration of the well. When a submersible pump is used for purging, clean flexible Teflon tubes will be used for groundwater extraction. Pumps will be placed 2 to 3 ft from the bottom of the well to permit reasonable draw down while preventing cascading conditions.

Water will be collected into a measured bucket to record the purge volume. Casing volumes will be calculated based on total well depth, standing water level, and casing diameter. One casing volume will be calculated as $\mathbf{V = \pi\, r^2\, h\, 7.48}$ where **V** is the volume of one well casing of water in gallons ($1ft^3$ = 7.48 gallons); π = 3.14; **r** is the radius of the inner well casing (in ft); and **h** is the total height of the water column in the well (in ft).

It is most important to obtain a representative sample from the well. Stable water quality parameter field measurements (temperature, pH, and specific conductivity [EC]) indicate representative sampling is obtainable. Water quality is considered stable if for three consecutive readings:

- Temperature range is no more than +1/C;
- pH varies by no more than 0.2 pH units; and
- EC readings are within 10% of the average.

If the well casing volume is known, measurements will be taken before the start of purging, in the middle of purging, and at the end of purging each casing volume. If the well casing volume is NOT known, measurements will be taken every 2.5 minutes after flow starts. If water quality parameters are not stable after 5 casing volumes or 30 minutes, purging will cease, which will be noted in the field notes, and ground water samples will be taken. The depth to water, water quality field measurements, and purge volumes will be recorded on a Monitoring Well Purging and Sampling Record as presented at the end of this section.

If a well dewaters during purging and three casing volumes are not purged, that well will be allowed to recharge up to 80% of the static water column and dewatered once more. After water levels have recharged to 80% of the static water column, groundwater samples will be collected.

WATER LEVEL MEASUREMENT AND WELL PURGING RECORDS

During the collection of each sample, the following information will be recorded on a Monitoring Well Purging and Sampling Record as presented at the end of this section:

- Well identification;
- Sampler's name(s);
- Date and time of sample collection;
- Designation of sample as composite or grab, if applicable;
- Type of sampling equipment used;
- Field instrument readings and calibration;
- Field observations and details related to analysis or integrity of samples (e.g., conditions in nearby waterways, weather conditions, noticeable odors, colors, etc.);
- Preliminary sample descriptions (e.g., clear with strong ammonia-like odor);
- Time of arrival/entry on site and time of site departure; and
- Deviations from sampling plans.

PURGED WATER DISPOSAL

Purged and excess groundwater collected for sample container filling may be disposed on site or in the sampling area by dispersing onto the ground, or at the owner's direction.

ANALYTICAL METHODS AND REPORTING LIMITS

Requested analytes are provided in the following table. Reporting limits are laboratory specific based on the type of equipment each laboratory uses. Analytical methods and holding times are listed by analyte below.

Analyte	Standard Method	EPA Method	Holding Time
PH	4500H-B	150.1	24 hours
EC	2510B	120.1	28 days
Alkalinity	2320B	310.1	14 days
Ammonium	4500NH4	350.1	28 days
Bicarbonate	2320B	310.1	14 days
Carbonate	2320B	310.1	14 days
Chloride	4500Cl	300.0	28 days
Iron	3120B	200.7	6 months
Magnesium	3120B	200.7	6 months
Manganese	3120B	200.7	6 months
Nitrate as N	4500NO3	353.2; 300.0	48 hours
Nitrite as N	4500NO2	353.2; 300.0	48 hours
Phosphorus	4500P	365	28 days
Potassium	3120B	200.7	6 months
Sodium	3120B	200.7	6 months
Sulfate	4500SO4	300.0	28 days
TDS	2540C	160.1	7 days
TKN	4500-NH3	351	28 days

SAMPLE CONTAINERS AND PRESERVATIVES

Sample containers are generally available directly from the laboratory. All containers will be one-liter polyethylene, precleaned, and analyte specific. Groundwater samples for TKN and ammonia will be collected in containers containing H_2SO_4 as a preservative. The remaining samples need not be preserved. If a preservative is present, the bottle will be capped and lightly shaken to mix in the preservative. Samples from each location that require the same preservative may be placed in the same bottle if being analyzed by the same laboratory. Samples to be analyzed for dissolved metals must be filtered prior to preservation and analysis.

SAMPLING PROCEDURES

Water samples will be collected from each well and placed into laboratory prepared containers, sealed with tight fitting caps, labeled, and stored in a cool ice chest. Water

used for field measurements of temperature, pH, and EC shall not be used as sample water. The following are the recommended sample collection procedures:

- Rinse the tubing with one liter of sample prior to sample collection;
- If no preservative is present, rinse sample bottles three times with a small amount of sample;
- Collect sample directly into the sample bottle;
- Allow sample containers to be open for the shortest time possible to prevent contamination;
- Do not touch the inside of bottles, lids, or tubes. Hold the bottle lid with the inside facing down to prevent contaminating the inside of the lid;
- Allow the sample water to flow into the bottle from above;
- Close bottle tightly,
- Samples will be chilled to 4 C° immediately upon collection; and
- Transport samples to the lab as soon as possible.

