OAKDALE IRRIGATION DISTRICT

AGRICULTURAL WATER MANAGEMENT PLAN

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prepared by

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Preface

This Agricultural Water Management Plan (AWMP or Plan) has been prepared by Oakdale Irrigation District (OID or District) in accordance with the requirements of the Water Conservation Act of 2009 (SBx7-7) and the Governor's Executive Order B-29-15. SBx7-7 modifies Division 6 of the California Water Code (CWC or Code), adding Part 2.55 (commencing with §10608) and replacing Part 2.8 (commencing with §10800). In particular, SBx7-7 requires all agricultural water suppliers to prepare and adopt an AWMP as set forth in the CWC and the California Code of Regulations (CCR) on or before December 31, 2012. The Plan must be updated by December 31, 2015 and then every 5 years thereafter (§10820 (a)). Additionally, the CWC requires suppliers to implement certain efficient water management practices (EWMPs). Executive Order B-29-15, issued April 1, 2015 further requires 2015 AWMP updates for agricultural water suppliers serving more than 25,000 acres to include in their Plan a detailed drought management plan describing actions and measures to manage water demand during drought, along with quantification of water supplies and demands for 2013, 2014, and 2015 (to the extent available).

In preparing the Plan, OID and its technical consultant have relied on guidance provided in DWR's Guidebook to Assist Agricultural Water Suppliers to Prepare a 2015 Agricultural Water Management Plan (Guidebook), which was released in June 2015. Other primary resources used to develop this 2015 update were OID's 2012 AWMP, the CWC itself, and relevant sections of the CCR.

Cross-Reference of Relevant Sections of the California Water Code and Executive Order B-29-15 to Oakdale Irrigation District 2015 Agricultural Water Management Plan

California Water Code, Division 6, Part 2.55. Sustainable Water Use and Demand Reduction

Chapter 4. Agricultural Water Suppliers

Division	Subdivision	Paragraph	Code Language	Applicable AWMP Section(s)
10608.48	(a)		On or before July 31, 2012, an agricultural water supplier shall implement efficient water management practices pursuant to subdivisions (b) and (c).	**7**
	(b)		Agricultural water suppliers shall implement all of the following critical efficient management practices:	(see below)
		(1)	Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of Section 531.10 and to implement paragraph (2)	**3.7, 7, Att. B**
		(2)	Adopt a pricing structure for water customers based at least in part on quantity delivered.	**3.8, 7, Att. C**
	(c)		Agricultural water suppliers shall implement additional efficient management practices, including, but not limited to, practices to accomplish all of the following, if the measures are locally cost effective and technically feasible:	(see below)
		(1)	Facilitate alternative land use for lands with exceptionally high water duties or whose irrigation contributes to significant problems, including drainage.	**7**
		(2)	Facilitate use of available recycled water that otherwise would not be used beneficially, meets all health and safety criteria, and does not harm crops or soils.	**4.4, 7**
		(3)	Facilitate the financing of capital improvements for on-farm irrigation systems.	**7**
		(4)	Implement an incentive pricing structure that promotes one or more of the following goals: (A) More efficient water use at the farm level. (B) Conjunctive use of groundwater. (C) Appropriate increase of groundwater recharge. (D) Reduction in problem drainage. (E) Improved management of environmental resources. (F) Effective management of all water sources throughout the year by adjusting seasonal pricing structures based on current conditions.	**3.8, 7, Att. C**
		(5)	Expand line or pipe distribution systems, and construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance, and reduce seepage.	**1.3.1, 3.3, 7, 8**
		(6)	Increase flexibility in water ordering by, and delivery to, water customers within operational limits.	**1.3.1, 3.3, 7, 8**
		(7)	Construct and operate supplier spill and tailwater recovery systems.	**1.3.1, 3.3, 7, 8**
		(8)	Increase planned conjunctive use of surface water and groundwater within the supplier service area.	**1.3.1, 7, 8**
		(9)	Automate canal control structures.	**1.3.1, 3.3, 7, 8**
		(10)	Facilitate or promote customer pump testing and evaluation.	**7**
		(11)	Designate a water conservation coordinator who will develop and implement the water management plan and prepare progress reports.	**7**
		(12)	Provide for the availability of water management services to water users. These services may include, but are not limited to, all of the following: (A) On-farm irrigation and drainage system evaluations. (B) Normal year and real-time irrigation scheduling and crop evapotranspiration information. (C) Surface water, groundwater, and drainage water quantity and quality data. (D) Agricultural water management educational programs and materials for farmers, staff, and the public.	**7**
		(13)	Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional changes to allow more flexible water deliveries and storage.	**7**
		(14)	Evaluate and improve the efficiencies of the supplier's pumps.	**1.3.1, 4.3, 7, 8**

Division	Subdivision	Paragraph	Code Language	Applicable AWMP Section(s)
10608.48	(d)		Agricultural water suppliers shall include in the agricultural water management plans required pursuant to Part 2.8 (commencing with Section 10800) a report on which efficient water management practices have been implemented and are planned to be implemented, an estimate of the water use efficiency improvements that have occurred since the last report, and an estimate of the water use efficiency improvements estimated to occur five and 10 years in the future. If an agricultural water supplier determines that an efficient water management practice is not locally cost effective or technically feasible, the supplier shall submit information documenting that determination.	**7, 8**

California Water Code, Division 6, Part 2.8. Agricultural Water Management Planning

Chapter 3. Agricultural Water Management Plans

Article 1. General Provisions

Division	Subdivision	Paragraph	Code Language	Applicable AWMP Section(s)
10820	(a)		An agricultural water supplier shall prepare and adopt an agricultural water management plan in the manner set forth in this chapter on or before December 31, 2012, and shall update that plan on December 31, 2015, and on or before December 31 every five years thereafter.	**2**
10821	(a)		An agricultural water supplier required to prepare a plan pursuant to this part shall notify each city or county within which the supplier provides water supplies that the agricultural water supplier will be preparing the plan or reviewing the plan and considering amendments or changes to the plan. The agricultural water supplier may consult with, and obtain comments from, each city or county that receives notice pursuant to this subdivision.	**2**
	(b)		The amendments to, or changes in, the plan shall be adopted and submitted in the manner set forth in Article 3 (commencing with Section 10840).	**2**

Article 2. Contents of Plans

Division	Subdivision	Paragraph	Code Language	Applicable AWMP Section(s)
10826			An agricultural water management plan shall be adopted in accordance with this chapter. The plan shall do all of the following:	(see below)
	(a)		Describe the agricultural water supplier and the service area, including all of the following:	(see below)
		(1)	Size of the service area.	**3**
		(2)	Location of the service area and its water management facilities.	**3**
		(3)	Terrain and soils.	**3**
		(4)	Climate.	**3**
		(5)	Operating rules and regulations.	**3, Att. A**
		(6)	Water delivery measurements or calculations.	**3, Att. B**
		(7)	Water rate schedules and billing.	**3, Att. C**
		(8)	Water shortage allocation policies.	**3**
10826	(b)		Describe the quantity and quality of water resources of the agricultural water supplier, including all of the following:	(see below)
		(1)	Surface water supply.	**4, 5**
		(2)	Groundwater supply.	**4, 5**
		(3)	Other water supplies.	**4, 5**
		(4)	Source water quality monitoring practices.	**4**
		(5)	Water uses within the agricultural water supplier's service area, including all of the following: (A) Agricultural. (B) Environmental. (C) Recreational. (D) Municipal and industrial. (E) Groundwater recharge. (F) Transfers and exchanges. (G) Other water uses.	**5**
		(6)	Drainage from the water supplier's service area.	**5**

Division	Subdivision	Paragraph	Code Language	Applicable AWMP Section(s)
10826	(b)	(7)	Water accounting, including all of the following: (A) Quantifying the water supplier's water supplies. (B) Tabulating water uses. (C) Overall water budget.	**5, Att. F**
		(8)	Water supply reliability.	**4, 5**
	(c)		Include an analysis, based on available information, of the effect of climate change on future water supplies.	**6**
	(d)		Describe previous water management activities.	**1.3, 7, 8**
	(e)		Include in the plan the water use efficiency information required pursuant to Section 10608.48.	**All**
Article 3. Adoption and Implementation of Plans				
Division	Subdivision	Paragraph	Code Language	Applicable AWMP Section(s)
10841			Prior to adopting a plan, the agricultural water supplier shall make the proposed plan available for public inspection, and shall hold a public hearing on the plan. Prior to the hearing, notice of the time and place of hearing shall be published within the jurisdiction of the publicly owned agricultural water supplier pursuant to Section 6066 of the Government Code. A privately owned agricultural water supplier shall provide an equivalent notice within its service area and shall provide a reasonably equivalent opportunity that would otherwise be afforded through a public hearing process for interested parties to provide input on the plan. After the hearing, the plan shall be adopted as prepared or as modified during or after the hearing.	**2**
10842			An agricultural water supplier shall implement the plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan, as determined by the governing body of the agricultural water supplier.	**1.3.1, 7, 8**
10843	(a)		An agricultural water supplier shall submit to the entities identified in subdivision (b) a copy of its plan no later than 30 days after the adoption of the plan. Copies of amendments or changes to the plans shall be submitted to the entities identified in subdivision (b) within 30 days after the adoption of the amendments or changes.	**2**
	(b)		An agricultural water supplier shall submit a copy of its plan and amendments or changes to the plan to each of the following entities:	(see below)
		(1)	The department.	**2**
		(2)	Any city, county, or city and county within which the agricultural water supplier provides water supplies.	**2**
		(3)	Any groundwater management entity within which jurisdiction the agricultural water supplier extracts or provides water supplies.	**2**
		(4)	Any urban water supplier within which jurisdiction the agricultural water supplier provides water supplies.	**2**
		(5)	Any city or county library within which jurisdiction the agricultural water supplier provides water supplies.	**2**
		(6)	The California State Library.	**2**
		(7)	Any local agency formation commission serving a county within which the agricultural water supplier provides water supplies.	**2**
10844	(a)		Not later than 30 days after the date of adopting its plan, the agricultural water supplier shall make the plan available for public review on the agricultural water supplier's Internet Web site.	**2**
	(b)		An agricultural water supplier that does not have an Internet Web site shall submit to the department, not later than 30 days after the date of adopting its plan, a copy of the adopted plan in an electronic format. The department shall make the plan available for public review on the department's Internet Web site.	**2**

