Pixley Irrigation District
RESOLUTION No. 2012 - 9 -1

ADOPTING A FIVE YEAR UPDATE OF THE DISTRICT'S WATER MANAGEMENT PLAN

WHEREAS, a five year update to the Pixley Irrigation District's WATER MANAGEMENT PLAN, has been prepared, presented to and discussed by the Board of Directors of the Pixley Irrigation District which defines water management, control and policies of the Pixley Irrigation District:

THEREFORE, BE IT RESOLVED, that the WATER MANAGEMENT PLAN prepared by the staff of the Pixley Irrigation District, is adopted as presented and discussed as a noticed meeting scheduled for this date, is deemed acceptable and the Board of Directors finds that adoption of the same is in the best interest of the Pixley Irrigation District and its landowners;

RESOLVED FURTHER, that Daniel G. Vink, General Manager, is hereby authorized and directed to file said WATER MANAGEMENT PLAN on behalf of the Pixley Irrigation District with the U.S. Bureau of Reclamation as deemed acceptable to this Board of Directors and to execute such other documents as may be necessary to carry out the intent of the above resolution.

The foregoing Resolution was adopted at a regular meeting of the Board of Directors of the Pixley Irrigation District held on the 6th day of September 2012, upon a motion of the Director JUNIO and seconded by Director WESTBROOK, upon the following vote:

AYES: 4
NOES: 0
ABSENT: 1

APPROVED: _____
Daniel G. Vink, Secretary

Pixley Irrigation District
Water Management Plan
2008 Criteria

Date of first draft – (12/30/11)
Date of final – (5/18/12)

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Section 1: Description of the District

District Name: Pixley Irrigation District

Contact Name: Dan Vink

Title: General Manager

Telephone: (559) 686-4716

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Web Address

A. History

1. Date district formed: 1958 *Date of first Reclamation contract*: 1975
Original size (acres): 69,571 *Current year (last complete calendar year)*: 2010

The Pixley Irrigation District (District) was organized in 1958 pursuant to the California Irrigation District Law, Division 11, Sections 20500 through 29975, as amended, of the California Water Code. The District was formed for the purpose of promoting flood control on Deer Creek and to secure a supplemental irrigation water supply from the Federal Central Valley Project and other agencies. This supply was needed to sustain and enhance the irrigated agriculture that had developed in the area.

The District's water supply is derived from the use of groundwater, surface water diverted from Deer Creek and surface water diversions from the Sacramento - San Joaquin Rivers delta under a long-term water service contract for Central Valley Project water with the U.S. Bureau of Reclamation and the State of California.

In 1975, the District sold bonds to purchase a share of the capacity in the Cross Valley Canal in Kern County and entered into a three-party contract with the U.S. Bureau of Reclamation and the State of California (for wheeling) to provide an additional water supply from the Sacramento River for 31,102 acre-feet through an exchange for water supplies with the Arvin-Edison Water Storage District (Cross Valley Exchange Program). This contract provided an additional average water supply of approximately 29,000 acre-feet per year through the first 20 years of contract history.

The District is governed by a board of five directors elected for four-year terms on a staggered basis of two and three, at elections held every two years. The District Board of Directors appoint an Engineer-Manager, Assessor, Collector, Treasurer, Legal Counsel and Secretary.

2. Current size, population, and irrigated acres

	2010
Size (acres)	69,571
Population served	0
Irrigated acres	59,283

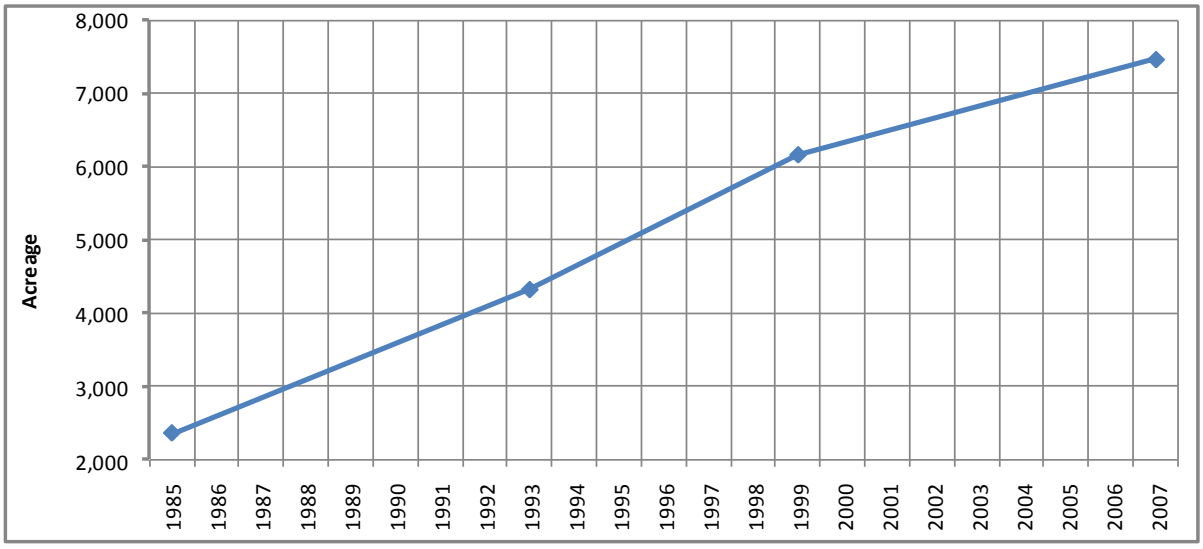
3. Water supplies received in current year

Water Source	*AF*
Federal urban water (Tbl 1)	
Federal agricultural water (Tbl 1)	
State water (Tbl 1)	
Other Wholesaler (define) (Tbl 1)	
Local surface water (Tbl 1)	1,000
Upslope drain water (Tbl 1)	
District ground water (Tbl 2)	
Banked water (Tbl 1)	
Transferred water (Tbl 6)	30,296
Recycled water (Tbl 3)	
Other (define) (Tbl 1)	
Total	31,296

4. Annual entitlement under each right and/or contract

	AF	*Source*	*Contract #*	*Availability period(s)*
Reclamation Urban AF/Y	0			
Reclamation Agriculture AF/Y	31,102	CVP	14-06-200-8238A	No CVP Wheeling
Other AF/Y	0			
Other AF/Y	0			

5. Anticipated land-use changes



Graph of Dairy\Ag Related Acreages for Pixley ID

There has been a general trend over the last few decades of increased dairy development in the district. This has reduced the irrigable acres within the District because of the development of dairy facilities, but has also increased the number of irrigable and cropped acres within the District as some new ground has been put into ag production due to dairy development and many dairies double crop their land.

6. Cropping patterns (Agricultural only)

List of current crops (crops with 5% or less of total acreage) can be combined in the 'Other' category.

Original Plan (2003)		*Previous Plan (enter date)*		*Current Plan*	
Crop Name	*Acres*	*Crop Name*	*Acres*	*Crop Name*	*Acres*
Alfalfa	5,452			Corn	22,152
Almonds	1,960			Alfalfa	12,160
Grapes	2,760			Almonds	5,443
Silage	9,145			Vineyard	4,981
				Wheat	3,299
				Cotton	2,920
				Sudan	984
Other (<5%)		*Other (<5%)*		*Other (<5%)*	1,335
Total	19,317	*Total*		*Total*	53,274

(See Planner, Chapter 2, Appendix A for list of crop names)

Although there is a large difference in cropped acres between the current plan and the plan in 2003, the actual increase in the District is not as drastic. The District's method of data collection changed around 2010. Prior to 2010 the method was to ask growers their cropped acreage information thinking that growers would reliably provide the requested information. Not all growers reported cropped acreage back to the District during this time, so information in the 2003 report reflects only a partial reporting of cropped acres. 2010 information is based on land use surveys completed by the California Department of Water Resources and provides a more complete view of the cropping in the District.

7. Major irrigation methods (by acreage) (Agricultural only)

Original Plan (2003)		*Previous Plan (enter date)*		*Current Plan*	
Irrigation Method	*Acres*	*Irrigation Method*	*Acres*	*Irrigation Method*	*Acres*
Furrow	12,377			Furrow	25,474
Sprinkler	500			Boarder Strip	16,000
Low Volume	3,052			Sprinkler	478
				Low Volume	11,321
Other	15,822	*Other*		*Other*	
Total	31,751	*Total*		*Total*	53,274

(See Planner, Chapter 2, Appendix A for list of irrigation system types)

The value for irrigated acres in 2010 is noticeably larger than the value of cropped acres in 2003, the reason for this is unknown as values were copied from the previous report. Initially it was thought this discrepancy was due to grower double cropping. Double cropping, however does not account for this large difference in acreages. There was a note in the 2003 report that irrigated acres came from the 1996 report. As previously mentioned, 2010 information is based on land use surveys completed by the California Department of Water Resources, includes double cropping and provides a more complete view of the cropping in the District.

B. Location and Facilities

See Plate 1 for a map that shows the general location of the District within Tulare County, CA. See Plate 2 for a map of District surface water conveyance facilities (creeks, canals and basins). The measurement facility for all channelized surface water flowing into the District is labeled on this map as Trenton Weir in Deer Creek. On the west side of the District Deer Creek continues past Highway 43, which is the location where the District views surface water is past their ability to divert.

See Plate 3 for a map of NRCS Soils within the District. See Plate 4 for a map of District turnout, control structures and measurement locations. The District does not own or operate any groundwater wells; however they do regularly monitor groundwater levels in privately owned wells. See Plate 5 for a map of the Deer Creek and Tule River Authority's (DCTRA) groundwater level monitoring network that covers the District. The District does not have any water quality monitoring locations.

The District includes approximately 69,571 acres of land, situated in the south-western part of Tulare County on the east side of the San Joaquin Valley. State Highway 99 bisects the District in a north-south direction and Deer Creek flows westerly through the entire length of the District. The Friant-Kern Canal is located from one to five miles east of the District's east boundary. The town of Pixley lies within the boundaries of the District, but for the most part is excluded from the District. The general location of the District is shown on Plate 1. The specific boundary of the District is presented in Plate 2.

The District has approximately 166 farm service outlets. Water delivery measurements are performed by means of calibrated slide gates (meter gates).

The District does not have any groundwater extraction facilities; therefore, each landowner must provide his own well(s) to sustain irrigation during periods when the District does not have surface water available.

1. Incoming flow locations and measurement methods

Location Name	*Physical Location*	*Type of Measurement Device*	*Accuracy*
Deer Creek Wasteway from FKC		Broad Crested Weir	± 4 %
East Main Canal		Parshall Flume	± 5 %
Harris Ditch		Parshall Flume	± 5 %
West Main Ditch		Parshall Flume	± 5 %

2. Current year Agricultural Conveyance System

The District's entire distribution system is unlined earth canals with CMP pipe or reinforced concrete control structures. Local financing by District landowners has been used for the construction of the distribution system. Collectively, the District owns or controls approximately 45 miles of earthen manmade canals in addition to the Deer Creek channel. The District delivers water from the Friant-Kern Canal through Deer Creek to District diversion structures in Deer Creek. The District's distribution system is shown on Plate 2. All of the District's distribution system also functions as their recharge facilities The 15 miles noted in the "Other" category accounts for the Deer Creek channel that is used to deliver surface water to District diversion locations. Currently the District facilities provide surface water delivery to approximately 27,510 acres within the District.

Miles Unlined - Canal	*Miles Lined - Canal*	*Miles Piped*	*Miles - Other*
45			Deer Creek - 15

3 Current year Urban Distribution System

Miles AC Pipe	*Miles Steel Pipe*	*Miles Cast Iron Pipe*	*Miles - Other*
N/A			

4. Storage facilities (tanks, reservoirs, regulating reservoirs)

In wetter years, the District maintains and operates its groundwater recharge/regulating reservoirs and distribution system to recharge the groundwater reservoir. The District maintains and/or operates nine (9) existing recharge and regulating basins with two basins planned for the future. The basins cover approximately 278 acres. The larger basins are divided into multiple cells for maximum efficiency and flexibility of operation.

Name	*Type*	*Capacity (AF)*	*Distribution or Spill*
School Pit (E)	Earth Embankment	150	Spill Capture
South Pit (E)	Earth Embankment	50	Spill Capture
Harris Pit (E)	Earth Embankment	25	Spill Capture
Michelle Pit No.1 (E)	Earth Embankment	150	Distribution
Hesse Pit (E)	Earth Embankment	200	Spill Capture
Valov Pit (E)	Earth Embankment	200	Spill Capture
West Main/Shop Pit (E)	Earth Embankment	50	Distribution
Michelle Pit No.3 (E)	Earth Embankment	200	Distribution
Berenda-Mesa Pit (E)	Earth Embankment	150	Spill Capture
Ave. 116 Lateral (P)	Earth Embankment	200	Spill Capture
DEID-PIXID Groundwater Bank Basins (P)	Earth Embankment	3,200	Spill Capture

(E) = Existing; (P) = Proposed

5. Outflow locations and measurement methods (Agricultural only)

Provide this information in Section 2 F.

6. Description of the agricultural spill recovery system

The District employs terminal basins in some location to capture spill from the District's distribution system, but these facilities then recharge the spill to local groundwater. In other words the water that enters these facilities cannot be delivered back to other parts of the system.

7. Agricultural delivery system operation (check all that apply)

On-demand	*Scheduled*	*Rotation*	*Other (describe)*
	100%		

8. Restrictions on water source(s)

Source	*Restriction*	*Cause of Restriction*	*Effect on Operations*
CVP	Availability	Pumping from Sacramento-San Joaquin Rivers Delta	Increase in groundwater pumping and purchases from other contractors
CVP	Availability	Reduced available surplus water supplies due to San Joaquin River Restoration Settlement	Increase in groundwater pumping and purchases from other contractors
East Main Diversion	Flow Rate	Physical	Maximum diversion from Deer Creek of approx. 45 CFS

9. Proposed changes or additions to facilities and operations for the next 5 years

Facility	Description	Schedule
Avenue 116 Lateral System	Construct a new surface water delivery system along Ave 116 to deliver to approx 8,000 acres that is currently not served	2012-2014
DEID-PIXID Groundwater Bank	Develop a new groundwater bank along Deer Creek through a partnership with DEID with a max dry year return of 30,000 AF/year	2012-2016

Recently the District completed a System Optimization Review Study that evaluated PIXID's available resources and potential projects that could be undertaken in the next five years. Through this effort to rank project alternatives based on benefits and costs the two projects listed in the table above were shown to be superior to other potential alternatives.

The Avenue 116 Lateral Project would be a cooperative project with Lower Tule River ID and would utilize LTRID's Casa Blanca Canal to deliver water to a new service area in PIXID through a connecting intertie and a new earthen lateral canal. This project would allow PIXID to avoid seepage losses that would otherwise be suffered through conveyance in Deer Creek. This avoided seepage allows the District to deliver and sell much more than it could otherwise.

The DEID-PIXID Groundwater Bank Project would develop a new bank with the ability to return up to 30,000 acre-feet per year to banking parties. The banking facility would be developed within PIXID along Deer Creek and DEID would be a partner in the facilities development so that they would have access to both a significant amount of the available banked

storage and the revenues generated from the bank. PIXID would potentially gain a stable revenue stream for the development of new District surface water delivery facilities and the leave behind percentage of banked supplies that would benefit local groundwater conditions is 10%.

In an over-arching sense, the District continues to need access to additional conservation storage space in order to "level out" a highly variable water supply. This storage space can either be surface (on-stream or off-stream storage) or can be provided through an enhanced conjunctive use (groundwater storage) program.

C. Topography and Soils

1. Topography of the district and its impact on water operations and management

The District is situated on the eastern floor of the San Joaquin Valley, approximately six miles west of the Sierra Nevada foothills. The District lies on and adjacent to the Deer Creek alluvial fan with a small area in the northwestern part of the District lying on the Old Tulare Lake bed. The surface slopes gently east to west from eight feet per mile on the east to five feet per mile near its western boundary. Maximum elevation is 415 feet above sea level on the east and the minimum elevation is 195 feet near its western boundary.

2. District soil association map (Agricultural only)

Soil Association	Estimated Acres	Effect on Water Operations and Management
Akers loam	16,707.7	Well drained, neg. runoff, saline-sodic phases moderately slow permeability
Hanford Loam	11,904.4	Well drained, neg. runoff, moderately rapid permeability
Gambogy-Giggriz	7,312.g	Poorly drained, moderately slow permeability
Gareck-Garces	5,118.7	Well drained, moderately slow permeability
Gambogy loam	4,666.9	Poorly drained, moderately slow permeability
Crosscreek loam	4,209.0	Well drained, moderately slow permeability above duripan, very slow below
Lethent loam	3,837.8	Moderately well drained, slow to very slow permeability
Colpien loam	3,540.9	Moderately well drained, moderately slow permeability
Biggriz loam	2,456.8	Somewhat poorly drained, moderately slow permeability
Kimberlina loam	2,342.4	Well drained, moderate to moderately rapid permeability, saline-sodic phases moderately slow permeability
Tagus loam	2,065.0	Well drained, moderate permeability
Flamen loam	1,141.7	Moderately well drained, moderate permeability above duripan slow permeability in duripan
Houser clay	944.8	Somewhat poorly drained, very slow permeability
Exeter loam	775.6	Moderately well drained, moderately slow permeability above druipan very slow in duripan

Soil Association	Estimated Acres	Effect on Water Operations and Management
Gepford clay	465.5	Poorly drained, ponded in areas, very slow permeability
Yettem loam	392.5	Well drained, moderately rapid permeability
Armona loam	386.7	Poorly drained, moderately slow to slow permeability due to sodicity and stratification
Excelsior loam	338.5	Well drained, moderate to slow permeability, slow permeability in saline-sodic horizons
Nord loam	337.5	Well drained, moderate permeability, moderately slow in saline-sodic phases
Centerville clay	156.3	Well drained, slow permeability
Nahrub loam	119.6	Somewhat poorly drained, very slow permeability, ponding can occur
Calgro loam	96.0	Moderately well drained, moderate permeability above duripan, very slow in duripan, rapid below duripan
Posochanet loam	60.9	Moderately well drained, slow permeability
Youd loam	48.9	Somewhat poorly drained, moderately slow permeability above duripan, slow to very slow in duripan
Tujunga sand	38.5	Excessively drained, rapid permeability

See Plate 3 for a map of NRCS Soils within the District.

3. Agricultural limitations resulting from soil problems (Agricultural only)
Growers within the District do not report limitations from soil problems.

Soil Problem	*Estimated Acres*	*Effect on Water Operations and Management*
Salinity	0	N/A
High-water table	0	N/A
High or low infiltration rates	0	N/A
Other (define)	0	N/A

Although historic documents for the District note that there were saline and alkaline lands within the District, much successful reclamation of these lands has taken place and currently there are no lands in the District that are viewed as being impaired. It would appear that with proper reclamation the soils in the District are now well drained and that there is not a shallow confining clay layer that causes shallow groundwater. This geologic feature appears to the west of the District and does not limit the use of lands within the District.

D. Climate

1. General climate of the district service area

	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Annual*
Avg Precip.	1.47	1.37	0.91	0.95	0.47	0.02	0.01	0.00	0.05	0.49	0.80	1.93	8.48
Avg Temp.	44.3	48.7	54.4	57.8	66.8	73.6	79.4	76.5	71.4	61.1	50.4	44.9	60.9
Max. Temp.	58	65	75	77	91	92	98	96	92	84	70	60	98
Min. Temp	28	33	38	40	46	53	61	57	52	45	33	32	28
ETo	1.15	1.90	3.59	4.74	6.79	7.63	7.90	7.13	5.31	3.35	1.76	1.11	52.36

Weather station ID CIMIS Porterville 169 *Data period: Year* Aug. 2000 *to Year* Nov. 2011

Average wind velocity 3.0 *Average annual frost-free days:* 225

2. Impact of microclimates on water management within the service area
Microclimates are not a significant factor in the PIXID.

E. Natural and Cultural Resources

1. Natural resource areas within the service area

Name	*Estimated Acres*	*Description*
None	None	Not applicable

2. Description of district management of these resources in the past or present
None.

3. Recreational and/or cultural resources areas within the service area

Name	*Estimated Acres*	*Description*
None	None	Not applicable

F. Operating Rules and Regulations

1. Operating rules and regulations
See Appendix B for the District's 2010 Water Policy and Operations document.

2. Water allocation policy (Agricultural only)
See Appendix B for the District's 2010 Water Policy and Operations document.

As per the California State Water Code, the District allocates water to growers based on irrigated acreage. However, in this allocation there is always consideration of the federal Reclamation Reform Act given that much of the surface water delivered by the District is from Federal projects and through Federal facilities. Generally there is greater demand for surface water than the District can supply, so requests for water are provided on a first come first serve basis.

Allocation of water is made uniformly throughout the District's surface water service area, except where capacity constraints occur. In some cases, canal prorate requirements may apply.

3. Official and actual lead times necessary for water orders and shut-off (Agricultural only)
See Appendix B for the District's 2010 Water Policy and Operations document.

Water orders for both turn on and off must be placed 24 hours in advance with the District office. Water orders need to be placed by 9:00 a.m. to be effective for the following day. Water orders for Sunday or Monday by 9:00 a.m. need to be placed on the preceding Saturday.

4. Policies regarding return flows (surface and subsurface drainage from farms) and outflow (Agricultural only)
See Appendix B for the District's 2010 Water Policy and Operations document.

Growers are not allowed to pump tailwater back into the PIXID canal system. Tailwater recovery systems are encouraged. The District will discontinue delivery of water if wasteful use occurs. District staff has regularly communicated this policy to growers over the last several years through regular mailers. However, in order to be consistent, this existing policy will be added to the water information and operating policy document from the District shown in Appendix B by the next annual update (2013).

5. Policies on water transfers by the district and its customers
See Appendix B for the District's 2010 Water Policy and Operations document.

The District policy on water transfers within the District is that water may be transferred within the District from one landowner to another and from once parcel of land to another. Any landowner may assign for use within the District his right to the whole or any portion of the water apportioned to him per Section 22251 of the California Water Code.

The District's policy on water transfers between districts is that exchanges of water with other Friant districts are permitted with Board approval. The District has and will participate in beneficial transfers that promote sound water management.

The District's policy on transfers by individual growers to non-District parties is that such transfers are not permitted. District staff has regularly communicated this policy to growers over the last several years through regular mailers. However, in order to be consistent, this existing policy will be added to the water information and operating policy document from the District shown in Appendix B by the next annual update (2013).

G. Water Measurement, Pricing, and Billing

1. Agricultural Customers

a. Number of farms 94

b. Number of delivery points (turnouts and connections) 166

c. Number of delivery points serving more than one farm 3

d. Number of measured delivery points (meters and measurement devices) 166

e. Percentage of delivered water that was measured at a delivery point 100

f. Delivery point measurement device table (Agricultural only)

Measurement Type	*Number*	*Accuracy (+/- %)*	*Reading Frequency (Days)*	*Calibration Frequency (Months)*	*Maintenance Frequency (Months)*
Orifices					
Propeller meter					
Weirs					
Flumes					
Venturi					
Metered gates	166	± 4	Daily	12	12
Acoustic doppler					
Other (define)					
Total	166				

2. Urban Customers **(This Section not applicable)**

a. *Total number of connections* None.

b. Total number of metered connections None.

c. Total number of connections not billed by quantity None.

d. Percentage of water that was measured at delivery point None.

e. Percentage of delivered water that was billed by quantity None.

f. Measurement device table

Meter Size and Type	*Number*	*Accuracy (+/-percentage)*	*Reading Frequency (Days)*	*Calibration Frequency (Months)*	*Maintenance Frequency (Months)*
5/8-3/4"					
1"					
1 ½"					
2"					
3"					
4"					
6"					
8"					
10"					
Compound					
Turbo					
Other (define)					
Total					

3. Agriculture and Urban Customers

a. Current year agriculture and /or urban water charges - including rate structures and billing frequency

See Appendix B for the District's 2010 Water Policy and Operations document.

The District charges for water by quantity (acre-foot), at a uniform rate. The charges are set on an annual basis by resolution of the Board of Directors. The primary considerations by the Board of Directors in setting water charges are hydrologic conditions, seasonal considerations, status of District reserves, and price of available waters. In the current year the District set a spring rate of $50 per acre-foot and a summer rate of $65 per acre-foot.

The District assesses growers on a per acre basis based on the estimated value of their land according to Bureau guidelines. Based on this valuation, the District assesses an annual rate of 0.7% which is billed in two portions through the year.

b. Annual charges collected from customers (current year data)

Fixed Charges			
Charges ($ unit)	*Charge units ($/acre), ($/customer) etc.*	*Units billed during year (acres, customer) etc.*	*$ collected ($ times units)*
$67.99	Average assessment rate for whole District /acre	62,692 acres	$4,262,778

Volumetric charges			
Charges ($ unit)	*Charge units ($/AF), ($/HCF), etc.*	*Units billed during year (AF, HCF) etc.*	*$ collected ($ times units)*
$63.91	Average water rate over whole year /AF	16,230 AF	$1,037,300

See Appendix C for an example of a District Sample Bill. The bill clearly shows how much water was used and that it is billed on a volumetric basis. PIXID can provide extra copies of the bills for the past several years upon grower request.

c. Water-use data accounting procedures

Water measurements are taken on a daily basis by each water systems operator (ditchtender). They are relayed to District office staff, summarized and billed to each water user on a monthly basis. Any discrepancy must be addressed with the District. The District currently uses TruePoint water accounting software.

H. Water Shortage Allocation Policies

1. Current year water shortage policies or shortage response plan - specifying how reduced water supplies are allocated

See Appendix B for the District's 2010 Water Policy and Operations document.

The District does not have sufficient surface water resources to deliver amounts close to what crops require throughout the year. Therefore all growers in the District also have groundwater wells and rely heavily on groundwater resources. The primary component of the District's water shortage response plan is its method of communication with District growers regarding the developing surface water supplies through the year and the reliability of groundwater resources.

2. Current year policies that address wasteful use of water and enforcement methods
See Appendix B for the District's 2010 Water Policy and Operations document.
The District has no current year policy that supplements the general policy. Based on the general policy, it is the responsibility of the farm operator to manage their water supply after it is taken from the District facilities. The District encourages consideration of neighboring landowners and responsible management of tailwater. According to Section 22255, of the California Water Code, persons wasting water may be refused water delivery until such conditions are remedied.

Section 2: Inventory of Water Resources

A. Surface Water Supply

1. Acre-foot amounts of surface water delivered to the water purveyor by each of the purveyor's sources

See Appendix A - Water Inventory Tables, Table 1

2. Amount of water delivered to the district by each of the district sources for the last 10 years

See Appendix A - Water Inventory Tables, Table 8

B. Ground Water Supply

1. Acre-foot amounts of ground water pumped and delivered by the district

See Appendix A - Water Inventory Tables, Table 2

2. Ground water basin(s) that underlies the service area

Name	*Size (Square Miles)*	*Usable Capacity (AF)*	*Safe Yield (AF/Y)*
Tule Sub-basin	733	14.6 M	Unknown

3. Map of district-operated wells and managed ground water recharge areas

See Plate 5 for a map of Groundwater Monitoring facilities within the District.

The District does not own any groundwater extraction wells. See Appendix A - Water Inventory Tables, Table 2.

4. Description of conjunctive use of surface and ground water

The District overlays two extensive and usable groundwater aquifers. The upper unconfined aquifer is above the well documented Corcoran "A" Clay layer and is very receptive to recharge from locations throughout the District and extending east into the foothills of the Sierra Nevada Mountains. The lower aquifer is confined under the Corcoran Clay and can most effectively be recharged from areas east of Highway 99.

On average, approximately 25,000 acre-feet of surface water per year has been brought into the District's service area since the beginning of District operations. These highly variable supplemental water supplies have, however, required the District to develop and operate a conjunctive use water management program. The District owns, or has access to by agreements, approximately 278 acres of sinking/re-regulation basins within the District boundaries. These basins, along with the Deer Creek channel and the District's canals, are used for direct groundwater recharge when surface water supplies are available. The depth to groundwater for the past ten years has averaged 124.0 feet over the District. It is estimated that a third of the water imported by the District has been directly recharged into the underground reservoir by District operations since the District's inception.

5. Ground Water Management Plan
The District is a participant in the Deer Creek and Tule River Authority (DCTRA). This seven member joint powers authority collectively has a groundwater management plan to which all members agencies are a part. See Appendix D for the DCTRA Ground Water Management Plan.

The DCTRA's Groundwater Management Plan was originally developed and adopted in March 1995 under the provisions of California State Assembly Bill (AB) 3030. This plan was later updated to be compliant with California State Senate Bill (SB) 1938 in July 2006.

6. Ground Water Banking Plan
The District does not have a formal groundwater banking plan at this time. However, the District has investigated the potential for groundwater banking within the District. The District currently is pursuing a project with Delano-Earlimart ID to develop a groundwater bank within the District along Deer Creek. See Appendix E for the DEID-PIXID Reconnaissance Investigation into a potential Ground Water Bank in PIXID.

Beyond this effort the District has considered developing a much larger groundwater bank to take advantage of the large cone of depression caused by groundwater pumping in the District.

C. Other Water Supplies

1. "Other" water used as part of the water supply
See the Appendix A - Water Inventory Tables, Table 1

D. Source Water Quality Monitoring Practices

1. Potable Water Quality (Urban only)
The current groundwater quality within the District is understood to be of excellent quality. However, the District does not own any groundwater wells and therefore does not collect groundwater quality information.

2. Agricultural water quality concerns: *Yes* _____ *No* X
(If yes, describe)

3. Description of the agricultural water quality testing program and the role of each participant, including the district, in the program
PIXID does not have its own surface-water-quality monitoring-program. However, one (1) separate water quality monitoring program has historically been in place. This program has developed a history of water quality sampling events and test results and is still conducted by specific water contractors. As the conducting entity is a public agency, the developed information is a part of the public domain and is thus available to each of the contractors diverting water from the Friant-Kern Canal. While this program is principally designed to address domestic water quality program issues, the generated data covers all of the constituents of concern related to agricultural uses. This information is available upon request through the

Friant Water Authority (FWA). The District directs growers to the FWA if they ask for water quality information.

The Department of Health Services (DHS) has approved a monitoring program specific to four (4) permitted water systems diverting raw water from the Friant-Kern Canal. The testing frequency is designed to assure compliance with state and federal drinking water quality programs and thus is more than sufficient to insure an adequate testing frequency for agricultural concerns.

The District participated in the Southern San Joaquin Water Quality Coalition on behalf of its growers for compliance with State Water Resource Control Board's agricultural discharge permitting. This coalition tests water quality in a monitoring network across a large area to develop information to show that there are no issues of concern in smaller local areas.

4. *Current water quality monitoring programs for surface water by source (Agricultural only)*

Analyses Performed	*Frequency*	*Concentration Range*	*Average*
Title 22 Standard Compliance	Monthly	As per state requirements	Well below State MCLs

Current water quality monitoring programs for groundwater by source (Agricultural only)

Analyses Performed	*Frequency*	*Concentration Range*	*Average*
None.			

E. Water Uses within the District

1. Agricultural

See Appendix A - Water Inventory Tables, Table 5 - Crop Water Needs

2. Types of irrigation systems used for each crop in current year

Crop name	*Total Acres*	*Level Basin - acres*	*Furrow - acres*	*Boarder Strip*	*Sprinkler - acres*	*Low Volume - acres*	*Multiple methods - acres*
Corn	22,152	0	22,152	0	0	0	0
Alfalfa	12,160	0	0	11,682	478	0	0
Almonds	5,443	0	0	0	0	5,443	0
Vineyard	4,981	0	0	0	0	4,981	0
Wheat	3,299	0	0	3,299	0	0	0
Cotton	2,920	0	2,920	0	0	0	0
Sudan	984	0	0	984	0	0	0

Crop name	*Total Acres*	*Level Basin - acres*	*Furrow - acres*	*Boarder Strip*	*Sprinkler - acres*	*Low Volume - acres*	*Multiple methods - acres*
Other (<5%)	1,335	0	402	36	0	897	0
Total	53,274	0	25,474	16,001	478	11,321	0

3. Urban use by customer type in current year

Customer Type	*Number of Connections*	*AF*
Single-family	0	0
Multi-family	0	0
Commercial	0	0
Industrial	0	0
Institutional	0	0
Landscape irrigation	0	0
Wholesale	0	0
Recycled	0	0
Other (specify)	0	0
Other (specify)	0	0
Other (specify)	0	0
Unaccounted for	0	0
Total	Not Applicable	Not Applicable

4. Urban Wastewater Collection/Treatment Systems serving the service area – current year

Treatment Plant	*Treatment Level (1, 2, 3)*	*AF*	*Disposal to / uses*
Not applicable		0	
	Total	0	
Total discharged to ocean and/or saline sink			

5. Ground water recharge/management in current year (Table 6)

Recharge Area	*Method of Recharge*	*AF*	*Method of Retrieval*
See Table 2 in Appendix A	Recharge Basins	4,260	
Conveyance System	Channel Losses	10,806	
	Total	15,066	

6. Transfers and exchanges into or out of the service area in current year (Table 6)

From Whom	*To Whom*	*AF*	*Use*
Lower Tule River ID	Pixley ID	13,292	Irrigation
Porterville ID	Pixley ID	17,004	Irrigation

7. Trades, wheeling, wet/dry year exchanges, banking or other transactions in current year

(Table 6)

From Whom	*To Whom*	*AF*	*Use*
N/A			

8. Other uses of water in current year

Other Uses	*AF*
N/A	

F. Outflow from the District (Agricultural only)

Districts included in the drainage problem area, as identified in "A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley (September 1990)," should also complete Water Inventory Table 7 and Appendix B (include in plan as Attachment L)

See Plate 2, Map of District Boundary and Distribution Facilities, for the location of District facilities. The District's only surface water outflow point is where Deer Creek flows past Highway 43 on the west edge of the District. The District does not have subsurface outflow points or outflow water-quality testing locations (see Appendix A – Water Inventory Tables, Table 7).

In reference to Appendix B, the District acknowledges that it is listed as a drainage problem area within the listed Tulare subarea. However, the area identified in "A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley (09/'90)", being the far west edge of the District has not been viewed as a drainage problem area by the District. These lands are currently in agricultural production, without drainage water collection systems, and are producing consistently with other lands in the District. No drainage water is being produced by these lands and therefore it also does not flow from these lands. The District's belief is that historically this area had soils that did not drain well and they were identified as potentially problematic if they were ever irrigated. However, as this area has been developed and reclaimed soil amendments have increased the permeability of the soils and growers have found that there is not a confining clay layer in this area that would cause shallow groundwater. Instead the depth to water in the area is more than 100 feet. For this reason the District will not be implementing any of the six recommended water conservation programs to improve conditions in identified drainage problem area. The District does not collect any groundwater quality information.

1. Surface and subsurface drain/outflow in current year

Deer Creek is a natural channel that flows from east to west through the southern third of PIXID. In most cases surface water in Deer Creek is fully diverted by PIXID for irrigation and/or recharge purposes. However, there are some times when downstream water purveyors schedule delivery of surface water from the Friant-Kern Canal while PIXID is delivering water in order to coordinate irrigation runs (usually Alpaugh ID or Atwell Island ID). Generally this scheduled

delivery of purchased surplus surface water is the only regular outflow from the District. In very wet years there is the possibility that Deer Creek runoff may exceed PIXID's irrigation and recharge demand. In these rare times excess water in Deer Creek makes it past District diversion points and can be diverted by downstream water purveyors or may eventually flow into the Tulare Lake Bed.

Outflow point	*Location description*	*AF*	*Type of measurement*	*Accuracy (%)*	*% of total outflow*	*Acres drained*
	Deer Creek at Road 88 Dam	7,200	Chart Recorder over weir	5	100	N/A

Outflow point	*Where the outflow goes (drain, river or other location)*	*Type Reuse (if known)*
	Deer Creek flow to Alpaugh or Atwell Island ID	Irrigation
	Deer Creek flow to Tulare Lake Bed	Floodwater (rare)

2. Description of the Outflow (surface and subsurface) water quality testing program and the role of each participant in the program

The District does not test the water quality of water flowing out the District. As was described in the previous section, the waters that flow past the District in the Deer Creek channel are either run-off from the Deer Creek watershed beyond the District's ability to divert or it is scheduled Friant Division CVP water for downstream water purveyors. These supplies are not surface drainage, subsurface drainage or spill.

3. Outflow (surface drainage & spill) Quality Testing Program

Analyses Performed	*Frequency*	*Concentration Range*	*Average*	*Reuse limitation?*
Not applicable				

Outflow (subsurface drainage) Quality Testing Program

Analyses Performed	*Frequency*	*Concentration Range*	*Average*	*Reuse limitation?*
Not applicable				

4. Provide a brief discussion of the District's involvement in Central Valley Regional Water Quality Control Board programs or requirements for remediating or monitoring any contaminants that would significantly degrade water quality in the receiving surface waters.

The District is not responsible for groundwater remediation or contaminant plume management, and therefore they are not involved directly in any Central Valley Regional Water Quality Control Board programs. Those responsibilities are assigned to other agencies such as cities, counties, the USEPA or California Department of Toxic Substances Control. The District is a part of the Southern San Joaquin Water Quality Coalition (SSJWQC). This coalition's efforts are to monitor surface water quality and report to the Regional Board. Although the District is a part of the coalition, it does not do any groundwater quality monitoring nor does it receive the data collected by the coalition. Also, the District is not involved with the Regional Board's ag waiver program as that is viewed as the responsibility of individual landowners. PIXID tries to stay informed of contaminant plumes and their management and remediation within District boundaries. Surface water quality information for a few testing locations in local rivers is summarized in an annual report generated by the SSJVWC and can be requested from the SSJVWC Coordinator. Appendix H is a table of water quality data for monitored locations from the 2010 annual report.

Contact information by which the SSJWQC Coordinator can be reached:
Kings River Conservation District
4886 East Jensen Avenue
Fresno, CA 93725
(559) 237-5567
http://www.krcd.org/

G. Water Accounting (Inventory)

The tables listed below can be found in Appendix A – Water Inventory Tables.

1. *Water Supplies Quantified*
   a. *Surface water supplies, imported and originating within the service area, by month (Table 1)*
   b. *Ground water extracted by the district, by month (Table 2)*
   c. *Effective precipitation by crop (Table 5)*
   d. *Estimated annual ground water extracted by non-district parties (Table 2)*
   e. *Recycled urban wastewater, by month (Table 3)*
   f. *Other supplies, by month (Table 1)*

2. *Water Used Quantified*
   a. *Agricultural conveyance losses, including seepage, evaporation, and operational spills in canal systems (Table 4) or*
      Urban leaks, breaks and flushing/fire uses in piped systems (Table 4)
   b. *Consumptive use by riparian vegetation or environmental use (Table 6)*
   c. *Applied irrigation water - crop ET, water used for leaching/cultural practices (e.g., frost protection, soil reclamation, etc.) (Table 5)*
   d. *Urban water use (Table 6)*
   e. *Ground water recharge (Table 6)*
   f. *Water exchanges and transfers and out-of-district banking (Table 6)*

g. Estimated deep percolation within the service area (Table 6)
h. Flows to perched water table or saline sink (Table 7)
i. Outflow water leaving the district (Table 6)
j. Other

3. Overall Water Inventory
a. Table 6

H. Assess Quantifiable Objectives:

Identify the Quantifiable Objectives that apply to the District (Planner, chapter 10) and provide a short narrative describing past, present and future plans that address the CALFED Water Use Efficiency Program goals identified for the District.

QO #	*QO Description*	*Past, Present & Future Plans*
1	Decrease flows to salt sinks to increase the water supply for beneficial uses – All affected lands	PIXID currently has little information on the extent, severity and causes of saline waters in the District.
2	Provide long-term diversion flexibility to increase the water supply for beneficial uses – Pixley NWR	The District maintains the ability to divert surface water to the Pixley NWR. However, the Pixley NWR chooses not to contract for District supplies because the seasons when they want water generally oppose when irrigation supplies are available. Also, this refuge is generally focused on upland habitat that requires very little water. For these reasons the Pixley NWR has chosen to depend on a groundwater well for water to support refuge habitat.
3	Provide long-term diversion flexibility to increase the water supply for beneficial uses – Salt Affected Soils	The District is not aware of any salt affected lands within the District. However, the District maintains the ability to divert both Deer Creek run-off and Friant Division CVP supplies.

QO #	QO Description	Related BMP	Interest in Funding
1	Decrease flows to salt sinks to increase the water supply for beneficial uses – All affected lands	Optimize Conjunctive Use	Yes
2	Provide long-term diversion flexibility to increase the water supply for beneficial uses – Pixley NWR	Automate Canal Structures	Yes
3	Provide long-term diversion flexibility to increase the water supply for beneficial uses – Salt Affected Soils	Automate Canal Structures	Yes

It should be noted that the vast majority of the District does not have to deal with salt affected soils. In fact, in the eastern half of the District growers apply gypsum to add salt to the soil as a cultural practice.

Section 3: Best Management Practices (BMPs) for Agricultural Contractors

A. Critical Agricultural BMPs

1. *Measure the volume of water delivered by the district to each turnout with devices that are operated and maintained to a reasonable degree of accuracy, under most conditions, to +/- 6%*

Number of turnouts that are unmeasured or do not meet the standards listed above: 0

Number of measurement devices installed last year: 0

Number of measurement devices installed this year: 0

Number of measurement devices to be installed next year: replacements only

Types of Measurement Devices Being Installed	*Accuracy*	*Total Installed During Current Year*
Differential Gates	± 4 %	0

Differential gates are added when a gate cannot be rehabilitated or a new turnout is installed. In 2010 no differential gates were installed as replacement or in addition to the system. The District operates and maintains all the differential gates in the district boundaries.

At turnouts that serve multiple customers, District policy is that only one customer can be served at a time through these facilities. At these locations, one turnout from District conveyance facilities delivers to a pipeline owned by landowners that can deliver to multiple delivery points. Times when deliveries are switched from user to another are scheduled and coordinated by District staff and landowners This allows for the existing gates to be used as measuring facilities, satisfying the requirements of Section 3404 of the Central Valley Project Improvement Act. This policy will be added to the District's water policy document for clarity in the next annual update (2013).