At each sampling location, all bottles designated for a particular analysis will be filled sequentially before bottles designated for the next analysis are filled. If a duplicate sample is to be collected at this location, all bottles designated for a particular analysis will be filled sequentially before bottles for another analysis are filled.

All samples collected will be labeled in a clear and precise way for proper identification in the field and for tracking in the laboratory. Every sample, including samples collected from a single location but going to separate laboratories, will be pre-assigned an identifiable, unique sample number. The following is an example sample label:

Sample #:	**Well ID:**
Analytes:	**Date:**
Collected by:	**Time:**

It will be possible to identify each unique sample by recording the following information on the Monitoring Well Purging and Sampling Record:

- Sample identification numbers and any explanatory codes;
- Sample date and time;
- Lot numbers of the sample containers;
- Chain-of-custody form numbers;
- Shipping arrangements (overnight air bill number); and
- Name(s) of recipient laboratory (ies).

CHAIN-OF-CUSTODY

A chain-of-custody (COC) record will be completed and accompany all sample shipments for each laboratory and each shipment. If multiple coolers are sent to a

single laboratory on a single day, COCs will be completed and sent with the samples for each cooler. Generally, the laboratory will supply blank COCs. An example COC is included at the end of this section.

The COC will identify the contents of each shipment and maintain the custodial integrity of the samples. Generally, a sample is considered to be in someone's custody if it is either in someone's physical possession, in someone's view, locked up, or kept in a secured area that is restricted to authorized personnel. The sampling team leader or designee will sign the COC in the "relinquished by" box and note date, time, and air bill number.

SAMPLE HANDLING AND TRANSPORT

The following outlines the packaging procedures for sample delivery to a California Certified Environmental Laboratory Accreditation Program (ELAP) laboratory:

- Pack ice in zip-locked, double plastic bags. Seal the drain plug of the cooler with tape to prevent melting ice from leaking out;
- Line the bottom of the cooler with bubble wrap to prevent breakage during shipment;
- Check screw caps for tightness;
- Seal all container tops with tape;
- Secure sample labels onto the containers with clear tape;
- Wrap all glass sample containers in bubble wrap to prevent breakage;
- Seal all sample containers in heavy-duty plastic zip-lock bags with the sample numbers written on the outside of the bags with indelible ink;
- Place samples in a sturdy cooler(s) lined with a large plastic trash bag. Enclose the appropriate COC(s) in a zip-lock plastic bag affixed to the underside of the cooler lid;
- Fill empty space in the cooler with bubble wrap or Styrofoam peanuts to prevent movement and breakage during shipment;
- Double seal ice in two ziplock plastic bags and place on top and around the samples;
- Secure each ice chest with strapping tape; and
- Secure address and shipping labels to cooler.

EST. 1968

PROVOST& PRITCHARD

CONSULTING GROUP

An Employee Owned Company

Monitoring Well Purging and Sampling Record

Client: _____ Date: _____

Project Name: _____ County: _____

Project Address: _____

Project Manager: _____ Job No: _____ Phase(s): _____

Regulatory Contact: _____ Telephone: _____

Sample Containers: _____ Air Temp (F): _____

Preservatives: _____ Precipitation: _____

Instrumentation: _____ Wind (dir/speed): _____

Date Last Calibrated/By: _____ Sampler Signature: _____

Well Number						
Well Elevation (ft)						
Well Diameter (in)						
Slotted Interval (ft)						
DTW (ft)						
GW Elevation (ft)						
Sounding Depth (ft)						
Well Volumes (gal)						
Notes:						
Well Volume Purged (1st)						
Time						
Temp (C°)						
pH						
EC						
Volume Removed (gal)						
Well Volume Purged (2nd)						
Time						
Temp (C°)						
pH						
EC						
Volume Removed (gal)						
Well Volume Purged (3rd)						
Time						
Temp (C°)						
pH						
EC						
Volume Removed (gal)						
Sample Depth (ft)						
Sample Time						

Equipment used:

Remarks:

2" Well Volume = 0.163 x height of water column

4" Well Volume = 0.653 x height of water column

KINGS BASIN IRWMP PROJECT LIST

Adopted 10-17-2012

Project ID	Member/IP Organization	Project Title	Project Status	RG1	RG2	RG3	RG4	RG5	MO1	MO2	MO3	MO4	MO5	MO6	MO7	MO8	MO9	MO10	MO11	MO12	MO13	MO14	MO15
				Halt, and ultimately reverse, the current overdraft and provide for sustainable management of surface and groundwater	Increase the water supply reliability, enhance operational flexibility, and reduce system constraints	Improve and protect water quality	Provide additional flood protection	Protect and enhance aquatic ecosystems and wildlife habitat	Increase amount of groundwater in storage with intent to eliminate the groundwater overdraft in 20 years	Identify opportunities and Projects	Identify DAC priority needs and promote/support solutions to DAC water issues	Increase average annual supply and reduce demand	Increase dry year supply	Increase regional conveyance capacity	Compile baseline water quality data for ground & surface water	Encourage Best Management Practices, policies & education that protect water quality	Identify sources of water quality problems & promote/support solutions to improve water quality	Increase surface storage	Sustain the Kings River Fisheries Management Program	Pursue opportunities to incorporate habitat benefits into projects	Increase public awareness of IRWM Efforts	Invoive local water districts and land use agencies in generating and confirming the current and future water needs to ensure compatibility and consistency with land use and	Comply with SBx7-7
1	Bakman Water Company	Bakman Water Company Water Meter Installation	Ready For Construction	P	S	S			S		S	S	S			S							P
2	Bakman Water Company	SCADA system for wells improved groundwater management, operations, supply reliabilty & conservation	Planning	S	P	S			S		P	S	S				S						S
3	Biola Community Services District	Biola CSD Drinking Water Improvement Project	Preliminary Design	S	P	S					P	S				S					S		
4	City of Clovis	City of Clovis, Water Intertie (North)	Preliminary Design	S	P				S			S	S	P									
6	City of Clovis	Clovis Harlan Recycled Water Extension	Preliminary Design	P	S				P			S	S										
7	City of Clovis	Tarpey Village Metering Project	Planning	P	S				P			S	S								S		
8	City of Dinuba	Dinuba Reclamation Conservation & Recreation (RCR) Project	Preliminary Design	P	S	S		S	P			S			S	S	S	S		S		S	
11	City of Fresno/Water Division	Nielsen Recharge Facility	Preliminary Design	P	S	S	S		P		S	S	S					S					
12	City of Fresno/Water Division	Three Reclamation Water Wells at the Fresno/Clovis Regional Wastewater Reclamation Facility	Preliminary Design	P	S	S			P		S	S	S										
15	City of Fresno/Water Division	Tertiary Treatment at Fresno/Clovis Regional Reclamation Facility	Ready For Construction	P	S	S			P		S	S	S										
16	City of Fresno/Water Division	Northwest Fresno Regional Recharge Facility	Preliminary Design	P	S	S	S		P		S	S	S					S					
17	City of Fresno/Water Division	Southeast Fresno Stormwater Detention, Greenbelt and Environmental Habitat Restoration Area	Conceptual	S	P	S	S	S	P		S	S	S	S		S		S		S			
18	City of Fresno/Water Division	Regional Groundwater Banking Facility	Planning	P	S	S	S		P		S	S	S										
19	City of Fresno/Water Division	Southeast Surface Water Treatment Facility	Preliminary Design	P	S	S			P		S	S	S	S		S							
20	City of Fresno/Water Division	Southeast Fresno Regional Recharge Facility	Planning	P	S	S	S		P		S	S	S					S					
21	City of Fresno/Water Division	Southwest Fresno Regional Recharge Facility	Planning	P	S	S	S		P		S	S	S					S					
22	City of Fresno/Water Division	Northeast Fresno Recycled Water Transmission Pipeline and Reclamation Facility Supply Pipeline	Conceptual	P	S	S			P			S	S										
24	City of Fresno/Water Division	Sunnyside Area Sewer Conversion	Conceptual		S	P							S				P						
25	City of Fresno/Water Division	Fort Washington Sewer Conversion	Conceptual		S	P							S				P						
26	City of Kerman	City of Kerman Water Meter Project	Preliminary Design	P	S				P			S	S										
27	City of Parlier	Parlier Water Storage Project	Planning & Preliminary Design	S	P				P									S					
29	City of San Joaquin	City of San Joaquin Water Meter Project	Conceptual	P					P		S	S									S		
32	City of Selma	Storm Drain Upgrade	Ready For Construction				P							P									
33	City of Selma	Storm Drain Storage/Recharge Project	Planning				P							P									
34	Consolidated Irrigation District	Recharge Basin near South and Highland	Preliminary Design	P	S	S	S	S	P			S	S		S			S	S		S		
35	Consolidated Irrigation District	Ward Drainage Canal Capacity Enlargement and Recharge Project	Conceptual	P	S	S	S	S	P			S	S	S				S	S				
36	Consolidated Irrigation District	Recharge Pond Near Kingsburg/Selma Branch Canal Divide	Planning	P	S	S	S	S	P			S	S					S	S				
37	Consolidated Irrigation District	Fowler Switch Capacity Improvement Project	Conceptual	S	P		S		S					P									
38	Consolidated Irrigation District	Fowler Switch / C&K Canal Intertie Project	Planning	S	P		S		S					P									
39	Consolidated Irrigation District	Rechange Pond off Kingsburg Branch Canal	Planning	P	S	S	S	S	P			S	S					S	S				
40	Consolidated Irrigation District	Recharge Pond off Ward Drainage Canal	Conceptual	P	S	S	S	S	P			S	S					S	S				
41	Consolidated Irrigation District	Recharge Pond off Cole Slough Canal	Conceptual	P	S	S	S	S	P			S	S					S	S				
42	Consolidated Irrigation District	Westside Banking Facility	Planning	P	S	S	S	S	P			S	S					S	S				
43	Consolidated Irrigation District	C&K Canal Capacity Improvement Project	Conceptual	S	P		S		S					P									
44	Consolidated Irrigation District	Santa Fe Pond Enlargement	Conceptual	P	S	S	S	S	P			S	S					S	S				
54	County of Fresno	CSA 43 Raisin City Sewer Feasibility Study	Conceptual & Planning			P					P						S						
61	Easton CSD	Easton Safe Drinking Water Feasibility Study Project	Conceptual		S	P				S	P					S	S				S		
65	Fresno Irrigation District	FID Measurement and Metering Project	Planning	P	S				S			S											P
66	Fresno Irrigation District	Southwest Flood Water Protection and Utilization Project	Planning	P	S	S	S	S	P			S	S	S	S			S	S		S		
67	Fresno Irrigation District	Jameson Pond	Preliminary Design	P	S				S			S	P		S								
68	Fresno Irrigation District	Oleander Basin Banking Project	Planning	P	S				S			S	P		S								
71	Fresno Irrigation District	Eastside Streams Improvement Project	Conceptual		P		S	S	S				P										
72	Fresno Irrigation District	Big Dry Creek Recharge Project	Conceptual	P	S		S	S	P			S		S									
73	Fresno Metropolitan Flood Control Dist.	Dry Creek Improvement Project	Conceptual, Planning, Preliminary Design, Ready for Construction	S		S	P	S	S			S	S	S			S	P		S			
74	Fresno State University	Recycling Well Water with Nitrates for Crop Production	Conceptual		P	S										P	S						