Governor Edmund G. Brown Executive Order B-29-15

Item 12. Agricultural Water Suppliers (more than 25,000 acres)		
Item	Order Language	Applicable AWMP Section(s)
12	Agricultural water suppliers that supply water to more than 25,000 acres shall include in their required 2015 Agricultural Water Management Plans a detailed drought management plan that describes. the actions and measures the supplier will take to manage water demand during drought. The Department shall require those plans to include quantification of water supplies and demands for 2013, 2014, and 2015 to the extent data is available. The Department will provide technical assistance to water suppliers in preparing the plans.	**3.9, 4, 5, Att. D**

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Attachments

Acronyms and Abbreviations

AB3616	Assembly Bill 3616, the Agricultural Efficient Water Management Act of 1990
af	Acre-Feet
af/ac	Acre-Feet per Acre
af/ac-yr	Acre-Feet per Acre per Year
AWMC	Agricultural Water Management Council
AWMP	Agricultural Water Management Plan
BMO	Basin Management Objective
BO	Biological Opinion
CASGEM	California Statewide Groundwater Elevation Monitoring System
CCR	California Code of Regulations
CCUF	Crop Consumptive Use Fraction
CDEC	California Data Exchange Center
CDM	Camp Dresser McKee
cfs	Cubic Feet per Second
CHO	Constant Head Orifice
CIMIS	California Irrigation Management Information System
CIP	Cast In Place
CNRA	California Natural Resources Agency
CSJWCD	Central San Joaquin Water Conservation District
CVP	Central Valley Project
CWC	California Water Code
DF	Delivery Fraction
DMS	Database Management System
DMP	Drought Management Plan
DSO	Distribution System Operator
DSS	Decision Support System
DWR	California Department of Water Resources
EIR	Environmental Impact Report
ESJWQC	East San Joaquin Water Quality Coalition
ET	Evapotranspiration
ETa	Actual Evapotranspiration
ETaw	Crop Evapotranspiration of Applied Water
ETo	Reference Evapotranspiration
ETpr	Crop Evapotranspiration of Precipitation
EWMP	Efficient Water Management Practice
FWUA	Friant Water Users Authority
GMP	Groundwater Monitoring Plan
gpm	Gallons per Minute
IDC	Integrated Water Flow Model (IWFM) Demand Calculator
in	Inches
IRGMP	Integrated Regional Groundwater Management Plan
ITRC	Irrigation Training and Research Center
METRIC	Mapping Evapotranspiration at high Resolution with Internalized Calibration
mph	Miles per Hour
MID	Modesto Irrigation District
MOU	Memorandum of Understanding Regarding Efficient Water Management Practices by Agricultural Water Suppliers in California

NASS	National Agricultural Statistics Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
OID	Oakdale Irrigation District
PEIR	Programmatic Environmental Impact Report
PG&E	Pacific Gas and Electric
PVC	Polyvinyl Chloride
RWQCB	Regional Water Quality Control Board
SBx7-7	Senate Bill x7-7, Water Conservation Bill of 2009
SCADA	Supervisory Control and Data Acquisition
SEBAL	Surface Energy Balance Algorithm for Land
SEWD	Stockton East Water District
SGMA	Sustainable Groundwater Management Act of 2014
SJCDWQC	San Joaquin County and Delta Water Quality Coalition
SOI	Sphere of Influence
SSJID	South San Joaquin Irrigation District
STRGBA	Stanislaus and Tuolumne Rivers Groundwater Basin Association
SWRCB	(California) State Water Resources Control Board
TAF	Thousands of Acre-Feet
TCC	Total Channel Control
TID	Turlock Irrigation District
USBR	United States Bureau of Reclamation
USGS	United States Geological Survey
VAMP	Vernalis Adaptive Management Plan
VFD	Variable Frequency Drive
WMF	Water Management Fraction
WRP	Water Resources Plan
WUE	Water Use Efficiency
WWCRA	Westwide Climate Risk Assessment

Executive Summary

Introduction

Oakdale Irrigation District (OID or District) has prepared this Agricultural Water Management Plan (AWMP) in accordance with the requirements of the Water Conservation Act of 2009 (SBx7-7) and the Governor's Executive Order B-29-15. This AWMP updates the District's 2012 AWMP and describes OID's leadership in water management within its sphere of influence and the San Joaquin Valley as a whole. The District's mission is to protect and develop OID water resources for the maximum benefit of the Oakdale Irrigation District community by providing excellent irrigation and domestic water service. Recent water management activities by the District include development of the OID Water Resources Plan (WRP), a comprehensive study of the District's water resources, delivery system, and operations. The overall objective of the WRP is to identify how the District can best protect its water rights while developing affordable methods of financing the necessary improvements to continue to meet the needs of all its stakeholders and serve the region. Implementation of the WRP is an ongoing process that has continued since its completion in 2007.

Development and update of the AWMP represents a substantial effort by OID to evaluate its progress in implementing the WRP and overall water management, including the development of detailed water balances spanning the period from 2005 to 2014 for the distribution system, the farmed lands, and the drainage system of OID and its customers. Additionally, OID has evaluated the implementation of the full range of efficient water management practices (EWMPs) detailed in SBx7-7 with respect to its water management objectives and various water use efficiency improvements. In response to Executive Order B-29-12, the 2015 AWMP includes a detailed drought management plan and description of impacts on supplies and demands during recent drought years.

Water Resources Plan

The OID distribution system infrastructure and operating policies evolved primarily to satisfy the needs of forage crops, and are still generally adequate to meet those needs. However, improved water delivery strategies were needed to satisfy the evolving irrigation needs of orchards and other specialty crops. The OID Board and management recognized that modernization of the District's policies, procedures and facilities was needed. As a result, and in conjunction with increased financial capability resulting from completion of payments on a large bond issue leading to increased revenue from hydropower generation, and increases in revenue from water transfers, the District undertook the development of the comprehensive OID WRP. The overall objective of the WRP is to identify how the District could best protect its water rights while developing affordable methods of financing the necessary improvements to continue to meet the needs of all its stakeholders and serve the region. The WRP includes an evaluation of financial objectives and needs, annexation of adjacent lands, water transfers, and other considerations.

Since completion of a Programmatic Environmental Impact Report (PEIR) for the WRP in 2007, OID has actively implemented improvements identified in the WRP. Improvements under the WRP include canal maintenance and rehabilitation, flow control and measurement, groundwater well replacement, pipe replacement, regulating reservoir construction, a Woodward Reservoir intertie (since deferred), turnout maintenance and replacement, outflow management projects (i.e. spillage and runoff reduction and reuse), reclamation projects, SCADA system expansion, and annexation. Additionally, critical main canal and tunnel improvement projects have been implemented to reduce the risk of critical failures that could leave the District unable to deliver water to large portions of its service area. Implementation of the WRP has occurred generally according to schedule and in some cases ahead of schedule.

The estimated cost of infrastructure improvements to be implemented under the WRP is in excess of $170 million (2007 dollars). These improvements will continue to be implemented over the 25 year planning horizon and fall in the following general categories:

- Main Canals and Tunnels Improvement Projects ($45 million)
- Canal and Lateral Rehabilitation ($34 million)
- Flow Control and Measurement Structures ($4 million)
- New and Replacement Groundwater Wells ($14 million)
- Pipeline Replacement ($45 million)
- North Side Regulating Reservoir ($6 million)
- Irrigation Service Turnout Replacement ($5 million)
- Outflow Management Projects ($11 million)
- Reclamation Projects ($6 million)
- Miscellaneous In-System Improvements ($2 million)

Critical infrastructure and water conservation improvements being implemented under the WRP are being funded through annexation of new lands and through local and regional temporary water sales and transfers primarily via a pay as you go approach; as water is conserved and transferred, OID receives revenue and implements additional improvements, resulting in additional water conservation. In 2009, OID pushed forward with WRP implementation by bonding for $32 million to provide funding for critical infrastructure and large scale water conservation projects that were substantially completed by 2012. Since 2012, OID has continued to implement additional projects subject to prioritization and funding and is planning for future project implementation.

The scope of the WRP encompasses the topics addressed in this AWMP, including evaluation of individual EWMPs. As a result, the EWMPs that OID is implementing are integral to a well-planned, comprehensive distribution system modernization program. This AWMP describes past, current, and future OID actions and initiatives related to each EWMP, in the context of the WRP and other water management actions by OID.

Implementation of Efficient Water Management Practices

SBx7-7 describes sixteen EWMPs aimed at promoting efficient water management. Of these, two are "critical" or mandatory and the remaining fourteen are to be implemented if technically feasible and locally cost effective. Of the fourteen conditional EWMPs, OID is implementing all of those that are technically feasible at locally cost effective levels and continues to increase implementation of key EWMPs that most effectively support the District's water management objectives and align with the WRP. The EWMPs, along with past and future implementation activities by OID are described in Table ES-1.

Conclusion

Development of this AWMP has provided OID with an opportunity to evaluate and describe its ongoing agricultural water management practices with a focus on implementation of OID's comprehensive WRP. The AWMP includes an evaluation of how these actions support the District's local water management objectives as well as past and future water use efficiency improvements. As demonstrated in the AWMP, OID is a local leader in water management and is committed to the ongoing evaluation and implementation of water management practices that meet local objectives. In the future, OID will continue to increase efforts to effectively manage available water supplies.