2. *Designate a water conservation coordinator to develop and implement the Plan and develop progress reports*

Name: Daniel G. Vink *Title:* General Manager

Address: 357 East Olive Avenue, Tipton, CA 93272

Telephone: (559) 686-4716 *E-mail:* dvink@ltrid.org

3. Provide or support the availability of water management services to water users
See Appendix F, Notices of District Education Programs and Services Available to Customers.

a. On-Farm Evaluations

1) On farm irrigation and drainage system evaluations using a mobile lab type assessment

	Total in district	*# surveyed last year*	*# surveyed in current year*	*# projected for next year*	*# projected 2nd yr in future*
Irrigated acres	None				
Number of farms	94	5%	5%	5%	5%

The District will actively advertise to make growers aware of available mobile lab resources for on-farm efficiency evaluations through their website and regular communications with their growers (newsletter, email service, fliers in direct mailings, etc.). However, the District understands that many growers currently have irrigation and groundwater well consultants that regularly provide this service to growers in the District. For this reason the District will survey growers within the next year to determine what percentage of them have consultants that provide them with regular evaluations of their irrigation efficiency.

The District has been made aware, by North West Kern Resource Conservation District (NWKRCD), that the average price for a typical irrigation system evaluation is approximately $1,000. The District is willing to make some funds available to increase the availability of these services to growers. PIXID will make $250 per evaluation (25% of typical cost) available for growers with economic hardships up to a total of $1,250 per year. This would equate to contributions to 5 potential irrigation system evaluations (5% of District farms).

The criteria for economic hardship will be generated by the District and included in next year's annual update. The District will inform growers of the availability of these funds and the criteria after it is established on the District's website. When economic hardship criteria are met by growers, funding would be provided to NWKRCD. The District will also request that system evaluation information be shared with the District to help better inform the District on local irrigation efficiencies.

2) Timely field and crop-specific water delivery information to the water user

The District refers growers to the Kings River Conservation District website for local timely field and crop-specific water delivery information.

The District's metering of delivered water is at the turnouts from the conveyance system, but private growers systems then convey water to multiple fields owned by the same landowner from that turnout location. The District's conveyance system can be seen in Plate 4 and provides growers access to surface water conveyance facilities, with the distance between these facilities being generally one mile apart. Private conveyance to each field is not reported to the District.

The District has evaluated deliveries by turnout from the District conveyance system to evaluate areas where surface water is being used within the District. This information was evaluated using the District's GIS system.

Also, the District recently undertook a study of the estimated crop water use within the District between 1985 – 2007. This retrospective effort was an effort to evaluate the changing crop conditions within the District over time and gauge where the crop water use for the District was increasing or staying relatively the same. During this effort interviews with growers were conducted to better understand irrigation practices within the District. This effort used GIS based crop maps from DWR within the District's service area and calculated optimum crop water use based on published crop ET information for this region and accounting for effective precipitation. This study and the topic of irrigation by crop has been discussed several times in the regular public meetings held by the Board of Directors.

The District offers a service to growers that they can submit water orders over the internet, check their water delivery accounts from the District website, and get email water supply update notices from the District.

b. Real-time and normal irrigation scheduling and crop ET information

As per this BMP the District has developed and sponsors a local CIMIS station which was constructed with the assistance of the Deer Creek and Tule River Authority members. Before the next annual update the District will update their website with the CIMIS station information and also provide growers with links to the available information on the DWR CIMIS network for crop ET calculations and crop specific irrigation scheduling. With this information growers have the necessary information to convert the real-time ETo information from the local CIMIS station into real-time crop ET and irrigation scheduling information.

Also, normal year crop ET adjusted for effective precipitation is available through reports at the District office, on the District website and on Cal Poly ITRC's website. At the Cal Poly ITRC's website there is information on dry, normal and wet years for varying regions within the state including one covering the District.

The Kings River is approximately 30-40 miles north of the District, but has the same regional climate as the District. An Inspection of reference ETo maps published by CIMIS (http://wwwcimis.water.ca.gov/cimis/images/etomap.jpg) shows that zone 12 covers an area that is common to the Kings River contractors and the District. Also, rainfall totals between these two areas are historically very similar. For these reasons it is understood that the real-time ET information published by Kings River Conservation District is valid for use in the District's service area. A link to the real-time ET information for the Kings River Contractors on the KRCD site will be included in the District website update and its use will be discussed in further detail in the next Ag Water Management Plan.

Farmers have reported other sources they use to gain ET information as well, complicating the process for the District to meet this BMP. These other sources range from using soil moisture probes (see Appendix I), receiving daily crop ETc values from on-farm services such as John Deer tractor dealerships, local chemical companies, or contracted Pest Control Advisors.

c. Surface, ground, and drainage water quantity and quality data provided to water users

The District provides regularly email updates on surface water supplies to District growers, allow District growers to submit water orders on-line and allow growers to access their current water account information using a secure password on the District website.

The District provides current surface water supply information from the Bureau of Reclamation and the Friant Water Authority for Friant Division CVP contract supply availability.

The District provides available surface water quality data on request.

d. Agricultural water management educational programs and materials for farmers, staff, and the public

Program	*Co-Funders (If Any)*	*Yearly Targets*
Friant Water Authroity – "Friant Waterline"	Friant Division Contractors	Monthly Mailings
District Newsletter – "Legend"	None	Periodic Email Distribution

The District provides information on weather, crop ET, soil moisture holding capacity, crop characteristics, irrigation scheduling and water-use planning on the District website.

- Links to Cal Poly's ITRC and Fresno States's Center for Irrigation Technology websites provide farmers and the public with technical reports and other articles on efficient irrigation techniques employed in this area.
    - http://www.itrc.org/reports/index.php;
    - http://cit.cati.csufresno.edu/research_publications/.
- Local weather conditions are reported through the District and DCTRA sponsored CIMIS station.
    - http://wwwcimis.water.ca.gov/cimis/frontStationDetailInfo.do?stationId=169&src=info;
- Crop ET information is available through links to the DWR CIMIS network and the available documents at this location on how to calculate crop ET. Also links to normal, wet and dry year crop ET information for the District's region are available on Cal Poly's ITRC website.
    - http://wwwcimis.water.ca.gov/cimis/infoEtoCropCo.jsp;
    - http://biomet.ucdavis.edu/irrigation_scheduling/bis/BIS.htm;
    - http://wwwcimis.water.ca.gov/cimis/pdf/21427-KcAgronomicGrassandVeg.pdf;
    - http://wwwcimis.water.ca.gov/cimis/pdf/21428-KcTreesandVines.pdf;
    - http://www.itrc.org/etdata/irrsched.htm.
- Links to the DWR CIMIS network make farmers and the public aware of a variety of ag water software that is available to help irrigators with data management and irrigation scheduling.
    - http://wwwcimis.water.ca.gov/cimis/infoIrrSoftware.jsp

- Also, links to Cal Poly's ITRC website and the DWR CIMIS network provide farmers and the public with information on crop water budgets and irrigation scheduling techniques.
    - http://www.itrc.org/irrevaldata/isedata.htm;
    - http://wwwcimis.water.ca.gov/cimis/infoIrrOverview.jsp;
    - http://wwwcimis.water.ca.gov/cimis/infoIrrSchedule.jsp;
    - http://wwwcimis.water.ca.gov/cimis/infoIrrBudget.jsp;
- Also the District links ACWA's Water Event's and Water Education Foundation's webpages on its website to inform growers and the public about available conferences, webinars, tours and classes on water issues, environmental concerns, existing and developing regulations, as well as irrigation methods and technologies.
    - http://www.acwa.com/category/event-type/external-meeting;
    - http://www.watereducation.org/doc.asp?id=1070.

The District took on a District-wide water balance study that addressed irrigation efficiencies, cultural practices, and other water issues. Also the District undertook a System Optimization Review Study in partnership with the Bureau of reclamation. Both reports were discussed by staff, the Board of Directors and they were open to the public at public Board meetings. Additional joint Board meetings were held for significant discussions focused on calculated crop water use, irrigation efficiency and conservation. Discussion on calculated crop water use covered the comparison between ETc and irrigation efficiency fraction and reported applied water from District growers.

Some staff members regularly attend conferences such as the Bureau's Water Users Conference and Association of California Water Agencies where there are seminars on efficient irrigation techniques and after these conferences these individuals share this information with other staff members as well as the Board of Directors.

The District is a member of ACWA and this agency supports a regular program of education with grade school teachers throughout the state, bringing them to agricultural areas like the District and explaining to them how agriculture supports our society and how farmers efficiently use available water supplies to produce our Nation's food supply.

e. other

4. Pricing structure - based at least in part on quantity delivered
Describe the quantity-based water pricing structure, the cost per acre-foot, and when it became effective.

There are a number of factors that go into determining the price of water to the farm operators in the Pixley Irrigation District (District). These factors, including such things as water availability, canal side price, District operating costs and cost of competing supplies are all considered by the Board of Directors when they annually set the price of water for sale to the farmers. Costs have averaged approximately $30 per acre-foot over the past ten years, but have been as high as $35 per acre-foot in certain years.

The delivered rate to Tupman, at the beginning of the Cross Valley Canal, under the three-party water service contract with the U.S. Bureau of Reclamation and the State of California for the Sacramento River water provided through the Cross Valley Canal Exchange Program, is determined annually and has averaged in excess of $50 per acre-foot. The District has now negotiated its eighth interim renewal contract.

The District had made payments to the U.S. Bureau of Reclamation sufficient to avoid the accrual of any O&M interest bearing deficit resulting from passage of the 1986 amendments to Reclamation Law. Notwithstanding all of these factors, however, the price for delivered surface water needs to be competitive with groundwater costs. This encourages the use of surface water to meet irrigation demands, when available, thereby preserving the limited groundwater resource. Billing policies for delivered surface water supply have been developed and are periodically modified based on a multiple number of factors, many of which are beyond the control of the District. These include billing policies of the USBR, the water pricing policies and procedures of the USBR, the reserve position of the District, the payment capability of the farm operators and the basis of assurance provided by the farm operator that the District will receive payment. Significant input is both sought out and received with regard to these policies.

The pricing policy of the District is based on allowing for the delivery of surface water on a price basis which is competitive with groundwater pumping costs. This encourages the use of surface water to meet irrigation demands, when available, thereby preserving the groundwater resource for times when little or no surface water is available. Farm operators have amply indicated and demonstrated that the incentive to decrease the cost of applied water, when applied water does not result in increased yield, is the primary element of cost control. This parallels the farm operators' desire to improve on-farm efficiency through reduced labor and groundwater pumping costs.

Water pricing policies established by the District are based on a recouping of the costs of securing and delivering the water.

The supply is priced and billed in a fashion that is indicative of the delivered nature of the supply. That is, the District has policies which apply to water which is made available for direct delivery to farm operators with separate policies associated with deliveries for groundwater recharge. As the basic goal for direct surface deliveries is to optimize the conjunctive use capabilities of the District and to deliver in-lieu pumping water when same is available, verification by the District is accomplished on a periodic basis to assure that the price for delivered water is competitive with power costs associated with pumping groundwater within the District. The District tracks by way of external inquiries, as well as farm operator input, the costs associated with groundwater pumping and utilizes this input to verify the competitiveness of the established price for District supplies. The principal mechanism which the District utilizes to price the cost of actual surface deliveries is the annual assessment. The assessment rate is a per acre charge established following adoption of the annual budget. The assessment is divided into four (4) components, each related to District budget items. The four categories and their respective percentages of the total are as follows:

Groundwater	4.97%
Distribution System	27.17%
Surface Water	28.57%
Operation & Maintenance	39.29%

The billing process is fashioned in such a manner that, for delivered supplies, the farm operators are charged for water on a metered basis and billed following deliveries. In this fashion, farm operators are encouraged only to utilize that water which they need and are not penalized for unused water which may be available.

Water which is not delivered for consumptive purposes, principally due to the non-storable nature of the District's surface supply, is delivered for groundwater recharge. The costs of the water associated with this recharge program are not borne by the water delivery charge income, but by a percentage of the assessment. As previously noted, the District sought and received considerable input with respect to the development of this policy and with further respect to the level of assessment which is established in order to insure that recharge programs are maintained and contributions to the groundwater reservoir are maximized.

With increases in the costs of operation and those associated with water acquisition, the assessment rate has been increased substantially over time. The current level of assessment income is in excess of $4,200,000 per year, as compared to a mid-1970's level of less than $300,000.

5. Evaluate and describe the need for changes in policies of the institutions to which the district is subject

The Board of Directors and the District Manager review, at least on an annual basis, the policies of the District to insure consistency with the then current rules and regulations impacting the District.

6. Evaluate and improve efficiencies of district pumps

Describe the program to evaluate and improve the efficiencies of the contractor's pumps.

Not applicable. The District does not have any pumps.

B. Exemptible BMPs for Agricultural Contractors

(See Planner, Chapter 2, Appendix C for examples of exemptible conditions)

1. Facilitate alternative land use

Drainage Characteristic	*Acreage*	*Potential Alternate Uses*
High water table (<5 feet)	0	Not Applicable
Poor drainage	0	Not Applicable
Ground water Selenium concentration > 50 ppb	0	Not Applicable
Poor productivity	0	Class 6 lands not eligible

Describe how the contractor encourages customers to participate in these programs.

Although the District was listed in September 1990 document titled "A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley", there are no perched groundwater areas within the District. It is the District's understanding that a small area on the far west side of the District was included in this report only because it is adjacent to drainage impaired lands west of Highway 43. Consistent with this the District is not aware of any subsurface drainage systems within the District. Also, consistent with this understanding, the District does not encourage customers to participate in any programs to facilitate alternative land use.

2. Facilitate use of available recycled urban wastewater that otherwise would not be used beneficially, meets all health and safety criteria, and does not cause harm to crops or soils

Sources of Recycled Urban Waste Water	*AF/Y Available*	*AF/Y Currently Used in District*
Pixley Public Utility District	Amounts recycled to growers in lieu of District water	

Pixley PUD is under requirements by state agencies to land apply the treated waste stream on property that they control at agronomic rates. Some District growers near the PUD's facilities can contract for this water and therefore it can be used in lieu of District water. It is the PUD's responsibility to ensure that all state standards are met in the land application of this supply. The water from Pixley PUD is not a district supply, does not flow through District facilities and for those reasons the District has no records of its delivery. This water is delivered to only one grower in the District.

3. Facilitate the financing of capital improvements for on-farm irrigation systems

Funding source Programs	*How provide assistance*
Natural Resource Conservation Service Agricultural Water Enhancement Program (AWEP) or Environmental Quality Incentives Program (EQIP)	Available Information

The District maintains a listing of potential funding sources and makes staff available to provide assistance in completing funding application documents. District farmers are notified about potential funding sources by public Board Meetings, information posted on the District's website, and regular email updates. The District will include an example of this information made available to growers in the next annual update.

4. Incentive pricing

Structure of incentive pricing	*Related goal*

The District prices water to be competitive with the average District cost to pump groundwater in normal to wet year intentionally. The goal of this pricing structure is to encourage surface water use and maximize the replenishment of local groundwater through in-lieu recharge. In dry years the District prices surface water in such a way that those with the most usable groundwater will access that first thus leaving the available surface water for those growers with less reliable groundwater (District goal for dry year). Both of these efforts are done under conjunctive use operations that make up the Districts overarching water operation.

5. a) Line or pipe ditches and canals

Canal/Lateral (Reach)	*Type of Improvement*	*Number of Miles in Reach*	*Estimated Seepage (AF/Y)*	*Accomplished/ Planned Date*
There are no plans to line or pipeline any of the District channel facilities.				

The District uses its earthen channel system as a recharge facility during wet times. Given that all growers in the District must in some way rely on groundwater resources, the seepage from the earthen conveyance system is viewed as beneficial recharge to the local groundwater aquifer. For this reason there are no plans to line or pipeline portions of the District conveyance system.

b) Construct regulatory reservoirs

Reservoir Name	*Annual Spill in Section (AF/Y)*	*Estimated Spill Recovery (AF/Y)*	*Accomplished/ Planned Date*
None			

6. Increase flexibility in water ordering by, and delivery to, water users

The District's water order process is managed by a staff member that is available by phone or by email. Also the District has developed the ability for growers to submit their water orders on-line at the District's website if they wish. The District continues to look for new ways to serve their growers and provide flexible, timely and consistent water delivery service. Please see Appendix G District Water Order Form, for an example of the District's water order form.

7. Construct and operate district spill and tailwater recovery systems

Distribution System Lateral	*Annual Spill (AF/Y)*	*Quantity Recovered and reused (AF/Y)*
There are no District Spills	All supply is contained within the Distribution System	
Total		

The District has a few terminal basins used to capture water at the end of a conveyance system. These facilities recharge this water to the local groundwater aquifer. However, the District does not suffer from spills. Also, the District does not allow tailwater recovery systems to be diverted

into District conveyance systems. Private tailwater return systems within the District are used on farms to allow growers to apply large heads of water to fields, thereby increasing the irrigation efficiency, and tailwater is then recirculated back to the head of the field for a second longer application after the field is uniformly wetted up.

Drainage System Lateral	*Annual Drainage Outflow (AF/Y)*	*Quantity Recovered and reused (AF/Y)*
There are no District Drainage Systems		
Total		

As was previously mentioned, there are no perched groundwater areas within the District and no known subsurface drainage systems within the District. Also, surface drainage in this area is not collected through any systems, as it is the responsibility of landowners to manage stormwater on their own properties. Therefore there are no District Drainage Systems and no Drainage Outflow or Quantity Recovered.

8. Plan to measure outflow.

Total # of outflow (surface) locations/points 1

Total # of outflow (subsurface) locations/points 0

Total # of measured outflow points 1

Percentage of total outflow (volume) measured during report year 100

Identify locations, prioritize, determine best measurement method/cost, submit funding proposal

Location & Priority	*Estimated cost (in $1,000s)*				
	2009	*2010*	*2011*	*2012*	*2013*

As was previously discussed, the only outflow from the District is through Deer Creek, and waters that flow through Deer Creek past the District are either floodwater or schedule irrigation supplies by downstream water purveyors. For this reason the District measures one location to gather information on flows past their diversion locations and that covers all of the outflow locations. There are no plans to measure any other locations.

9. Optimize conjunctive use of surface and ground water

The nature of the water supply available to the District is such that it can only supply supplemental water to the farm operators within the District. The District makes no guarantees

or warranties as to the delivery of surface waters and has no areas which rely solely on the delivery of such supplies. Decisions are made on at least an annual basis as to whether or when surface water will be made available to the farm operators. There are periodic modifications made to the initial decision during years when considerable modification is made to the declaration of available supply by the USBR and by reservoir release operations during the flood control season on the Tule River. In addition to the decision being based on information such as a determination by the USBR as to the quantity of water available, added variables, such as the timing of the availability of such supplies based on storability characteristics in both Millerton Reservoir and Success Reservoir and the crop types of farm operators, influence the decision. As the majority of the supply available to the District is non-storable, delivery schedules are predicated more on the non-storable characteristics of these supplies than on the demands of the farm operators to meet the ET requirement of their crops. The timing and availability of the District's west-side contract supply are also factored into the decision. The recent limitations associated with this supply have, however, reduced the influence on the internal run decision.

To the maximum extent possible, the District establishes the delivery schedule on a basis to meet demands of the farm operators. The District delivers water to the groundwater basin which is not demanded instantaneously by the farm operators and the water is then retrieved from that reservoir by the farm operators on a schedule which they control in order to meet crop demands. The District maintains a distribution system with operational characteristics consistent with the goal of jointly managing surface and groundwater supplies. The District maintains 278 acres of groundwater recharge reservoirs which are utilized in the operational scheme during above-normal years and shunted from the system during normal and dry years. The District also spreads water on 960 acres of the Pixley National Wildlife Refuge. In most dry year conditions, the District does not make any deliveries of surface water due to their relationship with other districts who are also members of the Deer Creek and Tule River Authority (DCTRA). With the joint management of contract supplies within the DCTRA, the districts requiring delivery of surface water during dry year periods can now bank water with the District who has agreed to take the surface water for banking during normal to above-normal years, in exchange for the release of the District's CVP supply during dry year periods.

In order to further augment spreading capability and to expand on conjunctive use capability, the DCTRA has recently completed its first groundwater recharge facility adjacent to the Friant-Kern Canal and the natural channel of Deer Creek. This facility was utilized during the last year, is currently being used and will continue to be utilized in the future to recharge available supplies during above-normal runoff conditions. It is anticipated to be augmented by other similar facilities in the future at sites which are currently under consideration.

10. Automate canal structures

There are no planned projects to automate canal structures in the near-term. The District has not studied the potential for automating canal structures, but is using the automated LTRID facilities at the Tule River Weir and the Wood Central Ditch diversion from the Tule River as pilot projects to gage their water management improvement potential. This effort will be reported on in future annual updates.

11. Facilitate or promote water customer pump testing and evaluation

The District provides information to the farm operators relative to the availability of pump testing and efficiency services provided by the serving utility or local pump companies. The involvement of the District with private pump efficiencies is related to water conservation and overall resource management. The fact that a farmer may apply a given amount of water to a field with a pump which is operating at a less than optimum efficiency does affect the application time and the total quantity of water which is being demanded by the crop. This information can be found in the District's Water Information & Operating Policy in Appendix B. The third paragraph below the numbered list references available services. This policy is sent to all growers each year.

12. Mapping

GIS maps	*Estimated cost (in $1,000s)*				
	2009	*2010*	*2011*	*2012*	*2013*
Layer 1 – Distribution system	0.0	0.0	0.0	0.0	0.0
Layer 2 – Drainage system	n/a	n/a	n/a	n/a	n/a
Suggested layers:					
Layer 3 – Ground water information	0.8	0.8	0.8	0.8	0.8
Layer 4 – Soils map	0.1	0.1	0.1	0.1	0.1
Layer 5 – Natural & cultural resources	n/a	n/a	n/a	n/a	n/a
Layer 6 – Problem areas	0.1	0.1	0.1	0.1	0.1

The District's current GIS system is very developed. It was developed by a consultant and has transitioned into a usable tool that District staff employs in water management. The current system is populated with information on parcels within the District, the District's conveyance system, the District's SCADA monitoring locations, the District's measurement locations, NRCS soils information in the area and the District's groundwater monitoring network. District staff now regularly uses the GIS System to develop groundwater contour maps of District seasonal groundwater conditions. The GIS system is not currently viewed as having any significant deficiencies and therefore there is no plan to expand capabilities.

C. Provide a 3-Year Budget for Implementing BMPs

1. Amount actually spent during current year.

BMP #		*BMP Name*	*Actual Expenditure (not including staff time)*	*Staff Hours*
A	*1*	*Measurement*	*$1,000*	*100*
	2	*Conservation staff*	*$400*	*8*
	3	*On-farm evaluation /water delivery info*	*$200*	*4*
		Irrigation Scheduling	*$0*	*0*
		Water quality	*$0*	*0*
		Agricultural Education Program	*$0*	*0*
	4	*Quantity pricing*	*$200*	*4*
	5	*Policy changes*	*$200*	*4*
	6	*Contractor's pumps*	*$0*	*0*
B	*1*	*Alternative land use*	$0	0
	2	*Urban recycled water use*	N/A	N/A
	3	*Financing of on-farm improvements*	$0	0
	4	*Incentive pricing*	$300	8
	5	*Line or pipe canals/install reservoirs*	$0	0
	6	*Increase delivery flexibility*	$140	4
	7	*District spill/tailwater recovery systems*	$0	0
	8	*Measure outflow*	*$0*	*0*
	9	*Optimize conjunctive use*	$70	2
	10	*Automate canal structures*	$0	0
	11	*Customer pump testing*	$50	0
	12	*Mapping*	$0	*0*
		Total	$2,560	134

2. Projected budget summary for the next year.

BMP #		*BMP Name*	*Budgeted Expenditure (not including staff time)*	*Staff Hours*
A	*1*	*Measurement*	*$1,000*	*100*
	2	*Conservation staff*	*$400*	*8*
	3	*On-farm evaluation /water delivery info*	*$200*	*4*
		Irrigation Scheduling	*$0*	*0*
		Water quality	*$0*	*0*
		Agricultural Education Program	*$0*	*0*
	4	*Quantity pricing*	*$200*	*4*
	5	*Policy changes*	*$200*	*4*
	6	*Contractor's pumps*	*$0*	*0*
B	*1*	*Alternative land use*	$0	0
	2	*Urban recycled water use*	N/A	N/A
	3	*Financing of on-farm improvements*	$0	0
	4	*Incentive pricing*	$300	8
	5	*Line or pipe canals/install reservoirs*	$0	0
	6	*Increase delivery flexibility*	$140	4
	7	*District spill/tailwater recovery systems*	$0	0
	8	*Measure outflow*	*$0*	*0*
	9	*Optimize conjunctive use*	$70	2
	10	*Automate canal structures*	$0	0
	11	*Customer pump testing*	$50	0
	12	*Mapping*	$0	*0*
		Total	$2,560	134

3. Projected budget summary for 3rd year.

BMP #		*BMP Name*	*Budgeted Expenditure (not including staff time)*	*Staff Hours*
A	*1*	*Measurement*	*$1,000*	*100*
	2	*Conservation staff*	*$400*	*8*
	3	*On-farm evaluation /water delivery info*	*$200*	*4*
		Irrigation Scheduling	*$0*	*0*
		Water quality	*$0*	*0*
		Agricultural Education Program	*$0*	*0*
	4	*Quantity pricing*	*$200*	*4*
	5	*Policy changes*	*$200*	*4*
	6	*Contractor's pumps*	*$0*	*0*
B	*1*	*Alternative land use*	$0	0
	2	*Urban recycled water use*	N/A	N/A
	3	*Financing of on-farm improvements*	$0	0
	4	*Incentive pricing*	$300	8
	5	*Line or pipe canals/install reservoirs*	$0	0
	6	*Increase delivery flexibility*	$140	4
	7	*District spill/tailwater recovery systems*	$0	0
	8	*Measure outflow*	*$0*	*0*
	9	*Optimize conjunctive use*	$70	2
	10	*Automate canal structures*	$0	0
	11	*Customer pump testing*	$50	0
	12	*Mapping*	$0	*0*
		Total	$2,560	134

Section 4: Best Management Practices for Urban Contractors

(Due to the adoption of revised BMPs in December 2008, this section will be updated in Spring 2009.)

A. Urban BMPs

1. *Utilities Operations*
   - *1.1 Operations Practices*
   - *1.2 Pricing*
   - *1.3 Metering*
   - *1.4 Water Loss Control*

2. *Education*
   - *2.1 Public Information Programs*
   - *2.2 School Education*

3. *Residential*

4. *CII*

5. *Landscape*

B. Provide a 3-Year Budget for Expenditures and Staff Effort for BMPs

1. Amount actually spent during current year.

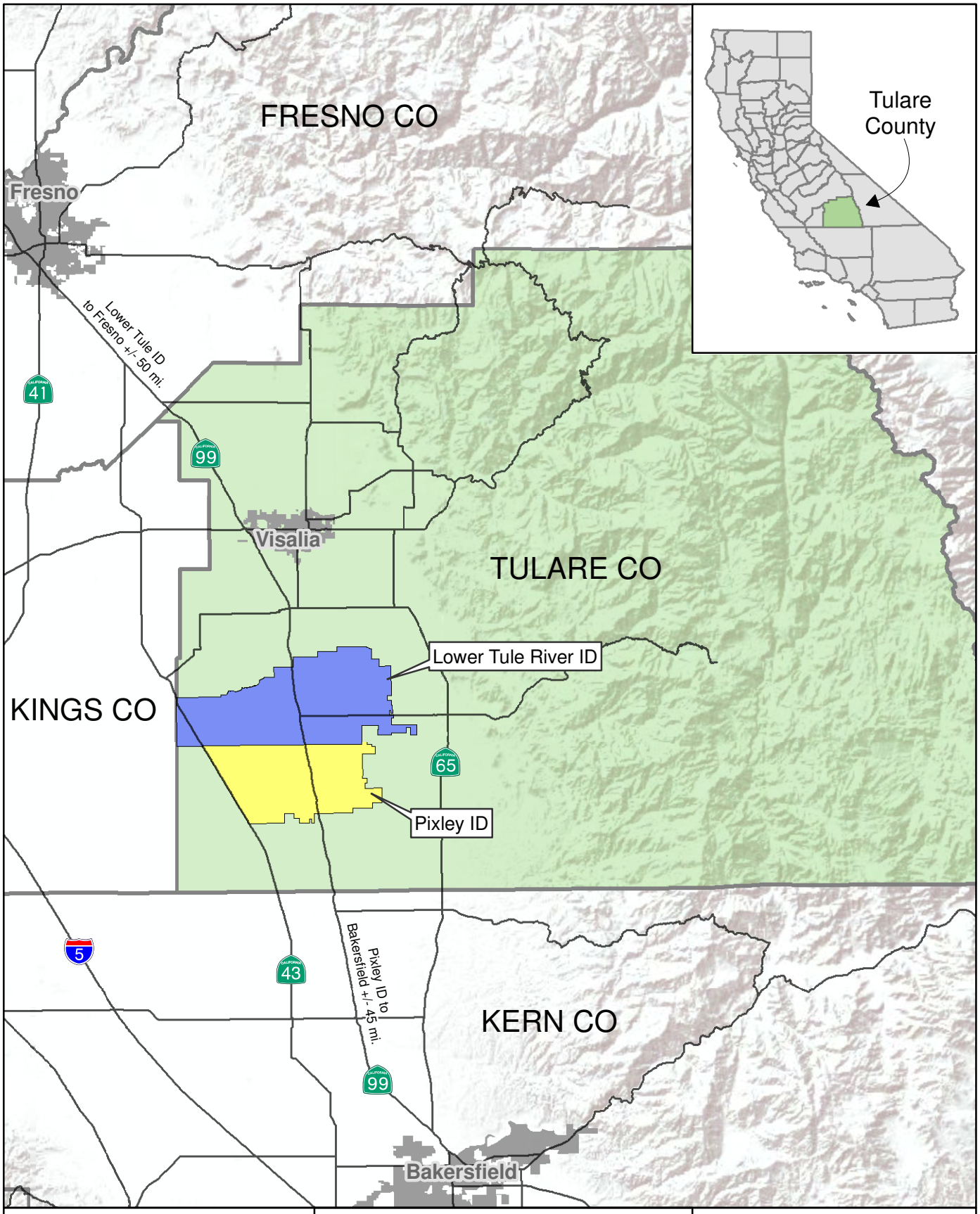
Year 2010 BMP #	BMP Name	Projected Expenditures (not including staff hours)	Staff Hours
1.	Utilities Operations		
	1.1 Operations Practices	$100	150
	1.2 Pricing	$0	10
	1.3 Metering	$500	100
	1.4 Water Loss Control	$0	0
2.	Education		
	2.1 Public Information Programs	$100	25
	2.2 School Education	$0	0
3.	Residential	n/a	0
4.	CII	n/a	0
5.	Landscape	$0	0
		Total $700	285

2. Projected budget summary for 2nd year.

Year 2011 BMP #	BMP Name	Projected Expenditures (not including staff hours)	Staff Hours
1.	Utilities Operations		
	1.1 Operations Practices	$100	150
	1.2 Pricing	$0	10
	1.3 Metering	$500	100
	1.4 Water Loss Control	$0	0
2.	Education		
	2.1 Public Information Programs	$100	25
	2.2 School Education	$0	0
3.	Residential	n/a	0
4.	CII	n/a	0
5.	Landscape	$0	0
		Total $700	285

3. Projected budget summary for 3rd year.

Year 2012 BMP #	BMP Name	Projected Expenditures (not including staff hours)	Staff Hours
1.	Utilities Operations		
	1.1 Operations Practices	$100	150
	1.2 Pricing	$0	10
	1.3 Metering	$500	100
	1.4 Water Loss Control	$0	0
2.	Education		
	2.1 Public Information Programs	$100	25
	2.2 School Education	$0	0
3.	Residential	n/a	0
4.	CII	n/a	0
5.	Landscape	$0	0
		Total $700	285

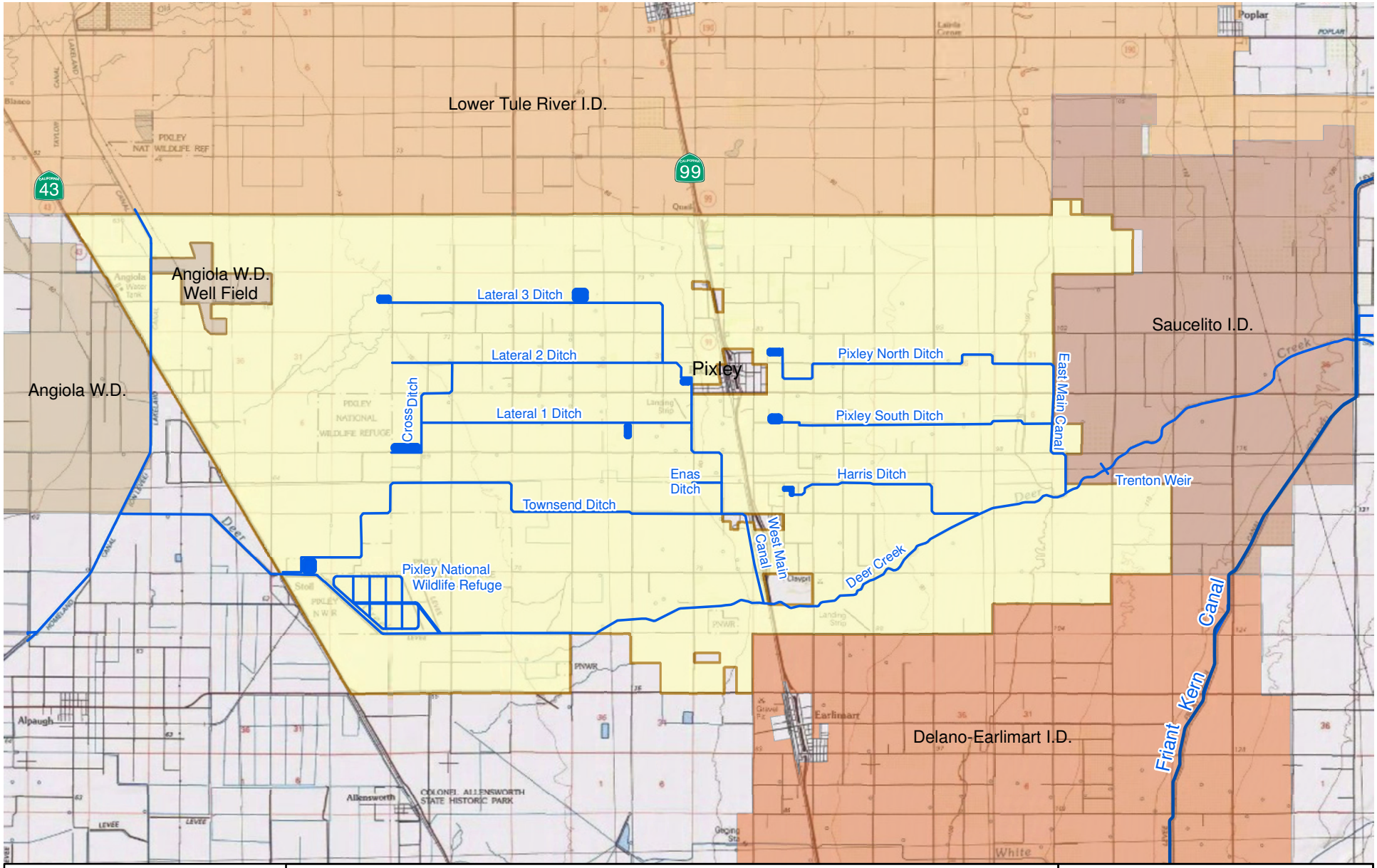


EST. 1968
PROVOST & PRITCHARD
CONSULTING GROUP
An Employee Owned Company
286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

LOCATION MAP

PLATE 1

SOR Area



0 1 2 3 Miles

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

Legend

Pixley I.D.

Pixley ID Facilities

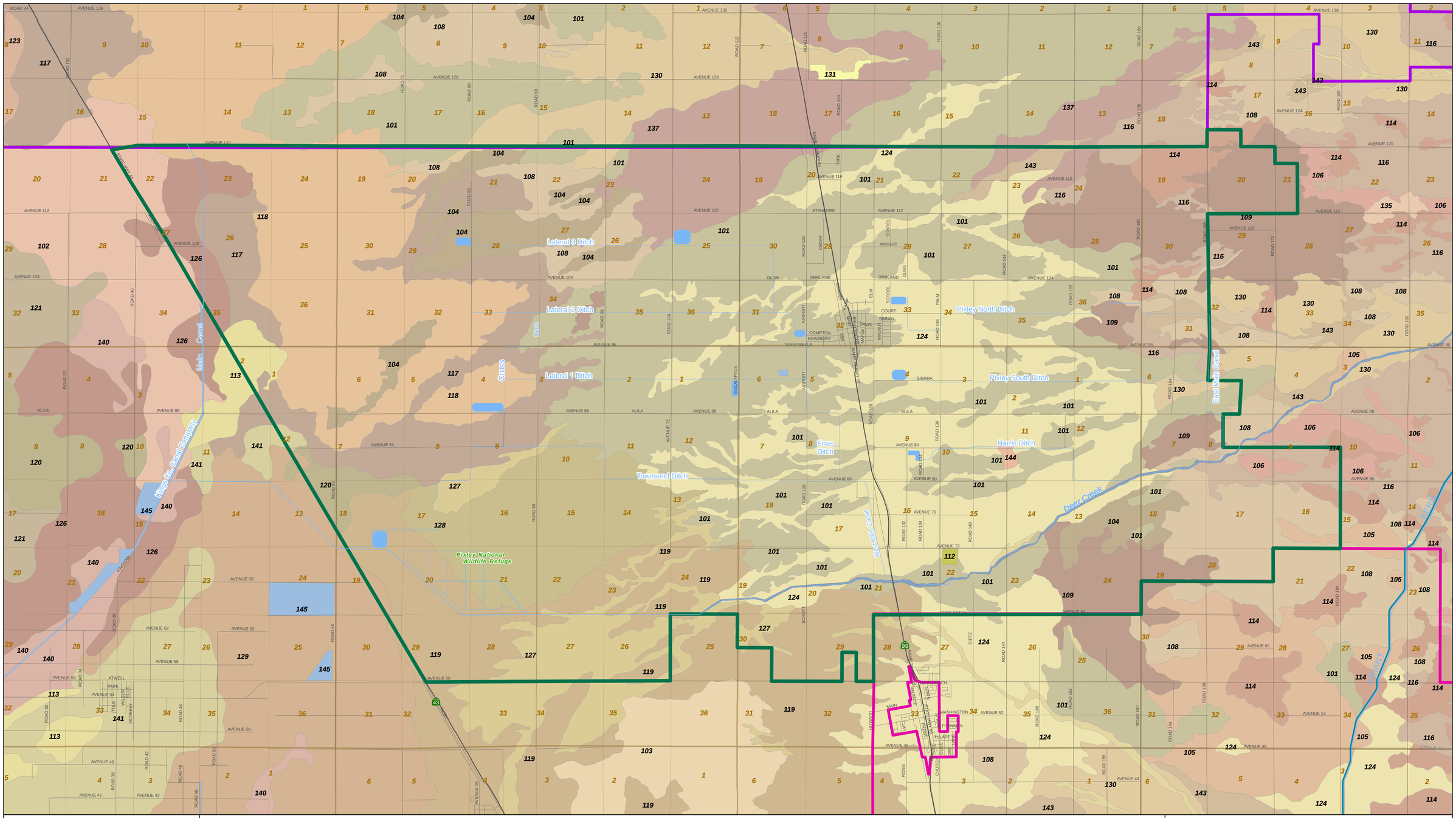
PLATE 2

R. 23 E. R. 24 E. R. 25 E. R. 26 E.

T. 22 S.

T. 23 S.

T. 24 S.



Pixley Irrigation District

Tulare County
Western Soils Survey

PLATE 3

PROVOST & PRITCHARD ENGINEERING GROUP
Est. 1969
An Employee Owned Company

1/3/2007
\\huntington\gis\Clients\Pixley_ID\315906V1\REC\SoilsMap22x34.mxd

Lower Tule River I.D.

Angiola W.D.

Angiola W.D. Well Field

Saucelito I.D.

Delano-Earlimart I.D.

Ave 116 Lateral Project

Berrenda-Mesa Pit

Lateral 3 Ditch

Michelle No. 3 Pit

Lateral 2 Ditch

Westly Main Pit

Pixley

School Pit

Pixley North Ditch

South Pit

Pixley South Ditch

East Main Canal

CrossDitch

Hesse Pit

Lateral 1 Ditch

Michelle No. 1 Pit

Enas Ditch

Harris Pit

Harris Ditch

Townsend Ditch

Valov Pit

West Main Canal

Teviston

Trenton Weir

East Main Diversion & Parshall Flume

Batsch Dam

Harris Check

Hunt Dam

Leslie Dam

West Main Diversion & Parshall Flume

Bowen Dam

Perry Dam

99 Check

Deer Creek Wasteway

DCTRA Basins

Deer Creek

Private Ditch

Homeland Canal

Earlimart

Friant Kern Canal

PIXLEY NAT WILDLIFE REF

PIXLEY NATIONAL WILDLIFE REFUGE

PIXLEY N W R

PNWR

COLONEL ALLENSWORTH

Allensworth

Stoil

Claypit

Gravel Pit

Landing Strip

0 0.5 1 1.5 Miles

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

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

Legend

- Existing Canal
- Existing Canal - Private
- Creek
- Proposed Canal
- Broad Crested Weir
- Diversion and Measurement Station
- Earthen Dam With CMP Risers
- Drop Check
- Existing Basin
- Proposed Basin
- Flow Direction

Pixley ID

PLATE 4

Water Control Structures

2/8/2012 \\pineflat\dwg_dgn\Clients\Pixley I.D. - 3159\315908V2\GIS\Map\ReportFigures\pixleyid_facilities_detail11x17.mxd

Well Water Levels

Elevation of Water
Spring 2010

PLATE 5

Spring 2010 Wells
Elevation- 10 ft intervals
Elevation- 100 ft intervals
Roads

Water Surface Elevation

Feet Above sea level

High : 504.266

Low : -24.7591

Appendix A Water Inventory Tables

Year of Data	2010	**Enter data year here**

Table 1

Surface Water Supply

2010 Month	**Federal Ag Water** (acre-feet)	**Federal non-Ag Water.** (acre-feet)	**State Water** (acre-feet)	**Local Water** (acre-feet)	**Water (define)** (acre-feet)	**Drain Water** (acre-feet)	**Total** (acre-feet)
Method				M1			
January	0	0	0	0	0	0	0
February	0	0	0	1,000	0	0	1,000
March	0	0	0	0	0	0	0
April	0	0	0	0	0	0	0
May	0	0	0	0	0	0	0
June	0	0	0	0	0	0	0
July	0	0	0	0	0	0	0
August	0	0	0	0	0	0	0
September	0	0	0	0	0	0	0
October	0	0	0	0	0	0	0
November	0	0	0	0	0	0	0
December	0	0	0	0	0	0	0
TOTAL	0	0	0	1,000	0	0	1,000

Table 2

Ground Water Supply

2010 Month	Groundwater (acre-feet)	Groundwater *(acre-feet)
Method		E2
January	0	163
February	0	1,744
March	0	7,066
April	0	11,254
May	0	17,061
June	0	25,448
July	0	39,779
August	0	32,142
September	0	23,712
October	0	7,490
November	0	2,254
December	0	1,788
TOTAL	0	169,901

*normally estimated

Table 3

Total Water Supply

2010 Month	Surface Water Total (acre-feet)	Groundwater (acre-feet)	M&I Wastewater (acre-feet)	District Water (acre-feet)
Method				
January	0	0	0	0
February	1,000	0	0	1,000
March	0	0	0	0
April	0	0	0	0
May	0	0	0	0
June	0	0	0	0
July	0	0	0	0
August	0	0	0	0
September	0	0	0	0
October	0	0	0	0
November	0	0	0	0
December	0	0	0	0
TOTAL	1,000	0	0	1,000

*Recycled M&I Wastewater is treated urban wastewater that is used for agriculture.