P = Primary
S = Secondary

KINGS BASIN IRWMP PROJECT LIST

Adopted 10-17-2012

Project ID	Member/IP Organization	Project Title	Project Status	RG1	RG2	RG3	RG4	RG5	MO1	MO2	MO3	MO4	MO5	MO6	MO7	MO8	MO9	MO10	MO11	MO12	MO13	MO14	MO15
				Halt, and ultimately reverse, the current overdraft and provide for sustainable management of surface and groundwater	Increase the water supply reliability, enhance operational flexibility, and reduce system constraints	Improve and protect water quality	Provide additional flood protection	Protect and enhance aquatic ecosystems and wildlife habitat	Increase amount of groundwater in storage with intent to eliminate the groundwater overdraft in 20 years	Identify opportunities and Projects	Identify DAC priority needs and promote/support solutions to DAC water issues	Increase average annual supply and reduce demand	Increase dry year supply	Increase regional conveyance capacity	Compile baseline water quality data for ground & surface water	Encourage Best Management Practices, policies & education that protect water quality	Identify sources of water quality problems & promote/support solutions to improve water quality	Increase surface storage	Sustain the Kings River Fisheries Management Program	Pursue opportunities to incorporate habitat benefits into projects	Increase public awareness of IRWM Efforts	Invoive local water districts and land use agencies in generating and confirming the current and future water needs to ensure compatibility and consistency with land use and	Comply with SBx7-7
75	Fresno State University	Recycling Turbid Well Water for Crop Production	Conceptual		P								P			S							
76	Fresno State University	Developing a Model GWMP of Integrated, All-in-One Strategy for Conservation, Groundwater, and Wastewater Management	Conceptual	P	S	S							S			P	S				S		
77	Fresno State University	Experiment Using Non-Potable Water as an Alternative to Potable Groundwater or Surface Water in Cooling Towers and then Re-cycling that Water for Crop Production	Conceptual	S	P	S										P	S						
80	Kings River Conservancy	The Kings Ribbon of Gems - North Riverside Park	Ready For Construction			S		P															
100	Kings River Conservancy	The Kings Ribbon of Gems - Sanger Kings River Park and River Access	Preliminary Design			S		P									P		S				
106	Kings River Conservation District	Kings River Levee Evaluation	Ready For Construction		S		P			P				S									
107	Kings River Conservation District	Kings River Levee Critical Repairs	Planning		S		P				P			S									
108	Kings River Conservation District	North Fork Channel Recharge Project - Site 16	Conceptual	P	S	S	S	P	P			S	S	S									
116	Kings River Conservation District	McMullin Recharge Project - Site #1	Planning	P	S	S	S	P	P			S	S	S									
117	Kings River Conservation District	Kings River North Fork Flood Protection and Wildlife Enhancement Project	Preliminary Design		S		P				P			S									
118	Laguna Irrigation District	Laguna Groundater Recharge Site 11	Planning	P	S	S	S	S	P			S	S	S									
120	London Community Services District	London Water Conservation Project	Ready For Construction	P	S	S			P		S	S											S
123	Self-Help Enterprises	Seville Community Flood Control Project	Conceptual				P			S	P			S									
124	Self-Help Enterprises	Yettem Community Flood Control Project	Conceptual				P			S	P			S									
125	Sultana Community Services District	Sultana Safe Drinking Water Feasibility Study Project	Planning																				