Table ES-1. Summary of OID Implementation Status for EWMPs Listed Under SB7x-7

Water Code Reference No.	EWMP	Implementation Status	Implemented Activities	Planned Activities
Critical (Mandatory) Efficient Water Management Practices				
10608.48.b(1)	Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of Section 531.10 and to implement paragraph (2).	Being Implemented	1. Evaluated and categorized all turnouts with respect to measurability. 2. Developed standards for using USBR meter gates and constant head orifice (CHO) meter gates where applicable and other types of new standardized turnout measurement devices where not applicable. 3. Dedicated annual budget line item for turnout replacement and initiated replacement of turnouts requiring corrective actions. 4. Development and implementation of a Water Measurement Plan for customer deliveries (Attachment B). 5. Implementation of Storm water ordering and delivery management software	1. Continue to dedicate annual budget line item for turnout replacement 2. Continue replacement of turnouts requiring corrective actions. 3. Continue implementation of Water Measurement Plan (Attachment B).
10608.48.b(2)	Adopt a pricing structure for water customers based at least in part on quantity delivered.	Being Implemented	1. Conducted a rate study to determine rates required to cover cost of service. 2. Conducted Proposition 218 rate update. 3. Established rate structure based in part on volume of water delivered. 4. Volumetric billing for out-of-district water sales and future annexations. 5. Implementation of Storm volumetric billing software 6. Mock volumetric billing statements provided to customers throughout the 2015 water season	1. Continue implementation of rate structure based in part on volume delivered. 2. Continue volumetric billing for out-of-district water sales and annexed lands.
Additional (Conditional) efficient Water Management Practices				
10608.48.c(1)	Facilitate alternative land use for lands with exception-ally high water duties or whose irrigation contributes to significant problems, including drainage.	Not Technically Feasible	Lands with exceptionally high water duties or whose irrigation contributes to significant problems are not found within the District boundaries, nor within the District Sphere of Influence. Furthermore, OID's rules and regulations prohibit wasteful use of water, preventing exceptional water duties or significant problems from occurring.	
10608.48.c(2)	Facilitate use of available recycled water that otherwise would not be used beneficially, meets all health and safety criteria, and does not harm crops or soils	Being Implemented	1. Sconza Candy cooling water is captured in the District distribution system. 2. Tomato processing water is applied directly to lands within the District. 3. OID is evaluating the utilization of treated M&I discharge from the City of Oakdale	1. Continue existing use of recycled water within OID. 2. Consider requests from all qualifying permitted dischargers for additional use of recycled water. 3. Continue to evaluate the utilization of treated M&I discharge from the City of Oakdale.
10608.48.c(3)	Facilitate financing of capital improvements for on-farm irrigation systems	Being Implemented	1. OID provides technical assistance to growers implementing on-farm improvements through the NRCS EQIP program. 2. OID has developed a comprehensive, innovative voluntary on-farm water conservation program and is proceeding with environmental permitting and policy discussions with DWR and USBR.	1. Continue technical assistance to growers implementing on-farm improvements through the NRCS EQIP program. 2. Continue development and implementation of on-farm water conservation program.

Water Code Reference No.	EWMP	Implementation Status	Implemented Activities	Planned Activities
10608.48.c(4)	Implement an incentive pricing structure that promotes one or more of the following goals: (A) More efficient water use at farm level, (B) Conjunctive use of groundwater, (C) Appropriate increase of groundwater recharge, (D) Reduction in problem drainage, (E) Improved management of environmental resources, (F) Effective management of all water sources throughout the year by adjusting seasonal pricing structures based on current conditions.	Being Implemented	1. A water rate based in part on the volume of water delivered encourages efficient farm water use. 2. OID promotes conjunctive use of groundwater by setting water rates to promote use of available surface water.	1. Continue to encourage efficient farm water use. 2. Continue to promote use of available surface water supplies.
10608.48.c(5)	Expand line or pipe distribution systems, and construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance and reduce seepage	Being Implemented	1. Concrete lined approximately 3.3 miles of South Main Canal and tunnels in 2010 2. Concrete lined 105 miles of canals 3. Replaced 100 miles of canals with buried pipeline 4. Constructed Robert Van Lier Reservoir in 2001 5. Constructed the North Side Regulating Reservoir in 2010 6. Invested $27.3 million in main canal and tunnel improvements, canal and lateral rehabilitation, and pipeline replacement since 2006 ($3 million since 2012). 7. Implemented TCC on Cometa and Claribel laterals to better regulate system flows and increase distribution system flexibility.	1. Continue to implement WRP main canal and tunnels improvement projects. 2. Continue to implement WRP canal and lateral rehabilitation projects. 3. Continue to implement WRP pipeline replacement projects. 4. Continue with next phases of District-wide TCC implementation.
10608.48.c(6)	Increase flexibility in water ordering by, and delivery to, water customers within operational limits	Being Implemented	1. Planned and initiated transition, within facility constraints, to an arranged demand ordering and delivery schedule for irrigators who require increased delivery flexibility. Under arranged demand, growers are typically provided water within 72 hours of placing their order with OID. 2. Invested more than $8.4 million in flow control and measurement improvements including TCC and $1.5 million in turnout replacement since 2006, resulting in increased water ordering and delivery flexibility. 3. Implemented STORM water ordering and delivery management software to better track cropping and water deliveries. 4. Due to land conversion and annexation, arranged deliveries have increased from approximately 23k acres in 2012 to almost 30k acres in 2014. 5. OID has worked closely with local irrigation design companies to ensure existing OID operational constraints and capacities are identified and taken into consideration during the design of private irrigation systems to allow growers to utilize surface water from OID as much as possible.	1. Continue transition to arranged demand ordering and delivery schedule for irrigators who require increased delivery flexibility. As facility constraints are eased by facility modernization program, service constraints will also ease. 2. Continue to implement WRP flow control and measurement structures projects 3. Continue to implement WRP turnout replacement projects 4. Continue to work with local irrigation design companies during their design of private irrigation systems.

Water Code Reference No.	EWMP	Implementation Status	Implemented Activities	Planned Activities
10608.48.c(7)	Construct and operate supplier spill and tailwater recovery systems	Being Implemented	1. Two drainwater recovery systems irrigate more than 760 acres. 2. Reclamation pumping within OID to recover approximately 8,800 af annually 3. Interception and reuse of approximately 2,100 af per year of tailwater entering the OID distribution system 4. Gravity flow and lift pumping of approximately 22,100 af per year to the neighboring districts of MID, SSJID, and CSJWCD 5. Automation of the District's laterals to provide downstream control has the potential to dramatically reduce spillage through spillage prevention. Implementation of TCC on the Cometa and Claribel laterals is estimated to have reduced spillage by 5,000 to 7,000 af annually. 6. OID has implemented $1.7 million in outflow management and reclamation projects since 2006.	1. Continue to implement WRP outflow management projects. 2. Continue to implement WRP reclamation projects. 3. Continue with next phases of District-wide TCC implementation.
10608.48.c(8)	Increase planned conjunctive use of surface water and groundwater within the supplier service area	Being Implemented	1. OID water rates encourage use of available surface water supplies. 2. OID improvements in flexibility in water ordering by and delivery to customers encourages use of surface water and discourages conversion to or reliance solely on groundwater. 3. OID actively participates in local and regional groundwater management initiatives, including development of the USGS groundwater model of the Modesto Subbasin. 4. Potential groundwater recharge areas have been identified as part of the STRGBA Recharge Characterization Report. 5. OID has maintained and enhanced groundwater production capability, investing nearly $1 million since 2006. 6. OID make district pumps available for frost protection during the irrigation season when surface water is not available. 7. OID has achieved in-lieu groundwater recharge through annexation of over 10,000 acres since 2006.	1. Utilize regional groundwater model as a planning tool to develop optimized conjunctive use strategies to: (1) enhance groundwater production and uniformity of availability of GW supplies, (2) consider annexation, out of district water sales and transfers to provide in lieu recharge and decrease reliance on groundwater. 2. Continue improving flexibility in water ordering and delivery to encourage use of surface water and discourage surface users from converting to groundwater. 3. Continue to implement WRP groundwater well, reclamation, and outflow management projects.
10608.48.c(9)	Automate canal control structures	Being Implemented	1. Automated inlets and outlets to the regulating reservoirs 2. Automated Cashman Dam and Little John Creek Diversion Dam 3. Installed 31 automated flow control gates, six automated turnouts, and 28 automated check structures as part of TCC. 4. District-wide, automation includes 98 Rubicon gates and meters. 5. Twelve actuator-controlled automated gates have been installed. 6. SonTek IQ flowmeters have been installed at 12 sites since 2012. 7. OID has invested more than $8.4 million in flow control and measurement structure projects since 2006.	1. Continue to automate the remaining canal and pipeline headings. 2. Continue with next phases of District-wide TCC implementation. 3. Continue to implement other WRP flow control and measurement structure projects.

Water Code Reference No.	EWMP	Implementation Status	Implemented Activities	Planned Activities
10608.48.c(10)	Facilitate or promote customer pump testing and evaluation	Being Implemented	1. OID promotes the use of the PG&E pump testing program by private pumpers within the District. 2. A link to the PG&E Ag Pump Efficiency Program is provided on the OID web site. 3. As part of STRGBA, OID evaluated groundwater pumping efficiencies for irrigation supply and completed a well-field optimization study.	1. Continue to promote use of the PG&E pump testing program by private pumpers within the District.
10608.48.c(11)	Designate a water conservation coordinator who will develop and implement the water management plan and prepare progress report.	Being Implemented	1. Designated a Water Conservation Coordinator in October 1997.	1. Continue to employ a designated Water Conservation Coordinator.
10608.48.c(12)	Provide for the availability of water management services to water users.	Being Implemented	1. Link to CIMIS on OID web site. 2. Links to cooperative extension and other agricultural information on OID web site. 3. Newsletter provided to customers. 4. Offer no-cost on-farm irrigation consultations and review by OID staff upon request and as associated circumstances arise. 5. Developed and in process of implementing voluntary farm water conservation program.	1. Continue link to CIMIS and other resources on OID web site. 2. Continue newsletter to customers. 3. Proceed with development and implementation of on-farm water conservation program. 4. Post current and historical water use information on OID website and initiate online bill pay.
10608.48.c(13)	Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional changes to allow more flexible water deliveries and storage.	Being Implemented	1. Continued discussions with Reclamation to obtain a Warren Act Contract with the USBR to gain carryover storage in New Melones Reservoir to provide greater dry year flexibility. 2. Identified mechanisms for voluntary transfers of water that facilitate greater water supply flexibility and storage. 3. Active participation in initiatives that affect its water users.	1. Continue discussions with Reclamation to obtain a Warren Act Contract with the USBR to gain carryover storage in New Melones Reservoir to provide greater dry year flexibility. 2. Continue discussions with DWR and USBR regarding policies that impede voluntary water transfers. 3. Continue active participation in initiatives that affect its water users.
10608.48.c(14)	Evaluate and improve the efficiencies of the supplier's pumps.	Being Implemented	1. Regular testing and evaluation of 74 pumps within OID boundaries by qualified staff. 2. As part of STRGBA, evaluated groundwater pumping efficiencies for irrigation supply and completed a well-field optimization study. 3. Annual maintenance and improvements as part of WRP implementation.	1. Continue testing and evaluation program for existing pumps. 2. Continue to include new wells and pumps in the existing program to evaluate and improve pump efficiencies.

