WATER SUPPLY ENHANCEMENT PROJECT FOR THE POSO CREEK INTEGRATED REGIONAL WATER MANAGEMENT PLAN REGION

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ABSTRACT

This paper provides an overview of the Water Supply Enhancement Project (Project) for the Poso Creek Integrated Regional Water Management (IRWM) Region (Region). The Project involves implementation of both non-structural and structural measures identified in the Poso Creek IRWM Plan. A combination of local, private, state, and federal funding sources are being utilized to fund the implementation measures.

The Region is located in north Kern County and southern Tulare County of the Southern San Joaquin Valley, California, and contains predominately agricultural districts with 347,000 irrigated acres out of 500,000 gross acres. The managed water supplies for districts within the Region include:

Local: Kern River, Poso Creek, and the common groundwater basin
State: State Water Project (SWP) via the California Aqueduct
Federal: Central Valley Project (CVP) via the California Aqueduct and the Friant-Kern Canal

Court-ordered actions and hydrologic droughts in California are causing a decrease in available surface supplies to agricultural, urban, and environmental water users. Implementation of the Project is needed to off-set existing and projected losses to surface supply reliability and to conserve groundwater. Since the Region is located at the crossroads of the California Aqueduct, Friant-Kern Canal, and the Kern River, it is an ideal location for conjunctive management.

INTRODUCTION AND BACKGROUND

The Poso Creek IRWM Plan Region (Region) is located in north Kern County and southern Tulare County of the Southern San Joaquin Valley, California as shown in Figure 1. The Water Supply Enhancement Project (Project) is being implemented based on an integrated Plan developed for the Region that provided a framework for (1) coordinating groundwater and surface water management activities through regional objectives, and (2) implementing the measures necessary to meet those objectives.

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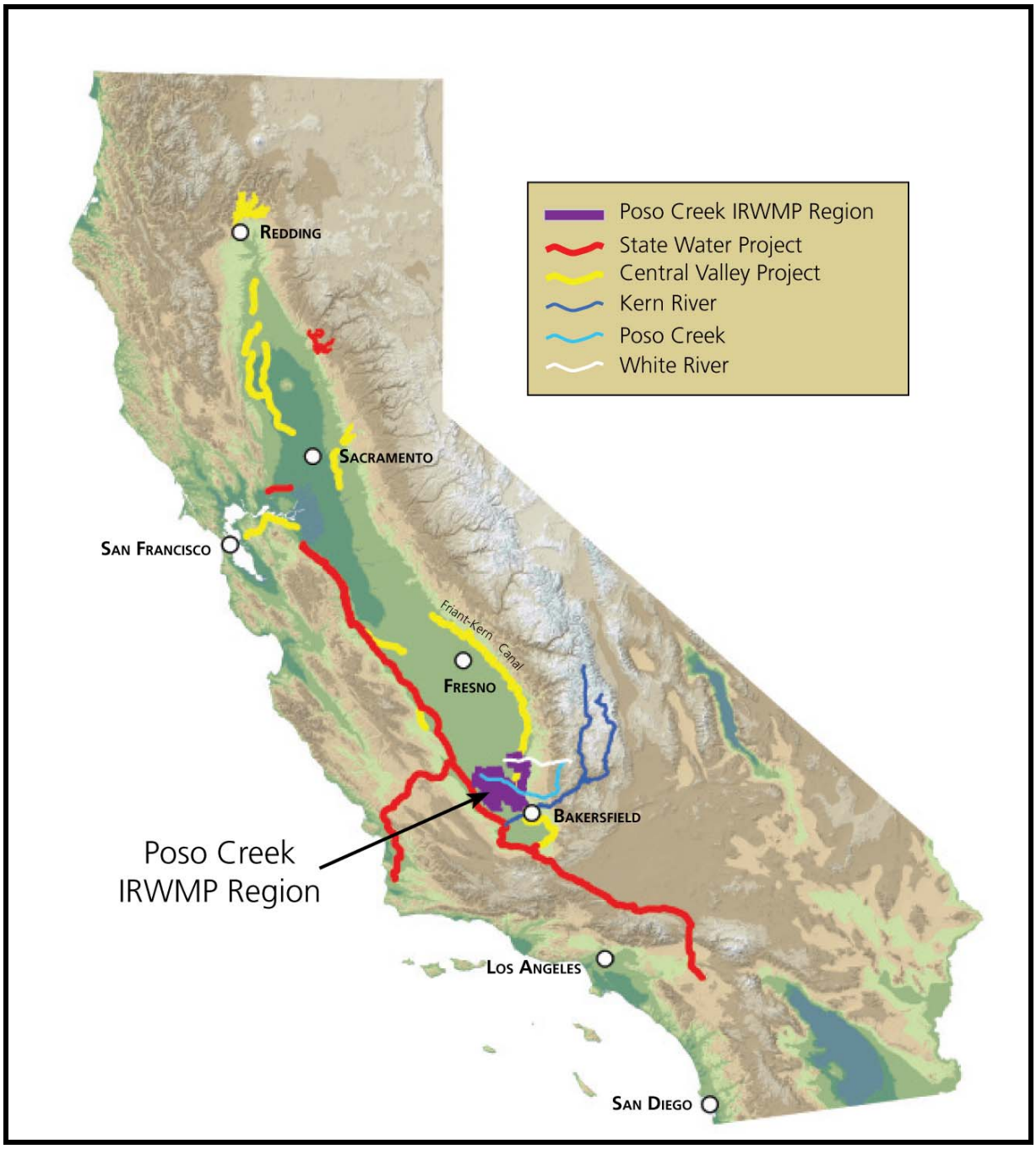