P = Primary
S = Secondary

Upper Kings Basin Integrated Regional Water Management Authority
Board meeting October 17, 2012
Fresno County Farm Bureau, 1274 W. Hedges, Fresno, 93728

Minutes of the Meeting of the Board of the Upper Kings Basin Integrated Regional Water Management Authority (Water Authority) held October 17, 2012.

1. Call to order

Chair Harry Armstrong called the meeting to order at 9:33 am. Armstrong noted that there was a quorum.

Directors/Alternate Directors Present:
Harry Armstrong, City of Clovis
Robert Nielsen, Jr., Consolidated Irrigation District
Dean Uota, City of Dinuba (alternate)
Martin Querin, City of Fresno (alternate)
Lou Martinez, City of Parlier (alternate)
Chris Kapheim, Alta Irrigation District (alternate)
Dave Orth, Kings River Conservation District (alternate)
Denise Akins, County of Tulare (alternate)
Ken Moore, City of Kerman (alternate)
Buzz Burleson, Fresno Metropolitan Flood Control District (alternate)
Debbie Poochigian, County of Fresno
Don Mills, Kings County Water District (alternate)
Bruce Blayney, City of Kingsburg

Members Absent:
Fresno Irrigation District
City of Sanger
City of Reedley
Raisin City Water District
City of Selma

Interested Parties Present:
Paul Boyer: Self-Help Enterprises, Hardwick Water Company, Sultana Community Services District
James Malloyan:, James Irrigation District, Mid-Valley Water District
Steve Pickens, Bakman Water Company
Robert Nielsen, Jr.: Liberty Canal Company, Liberty Water District
Edith Forrstrom, Biola Community Services District
Sue Ruiz, Easton Community Services District

Interested Parties Absent:
California Native Plant Society, Sequoia Chapter
City of San Joaquin
Community Water Center
County of Kings
Cutler Public Utilities District
East Orosi Community Services District
El Rio Reyes Conservation Trust
Fresno County Farm Bureau
Kings River Conservancy
Kings River Water Association
Laguna Irrigation District
London Community Services District
Orange Cove Irrigation District
Orosi Public Utilities District
Riverdale Irrigation District
Riverdale Public Utility District
Sanger Environmental Fund
Sierra Club, Tehipite Chapter
Sierra Resource Conservation District
Terranova Ranch, Inc.
Tulare Basin Wildlife Partners
UC Cooperative Extension - Fresno

Others Present:
Eric Osterling, KRCD
Rick Hoelzel, KRCD
Ron Samuelian, Provost & Pritchard
Heather Bashian, Provost & Pritchard
Randy Shilling, KRCD
Joe Prado, County of Fresno
Tom Lutterman, Depart. of Water Resources
Sarge Green, Calif. State University Fresno
Harold Poras, Self-Help Enterprises
Shay Bakman, Bakman Water Company
Phil Desatoff, Consolidated Irrigation District
Abigail Solis, Community Water Center
Brain Trevarrow, KRCD
Cristel Tufenkjian, KRCD
Lisa Koehn, City of Clovis
Betsy Luht, Calif. Depart. of Public Health
Brock Buche, City of Fresno
Jerry Lakeman, Fresno Metro. Flood Control Dist.

2. Addition to or Deletion from the Agenda
None

3. Public Presentations
None

4. Approval of Minutes of the July 18, 2012 Regular Board of Directors
It was moved by Director Martinez, seconded by Director Nielsen and unanimously carried that the minutes of the July 18, 2012 regular meeting of the Board of Directors be approved as presented.

5. Member-Interested Party Reports
Chair Armstrong called on Robert M. Gailey, P.G., C.HG., The Source Group, Inc., to discuss water supply well rehabilitation and modification. Gailey provide a brief overview of options for addressing nitrates in drinking water supply wells including background on well performance, tasks commonly required to restore wells to service and an overview of the East Orosi east well project.

6. Advisory Committee Report
Chair Armstrong called on Director Orth to provide a report on Advisory Committee activities. Orth reported that the Advisory Committee held its regularly scheduled meeting on September 19. Orth noted that there was not a quorum. Orth reported that due to the number of new projects, twenty-one in total, it was not possible to review prior to the September 19 Advisory Committee meeting. Orth reported that the Advisory Committee decided to allow the Project Work Group to take the recommended Project List directly to the Board. Orth noted that this will be discussed under agenda item #11 Recommendation to approve new projects and to adopt the Project List.