1. Introduction

The Oakdale Irrigation District (OID or District) 2015 Agricultural Water Management Plan (AWMP or Plan) describes water use and water management activities within OID. A primary function of the AWMP is to document the ongoing implementation of OID's Water Resources Plan (WRP) prepared in November 2005 (CH2MHill 2005). This AWMP has been prepared in accordance with the requirements of the Water Conservation Bill of 2009 (SBx7-7), which modifies Division 6 of the California Water Code (CWC), adding Part 2.55 (commencing with §10608) and replacing Part 2.8 (commencing with §10800) and with the Governor's Executive Order B-29-15, issued April 1, 2015. This AWMP updates OID's previous AWMP adopted by the Board of Directors in December 2012.

OID adopted its first AWMP in 2005, which was prepared according to the Memorandum of Understanding Regarding Efficient Water Management Practices by Agricultural Water Suppliers in California (MOU). The MOU was developed by the advisory committee for Assembly Bill 3616, the Agricultural Efficient Water Management Act of 1990 (AB3616).

This section provides a brief description of OID's history and evolution, discussion of the implementation of OID's comprehensive WRP, an overview of the requirements of SBx7-7, and the implications of these factors to the development of this Plan.

1.1 OID History

OID was formed in 1909 and in 1910 purchased certain Stanislaus River water rights and facilities from two existing water companies. Half interest in this acquisition was deeded to OID's sister district, the South San Joaquin Irrigation District (SSJID). Thereafter, the Districts initiated expansion of their shared storage and respective distribution systems. OID and SSJID hold pre-1914 water rights for diversion of 1,816.6 cfs from the Stanislaus River at Goodwin Dam. Construction of New Melones Reservoir (completed in 1979) resulted in potential impacts on the ability of the districts to divert water under their senior water rights (Figure 1-1). In 1988 OID and SSJID entered into an operational agreement with USBR recognizing and protecting the rights of the districts. This agreement dictates the obligations and responsibilities of the USBR in the delivery of the district's water rights through the New Melones facility. The agreement provides the districts a combined supply of 600,000 acre-feet (af) of water annually, subject to availability, representing one of the most abundant and reliable water supplies in California.

Figure 1-1. New Melones Dam and Reservoir.

Despite a secure and abundant water supply, OID's financial constraints forced it to operate primarily in the mode of controlling costs to match limited available revenues for several decades. Consequently, OID's operation and maintenance practices did not change substantially for more than 50 years. Meanwhile, regional and State water demands grew, customer needs within the District began to change, and many components of the conveyance system began to reach the end of their service lives.

Throughout the long history of irrigation in Oakdale, forage crops grown to support the substantial dairy and livestock operations in the region have dominated the irrigated cropping pattern. Although permanent crops, particularly almonds, have expanded within OID in recent years, forage crops[1] continue to account for about 61% of the irrigated land in the District s of 2014. The OID distribution system infrastructure and operating policies evolved primarily to satisfy the needs of forage crops, and are still generally adequate to meet those needs. However, improved water delivery strategies were needed to satisfy the evolving irrigation needs of orchards and other specialty crops.

The OID Board and management recognized that modernization of the District's policies, procedures and facilities was needed. As a result, and in conjunction with increased financial capability resulting from completion of payments on a large bond issue leading to increased revenue from hydropower generation and increases in revenue from water transfers, the District undertook the development of the comprehensive OID Water Resources Plan (Figure 1-2). The WRP identifies specific actions best suited to meet OID's modernization goals. Since completion of a Programmatic Environmental Impact Report (PEIR) in 2007, OID has actively implemented many of the specific improvements identified in the WRP.

Improved water delivery infrastructure and operational practices are being designed and implemented to satisfy the irrigation needs of all OID water users, including orchards and other specialty crops. In particular, water control and storage within the distribution system are being increased through extensive physical and operational improvements, reducing system losses and enabling improvement of delivery practices including low-volume deliveries on more flexible, high-frequency schedules, while continuing to allow traditional high-volume deliveries on low-frequency schedules.

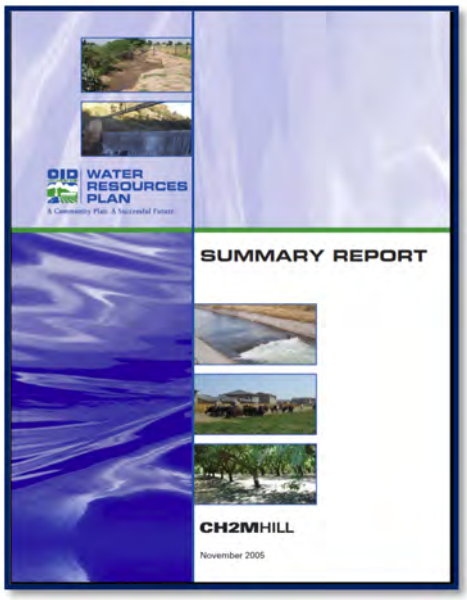

Figure 1-2. OID Water Resources Plan.

1.2 Requirements of SBx7-7 and the California Water Code

The Water Conservation Bill of 2009 (SBx7-7 or Bill) amends the California Water Code (CWC) Division 6 with regards to agricultural and urban water management by adding Part

[1] Includes pasture and double-cropped oats and corn.

2.55 (commencing with §10608) and replacing Part 2.8 (commencing with §10800). In particular, SBx7-7 requires all agricultural water suppliers to prepare and adopt an AWMP as set forth in the Bill on or before December 31, 2012. The plan must be updated by December 31, 2015 and then every five years thereafter (§10820 (a)).

Additionally, the Bill requires agricultural water suppliers to implement certain efficient water management practices (EWMPs). Specifically, under §10608.48 of the CWC, all agricultural water suppliers are required to implement the following "critical" EWMPs:

(1) Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of §531.10.
(2) Adopt a pricing structure for water customers based at least in part on quantity delivered.

Further, agricultural water suppliers are required to implement the following EWMPs, if they are locally cost effective and technically feasible:

(1) Facilitate alternative land use for lands with exceptionally high water duties or whose irrigation contributes to significant problems, including drainage.
(2) Facilitate use of available recycled water that otherwise would not be used beneficially, meets all health and safety criteria, and does not harm crops or soils.
(3) Facilitate financing of capital improvements for on-farm irrigation systems.
(4) Implement an incentive pricing structure that promotes one or more of the following goals:
    (A) More efficient water use at the farm level.
    (B) Conjunctive use of groundwater.
    (C) Appropriate increase of groundwater recharge.
    (D) Reduction in problem drainage.
    (E) Improved management of environmental resources.
    (F) Effective management of all water sources throughout the year by adjusting seasonal pricing structures based on current conditions.
(5) Expand or pipe distribution systems, and construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance, and reduce spillage.
(6) Increase flexibility in water ordering by, and delivery to, water customers within operational limits.
(7) Construct and operate supplier spill and tailwater recovery systems.
(8) Increase planned conjunctive use of surface water and groundwater within the supplier service area.
(9) Automate canal structures.
(10) Facilitate or promote customer pump testing and evaluation.
(11) Designate a water conservation coordinator who will develop and implement the water management plan and prepare progress reports.
(12) Provide for the availability of water management services to water users. These services may include, but are not limited to, all of the following:
    (A) On-farm irrigation and drainage system evaluations.

(B) Normal year and real-time irrigation scheduling and crop evapotranspiration information.

(C) Surface water, groundwater, and drainage water quantity and quality data.

(D) Agricultural water management educational programs and materials for farmers, staff, and the public.

(13) Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional changes to allow more flexible water deliveries and storage.

(14) Evaluate and improve the efficiencies of the supplier's pumps.

Agricultural water suppliers not in compliance with the Bill are not eligible for state water grants or loans.

1.3 Previous Water Management Activities

1.3.1 2005 Water Resources Plan

OID's mission is to protect and develop Oakdale Irrigation District water resources for the maximum benefit of the Oakdale Irrigation District community by providing excellent irrigation and domestic water service. In order to achieve this mission today and in the future, the District's Board of Directors initiated the development of the OID Water Resources Plan (WRP) in November of 2004. The WRP is a comprehensive study of the District's water resources, delivery system, and operations. The overall objective of the WRP was to identify how the District could best protect its water rights while developing affordable methods of financing the necessary system improvements to continue to meet the needs of all its stakeholders and serve the region. The WRP includes an evaluation of financial objectives and needs, annexation of adjacent lands, water transfers, and other considerations. The Draft Plan was completed in November 2005 and finalized following the completion of a draft Programmatic Environmental Impact Report (PEIR) in January 2007. The specific goals of the WRP are depicted in Figure 1-3.