Table 4

Distribution System

2010 Canal, Pipeline, Lateral, Reservoir	Length (feet)	Width (feet)	Surface Area (square feet)	Precipitation (acre-feet)	Evaporation (acre-feet)	Spillage (acre-feet)	Seepage (acre-feet)	Total (acre-feet)
Deer Creek	77,687	95	7,380,265	227	719	0	2,513	(3,005)
East Main Canal	12,428	12	149,136	5	15	0	402	(412)
Pixley North Ditch	28,730	9	258,570	8	25	0	929	(947)
Pixley South Ditch	24,910	9	224,190	7	22	0	806	(821)
Harris Ditch	19,182	11	211,002	6	21	0	621	(635)
West Main Canal	33,066	22	727,452	22	71	0	1,070	(1,118)
Townsend Ditch	48,449	10	484,490	15	47	0	1,567	(1,600)
Cross Ditch	12,894	8	103,152	3	10	0	417	(424)
Lateral 1 Ditch	23,760	13	308,880	9	30	0	769	(789)
Lateral 2 Ditch	23,750	12	285,000	9	28	0	768	(787)
Lateral 3 Ditch	29,180	11	320,980	10	31	0	944	(965)
TOTAL			10,453,117	321	1,019	0	10,805	11,503

Table 5

Crop Water Needs

2010 Crop Name	Area (crop acres)	Crop ET (AF/Ac)	Leaching Requiremen (AF/Ac)	Cultural Practices (AF/Ac)	Effective Precipitatio (AF/Ac)	Appl. Crop Water Use (acre-feet)
Corn	22,152	2.29	0.00	0.57	0.00	63,410
Alfalfa	12,160	4.60	0.00	1.15	0.29	66,363
Almonds	5,443	3.42	0.00	0.34	0.14	19,696
Vineyard	4,981	2.58	0.00	0.26	0.03	14,003
Wheat	3,299	1.35	0.00	0.34	0.19	4,940
Cotton	2,920	2.56	0.00	0.64	0.00	9,338
Sudan	984	1.71	0.00	0.43	0.00	2,101
Other (<5%)	1,335	1.75	0.00	0.44	0.02	2,894
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
Crop Acres	53,274					182,746

Total Irrig. Acres 53,274 (If this number is larger than your known total, it may be due to double cropping)

Table 6

2010 District Water Inventory

Water Supply	Table 3		1,000
Riparian ET	(Distribution and Drain)	minus	0
Groundwater recharge	intentional - ponds, injection	minus	4,260
Seepage	Table 4	minus	10,805
Evaporation - Precipitation	Table 4	minus	698
Spillage	Table 4	minus	0
Transfers/exchanges/trades/wheel	(into or out of the district)	plus/minus	30,296
Non-Agri deliveries	delivered to non-ag customer	minus	0
Water Available for sale to agricultural customers			15,533
Compare the above line with the next line to help find data gaps			
2005 Actual Agricultural Water Sales	From District Sales Records		39,936
Private Groundwater	Table 2	plus	169,901
Crop Water Needs	Table 5	minus	182,746
Drainwater outflow	(tail and tile not recycled)	minus	0
Percolation from Agricultural Land	(calculated)		27,091

Table 7

Influence on Groundwater and Saline Sink

2010

Agric Land Deep Perc + Seepage + Recharge - Groundwater Pumping = District Influence	15,065
Estimated actual change in ground water storage, including natural recharge)	(25,000)
Irrigated Acres (from Table 5)	53,274
Irrigated acres over a perched water table	0
Irrigated acres draining to a saline sink	0
Portion of percolation from agri seeping to a perched water table	0
Portion of percolation from agri seeping to a saline sink	0
Portion of On-Farm Drain water flowing to a perched water table/saline sink	0
Portion of Dist. Sys. seep/leaks/spills to perched water table/saline sink	0
Total (AF) flowing to a perched water table and saline sink	0

Table 8

Annual Water Quantities Delivered Under Each Right or Contract

Year	Federal Ag Water (acre-feet)	Federal non-Ag Water. (acre-feet)	State Water (acre-feet)	Local Water (acre-feet)	Water (define) (acre-feet)	Drain Water (acre-feet)	Total (acre-feet)
2001	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0
2003	0	0	0	1,697	0	0	1,697
2004	0	0	0	0	0	0	0
2005	0	0	0	9,794	0	0	9,794
2006	0	0	0	9,156	0	0	9,156
2007	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0
2010	0	0	0	1,000	0	0	1,000
Total	0	0	0	21,647	0	0	21,647
Average	0	0	0	2,165	0	0	2,165

Appendix B LTRID & PIXID 2010 Water Information & Operating Policy

PRORATE OR CANAL ALLOCATION

The need for prorating water use on canals occurs when demand exceeds the design capacity of specific canals. This problem typically occurs only in the summer months and only for short periods. During prorate periods the water users in the affected areas are given an allocation of water to be used within a two-week time frame. Prorates are designed to provide equitable water allocation to all water users. Cooperation when prorate is necessary will greatly assist in providing equal treatment to all District water users. If you have any questions, please contact the District office.

WATER MEASUREMENTS

The Water Systems Operator using one of following three methods take water measurements at the numbered turnout:

1. Pump test rating
2. Gravity Measurement
3. Meter

Pumps will be rated once each season without charge upon request or if any changes are made to the pump station.

Any discrepancy regarding the quantity of water charged to an account must be reviewed with the District prior to the 15th of the month following the date of billing. All charges will be considered correct and final after that date.

Emergency Phone Numbers:

559-686-4716 / 559-752-5050

Follow the instructions to be transferred to the attendant on call.

On behalf of the Board of Directors I want to thank you for your cooperation in providing equitable, reliable water service to the water users of the Lower Tule River & Pixley Irrigation District.

If you have any questions regarding this policy, please feel free to contact the District office at the numbers indicated.



DAN VINK

GENERAL MANAGER

Lower Tule River Irrigation District
Pixley Irrigation District

357 E OLIVE AVE
TIPTON CA 93272
Phone (559) 686-4716
Fax (559) 686-0151
Email: ltrid@ltrid.org
www.ltrid.org

Lower Tule River Irrigation District
Pixley Irrigation District

357 E OLIVE AVE

TIPTON CA 93272

559-686-4716

559-686-0151 FAX

WATER INFORMATION & OPERATING POLICY

Working together to meet your water needs now and into our future

WATER OPERATING POLICY

In an effort to provide an affordable and reliable water supply, the following guidelines have been adopted by the Board of Directors of the Lower Tule River & Pixley Irrigation District, and are implemented by the staff of the District to insure equitable distribution of water to all water users within the District.

The District's contract water supply is supplemental only and therefore does not provide the sole supply for District wide crop irrigation requirements in all years. Elements of the Districts water supply program include:

- In years when water is available above the amount to meet irrigation demand the District actively recharges the groundwater aquifers through numerous sinking basins and river channels in the District.
- In water short years, the District's surface water supply is intended to supplement grower owned wells.
- In certain years water runs may be scheduled at different times throughout the year in order to maximize available supply and to coordinate with irrigation deliveries.

WATER RATES & WATER RUNS

The Board of Directors determines the water rate and establishes water runs. Water rates and water runs are based on the most current information available. The District endeavors to keep water-users notified in advance of any changes. Changes in water runs may occur on short notice due to uncontrollable conditions that affect water supply. Additional information regarding water rates and water runs can be found on the District's web site: www.ltrid.org

WATER ORDERS

- All turnouts are numbered either on the gate or on the pump apparatus. Orders for water should be made referencing the turnout number.
- Water orders for both turn on and turn off must be placed 24 hours in advance with the District office.
- Water orders need to be placed by 9:00 a.m. to be effective for the following day.
- Please place water orders for Sunday or Monday by 9:00 a.m. on or before the preceding Saturday.
- Water orders may be placed in the office during normal office hours from 7:00 a.m. to 4:30 p.m. during the weekdays and 7:00 a.m. to 9:00 a.m. on Saturdays and Holidays during water runs.
- In order to provide for consistency and accountability, water systems operators cannot take water orders in the field either verbally or through written notes.

It may be necessary for the District to establish specific on/off times by turnout due to operational constraints of the canal system. District canals and check structures are to be operated by District personnel only unless an extreme emergency exists. Turnouts are to be operated by the water user. Please contact the District office for specific turnout numbers and on/off times or if turnout numbers are not present or are illegible.

EMERGENCY PROCEDURE

There is a 24-hour answering service for emergencies that occur outside of regular business hours. The emergency telephone numbers are listed on the back page.

Please do not place water orders with the answering service.

When calling the answering service please leave a name and telephone number along with other pertinent information. An example of an emergency would be a ditch break or anything that alters the flow of water that might cause property damage.

WATER USE STATEMENT

A monthly water statement will be mailed to each water user during the first ten days of each month. The statement will include water use and account balance as of the end of the preceding month.

Delinquency Charge. Payment for water is due upon receipt of the statement. A penalty will be added if payment is not received by the end of the month in which the statement was generated. Penalties will be assessed at 1.5% of the unpaid balance or $2.50 whichever is greater.

Lower Tule River Irrigation District
Pixley Irrigation District

Updated: February 2007

Deposit Requirements for Water Deliveries to Rented/Leased Property

Water deliveries to land rented by those who do not own more than 20 acres within the District shall be secured according to the following formula and procedures:

A deposit consisting of the below formula shall be made prior to the delivery of any water:

(Acres Rented) x (1.0) x (Published Water Rate)

Example: If the water rate is $50 per a/f and a renter is renting 100 acres then the District will require a deposit of $5,000.

(100) x (1.0) x ($50)

When the deposited amount falls below 20% of the total deposit, the user will receive one verbal reminder from the District to reinstate the required deposited amount as per the formula. When the deposited amount falls below 10% of the total required deposit, water deliveries to the user will be terminated. Any unused deposit will be refunded to the user within 45 days of the completion of the water run, or by September 15th, whichever is later.

Water deliveries secured through a landowner guarantee are not subject to this policy.

Board Action January 7th 2007.

Updated: February 2007

Appendix C District Sample Bill

CUSTOMER BILL

Customer # [redacted] Bill # 42247
Bill Date 11/30/2011

DEGROOT, BILL & EVONNE (TR)
15419 AVENUE 96
PIXLEY, CA 93256-9730

Pixley Irrigation District
357 E Olive Avenue Tipton, Ca 93272

357 E Olive Ave
Tipton, CA 93272
(559) 752-5050 or
(559) 686-4716
pixley@ltrid.org

Billing Summary

Account Balance	
Previous Balance	$6,110.65
Payments/Credits	$6,110.65
Penalties	$0.00
Charges	$97.50
Adjustments	$0.00
Total Due	**$97.50**

Water Usage	
Billing Period (November)	11/1/2011 To 11/30/2011
Billed Usage	1.50 Af

Summary

Turnout	Description	Qty	Rate	Amount
01-PS120	01-PS120 - 159.000ac - Pixley Regular	1.50 Af	$65.00	$97.50
	Total	**1.50 Af**	**$65.00**	**$97.50**

Detach and return the bottom remittance portion with your payment.

Customer # [redacted] Bill # 42247

Delinquent Date	12/31/2011
Previous Balance	$6,110.65
Payments/Credits	$6,110.65
Penalties	$0.00
Charges	$97.50
Adjustments	$0.00
Total Due	**$97.50**

DEGROOT, BILL & EVONNE (TR)
15419 AVENUE 96
PIXLEY, CA 93256-9730

Amount Enclosed $

Unmetered Turnouts				
Date	Turnout	CFS	Hours	Consumed AF
11/1/2011	01-PS120	2.59	7.00	1.500
Total For Turnout	01-PS120		7.00	1.50
	Total		7.00	1.50

Appendix D DCTRA July 2006 Groundwater Management Plan

GROUNDWATER MANAGEMENT PLAN

DEER CREEK AND TULE RIVER AUTHORITY

JULY 2006



DENNIS R. KELLER / JAMES H. WEGLEY
CONSULTING CIVIL ENGINEERS

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SECTION 1
PURPOSE
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

SECTION 1
PURPOSE
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

PLAN OBJECTIVE

The members of the Deer Creek and Tule River Authority (Authority) desire to formalize their existing groundwater management practices for the continuance of local management and to enhance existing monitoring activities in a coordinated manner. Through this Groundwater Management Plan (Plan) the Authority will identify and implement modifications to ongoing practices in order to preserve and enhance groundwater resources. The Authority will organize existing and expanded groundwater management activities to facilitate the implementation of the Plan.

Preservation and enhancement of the groundwater resource is vital to sustaining the local economics which have been built up in reliance, in whole or in part, on this resource. The Authority's objective is to preserve the utility of the groundwater resource, both in terms of quantity and quality at the least possible cost. Enhancement or augmentation of the resource is necessary to mitigate the present level of overdraft and the attendant long-term decline in groundwater levels in the overall groundwater basin. The Plan objectives can be accomplished, at least cost, by joint implementation of the Plan through the Authority as opposed to individual implementation by the Authority members.

AUTHORITY

The Authority is organizing current and proposed groundwater management activities

under provision of Part 2.75 of Division 6 of the California Water Code commencing with Section 10750, otherwise known as AB3030, the Groundwater Management Act of 1992. The 1992 Act was amended in 2002 and 2004 to describe specific requirements for the Plan.

For the purpose of groundwater management, powers granted to an entity which adopts a Plan include the powers of a water replenishment district (Part 4, Division 18, California Water Code), to the extent not already possessed by the entity, but not limited to the following:

1. Acquire and operate facilities, waters and rights needed to replenish the groundwater supplies;
2. Store water in groundwater basins, acquire water rights, import water into the Authority and conserve water;
3.. Participate in legal proceedings as required to protect and defend water rights and water supplies and to prevent unlawful exportation of water from the Authority.
4. Under certain conditions to exercise the right of eminent domain;
5. Act jointly with other entities in order to economically perform required activities;
6. Carry out investigations required to implement the Plan;
7. Fix rates for water for replenishment purposes; and
8. Fix the terms and conditions of contracts for use of surface water in-lieu of groundwater.

PLAN ELEMENTS

Part 2.75, Groundwater Management, of the Water Code establishes required (§10753.7) and recommended (§10753.8) elements of a groundwater management plan. Bulletin 118 prepared by the Department of Water Resources (DWR) also provides recommendations for groundwater management plans.

The Authority's Plan has been prepared to address the requirements and recommendations for groundwater management plans. Table 1-1 summarizes these elements and their respective location within the Authority's Plan.

TABLE 1-1
PLAN SUMMARY
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

SECTION REFERENCE	SUBJECT	PLAN LOCATION
REQUIRED PLAN ELEMENTS (Water Code §10753.7 (a))		
(1)	Basin management objectives	Section 4
(1)	Monitoring and Management: – groundwater levels – groundwater quality – land surface subsidence – changes of surface water flow and quality	 Section 5, Section 6 Section 5, Section 6 Section 5, Section 6 Section 5, Section 6
(2)	Plan to involve other agencies	Section 2, Section 5, Section 7
(3)	Map of groundwater basin and local agencies	Section 2
(4)	Monitoring protocols	Section 6
RECOMMENDED PLAN ELEMENTS (Water Code §10753.8)		
a.	Saline Water Intrusion	Section 5
b.	Wellhead Protection (Recharge Areas)	Section 5
c.	Migration of Contaminated Water	Section 5
d.	Well Abandonment/Destruction	Section 5
e.	Overdraft Mitigation	Section 5
f.	Groundwater Replenishment	Section 5
g.	Groundwater Extractions	Section 5
h.	Groundwater Monitoring	Section 5, Section 6
i.	Conjunctive Use	Section 5
j.	Well Construction Policies	Section 5
k.	Operation of Facilities	Section 5, Section 7
l.	Relationships with Other Agencies	Section 5
m.	Land Use Planning	Section 5

TABLE 1-1 (cont'd)
PLAN SUMMARY
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

ADDITIONAL PLAN ELEMENTS (DWR Bulletin 118, Appendix C) (1)		
(4)	Advisory Committee of Stakeholders	Section 7, Appendix A
(5)	Groundwater basin description: – physical features and characteristics – historical data – issues of concern – historical and project water demands and supplies	Section 2
(8)	Existing and planned management actions	Section 5, Section 6
(10)	Monitoring program features: – map of monitoring sites – type and frequency of monitoring	Section 6
(12)	Groundwater Management Reports	Section 7
(13)	Plan re-evaluation	Section 7

Note: (1) DWR Bulletin 118, Appendix C outlines 14 required and recommended components for groundwater management plans. Required elements have been documented.

PLAN CONTACT INFORMATION

Questions or requests for additional information regarding the Authority's Plan should be directed to the Program Manager at the following address:

Deer Creek and Tule River Authority
357 East Olive Ave.
Tipton, CA 93272
Phone: 559/686-4716 FAX: 559/686-0151

Business Hours: 8:00 a.m. - 4:30 p.m.
Monday through Friday

The Authority meets on the 3rd Friday of each odd-numbered month. Authority meetings are held at above address and are open to the public.

SECTION 2
GENERAL
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

SECTION 2
GENERAL
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

DESCRIPTION OF AUTHORITY

The Deer Creek and Tule River Authority (Authority) is a joint powers Authority comprised of the following members: Lower Tule River Irrigation District, Pixley Irrigation District, Porterville Irrigation District, Saucelito Irrigation District, Stone Corral Irrigation District, Tea Pot Dome Water District and Terra Bella Irrigation District (Districts). The Authority's primary purpose is the joint exercise of the powers of the Authority members in order to facilitate more efficient operations and management of their activities. Integral to this purpose is the joint conjunctive management of the Authority members surface and groundwater supplies. The Authority will work with its members and other water entities to insure an adequate water supply.

The Districts were originally organized to provide a reliable water supply to their landowners. AB 3030 provides a means for local districts to jointly manage their individual supplies. In order to preserve local management and enhance existing groundwater management programs operated over many years by the Districts, the Board of Directors of the Authority on March 24, 1995, adopted a Groundwater Management Plan (Plan) under provisions of AB 3030. The 1994 Plan enabled the Authority to establish policies that served to enhance the overall management of the water supplies available to the Authority members.

In 2002 and 2004, Senate Bill (SB) 1938 and Assembly Bill (AB) 105, respectively, amended the requirements of groundwater management plans. This Plan incorporates the necessary elements to update the Authority's original 1994 Plan.

AB 3030 provides for the development of a groundwater management plan within the boundaries of the Authority members. The underlying groundwater basin is part of the larger Tulare Lake Basin as identified in State of California Bulletin 118. The management area for the Authority's Plan may include, by agreement, adjacent entities whose activities would influence the common groundwater resource. The Authority's member Districts and the Plan area is shown on Figure 2-1.

Plan Participants

The Authority will be responsible for the implementation of the Plan. The Authority's member Districts comprise the primary Plan Participants. The identification and involvement of additional Plan Participants will result from Plan activities.

The Plan Participants are presented in Appendix A. This Appendix will be revised accordingly to reflect the Plan's current participants.

Stakeholders

For the purposes of the Plan, a stakeholder will be defined as any individual, group, or entity located within the Plan Area that may be affected by the implementation of the Plan. Stakeholders can be Plan Participants.

An initial compilation of groundwater basin stakeholders is presented in Appendix A. Additional stakeholders may be identified through Plan activities.

Advisory Committee

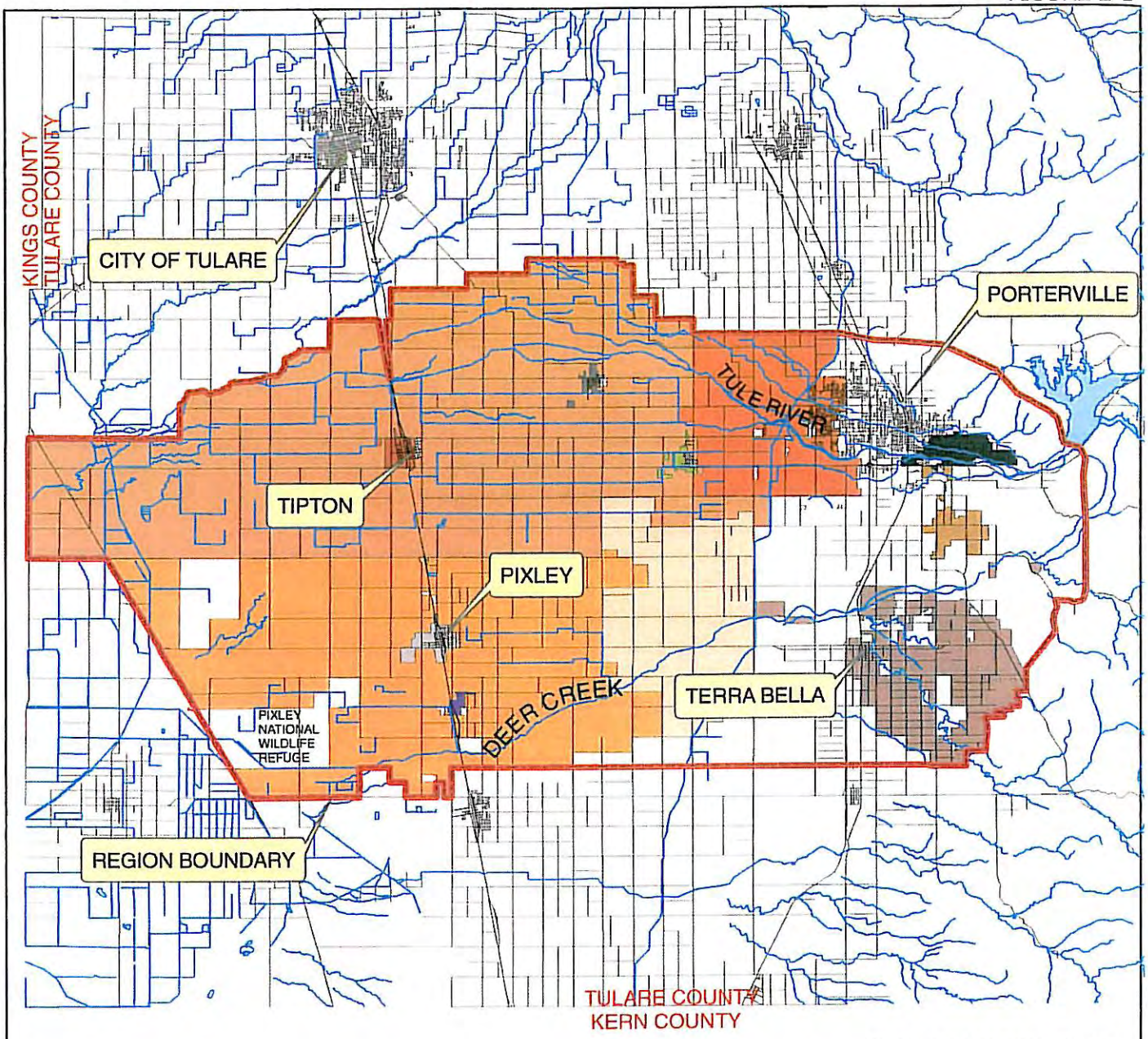
The Authority has created an Advisory Committee to oversee the development, implementation and subsequent refinement of the Plan. The members of the Advisory Committee are presented in Table 2-1.

TABLE 2-1
ADVISORY COMMITTEE MEMBERS
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

NAME	TITLE	REPRESENTING DISTRICT
Dan Vink	General Manager	Lower Tule River Irrigation District
Dan Vink	General Manager	Pixley Irrigation District
Dave Hoffman	Manager	Porterville Irrigation District
Dave Hoffman	Manager	Saucelito Irrigation District
Keith Norris	Manager	Tea Pot Dome Water District
Sean Geivet	General Manager	Terra Bella Irrigation District
Dennis R. Keller	Consulting Civil Engineer	Authority Consultant

Additional Advisory Committee members may be identified and included during the implementation of the Authority's Plan.

FIGURE 2-1



SOURCE: TULARE COUNTY GRAPHICAL INFORMATION SYSTEM, 1999

LEGEND

GEOGRAPHICAL INFORMATION
- Boundary - Groundwater Management Plan
- Streams
- Streets
- Lake Success

PUBLIC UTILITY DISTRICTS
- Pixley Public Utility District
- Porter Vista Public Utility District
- Woodville Public Utility District

COMMUNITY SERVICES DISTRICTS
- Poplar Community Services District
- Teviston Community Services District
- Tipton Community Services District

IRRIGATION DISTRICTS
- Lower Tule River Irrigation District
- Pixley Irrigation District
- Porterville Irrigation District
- Saucelito Irrigation District
- Terra Bella Irrigation District
- Vandalia Irrigation District

N W E S

10 5 0 10 Miles

PLAN BOUNDARIES
GROUND WATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

KELLER/WEGLEY

SECTION 3
GROUNDWATER BASIN CHARACTERISTICS
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

SECTION 3
GROUNDWATER BASIN CHARACTERISTICS
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

GENERAL

The Deer Creek and Tule River Authority (Authority) is located within the Tule River Sub-basin of the San Joaquin Valley Groundwater Basin (Basin No. 5-22.13). The Tule River Sub-basin is bounded by the following groundwater sub-basins; Kaweah River (north), Tulare Lake (west) and Kern County (south). The groundwater basin includes three major surface drainages: Tule River, Deer Creek and White River.

Typical annual rainfall in the basin is approximately 11 inches. The western portion of the Basin is typically more arid. The eastern edge of the Basin along the mountains experiences higher rainfall amounts.

The region encompassed by the Authority's Groundwater Management Plan (Plan) is shown on Figure 2-1 in Section 2. Table 3-1 summarizes the communities located in the basin and their respective populations.

TABLE 3-1
COMMUNITY POPULATIONS
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

COMMUNITY	POPULATION (1)
Pixley	2,589
Poplar/Cotton Center	1,496
Porterville (2)	46,346
Terra Bella	3,466
Tipton	1,790
Woodville	1,678

NOTE: (1) Population based upon Census 2000
Census Designated Place (CDP).
(2) Includes East Porterville CDP (population, 6,730).

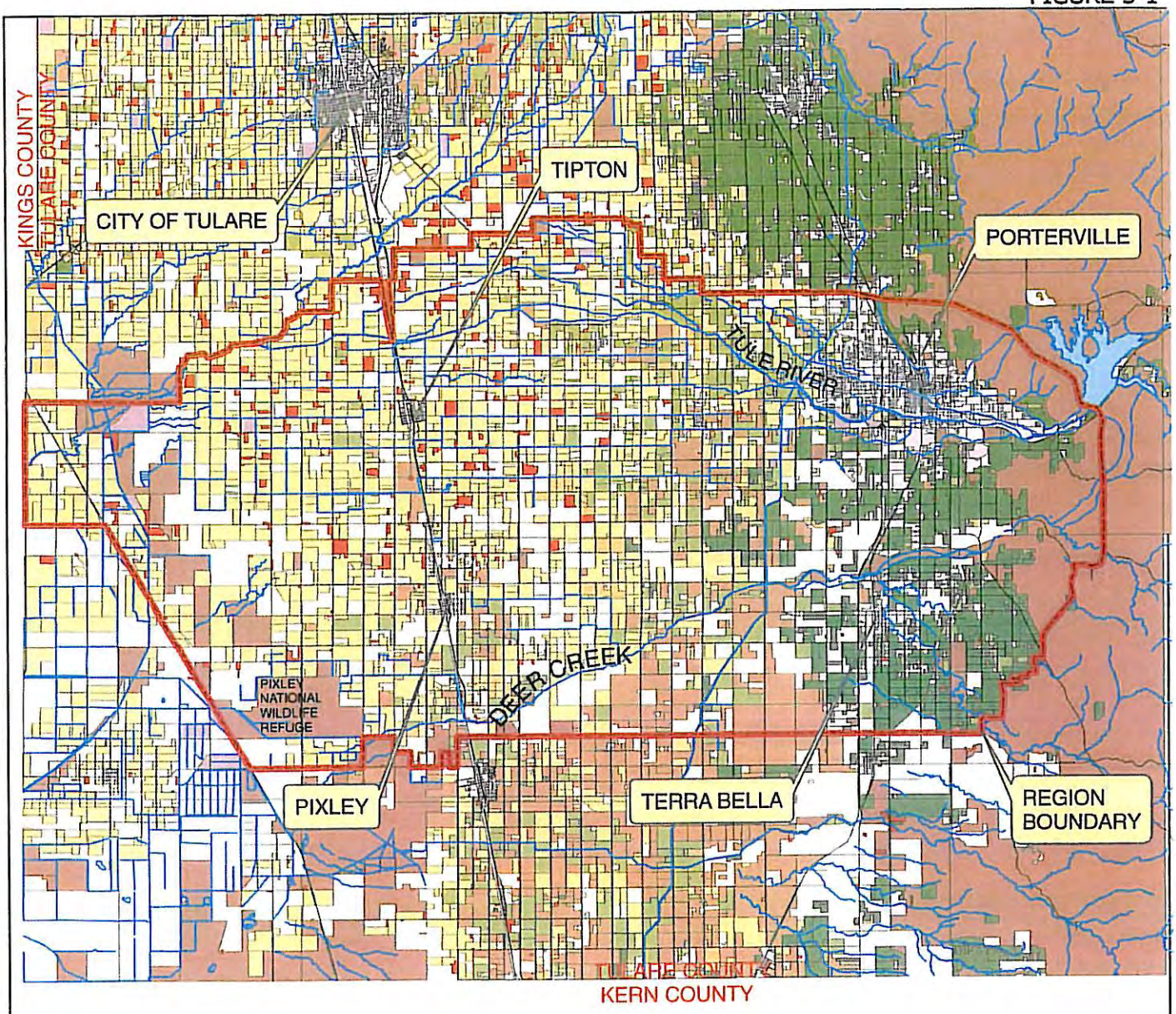
The Basin is rural in nature, dominated by agricultural land use as shown in Figure 3-1.

PHYSICAL CHARACTERISTICS

The physical characteristics of the groundwater basin influence the content of the Plan. In particular, the manner in which groundwater is replenished is directly affected by surface and subsurface characteristics, such as the permeability of the overlying and subsurface soils. The permeability of the soils within the groundwater basin is shown on Figure 3-2. In general, the soils having higher permeability rates are located adjacent to the main surface water drainages.

The Authority members overlie areas of both unconfined and confined aquifers. There are limited areas of perched water and shallow groundwater tables. These conditions result from subsurface geologic conditions. A general depiction of the aquifer and subsurface geologic conditions is presented on Figure 3-3. Figure 3-4 shows the groundwater elevations for spring, 2004, as compiled and prepared by the Department of Water Resources.

FIGURE 3-1



SOURCE: TULARE COUNTY GRAPHICAL INFORMATION SYSTEM, 1999

LEGEND

GEOGRAPHICAL INFORMATION

- Boundary - Groundwater Management Plan
- Streams
- Streets
- Lake Success

LAND USE

- Citrus
- Deciduous Fruit and Nuts
- Field Crops
- Semi Agricultural: Livestock, Dairies, Etc.
- Truck, Nursery and Berry Crops
- Vineyards
- Native Vegetation
- Water Surfaces
- Urban

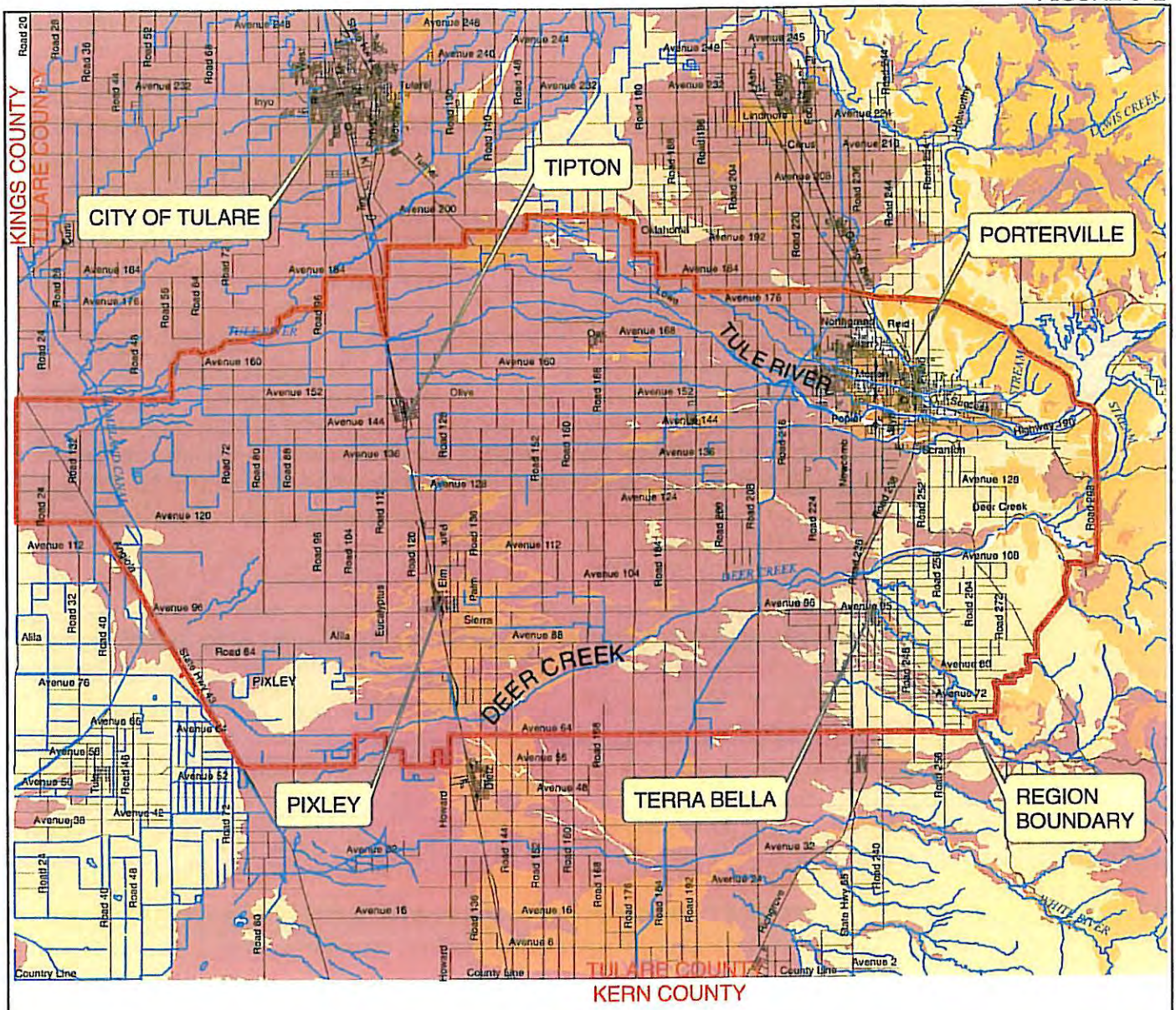
N W E S

10 5 0 10 Miles

LAND USE
GROUND WATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

KELLER/WEGLEY

FIGURE 3-2



SOURCE: TULARE COUNTY GRAPHICAL INFORMATION SYSTEM, 1999

LEGEND

GEOGRAPHICAL INFORMATION

- Boundary - Groundwater Management Plan
- Streams
- Streets
- Lake Success

PERMEABILITY

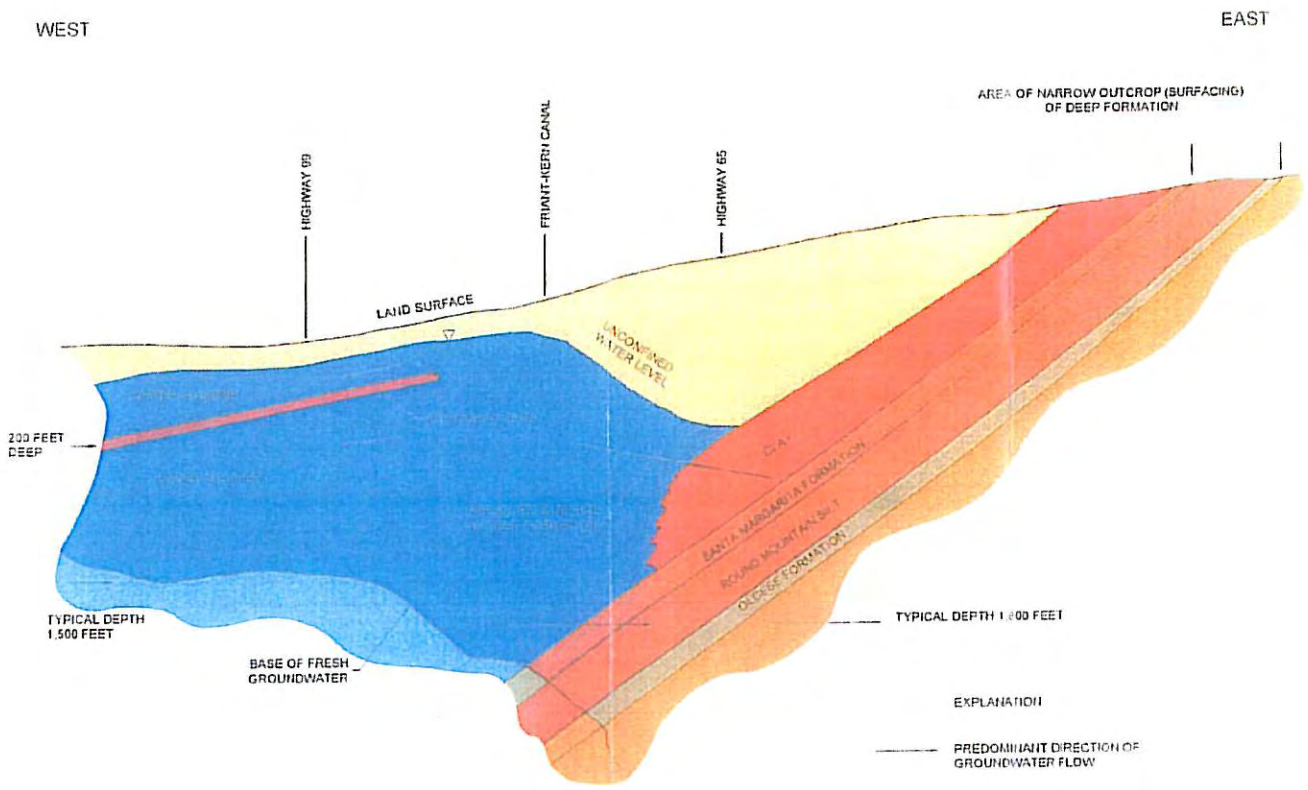
- Moderate
- Rapid
- Rock
- Slow
- Under Water

N
W E
S

10 5 0 10 Miles

SOIL PERMEABILITY
GROUND WATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

KELLER/WEGLEY





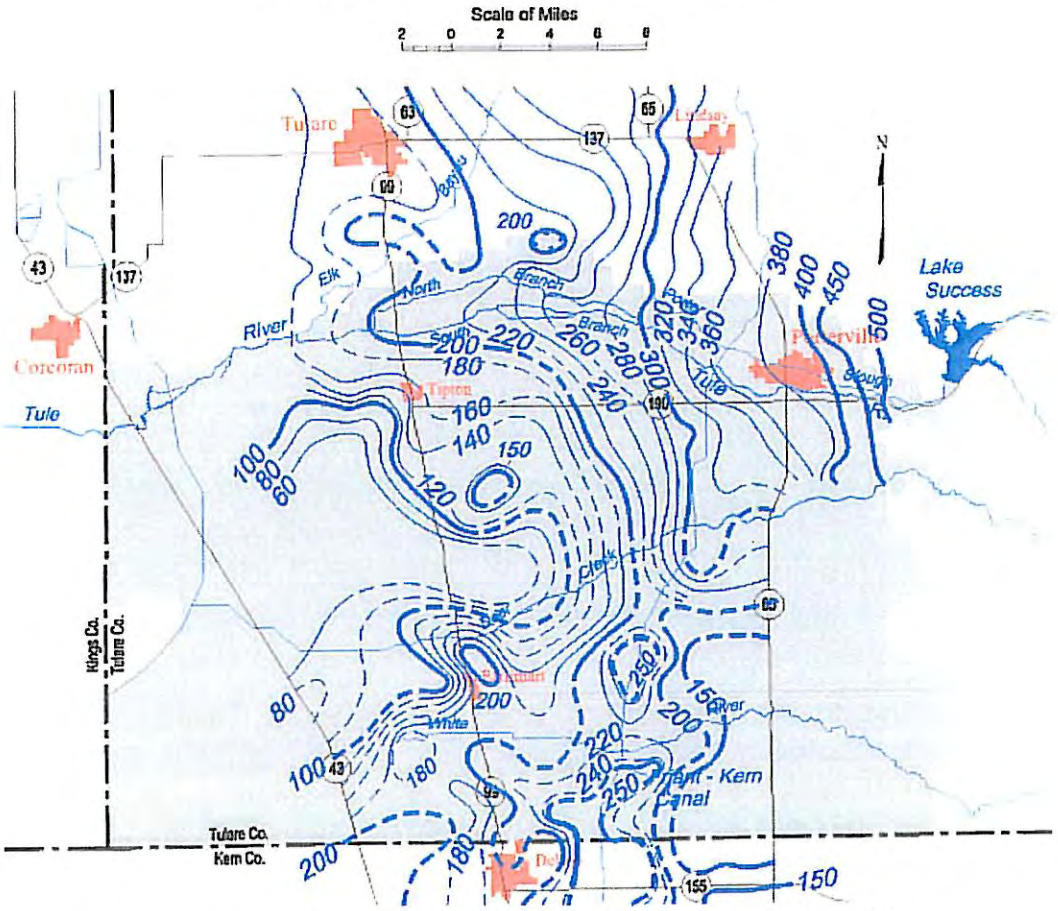
SOURCE: FIGURE 9, ANALYSIS OF GROUNDWATER RESOURCES
PROVOST AND PRITCHARD 2001.