7. Status and Discussion of Planning Grants
Chair Armstrong called on Water Authority staff member Eric Osterling to provide a status report on the Disadvantaged Communities (DAC) Pilot Study. Osterling reported that at least one meeting has been held in all of the DAC Pilot Study sub-regions. Osterling also noted that meeting dates and materials are posted at www.kingsbasinauthority.org. Osterling reported that the northern Tulare Sub-region has identified a consolidation pilot project.

8. Staff Reports
Planning and Implementation Contracts – Chair Armstrong called on Osterling to report on the status of planning and implementation contracts. Osterling reported that the Prop. 84 Round 1 Implementation invoices continue to be submitted. Osterling reported that the Prop. 50 Round 2 grant should be closed out by January 2013.

Inter-regional and Statewide Coordination - Chair Armstrong called on Osterling to report on inter-regional and statewide coordination. Osterling reported that the Tulare Basin Coordinated IRWM Group held their monthly meeting in October. The group discussed coordinating the climate change discussion for each of the IRWMP updates. Osterling reported that he attended an IRWMP roundtable of regions conference call which discussed upcoming grant solicitations and technical assistance from DWR. Osterling reported that four delegates from the Water Authority will be attending DWR's IRWMP leadership workshop scheduled in the Fresno area on November 14.

Public Information – Chair Armstrong called on Cristel Tufenkjian to provide an update on public information. Tufenkjian noted a handout regarding an article in the Sacramento Bee about Easton Community Services District's water quality issues. Tufenkjian reported that a response from Water Authority Chair Harry Armstrong was published in the Sacramento Bee. Tufenkjian also reported that an article about the Water Authority was published in the Porterville Recorder. Tufenkjian reported that the Outreach Work Group met to discuss developing a website for the Water Authority. Tufenkjian invited Board members to participate.

Legislation – Chair Armstrong called on Orth to provide a report on legislation. Orth reported that the current legislative session ended on August 31. Orth reported on AB 685 (Eng) State water policy - this bill declares that every human being has the right to clean, affordable and accessible water. The bill was signed by the Governor. Orth noted that a letter was sent by the author to the Legislative Journal describing his intent of the bill to describe a policy for the regulators and agencies to consider when developing regulations. Orth reported that two bills were introduced in the final weeks of the session as the result of the drinking water stakeholder work group's efforts. AB 2238, (Perea) Public Water Systems: Drinking Water - this bill provided an emergency funding mechanism for Department of Public Health and AB 403 (Alejo) Water quality: integrated plan: Salinas. Valley - this bill provided up to $2 million from a SWRCB account for the Salinas area to conduct a DAC study. Both bills did not emerge from Committee. It is anticipated that AB 403 will be reintroduced in the next legislative session. Orth reported that the State Water Resources Control Board's nitrate report is anticipated to be released in December. Orth reported that the Governor appointed a Drinking Water Stakeholder Group in June that included Water Authority representatives Chris Kapheim, Maria Herrera and co-chaired by Laurel Firestone and himself. The purpose of the work group was to provide input to the Governor about the SWRCB report to the Legislature regarding the UC Davis nitrate study. The SWRCB is considering the recommendations from that report for inclusion in the SWRCB's report to the legislature. Orth reported that the Group issued its report to the Governor on August 20. Orth also reported that the Group recommended maintaining the stakeholder process and relationships with the agencies and legislature to develop solutions moving forward. Orth stated that he and Firestone are working on a draft work plan for continuation of the Group.

9. Recommendation to approve request to join the Authority as an Interested Party
Chair Armstrong called on Tufenkjian to report on CSUF's request to join as an Interested Party. Tufenkjian reported that a letter and New Member/Interested Party Questionnaire were received from California State University, Fresno (CSUF) requesting to join the Water Authority as an Interested Party. CSUF appointed Mr. Sarge Green as their Representative and Mr. Robert Boyd as their Alternate. Green provided an overview of CSUF and its interest in joining the Water Authority. Tufenkjian reported that the Advisory Committee recommends to the Board that they approve the request by the California State University, Fresno to join the Water Authority as an Interested Party. It was moved by Director Mills, and seconded by Director Orth and unanimously carried to approve California State University, Fresno as an Interested Party.

10. Recommendation to approve Raisin City Water District's membership status change
Chair Armstrong called on Tufenkjian to provide a report on Raisin City Water District's membership status. Tufenkjian reported that in response to the Board's request to follow-up with Raisin City Water District regarding their membership status, a letter was sent on August 9 on behalf of the Water Authority to Raisin City providing the requirements for withdrawal from the Water Authority as stated in the JPA agreement. A response letter was received by Raisin City Director Jerry Boren dated August 30 stating that the Raisin City Water District Board voted to terminate membership in the Water Authority. Tufenkjian reported that the written notice to file a withdrawal has been met. Tufenkjian reported that a letter was received by Raisin City Water District on September 14 requesting to become an Interested Party. Raisin City Water District appointed Jerry Rai as their representative and Michael Reid as their Alternate. Tufenkjian reported that the Advisory Committee recommends to the Board that Raisin City's application to become an Interested Party be supported on condition of receiving payment of a past due invoice. Tufenkjian reported that payment has been received for the $7,000 due from Raisin City Water District for fiscal year 2011-12. It was moved by Director Orth, and seconded by Director Nielsen and unanimously carried to approve Raisin City Water District's withdrawal from the Water Authority. It was moved by Director Orth, and seconded by Director Querin and unanimously carried to approve Raisin City Water District as an Interested Party.