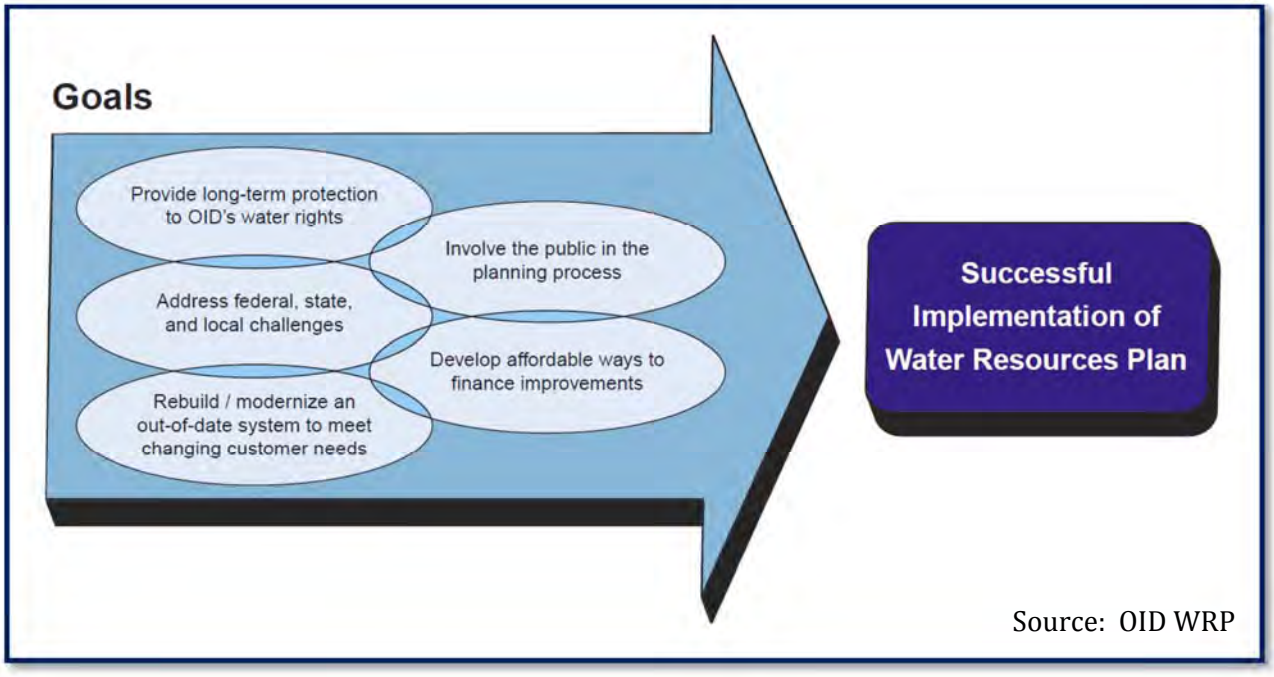

Figure 1-3. Goals of the OID Water Resources Plan.

Development of the WRP included comprehensive analysis of OID's Stanislaus River water rights, current and future groundwater levels, irrigation practices, and the OID delivery system. The analysis also included review of historical land use trends and development of forecasted future land use trends and related impacts on water supplies, demands, and operational requirements to meet water user needs. The WRP provides specific, prioritized recommendations for OID physical and operational improvements as well as a plan to phase the implementation of improvements consistent with available financial resources. The WRP implementation schedule is shown in Figure 1-4.

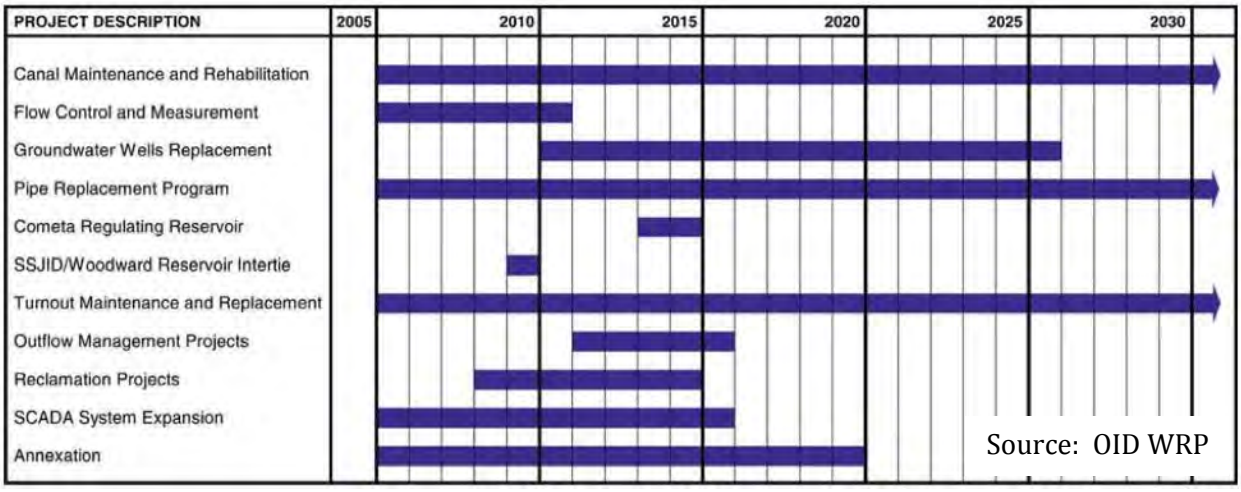

Figure 1-4. OID WRP Implementation Schedule.

As indicated by the schedule, improvements under the WRP include canal maintenance and rehabilitation, flow control and measurement, groundwater well replacement, pipe replacement, regulating reservoir construction, a Woodward Reservoir intertie (since deferred), turnout maintenance and replacement, outflow management projects (i.e. spillage and runoff reduction and reuse), reclamation projects, SCADA system expansion, and annexation. Additionally, critical main canal and tunnel improvement projects have been and are currently being implemented to reduce the risk of critical failures that could leave the District unable to deliver water to large portions of its service area. Implementation of the WRP has occurred generally according to schedule and in some cases ahead of schedule. Since 2012, implementation has slowed somewhat due to difficulty in obtaining approval from State and Federal agencies for water transfers and as a result of drought.

The estimated cost of infrastructure improvements to be implemented under the WRP is in excess of $170 million (2007 dollars). These improvements will continue to be implemented over the 25 year planning horizon and fall in the following general categories:

- Main Canals and Tunnels Improvement Projects ($45 million)
- Canal and Lateral Rehabilitation ($34 million)
- Flow Control and Measurement Structures ($4 million)
- New and Replacement Groundwater Wells ($14 million)
- Pipeline Replacement ($45 million)
- North Side Regulating Reservoir ($6 million)
- Irrigation Service Turnout Replacement ($5 million)
- Outflow Management Projects ($11 million)
- Reclamation Projects ($6 million)
- Miscellaneous In-System Improvements ($2 million)

Critical infrastructure and water conservation improvements being implemented under the WRP are being funded through annexation of new lands and through local and regional temporary water sales and transfers primarily via a pay as you go approach; as water is conserved and transferred, OID receives revenue and implements additional improvements, resulting in additional water conservation. In 2009, OID pushed forward with WRP implementation by bonding for $32 million to provide funding for critical infrastructure and large scale water conservation projects that were substantially completed by 2012. Since 2012, OID has continued to implement additional projects subject to prioritization and funding and is planning for future project implementation.

The scope of the WRP encompasses the topics addressed in this AWMP, including evaluation of individual EWMPs. As a result, the EWMPs that OID is implementing are integral to a well-planned, comprehensive distribution system modernization program. This AWMP describes past, current, and future OID actions and initiatives related to each EWMP, which are largely guided by the WRP.

1.3.2 Other Water Management Activities

The District is involved in a variety of other water management activities at local, regional, and state levels. These activities include the following:

- **2005 Agricultural Water Management Plan.** OID previously prepared an AWMP that was adopted by the District's Board of Directors in September 2005. The 2005 AWMP was prepared according to the MOU developed by the advisory committee for AB3616, which established the AWMC.
- **2012 Agricultural Water Management Plan.** OID prepared and adopted a substantial update of its 2005 AWMP in 2012. The updated AWMP was developed to meet the requirements of SBx7-7 and to integrate the WRP.
- **Stanislaus and Tuolumne Rivers Groundwater Basin Association (www.strgba.org).** OID was one of the six agencies that founded the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA), coalition of local agencies and cities, in 1994. The coalition initially developed an SB1938-compliant Integrated Regional Groundwater Management Plan (IRGMP) for the Modesto Groundwater Subbasin[2] in 2005 (Bookman-Edmonston 2005). The purposes of the association are to evaluate groundwater supply; promote coordinated groundwater management planning; develop a hydrologic groundwater model of the subbasin; determine the need for additional or improved extraction, storage, delivery, conservation, and recharge facilities; and to provide information to guide the management, preservation, protection, and enhancement of groundwater quality and quantity in the subbasin. The goal of the IRGMP is to conjunctively manage water supplies to ensure a reliable, long-term water supply to meet beneficial uses by agricultural, industrial, and municipal users while protecting the environment. The District adopted the plan by resolution on August 2nd, 2005. OID continues to actively participate in groundwater management for the Modesto Subbasin as part of implementation the Sustainable Groundwater Management Act of 2014 (SGMA). The STRGBA supported the development of a long-term USGS hydrologic model of the Modesto area that was completed in 2015 (USGS 2015).
- **East San Joaquin Water Quality Coalition (www.esjcoalition.org).** The District is a member of the East San Joaquin Water Quality Coalition under the Irrigated Lands Regulatory Program of the State Water Resources Control Board, which represents the portion of OID south of the Stanislaus River. The coalition was formed in 2003 to represent dischargers who own or operate irrigated lands east of the San Joaquin River within Madera, Merced, Stanislaus, Tuolumne and Mariposa Counties and portions of Calaveras County. The coalition files required reports with the Central Valley Regional Water Quality Control Board, conducts a water quality monitoring program for area rivers and agricultural drains, and works with land owners to solve water quality problems, if they are found. Prior to joining the coalition in 2011, OID filed as an individual discharger and collected its own water quality information from 2004 to 2010.

[2] Expanded to include all of OID's service area.