Figure 1. Location of Poso Creek IRWM Plan Region

The Plan's Regional Water Management Group (RWMG) was formed in March, 2005, and includes six special districts and one resource conservation district within the Region, as shown on Figure 2. The RWMG is an experienced group of water managers that includes:

- Semitropic Water Storage District – Lead Agency
- Cawelo Water District
- Delano-Earlimart Irrigation District
- Kern-Tulare Water District
- North Kern Water Storage District
- Shafter-Wasco Irrigation District
- North West Kern Resource Conservation District

The RWMG completed and adopted the Poso Creek IRWM Plan in July 2007. The RWMG, Stakeholders, and Plan Participants continue to meet monthly to coordinate implementation activities.

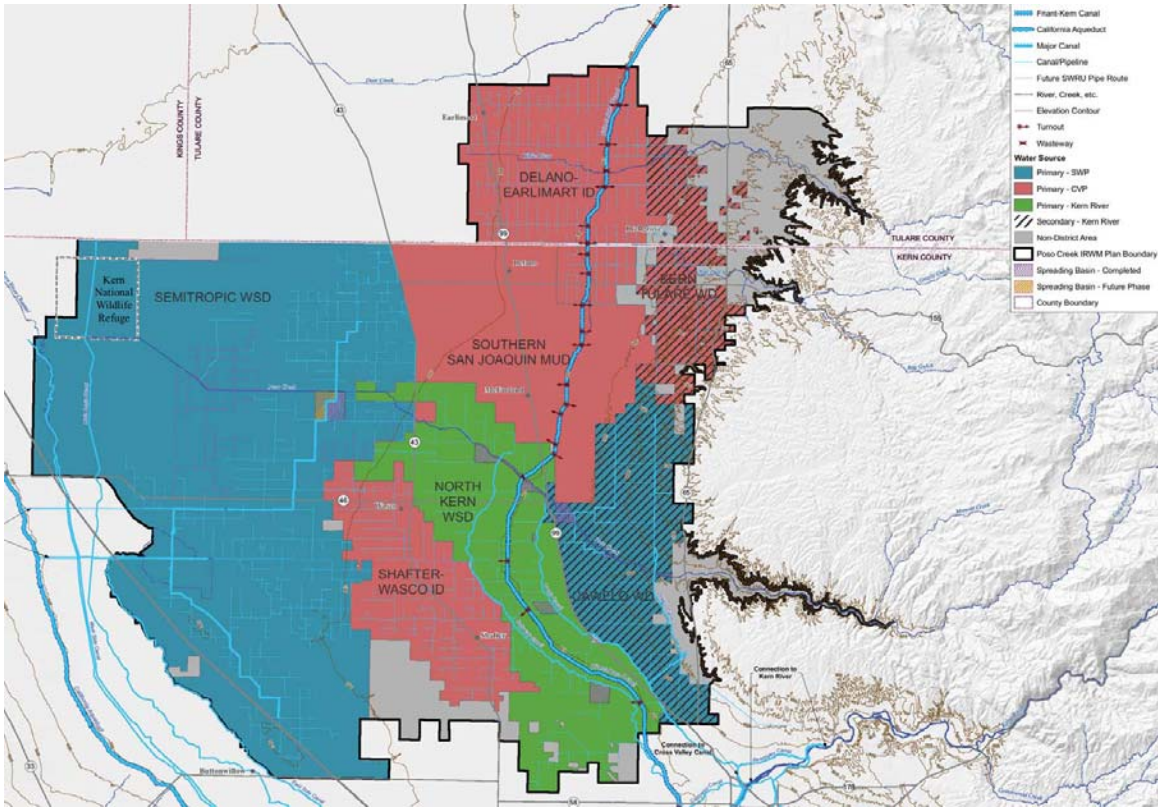

Figure 2. Districts within the Poso Creek IRWM Plan Region.

The Region has a very unique location regarding water supply and this is a valuable asset, not only to the Region but to California. The proximity of the Region to the California Aqueduct, Friant-Kern Canal, Kern River, Poso Creek, and groundwater banking facilities, combined with large conveyance and absorptive capacity, provides an ideal setting for expanded conjunctive use operations.

In addition to the unique location, the Region's assets include a groundwater basin that is common to the districts with multiple surface water supplies from several sources. Once the individual districts began meeting and considering expanding conjunctive water management operations as a regional group, it became apparent that the reliability of water supply to the Region could be increased by operating cooperative programs among the districts. Since the RWMG members share common interests and the group is of a manageable size, water management programs to off-set losses in surface water reliability and to conserve groundwater developed quickly from planning to implementation.