11. Recommendation to approve new projects and to adopt the Project List

Chair Armstrong called on Osterling to provide a report on new projects and the adoption of the Project List. Osterling reported that an updated Project List is needed to meet the new requirements of the updated IRWMP. Osterling reported that a project development workshop was held in August to provide guidance to members regarding updating their projects to meet the new requirements. Osterling reported that the process for adding new projects to the Project List followed the guidelines of Chapter 7 of the updated IRWMP that was adopted by the Board at their July 18 Board meeting. It also followed Chapter 5 that discuss the goals and objectives of the Water Authority. Osterling reported that 22 new projects were received and evaluated by the five members of the Project Work Group. Osterling stated that reviewing these projects is a tremendous commitment of time. Osterling reported that 16 out of the 22 projects were recommended to be added to the Project List by the Project Work Group. Six projects are not being recommended because the Project Work Group has determined that the projects did not meet the goals and objectives of the IRWMP. Armstrong invited project applicant representatives to provide comments regarding their projects. Edith Forrstrom, Biola Community Services District representative reported that Biola Regional Water Improvement Project was not recommended. Forrstrom discussed that Biola's water management plan has been updated and that as a rural community it is difficult to be designated as a regional project. Forrstrom noted that Biola is a Disadvantaged Community. Forrstrom asked the Board to reconsider placing Biola's project on the Project List. Sue Ruiz, Easton Community Services District representative asked the Board to reconsider placing Easton Community Service's project on the Project List. Ruiz reported the Project Work Group determined that Easton's project did meet regional objective #3 – improve water quality. Ruiz reported that Easton's project also meets measurable objective #3 – identify DAC priority needs. Ruiz stated that this project is to assist Easton in determining what are the options for dealing with water quality in their community. Discussion followed regarding the process and timing for reconsidering the projects that were rejected. It was moved by Director Burleson, and seconded by Director Martinez and unanimously carried to approve new projects and adopt the Project List and that those projects that were rejected be referred back to the Work Group and Advisory Committee for refinement for reconsideration by the Board.

12. Recommendation to adopt the Kings Basin IRWMP

Chair Armstrong called on Samuelian to provide a report on the adoption of the Kings Basin IRWMP. Samuelian reported that the IRWMP update has been a year-long process. The IRWMP Update Work Group met monthly to review and discuss each chapter and guidelines. Samuelian reported that input and comments were received during this process by over 25 stakeholders with regular updates provided to the Advisory Committee and Board at their regularly scheduled meetings. A Work Group draft was prepared on June 6, 2012. The public comment period was from 8/8/12 – 9/14/12 with a public notice being filed. Twenty-five public comments were received and addressed. Samuelian reported that it is the recommendation of the Advisory Committee to approve the Kings Basin IRWMP with comments that were addressed. Samuelian outlined the next steps including publishing and addition to the website of the Kings Basin IRWMP and Project List. Samuelian reported that to be eligible for grant funding, each Member and Interested Party must adopt the updated IRWMP. It was noted by several Board members that a tremendous effort was provided by the IRWMP Update Work Group and the consulting firm Provost & Pritchard to accomplish this project. It was moved by Director Kapheim, and seconded by Director Querin and unanimously carried to adopt the Kings Basin Integrated Regional Water Management Plan.

13. Recommendation to execute Proposition 84 sub-grantee agreements

Chair Armstrong called on Osterling to provide a report on execution of sub-grantee agreements. Osterling reported that four sub-grantee agreements for Proposition 84 were ready to be executed. It was moved by Director Nielsen, and seconded by Director Moore and unanimously carried to authorize Chairman Armstrong to execute Proposition 84 Round 1 Implementation Grant sub-agreements in the form substantially as presented with 1) County of Fresno 2) City of Clovis 3) East Orosi Community Services District and 4) Consolidated Irrigation District.