- **San Joaquin County and Delta Water Quality Coalition (www.sjdeltawatershed.org).** The District is a member of the Delta Water Quality Coalition under the Irrigated Lands Regulatory Program of the State Water Resources Control Board, which represents the portion of OID north of the Stanislaus River. The coalition was formed in 2003 to represent dischargers who own or operate irrigated lands in portions of San Joaquin County, Calaveras County, and Contra Costa County. The coalition files required reports with the Central Valley Regional Water Quality Control Board, conducts a water quality monitoring program for area rivers and agricultural drains, and works with land owners to solve water quality problems, if they are found. Prior to joining the coalition in 2011, OID filed as an individual discharger and collected its own water quality information from 2004 to 2010.
- **Tri-Dam Project and Power Authority (www.tridamproject.com).** The Tri-Dam Project and the Tri-Dam Power Authority are partnerships between OID and SSJID that developed and now operate and maintain two reservoirs above New Melones Lake, one reservoir below the Lake on the Stanislaus River, and the Sand Bar power generation facility. The reservoirs are operated for irrigation water supply and power generation, as well as for recreation and associated water activities.
- **Save the Stan (www.savethestan.com).** Save the Stan is a public education program of SSJID and OID. The purpose of the program is to inform the public about the NOAA Biological Opinion (BO) for the protection of Central Valley steelhead from the operations of New Melones Reservoir and the associated ramifications on the local ecosystem, economy and water supply. In particular, the district is concerned that the BO reasonable and prudent alternatives would result in an empty New Melones Reservoir in approximately one of six years.
- **San Joaquin Tributaries Authority (calsmartwater.org).** The San Joaquin Tributaries Authority (SJTA) is a coalition of water agencies whose members include the Modesto Irrigation District, Turlock Irrigation District, Oakdale Irrigation District, Merced Irrigation District, South San Joaquin Irrigation District, and the City and County of San Francisco. The SJTA mission is to promote sound, environmentally responsible solutions to water supply management within a framework that recognizes the historic rights of its member agencies and the concerns of its ratepayers.

2. Plan Preparation

2.1 AWMP as Water Resources Plan "Report Card"

As described previously, this AWMP has been prepared in accordance with SBx7-7 and the CWC. More fundamentally, this plan provides an update describing the status of WRP implementation and lays out ongoing and future water management actions by the District.

2.2 Public Participation

Public participation in the development of this Plan included:

- A presentation to the OID Board of Director's describing the AWMP update on January 5, 2016;
- Notification of OID's intent to update its AWMP was made via letters to required agencies and a notice in the Modesto Bee on February 3 and February 10, 2016;
- Posting of the draft Plan on the District's web page on February 3, 2016;
- Review of the publicly noticed presentation of the draft Plan at a special hearing on March 1, 2016; and
- Approval of the final Agricultural Water Management Plan at a regularly scheduled Board of Directors meeting on March 1, 2016.

The public is invited to attend all Board meetings with time reserved on each agenda for public comment. The Board members are accessible to the public by phone and at Board meetings. The District has a web site where the agendas of all Board meetings are published along with the most recent Board minutes, newsletters and other important information. Comments can also be received via e-mail using a link on the OID website (www.oakdaleirrigation.com). Documentation of public participation is provided in Attachment H.

The District distributes a newsletter periodically to keep landowners informed of current events, water supply status, new policy requirements and to publicize important local, state and federal issues impacting its constituents. The District maintains an open exchange of information with local newspapers and, if necessary, issues press releases on matters of importance to the public.

The District also relies to a certain extent on employees in the field to keep customers informed of the latest water management information.

2.3 Regional Coordination

The District coordinates operation of the Tri-Dam Project cooperatively with SSJID and coordinates with neighboring districts and other entities as appropriate; however, OID does not plan to develop a regional AWMP at this time due to differences in the institutional, physical, and operational characteristics of each District. As an active participant in the implementation of SGMA, OID also coordinates with other water management entities in the groundwater subasins it overlies.

3. Background and Description of Service Area

3.1 History and Organization

OID was organized in 1909 under the California Irrigation District Act, which provided for the organization of irrigation districts and for the acquisition or construction thereby of works for irrigation of lands embraced within such district and also to provide for distribution of water for irrigation purposes, approved March 31, 1897, (Statutes 1897, p. 254 et seq.).

On September 13, 1909, a petition was presented to the Stanislaus County Board of Supervisors by the Board of Directors of the Oakdale Irrigation District signed by a majority of the holders of title of lands within the proposed District. The petition requested permission to organize an irrigation district under the California Irrigation District Act. The Board of Supervisors ordered that an election be held on October 23, 1909. Formation of the District was approved by more than two thirds of the voters within the proposed District boundaries.

After the task of legal formation was complete, the Board of Directors adopted a plan for constructing the necessary canals and works and acquiring the necessary property and rights to carry out the provisions of the act under which it was created. The Board determined that $1,600,000 would be required to carry out this plan. Since the District was newly formed, bonds were necessary to raise the capital, and on February 26, 1910, another election was held to seek constituent approval for issuance of bonds. In the interim, another election was held to raise $30,000 to make repairs and to pay salaries of employees.

A more detailed description of the history of the development of the District's surface water supply is provided in Section 4: Inventory of Water Supplies.

The District is organized into five political divisions with each division being represented by a director who is elected for a four-year term by the landowners residing within the division. Elections are held every two years so that only two or three of the directors' seats are subject to election at any one time. The Board of Directors elects a Board President to run the meetings and a Vice-President to serve if the Board President is unavailable. The Board President serves for a two-year term. Directors of OID also serve as board members on the Tri-Dam Authority Board and the Tri-Dam Project Board of Directors together with Directors from the SSJID.

The General Manager is principal administrative officer of the District and serves as Secretary to the Board of Directors. The Chief Financial Officer, Support Services Manager, and the Water Operations Manager report to the General Manager. Currently, there are 71 full-time District employees with two employees in Administration, a Safety Coordinator, six employees in Accounting, 28 employees in Support Services, and 33 employees in Water Operations. An organizational chart of the District is provided in Figure 3-1.

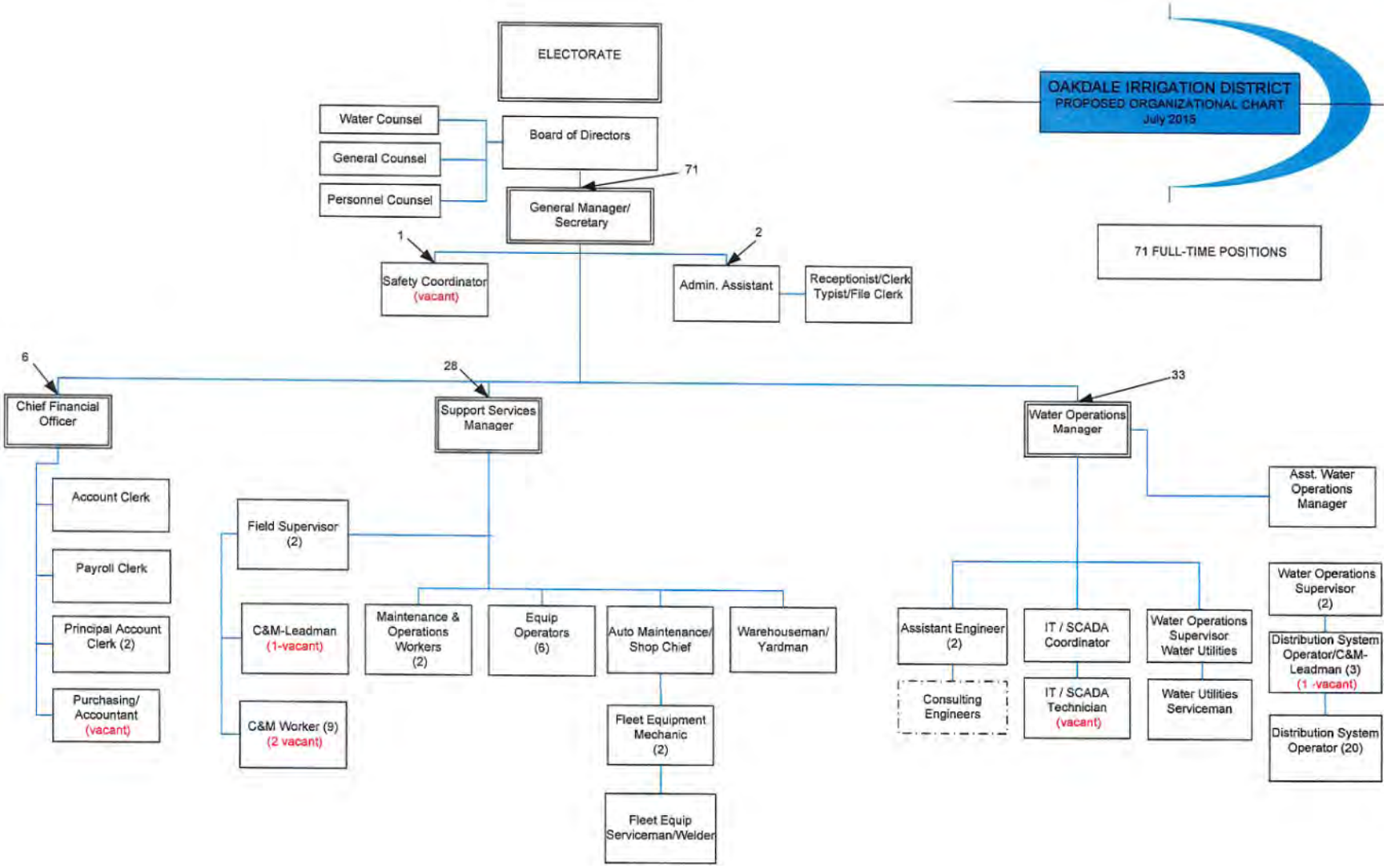

Figure 3-1. OID Organizational Chart.

3.2 Size and Location of Service Area

The District is located in the northeastern portion of the San Joaquin Valley, approximately thirty miles southeast of Stockton and twelve miles northeast of Modesto (Figure 3-2). The District encompasses lands located both north and south of the Stanislaus River, with about 20% of these lands located within southeastern San Joaquin County and 80% in eastern Stanislaus County. OID is bounded by the Modesto Irrigation District (MID) to the south and west, by the SSJID to the west, and by the Central San Joaquin Water Conservation District (CSJWCD) to the north.