SURFACE CONDITIONS
GROUND WATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

KELLER/WEGLEY

Tule Groundwater Basin

Spring 2004, Lines of Equal Elevation of Water in Wells, Unconfined Aquifer



Contours are dashed where inferred. Contour interval is 10, 20 and 50 feet.



SOURCE: DEPARTMENT OF WATER RESOURCES

GROUNDWATER ELEVATIONS
GROUND WATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

SECTION 4
BASIN MANAGEMENT OBJECTIVES
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

SECTION 4
BASIN MANAGEMENT OBJECTIVES
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

GENERAL

The Deer Creek and Tule River Authority (Authority) has developed five (5) basin management objectives to guide the implementation of the Groundwater Management Plan (Plan). By accomplishing these objectives, the Authority believes that a more reliable groundwater supply for long-term beneficial uses within the Plan area will be realized. The Authority's basin management objectives within the Plan area are:

1. To promote and realize groundwater resource protection;
2. To facilitate groundwater resource sustainability;
3. To develop groundwater resource understanding;
4. To develop groundwater basin understanding; and
5. To promote and facilitate information dissemination regarding the groundwater resource.

Each basin management objective is described below.

GROUNDWATER RESOURCE PROTECTION

Groundwater needs to have water quality that will sustain its beneficial uses to remain a viable water resource within the groundwater basin. This objective focuses the Authority's management strategies to maintain the good water quality of the Plan Area's groundwater. The Authority will utilize the following strategies to achieve this objective:

1. Wellhead/Recharge Area Protection;

2. Migration of Contaminated Water Controls;

3. Well Abandonment and Destruction Policies; and

4. Well Construction Policies.

Protection of the groundwater beneath the Plan Participants ensures that the maximum amount of groundwater remains available. Achieving this basin management objective minimizes the potential to lose groundwater volumes to contamination.

GROUNDWATER RESOURCE SUSTAINABILITY

Groundwater is the primary water supply in the Plan Area for both domestic and agricultural purposes. This objective emphasizes the maintenance and/or increase of the available groundwater supply. The following management strategies will be used toward achieving this objective:

1. Overdraft Mitigation;

2. Groundwater Recharge Policies;

3. Groundwater Extraction Management;

4. Conjunctive use Policies; and

5. Operation of Facilities.

This basin management objective of the Plan will identify and quantify the surface and groundwater supplies available to the Authority members and define the interaction between these supplies. Groundwater storage is affected by groundwater pumping and groundwater recharge as water users attempt to meet their water use demands. The net result of the

interactions between the available water supplies and the demands for water is a change in groundwater storage. This basin management objective is intended to provide the Authority with the information and tools required to maintain and improve the total water supply through coordinated management of groundwater.

GROUNDWATER RESOURCE UNDERSTANDING

The purpose of this basin management objective is to further develop knowledge regarding the Plan Area's groundwater. With detailed information regarding the groundwater resource, improved characterization will lead to future groundwater management decisions. The primary Plan element that will achieve this objective is groundwater monitoring.

Groundwater levels monitored at least annually will indicate the status (availability) of the resource. Groundwater levels also reveal the effectiveness of other strategies, such as groundwater recharge efforts. Monitoring data developed over time will serve as the foundation of conclusions regarding groundwater reliability and management strategy effectiveness.

GROUNDWATER BASIN UNDERSTANDING

This basin management objective garners basin information to facilitate evaluations regarding basin features and potential groundwater resource impacts.

Changes to the groundwater basin's topographic, geologic and hydrologic conditions may adversely affect the groundwater. Land use development can impact both the quantity and quality of groundwater. The availability of surface water reduces overall demand on the groundwater.

This objective will be achieved through the following management strategies:

1. Land Subsidence Monitoring;
2. Land Use Planning; and
3. Surface Water Management.

Through these strategies, the Authority will remain familiar with the Plan Area's topographic, geologic and hydrologic conditions that may affect the groundwater resource. The Authority will have the capability to react to proposed projects and changing conditions and potentially avoid adverse groundwater impacts.

INFORMATION DISSEMINATION

Groundwater resource and basin information and knowledge will result from the active implementation of this Plan. The Authority will serve as the primary conduit of information regarding the Plan and subsequent results.

This Basin management objective will result from the following plan elements:

1. Groundwater Basin and Resource Information Management;
2. Groundwater Basin and Resource Reports; and
3. Local Agency and Stakeholder Involvement.

The Plan and its management strategies will result in the compilation of various data and information regarding the groundwater basin and its resources. The Authority will compile, manage and disseminate this information to facilitate improved coordination and use of the Plan Area's hydrologic resources. The Plan will also result in various opportunities for the Basin's stakeholders to respond to basin management efforts.

SECTION 5
MANAGEMENT STRATEGIES
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

SECTION 5
MANAGEMENT STRATEGIES
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

GENERAL

California Water Code Sections 10753.7 and 10753.8 set forth required and recommended elements that establish strategies for groundwater management. Each strategy and the Deer Creek and Tule River Authority's (Authority) planned activities conducted in support of the strategy are described in this section. Some activities have been in use since the adoption of the previous 1994 Groundwater Management Plan (Plan). Planned activities describe proposed Authority efforts that will be utilized during the implementation of this Plan.

SALINE WATER INTRUSION CONTROL

The Tule River Groundwater Basin is a subbasin of the Tulare Lake Hydrologic Region. The western edge of the Plan Area is situated about 90 miles from the Pacific Ocean. The Authority does not consider saline water intrusion controls a management strategy that warrants consideration.

Plan Activities

None - The Authority reserves the right to decide whether or not it will be involved with this strategy in the future as authorized by Water Code Section 10753.8.

WELLHEAD AND RECHARGE AREA PROTECTION

The management strategy consists of the identification, establishment and management of wellhead and recharge protection areas. Areas where groundwater pumping and recharge occur warrant dedicated attention by the Authority. Wells represent a direct conduit to groundwater. Recharge area (basins) are typically constructed in areas exhibiting high soil permeability characteristics.

The Authority will monitor and participate in land use development activities within the Plan Area. The Authority will also consider structural measures such as fencing or land acquisition to protect wellhead or recharge areas.

Plan Activities

1. Land use and development monitoring;
2. Participation in pertinent land use/zoning planning procedures; and
3. Incorporation of security measures such as fencing, as necessary.

MIGRATION OF CONTAMINATED GROUNDWATER CONTROLS

This management strategy incorporates regulations and controls for contaminated groundwater. The Authority has not identified specific plumes of contaminated groundwater. Source specific plumes of contaminated groundwater, such as those from leaking underground storage tanks, fall under the jurisdiction of various state and federal agencies. The Authority is not in a position at this time to pursue regulations regarding unattributed groundwater contamination.

The Authority will develop and implement protocols to obtain and compile information regarding contaminated groundwater. Monitoring of groundwater quality will also be conducted.

Plan Activities

1. Monitoring of regulatory activities and records regarding contaminated groundwater within Plan Area; and
2. Complete an inventory and evaluate available groundwater quality data.

WELL ABANDONMENT/DESTRUCTION POLICIES

Improper well abandonment may allow contamination of the groundwater. Well abandonment must be conducted in conformance with standards adopted by the County of Tulare. The Authority will monitor these activities by reviewing abandonment records compiled by the County. Appropriate information on proper abandonment of wells within the Plan area will be made available through the Authority.

In lieu of well abandonment, the Authority will pursue the conversion of a production well to a monitoring well if such suitable opportunities arise and funding is available.

Plan Activities

1. Establish and maintain a protocol with Tulare County regarding review of well abandonment records;
2. Develop record keeping system/database of abandoned wells;
3. Establish public education activity to inform stakeholders of well standards and policies; and
4. Develop and implement program to convert abandoned production wells to monitoring wells.

WELL CONSTRUCTION POLICIES

The increase in groundwater extraction resulting from the construction of additional wells affects the long-term water balance of the region. Well construction may allow contamination of the groundwater if not done properly. Well construction must be conducted in conformance with standards adopted by the County of Tulare. The Authority will monitor these activities by reviewing well construction records compiled by the County. Appropriate information on proper construction of wells within the Plan area will be made available through the Authority.

Opportunities for additional groundwater monitoring wells may arise through the abandonment of existing production wells. The Authority will consider such a conversion to eliminate the construction of additional wells.

Plan Activities

1. Establish and maintain a protocol with Tulare County regarding review of well construction records;
2. Develop a record keeping system/database of constructed wells;
3. Establish public education activity to inform stakeholders of well construction standards and policies; and
4. Develop guidelines for monitoring well conversion.

OVERDRAFT MITIGATION

The groundwater basin is experiencing groundwater overdraft as evidenced by lower groundwater levels within the Plan Area.

This management strategy is best achieved through the implementation of several companion management strategies. Overdraft mitigation is accomplished through the integration of the following strategies:

1. Groundwater Recharge/Management;
2. Groundwater Extraction Policies;
3. Conjunctive Use Policies; and
4. Surface Water Management.

These strategies will be implemented to attempt to achieve a hydrologic balance within the Plan area, thereby reducing overdraft of the groundwater resource.

GROUNDWATER RECHARGE MANAGEMENT

The replenishment of the underlying groundwater occurs naturally and through deliberate, controlled means. The Authority's groundwater replenishment is achieved by controlled means principally through direct recharge to the underground and through the delivery of surface water, when available, to lands otherwise relying on the groundwater resource.

Direct recharge is achieved through the placement of surface water in channels or basins located on permeable soils for the express purpose of percolation to the underground. Within the area of the Authority, the members use natural channels, unlined ditches and canals and percolation basins for this purpose. It is the intention of the Authority members to expand the current network of recharge facilities. The monitoring of groundwater conditions under this Plan will enable the Authority to identify areas of need in this regard.

Delivery of surface water for irrigation purposes reduces the need for water users to draw on groundwater thereby conserving the water available in the aquifer for later use. The use of surface water in this manner is known as in-lieu recharge and is practiced by all Authority members. An additional benefit is derived when irrigation water applied beyond crop water needs percolates to the underground.

Plan Activities

1. Maintain and/or expand relationships involving networks of groundwater recharge facilities;
2. Maintain and/or expand surface water deliveries within the Plan area.; and
3. Pursue additional surface water supplies for specific purposes of groundwater recharge.

GROUNDWATER EXTRACTION POLICIES

Effective groundwater replenishment and maintenance of groundwater levels involves the management of water supplies available to the basin and extractions from the basin. Groundwater extractions within the management area are primarily by private wells. Management of groundwater extractions can best be achieved through economic incentives, rather than through the regulation of extractions. This current practice will continue to be implemented through the pricing of surface water at rates which encourage water users to use surface water in-lieu of pumping groundwater.

Plan Activities

1. Secure surface water quantities and establish subsequent pricing that encourages maximum surface water use;
2. Develop and implement an educational program focused on:
    a) Timing of use of groundwater;
    b) Timing of use of surface water; and
3. Evaluate grower incentive based banking program.

CONJUNCTIVE USE POLICIES

Groundwater management in California is rooted in the conjunctive use of surface and groundwater resources. Use of the water supplies from the two sources is integrated to accomplish the optimum utilization of each source.

In years of shortage, that previously stored water is pumped to supplement available surface water. Authority members will be encouraged to maximize the utilization of available facilities and resources for conjunctive use through cooperative management.

Conjunctive use opportunities motivated the Authority members to enter into long-term contracts with the United States beginning in the 1950's for the importation of supplemental surface water supply from the Friant Unit of the CVP.

Water transfers and exchanges are an integral part of the existing conjunctive use programs. Under the Plan, the Authority members will seek to preserve and enhance conjunctive use activities through coordinated use of available supplies made possible by water transfers and exchanges and through expansion of recharge facilities. Enhancement of conjunctive use activities could include the development of water banking arrangements with other agencies by utilizing available groundwater storage capacity for the temporary storage of water.

This management strategy will result from the integration of the following plan elements:

1. Groundwater Recharge Policies;
2. Groundwater Extraction Policies; and
3. Surface Water Management.

SURFACE WATER MANAGEMENT

Surface Water Quantity

The Authority members import surface water supplies from the Central Valley Project through the Friant Division and the Cross Valley Canal exchange program under long-term contracts with the United States and receive local surface supplies from the Tule River and Deer Creek. Also, the Authority members make short-term and year-to-year arrangements to secure additional Central Valley Project (CVP) water and other supplies. The Authority members have in place and operate an extensive system of conveyance, distribution and recharge facilities throughout their service area to make use of available surface supplies. Table 5-1 summarizes the water supply contract amounts of each member District of the Authority.

Under this Plan, the Authority will seek to preserve the existing water rights and contracts and will pursue opportunities to supplement these supplies through importation of additional water supplies for Authority members. Supplemental supplies may be obtained through purchase of additional CVP water from other entities, "Section 215 water" from the United States and through other programs as may be available. Efficient water use and distribution within the management area will be encouraged through the use of transfers and exchanges among Authority members.

Importation of affordable water supplies, in quantities sufficient to achieve a long-term water balance within the service area of the Authority members, is a prerequisite for successful implementation of the recharge groundwater management strategy. All opportunities to supplement the regular supplies of the Authority members through long-term water exchange and banking agreements, hereinafter referred to as Projects, will be evaluated for compatibility with the goals of this Plan pursuant to an adopted evaluation process.

TABLE 5-1
WATER SUPPLY
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

District	Acres	CVP Supply (AF)	Avg CVP Supply (AF)	Conveyance System	Other Notes
Lower Tule River ID	104,000	61,200 Class 1 238,000 Class 2 31,102 CVC	156,240	300 mi. Canals 25 mi. Rivers 5 mi. Piped	Local supply from Tule River 70,000 AF/y average
Pixley ID	70,000	31,102 CVC		46 mi. Canals 14 mi. River	Access to Deer Creek - minor supply
Porterville ID	17,000	16,000 Class 1 30,000 Class 2	27,320	13 mi. Unlined Canals 7 mi. Piped 12 mi. Rivers/Slough	Local supply from Tule River 10,600 AF/y average
Saucelito Irrigation District	19,500	21,200 Class 1 32,800 Class 2	33,300	100% Piped	
Stone Corral ID (1)	6,500	10,000 Class 1	9,200	100% Piped	GW storage is limited-Aquifer thickness <1600'
Terra Bella ID	13,300	29,000 Class 1	26,680	100% Piped	GW storage is limited-Aquifer thickness <1600'

Notes: (1) Not in groundwater basin.

This evaluation process will consist of the following steps:

1. Submittal of written proposal and technical report;
2. Authority Advisory Committee and consultant evaluation;
3. Proponent and Authority Coordination; and
4. Authority Advisory Committee recommendation and Board of Directors action.

For any proposed Project, the Proponent will initiate the process through the transmittal of a written proposal describing the Project, including the anticipated benefits. A technical report will be prepared by the Proponent and evaluated by the Authority. The report must describe:

1. Quantities and sources of water;
2. Structures and other physical features of the proposed Project;
3. Water accounting measures and/or methods;
4. Funding;
5. Schedule, including CEQA compliance;
6. Anticipated benefits; and
7. Proponent's evaluation of compliance with Plan's management objectives.

The Authority Advisory Committee will evaluate the Technical Report prior to any Board determination regarding the proposed Project.

The Authority Advisory Committee will utilize outside consultants, as necessary, for further evaluations. The proposal and technical report will be reviewed for consistency with the Plan's basin management objectives and utilization of adopted management strategies.

The resulting evaluation will be returned to the Project Proponent. The Authority Advisory Committee will coordinate with the Proponent to develop the final proposed Project.

Upon finalization of the proposed Project, the Authority Board of Directors will act to determine the compatibility of the proposed Project with the goals of this Plan. Similarly, water exchange and banking agreements among Authority members will be used where they may enable the Authority members to distribute water to areas identified under this Plan as suffering from groundwater depletion and as being suitable for groundwater storage.

Surface Water Quality

The surface waters of the Plan area are varied. Imported surface water originates in the San Joaquin River watershed (Friant-Kern Canal). Local surface water can be found in the Tule River and Deer Creek. These imported and local surface waters are subject to monitoring programs by various agencies. Current surface water monitoring programs are summarized in Table 5-2. Under this management strategy, the Authority will review results of existing monitoring programs. Additional surface water quality monitoring will be developed if deemed necessary.

Plan Activities

1. Maintain or increase quantities of imported surface water;
2. Preserve existing surface water rights;
3. Promote efficient water use through the use of water exchanges and transfers;
4. Investigate potential for water banking opportunities within the Plan area;
5. Develop additional water storage capacity within the Plan area; and
6. Monitor existing surface water quality testing efforts by other agencies.

TABLE 5-2
SURFACE WATER QUALITY MONITORING
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

SURFACE WATER	MONITORING AGENCY	FREQUENCY
Friant-Kern Canal	Reclamation District 770	Annually
	Terra Bella Irrigation District	Varies - monthly to annually
Tule River	Reclamation District 770	Annually
	Tule River Association	Seasonal

OPERATION OF FACILITIES

This management strategy consists of the construction and operation of facilities that address groundwater recharge, storage extraction, conservation contamination clean-up and water recycling. Current efforts primarily address groundwater recharge through percolation basins and unlined irrigation distribution channels. In general, the current projects are implemented individually by member Districts.

Additional groundwater facilities will be needed to sustain the resource as demands placed on the groundwater resource increase. The Authority will evaluate potential projects that will address this need. The current scope of this strategy will be expanded as necessary. Opportunities to incorporate recycling and reclamation and water conservation may be possible through coordination with domestic utility providers.

Plan Activities

1. Maintain policy that encourages the use of unlined channels (where possible);
2. Maintain policy which facilitates maintenance of recharge basins;
3. Develop and implement protocol to identify operations projects; and
4. Upgrade and expand surface water conveyance facilities.

GROUNDWATER MONITORING

Groundwater monitoring will be used by the Authority to assess the quantity and quality of the groundwater resource. The details of this management strategy are described in Section 6.

Each member District of the Authority currently participates in biannual monitoring of groundwater levels. Additional groundwater level information is available from domestic water providers.

In general, regular groundwater quality assessments are conducted by domestic water providers within the region. The Authority will develop a protocol to compile groundwater quality data. Additional groundwater quality monitoring efforts will be developed as needed.

LAND SUBSIDENCE MONITORING

The Authority does not have any substantial information regarding land subsidence within the Plan area. This management strategy consists of developing and implementing monitoring protocols to determine the pressure of land subsidence. The Authority's efforts will establish a starting point for future evaluations.

Plan Activities

1. Identify and establish an elevation control network throughout the Plan area; and
2. Conduct periodic survey of control network to determine presence, if any, of land subsidence.

LAND USE PLANNING

This management strategy consists of reviewing land use plans and coordination with local planning agencies. Under this strategy, the Authority will review projects and basin activities that affect land use and the potential for groundwater resource impacts.

Plan Activities

1. Develop and maintain protocols to participate in local land use planning efforts; and
2. Continue participation in California Environmental Quality Act as a responsible agency.

GROUNDWATER BASIN AND RESOURCE INFORMATION MANAGEMENT

Many strategies to be utilized by the Authority will produce groundwater resource and basin data or information. This information will need to be completed and inventoried.

The purpose of this management strategy is to ensure that data and information gathered during the implementation of the Plan is readily available for evaluation purposes. Many Plan efforts could be implemented by Authority member Districts or other Plan Participants. Centralizing this data and information will be critical to groundwater management.

Under this management strategy, the Authority will also conduct assessments and evaluations of the implementation data. These efforts will serve as the basis of development for the Authority's annual reports and other Plan documents.

In addition, a conjunctive use model for the Tule groundwater basin area was developed for the Department of Water Resources in 2002. The model is a productive tool that is available to the Authority. This tool provides an additional method to evaluate Plan data and conduct groundwater resource assessments.

Plan Activities

1. Establish data management authority and responsibilities;
2. Develop and implement data collection and inventory protocols and standards; and
3. Conduct periodic refinement and use of predictive groundwater model.

GROUNDWATER BASIN AND RESOURCE REPORTS

This management element consists of the preparation of reports and other documents used by the Authority to disseminate information and findings regarding its efforts under the Plan. Reports will be used to document Plan activities and subsequent effectiveness. These reports will also be used to present new and/or additional knowledge regarding the Basin characteristics and resources.

Detailed information regarding the Authority's reporting efforts can be found in Section 7, Implementation.

Plan Activities

1. Prepare Annual Groundwater Management Plan Report; and
2. Prepare technical memoranda as necessary to disseminate information regarding Plan activities.

LOCAL AGENCY AND STAKEHOLDER INVOLVEMENT

This management strategy consists of efforts to engage individuals and agencies within the Plan area in Plan participation. Three primary elements will form the foundation of this management strategy: Plan participation, Advisory Committee and Public Review. The first element is Plan Participation. There exists many agencies within the Plan area that will realize benefits from the Authority's coordinated Plan efforts to manage the groundwater resource. The Authority will pursue opportunities to engage such agencies as Plan Participants. Additional Plan Participants increase the extent of coordinated groundwater resource management and the amount of resources available to implement the Plan.

The second element of this strategy is the development and utilization of a Plan Advisory Committee (Committee) to address the implementation of the Plan. The Authority will establish the criteria regarding Committee formation and participation. To be effective, the Committee must include individuals and agencies that represent the various resource interests of the Plan area. The Authority will endeavor to enlist sufficient representation for the Committee. Additional committees may be created as necessary to facilitate implementation of the Plan.

The third element of this strategy consists of public participation and review. The meetings of the Authority are open to the public. Public notification will be completed to encourage public participation. During Plan reporting efforts, the public will be afforded opportunity to review and publicly comment on the Plan and its implementation. The Plan will be considered public record and available for inspection.

Plan Activities

1. Pursue Plan participation by local agencies within Plan Area;
2. Maintain advisory committee of Plan Participants and Plan stakeholders; and
3. Establish and maintain public notification and participation procedures regarding Plan activities.

SECTION 6
MONITORING
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

SECTION 6
MONITORING
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

GENERAL

Optimal use of the groundwater resource is dependent on the acquisition of good basic data respecting both geology and hydrology. The purpose of this element of the Deer Creek and Tule River Authority (Authority) Groundwater Management Plan (Plan) is to monitor conditions within the groundwater basin to identify changing conditions which may require attention. Monitoring includes gathering and analyzing basic data generated from Plan management activities to characterize the basin to provide the information necessary for future management decisions. Existing and proposed management activities in this regard may be enhanced to provide a more complete picture of the condition of the groundwater resource. The Plan's primary monitoring effort will be directed at the groundwater resource. Additional monitoring efforts will result from activities proposed by management strategies.

GROUNDWATER MONITORING

Groundwater monitoring will consist of two components which are groundwater levels and groundwater quality.

Groundwater Levels

Data regarding groundwater levels is used to evaluate groundwater movement and storage conditions. Groundwater contour maps showing lines of equal elevation of the water surface indicate the direction of groundwater movement and can be used to develop estimates of

groundwater flow entering or leaving the management area. Maps of depth to groundwater can provide insight into the distribution of pumping lifts and resulting energy costs for extraction. Maps showing changes in groundwater levels, when used in conjunction with data on specific yield, can also be used to estimate changes in groundwater storage.

The Authority members routinely measure groundwater levels in approximately 200 wells. (The location of these wells is presented in Figure 6-1.) Measurements are made in both spring (February) and fall (October). The present monitoring networks will be maintained or enhanced to assure the availability of sufficient data for the preparation of groundwater contour maps. Measurement of groundwater levels will continue to be performed in both spring and fall in order to show seasonal variations.

Groundwater Quality

Monitoring of groundwater quality provides the information required for determinations of the suitability of groundwater for various uses. Comprehensive groundwater quality data for the Plan area does not exist. The Authority will develop protocols to obtain groundwater quality data from domestic water providers and other sources and consolidate it for management purposes.

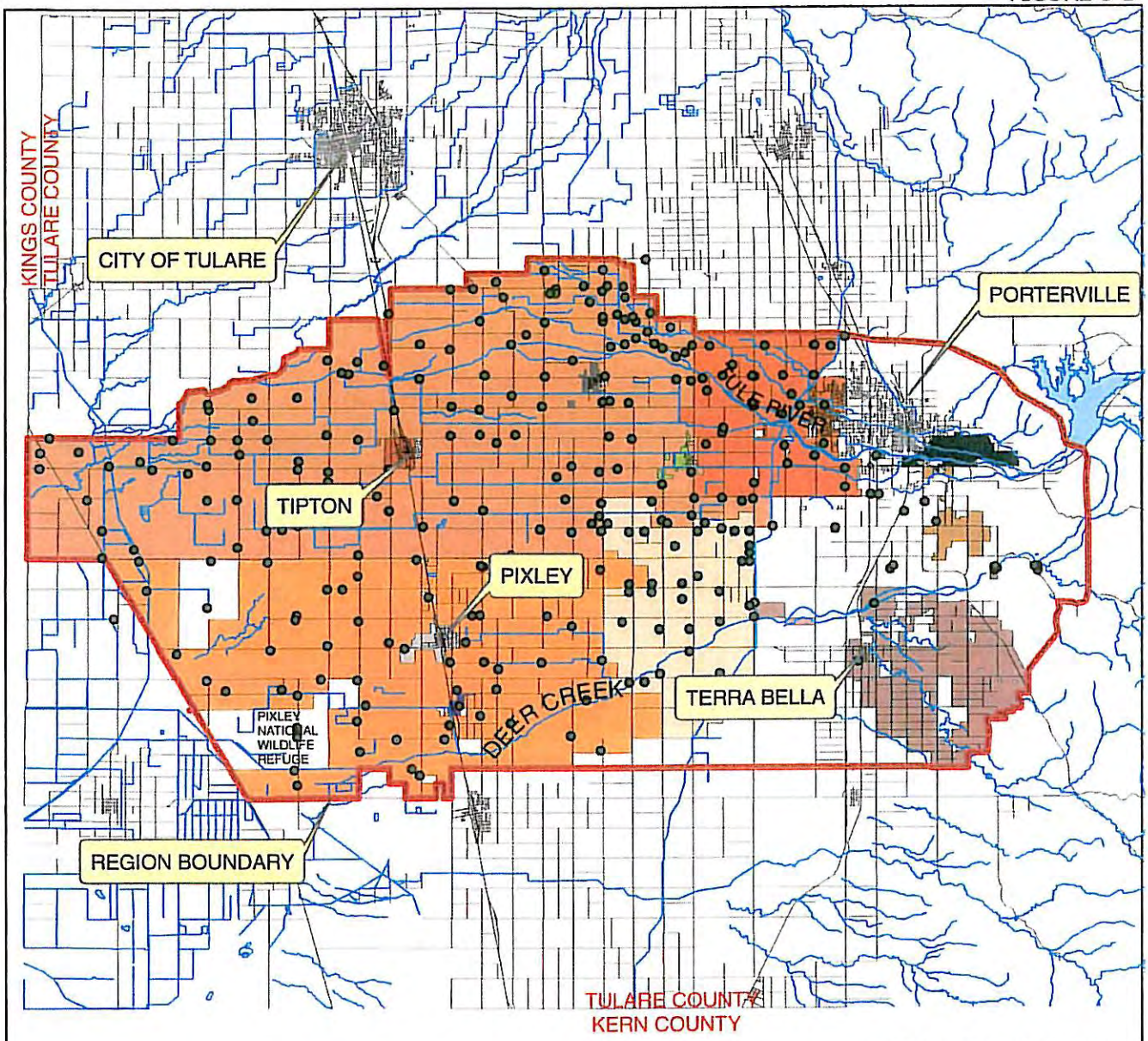
The sampling of the Authority's wells will be expanded, if necessary, to provide sufficient data to allow identification of water quality problem areas. Supplemental sampling may also be performed to better define localized areas of impaired water quality. Testing will typically include standard agricultural type analysis, but may also include additional testing, such as Title 22 parameters, as required.

ADDITIONAL MONITORING

Data related to the hydrologic inventory will be collected annually for quantification and analysis. Components of the inventory include precipitation, runoff, imported supplies, amounts of groundwater replenished and quantities of groundwater extracted. Additional monitoring efforts will result from the following Plan management strategies:

1. Groundwater Recharge Management;
2. Groundwater Extraction Policies;
3. Surface Water Management;
4. Land Use Planning;
5. Well Abandonment/Destruction Policies; and
6. Well Construction Policies.

FIGURE 6-1



SOURCE: TULARE COUNTY GRAPHICAL INFORMATION SYSTEM, 1999

LEGEND

GEOGRAPHICAL INFORMATION
- Boundary - Intergrated Regional Management Plan
- Streams
- Streets
- Lake Success

PUBLIC UTILITY DISTRICTS
- Pixley Public Utility District
- Porter Vista Public Utility District
- Woodville Public Utility District

COMMUNITY SERVICES DISTRICTS
- Poplar Community Services District
- Teviston Community Services District
- Tipton Community Services District

IRRIGATION DISTRICTS
- Lower Tule River Irrigation District
- Pixley Irrigation District
- Porterville Irrigation District
- Saucelito Irrigation District
- Terra Bella Irrigation District
- Vandalia Irrigation District
- Monitoring Well

N W E S

10 5 0 10 Miles

GROUND WATER MONITORING WELL LOCATIONS
GROUND WATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

KELLER/WEGLEY

SECTION 7
PLAN IMPLEMENTATION
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

SECTION 7
PLAN IMPLEMENTATION
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

GENERAL

The Deer Creek and Tule River Authority's (Authority) Groundwater Management Plan (Plan) documents will be maintained at the office of the Lower Tule River Irrigation District. The office will act as the Plan's resource center and data clearinghouse. Monitoring Data and information gathered during Plan implementation will be compiled and stored at the office. The Authority will lead Plan activity, report preparation and information dissemination efforts.

PLAN PARTICIPATION

The Plan officially recognizes stakeholders through the execution of a Memorandum of Understanding (MOU). The original stakeholders comprising the Authority executed a MOU to indicate their support of the original Plan. A copy of this MOU is presented in Appendix B. The purpose of the MOU is to document the interests and responsibilities of participants in the adoption and implementation of the Plan. The MOU also promotes the sharing of information, the developing of a course of action and the resolving of differences that may arise regarding the Plan. It is anticipated that stakeholder involvement will increase with time. The Authority will continue to pursue new stakeholder involvement and shall endeavor to enter into agreements with other local agencies. The form of agreement shall be consistent with the existing MOU and shall also be in compliance with California Water Code §10750.8.

DISPUTE RESOLUTION

The Plan acknowledges that controversial issues could arise concerning the groundwater resource. Stakeholders are encouraged to work through the Plan in addressing and resolving differences. When this process proves insufficient, the Authority has a policy in place that can be applied by the Plan. The Plan hereby adopts the Authority's "Alternative Dispute Resolution Policy." Appendix C of the Plan includes the most current version of the policy.

ANNUAL REPORT

Documentation in the form of an annual report will be prepared as required to record the results of the management activities monitoring elements of the Plan. The contents of the annual report will include:

1. Maps and/or tables showing:
    a. Spring and fall groundwater elevations;
    b. Changes in the monitor well network;
    c. Changes in groundwater levels between subsequent spring readings; and
    d. Groundwater quality;
2. Estimation of the changes in groundwater storage computed using specific yield data and maps of change in groundwater levels;
3. Summary of water resource data; and
4. Assessment of the effectiveness of management activities.

PLAN EVALUATION

The Plan will be re-evaluated annually subsequent to the findings of the Plan's annual report. The Authority's Plan Advisory Committee will be responsible for monitoring the Plan's activities and progress towards its management objectives.

The re-evaluation of the Plan will include an assessment of the effectiveness of Plan activities and a determination of potential modification(s) to the Plan.

ADDITIONAL REPORTS

Additional reports and technical memoranda may be produced as a result of Plan activity, grant funding requirements or other need for documentation. The content of any supplemental documents will address the informational requirements.

SCHEDULE

Implementation of the Authority's Plan will be structured according to the schedule presented in Table 7-1.

TABLE 7-1
IMPLEMENTATION SCHEDULE
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

PLAN ACTIVITY	OCCURRENCE
Plan Management Strategies and Activities	Monthly (As Required)
Advisory Committee	Bi-monthly
Authority General Meeting	Bi-monthly
Plan Report	Annually
Plan Re-evaluation	Annually
Groundwater Monitoring	Semi-Annually (Additional As Required)

PLAN FUNDING

Implementing the Plan will require dedicated funding through the Authority and the Plan Participants. In general, funding for the Plan and its activities will be derived from grants, in-lieu contributions, cost-sharing agreements and/or assessments.

Grants

The Authority will pursue opportunities to fund Plan activities through grants offered by DWR and other agencies. Member Districts may be asked to support grant applications on the Authority's behalf.

Cost-Sharing Agreements

Costs for annual groundwater reports, Plan updates and other reporting efforts will be distributed and collected according to any cost-sharing agreements for Authority project activities.

Additional cost-sharing agreements may be developed as necessary to fund other projects considered during the implementation of the Plan.

In-lieu Contributions

Some Plan activities, such as groundwater monitoring will be funded through the Districts' own operations.

Assessments

Upon adoption of this Plan, the Authority is authorized to levy and collect general groundwater replenishment assessments, as well as water extraction fees based on the amount of groundwater extracted from the aquifer within the Plan Area. Any assessment or fees proposed to be collected by the Authority under this Plan for the purpose of groundwater management must be approved by an area-wide election as provided in the implementing statutory provisions related to AB 3030.

APPENDIX A
PLAN PARTICIPANTS AND BASIN STAKEHOLDERS
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

TABLE A-1
PLAN PARTICIPANTS
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

PARTICIPANT
Lower Tule River Irrigation District
Pixley Irrigation District
Porterville Irrigation District
Saucelito Irrigation District
Tea Pot Dome Water District
Terra Bella Irrigation District
Vandalia Irrigation District

TABLE A-2
BASIN STAKEHOLDERS
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

STAKEHOLDER	INTEREST
Lower Tule River Irrigation District	District Landowners
Pixley Irrigation District	District Landowners
Porterville Irrigation District	District Landowners
Saucelito Irrigation District	District Landowners
Tea Pot Dome Water District	District Landowners
Terra Bella Irrigation District	District Landowners
Vandalia Irrigation District	District Landowners
Tipton Community Services District	Domestic Water Supply/Use
Poplar Community Services District	Domestic Water Supply/Use
Woodville Public Utility District	Domestic Water Supply/Use
Terra Bella Irrigation District	Domestic Water Supply/Use
Pixley Community Services District	Domestic Water Supply/Use
Teviston Community Services District	Domestic Water Supply/Use
Pixley Wildlife Refuge	Wildlife
Bureau of Reclamation	Surface Water Supplies
Friant Water Authority	Surface Water Supplies
National Resources Conservation Service	Natural Resources
Audubon Society	Wildlife/Monitoring
Tulare County	Land Use/Planning
City of Porterville	Domestic Water Supply/Use

APPENDIX B
PLAN PARTICIPATION AGREEMENT
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

MEMORANDUM OF UNDERSTANDING BETWEEN DEER CREEK AND TULE RIVER AUTHORITY AND _____

ARTICLE 1 - AGREEMENT

The articles and provisions contained herein constitute a bilateral and binding agreement by and between DEER CREEK AND TULE RIVER AUTHORITY (hereinafter the "Authority") and _____ (hereinafter "Agency").

ARTICLE II - RECOGNITION

The Authority has developed a Groundwater Management Plan (hereinafter the "Plan") with input from several local agencies located within the Authority boundaries. It is the intent of Authority to allow and encourage such agencies to coordinate efforts and be a part of the Authority's Plan by means of a separate Memorandum of Understanding (hereinafter the "MOU") between each agency and Authority.

ARTICLE III - PURPOSE

It is the purpose of the MOU, entered into willingly between Authority and Agency, to document the interests and responsibilities of both parties in the adoption and implementation of the Plan. It is also hoped that such MOU will promote and provide a means to establish an orderly process to share information, develop a course of action and resolve any misunderstandings or differences that may arise regarding the Plan.

ARTICLE IV - COORDINATE

There shall be an annual coordinating meeting (hereinafter the "Meeting") between the Authority and the Agency. Authority shall give notice to the Agency thirty (30) days prior to date of the Meeting to discuss the manner in which the Plan is being implemented and other items related to the Plan. If there are concerns or questions, regarding the Plan, Agency shall transmit its concerns in writing to Authority seven (7) days prior to the Meeting.

ARTICLE V - OBLIGATIONS

The Plan shall be binding on the parties hereto unless superseded by the MOU or amendment thereto.

ARTICLE VI - AREA OF PLAN

The Plan shall be effective in all areas within the Agency boundaries. The Plan shall also be effective in any area annexed to the Agency subsequent to the adoption of the Plan.

ARTICLE VII - TERM

The initial term of the MOU shall commence on the date hereof and continue for five (5) years, and shall continue year to year thereafter, unless terminated by written notice given at least one (1) year prior to such termination.

This Memorandum of Understanding is made and entered into this _____ day of _____, 2007.

DEER CREEK AND TULE RIVER AUTHORITY

By: _____

Title: _____

By: _____

Title: _____

_____

By: _____

Title: _____

By: _____

Title: _____

APPENDIX C
ALTERNATIVE DISPUTE RESOLUTION POLICY
GROUNDWATER MANAGEMENT PLAN
DEER CREEK AND TULE RIVER AUTHORITY

ALTERNATIVE DISPUTE RESOLUTION POLICY
DEER CREEK AND TULE RIVER AUTHORITY

Purpose. The Authority recognizes that defending or prosecuting lawsuits can be expensive and time-consuming, resulting in a drain on Authority resources that should be avoided, if reasonably possible. To that end, the Authority hereby implements this policy to encourage the resolution of disputes, claims and lawsuits through alternative dispute resolution procedures related to the adopted Groundwater Management Plan.

Procedures. Whenever the Authority is named in a lawsuit or receives a written claim or a serious threat of imminent litigation, the Authority staff shall immediately consult with the Authority General Counsel regarding the same. Together, the Authority staff and the Authority General Counsel shall formulate a recommended response to be considered by the Board of Directors at its next meeting.

Whenever the Authority becomes aware of any unasserted potential lawsuit, claim or dispute, with a reasonable likelihood of being asserted, against the Authority, the Authority staff shall consult with the Authority's counsel regarding the best method for responding to the same. Possible responses include, but are not limited to, the following:

1. Do nothing;
2. A verbal communication from the Authority or its general counsel;
3. A written communication from the Authority or its general counsel;
4. An offer to meet and discuss the matter with Authority personnel;
5. An offer to mediate the matter before a neutral third-party mediator;
6. An offer to arbitrate the matter before the American Arbitration Association; or
7. An offer to arbitrate the matter using the rules of Judicial Arbitration found in California statutes.

Authority staff shall advise the Board of Directors of any unasserted lawsuit, claim or dispute, with a reasonable likelihood of being asserted, including the Authority's response to the same. The Board of Directors shall be advised whether or not the matter is resolved. If the potential lawsuit, claim or dispute becomes an actual lawsuit, claim or dispute, the response of the Authority shall be handled as set forth above in the previous paragraphs.

It shall be the practice of the Authority to encourage mediation of lawsuits, claims or dispute, whenever reasonably practical, in order to resolve such matters. Mediation shall be by a neutral third-party qualified to mediate such matters.

Appendix E Pixley ID and Delano-Earlimart ID Reconnaissance Study of a Joint Groundwater Bank within Pixley ID

Pixley I.D. and Delano-Earlimart I.D. Reconnaissance Study on a Joint Groundwater Bank within Pixley I.D.

Southern Tulare County, California

March 2008

Prepared for:

Pixley ID and Delano-Earlimart ID

Prepared by:

Provost & Pritchard Engineering Group, Inc.
Visalia, California

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ABBREVIATIONS

AF.....Acre Feet
AWD.....Angiola Water District
CEQA.....California Environmental Quality Act
CIMIS.....California Irrigation Management Information System
CVC.....Cross-Valley Canal
CVP.....Central Valley Project
DCTRA.....Deer Creek and Tule River Authority
DEID..... Delano-Earlimart Irrigation District
Et..... Evapotranspiration
FKC.....Friant-Kern Canal
FWUA.....Friant Water Users Authority
GIS.....Geographic Information System
GPM.....Gallons Per Minute
Hp.....Horsepower
ITRC..... Irrigation Training Research Center
kW-hr.....Kilowatt-Hour
NRCS..... Natural Resource Conservation Service
PIXID.....Pixley Irrigation District
RGRCP ..... Rubber Gasketed Reinforced Concrete Pipe
RRA..... Reclamation Reform Act
SJR .....Sand Joaquin River
SWSA.....Surface Water Service Area
USBR or Reclamation ..... United States Bureau of Reclamation
USGS.....United States Geological Service

EXECUTIVE SUMMARY

Introduction

This study attempted to locate common areas of potential direct recharge and in-lieu recharge that would allow for the recovery of groundwater without adversely affecting groundwater conditions for Pixley Irrigation District (PIXID) water users. These locations were analyzed while attempting to minimize costs for recovery and return to Delano-Earlimart Irrigation District (DEID) where it could be used or exchanged.

This reconnaissance level investigation attempts to identify the following:

1. If the concept of a joint groundwater bank with facilities primarily located within PIXID is worth pursuing;
2. The order of magnitude for the construction costs for such a Project,
3. The benefits from such a Project, and
4. If there are any fatal flaws in the envisioned Project.