CONJUNCTIVE WATER USE EXPERIENCE IN REGION

The agricultural districts in the Poso Creek region have been participating in conjunctive water use for over 50 years, with some of their landowners practicing conjunctive use for over 100 years. In particular, conjunctive water use refers to the coordinated and planned use and management of both surface water and groundwater resources to maximize the availability and reliability of water supplies in a region. (DWR, 2009)

Surface water supplies can be stored through *in-lieu* recharge (delivery of surface water for irrigation instead of pumping groundwater) and direct recharge (delivery of surface water into ponds or channels) in individual districts and also in neighboring districts that form banking and exchange agreements. The projects identified in the Poso Creek IRWM Plan reflect the RWMG's primary goal to enhance regional water reliability and conserve groundwater through coordinated operation of neighboring district facilities to compliment their in-district facilities.

HISTORICAL AND PROJECTED WATER SUPPLY FOR THE REGION

The Region is underlain by the Poso Creek Hydrologic Unit, a subbasin of the Tulare Lake Basin (DWR No. 5-22.14) (Poso Creek RWMG, 2007), thus all of the districts have usable groundwater. The various water supplies for the Region are summarized in Table 1, followed by the proportions of the local and imported surface water supplies.

Table 1. Water Supply Sources for the Regional Water Management Group

	SWP	CVP Delta	CVP Friant	Kern River	Poso Creek or Other Local Streams	Ground-water
Cawelo	✓			✓	✓	✓
Delano-Earlimart			✓		✓	✓
Kern-Tulare		✓		✓	✓	✓
North Kern				✓	✓	✓
Semitropic	✓				✓	✓
Shafter-Wasco			✓			✓

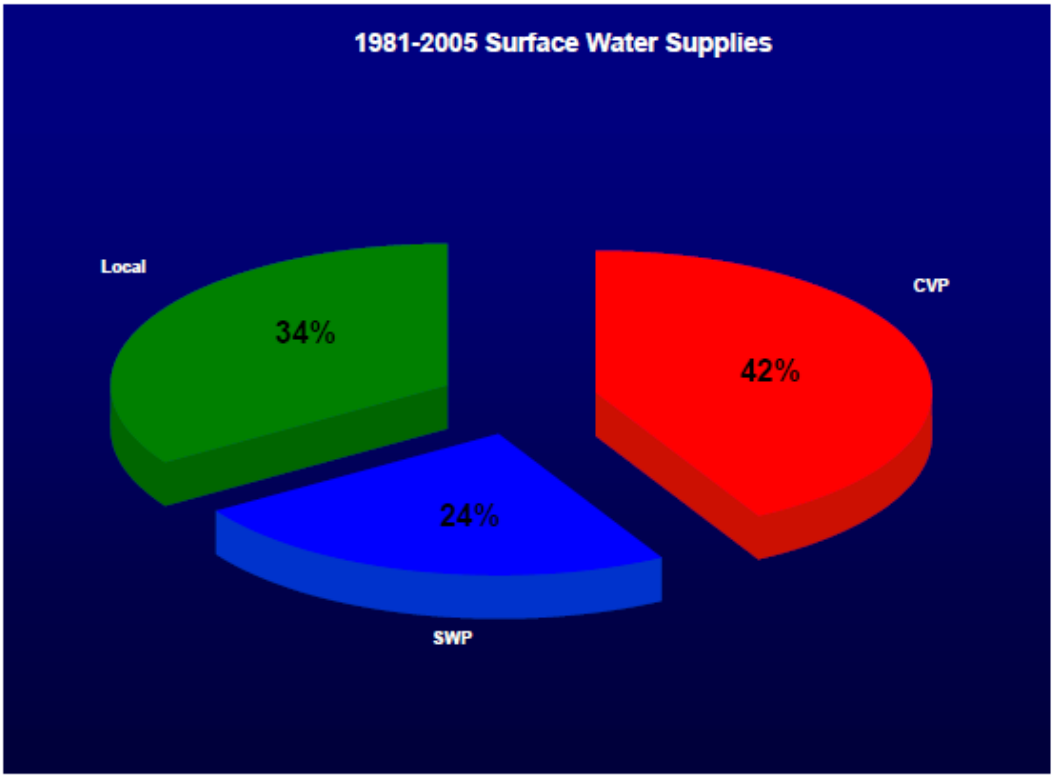

Figure 3. Proportions of Local and Imported Water Supplies.
(Poso Creek RWMG, 2007)

The total surface water diversions from all sources to the Region from 1981 through 2005 are shown in Figure 4. This 25-year period was selected as a baseline for analyses performed for the Operations Model developed for the Poso Creek IRWM Plan. This model analyzed historical water deliveries, supply, demand, and spreading. The annual surface water diversions to the area varied from less than 400,000 acre-feet per year to over 1,000,000 acre-feet per year. The average over the period was 775,000 acre-feet per

year (Poso Creek RWMG, 2007). A combination of hydrological, environmental, and regulatory constraints are affecting conveyance and reliability of surface supplies delivered to the Region, which results in a projected decrease of the three principal sources of surface water delivered to the Region in comparison to historical supplies (DWR, 2008).