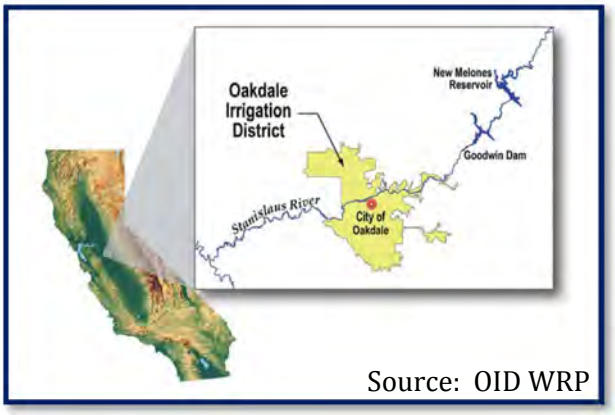

Figure 3-2. Location of OID.

Upon formation, the District included the towns of Oakdale, Riverbank and Valley Home (then called Thalheim). Riverbank detached from the District in 1981, although some small "islands" of the town remain in the District.

The District's current service area encompasses approximately 81,000 acres[3], of which 64, 724 acres were assessed an irrigation charge in 2014.

3.3 OID Distribution System

OID diverts water from the Stanislaus River at Goodwin Dam into the Joint Main Canal on the north side of the River and the South Main Canal on the south side. The Joint Main Diversion (OID North Main Canal and SSJID Main Canal headings) is operated by the Tri-Dam Project. OID schedules orders for the Frymire Lateral with the Tri-Dam Project but controls the headgate remotely.

Figure 3-3. North Main Canal.

Approximately 3.5 miles downstream of Goodwin Dam, the Joint Main Canal bifurcates into OID's North Main Canal (Figure 3-3) and SSJID's Main Canal. The North Main Canal and Frymire Lateral serve approximately 27,575 acres, or 40% of OID's service area.

The South Main Canal serves the remaining 40,690 acres, or 60%, of OID's irrigated area. The South Main breaks out of the Stanislaus River canyon roughly a mile upstream of the Community of Knight's Ferry, runs due south for about two miles, and approximately ten miles

[3] Includes the irrigation service area and service area within the City of Oakdale and urban areas just east of the city limits.

southwesterly, terminating near the heads of four major OID lateral headings: the South, Brichetto, Claribel and Riverbank Laterals. The Joint Main, North Main and South Main Canals have a combined length of 35 miles. The District constructed the 250 acre-foot Robert Van Lier Regulating Reservoir in 2001 near the terminus of the South Main Canal, which enhances the delivery flexibility to growers while also allowing for reduction of operational spillage. In early 2010, the District completed construction of the 300 acre-foot North Side Regulating Reservoir, which provides similar benefits to the north side of the District (Figure 3-4).

Water is delivered to landowners through approximately 2,000 delivery gates served by approximately 330 miles of laterals off of the main canals. Originally, the entire lateral system consisted of open, unlined ditches. Over time, selected laterals and lateral reaches have either been concrete lined or placed in low-head, cast-in-place (CIP) concrete or PVC pipelines. In the 1980s, the District received a $22 million low-interest loan under the Bureau of Reclamation PL-984 Loan Program, which was used to construct 50 miles of CIP pipelines and related standpipes and water control structures. At the present time, approximately 100 miles of the District's laterals are pipelines, 105 miles are open, concrete-lined ditches, and the remainder are unlined open ditches. However, the 105 miles of concrete lined ditches typically are not continuous, meaning that concrete lining occurs in short reaches along mostly unlined ditches. The condition of the lining is generally best in the main canals as compared to the laterals.

Figure 3-4. North Side Regulating Reservoir.

The main and lateral distribution system remains upstream level controlled as originally constructed, with a few exceptions:

- Completion in 2001 of the Robert Van Lier Regulating Reservoir near the terminus of the South Main Canal and completion in 2010 of the North Side Regulating Reservoir near the terminus of the North Main Canal enables flow changes to be made more readily than before. The reservoirs are operated to increase delivery flexibility to water users while also reducing operational spillage by better matching diversion and delivery volumes. Additionally, the reservoirs provide for steadier flow to downstream laterals, improving the steadiness of farm deliveries and enabling on-farm water management improvements. Reservoir storage fluctuates daily with the objective of operating within the middle one third of the capacity.
- The Cometa and Claribel laterals were automated in 2011 as part of a pilot automation project and are currently being operated in downstream flow control. Similar automation is anticipated to be extended to other laterals in the future now that the two-year pilot project has been successfully completed.

The District maintains 90 miles of drains, along which are located 42 District drainwater (reclamation) pumping plants. These pumping plants recover drainwater and, in most cases, return it to the OID distribution system for supply to water users. In some cases the pumps are used to lift water into the adjacent Modesto Irrigation District (MID) distribution system. Finally, the District owns and operates 25 groundwater production wells, which are used primarily for operational convenience and to provide supplemental water supply.

A map of the District's water management facilities is provided in Figure 3-5 on the following page.

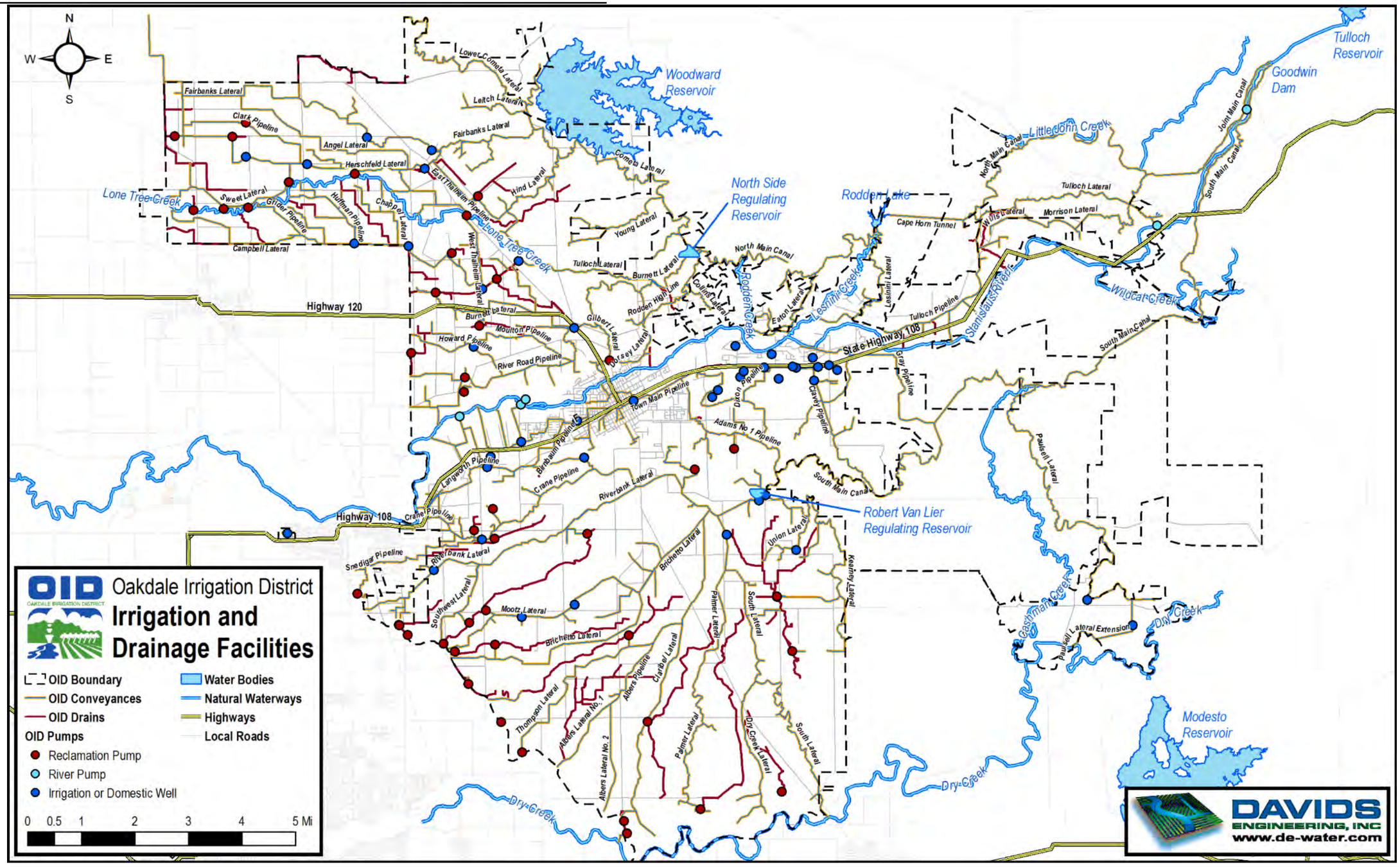

Figure 3-5. Oakdale Irrigation District Irrigation and Drainage Facilities.

The District is currently divided into 10 Distribution System Operator (DSO) divisions, including 5 north of the Stanislaus River and 5 south of the River. The divisions operate under the supervision of the Water Operations Manager. Within divisions, actual field operations are executed by the DSOs. OID has a total of 23 DSOs, including 10 to cover the regular day shift, 5 for relief day shift, 4 to cover the regular night shift and 2 for the relief night shift with 2 night rovers (DSO not assigned to a specific division who is available to assist wherever needed). DSOs work 6 days on, 3 days off, 12 hours per shift. Tables 3-1a and 3-1b below show the number of irrigated acres and number of parcels by division, based on data from the 2015 irrigation season.

Table 3-1a. Number of Acres and Parcels by Division (South Side).

Statistic	Division 1	Division 2	Division 3	Division 4	Division 5
Total Area (acres)	11,907	6,394	13,741	4,694	4,004
No. of Parcels	249	270	251	413	288*
Avg. Parcel Size (acres)	48	24	55	11	14

* Number of parcels does not include parcels within the city limits of Oakdale

Table 3-1b. Number of Acres and Parcels by Division (North Side).