To that end, the existing in-lieu and direct recharge capabilities are evaluated in PIXID to see if they could be used in the Project. The groundwater aquifer under PIXID is evaluated to identify any confining clay layers that might limit groundwater storage and surface soils are investigated to determine where potential direct recharge sites might be located. Well drillers reports and locally available information on the characteristics of the groundwater aquifer are researched to help investigate the likely capacity of recovery wells associated with the Project. A field investigation is conducted to identify construction obstacles along different conveyance facility alignments. Conceptual facilities are laid out and preliminary cost estimates generated to establish the order of magnitude of Project costs. These costs are then compared to other operating groundwater banks in the area to determine the feasibility of the Project given other available alternatives. And finally, the benefits of the Project are identified and the next steps in the Project are laid out and briefly explained.

Issues / Constraints

PIXID In-Lieu Recharge Capacity

One of the first things evaluated in this study was the in-lieu recharge capacity within PIXID. There are 69,550 acres within PIXID that were estimated to have an annual crop demand of as high as 133,200 acre feet (AF), and, adjusting for a 75% irrigation efficiency, the headgate demand of irrigation water could be as high as 177,600 AF in an extremely dry year. However, average effective precipitation reduced the headgate demand total to approximately 167,500 AF per year. Using this number and PIXID's total acreage, the average headgate per acre is approximately 2.4 AF per acre.

The existing estimated PIXID Surface Water Service Area (SWSA) is approximately 34,900 acres. Considering this smaller portion of the District, the estimated annual

irrigation demand of the District's SWSA is approximately 84,600 AF, or roughly 50% of the total District annual demand.

Table ES-1: Estimated PIXID In-lieu Recharge Potential

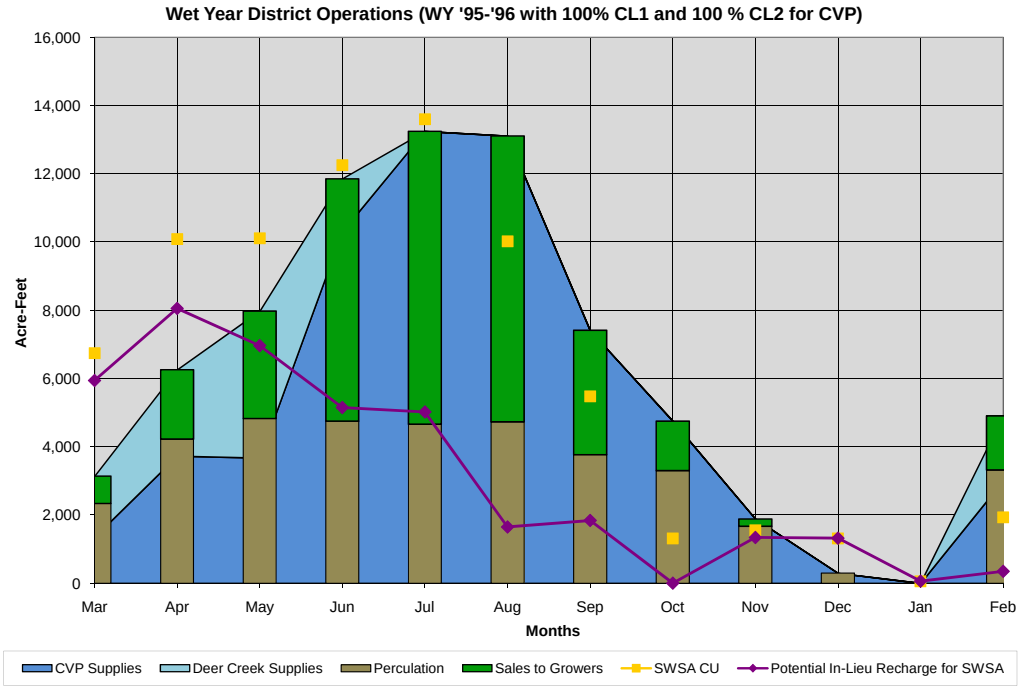
	Cropped Acreage within Pixley ID			Pixley ID Surface Water Service Area		
	Estimated Consupmtive Use (AF)	Headgate Demand with Irrigation Efficiency (AF)	Headgate Demand less Effective Precip. (AF)	Estimated Consupmtive Use (AF)	Headgate Demand with Irrigation Efficiency (AF)	Headgate Demand less Effective Precip. (AF)
Jan	100	134	0	50	67	0
Feb	3,450	4,600	0	1,731	2,308	127
Mar	12,079	16,105	15,512	6,061	8,081	7,829
Apr	18,043	24,057	24,057	9,054	12,072	12,072
May	18,075	24,100	24,100	9,070	12,093	12,093
Jun	21,920	29,227	29,227	10,999	14,665	14,665
Jul	24,324	32,432	32,432	12,206	16,275	16,275
Aug	17,929	23,906	23,906	8,997	11,996	11,996
Sep	9,800	13,067	13,067	4,918	6,557	6,557
Oct	2,333	3,111	2,114	1,171	1,561	1,137
Nov	2,763	3,684	2,389	1,386	1,848	1,297
Dec	2,370	3,160	660	1,189	1,585	520
Total	133,187	177,583	167,464	66,832	89,108	84,568
Acres	69,550	69,550	69,550	34,900	34,900	34,900
AF/Acre	1.9	2.6	2.4	1.9	2.6	2.4

PIXID's surface water supplies were also analyzed over the available period (1994 - 2006). It appears that over this period of 156 months the District received some Deer Creek supplies in 34 months, Friant Division CVP floodwater (215 Water) in 6 months, CVP Class Two water in 37 month and CVP Class One water in 28 months out of 156 months (there were 78 months of significant irrigation demand during this period).

Table ES-2: Total Historic Monthly PIXID Deliveries

			Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	WY Total
			Total Combined Friant Division CVP and Deer Creek Deliveries												
Water Year	CL 1	CL 2	(AF)	(AF)	(AF)	(AF)	(AF)	(AF)	(AF)	(AF)	(AF)	(AF)	(AF)	(AF)	(AF)
	%	%													
1994-1995	80	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995-1996	100	100	3,138	6,257	7,976	11,855	13,243	13,109	7,410	4,752	1,884	294	0	4,906	74,825
1996-1997	100	58	6,460	8,455	9,063	11,203	11,932	10,971	0	0	0	3,327	1,250	5,790	68,451
1997-1998	100	60	7,463	6,675	2,685	6,353	10,305	3,451	3,071	4,795	0	0	2,144	14,527	61,469
1998-1999	100	10	13,550	19,297	13,601	12,407	14,748	12,444	8,897	5,225	964	0	1,435	3,322	105,889
1999-2000	100	20	1,764	2,644	3,510	8,101	7,718	4,823	0	0	0	0	0	1,037	29,597
2000-2001	100	17	5,649	5,207	8,303	10,793	11,520	2,358	0	0	0	0	0	0	43,830
2001-2002	100	5	0	0	0	8,015	1,083	0	0	0	0	0	0	0	9,098
2002-2003	100	8	0	0	0	5,582	8,006	0	0	0	0	0	0	0	13,588
2003-2004	100	5	0	2,342	2,428	13,482	11,053	0	0	0	0	0	0	0	29,305
2004-2005	100	8	0	0	3,528	6,399	182	0	0	0	0	0	0	0	10,109
2005-2006	100	US	6,202	7,873	11,836	12,521	15,710	11,223	1,840	0	0	0	2,384	10,225	79,814
2006-2007	100	US	3,078	6,821	8,328	11,381	15,044	10,812	7,514	0	0	0	0	0	62,978
Max.			13,550	19,297	13,601	13,482	15,710	13,109	8,897	5,225	1,884	3,327	2,384	14,527	105,889
Min.			0	0	0	0	0	0	0	0	0	0	0	0	0
Avg.			3,639	5,044	5,481	9,084	9,273	5,322	2,210	1,136	219	279	555	3,062	45,304

Figure ES-1: PIXID Consumptive Use and In-Lieu Recharge Potential in Wet Years



Water Year 1995 was analyzed as a potentially limiting example for in-lieu recharge because it was a wet year with Class One and Class Two CVP allocations of 100%. 215 Water was also available every month of that water year. However, during that water year, PIXID sales to growers totaled approximately 37,000 AF while the estimated total consumptive use for the SWSA was approximately 84,600 AF. Total deliveries through the water year totaled 75,000 AF, but roughly 51% (38,000 AF) of available supplies were lost to seepage. It does appear that some of this seepage was intentional recharge, but the irrigation intense months of June and July experienced 40% and 35% seepage losses. As shown in **Figure ES-1**, it appears that even in the wettest years there is the potential for between 2,000 to 8,000 AF/month of potential in-lieu recharge over the SWSA (purple line) within the growing season totaling approximately 27,800 AF over the year analyzed.

PIXID Direct Recharge Capacity

Another constraint that was evaluated was the direct recharge capacity within PIXID. Currently, PIXID is able to accomplish direct groundwater recharge through the use of Deer Creek, the existing canal system (consisting entirely of unlined earth canals), and sinking basins owned by the District. The District utilizes approximately nine recharge and regulation basins covering approximately 330 acres. Historical delivery records obtained from PIXID also suggest that the estimated percolation rate of the District's

conveyance system is in the 30 to 50 percent range of canal flows. This can be determined by comparing the monthly average sales to growers and percolation volumes from 1994 thru 2006 during the irrigation season, as shown in **Table ES-3**.

Table ES-3: Historical PIXID Sales and Percolation Records

	Monthly Averages (1994 thru 2006) (Volumes in AF)											
	March	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**	**January**	**February**
Sales to Growers	1,080	1,630	2,460	5,160	5,870	3,590	1,140	380	20	0	0	270
Percolation	2,560	3,240	2,750	2,390	2,540	1,730	1,070	750	190	280	370	2,010
Total	3,640	4,870	5,210	7,550	8,410	5,320	2,210	1,130	210	280	370	2,280
% Percolation	70%	67%	53%	32%	30%	33%	48%	66%	90%	100%	100%	88%
Max Recorded Monthly Perc.	12,630	18,170	10,500	5,410	5,140	4,730	4,160	3,300	1,670	3,330	2,140	14,350

As shown in the **Table ES-3**, July (the peak of the irrigation season) has an average percolation volume of 30% of the total amount of water conveyed and sold through the District's distribution system. This percentage increases both in the earlier and later portions of the irrigation season. Also included in the above table are the maximum recorded monthly percolation volumes from 1994 thru 2006. Records indicate that the District does have the capability of percolating upwards of 18,000 AF in a single month using their existing facilities[1].

Deer Creek currently functions as a natural direct recharge facility because of its good percolation capability mainly due to its sandy banks and floor. A study for the U.S. Bureau of Reclamation in 1995 conducted by CH2M Hill stated that, "Based on many years of experience using Deer Creek for conveyance, PID (PIXID) estimates that approximately 50 cfs would need to be released from the Friant-Kern Canal (FKC) to provide 14 cfs at the refuge (Pixley National Wildlife Refuge)." Using this estimate, the recharge potential of Deer Creek was further divided into the portions west and east of Highway 99, as shown in **Table ES-4** below.

Table ES-4: Estimated Deer Creek Recharge Capability within PIXID

Portion of Deer Creek	Length (ft)	% of Total Length	Recharge Capability (AF/day)	Recharge Capability (AF/month)
Entire within PIXID	77,700	100%	71	2,130
West of Highway 99	46,200	59%	42	1,260
East of Highway 99	31,500	41%	29	870

[1] In April of 1998 PIXID took delivery of 19,297 AF of Deer Creek supplies, but made only 1,126 AF of sales to growers, thereby creating 18,171 AF of recharge or seepage that month.

Existing Groundwater Conditions

The existing groundwater condition within PIXID was evaluated to determine:

1. The depth to water;
2. The presence of subsurface clay layers that would restrict or limit groundwater banking;
3. Obvious groundwater quality issues, and
4. Available storage capacity.

In general, the groundwater table within PIXID is depressed, with the center region of the District having a greater depth to groundwater than the perimeter region. The deepest groundwater depressions are located under the town of Pixley and in the middle of the District east of Highway 99. There is some groundwater "mounding", just north of Earlimart, in the southwest portion of the District, and in the northwest corner of the District. As a result, the general groundwater flow trend for the District is from the District boundaries to the center of the District.

The DEID/PIXID shared boundary is located on the inward slope of the depression (water flowing toward the center of PIXID). In this region, the depth to groundwater gradient can be as much as 50 feet increase in depth in 1.5 miles, as was measured in February 2007. The estimated groundwater flow direction along the shared boundary is northward into the deepest depression within PIXID. The groundwater below Deer Creek most likely follows the same path northward. Thus, any additional direct groundwater recharge in the southeast region of PIXID will most likely migrate very slowly northward toward the most significant depression.

Limitation on Impact to Local Groundwater Users

One of the guiding limitations for the Project was that recovery from the Project had to be proximate to recharge efforts so as to avoid negative impacts to local groundwater users. Therefore, although PIXID has a significant in-lieu recharge capacity throughout the District, this capacity cannot be used for banking purposes unless the recovery facilities are spread throughout the District where in-lieu surface water deliveries are made. Due to the very large construction cost associated with spreading out recovery and conveyance facilities, this scenario was not pursued. Instead more concentrated recovery facilities within a new dedicated recharge facility (located in one or two sections) were envisioned.

In order to further protect local groundwater users, the Project, in each Project magnitude considered, was structured to only recover what had already been recharged. In wet years, the newly proposed direct recharge facility will store banked volumes of water in the aquifer beneath the recharge facility. Given the proposed recovery facility configuration and the slow rate of lateral groundwater flow in the area, it is doubtful that if the bank is exercised regularly any stored water would travel significantly outside the recoverable area. As waters are recharged and banked, a groundwater mound will grow beneath the direct recharge site. This will cause groundwater levels in the vicinity of the well field to be higher than they would be without

the Project, benefiting growers in the area with higher groundwater levels and lower groundwater pumping costs.

In years when banked water is requested for return, the recovery facilities would draw water from the groundwater mound. Restrictions on the amount that can be recovered in any one year and a schedule of recovery limits for successive dry years will protect local groundwater users from potential negative impacts from the Project. A detailed investigation of existing groundwater wells will need to be performed prior to locating the recovery wells for the Project. Regular and active monitoring of local precipitation, groundwater levels in on and off-site wells, and recharged and recovered volumes from the Project will help Project participants make management decisions that will allow the Project to succeed while protecting local groundwater users.

DEID's Available Banking Supply

DEID (54,418 acres) has a large Class One contract (108,800 AF) on the Friant Division CVP System (CVP) and a significant amount of Class Two contract (74,500 AF) and has therefore benefited from a generally decreasing depth to groundwater since the advent of the importation of CVP water. DEID has estimated that the District has available surface water supplies for banking projects in years when they receive more than 120,000 AF. The historic surface water resources available to DEID were analyzed and future impacts from the San Joaquin River Restoration Settlement (NRDC v. Rodgers) were considered. This analysis determined that between 1983 and 2003, DEID had some available supplies for a banking effort in 11 out of the 21 years (roughly every other year).

DEID Distribution Area Considerations

DEID Lateral 111.6W is the District's northernmost pipeline lateral which is located along the north side of Avenue 56. This lateral is located approximately three miles south of Deer Creek, and is generally located between 1 and 1.5 miles south of the southern PIXID boundary. The total estimated service area of Lateral 111.6W is 9,039 acres. This area only includes lands that are able to receive water from turnouts along the lateral and any sublaterals originating from Lateral 111.6W, and excludes Reclamation Law Excess lands listed in 2004.

DEID crop report data was used to calculate an average annual demand for the entire District. After applying an assumed irrigation efficiency of 75%, the District-wide DEID head gate demand is estimated to be 3.4 AF/acre per year. Applying this demand figure to the total Lateral 111.6W service area, the estimated total demand for the lateral is 30,730 AF/year, as shown in **Table ES-5** below.

Lateral 111.6W consists of a tapering diameter pipeline that begins as a 66-inch diameter pipeline at the FKC and gradually tapers down to a diameter of 15 inches west of Highway 99. The capacity of the lateral is estimated to be approximately 101 cfs at the FKC and approximately 4 cfs west of Highway 99.

Two locations were envisioned for connections to Lateral111.6W for conveyance return of banked groundwater (see **Figure ES-2**). For the small and large magnitude Projects considered, the connection location was along Road 164. The service area downstream of this connection location was estimated to be 3,960 acres with an annual headgate demand of approximately 13,460 AF. For the medium magnitude Project a connection location near Road 176 was envisioned as shown in **Figure ES-2**. The service area downstream of this connection location was estimated to be 6,180 acres with an annual headgate demand of approximately 21,000 AF.

Table ES-5: DEID Lateral Headgate Demand Estimate

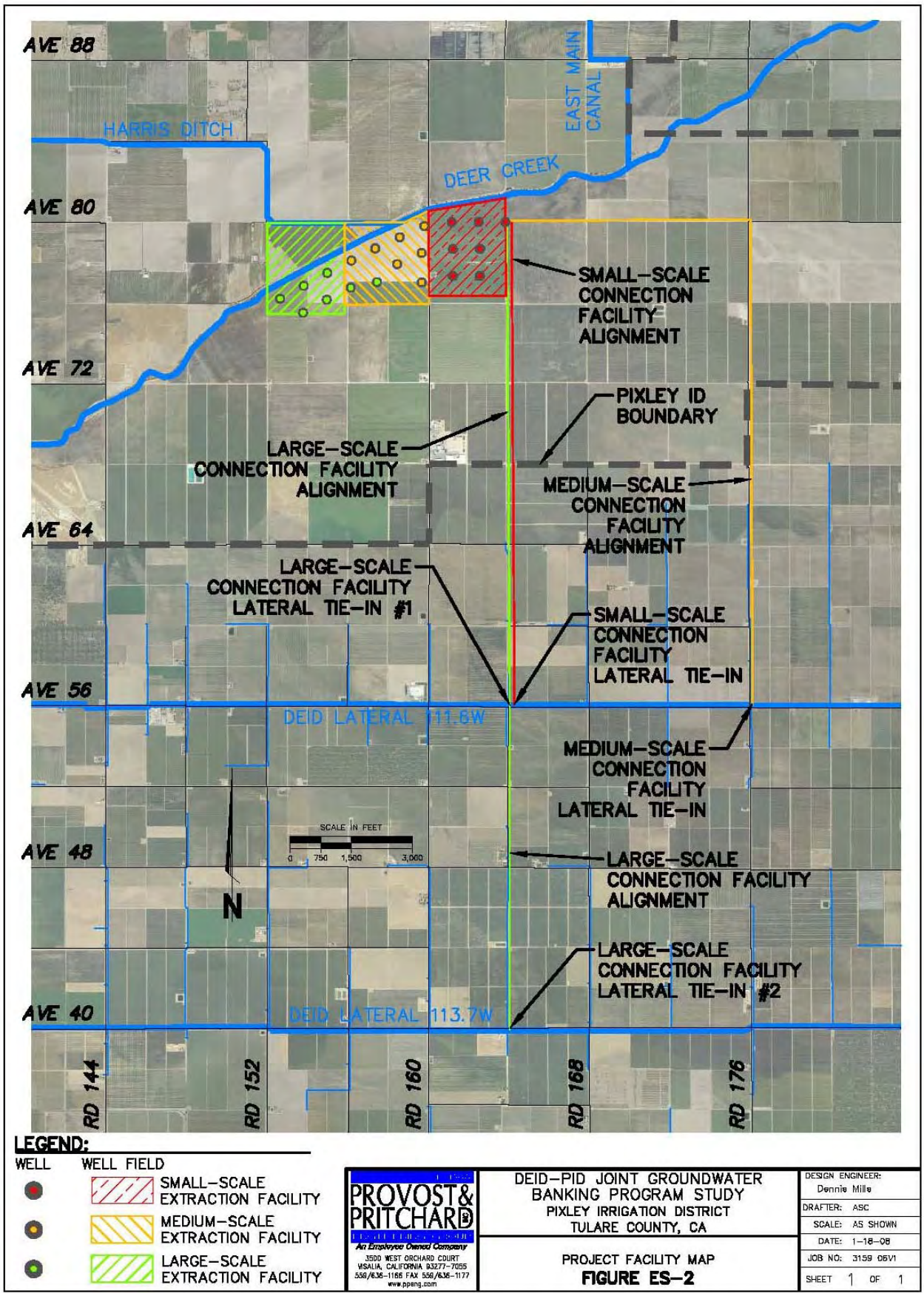
Lateral	10,000 AF Service Area (Acres)	20,000 AF Service Area (Acres)	30,000 AF Service Area (Acres)	Total Lateral Service Area (Acres)	Total Lateral Irrigation Demand (AF/yr)
111.6W	3,959	6,177	3,959	9,039	30,730
113.7W	0	0	5,100	8,081	27,480

Similar to Lateral 111.6W, Lateral 113.7W travels east and west on the south side of Avenue 40. This lateral is located 2 miles south of Lateral 111.6W and approximately five miles south of Deer Creek. The estimated service area of Lateral 113.7W (from the FKC to Highway 99) is 8,081 acres with an estimated total headgate demand of 27,480 AF/year. Lateral 113.7W begins as a 66-inch diameter pipeline at the FKC and tapers down to a diameter of 12 inches west of Highway 99. The capacity of the lateral is estimated to be approximately 97 cfs near the FKC and approximately 3 cfs near Highway 99. The large magnitude Project had a connection location for Lateral 113.7 W near Road 164 as shown in **Figure ES-2**. The service area downstream of this connection location was estimated to be 5,100 acres with an annual headgate demand of approximately 17,340 AF.

This study determined that combinations of the service areas from these two Laterals could adequately provide sufficient agricultural demand for the maximum annual delivery from all considered magnitudes of the Project's recovery facilities in the most significant months in the growing season.

Concept for Recharge, Recovery and Conveyance Facilities

The conceptual Project's banking facilities consisted mainly of the recovery wells along Deer Creek, offset roughly 500 feet to the south of the channel as shown in **Figure ES-2**. Given the available geologic information in the area it is estimated that recovery wells will likely be constructed to a depth of 1,000 below ground surface, are expected to produce approximately 2,000 gallons per minute and require roughly 300 horsepower motors. It is expected that it will cost approximately $62 per AF (energy costs) to recover the stored groundwater resources. Local groundwater conditions and direction of groundwater flow were considered and it was determined that recovery wells on the south side of Deer Creek would effectively capture recharged waters without losing


AVE 88
AVE 80
AVE 72
AVE 64
AVE 56
AVE 48
AVE 40
HARRIS DITCH
DEER CREEK
EAST MAIN CANAL
SMALL-SCALE CONNECTION FACILITY ALIGNMENT
PIXLEY ID BOUNDARY
LARGE-SCALE CONNECTION FACILITY ALIGNMENT
MEDIUM-SCALE CONNECTION FACILITY ALIGNMENT
LARGE-SCALE CONNECTION FACILITY LATERAL TIE-IN #1
SMALL-SCALE CONNECTION FACILITY LATERAL TIE-IN
DEID LATERAL 111.6W
MEDIUM-SCALE CONNECTION FACILITY LATERAL TIE-IN
SCALE IN FEET
0 750 1,500 3,000
N
LARGE-SCALE CONNECTION FACILITY ALIGNMENT
LARGE-SCALE CONNECTION FACILITY LATERAL TIE-IN #2
DEID LATERAL 113.7W
RD 144
RD 152
RD 160
RD 168
RD 176
LEGEND:
WELL
WELL FIELD
SMALL-SCALE EXTRACTION FACILITY
MEDIUM-SCALE EXTRACTION FACILITY
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www.ppeng.com
DEID-PID JOINT GROUNDWATER BANKING PROGRAM STUDY
PIXLEY IRRIGATION DISTRICT
TULARE COUNTY, CA
PROJECT FACILITY MAP
FIGURE ES-2
DESIGN ENGINEER: Dennis Mills
DRAFTER: ASC
SCALE: AS SHOWN
DATE: 1-18-08
JOB NO: 3159 06V1
SHEET 1 OF 1

stored supplies to deeper groundwater areas to the north. The storable\recoverable volume of groundwater in the area of the banking facilities was estimated to be between 50,000 and 100,000 AF. Locating the recovery wells to the south of Deer Creek also avoids the need to cross the channel with a conveyance facility. Indications are that Deer Creek is an excellent recharge facility and that intentional recharge will largely be performed through the channel between the East Main and Harris Ditch check structures. A network of pipelines will convey water from the recovery wells to a central regulation basin within the larger recharge facility before the water is conveyed south to DEID.

From the regulation basin a booster station(s) will be used to lift water uphill through a pipeline or an open channel to DEID's lateral pipelines. It is estimated that it will cost between $17 and $26 per AF in energy costs to lift water through the conveyance facility to DEID. The most promising alignments for this conveyance facility, due to available downstream headgate demand, relatively short length and lack of construction obstacles, were determined to be along Roads 164 or 176. It also appears that it is only necessary to connect the conveyance facility to either DEID's Lateral 111.6W (for the small and medium magnitude Project) or both Lateral 111.6W and 113.7W (for the large magnitude Project). Connections to DEID's laterals long the Roads 164 or 176 provided sufficient agricultural demand during the growing season to determine that DEID could easily use the delivered dry year water given the agricultural demand downstream. The estimated total construction cost for the recharge, recovery and conveyance facilities is between $15 and $50 million depending on the amount of water to be recharged and the amount of dry year return capacity to be installed.

Table ES-6: Estimated Project Facility Construction and Cost per Share

Alignment	**Road 164**			**Road 176**			**Road 164**		
Maximum Dry Year Return	**10,000 AF**			**20,000 AF**			**30,000 AF**		
Maximum Well Field Capacity	**31 CFS**			**62 CFS**			**93 CFS**		
Conveyance Facility Option	**48" RGRCP**	**72" RGRCP**	**Lined Channel**	**72" RGRCP**	**96" RGRCP**	**Lined Channel**	**72" RGRCP**	**96" RGRCP**	**Lined Channel**
Capital Cost									
Extraction Facility	$4,672,000	$4,672,000	$4,672,000	$9,468,000	$9,468,000	$9,468,000	$13,970,000	$13,970,000	$13,970,000
Recharge Facility	$6,223,000	$6,223,000	$6,223,000	$11,770,000	$11,770,000	$11,770,000	$17,299,000	$17,299,000	$17,299,000
Connection Facility	$5,168,000	$10,259,000	$4,876,000	$14,510,000	$18,345,000	$8,726,000	$13,924,000	$19,189,000	$10,543,000
Total	**$16,063,000**	**$21,154,000**	**$15,771,000**	**$35,748,000**	**$39,583,000**	**$29,964,000**	**$45,193,000**	**$50,458,000**	**$41,812,000**
Cost per AF of Dry Year Return =	**$1,606**	**$2,115**	**$1,577**	**$1,787**	**$1,979**	**$1,498**	**$1,506**	**$1,682**	**$1,394**

Conceptual Facility Costs Comparison

The concept of shares was used in the Project to evaluate the construction costs for Project facilities so as to more easily compare the Project's construction costs to the cost for participation in other local groundwater banks. For the purpose of this evaluation one share was made equivalent to one AF of dry year return water. A share was also made to cost an amount equal to the total Project construction cost divided by the total number of available shares. As seen in **Table ES-6** the cost per share of the

Project generally goes down as the Project's dry year return capacity increases. This is due to an economy of scale in the construction costs for Project facilities.

Semitropic Water Storage District (SWSD) charged $950 - $1,200 per share in 2004 to participate in their groundwater bank. However, these rates are four years old and have been adjusted over time through the use of escalators in the agreements. Also, there are indications from their more recent literature that new ventures by SWSD will cost between $1,600 and $2,000 per share. SWSD primarily uses in-lieu recharge where some of the costs are paid by the District growers and therefore do not require for the same amount of capital facilities. Also, their deliveries from the Aqueduct are "schedulable" and reduce recharge facility costs. Given all this, the estimated $1,400 - $1,580 cost per share for this Project (for lined channel alternatives) would indicate that the costs for Project facilities are consistent with other local groundwater banks.

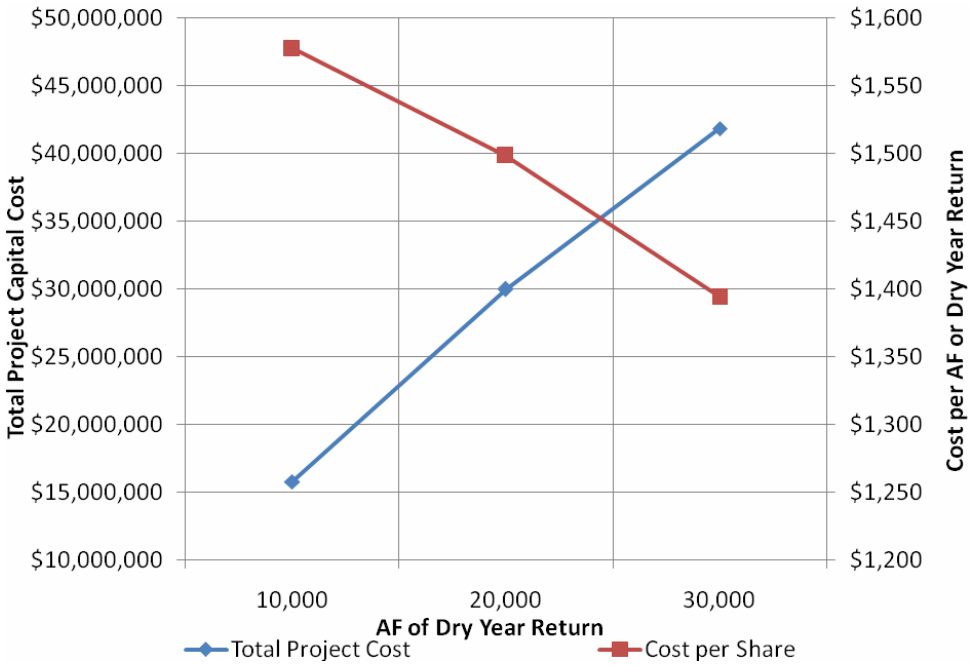


Figure ES-3: Estimated Capital Cost and Estimated Cost per Share

In local groundwater banks, the costs associated with the source water to be banked and the delivery costs to the bank are borne by the banking partner and not by the district where the water bank is located. For purposes of this analysis, it was assumed that banking partners would be subject to fees for recharging water in and recovering water from the Project. Project partners would also be subject to a management cost per year per share owned in the Project. An estimate of anticipated necessary cost was generated and it was determined that banking partners would be charged a fee of between $3-5 per AF to recharge water and a fee of $4-8 per AF in addition to the power costs to recover and covey waters from the Project. The Project partners would also be required to annually pay between $2-4 per share for management of the Project and between $6-8 per share for maintenance of the facilities. In addition to all other costs, there will also be the cost to recover groundwater and deliver it to DEID, which is

estimated to be $65 to $75 per AF depending on the conveyance facility alternative considered.

Table ES-7: Estimated Project Put and Take Costs

Project Magnitudes In AF of Dry Year Return Capacity	Assumed Source Water Cost	Management Cost per Share	Maintenance Cost per Share	Recharge Cost per AF	Recovery Base Cost per AF	Recovery Energy Cost per AF
10,000	$25.00	$3.70	$7.80	$4.40	$3.90	$61.81
20,000	$25.00	$2.50	$6.65	$3.40	$5.90	$61.81
30,000	$25.00	$2.15	$5.95	$3.00	$7.80	$61.81

Table ES-8: Estimated Total Project Costs per AF from Project Simulation

Project Magnitudes In AF of Dry Year Return Capacity	Est. Total Impact from SJR River Restoration over Period (AF)	Est. Total Delivery to Bank over Period (AF)	Total Loss to Sepage over Period (AF)	Est. Total Delivery from Bank over Period (AF)	Initial Construction Cost	Total Debt Service Cost	Total Cost Per AF	Cost Per AF neglecting Debt Service
10,000	480,000	102,100	10,210	77,955	$15,771,000	$ 34,040,000	$600	$163
20,000	480,000	189,902	18,990	143,477	$29,964,000	$ 64,640,000	$607	$156
30,000	480,000	269,902	26,990	201,977	$41,812,000	$ 90,240,000	$602	$155

Surplus Banking Capacity

Each Project magnitude was sized to be able to deliver the maximum dry year return capacity to the corresponding DEID service area between April and September. This leaves the off season months of October through March for additional deliveries beyond the currently proposed annual return if desired. The approximate magnitude increase is these months for each Project magnitude is approximately 10% of the currently proposed dry year return capacity. This additional capacity could be used by DEID or marketed to others if DEID had a corresponding amount of CVP water that could be transferred that year.

It is also possible in this arrangement for the Project's conveyance facility to be sized for the anticipated arrangement with DEID, but to allow third parties to participate if sufficient recharge and recovery facilities are constructed. The consequence would be lower per share capital facility costs but increased lift costs to convey water from the Project to the DEID service areas. This higher lift cost could be blended into a premium price for Project partners that want to bank waters beyond the basic arrangement between PIXID and DEID. For example, if the Project's conveyance facility was constructed for 20,000 AF dry year return, while the recharge and recovery facilities were constructed for 30,000 AF dry year return, this would allow the Project to deliver 30,000 AF a year through a slightly undersized conveyance facility. The extra 10,000 AF would be charged a sufficient charge to reduce the per AF cost for DEID. A dry year water cost of approximately $200 per AF could be used within the Friant Division CVP as a valid price point for premium water. Since the cost to recover and convey water to

DEID would be approximately $100 per AF, the premium price charged for the extra 10,000 AF would offset the cost 10,000 AF of recovery and conveyance for DEID.

Potential Recharge Benefits to PIXID

PIXID would likely own the Project banking facilities (recovery wells and recharge facilities) and would retain a priority right to recharge District surface waters whenever they were available (assumed to mostly be Deer Creek and 215 Water supplies). This would mean that DEID would hold a secondary right to the recharge facilities. It is assumed the DEID's water to be banked would be schedulable surplus water (likely late season water that would otherwise be carried over in Millerton Lake). The ability for PIXID to create a facility with significant recharge capacity would benefit the District to offset existing overdraft. This facility could help to stabilize the resource that anchors the local agricultural economy of the District and potentially generate some regular funds to help continue to construct the SWSA through other portions of the District.

Potential Dry Year Supply Benefits to DEID

DEID would benefit from the Project through the conversion of surplus waters in wet years to be made available dry year supplies. If the Project is simply a joint bank with no outside interests, then the maximum dry year return capacity for the Project is only limited by the available finances and the area converted to recharge and recovery facilities. The storage capacity of the Project has been estimated to be between 50,000 and 100,000 AF.

However, if outside interests are involved and exchanges using DEID's CVP supplies are intended, then the practical maximum for outside participation is 30,000 AF of dry year return. This is the limit of what DEID would be allocated in Friant Division CVP supplies in a critically dry year for the entire District.

Conclusion

In order to gain perspective on how the magnitude of the banking program might impact the cost per AF, three Project magnitudes were evaluated (10, 20 and 30 thousand acre-feet dry year return). This evaluation showed that the cost per AF went down as the magnitude of the banking program went up. However the capital expense involved in any of the envisioned Projects is several million dollars. The outcome of this study found that the concept of a groundwater banking facility (recharge and recovery facilities) within PIXID and conveyance facilities delivering water back to DEID was feasible for a cost per AF that was reasonable in comparison to other groundwater banking projects in the southern San Joaquin Valley.

Other Possibilities

Given LTRID's historic relationship with PIXID and their share of impact from the PIXID's groundwater depression, it would seem prudent to discuss or evaluate the potential of including LTRID as a Project partner. There may also be additional benefits

garnered from the Project if a district with a large CVP Friant Division Class Two contract and significant Tule River rights were involved in the Project.

P&P learned during this reconnaissance study that Saucelito ID has recently applied for state grant funding (DWR Local Groundwater Assistance) to study the potential of using the section of Deer Creek that runs through their district and new recovery facilities as a groundwater banking project. Currently not much is understood about the proposed groundwater bank, but given that this district is and adjacent neighbor to the east that is just upstream along Deer Creek, it would seem prudent to discuss or evaluate the potential of combining Saucelito ID's effort into the Project.

PIXID is in a unique location where the possibility of working with Tulare Lake Basin Water Storage District (TLBWSD) might have the potential for a new facility that could convey water across the Valley between the Friant–Kern Canal and the California Aqueduct. Having a groundwater banking facility connected to a conveyance facility between the Friant Division CVP and SWP to help store and regulate supplies between the two systems would be a very valuable and marketable commodity. It is recommended that this concept be investigated. The concept has the possibility of providing the ability to potentially offset some of the impacts of the San Joaquin River Restoration Settlement through reregulation of wet year water on the Friant Division CVP, but could also be involved in the reregulation of San Joaquin River water moved into the California Aqueduct and delivered back to the Friant Division CVP through a conveyance facility along the southern rim of the Tulare Lake bed.

Areas of Additional Research

In the fall of 2008, as the results of the reconnaissance study began to indicate that the Project was feasible, a general outline of activities was prepared to help better describe the likely steps that would need to be taken toward the goal of having a functional groundwater bank. Three general categories were focused on: Groundwater Monitoring, Groundwater Modeling and Groundwater Management Plan.

As is shown in the **Table ES-9** both district's currently have a semi-annual monitoring program that collects depth to groundwater information from a network of privately owned extraction wells throughout their districts, both districts have generated groundwater contours from this information to better evaluate groundwater conditions in the area, and both districts have or participate in groundwater management plans that are compliant with Senate Bill 1938. This is an excellent starting point for the management framework that will need to be in place before the Project could become operational.

	Basic Understanding		Expanded Monitoring and Analysis		Active Groundwater Bank		
Groundwater Monitoring	Semi-Annual Mon. Prog. By District	Well Canvass for additional potential monitor wells and analysis of well completion reports across District	WQ Sampling, Improved crop water use data, Water Conveyance data on Deer Creek and GW extraction data	Clustered Monitor Wells at Key locations with groundwater level loggers	Banking GW Monitoring Committee and Annual Reports	Monitoring of GW levels in key wells every two weeks during extraction, monitoring piezometers around direct recharge facilities monthly during recharge, monitoring of production well rates very regularly.	
Groundwater Modeling	Groundwater Contours	More detailed Investigation of GW Aquifer Characteristics	Conceptual Model	Water Balance and Numeric Model for Project Area	Banking Program Justification that no growers will be harmed		
Groundwater Management Plan	1st DCTRA GWMP	DCTRA GWMP - SB1938 compliant	Develop GW Banking Program Guidelines	Pixley ID GWMP - SB 1938 compliant	Groundwater Banking Program and CEQA	GW Banking Program Updates	

Already accomplished

Accomplished through DWR AB303 Program

Accomplished through USBR Water 2025 Program

Table ES-9: Table Outlining Progressive Steps Toward Groundwater Banking

In the category of groundwater monitoring, it is anticipated that several more monitor wells will need to be added to the monitoring program in PIXID and also the northern portion of DEID to provide enough information to satisfy local growers that the Project is not negatively impacting their groundwater levels. Also, groundwater quality sampling through the area should be conducted to better understand if there are groundwater quality constituents that would prevent any use (domestic, municipal, industrial or agricultural) of the supply. This information is important for this Project in terms of assuring DEID water users that they are receiving waters of equal of better quality than they already have access to. Eventually district owned monitor wells with dedicated data loggers that monitor water levels should be constructed in key areas to help better record the Project impacts to groundwater levels around and throughout the Project area. A committee of local interested landowners that support the goals of the Project should be selected and given the responsibility to evaluate annual summaries of Project operations and information collected on water levels in the Project area. This group would then report back to both boards of directors so that Project operations can be evaluated and local concerns address or greater productivity of Project facilities considered. As a part of the increased monitoring due to the Project, groundwater level readings would be taken bi-weekly or monthly during periods of groundwater recovery and recharge so that if unexpected impacts begin to appear, they can be addressed as quickly as possible.

The groundwater modeling category will build off the groundwater monitoring information that is available and attempt to create a conceptual model for the Project area that quantifies groundwater inflows and outflows, considers seepage, precipitation and available surface water supplies, and also considers existing groundwater pumping in the area. This conceptual model would then be calibrated using historic data in an effort to create a tool that accurately considers and anticipates responses to changes in available supplies and impacts to groundwater levels. Once this tool has been established, then it can be built upon by incorporating further modeling of the proposed Project so that Project partners and local growers will have a reasonable idea of how Project operations will benefit and impact groundwater levels and resources in the Project area. This evaluation or modeling will likely be the backbone of any environmental permitting or CEQA compliance that is undertaken prior to Project construction.

Finally, at some point it may be necessary to consider revising PIXID's groundwater management plan (or its inclusion in the DCTRA's groundwater management plan) to ensure that the Project partners are provided the flexibility and authority necessary to adequately manage the Project and protect the resources of local landowners. It is anticipated that, as part of the Project, operating guidelines (the groundwater banking program) will be developed in conjunction with groundwater modeling evaluations to determine the most efficient use of Project facilities possible that can still protect the resources of local landowners in the Project area. An example of these guidelines would be that if dry year water was request several years in a row (extended drought period), the maximum Project delivery would decrease in defined steps every successive year after the first year of delivery. The defined steps would likely be related to the percent allocation on the Friant Division CVP, the amount of Deer Creek run-off available to PIXID from the previous year and precipitation for during the winter of that year.

In December of 2008 PIXID applied for grant funding from both the United States Bureau of Reclamation (USBR) through their Water 2025 Program and the California Department of Water Resources Local Groundwater Assistance Program for studies that would more fully develop the understanding of the Project's regional potential, the Project area's local groundwater characteristics and the expected local impacts from the Project. As is shown in **Table ES-9**, these grant funds are hoped to further several portions of the work identified as next steps towards an operational Project.

Appendix F Notices of District Education Programs and Services Available to Customers

FRIANT WATER AUTHORITY

FRIANT Waterline

February 2009
Volume 21, No. 184

Spring's Deceptive Serenity



Friant Water Authority / T. Randall McFarland

Fragile blossoms and a brilliant San Joaquin Valley early spring morning frame the Friant-Kern Canal as it snakes around the low foothills north of Lindsay on February 19. Despite the tranquil beauty, the Friant Division's water supply outlook this spring is initially considerably less than serene.

Friant Feeling Water Pinch

Initial Class 1 Supply Declaration Just 25%; CVP May Have To Supply Exchange Contractors From San Joaquin River



U.S. Bureau of Reclamation Regional Director Donald Glaser is flanked by Area Manager Michael Jackson (left) and Operations Manager Ron Milligan (right).