Also illustrated in Figure 4 is the annual variation from the average groundwater level changes for the Region. The average groundwater level change over the 25-year period is represented on the secondary y-axis as 0 feet. During this 25-year period (1981 through 2005) average groundwater levels for the Region, which drop in the dry years, have been able to recover to near pre-drought conditions in the wet-periods indicating a long-term positive balance between supplies and demand in the Region. (Poso Creek RWMG, 2007)

The operating range of the basin over the 25-year period is outlined by red dotted lines. By observation of the water level fluctuations for the Region and the Operations Model, it is estimated that the groundwater basin in the Region stores approximately 100,000 acre-feet of water for every 10 feet of water level change. There is approximately a 50-foot difference between the lowest groundwater level and the highest in the 25-year study period. No significant impacts to the groundwater basin occurred during this period. Therefore, at a minimum, an estimated 500,000 acre-feet of usable storage is available in the groundwater basin when the groundwater is at the lower limit.

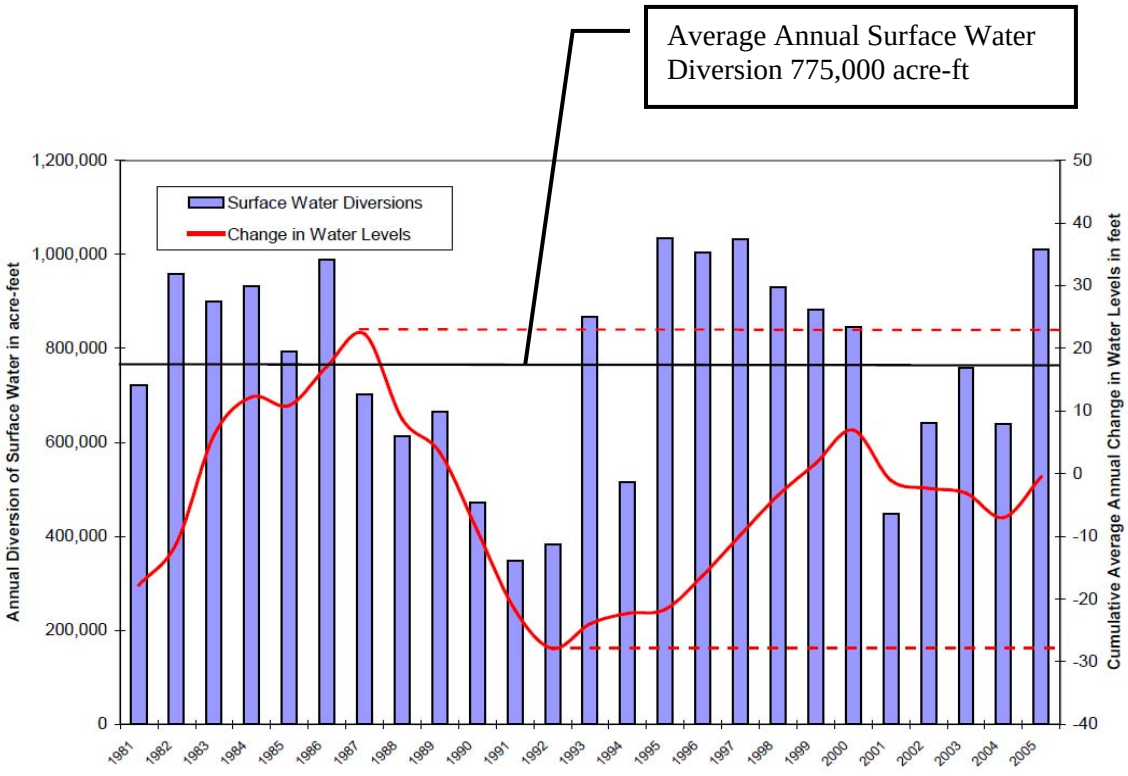

Figure 4. Historical Surface Water Diversions and Average Change in Groundwater Levels

PURPOSE AND NEED FOR PROJECT

Water supply reliability and sustainability of the common groundwater basin within the Region are being impacted by changing dynamics of water supply timing and availability, such as:

- ✓ Environmental and water quality regulations, including Court-ordered actions;
- ✓ Increased urbanization resulting in reductions in water available for agriculture; and
- ✓ Changes in weather patterns associated with climate change.

While the *common groundwater basin* is the reason that all overlying uses will feel the impact, it is also the reason that anything that is done to mitigate declines in water levels, such as projects identified in the Poso Creek IRWM Plan, will benefit all uses. The *need* for a water supply enhancement project for this Region (Project) is to respond to these projected reductions in water supply as illustrated in Figure 5, below.