14. Recommendation to amend JPA Section 3.02

Chair Armstrong called on Orth to report on the amendment to the JPA Section 3.02. Orth reported that the Advisory Committee members expressed a concern regarding the inability to achieve a quorum for the Advisory Committee. Orth stated that the Upper Kings Basin Integrated Regional Water Management Joint Powers Agreement (JPA) Section 3.02 – Advisory Committee and Other Committees states that "A majority in number of the members of the Advisory Committee shall constitute a quorum for the transaction of the Advisory Committee's business." Orth reported that due to the current Advisory Committee membership, it requires 26 members to be present to reach a quorum. Orth stated that the Advisory Committee has never conducted a meeting with a quorum present. Orth reported that at the Advisory Committee at their September 19, 2012 meeting directed KRCD, as the Water Authority's fiscal agent, to consult with counsel about amending the JPA regarding what constitutes a quorum for the Advisory Committee. Orth recommended that the Board approve the proposed amendment to the JPA Section 3.02 to allow for flexibility in constituting a quorum for the Advisory Committee. The suggested amendment to Section 3.02 allows the Board to set a quorum at its discretion. Orth stated that if the suggested amendment is approved by the Board, 75 percent of all the members must concur to amend the Agreement as stated in Section 7.01 of the JPA. Orth reported that once that occurs the Board would then set the majority for the Advisory Committee. It was moved by Director Orth, and seconded by Director Moore and unanimously carried to amend the JPA Section 3.02 to allow for flexibility in constituting a quorum for the Advisory Committee.

15. Recommendation to augment Fiscal Year 2011-12 Budget
Chair Armstrong called on Shilling to provide a report on the augmentation to the Fiscal Year 2011-12 budget. Shilling reported that the primary reason for the augmentation to the budget was to authorize the Prop 84 Implementation Grant Activity, Revenue & Expenses of $895,000. The Grant contract was signed and activity started right away before the budget could be adjusted at a quarterly meeting. Shilling reported that other adjustments that were made included adjusted revenue & expenses for the Mini-50, Prop-84 Planning Grant, and Prop-84 DAC Grant to actual amounts spent as of June 20, 2012; recognized the Other DAC Grant Contributions of $1,145; added the Interest Expense on the outstanding warrant of $395; and increased Professional Services by $2,395 to balance Revenues with Expenses. It was moved by Director Kapheim, and seconded by Director Mills and unanimously carried to approve the recommendation by the Budget Sub-committee to augment the Fiscal Year 2011-2012 budget.

16. Recommendation to approve proposed Fiscal Year 2012-13 Budget
Chair Armstrong called on Shilling to provide a report on the proposed Fiscal Year 2012-13 budget. Shilling reported that the Ad Hoc Budget Committee met on June 26 to consider a draft budget for Fiscal Year 2012-13. Shilling provided an overview of the proposed budget. It was moved by Director Kapheim, and seconded by Director Martinez and unanimously carried to approve the recommendation by the Budget Sub-committee to approve the Fiscal Year 2012-13 budget.

17. Request to approve Quarterly Financial Reports
Chair Armstrong called on Shilling to provide an overview of the quarterly financial report for the periods April1 – June 30 and July 1– September 30, 2012. Shilling noted that the financial report was included in the agenda packet. Shilling reviewed the expenses and income. It was moved by Director Burleson, and seconded by Director Akins and unanimously carried to approve the quarterly financial report for the periods April1 – June 30 and July 1– September 30, 2012.

18. Consider using Reserve Funds for cash flow to fund grant expenditures
Chair Armstrong called on Shilling to provide a report on using reserve funds for cash flow to fund grant expenditures. Shilling reported that on January 18, 2012, the Board adopted *Policy No. UKB-004 – Reserve Fund Policy*. Shilling reported that excerpts from that policy statement read as follows: "Undesignated funds held by the Authority could be used to pursue development of collective benefit projects and/or be used as matching funds for collective benefit project grants. The strategy of the Authority is to develop and maintain the financial resources to allow it to respond to

collective benefit project opportunities swiftly and efficiently." Shilling reported that the Prop 84 Planning Grant and the DAC Pilot Project are both collective benefit opportunities that require the Authority to spend money on the projects and then bill DWR for reimbursement. Shilling reported that the Budget Committee discussed this item on June 26 and recommends that Reserve Funds currently calculated at $148,834 be approved for use for cash flow purposes to fund Prop 84 collective benefit grant expenses while waiting for grant reimbursements. Shilling stated that by using reserves in this way, issuing additional warrants and paying interest may not be necessary. It was moved by Director Blayney, and seconded by Director Nielsen and unanimously carried to approve the recommendation by the Budget Sub-committee to authorize using the Reserve Funds for cash flow purposes to fund grant expenditures while waiting for reimbursement by the grants.

19. Other items for discussion or reporting
No other items for discussion.

20. Next meeting date: January 16, 2013 at 9:30 am, Fresno County Farm Bureau
Chair Armstrong reported that the next regularly scheduled Board of Directors meeting is on January 16, 2013 at 9:30 am at the Fresno County Farm Bureau office.

It was moved by Director Martinez and seconded by Director Nielsen, and unanimously carried to adjourn the meeting. There being no further business, Chair Armstrong adjourned the meeting at 11:17 am.

Respectfully submitted,

_____
David Orth
Secretary/Treasurer

_____
Approved

/
/
/