A third consecutive year of drought has taken a toll on the U.S. Bureau of Reclamation's initial water supply declaration for the Central Valley Project's Friant Division.

The Bureau announced February 20 that Friant water users, at least for now, can expect a water supply of just 200,000 acre-feet, only 25% of the total Class 1 water under contract, in the contract year that begins March 1. There would be no Class 2 water.

15% OF AVERAGE

If the declaration were to hold, Friant's overall supply would be only 15% of its long-term average annual delivery of 1.3 million acre-feet. Based upon Friant's unique two-class system of water supply, the project's first 800,000 acre-feet of yield is used by Class 1 contractors that have limited or no access to groundwater or other surface supplies.

Please see **Water Pinch**, back page

River Bill Awaits Vote By House

Action To Follow Senate OK, Provide Certainty

Action by the House of Representatives is expected shortly on a massive omnibus public lands, water and resources bill containing the legislation that would implement the San Joaquin River settlement.

It was not known at press time exactly when the House might take up the bill. Its consideration was delayed by debate over the huge economic stimulus passage that recently was approved by Congress and signed into law by President Obama.

IMPORTANT STEP

"This is an important and long-awaited step toward putting the litigation over the San Joaquin River behind us," Ronald D. Jacobsma, Friant Water Users Authority Consulting General Manager, said after the Senate passage of S. 22 – the Omnibus Public Lands Management Act of 2009 – on a vote of 74-21 January 15.

"This action will lead toward implementation of the Settlement while providing safeguards and water supply certainty for Friant users.

"It is a major advancement on Friant's No. 1 priority under the Settlement, strengthening and putting the agreement's Water Management Goal to work to minimize or eliminate effects on Friant's water supply as a result of river restoration flow releases," Jacobsma added.

SAME SITUATION

He also noted, "The settlement remains the only way to provide certainty in a highly uncertain legal environment that has surrounded the San Joaquin River litigation since it was filed in 1988.

All of the factors that encouraged the Friant contractors to settle 2½ years ago are still in play."

Friant Water Users Authority member districts and board members view the Settlement as a sound business decision.

The FWUA sees the Settlement as a far superior and sure outcome than would have been possible had the San Joaquin River case and its anticipated

Please see **River Bill**, back page

New State Effort Begins On Framing A Water Infrastructure Bond

One state crisis may be out of the way but another continues and is gaining renewed attention at the State Capitol.

With the state's budget crisis finally resolved, legislators and the Schwarzenegger administration are turning focus back to the worsening water situation and California's long-term water infrastructure needs.

'DISCUSSION EMERGING'

"Discussions are emerging once again on a California water infrastructure bond," said Ronald D. Jacobsma, Friant Water Authority General Manager.

The latest consideration is being given to numerous Delta improvements and a new version of a Peripheral Canal, which would move at least some water destined to Central and Southern California around the fragile Bay-Delta estuary. The project was a key recommendation of the Delta Vision Committee late last year following months of consideration.

Please see **Infrastructure**, Page 3

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Waterline
February 2009
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Volume 21, No. 184
Published by the Friant Water Authority, as a review of issues and developments, to inform those interested in water supplies along the East Side of the southern San Joaquin Valley. To comment or ask any questions, please write or call us at (559) 562-6305, visit our web site at *www.friantwater.org* or contact your local irrigation district. This issue was printed February 25.

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- Nick Canata, *Vice Chairman*
- Marvin L. Hughes, *Secretary-Treasurer*
- Ronald D. Jacobsma, *General Manager*
- Mario Santoyo, *Assistant General Manager*
- J. Randall McFarland, *Waterline Editor*

Arvin-Edison Water Storage District
Delano-Earlimart Irrigation District
Exeter Irrigation District
Fresno Irrigation District
Ivanhoe Irrigation District
Kern-Tulare Water District
Lindmore Irrigation District
Lindsay-Strathmore Irrigation District
Lower Tule River Irrigation District
Orange Cove Irrigation District
Pixley Irrigation District
Porterville Irrigation District
Saucelito Irrigation District
Shafter-Wasco Irrigation District
Southern San Joaquin Municipal Utility District
Stone Corral Irrigation District
Tea Pot Dome Water District
Terra Bella Irrigation District
Tulare Irrigation District

AROUND FRIANT

KERN-TULARE WATER DISTRICT

Kern-Tulare Merges With Rag Gulch District

Two water districts straddling the boundary between Kern and Tulare counties have consolidated.

The Kern-Tulare and Rag Gulch water districts officially merged as 2009 began under the Kern-Tulare name.

The consolidated agency provides agricultural water delivered through the Friant-Kern Canal under a Cross Valley Canal contract and arrangements with the City of Bakersfield, Arvin-Edison Water Storage District and Kern County Water Agency.

Steve Dalke, Kern-Tulare General Manager, said the two districts shared a common distribution system, management, and staff, but were governed by two separate boards of directors.

Water contracts were managed separately, Dalke said.

District accounting, audit and budgets were also accounted for separately and both districts were previously members of the Friant Water Authority and Friant Water Users Authority..

"All other aspects of district management were already integrated," Dalke said. "It is working very well."

Consolidation is expected to save $156,000 annually and is already resulting in significant time savings efficiencies for the district's office manager and for Dalke.

There are no significant impacts upon water supply or Reclamation Reform Act compliance, Dalke said. All Rag Gulch assets were merged into Kern-Tulare.

Each board had five members, but four – Andrew Pandol, Kent Stephens, Curt Holmes and John Zaninovich – were already directors of each district.

Those men have continued in office along with Kern-Tulare Water District Director Bruce Kelsey.

The other Rag Gulch Water District director, Chris Caratan, was appointed Treasurer of the consolidated district.

Kern-Tulare Water District was formed on March 5, 1974, and Rag Gulch Water District was organized January 24, 1955, both for the purpose of providing agricultural water service. Neither district has ever provided domestic or residential water service.

As combined, the districts cover 23,472 acres.

TULARE IRRIGATION DISTRICT

District Directors See Friant Division

Tulare Irrigation District directors and staff members took part in a Friant Division tour January 20.

The TID group was hosted by the Friant Water Authority. Assistant General Manager Mario Santoyo led the tour.

Attending were Directors David Bixler, President; Rick Borges, Vice President; Mike Thomas; and Dave Martin.

Also participating were General Manager J. Paul Hendrix, District Engineer Aaron Fakuda; Watermaster Marco Crenshaw; Controller Rich Tapley; and guests Jim Koontz with the law firm that represents TID; and Dennis Mills, of the engineering firm of Provost and Pritchard.

The tour included the San Joaquin River, Friant Dam and Millerton Lake, along with portions of the Friant-Kern Canal.

Participants saw such canal features as siphons and related facilities at Little Dry Creek (northeast of Clovis), Kings River (northeast of Centerville and Sanger), and the St. John's and Kaweah rivers (between Woodlake and Exeter).

They visited TID's Main Canal headworks and viewed some of the Friant-Kern Canal reaches that present difficult operation and maintenance challenges, including capacity constraints, exotic aquatic weed infestations and concrete liner panel failures. The tour also visited the Friant Water Authority offices and maintenance yards in Orange Cove and Lindsay.

AROUND CALIFORNIA

State Boosts Fight In Battle Against Mussels Invasion

California Food and Agriculture officials have announced they are stepping up their battle against invasive Quagga and Zebra mussels, as well as Asian citrus psyllids that threaten Southern California orange trees.

"One of the greatest challenges to human health, to our environment and to our food supply comes from invasive species," A.G. Kawamura, Department of Food and Agriculture Secretary, said at the World Ag Expo in Tulare February 10.

Formation of an Invasive Species Council was announced. It is to include secretaries of five state agencies that previously had dealt with the environmental problem.

They include Mike Chrisman, Resources Secretary; Linda Adams, state Environmental Protection Agency; Kim Belshe, Health and Human Services Agency; and Matt Bettenhausen, California Emergency Management Agency.

Kawamura said the council wants to eliminate duplication of efforts and more efficiently use the state's resources.

Quagga and Zebra mussels were first detected in the Great Lakes in the late 1980s, resulting in hundreds of millions of dollars in damage to water delivery systems.

They were found in the Colorado River system in January 2007 and were later found in San Diego and Riverside counties by state and local water agencies.

Zebra mussels were discovered in San Justo Reservoir in San Benito County in January 2008.

In addition to devastating the natural environment, Quagga and Zebra mussels pose a dramatic economic threat to California.

"If the Quagga gets into the Central Valley Project," said California Department of Food and Agriculture spokesman Mike Jarvis, "you can kiss the transport of water goodbye."

The psyllid can transmit the citrus greening disease, which has killed tens of thousands of acres of trees in Florida and Brazil.

SACRAMENTO RIVER

Salmon Numbers Are Down Again

Numbers of salmon returning to spawn in the Sacramento were down again last fall, according to the Pacific Fishery Management Council.

It said 66,286 adult salmon returned to the Sacramento River to spawn, the least ever counted and down from 87,881 salmon in 2007.

Salmon fishing restrictions may again be imposed off California's coast this summer.

The San Francisco *Chronicle* reported that scientists believe warmer ocean conditions in 2005 and 2006 led to a lessening of food supply just as young salmon were entering the ocean.

The environmental community generally blames California water diversions, including Delta pumping into the Delta-Mendota Canal and California Aqueduct, for the decline.

STATE OF CALIFORNIA

State Considers Groundwater Action

There is growing concern among farmers and water agencies over a recommendation by the California Legislative Analyst that the state begin regulating groundwater.

State legislators were urged by the report to take away local controls and give power to regulate groundwater to the state, which already regulates surface water rights and water quality.

Along with concern over a new bureaucracy, there are worries that such a change might well lead to new regulatory requirements, permits and fees.

Catherine Freeman, a senior fiscal and policy analyst for the Legislative Analyst's Office, said the office has not determined how the state should regulate groundwater.

"It's not an easy answer to solve," Freeman said. "A farmer in the north state, central state and south state would have pretty different opinions."

Such a process would likely end the current assumption that groundwater beneath private property is a property right.

SAN JOAQUIN RIVER AND RESERVOIR WATER CONDITIONS

WATERSHED PRECIPITATION

Inches	2008-09 *Including Feb. 18*	2007-2008 *Including Feb. 18*	Seas'n Avg. *Through February*
Huntington Lake	27.38	20.27	29.60
Bass Lake	20.44	21.37	27.98
Friant	8.55	9.78	9.99

SEASONAL RUNOFF

Acre-Feet	In 2008-09	Predicted	Prev. Year
Feb. (18th)	41,913	50,000	35,528
April-July			624,561
Water Year	196,321	177,464	129,260

2006-2007 Total (October 1-September 30) — 1,113,905

FLOWS

San Joaquin River

Cubic Feet Per Second	Feb. 18	Feb. 18, '07
Calculated Natural Flow (Friant)	2,154	769
Actual Millerton Lake Inflow	2,413	1,078
Actual Flow At Friant	62	108
Flow at Gravelly Ford	13	
Flow below Mendota Dam	299	
Flow at Vernalis	1,565	
Total Delta Inflow	16,562	
Delta outflow Index	17,928	

Diversions at Friant Dam

Friant-Kern Canal	231	661
Madera Canal	0	0

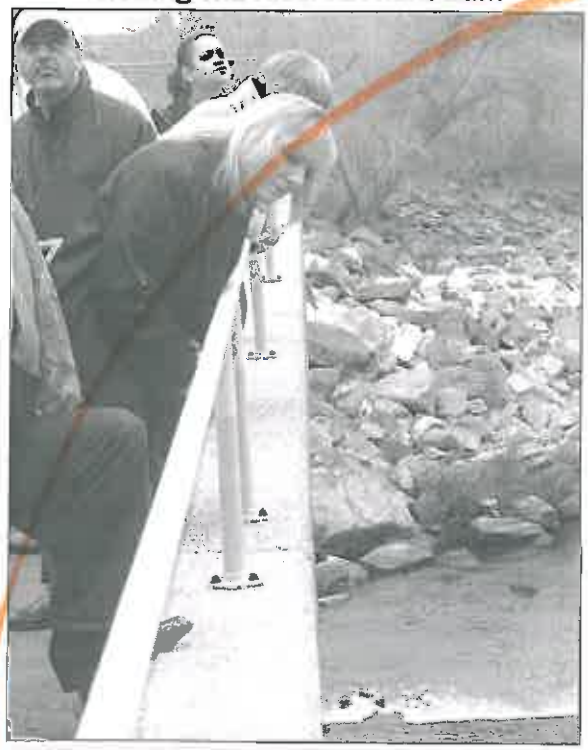
RESERVOIR STORAGE

Acre-Feet	Feb. 18	Last Year	Capacity
U.S. Bureau of Reclamation			
Millerton Lake	271,936	286,824	520,500
Southern California Edison Company			
Edison Lake	18,568	8,627	125,000
Florence Lake	1,168	1,176	64,400
Huntington Lake	53,302	37,101	89,000
Shaver Lake	57,696	73,245	135,200
Mammoth Pool	47,268	36,731	122,000
Redinger Lake	23,614	23,381	28,120
Pacific Gas and Electric Company			
Bass Lake	29,814	26,633	45,400
Kerckhoff Lake	3,558	3,605	4,200
Upstream Total	275,090	210,790	611,400
OVERALL	547,026	449,714	1,131,900

OTHER SOUTH VALLEY DAMS AND RESERVOIRS

Acre-Feet	Feb. 18	Capacity
Chowchilla River / Buchanan	16,936	150,000
Fresno River / Hidden	11,584	90,000
Merced River / New Exchequer	304,069	1,024,600
Kings River / Pine Flat	256,058	1,000,000
Wishon	39,477	128,600
Courtright	50,355	123,300
Kaweah River / Terminus	44,627	185,600
Tule River / Success	16,074	29,000*
**—Capacity for emergency flood control, 82,314 acre-feet.*		
Kern River / Isabella	12,641	360,000**
***—Capacity for emergency flood control, 570,000 acre-feet.*		
San Luis Reservoir / CVP	317,474	980,000
State Water Project portion	428,834	1,060,000
San Luis Reservoir total	746,308	2,040,000

Viewing The River At Friant Dam



Those on a Metropolitan Water District of Southern California tour of San Joaquin valley water features look over the San Joaquin River tailrace at Friant Dam. The group, from Calabasas, was led by Association of California Water Agencies President Glen Petersen, a director of the Los Virgenes Municipal Water District in the Ventura County community and a MWD board member. The Friant Water Authority and U.S. Bureau of Reclamation hosted the February 8 Friant Dam visit. FWA Assistant General Manager Mario Santoyo spoke.

No Water?

That's The Gloomy Prospect Within CVP's San Luis Unit

Prospects for Central Valley Project water supplies for San Luis Unit agricultural contractors along the valley's West Side have hit an irreducible minimum.

U.S. Bureau of Reclamation officials February 20 made official what had been widely reported for weeks – that CVP agricultural contractors south of the Delta can expect a zero allocation under a critically dry forecast.

10% SUPPLY AT BEST?

If water supplies used by the west valley agencies were to improve to reflect average amounts of inflow to Lake Shasta occurring for the rest of winter and spring, agricultural contractors could receive only a 10% allocation, Reclamation announced.

Because of the minimal amount of carryover water in storage, it is not considered likely that the 10% figure could be exceeded.

State Water Project contractors aren't much better off with a 15% declared supply.

Effects of the zero allocation are rapidly expanding. West Side agricultural, economic and social misery is growing after mushrooming during 2008 as a result of drought-reduced water supplies and court-ordered restrictions on Delta water export pumping to protect the threatened Delta smelt under the Endangered Species Act.

WESTLANDS IMPACTS

Westlands, the nation's largest water district, summed up the growing catastrophe in this statement:

"Farmers in the Westlands Water District have already begun destroying thousands of acres of almond orchards and plan on fallowing over 300,000 acres of land. Wherever possible, almond production will be stunted in hopes of keeping the trees alive through this desperate time. But there is no question that many years worth of investments will be lost.

"The human impact is worse. The latest estimates from economists with the University of California, Davis, predict that upwards of 75,000 people will lose their jobs this year and more than $2 billion will be lost from the San Joaquin Valley's economy because of the combination of drought and regulatory restrictions on water deliveries.

"That only accounts for the losses to agriculture south of the Delta. The damage from water shortages to manufacturing, housing construction, the Silicon Valley and many other sectors of the economy throughout the state will add immeasurably to the ultimate toll on California's working families.

"In Westlands, the crisis is well under way. Cropping decisions have already been made. Fields are being abandoned. The unemployment rate in the community of Mendota alone has soared to 40%.

"This is not merely a natural disaster. It is the product of a broken water system that has been neglected for too long. It is the inexorable result of an inflexible regulatory regime that makes all of our water conveyance problems worse. In the months ahead, hundreds of thousands of Californians will be paying the price for the state's failure to address the need for water."

'FAR REACHING'

The Farm Bureau in Fresno County, the nation's long-time leader in gross farm production value, said in a statement:

"At a time when everyone across the nation is talking about economic stimulus, it is ironic that we are hit with this huge economic suppressant when Fresno County and its residents – already plagued with high unemployment – can least afford it. The impacts from this year's water shortages will be far-reaching and widespread – on a social, economic, hydrological, and resource management basis."

Western Fresno County accounts for a quarter of the county's farm production. The zero allocation, the Farm Bureau said, means the ultimate beneficiary of affected crops – the consumer – will be harmed.

"Moreover, significantly reduced supplies to farmers in the Friant service area will impact production along the East Side as well," the Farm Bureau noted.

"Countywide, there will be more dependence on groundwater, which is already overdrafted in many parts of the county.... Without a reliable water supply, Fresno County's No. 1 employer – agriculture – is at great risk. Agriculture is the economic engine that drives the Valley and water is the fuel for that engine."

Storms Help; Much More Needed

Drought may still be in control of water supplies but late winter storms have been getting in some serious licks across the San Joaquin River watershed and other parts of the central and southern Sierra Nevada.

A storm at the end of January followed by repeated heavy snow – often at low elevations – and rain during February were encouraging, although not nearly enough.

"This wet weather has certainly helped, especially compared to the dismal precipitation experienced in January" said Ronald D. Jacobsma, Friant Water Authority General Manager.

Unfortunately, another storm that hit February 22 did not live up to expectations. It caused warm rain up to 7,500 feet, but not much of it.

77% RUNOFF FORECAST

The California Department of Water Resources predicted February 17 that the San Joaquin River's natural runoff during the peak April-through-July period would be 960,000 acre-feet, 77% of average, assuming average precipitation occurs.

Should critically dry weather dominate the coming months, San Joaquin River runoff could be as little as 530,000 acre-feet – 42% of average – between April 1 and July 31.

Millerton Lake, as of February 21, contained about 280,000 acre-feet and was just over half full. The lake has been rising slowly.

Infrastructure: New Discussions Take Place On State Water Bond

Continued from front page

Jacobsma said the Authority is closely following consideration on a new water infrastructure bond measure, SB 12, by state Senator Joe Simitian (*D-Palo Alto*), the Sacramento-San Joaquin River Delta, Clean Drinking Water, Water Supply Security, and Environmental Improvement Act of 2009.

If approved by the voters, the measure would authorize $6 billion in bonds for financing a water quality, environmental enhancement, and water supply reliability program. Jacobsma noted that the Authority has a number of concerns with the proposal, including governance, fees and a lack of a comprehensive approach to water problems.

Both Assembly Speaker Karen Bass (*D-Santa Monica*) and her counterpart, Senate Leader Darrell Steinberg (*D-Sacramento*) have said they hope to find consensus on a new state water-supply bond in 2009.

LENGTHY CONSIDERATION

Debate and consideration of such a proposal went on 2½ years before it seemed to disappear last year after failing to emerge from the Legislature in time to appear on the ballot.

Since then, water supply curtailments and future water prospects have only worsened in all parts of the state that depend upon water export pumping from the Delta.

"With the state's overall water situation getting worse, it is encouraging to see new efforts beginning in Sacramento in search of a solution," Jacobsma said.

He said hopes for a water plan are higher not only because of the current crisis but since agreement on a ballot measure last summer came to the brink of approval before becoming caught up in the state budget mess and State Capitol politics.

Tim Quinn, Association of California Water Agencies (ACWA) Executive Director, has said, "The only thing that will solve our problem is a comprehensive package, with all the pieces working simultaneously."

NEW SUPPORT

A Peripheral Canal as an important part of a comprehensive plan has gained much new traction over the past few years, despite memories of a 1982 statewide election defeat of a similar plan.

A new generation of water planners has come to believe that a Peripheral Canal is the only way to overcome mounting environmental and infrastructure blockades and fragility confronting and confounding state water supplies.

Last year's proposal by a cabinet-level committee called for "dual conveyance" with a "through Delta" conveyance feature (such as that now used to move north state water to export pumps near Tracy) that would include strengthening of existing levees.

Old Water Rights May Come Into Play For The First Time

Exchange Contractors' Historic Entitlement Is Basis For Friant-Kern, Madera Diversions

Historic San Joaquin River water rights have been at the heart of the Friant Division's supply for more than 65 years but a substitute supply of water that permits diversions into the Friant-Kern and Madera canals is seriously at risk this year for the first time.

The problem is that those water rights are not held within the Central Valley Project's Friant Division but rather underlie four western San Joaquin Valley districts and canal companies known as the San Joaquin River Exchange Contractors.

If the U.S. Bureau of Reclamation is unable to deliver all of the Exchange Contractors' substitute supply of water pumped from the Delta – usually 840,000 acre-feet but which in this critical dry year has been reduced to 650,000 acre-feet – the difference would have to be made up through releases from Friant Dam.

That is a distinct possibility this summer.

FRIANT RELEASES

Any such water for the Exchange Contractors would come directly out of the supply which would otherwise be delivered within the Friant Division.

Bureau officials have stated there is a potential for more than 250,000 acre-feet of San Joaquin River water to be delivered to the Exchange Contractors because of possible shortfalls in the Delta supply.

The unprecedented potential situation is a big reason why Reclamation limited the Friant Division's initial supply declaration to 25% of Class 1 contract amounts, with no Class 2 water at all. (Please see "Friant Feeling Water Pinch," *front page.*)

Friant Water Authority General Manager Ronald D. Jacobsma says the circumstances are disquieting evidence that "Friant's interest in the Delta is front, center and end."

MILLER & LUX RIGHTS

The Exchange Contractors' historic water rights are deeply rooted in the pioneering water development efforts of a historic cattle company, Miller & Lux, dating to the 1860s and 1870s. Miller & Lux secured full rights to control and use a major portion of the San Joaquin River's natural flow.

The Bureau of Reclamation in the 1930s acquired the right to use the Miller & Lux water for storage and diversion at the then-being-planned Friant Dam.

In exchange, the U.S. Bureau of Reclamation agreed to provide a substitute supply of CVP water totaling 840,000 acre-feet to the agencies now known as the Exchange Contractors in all but the driest years without charge (with Friant water users primarily paying system costs).

DELTA-MENDOTA CANAL

This exchange water is pumped from the Delta near Tracy with one of the CVP's highest priorities. Most is delivered through the CVP's Delta-Mendota Canal to Mendota Pool (35 miles west of Fresno) where it is diverted into several canals built long ago by the Miller & Lux farming interests, serving an area that reaches from Mendota to north of Newman.

The caveat in the exchange arrangement was that should deliveries of Delta water not be possible, the Exchange Contractors would be entitled to receive their historic San Joaquin River water.

Except for flood releases from Friant Dam, that has never occurred.



Friant Water Authority / J. Randall McFarland

The reconstructed original Fresno County Courthouse looks over Millerton Lake, where storage in mid-February was about half full.

Water Pinch: Class 1 At 25%

Continued from front page

The 1.4 million acre-feet under Class 2 contract develops only when it becomes apparent to the Bureau that all Class 1 demands can be met.

Impacting the Friant declaration is the growing possibility that the four San Joaquin River Exchange Contractors – the West Side agencies with historic San Joaquin River water rights – could potentially have to receive more than 250,000 acre-feet of water from Friant, based upon conservative runoff forecasts for the basins of the Sacramento and San Joaquin rivers, the Bureau said. (Please see "Old Water Rights May Come Into Play For The First Time," *this page.*)

In the 65 years since the CVP's Friant Division became operational, there has never been a need for the Exchange Contractors to be supplied with Friant water except during flood releases from Friant Dam.

FRIANT IMPROVEMENT?

CVP Operations Manager Ron Milligan said February's storm activity, which resulted in heavy low- to mid-elevation snow within the San Joaquin River watershed, has created "a very fluid situation" and "may allow some flexibility. Improvement in the Friant numbers is very possible."

Bureau officials said their Friant Division declaration is also based upon a very conservative water supply forecast that would be adjusted as San Joaquin River runoff predictions are refined to reflect late winter and spring storm activity and watershed snowpack measurements.

Still, Ronald D. Jacobsma, Friant Water Authority General Manager, said there is grave concern over the possibility that the valley's water supply curtailments now being felt on the West Side may soon spread to the East Side.

"The reduced supplies to Friant along with all of the CVP and State Water Project cuts on the West Side as a result of drought and Delta pumping cuts will have potential for devastating impacts on the entire San Joaquin Valley and its agricultural industry, the most productive in the history of the world," Jacobsma said.

This is the third consecutive below average water year. During the past two years, Friant's Class 1 contractors received a full supply. Last year, the Bureau was able to make available a 5% supply of water for Friant's Class 2 users.

HYDROLOGY DRIVEN

Reclamation's Mid-Pacific Regional Director, Donald Glaser, said the current situation "is almost totally driven by hydrology," including very low totals of water being stored in reservoirs along with low precipitation numbers.

"The natural timing and location of precipitation is so critical," Glaser said.

"The challenges we face right now have been building for some time," he added. Glaser pointed out that Reclamation and its CVP contractors were able to better weather a longer (six year) and more severe drought between 1987-92.

A Bureau statement attributed the situation to changing societal values, added purposes and demands placed on the projects' dedication of water for fish and wildlife purposes, resolution of Colorado River water allocations and increased environmental regulatory requirements.

The reduced supplies to Friant along with all of the CVP and State Water Project cuts on the West Side as a result of drought and Delta pumping cuts will have potential for devastating impacts on the entire San Joaquin Valley and its agricultural industry, the most productive in the history of the world"

—RONALD D. JACOBSMA

'LIMITED DISCRETION'

Reclamation said those changes "have reduced the available water supply and limited our operational discretion and flexibility. Also during the past decade, many farmers shifted from annual crops to trees and vineyards, making it more difficult to fallow crops during a drought."

Glaser said the Bureau supports the state in seeking long-range water supply solutions.

In the short term, Bureau officials said they are evaluating or pursuing several options to comply with obligations to senior water right holders while meeting public health and safety needs, and mandated water quality and environmental requirements.

"If water conditions do not improve, this would be the first time in many years in which Friant's firm supply of Class 1 water is less than 100%," said Friant Water Authority General Manager Ronald D. Jacobsma.

River Bill: Measure Awaits House Action

Continued from front page

outcome been left solely in the hands of the federal court in Sacramento that heard the litigation for 18 years.

FUNDING

The bill authorizes the Interior Department to begin spending an initial $88 million for Settlement implementation. The measure provides additional funding by dedicating existing water user fees to the Settlement and authorizing annual congressional appropriations of up to $300 million. "The legislation provides a method of funding these much needed channel improvements with money from the water users themselves without increasing Friant's financial obligation," said Jacobsma. The state has agreed to invest $200 million.

"We want to thank Senators Dianne Feinstein and Barbara Boxer for their leadership on the bill in the Senate, and Majority Leader Harry Reid for helping make it possible to pass this legislation as one of the first actions of the new Congress," he said. He also extended thanks to valley Congressmen Jim Costa, George Radanovich and Dennis Cardoza for their continued work in support of the bill. The San Joaquin River legislation continues to be opposed strongly by another valley Congressman, Rep. Devin Nunes.

HOUSE CONSIDERATION

The San Joaquin River legislation is one of some 160 measures contained within the 1,294-page bill. "This is a major piece of legislation that should be discussed thoroughly and given due process," House Natural Resources Chairman Nick Rahall (*D-West Virginia*) said of the omnibus package.

The FWUA and a number of its member agencies along the southern San Joaquin Valley's East Side were the non-federal defendants in the case, which was brought in 1988 against the United States government and U.S. Bureau of Reclamation. The plaintiffs are the Natural Resources Defense Council and a coalition of environmental and commercial fishing organizations that sought through the litigation, as it has evolved, to achieve restoration of San Joaquin River flows, fishery habitat and a return of salmon to the river downstream from Friant Dam.

FRIANT WATER AUTHORITY

June 2010

Volume 22, No. 197

FRIANT Waterline

Governor Backs Delay In Water Bond Vote Until '12



Friant Water Authority / J. Randall McFarland

Governor Arnold Schwarzenegger

Governor's Statement On Water Bond

Governor Arnold Schwarzenegger on June 29 issued this statement regarding the water bond scheduled to appear on the November ballot:

"After reviewing the agenda for this year, I believe our focus should be on the budget — solving the deficit, reforming out-of-control pension costs and fixing our broken budget system. It's critical that the water bond pass, as it will improve California's economic growth, environmental sustainability and water supply for future generations.

"For that reason, I will work with the Legislature to postpone the bond to the next ballot and avoid jeopardizing its passage."

November's scheduled voting on a comprehensive state water infrastructure bond package has become a victim of California's recession and financial crisis.

Governor Arnold Schwarzenegger, who has battled for nearly four years to place a comprehensive program before voters, said June 29 he favors postponing the vote on the $11.14 billion water bond from November 2 to an election in 2012 to "avoid jeopardizing its passage."

The Governor's position on the Safe, Clean and Reliable Drinking Water Supply Act (what was to be Proposition 18) was quickly endorsed by the water bond's legislative author, Senator Dave Cogdill (*R-Modesto*) and Senate President Pro Temp Darrell Steinberg (*D-Sacramento*).

IN LEGISLATURE

Legislative consideration was scheduled for July 1 (after *Waterline* press time) but it was not immediately clear if a decision would be made that day. Bond opponents in the Legislature quickly indicated an effort might be made to repeal the bond rather than postpone it. There was also speculation opponents might oppose the postponement to leave the issue before voters and then work for its defeat.

Two-thirds approval is needed to postpone the measure. Action must be finalized before August 9, when printing begins on November ballot materials.

With the primary out of the way, bond opponents had become increasingly vocal, citing the state's fiscal crisis and enormous $19.1 billion budget deficit in the fiscal year that began July 1 – factors that the Governor said now need to be the focus.

Recent poll numbers for the bond have been rather weak, even though surveys show Californians recognize the state's enormous water problems and support the bonds' concept.

The comprehensive package was years in the making and had to run a gauntlet of discussion, negotiation, debate and compromise before gaining the bi-partisan Legislative support it required last fall to win placement on the ballot. The other four policy bills are in effect and being implemented.

STORAGE FUNDS

The wide-ranging water bond, as passed in November 2009, included what has been missing from other water financing measures for decades – strong funding mechanisms for water storage, possibly including the proposed Temperance Flat

Please see **Water Bond**, back page

Friant Districts Maximize Water Supply Use, Avoid Spill

Friant Division districts have made the most of an unusual Sierra Nevada snowmelt runoff season to maximize beneficial water use while avoiding a spill over Friant Dam to date.

The U.S. Bureau of Reclamation has returned to normal Friant operations with a declared Friant Division supply of Central Valley Project water amounting to 100% (or 800,000 acre-feet) for Class 1 contractors and 5% for Class 2 users.

RECHARGE

A great deal of water was made available as surface supplies to be used in lieu of pumping and for direct groundwater recharge.

Class 2 contractors have already taken full advantage of a pair of "uncontrolled seasons" declared by the Bureau earlier this year to move about 557,000 acre-feet, 40% of the Class 2 contract supply. That effectively kept Millerton Lake, with its relatively small capacity of 520,500 acre-feet, from filling during the April and May portions of the peak snowmelt period. Class 2 water only becomes available after all Class 1 supply needs can be met by the Bureau.



Friant Water Authority / J. Randall McFarland

The setting summer sun lights up the waves over the rising surface of Millerton Lake on a hot June evening.

Along with these Class 2 deliveries, the Bureau made available Section 215 (non-storable) water to long-term Friant contractors.

Also, Friant's first low-cost supplies under the river Settlement's Restoration Water Account (RWA) were authorized to recapture water lost to river restoration. More than 82,000 acre feet of RWA water has been made available to Friant contractors whose water supplies were affected by the release of interim flows to the river during the spring. Interim flow releases were another factor in keeping a spill from occurring this spring.

STORAGE INCREASES

Millerton Lake storage as a result remained unusually low through May but has climbed steadily during June.

Please see **Supply**, back page

Friant 'Comfortable' With Interim Restoration Flow Management

This season's San Joaquin River Restoration Program interim flows have passed their peak with Friant officials generally satisfied with how the U.S. Bureau of Reclamation has managed the releases.

As scheduled, interim flows for data collection and river observation purposes were dropped from 1,550 cubic feet per second to 800 c.f.s. on May 28 and further reduced to 350 c.f.s. on June 8, Restoration Program officials reported. Releases are scheduled to remain at 350 c.f.s. until November.

"Interim restoration flows are back down. We're comfortable with how Reclamation has handled it and how the spring pulse flows have been managed," said Ronald D. Jacobsma, Friant Water Users Authority Consulting General Manager.

This year's interim flows began February 1 and are to continue through December 1.

Under the San Joaquin River litigation Settlement and its accompanying federal legislation, interim releases are scheduled to become year-round by the beginning of 2013.

Please see **Restoration**, Page 2

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Waterline
June 2010
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Volume 22, No. 197
Published by the Friant Water Authority, as a review of issues and developments to inform those interested in water supplies along the East Side of the southern San Joaquin Valley. To comment or ask any questions, please write or call us at (559) 562-6305, visit our web site at *www.Friantwater.org* or contact your local irrigation district. This issue was printed July 1.

FRIANT WATER AUTHORITY

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AROUND CALIFORNIA

NEW ZEALAND MUDSNAILS

New Invasive Species Worries Water Officials

Quagga and zebra mussels, meet the New Zealand mudsnail.

The New Zealand mudsnail is latest non-native aquatic invasive species to cause worry for California water and environmental managers, not because of its small size but due to the damage it can do.

In large numbers, these small snails can completely cover a stream bed and wreak havoc on local stream ecosystems.

Introduced from New Zealand to the western United States in the 1980s, New Zealand mudsnails have already invaded many Western rivers, including some watercourses in California.

They have recently been detected in such diverse locations as Santa Monica Mountains streams in Southern California and Lake Tahoe in Northern California.

Just as has been the case with the California invasion of quagga and zebra mussels in various aqueducts and reservoirs (none of which are in the San Joaquin Valley), the help of local hikers, horse riders, anglers, and others is being enlisted in preventing the spread of the New Zealand mudsnail.



Center for Lakes and Reservoirs
New Zealand Mudsnails on a small rock, with a penny for size comparison. Mudsnails quickly create dense colonies.

"The primary reason we are concerned is because of the mudsnails' ability to outcompete the native benthic invertebrate population," said Ted Thayer, manager of the Aquatic Invasive Species Program at the Tahoe Regional Planning Agency.

"New Zealand mudsnails are not digestible by the native fish, so when they outcompete the native invertebrates, the fish have nothing to eat."

Unlike zebra and quagga mussels, mudsnails do not affect water infrastructure or cling to boat engines, but their ecological impact to fish habitats is detrimental.

Mudsnails prefer streams, rivers and creeks. They are typically transferred from water body to water body via non-motorized boats.

Half of all endangered species in the United States are being threatened by invasive species that eat them, eat their food, crowd them out, and destroy their natural habitats.

Mudsnails reproduce by cloning themselves. A single snail can produce a colony of more than 40 million snails in just one year.

DELTA

'National Heritage' Label Ahead?

The Sacramento-San Joaquin Bay-Delta Estuary has been called unique, troubled and altered.

Now, it may become known as a "national heritage area," first of its kind in California.

The Delta Protection Commission is trying to determine if such a designation is worth pursuing.

National heritage areas fall under the auspices of the National Park Service but unlike national parks they carry no federal regulation of land use and require no local restrictions.

Federal Fish Agency Takes Aim On Stripers



An angler in the Delta holds a striped bass.

It is no secret that federal and state water export pumping plants near Tracy have borne nearly universal blame among the environmental and angling communities as well as some in the federal government itself for the Delta's fishery ills

That may be changing.

NOAA's National Marine Fisheries Services (NMFS), which recently came in for scathing criticism from a federal judge in an important ruling favoring Central Valley Project and State Water Project users, has become the latest to point toward a key Sacramento-San Joaquin Bay-Delta Estuary predator as a primary culprit in the demise of endangered salmon.

NO LIMITS OR SEASON?

Striped bass fishing seasons and limits should be eliminated, NMFS officials told the California Department of Fish and Game (CDFG). So should size limits. "NMFS has concluded that striped bass predation on salmon and steelhead is an important stressor warranting action," the agency said in a May letter to CDFG.

Please see **Striped Bass**, Page 3

Restoration: Water Is Recaptured

Continued from front page

Upon full implementation, including construction of river improvements over the next four to five years, the U.S. Bureau of Reclamation will be obligated to provide river flows that are anticipated to result in a long-term average reduction of 15-20% of Friant's historical water supply. That water will be used to restore flows to some 60 miles of the river with a Settlement goal of restoring a salmon fishery.

An equal Water Management Goal in the Settlement is designed to reduce or avoid those water supply impacts. Programs to be implemented under the Water Management Goal will include capturing and re-circulating or exchanging the releases, making wet-year water available at a reduced price for groundwater banking and recharge, and restoring the original capacity of the Friant-Kern and Madera canals.

RECOVERED WATER

Tens of thousands of acre-feet of interim flow releases were recaptured this year through exchanges. That water is currently being stored for Friant users in San Luis Reservoir. Jacobsma said the Bureau is looking at options to return that water to Friant districts, directly or indirectly, later this summer under the Water Management Goal.

"It is very encouraging to see that recirculation can really happen," Jacobsma said.

Because of above-average precipitation, Friant districts were also able to purchase reduced-price Restoration Water Account supplies this spring to help cushion effects of interim restoration flows.

The litigation was brought originally by the Natural Resources Defense Council and an environmental and commercial fishing coalition. The Settlement was reached in September 2006 by the Friant Water Users Authority and many of its member districts, the NRDC coalition, and the Bureau of Reclamation, Interior and Commerce departments.

DRAFT ASSESSMENTS

The Bureau recently released for public review a draft environmental assessment and draft finding of no significant impact for the recirculation of this year's San Joaquin River Restoration Program interim flow releases.

Reclamation is estimating that up to 60,000 acre-feet of Interim Flows have been recaptured and are available in San Luis Reservoir, which can be recirculated back to the 16 Friant Division Class 2 contractors as Class 2 supplies because only Class 2 supplies have been impacted this year by the interim flow releases. Class 2 is additional water, when available, beyond the firm amount of 800,000 acre-feet of Class 1 water generated by the Friant project.

Reclamation also released for public review a draft environmental assessment to cover interim flows in 2011.

The San Joaquin River Restoration Program implementing agencies are Reclamation, the U.S. Fish and Wildlife Service, National Marine Fisheries Service, California Department of Water Resources and California Department of Fish and Game.

SAN JOAQUIN RIVER AND RESERVOIR WATER CONDITIONS

WATERSHED PRECIPITATION

Inches	2009-10 *Including June 30*	2008-2009 *Including June 30*	Sass'n Avg. *Through June*
Huntington Lake	42.41	36.84	42.73
Bass Lake	41.36	29.02	40.62
Friant	17.41	11.25	14.33

SEASONAL RUNOFF

Acre-Feet	In 2009-10	Predicted	Prev. Year
June (30th)	669,618	580,000	222,783
April-July period	1,275,022	1,550,000	945,895
Water Year	1,707,583	2,166,000	1,396,000

2008-2009 Total *(October 1-September 30)* —1,455,300

FLOWS

San Joaquin River

Cubic Feet Per Second	*June 30*	*June 30, '09*
Calculated Natural Flow (Friant)	9,764	3,300
Actual Millerton Lake Inflow	9,078	3,733
Actual Flow At Friant	355	219
Flow at Gravelly Ford	135	1
Flow below Mendota Dam	850	586
Flow at Vernalis	3,147	1,310
Total Delta Inflow	19,752	
Delta outflow index	9,974	

Diversions at Friant Dam

Friant-Kern Canal	2,531	2,506
Madera Canal	1,006	999

RESERVOIR STORAGE

Acre-Feet	*June 30*	*Last Year*	*Capacity*
U.S. Bureau of Reclamation			
Millerton Lake	467,609	520,039	*520,500*
Southern California Edison Company			
Edison Lake	99,251	88,456	*125,000*
Florence Lake	59,453	57,660	*64,400*
Huntington Lake	67,576	67,569	*89,000*
Shaver Lake	116,074	130,995	*135,300*
Mammoth Pool	122,730	110,412	*122,000*
Redinger Lake	24,261	24,268	*28,120*
Pacific Gas and Electric Company			
Bass Lake	34,298	34,104	*53,000**
Kerckhoff Lake	3,839	3,724	*4,200*

**—Temporar; capacity pending Crane Valley Dam seismic retrofit.*

Upstream Total	549,482	533,156	*811,400*
OVERALL	1,017,091	1,053,195	*1,131,900*

OTHER SOUTH VALLEY DAMS AND RESERVOIRS

Acre-Feet	*June 30*	*Capacity*
Chowchilla River / Buchanan	63,127	*150,000*
Fresno River / Hidden	62,641	*90,000*
Merced River / New Exchequer	943,358	*1,024,600*
Kings River / Pine Flat	904,600	*1,000,000*
Wishon	122,126	*128,600*
Courtright	117,388	*123,300*
Kaweah River / Terminus	181,388	*185,500*
Tule River / Success	49,820	*29,000**

**—Capacity for emergency flood control, 86,314 acre-feet.*

Kern River / Isabella	330,125	*360,000**

**—Capacity for emergency flood control, 570,000 acre-feet.*

San Luis Reservoir / CVP	587,375	*980,000*
State Water Project portion	605,487	*1,060,000*
San Luis Reservoir total	1,192,862	*2,040,000*

Compromise Briefly Eases Pump Dispute

West Side Water Supply Now 45%

It didn't last long but the adversaries in the state's Delta pumping crisis were able to agree on short-term management of Delta water exports during late June.