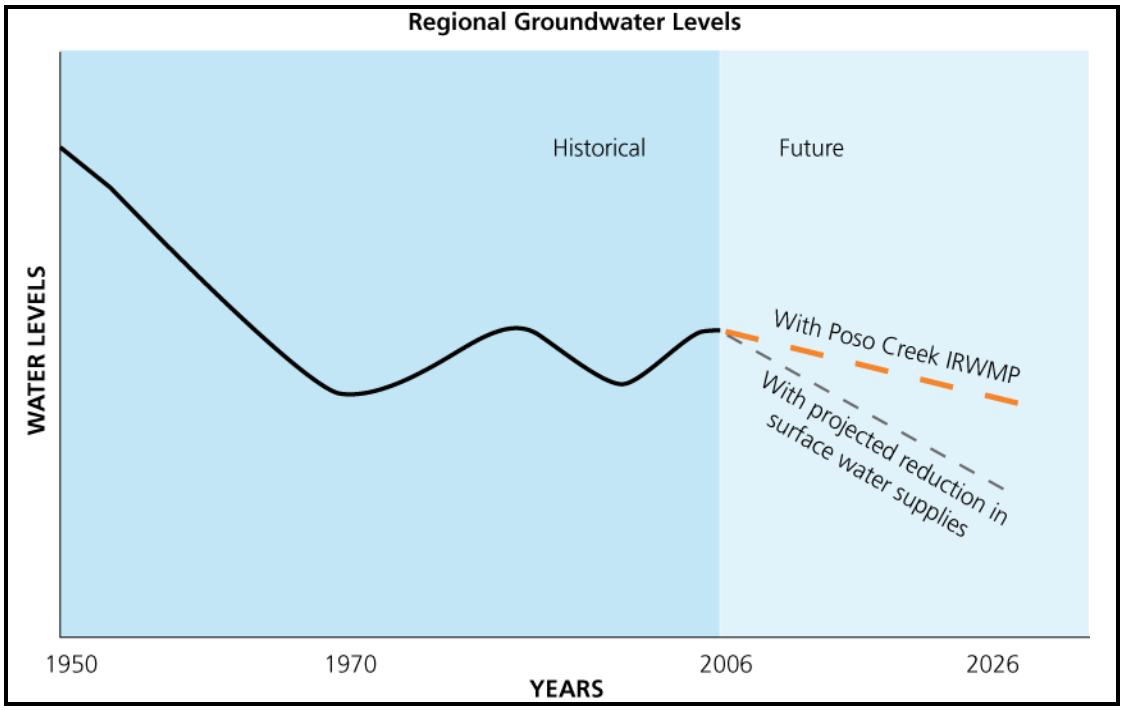

Figure 5. Challenges to the Region: Historical and Projected Groundwater Levels

The results of the Operations Model identified that future surface water supplies delivered to the Region were anticipated to decrease as compared to the recent 25-year historical period analyzed in the Poso Creek IRWM Plan. As a result of this future surface water supply uncertainty there would be an inherent decline in the average groundwater levels in the Region. To help offset this anticipated decline, the Poso Creek IRWM Plan identified non-structural and structural projects to limit the projected impact.

Implementing these identified projects will enhance the water supply reliability and conserve groundwater for the Region.

Therefore, the *purpose* of the water supply enhancement Project is to make the necessary non-structural and structural changes that allow for the Plan participants to reduce surface water supply losses by recharging the aquifer at the time the surplus surface water supplies are available. Implementing the Project would enhance storing of the surface supplies in a district which has capacity to absorb the supplies when they are available. Recharge can be performed by the following methods:

- Using direct recharge by delivering water into recharge ponds, and
- Using in-lieu recharge by delivering surface water for irrigation, thereby reducing pumping of groundwater.

When the Poso Creek IRWM Plan was completed in 2007, the Participants were capable of absorbing over 1 million acre-feet in a calendar year. As the structural and non-structural projects of the Poso Creek IRWM Plan are implemented, it will increase the absorptive capacity within the Region. Based on the findings of the Operations Model presented in Chapters 4, 5 and 7 of the Poso Creek IRWM Plan, *even if all structural and non-structural components of the Poso Creek IRWM Plan were implemented,* the Region would not be able to fully recover the loss of water supply unless a solution to the Sacramento-San Joaquin Delta pumping restrictions were developed (Poso Creek RWMG, 2007).

WATER SUPPLY ENHANCEMENT PROJECT

The Water Supply Enhancement Project components, shown in Figure 6 and listed in Table 2, will provide the districts within the Region operational flexibility to help adapt to water management constraints and maximize the use of their contract water supplies and other supplies that may be available from time to time. In particular, the Project provides the means for coordinating the assets, needs, and operations of the districts within the Region, with the end result being improved *water supply reliability and conserved groundwater*.