Farmers, water managers, environmentalists and city leaders negotiated a compromise plan for managing Delta pumping limits.

The agreement was short lived. It expired June 30.

At the same time, the U.S. Bureau of Reclamation increased the West Side's Central Valley Project (CVP) allocation to 45% of contract amounts, although the increase came long after cropping decisions were made for this year. The State Water Project (SWP) increased its supply to 50%.

Both increases occurred largely as a result of above-average runoff in Northern California this spring.

DELTA SMELT CASE

Secretary of the Interior Ken Salazar said the short-term agreement came in a pending court challenge to the U.S. Fish and Wildlife Service's biological opinion on the Delta smelt.

The agreement was reached by the Interior Department, California Department of Water Resources, water users and environmental groups. It covered operations of the CVP and SWP by protecting the Delta smelt while preserving the projects' ability to export water to urban and agricultural users.

Salazar said the settlement did not resolve the underlying challenge to the biological opinion but marked a step toward reducing conflict among the parties.

"It was not so long ago that this level of co-operation among these parties would not have been possible, and I commend everyone for their hard work and perseverance in reaching this agreement," said Salazar.

The opportunity for consensus arose after the U.S. District Court in Fresno issued a decision on May 27 finding that the irrigators were likely to succeed in their challenge to FWS's biological opinion and had to consider people as well as fish. Rather than holding hearings regarding an injunction, the court granted the parties' request to attempt to negotiate an appropriate agreement.

MAXIMUM PUMPING

Under the agreement, maximum pumping under the biological opinion was permitted while keeping the biological opinion and its limits in place.

As of July 1, all pumping restrictions required this summer under the smelt biological opinion ceased.

Hearings on the challenge to the substance of the biological opinion are scheduled for July 8-9 before U.S. District Judge Oliver Wanger in Fresno.

Westlands Water District General Manager Tom Birmingham said in a Fresno *Bee* column, "The immediate relief that we sought from the court was very limited, and the federal agencies and environmental groups have now agreed with us on a short-term plan.

"But the problems that Judge Wanger and the National Academy of Sciences identified in the biological opinions are fundamental and can only be resolved through substantial revisions to both."

Striped Bass

Continued from Page 2

"We are aware that striped bass have co-existed with salmon and steelhead in the Central Valley since striped bass were introduced in 1879," NMFS officials wrote. "Given the population crashes of salmon and steelhead that occurred as the region was developed, however, and the current serious declines in salmon stocks that are already threatened or endangered, it is necessary to re-examine the ecosystem effects of maintaining a striped bass sport fishery."

CHANGE REGULATIONS

NMFS said CDFG should change striped bass sport fishing regulations "in an attempt to reduce their predatory impact and thereby increase survival of native fish."

Those changes, NMFS said, should include a year-round season for striped bass fishing and removal of bag and size limits.

NMFS cited a 2009 statement by a biologist, Dr. Charles Hanson, which found, "Striped bass predation in rivers tributary to the Delta appears to be the largest single cause of mortality of juvenile salmon migrating through the Delta." Hanson said those mortality rates are about 90%.

LEGAL ACTION

On February 26, the CDFG was sued by the Coalition for a Sustainable Delta for its support of striped bass. That exotic species, introduced to the Delta 122 years ago, is damaging native species such as endangered salmon, steelhead and Delta smelt, the lawsuit alleges.

Striped bass were introduced to the Delta from the East Coast in 1879. The idea was to create a commercial fishery. That has evolved into a tremendously popular sport fishery. In part by feasting on native species, stripers have thrived in the Delta.

There has been another legal front this spring. U.S. District Judge Oliver Wanger ruled in an endangered species biological opinion challenge brought by water agencies over a federal biological opinion to protect the fish that NMFS "completely abdicated" its responsibility in the salmon case to consider alternatives "that would not only protect the species, but would also minimize the adverse impact on humans."



The Delta Maze

Not unlike its labyrinth of channels that seem to flow anywhere and everywhere, confusing issues continue to surround the Sacramento-San Joaquin Bay-Delta Estuary.

Near-Term Science Strategy Is Framed On Biological Opinions

While legal maneuvering continues over the federally-fashioned biological opinions governing Delta water export pumping, a task force of federal agencies reports progress in framing a near-term science strategy to support Delta water operations.

Also announced by the task force in late June was a preliminary strategy for completing an integrated biological opinion covering the Bay-Delta Conservation Plan (BDCP) and water project operations.

FROM NAS REPORT

The Association of California Water Agencies reports that the science strategy identifies an initial list of near-term scientific research issues arising from a recent National Academy of Sciences report on alternatives for reducing water project impacts on threatened and endangered fish species.

Activities outlined in the strategy could be used to guide 2011 water project operations.

The second strategy outlines analytical tools to help assess management of the Delta ecosystem and water supply, a path to obtain new information to decrease uncertainty, and a general approach to completing the new biological opinion.

UNRESOLVED ISSUES

Other scientific issues remain unresolved. They include determining the relative effects on endangered fish populations due to mortality at the water projects, Delta contaminants, food web dynamics, and predation and understanding the benefits of habitat restoration.

Officials in the Interior and Commerce departments in May announced plans to develop a single, integrated biological opinion to address the BDCP and water project operations.

Involved in the task force are the U.S. Fish and Wildlife Service, National Marine Fisheries Service, U.S. Bureau of Reclamation, and U.S. Geological Survey.

Stewardship Council Effort Is Under Way

Other Bay-Delta Plan Work Continues

A new state agency formed to develop a plan for the troubled Delta as a result of last fall's passage of comprehensive water legislation has begun its work.

The new Delta Stewardship Council has started functioning as a sequel to the unsuccessful CALFED Bay-Delta Process that spent well over $3 billion without checking the estuary's environmental and infrastructure deterioration or finding a solution for reliable water supplies.

The new council must also define its role in the development of another fairly recent Delta planning effort, the Bay-Delta Comprehensive Plan (BDCP), which is mandated by the water legislation to be incorporated into the council's Delta plan.

NO GUARANTEES

State Senator Joe Simitian (*D-Palo Alto*), who authored legislation that created the Stewardship Council, made no guarantees in an interview with the San Francisco *Chronicle* but said past "benign neglect and ineffective governance have not served the state well. There's always some risk with a new direction, but I think the old model was a proven failure."

CALFED labored some 15 years with the state and federal governments striving to ensure that "everyone gets better together" in water supply and quality, a better ecosystem and stronger levees.

The new council is small, with only seven members, compared with some 25 agencies that made up the unwieldy CALFED, and has certain defined authority that CALFED never had. The council's final Delta plan will be state law.

Although it ultimately failed, CALFED did conduct much research about the Delta estuary that should give the new council a head start.

STEWARDSHIP MEMBERS

Initial appointees to the Delta Stewardship Council include:

- Phil Isenberg, Chairman, a former Assemblyman, Mayor of Sacramento and past Chairman of the Delta Blue Ribbon Task Force.
- Randy Fiorini of Turlock, a grower and past President of the Association of California Water Agencies.
- Gloria Gray of Inglewood, a Los Angeles district water director and member of the California Latino Water Coalition.
- Patrick Johnston of Stockton, a former state Legislature member and past member of the Bay-Delta Authority and Delta Protection Commission.
- Hank Nordhoff of Del Mar, a businessman.

Please see **Stewardship**, back page

Water Bond: Governor Seeks Vote Delay Until 2012

Continued from front page

Reservoir in Friant's back yard on the San Joaquin River.

It would also clear the way for improved Delta water conveyance (which water users would pay for) and a host of Delta environmental and infrastructure fixes, along with projects all over the state, some of which had been called "pork" by opponents.

The bond also included funding to clean up contaminated groundwater, boost conservation efforts, update sewage systems and address water re-use and desalinization.

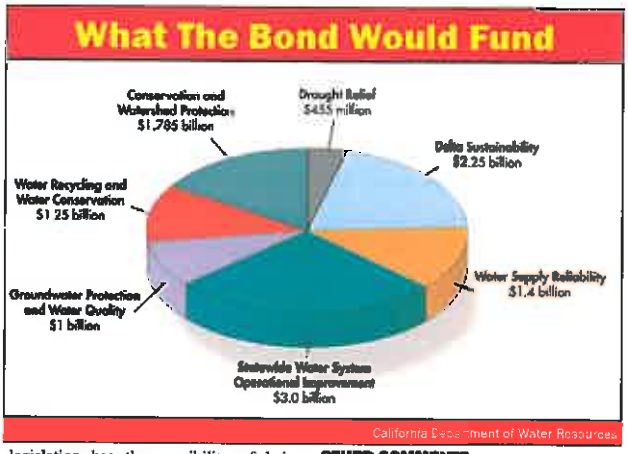
At the time it was enacted, Schwarzenegger said, "This is without any doubt the most comprehensive water infrastructure package ... in the history of California. Democrats and Republicans came together and tackled one of the most complicated issues in our state's history." Legislators, he said, "all compromised; they all came together."

SOLELY ECONOMIC

"It is important to note that the decision to delay the water bond to the 2012 ballot is not due to any problems or perceived weaknesses with the water bond itself," said Glenn Farrel, Friant Water Authority (FWA) Government Affairs Manager. "The decisions are based solely on the economic situation of the state and the voters' reactions to approving new general obligation bond debt in the wake of the current economic and state budget situation".

Farrel and FWA Assistant General Manager Mario Santoyo, a California Latino Water Coalition Director, were involved closely with the water bond bill's development last year.

"The water bond has great value to all of California and particularly the valley and Friant Division," Santoyo said. "Its critical importance is one of the reasons the Friant Water Authority has placed such a priority on the bond these past three years. Clearly, it's unfortunate the legislation has the possibility of being deferred to 2012 but the needs are all going to continue. We have full expectations that the measure will come before voters two years from now."



FRIANT SUPPORT

Directors of the Friant Water Authority and Friant Water Users Authority were in unanimous support of the bond measure.

FWA General Manager Ronald D. Jacobsma said, "Friant will remain engaged fully on the bond and related issues. Between the difficult economic situation and the state's financial crisis, now may not be the time to advance the ball but the state's aging water infrastructure, growing population, environmental problems and supply needs are simply going to have to be addressed."

Friant leaders will also continue to voice concern over pressures being generated – including concepts for new fee programs – to fund the rest of the Delta legislative package's implementation over the two years before the water bond reaches the ballot.

OTHER COMMENTS

"The water bond represents a truly comprehensive solution to fix the problems in the Delta, increase conservation and recycling, and expand the availability and quality of water supplies in every region of the state," Jim Earp, co-chair of a coalition backing the bond, said in a statement. "We're confident that when presented to voters, they will approve the measure. However, in light of the economic situation, we agree with the Governor and legislative leaders that the best timing for the water bond is in 2012. We support postponing the bond to 2012."

Steinberg said, "Given the challenges currently facing California, I agree with the Governor the water bond should be postponed."

"Timing is everything, and I'm willing to wait to bolster voter understanding of this critical measure," Cogdill said in a statement.

PACKAGE FEATURES

The bond represented a comprehensive deal aimed at taking major steps toward ensuring a reliable water supply for future generations, as well as restoring the Delta and other ecologically sensitive areas.

The plan is comprised of four policy bills and an $11.14 billion bond.

It established Delta governance and a Delta Stewardship Council (*please see related story, Page 3*), sets ambitious water conservation policy, ensures better groundwater monitoring, and provides funds for the State Water Resources Control Board for increased enforcement of illegal water diversions.

The bond would fund, with local cost-sharing, drought relief, water supply reliability, Delta sustainability, statewide water system operational improvements, conservation and watershed protection, groundwater protection, and water recycling and water conservation programs.

The bond was fashioned to include seven categories, including drought relief, water supply reliability, Delta sustainability, statewide water system operational improvement, conservation and watershed protection, groundwater protection and water quality, and water recycling and water conservation.

VALLEY POTENTIAL

Integrated regional water management programs, combined with new opportunities in the measure's chapters on drought relief, groundwater and water use efficiency, were viewed as providing varied funding assistance for southern San Joaquin Valley water projects and programs.

Schwarzenegger said last fall in signing the water bond legislation at Friant Dam that the bonds would fund "a variety of different projects which will fix the Delta; it will restore its ecosystem and it will go and build a better conveyance system.

"And we will have, once and for all, below and above the ground water storage, which we have been fighting for and I wouldn't have signed this without that water storage."

Supply: Reservoir Filling

Continued from front page

As of June 30, the reservoir behind Friant Dam contained 467,609 acre-feet. Storage was increasing at more than 10,000 acre-feet per day.

Edward Salazar of the U.S. Bureau of Reclamation operations staff in Fresno told contractors June 29 that between diminishing calculated natural flow amounts, upstream power company operational plans and demands from Friant water users and their districts, he does not expect a spill, although Millerton Lake may fill.

Spring featured a number of storm events with cold mountain temperatures and Sierra snowfall, particularly during April and May, slowing the snowmelt until warmer weather occurred in early June.

SIMULTANEOUS SNOWMELT

An unusual situation resulted when snow began melting rapidly at all elevations simultaneously, rather than beginning at lower elevations and moving up toward the crest on a more gradual basis as is usually the case.

The San Joaquin River's calculated natural flow popped up to as high as 20,700 cubic feet per second on June 7. Proving that the peak snowmelt is long since passed, much hotter weather on June 28 resulted in full natural flows (as if there were no dams) that were only half as great, around 10,000 c.f.s.

Upstream, Southern California Edison Company's reservoirs are now 91% of capacity with Mammoth Pool, the uppermost reservoir for the San Joaquin River's North Fork and Middle Fork supplies, remaining full and spilling.

STRONG DEMANDS

Water demands continue to be strong. On June 29, a flow of 1,006 c.f.s. was being released into the Madera Canal with 2,531 c.f.s. diverted to the Friant-Kern Canal.

With interim San Joaquin River Restoration Program flows having been cut June 8 as previously scheduled, the San Joaquin River release from Friant Dam amounted to 355 c.f.s. with 135 c.f.s. passing the gauging station at Gravelly Ford into a previously mostly dry reach of the river.



Friant Water Authority / J. Randall McFarland

Stevenson Creek roars toward the San Joaquin River in Fresno County with water being released upstream by Southern California Edison Company from the dam at Shaver Lake.

Stewardship: New Delta Council Beginning Its Work

Continued from Page 3

- Don Nottoli of Galt a Sacramento County Supervisor and Chairman of the Delta Protection Commission
- Richard Roos-Collins of Berkeley, Co-Chair of the Agricultural Water Management Council and a past member of the Bay Delta Conservation Plan Steering Committee

The appointments are considered preliminary. The appointees must still go through Senate confirmation.

The Friant Water Authority is a member of the BDCP Steering Committee. BDCP participants are examining impacts of various criteria for operating an isolated Delta conveyance facility, such as a tunnel or Peripheral Canal

FRIANT WATER AUTHORITY

June 2011

Volume 23, No. 208

FRIANT Waterline

Delta Smelt Mandates Appealed To High Court



U.S. Fish and Wildlife Service
A full-grown Delta smelt

Users Contend ESA Pumping Restrictions Are Unconstitutional

A Constitutional challenge to the federal government's Delta smelt regulations that have led to devastating water-delivery restrictions affecting two-thirds of California is on its way to the U.S. Supreme Court.

The Pacific Legal Foundation (PLF) – an organization that litigates for limited government, property rights, free enterprise, and a balanced approach to environmental regulations – is petitioning the high court to hear its appeal.

FRESNO ANNOUNCEMENT

The PLF, representing three West Side growers, announced the appeal June 24 during a Fresno news conference in which Friant Water Authority Assistant General Manager Mario Santoyo was among the speakers.

Santoyo noted the massive amounts of idled acreage, unemployment, and economic and social damage that occurred in the valley and elsewhere in California as a result of Delta water export and pumping reductions made to protect the Delta smelt.

For a time in 2009, it appeared the situation could adversely impact the Friant Division's San Joaquin River water supply that depends upon exports of substitute water to historic water rights holders on the valley's West Side.

The Delta smelt is a three-inch fish in the Sacramento-San Joaquin

Please see **Delta Smelt**, Page 3



Friant Water Authority / Priscilla Rodrigues
Mario Santoyo, Friant Water Authority Assistant General Manager, speaks to media

CVP Users 'Exempted' From Rules

Federal Conservation Plans Emulate New Regulations

A California Water Commission majority has held that Central Valley Project water contractors should be exempted from new state water efficiency and conservation reporting requirements if reports they prepare are in conformance with U.S. Bureau of Reclamation rules.

The commission included the CVP exemption in its action establishing water measurement regulations under SBX7-7, one of five bills included in a comprehensive water package enacted by the Legislature in October 2009.

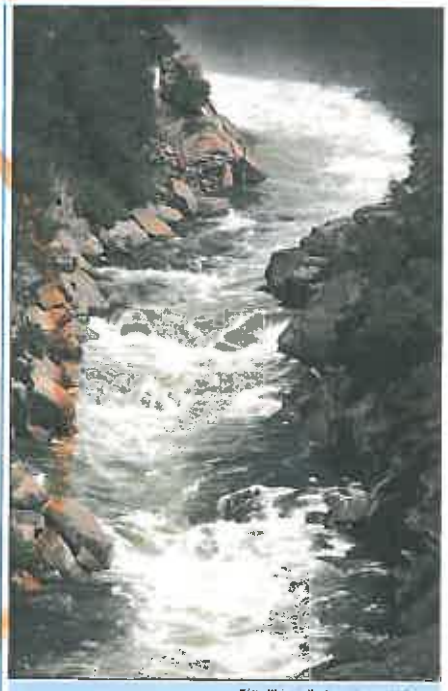
Mario Santoyo, Friant Water Authority Assistant General Manager, made the federal contractor exemption case for the Water Commission during a Sacramento hearing.

ENVIRONMENTAL OPPOSITION

"It wasn't easy because of opposition from the environmental interests," Santoyo said. "They argued hard against the exemption."

He said the Water Commission had to deal with arguments from those "who believe farm-

Please see **Efficiency**, back page



Friant Water Authority / Patricia Rodrigues
Whitewater churned by a flow of more than 14,000 cubic feet per second rolls down the San Joaquin River gorge below Redinger Lake June 24

Snowmelt Is In Full Swing

Late Runoff Peak Passes; Reservoirs Are Nearly Full

Later than usual but long anticipated peak Sierra Nevada snowmelt runoff has finally surged down the San Joaquin River and other western slope streams with high flows that rapidly increased reservoir storage to near capacity but remained under control just as hydrologists had calculated and planned.

Late June's seasonal maximum runoff came during the year's first big heat wave but the month ended with a brief return to an unusual winter-type June 29 storm. Rain for several hours poured down upon the San Joaquin River watershed with a little snow above 10,000 feet.

MAXIMUM SAN JOAQUIN RUNOFF

The season's peak flow thus far was 19,572 cubic feet per second on June 16.

A combination of generally cool spring weather, aggressive flood releases from Friant Dam and willingness of the U.S. Bureau of Reclamation to spur demand with lower-priced water and declarations of full supplies thus far has worked well in safely accommodating runoff from such a big snow accumulation year.

These releases made it possible to carve out space in Mil-

Please see **Snowmelt**, back page

Environmental Review Clears Way For 2011 Restoration Flow Recovery

A final environmental assessment and finding of no significant impact has cleared the way for the U.S. Bureau of Reclamation to again re-circulate recaptured San Joaquin River interim restoration flow water back to the Friant Division during the current water year.

Under the 2006 Settlement and later Congressional implementation legislation that resolved 18-year San Joaquin River litigation, an equal objective to restoring the river between Friant Dam and the Merced River was a Water Management Goal.

It is aimed at minimizing or eliminating Central Valley Project water supply impacts to Friant Division contractors resulting from restoration flows.

2010 WATER RECIRCULATION

Some success was achieved last year in recovering water under the Restoration Program's interim flow regime although most of the recaptured water was via exchange at Mendota Pool due to San Joaquin River conveyance restrictions below Sack Dam (east of Dos Palos) due to seepage problems adversely affecting a number of riverside farms in western Fresno, Madera and Merced counties.

The recaptured water was exchanged into San Luis Reservoir and later returned to the Friant Division through other exchanges and transfers.

The environmental documentation covers up to 260,000 acre-feet of recaptured

Please see **Restoration**, back page

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Volume 23, No. 208
Published by the Friant Water Authority, as a review of issues and developments to inform those interested in water supplies along the East Side of the southern San Joaquin Valley. To comment or ask any questions, please write or call us at (559) 562-6305, visit our web site at *www.Friantwater.org* or contact your local irrigation district. This issue was printed June 28.

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Environmental Group Brushes Off Drought, Pump Limit Impacts

The Pacific Institute has issued a report that has left those in California agriculture wondering if they missed something during California's most recent drought.


A dead West Side orchard after going without water — 2009

According to the Bay Area environmental "think tank," the 2007-09 drought and severe Delta water export pumping restrictions to protect a miniscule fish caused little impact on the Golden State's total farm production.

Even areas largely dependent upon on Delta water supplies were not badly harmed economically, the Pacific Institute's Juliet Christian-Smith, lead author, said.

"Indeed, there were high levels of suffering and unemployment in the region, but this report suggests the causes of the high rate of unemployment and sustained high levels of poverty are more complex and do not appear to be directly related to water supplies."

Please see **Drought Impacts,** Page 3

AROUND FRIANT AND CALIFORNIA

U.S. BUREAU OF RECLAMATION

New Operations Division Chief Named

Nick Zaninovich has taken his seat as the U.S. Bureau of Reclamation's Operations Division Chief for the South-Central California Area Office in Fresno at a moment in time guaranteed to be quite an initiation.

Zaninovich's first day on his new job was June 20, just as flows in the San Joaquin River and storage in Millerton Lake behind Friant Dam were rising due to a massive snowpack that is belatedly melting under Central California's first big heat waves of the season.

His new position is always challenging. Bureau Area Office operations staff members essentially manage the San Joaquin River, including Millerton Lake storage, river releases and flood operations, and declarations of Friant Division water supplies.

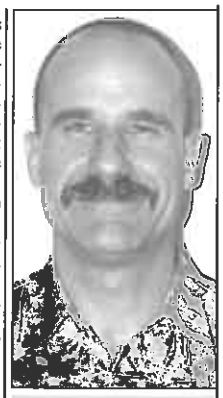
Zaninovich was introduced June 23 to Friant Water Authority Directors and Managers during a FWA board meeting in Visalia.

With more than 19 years of professional experience in the public and private sectors, Zaninovich is a product of California State University, Fresno, where he earned a Bachelor's Degree in Civil Engineering in 1992. He is a registered professional engineer in both California and Nevada.

"Nick has specialized training and experience in design and construction of urban storm water management systems, design and construction of urban storm drainage detention and retention basins, water distribution system operations and maintenance, pumping system designs, and water treatment plant operations," said Michael Jackson, the Bureau's Area Manager in Fresno.

He is no stranger to flood management.

"As an engineer for the Fresno Metropolitan Flood Control District, Nick determined urban storm drainage and flood control requirements for proposed developments, and participated on the subdivision review committees," said Jackson.


Friant Water Authority
Nick Zaninovich

Zaninovich also worked on the staff of Coastland Engineering as lead project manager for water and wastewater projects. He has served as Nevada County Solid Waste and Sanitation District Director, and has also authored or co-authored several water quality papers.

He has also worked for the South Tahoe Public Utility District and City of Dinuba.

Right now, Jackson said, Zaninovich "is on something of a steep learning curve"

Ed Salazar, Bureau staff member, has been serving for most of the past two years as the division's interim Chief. Jackson said that for now Salazar will continue to work with Friant contractors.

Ronald D. Jacobsma, Friant Water Authority General Manager, said the FWA and Friant districts are looking forward to working with Zaninovich.

"But we also want to thank Ed Salazar," Jacobsma said.

"He has done a terrific and highly professional job in managing the high flows, Restoration Program interim releases and Friant water supplies through some difficult periods."

ISABELLA DAM

Scoping Sessions Focus On Repairs

Major deficiencies in the condition of Isabella Dam and an auxiliary dam were discussed at recent scoping meetings held by the U.S. Army Corps of Engineers.

The Corps is dealing with problems of internal erosion, an active earthquake fault directly beneath the auxiliary dam, and a spillway that is considered too small. The dams now carry the Corps' most at-risk status. Water storage continues to be limited.

Major deficiencies include internal erosion, an active Kern River earthquake fault directly beneath the auxiliary dam, and a spillway on the main dam that is too small to handle a once-in-10,000-years storm event.

The problems were discovered by the Corps in 2006.

Various alternatives are being considered but the solution is apparently going to include development of an additional spillway large enough to safely handle maximum amounts of water without risk that such a huge storm's runoff might overtop the earth-fill structure.

The Corps has spent about $24 million on studies.

Corps officials hope to have a final decision on designs within six months. Construction could start in 2014 and take three years to complete.

CORPS OF ENGINEERS

Suit Aims At Levee Tree-Removal Plan

A lawsuit was filed June 20 by three environmental organization over a post-Hurricane Katrina policy of the U.S. Army Corps of Engineers that could mandate untold numbers of trees to be removed from levees along valley rivers.

The Corps in 2007 revised its levee maintenance policy to prohibit trees or shrubs on levees. Only short grass would be permitted.

The policy has not gone down well. Trees along streams provide shade and habitat for fish and other forms of wildlife.

"This would be the most massive intentional infliction of environmental damage on our rivers that we've seen in modern times," Bob Wright, a Friends of the River lawyer, said. Other plaintiffs are Defenders of Wildlife and the Center for Biological Diversity.

Endangered Species Act violations are alleged.

The policy has been delayed for a year throughout the Central Valley.

In the past, the Corps allowed trees on levees and at times has planted trees on such projects. Hurricane Katrina's levee failures in Louisiana in 2005 changed the Corps' thinking. Failure to comply would make local agencies ineligible for federal funds to recover from flood damage.

The California Department of Water Resources estimates removing trees on 1,600 miles of valley levees could cost $7.5 billion.

LAKE McCLURE

More Study Sought On Expansion Plan

Plans by the Merced Irrigation District to expand the Merced River's Lake McClure have run into a hurdle placed by the Obama administration.

A federal land manager stated earlier in June that the project would reduce the Merced River's wild and scenic protections. The administration says it wants further study.

Rep. Jeff Denham (*R-Atwater*) is sponsoring legislation backed on a bipartisan basis by four other valley Congressmen.

The plan calls for permitting the Merced Irrigation District to consider modifying New Exchequer Dam's existing spillway gates to allow MID to capture as much as 70,000 additional acre-feet in Lake McClure during wet years.

SAN JOAQUIN RIVER AND RESERVOIR WATER CONDITIONS

WATERSHED PRECIPITATION

Inches	2010-11 *Including June 29*	2009-2010 *Including June 30*	Season Avg. *Through June*
Huntington Lake	60.15	36.64	42.73
Bass Lake	54.36	29.02	40.62
Friant	26.21	11.25	14.33

SEASONAL RUNOFF

Acre-Feet	In 2010-11	Predicted	Prev. Year
June (29th)	768,517	840,000	222,758
April-July period	1,706,429	2,240,000	960,000
Water Year	2,588,186	3,313,000	1,321,281

2009-2010 Total *(October 1-September 30)* — 2,026,707

FLOWS

San Joaquin River

Cubic Feet Per Second	*June 29*	*June 30, '10*
Calculated Natural Flow (Friant)	13,948	10,268
Actual Millerton Lake Inflow	11,439	5,597
Actual Flow At Friant	3,981	791
Flow at Gravelly Ford	3,741	135
Flow below Mendota Dam	1,420	650
Flow at Vernalis	10,460	3,147
Total Delta Inflow	60,771	19,652
Delta outflow Index	45,747	8,674
Delta conditions	*Excess*	

Diversions at Friant Dam

Friant-Kern Canal	4,052	2,506
Madera Canal	1,191	993

RESERVOIR STORAGE

Acre-Feet	*June 29*	*Last Year*	*Capacity*
U.S. Bureau of Reclamation			
Millerton Lake	464,566	520,039	520,500
Southern California Edison Company			
Edison Lake	103,131	75,735	125,000
Florence Lake	63,263	61,226	64,400
Huntington Lake	84,061	87,994	89,000
Shaver Lake	124,560	103,995	135,300
Mammoth Pool	123,604	124,570	122,000
Redinger Lake	24,026	24,359	26,120
Pacific Gas and Electric Company			
Bass Lake	34,829	34,880	35,000*
Kerckhoff Lake	3,520	3,754	4,200
Upstream Total	560,816	506,155	611,400
OVERALL	1,131,900	1,026,195	1,131,900

*—Temporary capacity pending Butte Valley Dam seismic retrofit

OTHER SOUTH VALLEY DAMS AND RESERVOIRS

Acre-Feet	*June 29*	*Capacity*
Chowchilla River / Buchanan	14,777	150,000
Fresno River / Hidden	61,983	90,000
Merced River / New Exchequer	990,833	1,024,600
Kings River / Pine Flat	950,780	1,000,000
Wishon, Courtright total	244,378	251,900
Kaweah River / Terminus	179,328	185,600
Tule River / Success	39,503	40,000*
*—Capacity for emergency flood control, 82,314 acre-feet.		
Kern River / Isabella	360,236	360,000*
*—Capacity for emergency flood control, 570,000 acre-feet.		
San Luis Reservoir / CVP	699,163	962,000
State Water Project portion	934,329	1,080,000
San Luis Reservoir total	1,633,502	2,040,000

DELTA STEWARDSHIP COUNCIL

New Alternative Estuary Plan Will Be Considered



California Department of Water Resources
A meandering Delta channel.

An alternative proposal advocated by a coalition of agricultural and urban interests will be included in its entirety in an environmental impact report accompanying preparation of a new plan for the Sacramento-San Joaquin Delta.

The Delta Stewardship Council agreed to include the Alternate Delta Plan, which was prepared by a statewide coalition of agricultural and urban water agencies, business interests and local governments.

The Alternate Plan was submitted to the Delta Stewardship Council on June 10 as an alternative to the latest staff drafts of the Delta plan. The Delta Stewardship Council was formed by the 2009 water legislation package and is required to prepare a Delta Plan by January 1, 2012.

The Council announced it will be considering up to seven alternatives, including the coalition's Alternate Delta Plan. Other alternatives to be considered may tend to emphasize ecosystem improvements, water supply improvements or improvements for in-Delta interests. The coalition's plan is focused on meeting the co-equal goals as required by the 2009 legislation. The council will also consider its own staff draft and a no-project alternative.

Stephen Ottemoeller, Friant Water Authority Water Resources Manager, told the FWA Board of Directors that the draft Delta plan prepared by the Stewardship Council "is very regulatory in its approach, focuses too much on increasing flows through the Delta and reaches beyond the Delta itself into areas such as groundwater and water conservation."

ALTERNATIVE PLAN

In a letter accompanying its alternative proposal, the ag-urban coalition said its proposal would feature:

- Implementing a comprehensive program. "While the Alternate Plan calls for heavy investment in agricultural and urban water use efficiency and local resource development to reduce reliance on the Delta for future water demands, a plan that relies solely on these tools cannot succeed, as the past two decades verify. As the work of Delta Vision concluded, we need storage, Delta conveyance improvements, and ecosystem restoration investments to achieve the co-equal goals."
- Using a performance-based management approach through partnership and collaboration that the coalition says "cannot be created through regulation". The alternate plan places maximum reliance on a business model that provides assurances and other incentives for agencies that meet performance-based goals designed to meet statutory and regulatory requirements.
- Assuring accountability, with performance goals and measures for agencies and participants and mechanisms. "The Alternate Plan calls for the identification of clear and attainable ecosystem and water supply reliability goals, as well as measurement and monitoring of outcomes."
- Providing a path for a successful Bay Delta Conservation Plan (BDCP).
- Improving statewide water supply reliability. "The Alternate Plan intends to significantly improve water supplies for all areas of the state compared to current available supplies… . Storage, conveyance and restoration actions must be implemented to solve existing physical problems and protect fisheries. The Alternate Plan calls for a corresponding improvement in the amount of supply available to those paying for the solution. Without improvements in water supply, there is no economic justification to invest in costly conveyance, storage, and additional ecosystem restoration actions."

Please see **Alternative**, back page

Delta Smelt: Appeal Being Made On Constitutional Grounds

Continued from front page

Delta that has been declining for many years despite federal Endangered Species Act regulations.

Those have failed to halt the species' drop in numbers but, the PLF contends, "have crippled the San Joaquin Valley's agricultural economy over the past three years by dramatically reducing water pumping from the Sacramento-San Joaquin Delta into the valley and Southern California."

The appeal is of a Ninth Circuit ruling against the PLF in its litigation brought two years ago in U.S. District Court in Fresno.

'UNCONSTITUTIONAL'

"The Delta smelt water cutbacks aren't just bad for the economy and ineffective at helping the fish," said Middleton. "The point of our lawsuit is that they are flat-out unconstitutional."

He said the Commerce Clause limits federal regulation to interstate commerce. "But the Delta smelt isn't an interstate fish — it exists only in California. And it isn't commercial. Nobody buys it or sells it."

Middleton said that "under a faithful reading of the Constitution, the federal government has no authority to put the Delta smelt on the Endangered Species Act list. It has no authority to issue any regulations at all that focus on the Delta smelt, let alone mandatory water cutbacks that have dealt a crippling blow to California's farm economy over the past few years."

NINTH CIRCUIT RULING

In ruling against PLF's lawsuit and upholding the water cutbacks, the Ninth Circuit implied that any regulation that could somehow be said to have a "substantial relation" to interstate commerce is Constitutional.

"The Ninth Circuit was essentially saying there is no limit on the federal government's regulatory authority," Middleton said.

"If a regulation is valid simply because it might have some hypothetical tie to interstate commerce — as opposed to a clear, definable connection — there's no stopping point, no restraint on what the national government can do."

Middleton said federal supply curtailments continue to cause problems, even with wetter conditions.

"As late as March, when the Sierra snowpacks were the deepest in years, farmers in the federal water system were still being told they would receive only 60% of their contracted water allocation," he said. "That figure rose by May, but that was much later than farmers needed to do the most effective planning."

He noted a May 2 press release from the California Department of Water Resources that stated federal environmental regulations were still restricting supplies, adding that a 100% allocation would be "difficult to achieve even in wet years due to [water] pumping restrictions" for ESA-protected fish.

The PLF contended that at the height of the natural drought in 2007-09, federal pumping restrictions had a devastating effect on the San Joaquin Valley's agricultural economy with an estimated 200,000 acres of farmland fallowed because of irrigation cutbacks in the Westlands Water District alone.

NO EFFECT?

Many in California's environmental and fishing communities questioned the basis of that PLF statement and the litigation.

Bill Jennings of the California Sportfishing Protection Alliance said restrictions on Delta pumping had nothing to do with Westlands' fallowing, which he and other environmentalists contend resulted from Westlands' acquisition and retirement of land due to salt buildups and other soil quality problems.

"Blaming the farmers' problems on the Delta smelt and the Endangered Species Act is a red herring masking the Pacific Legal Foundation's philosophical objections to the concept of protecting endangered species," Jennings said.

"The Delta smelt is simply the canary in the coal mine representing the collapse of the biological tapestry in the Bay-Delta estuary. The land is fallowed because of the legacy of greed and over-irrigation of marginal lands."

Drought Impacts: Report Termed 'A Slap In The Face' To Ag

Continued from Page 2

Such statements are news to the many growers who fallowed lands in 2008-09, farm workers who were thrown out of work and owners of ag-related businesses that were also crippled economically or forced to close.

'A DISSERVICE'

"Attempts now by others to give a broad brush to say the agriculture economy is doing fine is a disservice," said Mike Henry of the California Farm Water Coalition.

A Coalition statement added, "Studies that attempt to misdirect the impacts felt by the recent water delivery restrictions caused by environmental regulations and the drought is a slap in the face to those who have lost jobs and farmers forced to leave fields unplanted. …This study introduces statewide agricultural production to minimize regional impacts. Linking unemployment in the West Side rural communities of Fresno County to countywide losses of home construction jobs is a fallacy. Anyone who has visited and met the people of these communities would realize their dependence on the farm economy."

According to the Pacific Institute, agricultural job losses during the drought – which hit hardest in the Latino population – were minor compared to declines in construction and other employment.

Christian-Smith, and co-authors Morgan Levy and Peter Gleick insisted, "The proportion of agricultural jobs has either remained stable or increased in the areas facing the greatest reductions in federal and state water deliveries. This finding directly contradicts claims that water shortages caused agricultural job losses." They said job losses were concentrated in non-agricultural sectors.

ACCEPTED AS FACT

This Pacific Institute report received considerable statewide news coverage that seemed to accept its contentions as fact. Such as happened before with some of the environmental group's "findings" that are critical of irrigated agriculture. One such report a few years ago insisted that water supply problems in agriculture could be solved through increased water management efficiency and conservation, even though growers in CVP districts today are among the world's most efficient users of water.

Restoration Flows

Continued from front page

interim flows that might be made available for recirculation back to Friant Division contractors as Class 1 or 2 supplies during the current water year but this year's wet conditions would indicate actual return deliveries would be far less because all releases since March 1 have been flood releases that are not available for recirculation.

Restoration releases after flood releases are terminated would be eligible for recapture and recirculation and Reclamation estimates that actual recirculation in 2011 will be closer to 15,000 to 20,000 acre-feet.

The process would utilize south-of-Delta facilities for direct delivery to the Friant Division or through transfers and exchanges between Friant contractors and non-Friant contractors

The State Water Resources Control Board in 2010 issued an order that permits recovered Restoration Program water to be stored or routed through San Luis Reservoir and delivered to Friant contractors directly or through exchanges or transfers.

WATER MANAGEMENT GOAL

This is another important step by the federal government in furthering the Friant Water Authority's determination to pursue all available means of recovery of river restoration releases under the Settlement to further the equal water management goal of the Settlement," said FWA General Manager Ronald D. Jacobsma.

Jacobsma said Friant also continues to pursue modifications to the Friant-Kern and Madera canals to bring them up to design capacity to help move more wet year water.

Additionally, construction of pump-back facilities on the Friant-Kern Canal's lower reaches to move re-circulated water back into the Friant Division is being pursued.

RECOVERED WATER

First-year interim restoration flows recovered by the U.S. Bureau of Reclamation in San Luis Reservoir and recirculated for use by Friant contractors amounted to about 51,500 acre-feet. About 260,000 acre-feet of interim flow water, above what would have been released before the Settlement, was released from Friant Dam into the river between October 1, 2009-September 30, 2010. A good water year eased the effect of water supply reductions to Friant users.

Interim releases are intended to help planners of the Restoration Program and its accompanying water management activities in gathering important data and building an understanding of what will be needed when full restoration flows aimed at restoring a salmon fishery begin. Effects of river restoration flows on adjacent groundwater and farming operations are among the many factors being analyzed.

It will be a bigger challenge to recirculate flows from the lower San Joaquin River or the Delta when river "fixes" are completed and permanent restoration flows begin in 2014 because of the ongoing Delta pumping restrictions and related environmental problems.

THE SETTLEMENT

That Settlement resolved 18-year old San Joaquin River litigation brought against the government by the Natural Resources Defense Council and a coalition of environmental and fishing groups.

The case evolved over the years, ultimately focusing on legal efforts by the plaintiffs to compel restoration of San Joaquin River flows, fishery habitat and a return of salmon to the river downstream from Friant Dam, northeast of Fresno. It had been scheduled to go to trial early in 2005 on "remedies" after a U.S. District Court judge in Sacramento ruled in 2004 that the United States was liable for restoring a historic fishery below Friant Dam. Ultimately successful Settlement negotiations followed.

Approximately 60 miles of the river system had been dry – except for occasional flood management releases – for 61 years following completion of the Central Valley Project's Friant Division.

Efficiency: CVP Compliance

Continued from front page

ers are not efficient with water use, and who feel that conservation can somehow create a new supply of water to put into the Delta."

Santoyo said federal water contractors began reporting individual water deliveries in 1982. A 6% meter accuracy requirement was added in 1992.

"The new obligations and duties that will be borne by agricultural water suppliers are not new to CVP contractors, and have been required of CVP contractors for some time," said Ronald D. Jacobsma, Friant Water Authority General Manager.

The proposed regulation states, "An agricultural water supplier subject to CVPIA (Central Valley Project Improvement Act) or RRA (Reclamation Reform Act of 1982) shall be deemed in compliance with this article if all irrigation water delivered by that water supplier to each customer is delivered through measurement devices that meet the United States Bureau of Reclamation accuracy standards defined in Reclamation's Conservation and Efficiency Criteria Standards of 2008 or future amendments."

A public comment period has started.

MEASUREMENT DEVICES

The action included a recommendation that the California Department of Water Resources adopt agricultural water measurement regulations. Accurate measuring devices would be mandated on nearly all irrigation laterals and turnouts in the state. Well over 100,000 such gates could be required.

Volume accuracy requirements for delivered water would be established at between 5-12%. A deadline of July 31, 2012, would be established. DWR representatives have suggested that certified volume measurement devices meeting accuracy requirements may cost $6,500 each and $1,200 a year for monitoring, repair and reporting.

"We don't know how many turnouts are going to require upgrading at a cost of $6,500 each or more," Mike Wade, California Farm Water Coalition Executive Director, told the California Farm Bureau Federation's *Ag Alert*. "It's impossible to know that until districts begin assessing their infrastructure to see what level of accuracy they're able to attain with current measurement."

EQUIPMENT COSTS

Using DWR estimates of gates that will need new devices installed, the capital costs range from about $96-$104 million.

Wade said the 2012 deadline does not mean that every gate must meet the currently recommended standard "but it does mean water suppliers will need a plan in place for how they're going to do it."

The regulation applies generally to retail and wholesale water suppliers serving 25,000 acres or more.

It does not apply to canal authorities or other entities that convey or deliver water through federal facilities not subject to the article, such as the Friant Water Authority (which operates and maintains the Friant-Kern Canal) and the Madera-Chowchilla Water and Power Authority (for the Madera Canal).

The legislation also required water suppliers to adopt a pricing structure for customers based at least in part on quantity delivered.

Alternative: Delta Proposal

Continued from Page 3

- Pursuing all important ecosystem stressors, not just the water conveyance system and flows. "The Alternate Plan calls for accelerated creation of habitat to continue reversing the loss of wetlands in the system, strong predation and poaching control programs, improved protection of salmon runs, pollution control programs to reverse nutrient imbalances and prevent further degradation of water quality, screening of unscreened diversions, and other actions that are determined to be substantially beneficial to the ecosystem."
- Improved water quality, using a framework to coordinate regulatory agencies and improve their regulatory approaches. It calls for mechanisms to address the most pressing ecosystem pollutant issues and for establishment of a drinking water policy to ensure water quality for future generations."
- Promoting a healthy Delta economy.