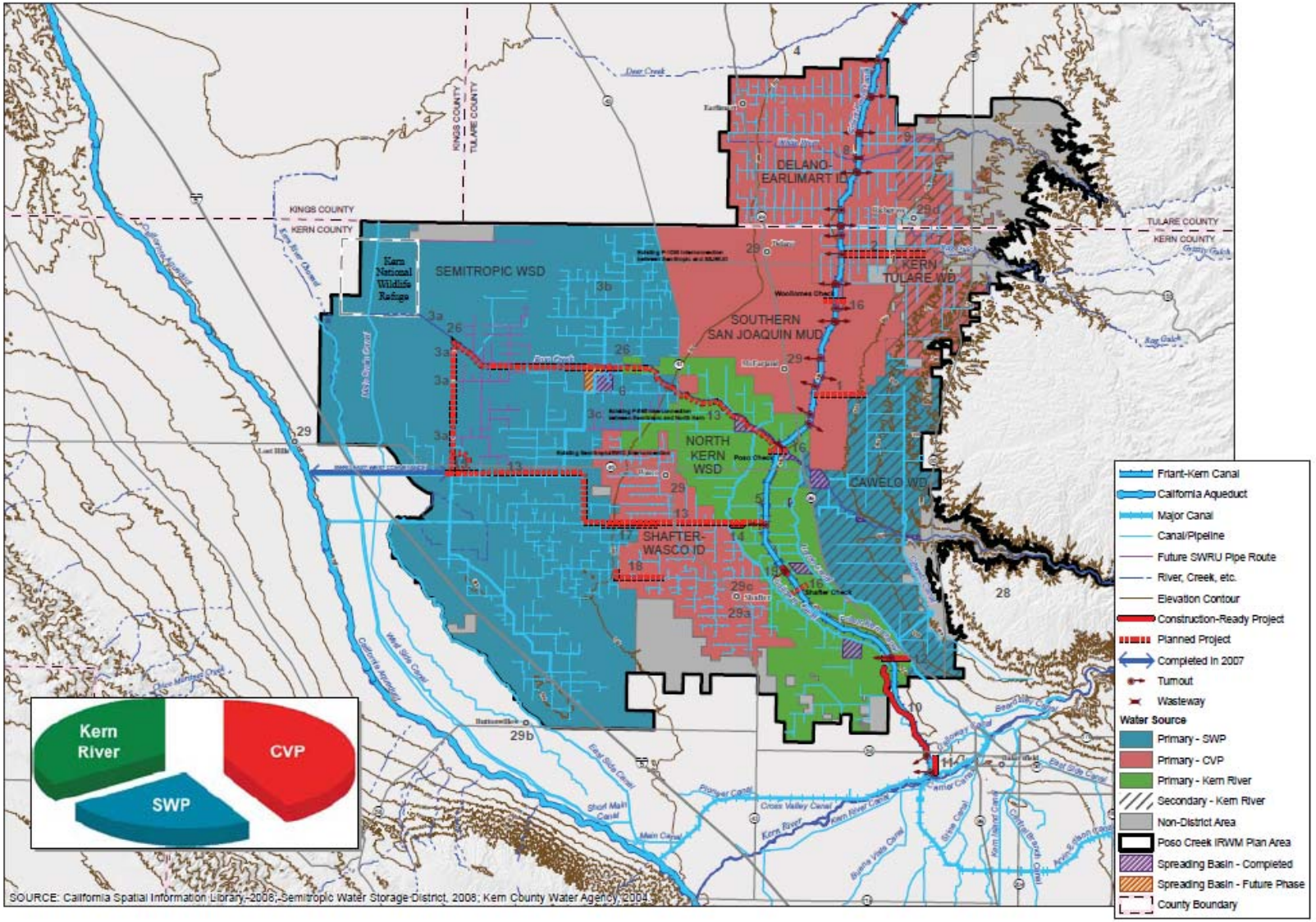

Figure 6. Water Supply Enhancement Project for the Poso Creek IRWM Plan Region

Table 2. Poso Creek IWRM Plan Projects

Structural Projects (Locations Shown on Map)

Updated January 2010

P = In Progress C = Construction Complete
D = Planning/Preliminary Design S = Shovel-Ready for Construction
= Federal funded ($) = Potential State or Federal funding

Expand In-Lieu Service Areas

- D 1 Connect Friant-Kern Canal Turnout to Cawelo's North System
- D 2 Ninth Avenue Pipeline
- S **3a** **Stored Water Recovery Unit ($917K)**
  - In-Lieu Service Area Facilities
  - Well Field Recovery Facilities & HCP
- C 3b Expand P-1030 In-Lieu Service Area
- C 3c New P-565 In-Lieu Service Area

Expand Direct Recharge

- D 4 G-W Banking North of DEID with Pixley ID
- D 5 G-W Banking Conveyance Improvements to North Kern WSD Recharge and Recovery Facilities; Additional Friant-Kern Canal Turnout and Groundwater Recovery Wells
- S **6** **Pond Poso Spreading Grounds ($2.2M)**
- D 7 Rag Gulch G-W Banking Project
- S **8** **Turnipseed GW Banking Project Enhancement along White River in DEID ($1.55M)**
- D 9 White River G-W Banking in Rag-Gulch

Modify Conveyance Systems

- S 10 Calloway Canal Improvements
- S **11** **Calloway Canal to Cross Valley Canal Interconnection**
- S **12** **Calloway Canal to Lerdo Canal Interconnection ($5M)**
- D 13 Multi-District Conveyance Facility
- S **14** **North Interconnection between North Kern WSD/Shafter-Wasco ($300K)**
- D 15 Pilot Arsenic Treatment Plant
- D 16 Reverse Flow in the Friant-Kern Canal
- D 17 Shafter-Wasco/Semitropic Interconnection on Kimberlina Road
- D 18 Shafter-Wasco/Semitropic Interconnection on Madera Avenue
- S **19** **South Interconnection between North Kern WSD/Shafter-Wasco**