COMPREHENSIVE APPROACH

The coalition said its Alternate Plan "is consistent with the comprehensive approach outlined in the Delta Vision Blue Ribbon Task Force's Strategic Plan and the 2009 legislative package. Its implementation would lead to improvements in water supply reliability for all areas of the state, improved ecosystem health for the Delta, and protection of the Delta's unique values as an evolving place.

"In contrast, the latest Council draft plan appears aimed at reducing water supplies and augmenting flows for fish through an approach that relies on regulations to force reductions in demand, with dire consequences for the state's economy. Such an approach is contrary to the co-equal goals and would eliminate the economic justification for local water agencies to pay for key elements of a comprehensive solution.

The Alternate Plan recognizes the need for conveyance improvements, additional groundwater and surface water storage and ecosystem restoration investments through the BDCP to address physical and environmental problems in the Delta and to help restore and protect fisheries. It also recognizes the value of sustaining California's farm economy.

"The Delta plan presents a once-only opportunity for the Delta Stewardship Council," the coalition said. "The Council can provide much-needed momentum and collaboration to further the achievement of the co-equal goals, or it can promote discord and delay improvements by driving stakeholders away from the process."

Snowmelt

Continued from front page

lerton Lake, which was down to 41% full as late as May 5 before beginning to fill. Water orders have been keeping the Madera and Friant-Kern canals at or near capacity.

SIGNIFICANT FLOOD RELEASES

Between March 1-June 30, flood releases into the San Joaquin River have amounted to 1,125,000 acre-feet, nearly twice the capacity of Millerton Lake. Those have included interim river restoration flows that otherwise would have been released totaling 281,400 acre-feet.

A flood release earlier in the winter sent approximately 190,000 acre-feet into the river from December 26, 2010-January 28, 2011.

San Joaquin River flood releases are fairly frequent and large in quantity because of Millerton Lake's small size – 520,500 acre-feet (with only 385,000 acre-feet of manageable storage available above its canal outlets). Additional storage, such as the proposed Temperance Flat Reservoir above Millerton Lake, would have captured much more of the high runoff and minimized flood releases.

NEARING CAPACITY

Storage in all San Joaquin River reservoirs was nearing or at capacity at the *Waterline's* press time on July 1.

Millerton Lake at midnight June 30 was 93% full, at 484,031 acre-feet. Although the lake behind Friant Dam was still filling, storage was going up more slowly, prompting the Bureau of Reclamation to reduce its release from Friant Dam – including flood releases – from 6,000 c.f.s. to 2,860 c.f.s. by month's end.

Upstream, Southern California Edison Company's Florence Lake and Mammoth Pool on the San Joaquin River are both full and other lakes are nearing capacity. Pacific Gas and Electric Company's Bass Lake storage is at its temporary capacity (restricted by work on Crane Valley Dam).



Friant Water Authority / J. Randall McFarland

Pitman Creek thunders toward Big Creek, swollen with the flow unleashed by a big snowpack melting on higher ridges.

Bureau operations staff member Ed Salazar said there remains a great deal of high elevation snow to melt, even though resulting runoff is not expected to reach another seasonal peak. He told Friant Water Authority directors that July's runoff is anticipated to reach 691,000 acre-feet.

"Ed has again done a terrific job in managing the river and reservoir under difficult circumstances," said Ronald D. Jacobsma, FWA General Manager.

The most recent California Department of Water Resources forecast, issued on June 29, anticipates the San Joaquin River's natural runoff – as if there were no dams – during the peak April-through-July period will most probably amount to 2,190,000 acre-feet, 175% of average.

High inflows to Millerton Lake will continue into the fall. As natural runoff tapers off, Southern California Edison is planning to begin dewatering Shaver Lake in August to complete a dam rehabilitation project this fall.

"We're going to have to be moving water through August, September, October and November," Salazar said.

EXPANDED COVERAGE: Center for Irrigation Technology's New Ag Water Use Study

FRIANT WATER AUTHORITY

November 2011

Volume 23, No. 213

FRIANT Waterline

The Reality Of Ag Water 'Savings'

CSUF Study Shows Conservation Doesn't Create Significant New Supplies

Friant Water Authority leaders are applauding a new academic study that derails the myths of claims that agricultural water conservation can result in enough new water to solve the problems of water management or at least provide the volumes of water desired by all users.

A report on the study released November 16 by the Center for Irrigation Technology at California State University, Fresno validates landmark water efficiency findings in a study conducted three decades ago.

CIT is an internationally-respected research body in the field of water use, management and efficiency on the CSUF campus. Its recent research confirms and builds upon the earlier work and conclusions of Robert Hagan and David Davenport at the University of California, Davis in 1982. (Please see related story, Page 3.)



'The study is an important addition to the ongoing discussions about California water and specifically what decisions must be made to assure adequate supplies for the future.'
—Dr. David Zoldoske

WHAT AGRICULTURE HAS BEEN SAYING

"We are very pleased to see that such an esteemed research group has validated much of what those of us involved in delivering and utilizing agricultural water supplies have been saying for decades," said Friant Water Authority Assistant General Manager Mario Santoyo. "Agriculture's water use efficiency has increased dramatically over the past 20 years and there is no evidence that conservation we've achieved is sufficient to create significant additional water supplies for others. We agree with what Dr. David Zoldoske, the CIT's Director, said in introducing the study."

According to Dr. Zoldoske, "The study is an important addition to the ongoing discussions about California water and specifically what decisions must be made to assure adequate supplies for the future. The information presented in this paper should provide a valuable tool in moving the discussions forward."

Santoyo noted that previous reports authored and embraced by environmental organizations have claimed agriculture can conserve 10-15% of its water with those supplies then made available to be redirected to other uses. "That is a fallacy, as this report clearly states," he said.

CONSERVATION OF ONLY 1.3%

"CIT's report demonstrates and details that agricultural conservation would account for just 1.3% of existing farm water supplies and only 0.5% of the state's total water

Please see Study, back page

A Foggy Fall Dawn Along The Friant-Kern



Wisps of fog rise from unhurried waters in the Friant-Kern Canal east of Clovis in Fresno County on a chilly November morning. Water orders have decreased seasonally and by month's end stood at 442 cubic feet per second being released from Friant Dam.

Friant Water Authority / J. Randall McFarland

Ag Facing Regulatory Expansion

Irrigated Lands Program Growing In Its Scope

Recent Central Valley Regional Water Quality Control Board action to include discharges to groundwater ensures that virtually all irrigated agricultural operations will fall under the Regional Board's Irrigated Lands Regulatory Program (ILRP), a reality for which many Friant Division districts and their growers are preparing.

David Orth, Southern San Joaquin Water Quality Coalition Coordinator (SSJWQC) and Kings River Conservation District General Manager, told a Kings River Water Association meeting November 14, "It's time for folks to understand the scope of the new Irrigated Lands Regulatory Program."

That scope, at least within the Tulare Lake Basin, is going to be much broader than it has been over the past several years.

Please see **Irrigated Lands**, Page 2

Mid-Fall Storms Are Little Help To Watershed

Storms have been stingy over the central Sierra Nevada since early October and long-term predictions appear to be offering little hope for change.

November provided four storm events over the San Joaquin River watershed, with only one bringing more – and that just modestly – than very light rain or snow.

The National Weather Service's long-range forecast for Central California in December, the beginning of the region's three wettest months, is for "equal chances" of above or below average precipitation, but January-through-April predictions are for below-average rain and snow.

Storage in the San Joaquin River's Millerton Lake remains higher than normal for this time of year as a result of the above-average 2010-11 water year and on November 30 stood at 298,397 acre-feet, just under 57% of capacity. Upstream storage is also fairly high. The U.S. Bureau of Reclamation has indicated that a significant storm event could trigger a need to evacuate some water from Millerton Lake to comply with flood control parameters. Such an event could result in additional supplies to Friant contractors and/or flood releases.

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FRIANT
Waterline
November 2011
Page 2
Volume 23, No. 213
Published by the Friant Water Authority, as a review of issues and developments to inform those interested in water supplies along the East Side of the southern San Joaquin Valley. To comment or ask any questions, please write or call us at (559) 562-6305, visit our web site at *www.Friantwater.org* or contact your local irrigation district. This issue was printed December 1.

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Shafter-Wasco Irrigation District
Stone Corral Irrigation District
Tea Pot Dome Water District
Terra Bella Irrigation District
Tulare Irrigation District

OBITUARY

Retired TBID Manager Boudreau Dies

John E. Boudreau, who managed the Terra Bella Irrigation District for three decades and became a leader in Friant Division water and power issues, died October 26 at his home in Cayucos. He was 78.


John Boudreau

Mr. Boudreau's career as Engineer-Manager with TBID began in 1968 and ended with his 1998 retirement. He was active in all issues involving the Central Valley Project and Friant water, including the former Friant Water Users Association.

In 1985, Mr. Boudreau helped organize the Friant Water Users Authority, which the next year became the Friant-Kern Canal's conveyance contractor for the U.S. Bureau of Reclamation. He was an active participant in the agency's Advisory Committee and served on many other Friant committees as well.

POWER AUTHORITY

From 1979-2000, Mr. Boudreau also managed the Friant Power Authority. He oversaw planning and construction of the FPA's three hydroelectric power plants on the face of Friant Dam.

"For those of us in the Friant Power Authority, our districts owe an enduring debt of gratitude to John and his foresight in the development of the FPA power project," said Delano-Earlimart Irrigation District General Manager Dale Brogan in a message to other Friant leaders in remembrance of Mr. Boudreau. "One of his more prophetic quotes about the FPA project, while in the middle of being financially devastated, was to hold on, knowing that one day the project would be profitable. That continues to ring in my ears."

COMPREHENSIVE PLAN UPROAR

Mr. Boudreau was a leader in what became a public uproar when the Bureau of Reclamation announced in 1994 that it was beginning the San Joaquin River Comprehensive Plan as called for in the Central Valley Project Improvement Act.

The first public meeting held by the Bureau to scope the plan was in Terra Bella and 400 attended. Even larger crowds objected to the process in meetings that followed in Delano, Tulare and Madera. Ultimately, Friant contractors lost no water as a result of the program.

Mr. Boudreau also was active in the Association of California Water Agencies, was an Executive Board member of the Thermal Electric Water Supply Committee, and chaired both the Tulare County Nuclear Power Plant Advisory Committee and Tulare County Flood Control Commission.

He was born in Los Angeles in March 1933, a week after Long Beach, where his parents lived, was heavily damaged in an earthquake.

SANTA CLARA GRADUATE

After spending his youth in Long Beach, where he was a body surfer and played basketball at St. Anthony's High School, John attended Santa Clara University on a basketball scholarship and earned a bachelor's degree in mechanical engineering.

He began his engineering career at Shell Chemical before joining Aerojet General in Sacramento in the 1960s as a test engineer on the Polaris missile program.

After a brief term of active duty in the U.S. Army as a second lieutenant, Mr. Boudreau served eight years in the Army Reserve, rising to the rank of Captain.

In 1956, he married Sue Josephson of San Jose, whom he met while he was at Santa Clara.

Irrigated Lands: All Irrigators Targeted By Program

Continued from front page

A SSJWQC newsletter states: "The current agricultural waiver applied only to surface water and allowed individuals to avoid regulation if it could be proven that the agricultural operation did not discharge storm water or irrigation water into surface waters of the state. The amended ILRP will begin with an assumption that *every irrigator* is a discharger because of the inclusion of groundwater."

"This is a regulatory program that all farmers will have to deal with," Orth said. "Except for extremely limited circumstances, irrigators will no longer be able to argue that they are not dischargers."

FEE INCREASE FROM STATE

They will also have to pay more. In September, the State Water Resources Control Board approved an ILRP fee increase for irrigators.

What had been an annual fee of 12 cents per acre has been raised to 56 cents for each acre due to the Legislature's decision during budget crisis deliberations to eliminate state general fund support for the program. Future state fee increases are possible.

The Regional Board has jurisdiction throughout the Central Valley and adjoining mountain and foothill areas in all or parts of 32 counties, including the Friant Division.

Although the Friant Water Authority is not a party to ILRP issues, the plan being framed for the Tulare Lake Basin affects all Friant districts that receive water from the Friant-Kern Canal.

DEER CREEK-TULE RIVER READINESS

Preparations and grower awareness efforts are under way. One example is the Deer Creek and Tule River Authority in Tulare County. It has sent applications for sub-watershed membership to all landowners of five acres or more. About 100,000 acres are enrolled and those who have not joined will have at least one more chance to sign up.

Sean Geivet, who manages the Terra Bella, Saucelito and Porterville irrigation districts (all members of the Deer Creek and Tule River Authority and Friant Water Authority), says landowners have been informed on water quality issues.

"I think growers are more up to speed than others may think," Geivet said. Especially in districts with federal water contracts from the Central Valley Project's Friant Division, increases in regulation and fees are nothing new, he said. Geivet said the Regional Board discussion is really over where to build a regulatory bureaucracy – either at a fairly local level or within the Regional Board. "Either way, we're going to be regulated," he said.

ARGUMENTS UNSUCCESSFUL

Regional Board action expanding its ILRP regulatory reach came despite extensive arguments submitted by the SSJWQC during hearings. The Coalition argued unsuccessfully that the Regional Board was over-reaching in regulating discharges to groundwater because not all irrigated agriculture degrades groundwater quality. Legal challenges to adequacy of the Regional Board's findings under the California Environmental Quality Act have been made.

Talks are continuing between SSJWQC and Regional Board staff representatives on development of a general order that would establish regulatory provisions for the Kings, Kaweah, Tule and Kern rivers sub-watersheds although that process is not likely to be completed and lead to implementation until 2014 or 2015.

The SSJWQC newsletter stated, "The Coalition will continue to meet with the Regional Board staff…in an effort to obtain a general order that best represents water quality issues and conditions for the Tulare Lake Basin." Coalition officials added, "The ability of the Coalition to continue representation of the landowners will depend ultimately on the additional requirements of the Regional Board."

About The CIT At Fresno State

Much of this month's Friant *Waterline* is dedicated to presenting an overview of an important study on farm irrigation efficiency and conservation.

Researching and authoring "Agricultural Water Use in California — a 2011 Perspective" were faculty and staff members at California State University, Fresno's Center for Irrigation Technology.

Created in 1980, CIT is recognized around the world as an independent testing laboratory applied research facility and educational resource.

CIT points out that one of California's biggest challenges is managing ever-increasing demands on its most precious resource – water. A core mission of CIT is to help extend this limited supply of water through the use of technology, research and education

SAN JOAQUIN RIVER AND RESERVOIR WATER CONDITIONS

WATERSHED PRECIPITATION

Inches	2011-12 *Including Nov. 30*	2010-2011 *Including Nov. 30*	Season Avg. *Through November*
Huntington Lake	5.75	17.40	8.14
Bass Lake	3.78	10.09	6.39
Friant	2.38	4.33	2.48

SEASONAL RUNOFF

Acre-Feet	In 2011-12	Predicted	Prev. Year
Nov. (30th)	27,967	45,000	52,918
April-July period			2,243,055
Water Year	76,549		112,602

2009-2010 Total *(October 1-September 30)* — 3,300,750

FLOWS

San Joaquin River

Cubic Feet Per Second	Nov. 30	Nov. 30, '10
Calculated Natural Flow (Friant)	480	1,007
Actual Millerton Lake Inflow	500	1,884
Actual Flow At Friant	105	303
Flow at Gravelly Ford	7	
Flow below Mendota Dam	M	
Flow at Vernalis (San Joaquin River)	2,381	
Total Delta Inflow	17,677	
Delta outflow index	12,444	
Delta conditions	*Excess*	

Diversions at Friant Dam

Friant-Kern Canal	442	0
Madera Canal	0	0

RESERVOIR STORAGE

Acre-Feet	Nov. 30	Last Year	Capacity
U.S. Bureau of Reclamation			
Millerton Lake	255,397	291,033	520,500
Southern California Edison Company			
Edison Lake	99,716	86,406	125,000
Florence Lake	75,727	39,119	64,400
Huntington Lake	63,903	75,493	89,000
Shaver Lake	4,364	25,903	135,200
Mammoth Pool	70,553	34,731	122,000
Redinger Lake	18,160	15,771	26,120
Pacific Gas and Electric Company			
Bass Lake	17,613	18,189	35,000*
Kerckhoff Lake	3,976	4,119	4,200
Upstream Total	324,037	299,731	611,400
OVERALL	622,434	591,324	1,131,900

**—Temporary capacity pending Crane Valley Dam seismic retrofit*

OTHER SOUTH VALLEY DAMS AND RESERVOIRS

Acre-Feet	Nov. 30	Capacity
Chowchilla River / *Buchanan*	107,866	150,000
Fresno River / *Hidden*	28,416	90,000
Merced River / *New Exchequer*	872,626	1,024,800
Kings River / *Pine Flat*	662,183	1,000,000
Wishon, Courtright total	144,993	261,900
Kaweah River / *Terminus*	20,376	185,600
Tule River / *Success*	10,650	40,000*
		**—Capacity for emergency flood control, 82,314 acre-feet.*
Kern River / *Isabella*	167,329	360,000*
		**—Capacity for emergency flood control, 670,000 acre-feet.*
San Luis Reservoir / CVP	844,114	960,000
State Water Project portion	917,606	1,080,000
San Luis Reservoir total	1,761,606	2,040,000

CENTER FOR IRRIGATION TECHNOLOGY'S NEW AG WATER USE STUDY

The Hagan-Davenport Report of 1982

UC Davis Study Set Efficiency Benchmark That Agriculture Still Uses

Other studies have come and gone but a 1982 report by two University of California, Davis, researchers remains as true today as when it was released. That work by Robert Hagan and David Davenport created a research foundation that much of production agriculture has embraced and used over the past three decades to improve irrigation efficiency, management and conservation.

Its findings have also been largely validated in the recently released Center for Irrigation Technology study and report upon which California State University, Fresno, researchers worked for the past few years.

STILL STAND

"Regarding the potential for agricultural water conservation to fix the water management problems in California, it is strongly evident that the major findings of the [Hagan-Davenport] Report still stand," the CIT report's conclusion states.

CIT adds. "Claims of excessive irrigation inefficiencies, with resulting large volumes of new water available, are wrong" due to common practices by farmers to recover and re-utilize water.

"We're encouraged that CIT finds it is strongly evident that major findings of the Hagan-Davenport Report that resulted from an extensive water efficiency study nearly 30 years ago stand," Friant Water Authority Assistant General Manager Mario Santoyo said. "We all know that what CIT says is true – that today's water issues go well beyond what Robert Hagan and David Davenport studied, but the basis of their work has been found to be just as relevant now as it was in 1982. Much of what critics of agricultural water use claim is being wasted is actually used again by other farmers and communities."

HAGAN-DAVENPORT CONCLUSIONS

Here are the Hagan-Davenport Report's principal conclusions:

- **"California's net water deficit can be reduced** only by agricultural water conservation actions that curtail soil surface evaporation ... and flows to highly saline sinks. Therefore, the realistic potential for agricultural water conservation, without loss in crop production, is not likely to be in the range of 10-50%, but is more likely to be approximately 2-3% of the water applied in California's irrigated agriculture.
- **"It is erroneous to conclude** that a particular irrigation system such as sprinkler or drip requires only a fraction of the water applied by systems such as furrow or border-strip. (With good design and management, most irrigation systems have a similar potential for efficient water application.) Because of the recoverability and reusability of field runoff and deep percolation, it is even more erroneous to conclude that decreasing runoff and deep percolation will proportionately reduce the state's net water deficit. Therefore, statements suggesting a 10-50% potential savings in agricultural water conservation by improving irrigation application systems are a disservice to the people of California because water policy and action programs based on such statements will substantially underestimate the state's needs for future water supplies."
- **"On-farm water savings** can best be achieved by proper management of existing and new irrigation systems and through good irrigation programs which determine the correct timing and quantity of water application. These savings will mainly occur as a reduction in recoverable water and as reuse of recovered water. On-farm reduction of irrecoverable water loss can be achieved without curtailing economic crop production, mainly by reducing soil surface evaporation but the magnitude of the state-wide savings that can be practically achieved through reduced [evaporation] is not expected to be substantial.
- **Water used in irrigation** is either recoverable or is irrecoverably lost. It is important that recoverable water be recovered and reused as efficiently as possible. However, it should not be permitted to accumulate under conditions where it is subject to evaporation or to transpiration losses by nonproductive vegetation. Seepage, surface runoff, and deep percolation contributing to soil moisture available to crops, groundwater, or wildlife habitat and recreation cannot be regarded as lost. Water flow to salt water bodies is irrecoverable and should be avoided. "Conservation decisions must take into account environmental and in-stream needs as well as the appropriate balance of potential water savings against net farm income, possible reductions in food and fiber production, infrastructural viability, and the ability of farmers to retain flexibility in their operations and remain competitive in the market."
- **Agencies distributing California's** irrigation water are individually distinctive in historic, geologic, geographic, water-source, political, and other characteristics, so water pricing, management and distribution policies vary considerably. "Because of these unique characteristics, universal recommendations on agricultural water conservation actions cannot be made."
- **"There is a large array of conservation** actions, but while these are workable in theory many are not always justified in practice because of technical, economic, and environmental reasons. These conservation actions might be taken during water storage, conveyance, and application; by use of cultural and crop management practices; by reusing and reclaiming water; and through institutional mechanisms."
- **"In much of the San Joaquin Valley**, water conservation has been practiced by water agencies and growers for many decades. This has been done out of necessity because of poor natural distribution of water and scarcity of water supplies relative to irrigation demands. Irrigation is essential because available water is the major resource lacking in an otherwise bountiful valley blessed with fertile soil and plentiful solar radiation."
- **"If water saving is looked at solely** from an on-farm viewpoint (without regard to associated effects), the decision to use water conservation measures depends on whether the motive is 1) just to reduce on-farm water demand, or 2) to reduce the state's net water deficit. Reducing field runoff (RO) and deep percolation (DP) by improving irrigation application efficiency, will reduce on-farm water demand but will not affect the state's water deficit because RO and DP are recoverable for reuse. The state's water deficit can only be reduced by curtailing irrecoverable losses to the air and to saline sinks, mainly to the ocean. This will not create new water, but it will make more of the existing water supplies available for agricultural, [municipal and industrial], and in-stream uses."
- **"The largest true loss of water** from agricultural areas occurs as crop transpiration which can theoretically be curtailed only by reducing the area, the rate and/or the time duration of the transpiring surface." Because crop growth and transpiration are related strongly, transpiration reductions by restricting irrigation, if considerable, "would clearly reduce crop production, and if small, may cause only a small reduction in crop yield but would increase the risk of substantial reductions in yield. Neither prospect is likely to be acceptable to growers. They are more likely to take water conservation actions, however, if their net farm profits increase through savings in production costs associated with water management."
- **There are many other effects** associated with agricultural water conservation actions. A positive result can be energy savings while negatives result if groundwater recharge or wildlife habitat water supplies are reduced as a result of conservation. Other benefits can include on-farm reductions in leaching of fertilizers or off-farm lessening of pollution.
- **San Joaquin Valley groundwater overdraft** can be reduced by reducing net water demand by cutting evapotranspiration to the air but since ET reduction tends to curtail agricultural production, this generally is not a practical solution. Another option is to bring more water into the valley through development or transfers.
- **"To be practical, these solutions** should result in little loss in farm profit, and water transfers should be of mutual benefit to the water sellers and the water buyers. The storage and transfer of surplus flood water (over and above that needed to maintain instream needs) that would otherwise be irrecoverably lost to the ocean would contribute considerably toward reducing California's total projected net water deficit. Also, increased storage, both as surface and groundwater, would reduce the state's vulnerability to future droughts."
- **No precise numerical conservation is reported** because "a distinction must be made between water savings that occur only on-farm and those that help alleviate the state's water deficit; and that deficit can only be met by reducing irrecoverable water outflow, but there is insufficient information on the economic and environmental impacts of reducing those irrecoverable water losses from the state."

'Recoverable Fractions' Principle Is Key In Ag Water Conservation

It's a term that may not sound familiar but a recent study and report has reaffirmed the critical importance of *recoverable fractions* in understanding the amount of water supply actually realized through agricultural water conservation.

"Some claim California agriculture is wasteful or inefficient with water used to irrigate crops and fields," says the Center for Irrigation Technology about the report prepared by California State University, Fresno researchers. "However, based on the principle of recoverable fractions..., new volumes of water gained through conservation practices are insignificant."

In fact, conclusions in CIT's report state, "The estimated potential new water from agricultural water use efficiency is 1.3% of the current amount used by the state's farmers – about 330,000 acre-feet per year... . That represents about 0.5% of California's total water use of 62.66 million acre-feet." Costs to achieve such a small total amount could be very high.

DEFINITION

CIT defines *recoverable fractions* as "surface runoff or deep percolation from an irrigated field that is reclaimed and re-used. The new use can be another field, farm, city water supply, or the environment."

"It is imperative to understand when discussing efficiency of volumetric consumption by agriculture the focus must be on the farm, district, and basin, not the individual field or irrigation event," CIT says.

The concept became recognized in a 1982 water efficiency report by Robert Hagan and David Davenport (*please see related story, this page*), although "fractions" were then referred to as water "losses."

GOOD OR BAD DESTINATIONS

"When irrigation water is applied to a field to satisfy the needs of a crop, that water can end up in several different places," the CIT report says. "...These fractions ... can be beneficial or non-beneficial." There are also consumptive or non-consumptive fractions.

According to CIT, understanding of the recoverable fraction concept and how it could affect water diversion changes requires acknowledgement of the complexities existing among different water users.

CIT says, "Impacts can be seen from flow reductions (and the timing of these reductions) in streams and rivers, as well as impacts to water quality from irrigation return flows, recoverable or irrecoverable. Everything downstream of any changes to the established water distribution patterns can be affected, including plants and animals, recreation, as well as human and industrial consumptive uses."

NON-BENEFICIAL

Non-beneficial fractions in fields result from irrigation inefficiencies and need to be minimized.

"Recoverable fractions aren't true depletions," the report says. "Rather they are water that can be used at a different place and different time than the original diversion. In fact, recoverable fractions may be recovered and reused several times and possibly for different purposes."

The report states, 'The only true depletions (losses) in terms of water volumes are irrecoverable fractions. All water users should continually strive to minimize irrecoverable fractions. However, recoverable fractions are just that, recoverable. There may be other undesirable impacts ... and the range of uses (e.g., irrigation, recreation, human consumption, stock watering) may be diminished with each reuse and recovery, but nonetheless, they are available."

NEED FOR CAUTION

"Caution should be used when evaluating estimates of new water available through conservation," the report says. "Decisions affecting agricultural water use are dependent on many variables including crop and irrigation system selection, soil management, available water delivery systems, and water quality. Agricultural water conservation estimates are, by necessity, based on generalizations involving these variables."

CENTER FOR IRRIGATION TECHNOLOGY'S NEW AG WATER USE STUDY

Friant-Kern Service Area Illustrates Study Findings

Two key findings in the Center for Irrigation Technology's "Agricultural Water Use in California" report are illustrated by recounting how things work in the Central Valley Project's Friant Division within districts served from the Friant-Kern Canal.

Friant's CVP supply is not only isolated from the rest of the Central Valley Project, the Friant-Kern Canal flows into the southern San Joaquin Valley, a closed basin (that is part of the Tulare Lake Basin). Water does not move back to the San Joaquin River or out to the Pacific Ocean except in the wettest of years, thus creating a closed-end system.

NONE OUT OF AREA?

CIT researchers found that "improved on-farm efficiency may not result in new water outside the use area." They said that bettering on-farm efficiency could actually permit more irrigated acreage or more water-intensive crops to be grown.

"An important point of this example is that the additional water within the system resulting from improved efficiencies is used to irrigate more crops," the study said. "The recovered fractions (water supplies) are not left in the reservoir or sent outside the district. … This water could be sold and transferred to another user."

Another finding related directly to Friant is that "improved on-farm efficiency can create third-party impacts." In Friant's case, better on-farm efficiency is part of a change from a balanced aquifer to aquifer overdraft.

"The improved on-farm efficiency did not create new water, it just changed the use of the affected water," CIT said.

DEEP PERCOLATION

"The overall impact on groundwater quality from reduced deep percolation is not clear. Less deep percolation could reduce the movement of nitrates and other soluble chemicals to the aquifer. If a salt balance is to be maintained in the soil to ensure crop production and quality, it may result in a higher salt concentration in the deep percolation that remains. This could eventually contribute to the overall salt concentration in the aquifer."

The report also summarizes how the conjunctive use of groundwater and surface water – so vital to the overall Friant Division water supply – operated.

"When there are sufficient surface water supplies available from the Friant-Kern Canal, groundwater sources may not be used. However, in times of scarcity, groundwater is used to augment, or even completely supplant, the canal supply.

"This is the concept behind conjunctive water management and water banks. In times of plenty, water is transferred to dedicated recharge areas … so that the excess water is percolated and stored in the aquifer. This stored water is then used in times of drought. Intentional percolation using dedicated sites provides for high-quality water reaching the aquifer."

To Read The Entire CIT Report And Its Findings

- There are many other issues and factors discussed in the report. It is available on line. Go to www.californiawater.org



Flowing Into A Closed Basin

The Friant-Kern Canal passes through the Delano area where its water deliveries have been a major factor in combating groundwater overdraft for 60 years. The Central Valley Project's Friant Division is a closed-end system with no outlet to the ocean.

Friant Water Authority photo / J. Randall McFarland

Many Factors Are A Part Of Efficiency Study

Analysis of irrigation efficiency can be very complex. "While the irrigation efficiency on an individual field may be poor, the irrigation efficiency of a farm, irrigation district, or the basin may be very high because the inefficiencies of one field (recoverable fractions) are picked up for use by others in a larger area," the Center for Irrigation Technology says.

However, diversions in themselves can lead to negative impacts on other beneficial uses and users. Thus, in most situations it should be an imperative to improve field irrigation efficiencies by reducing the required diversion to any individual field and in so doing, reducing surface and subsurface drainage flows.

TO REDUCE DIVERSIONS

An equation is included in the report to estimate required field water diversions in order to identify variables and their relationships. CIT says the equation shows that to reduce the acre-feet per year diverted to a field, one or more of these factors must occur:

- A reduction in irrigated acreage.
- A reduction in crop evapotranspiration (ETc)
- An increase in effectiveness of rainfall
- A reduction in the leaching ratio
- An increase in irrigation efficiency

"Reducing irrigated acreage should not be considered a water conservation measure, but a transfer of water out of agriculture," says the report. "The question is how will this impact regional and state economies and food supplies?"

Crop ETc is the combination of soil surface evaporation that occurs because of irrigation water that is present (not the immediate evaporation from free water surfaces during and just after the irrigation event) and transpiration from the crop surfaces.

Reducing ETc might be accomplished by reducing the soil wetted area, changing the crop to one using less water or changing crop management but, CIT says, "Such changes in practices have to be balanced with other factors such as the economics or disease and pest management impacts of such decisions."

IMPROVING EFFICIENCY

Improving irrigation efficiency is most important of all field application reductions to improve efficiency.

"This can involve improving management of the existing system or changing to an irrigation system that makes it easier to achieve the inherent potential efficiency of the system," says CIT's report.

Options for improved on-farm irrigation system management include understanding system characteristics and operating parameters, using some form of irrigation scheduling and maintaining the system to achieve the intended irrigation efficiency.

"The potential water savings from any of these options depends largely on how well or poorly the current irrigation system performs." CIT observes. "Many areas and growers in California already achieve high efficiencies." The Friant Division for many years has had some of the nation's highest irrigation efficiencies.

Study: 'Tiny Amounts Statewide' Can Be Conserved

Continued from front page

use," Santoyo said. "These are tiny amounts statewide, adding up to what CIT estimates as being 330,000 acre-feet each year." The report also shows that previous reallocations of agricultural water supplies for environmental purposes now add up to at least 5% of farm water diversions depending on the water year.

Experience since Central Valley Project water deliveries began in the Friant Division along the San Joaquin Valley's East Side in the mid to late 1940s agrees with what the CIT shows and is demonstrated in some detail by the study, Santoyo said. "Changes in irrigation practices create opportunities to use the saved water within the region, such as through transfers, but have not resulted in new supplies beyond the Friant Division," he said.

CIT's researchers state. "An important goal of this report is to affirm that the issue is not what total percentage of water agriculture diverts or consumes, it is whether or not agriculture is providing good stewardship over its allocation. As noted earlier, the [Hagan-Davenport] Report was published in part as a response to 'misunderstandings' that were leading to claims of water wastage within agriculture. These types of claims continue along with reference to solutions that could be quickly or easily implemented.

WATER WASTE CLAIMS REJECTED

"The authors of this paper, as did Davenport and Hagan, reject these claims and explain why based on the principle of recoverable versus irrecoverable fractions." (Please see related story, Page 3.)

Friant Water Authority General Manager Ronald D. Jacobsma pointed out CIT's study "demonstrates a clear and well-defined trend toward dramatic improvements in water management and efficiency. The study shows that between 1994-2008, drip irrigation use on California's 8 million irrigated acres increased by 150%, from 933,696 acres to 2,336,130 acres. The increase in drip irrigation and water use efficiency through the farmland irrigated from the Friant-Kern and Madera canals is even greater."

The report also points out the trade-offs that result in large-scale farm production within the San Joaquin Valley. "If society wants/needs this mix of food and fiber production, or if the normal flow of business decides in favor of this level of production, then the result is a large volume of consumptive plant water use – evapotranspiration. This is simply a result of the physics of irrigated crop production."

PERCOLATION AND GROUNDWATER

"Something else we have long known that has been validated by the report is that water applied to a crop but not actually used by the plant is not lost but typically percolates into the ground and helps boost groundwater supplies," Jacobsma said. "Groundwater is relied upon not only by thousands of farmers but many scores of communities and tens of thousands of rural residents with no other water source for domestic needs. CIT warns repeatedly of the potential for third party impacts if agricultural water use is reduced."

"As for switching to a crop that takes less water, it isn't that easy," said Santoyo. He said the CIT study is correct in pointing out that farm markets and economics, increased expenditures for field preparation and equipment, soil types and many other crucial factors must all be considered.

Santoyo also said the new study also "corroborates Friant's experiences in conjunctively using groundwater and surface water, noting that preservation of groundwater supplies is impossible if surface water supplies are inadequate or disrupted." The report notes that a serious overdraft problem, now amounting to some 2 million acre-feet annually across the state, will continue if surface water supply and reliability do not improve.

AG WATER USE ISN'T 'ISOLATED'

He said that it "is important to note the report's conclusion that farm water use isn't some isolated activity that takes place but that it's an integral part of what the report calls 'local and regional environments that are often co-dependent and impacted by decisions and activities of the local agricultural water users'."

The study says, "Water use patterns in the California have developed over decades, especially those involving large storage/delivery projects, resulting in co-dependent partnerships. Careful analysis must be done to evaluate all impacts before simply calling for increased on-farm water use efficiency. Changes to these environments that result in perceived benefits to some users can also result in negative impacts to other third-party users. It is essential to identify and understand these consequences."

"Friant's farmers know and understand what this report states," Jacobsma added, "that to be viable, any big changes have to be founded on assessments and analysis by the people who know the local conditions best – the farmers themselves."

Appendix G District Water Order Form

Turnout LTRID 05 01-North Fork Tule River @ Hwy 99 100.0 Field #[redacted]

Crop

Name	Acres	Plant	Harvest
Nothing	316	04/02/2007	12/31/2020

Tenant [redacted]

Allocation

Event - Water is OFF

Turn On 02/25/2012 07:00am Flow Rate 3.22 cfs Estimated Off --/--/---- --:--

Duration

Order Type

Request Information

Requested By

Requested To nsoto On 02/24/2012 10:17am

Comments

Add Water Order

Year of Data	2010	**Enter data year here**

Table 1

Surface Water Supply

2010 Month	**Federal Ag Water** (acre-feet)	**Federal non-Ag Water.** (acre-feet)	**State Water** (acre-feet)	**Local Water** (acre-feet)	**Water (define)** (acre-feet)	**Drain Water** (acre-feet)	**Total** (acre-feet)
Method				M1			
January	0	0	0	0	0	0	0
February	0	0	0	1,000	0	0	1,000
March	0	0	0	0	0	0	0
April	0	0	0	0	0	0	0
May	0	0	0	0	0	0	0
June	0	0	0	0	0	0	0
July	0	0	0	0	0	0	0
August	0	0	0	0	0	0	0
September	0	0	0	0	0	0	0
October	0	0	0	0	0	0	0
November	0	0	0	0	0	0	0
December	0	0	0	0	0	0	0
TOTAL	0	0	0	1,000	0	0	1,000

Table 2

Ground Water Supply

2010 Month	Groundwater (acre-feet)	Groundwater *(acre-feet)
Method		E2
January	0	163
February	0	1,744
March	0	7,066
April	0	11,254
May	0	17,061
June	0	25,448
July	0	39,779
August	0	32,142
September	0	23,712
October	0	7,490
November	0	2,254
December	0	1,788
TOTAL	0	169,901

*normally estimated

Table 3

Total Water Supply

2010 Month	Surface Water Total (acre-feet)	Groundwater (acre-feet)	M&I Wastewater (acre-feet)	District Water (acre-feet)
Method				
January	0	0	0	0
February	1,000	0	0	1,000
March	0	0	0	0
April	0	0	0	0
May	0	0	0	0
June	0	0	0	0
July	0	0	0	0
August	0	0	0	0
September	0	0	0	0
October	0	0	0	0
November	0	0	0	0
December	0	0	0	0
TOTAL	1,000	0	0	1,000

*Recycled M&I Wastewater is treated urban wastewater that is used for agriculture.

Table 4

Distribution System

2010 Canal, Pipeline, Lateral, Reservoir	Length (feet)	Width (feet)	Surface Area (square feet)	Precipitation (acre-feet)	Evaporation (acre-feet)	Spillage (acre-feet)	Seepage (acre-feet)	Total (acre-feet)
Deer Creek	77,687	95	7,380,265	227	719	0	2,513	(3,005)
East Main Canal	12,428	12	149,136	5	15	0	402	(412)
Pixley North Ditch	28,730	9	258,570	8	25	0	929	(947)
Pixley South Ditch	24,910	9	224,190	7	22	0	806	(821)
Harris Ditch	19,182	11	211,002	6	21	0	621	(635)
West Main Canal	33,066	22	727,452	22	71	0	1,070	(1,118)
Townsend Ditch	48,449	10	484,490	15	47	0	1,567	(1,600)
Cross Ditch	12,894	8	103,152	3	10	0	417	(424)
Lateral 1 Ditch	23,760	13	308,880	9	30	0	769	(789)
Lateral 2 Ditch	23,750	12	285,000	9	28	0	768	(787)
Lateral 3 Ditch	29,180	11	320,980	10	31	0	944	(965)
TOTAL			10,453,117	321	1,019	0	10,805	10,108

Table 5

Crop Water Needs

2010 Crop Name	Area (crop acres)	Crop ET (AF/Ac)	Leaching Requiremen (AF/Ac)	Cultural Practices (AF/Ac)	Effective Precipitatio (AF/Ac)	Appl. Crop Water Use (acre-feet)
Corn	22,152	2.29	0.00	0.57	0.00	63,410
Alfalfa	12,160	4.60	0.00	1.15	0.29	66,363
Almonds	5,443	3.42	0.00	0.34	0.14	19,696
Vineyard	4,981	2.58	0.00	0.26	0.03	14,003
Wheat	3,299	1.35	0.00	0.34	0.19	4,940
Cotton	2,920	2.56	0.00	0.64	0.00	9,338
Sudan	984	1.71	0.00	0.43	0.00	2,101
Other (<5%)	1,335	1.75	0.00	0.44	0.02	2,894
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
	0	0.00	0.00	0.00	0.00	0
Crop Acres	53,274					182,746

Total Irrig. Acres 53,274 (If this number is larger than your known total, it may be due to double cropping)

Table 6

2010 District Water Inventory

Water Supply	Table 3		1,000
Riparian ET	(Distribution and Drain)	minus	0
Groundwater recharge	intentional - ponds, injection	minus	4,260
Seepage	Table 4	minus	10,805
Evaporation - Precipitation	Table 4	minus	698
Spillage	Table 4	minus	0
Transfers/exchanges/trades/wheel	(into or out of the district)	plus/minus	30,296
Non-Agri deliveries	delivered to non-ag customers	minus	0
Water Available for sale to agricultural customers			15,533
Compare the above line with the next line to help find data gaps			
2005 Actual Agricultural Water Sales	From District Sales Records		39,936
Private Groundwater	Table 2	plus	169,901
Crop Water Needs	Table 5	minus	182,746
Drainwater outflow	(tail and tile not recycled)	minus	0
Percolation from Agricultural Land	(calculated)		27,091

Table 7

Influence on Groundwater and Saline Sink

2010

Agric Land Deep Perc + Seepage + Recharge - Groundwater Pumping = District Influence	15,065
Estimated actual change in ground water storage, including natural recharge)	(25,000)
Irrigated Acres (from Table 5)	53,274
Irrigated acres over a perched water table	0
Irrigated acres draining to a saline sink	0
Portion of percolation from agri seeping to a perched water table	0
Portion of percolation from agri seeping to a saline sink	0
Portion of On-Farm Drain water flowing to a perched water table/saline sink	0
Portion of Dist. Sys. seep/leaks/spills to perched water table/saline sink	0
Total (AF) flowing to a perched water table and saline sink	0

Table 8

Annual Water Quantities Delivered Under Each Right or Contract

Year	Federal Ag Water (acre-feet)	Federal non-Ag Water. (acre-feet)	State Water (acre-feet)	Local Water (acre-feet)	Water (define) (acre-feet)	Drain Water (acre-feet)	Total (acre-feet)
2001	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0
2003	0	0	0	1,697	0	0	1,697
2004	0	0	0	0	0	0	0
2005	0	0	0	9,794	0	0	9,794
2006	0	0	0	9,156	0	0	9,156
2007	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0
2010	0	0	0	1,000	0	0	1,000
Total	0	0	0	21,647	0	0	21,647
Average	0	0	0	2,165	0	0	2,165