Non-Structural Projects (some locations not shown on map)

- P **20** **Energy Usage**
- P 21 Joint Powers Authority
- P **22** **Institutional Agreements and Governance for IRWMP Implementation ($300K)**
- P **23** **GW Banking for Parties Outside of Poso Creek IRWMP Region ($5M)**
- P 24 Optimizing Region's Pumping Lifts
- P **25** **Enhance Groundwater Monitoring and/or Modeling**

Enhance Environmental Resources

- D **26** **Wildlife Improvement Projects in IRWMP Region**
- D 27 Environmental Water Management in Support of Wildlife Settlements Outside of IRWMP Region

Enhance Flood Control

- D 28 The Poso Creek Flood Control and Water Conservation Reservoir Project

Assist Economically Disadvantaged Communities

- D **29** **Enhance Water Supply, address Drinking Water Treatment Needs, and upgrade Waste Water Treatment Facilities (~$7M)**

- The *findings and conclusions* of the Poso Creek IRWM Plan include …

    - The Region has a water supply problem (with the projected long-term average annual reduction in surface water supplies projected to be over 100,000 acre-feet of the 775,000 acre-feet per year delivered into the Region during the period 1981-2005).

    - By the individual districts working together to operate as a Region, the problem can be reduced but not eliminated; Regional solutions, based on currently available supplies, will be limited in effectiveness until a solution to the Sacramento-San Joaquin Delta is achieved.

    - Project priority is given to enhancing conveyance between districts within the Region that increases absorptive capacity and operational flexibility so wet-period water can be delivered when it is available.

    - Both non-structural and structural measures are required.

- Implementation of the Project for the Poso Creek IRWM Plan includes...

    - **Non-structural measures being implemented**:

        - An organizational structure and environmental compliance framework that allows for banking and exchange approvals to be in place to take advantage of unregulated and unscheduled water supplies that are available from time to time, often on short notice (This means a pre-approval CEQA/NEPA documents for expediting approval of banking and exchange agreement among districts within the Region).

        - The framework that allows districts to form agreements to deliver their water supplies into the Region to maximize the utility of the Region's assets and thereby maximizing water supply and reliability to the Region (This is being accomplished by a monthly meeting framework that allows banking and exchange agreements between districts to be formed quickly and make use of the CEQA/NEPA expedited approval process for the Region).

        - A means of maintaining equity between districts within the Region, in terms of water and/or dollars (Presently, the districts continue to meet monthly and utilize their cost sharing mechanism of their MOU for the Region; in the future this could be used as a mechanism to raise local funding for projects, including participation from non-agricultural users).

- **Structural measures being implemented:**

  - *Conveyance Improvements* to deliver CVP supplies from the Friant-Kern Canal to non-CVP districts who have direct and in-lieu recharge capacity.

    - Interconnect North Kern and Shafter-Wasco to increase exchange capacity of CVP supplies.

    - Interconnect the Calloway and Lerdo canals to allow CVP and SWP contract supplies to be banked in North Kern and/or Cawelo.

    - Additional turnout capacity from Friant-Kern Canal to North Kern.
    - Enhancements to Poso Creek channel that improves conveyance of Friant-Kern CVP water into Semitropic, North Kern, and Cawelo.

  - *Absorptive Capacity Improvements* for banking wet-period supply by increasing the capacity for direct and in-lieu recharge and recovery facilities. Table 3 identifies the existing facilities and spreading basins under construction that are being added to increase the absorptive capacity during the "shoulder" months of the irrigation season when agricultural demand is lower.

  - *Flexibility in Absorbing Supplies* for all districts that receive delivery of SWP and CVP supplies delivered from the CA Aqueduct by interconnecting the Cross Valley Canal and Calloway Canal.

  - *West-to-East conveyance improvements* to enhance the return capacity ability of the Region to complete banking and exchange agreements that involve delivering CA Aqueduct supply for Friant-Kern Canal supply.

    - Interconnections between Semitropic and Shafter-Wasco; enhance an existing and consider new interconnections.

    - Interconnections between Semitropic and North Kern.

    - A Multi-District Conveyance Facility capable of bi-directional, direct delivery of water, up to 300 cfs, between the CA Aqueduct and the Friant-Kern Canal.

Table 3. Recharge, Storage and Recovery Facilities Capacity

Districts	Recharge Capacity				Recovery Capacity	
	Spreading Basin(s)	**Recharge Rate (ac-ft/day)**	**Fill Rate (cfs)**	**Spreading Ground Capacity (ac-ft/yr)**	**Instantaneous (cfs)**	**Annual (ac-ft/yr)**
SWSD	Pond-Poso (in construction)	250	370	65,000	105 (district wells) 705 (landowner wells)	66,000
SWID	none					
NKWSD	5 sites	720	363	300,000	200 - 300 (estimated)	80,000 (historical) 200,000 (theoretical)
DEID	Turnipseed (in construction)	50 - 60	25 - 30	TBD	TBD	TBD
KTWD	none					
CWD	1 site	160	80	65,000	40	29,000

Notes: 1. Data includes capacity for existing and proposed spreading grounds.

PROJECT IMPLEMENTATION AND ACCOMPLISHMENTS

The RWMG continues to meet monthly under a Memorandum of Understanding to implement the Water Supply Enhancement Project identified in the Poso Creek IRWM Plan. During the Plan formulation and monthly implementation discussions, two common themes emerged:

- A sense of shared responsibility on the part of the member districts of the RWMG for sound stewardship of the Region's surface water and groundwater resources, and

- Recognition that water supply challenges facing this Region may only be solved through regional collaboration and cooperation with neighboring districts, San Joaquin Valley planning efforts, such as the California Partnership for the Southern San Joaquin Valley, and state and federal agencies who are responsible for oversight of the Sacramento-San Joaquin Delta.

The RWMG recognizes that water management improvements and institutional changes will take time. The RWMG also recognized the projected loss of surface water supply to the Region has accelerated the need for regional management in order to off-set losses and avoid future conflicts. This is the driving force that has brought the districts together and is the shared focus as they implement the Water Supply Enhancement Project.

The district managers are gaining trust and experience by meeting regularly to discuss regional water management operations under both wet-year and dry-year conditions. The result of this dedicated communication is a collection of water management strategies that are being implemented as funding permits. Recent funding accomplishments are identified in Tables 2 and 4.

The RWMG has also made progress on removing institutional constraints that, once achieved, would gain back 16,000 acre-feet per year of the projected loss, based on the Operations Model. The modeling also indicated that even with all projects implemented, only about 40-percent of the average annual shortfall of over 100,000 acre-feet may be recovered unless there is a Sacramento-San Joaquin Delta solution, thus, limiting the effectiveness of local solutions to this challenging water supply problem.

Table 4. Recent Funding Accomplishments

District	PROJECT NAME	Funding Source	YEAR OF AWARD	AWARD AMOUNT
Integrated Regional Water Management Plans				
Semitropic Water Storage District	Poso Creek Integrated Regional Water Management Plan	State	2005	$499,435
Semitropic Water Storage District Lead Agency	System Optimization Reivew for the Poso Creek IRWM Plan Area	Federal	2008	$300,000
Conjunctive Use				
Delano-Earlimart Irrigaion District	Turnipseed Groundwater Bank - Phase II	Federal	2009	$300,000
Delano-Earlimart Irrigaion District	Turnipseed Groundwater Bank - Phase II	Federal	2009	$1,000,000
Shafter-Wasco and North Kern Water Storage District	Water Banking Improvement Project	Federal	2009	$300,000
Kern-Tulare Water District	South Interconneciton between North Kern WSD and Shafter-Wasco ID	Federal	2009	$0
Semitropic WSD	Pond-Poso Spreading and Recovery Facility	Federal	2009	$2,222,660
Semitropic-Rosamond Antelope Valley Water Bank JPA	Antelope Valley Water Bank Initial Recharge and Recovery Facility Improvement Project	Federal	2009	$5,000,000
North Kern WSD	Calloway Canal to Lerdo Canal Intertie	Federal	2009	$5,000,000
Cawelo Water District	Cross Valley Canal to Calloway Canal Intertie	Federal	2009	$0
Semitropic WSD	Planning, Design, and Permitting the Stored Water Recovery Unit of the Semitropic WSD GW Bank	Federal	2010	$917,000
Groundwater Management/AB303/Local GW Assistance Program				
Delano-Earlimart Irrigation District	Groundwater Monitoring Improvments	State	2008	$250,000
North Kern WSD	North Kern Groundwater Monitoring Program	State	2008	$250,000
Semitropic Water Storage District	Regional Subsidence Monitoring	State	2005	$220,000
Semitropic WSD	2005 Groundwater Monitoring Improvement Project	State	2005	$218,141
Semitropic WSD	2008 Groundwater Monitoring and Management Improvement Project	State	2008	$0
Total Funds Awarded				**$16,477,236**

SUMMARY

Districts within Poso Creek IRWM Plan Region of the Southern San Joaquin Valley are faced with re-regulating their local, state, and federal water supplies in an effort to reduce the impacts on their common groundwater basin. These districts are concerned with maintaining water supply reliability as they respond to the following issues:

- Court-ordered reductions on pumping South of the Sacramento-San Joaquin Delta,
- San Joaquin River Settlement, and
- Restrictions on Kern River water.

All of these concerns lead to a projected loss of surface water supply to the Region as compared to their historical use of supplies. These concerns have also led to the RWMG implementing this Water Supply Enhancement Project based on the findings of the Poso Creek IRWM Plan.
Implementing the Project requires an increased capital outlay for modifying and adding infrastructure needed to manage district water supplies differently than in the past. Recently, the districts were successful in receiving Federal funding assistance through Reclamation's Challenge Grant Program and they will continue to implement the Project as local, State, and Federal funds are available.

REFERENCES

Poso Creek Regional Water Management Group, July 2007. Semitropic Water Storage District – Lead Agency. *Poso Creek Integrated Regional Water Management Plan.*