Statistic	Division 6	Division 7	Division 8	Division 9	Division 10
Total Area (acres)	5,237	5,216	4,634	3,661	8,861
No. of Parcels	290	414	357	239	188
Avg. Parcel Size (acres)	18	13	13	15	47

Division size ranges between 3,661 acres and 13,741 acres and average 6,835 acres. The number of parcels ranges between 188 and 414 and average 296 per division. The average parcel size ranges between 11 and 55 acres, and averages about 23 acres. The divisions have been delineated to achieve uniform division of workloads among DSOs. To the extent possible, divisions are organized so that DSOs have control of their water from the main canal heading to the tail of their respective laterals. There are cases, however, where water is passed through one division to the next, rather than being delivered directly from the North or South Main Canals. In these cases, the upstream DSO is required to provide a steady flow rate to the downstream DSO according to the daily operations plan.

OID has historically delivered water on a rotational basis. The season generally begins (typically in late March or early April) with a 14 to 16 day rotation frequency. The rotation duration is typically incrementally decreased to 10 days as crop water use rates increase with ET during the peak of the summer, and then increased incrementally back to 14 or 16 days as crop water use rates taper off in the late summer and fall.

Beginning in 1998, the District initiated an arranged demand scheduling system to better meet the needs of specialty crops (crops other than pasture) and associated high-frequency irrigation

systems, such as drip and micro-spray. The goal is to deliver water to specialty crop customers as soon as possible within 72 hours (three days) of ordering. Delivery shutoff times are scheduled at the same time that the water order is placed; early shutoffs may be made arranged with 1 hour advance notification to the DSO. The District is able to provide this additional flexibility to growers subject to the capacity and operational constraints of the distribution system. As the number of specialty crop growers has increased, it has become increasingly difficult to provide the desired flexibility without system modernization. In response, OID has and continues to modernize its distribution system and update operational procedures to provide arranged demand scheduling to its specialty crop growers.

Historically, DSOs have used "rotation sheets" to organize and track water deliveries. One rotation sheet is prepared for each division, with the customers organized under each lateral on the sheet in the order in which they receive water. Important information about each customer is also provided on the sheet, including the customer's name, address, phone number, irrigators name and phone number, crop type, assessor's parcel number, irrigated acreage, typical number of hours to receive irrigation water, and typical delivery rate. As part of the modernization process and recent transition to volumetric billing, OID implemented the STORM water ordering and delivery management software in 2015..

Each DSO is responsible for determining how much water his or her division will need on a daily basis and requesting that amount from the main canal tender. (Note: The Division 1 and Division 6 DSOs act as main canal tender for the North and South Main Canals respectively, in addition to operating their divisions.) The DSOs may cooperatively transfer water between divisions to manage their rotations, if water is available. For example, if one division is cutting 10 cfs and the adjoining division is adding 10 cfs, the water can be transferred between the two, thereby avoiding routing two flow changes along the main canal. Each day, the main canal tender totals the division requests, calculates the change from the current flow rate and submits a flow change request (increase or decrease) to the Water Operations Supervisors. The Water Operations Supervisor then requests the operator at the Tri-Dam Authority to make the scheduled change.

Flow changes are also sometimes needed within the operating day. When accommodations cannot be made by Tri-Dam to adjust the flow as requested, the Robert Van Lier Regulating Reservoir on the south side or the North Side Regulating Reservoir on the north side are used as a buffer to meet the excess downstream demands or store the extra water.

Each DSO has a mobile phone that is used to notify customers of when they will receive irrigation water and to whom to pass the water when their turn is complete. The mobile phones are transferred between the day shift and night shift DSOs so that customers have only one number to call per division, any time of the day or night. Customers typically call to request schedule changes, or to report unusual conditions, such as delivery interruption. SCADA alarms are also transmitted to DSOs via text messaging or automated recording.

In addition, an emergency phone is carried by the Water Operations Manager, a Water Operations Supervisor, or a DSO leadman. At night the emergency phone is rotated amongst the DSOs or

carried by the roving DSO. During the non-irrigation season, the on-call supervisor carries the emergency phone.

3.4 Terrain and Soils

OID is located along the flanks of the San Joaquin Valley, between the foothills to the east and the nearly flat lands in the valley floor. The topography within the District varies from gently rolling to nearly level. Land surface elevation varies from nearly 300 feet on the east side near the Community of Knights Ferry to about 100 feet near Riverbank. The northern portions of the District west of Valley Home Road are nearly flat. East of Oakdale, the terrain is steeper while the topography on the south side of the District is moderately undulating, sloping in a southwesterly direction toward to the valley floor, with natural drains dissecting the terrain from northeast to southwest.

Soils within the District can generally be placed into two broad groups: those on the alluvial fans of the Stanislaus River and the soils out of the floodplain on fans and terraces. The alluvial soils tend to be deep and well to moderately well drained, making them suitable for all crops and particularly well suited for deep rooted tree crops such as walnuts and almonds. These soils are confined to the river corridor and therefore are limited in extent.

By comparison, the terrace soils occupy a much larger area, and are generally shallower and less well drained. In addition, major portions of the terrace soils are affected by hardpan conditions, which can severely restrict root development and penetration. The terrace soils are best suited for pasture and forage crops, although they can be modified by deep ripping to be made suitable for tree crops, particularly almonds. More and more of the terrace soils are being planted to tree crops over time.

3.5 Climate

The climate statistics presented in this section are based on the Oakdale CIMIS station (#194), established in 2004. In the District's 2005 AWMP, climate statistics were based on the Modesto CIMIS station (#71). Average weather parameters are similar between the two stations, but the Oakdale CIMIS station is considered more appropriate due to its closer proximity to the District, despite having less years of data available than the Modesto station.

OID has a climate typical of the San Joaquin Valley, with mild winters with moderate precipitation and warm, dry summers. Mean daily maximum temperatures range from about 56°F in December and January to nearly 92°F in July (Table 3-2). Mean daily minimum temperatures range from 35°F in January to about 59°F in July. Average annual reference evapotranspiration (ETo) is approximately 55 inches, ranging from a low of 1 inch in December and January to a high of over 8 inches in July. Approximately three quarters of the annual ETo occurs in the six-month period from April through September.

Average annual precipitation is 14.0 inches, with 11.5 inches, or slightly more than 80 percent, occurring in the five month period from November through March.

Even during the peak summer period, the average maximum relative humidity reaches 78%, which is indicative of an irrigated area, and exceeds 90% between November and April. Minimum relative humidity ranges between approximately 30% during the summer and roughly 65% during the wet winter months.

Average wind speed is lowest in November (4.0 miles per hour) and highest in the summer (6.4 mph in June and July).

There are no significant microclimates within the District that affect water management or operations.

Table 3-2. Mean Daily Weather Parameters by Month at Oakdale CIMIS Station (December 2004 through November 2015).

Month	Total ETo (in)	Total Precip. (in)	Average Daily Temperature (F)			Average Relative Humidity (%)			Average Wind Speed (mi/hr)
			Average	Min.	Max.	Average	Min.	Max.	
January	1.2	4.2	44.8	35.2	56.1	82.4	62.6	94.9	4.5
February	2.0	2.0	49.5	38.5	62.0	77.2	54.5	94.2	4.8
March	3.6	1.7	53.6	41.2	67.1	72.0	47.8	92.9	5.3
April	5.0	1.2	57.3	43.7	71.7	65.5	41.9	90.5	5.3
May	6.8	0.5	64.2	49.2	79.6	56.7	34.1	85.1	5.8
June	8.0	0.2	70.7	54.5	86.4	52.1	31.5	80.7	6.4
July	8.5	0.0	75.1	59.3	91.7	51.3	31.5	77.8	6.4
August	7.5	0.0	73.1	57.7	89.7	53.4	32.2	80.1	5.9
September	5.6	0.1	69.6	55.0	86.1	55.5	33.3	81.8	5.1
October	3.6	0.6	61.8	48.4	77.7	61.8	38.0	86.3	4.6
November	1.8	1.1	51.8	40.2	65.6	75.5	51.3	93.0	4.0
December	1.1	2.5	45.5	36.6	56.0	80.9	61.3	93.6	4.9
Annual	54.5	14.0	59.7	46.6	74.1	65.3	43.3	87.6	5.2

3.6 Operating Rules and Regulations

The District "Rules and Regulations Governing the Operation and Distribution of Irrigation Water within the Oakdale Irrigation District Service Area" (Rules and Regulations) are occasionally reviewed and revised as needed to address changing conditions, most recently in 2005. The rules and regulations prescribe conditions that ensure distribution of irrigation water to users in an orderly, efficient and equitable manner; they are available to water users and the public in pamphlet form or in electronic form from the OID website, and are attached to this report for convenient reference (Attachment A).

3.7 Water Delivery Measurement and Calculation

OID has initiated substantial changes to improve flow measurement as part of implementation of the WRP in order to improve delivery service to irrigation customers while also increasing institutional knowledge of system operations to support ongoing operations and maintenance as well as future planning. Additionally, OID has prepared a plan to comply with the Agricultural Water Measurement regulation included as §597 of Title 23 of the California Code of Regulations. The plan is included as part of this AWMP. See Section 7 and Attachment B (Water Measurement Plan) for more information.

Historically, the general approach to improving water measurement within OID was to focus efforts on the improved measurement of inflows and outflows at the District boundaries (where needed) and to progress inward with upstream to downstream priority, as financial resources became available. This approach enabled development of a District-wide water balance and increasingly allowed for the evaluation of water management within subdivisions of the District. As part of modernization of the distribution system underway through the implementation of the WRP, OID's focus has progressed to rehabilitation of all diversions from the main canals. Downstream flow measurement and control, coupled with upstream level control and flow measurement are instrumental to the OID modernization process.

Water diverted from the Stanislaus River into the Joint and South Main Canals is measured by gaging stations operated and maintained by the Tri-Dam Authority to U.S. Geological Survey standards. OID has engaged outside services to conduct monthly checks and to refine the ratings of these boundary inflow gages.

Figure 3-6. Cashman Dam.

Releases from main canals into laterals are measured by various means, including rated pipeline gates, open channel flow measurement devices, and rated canal sections. Water stage is measured by various means including pressure transducers, ultrasonic water level sensors, weir sticks, measuring tapes, Clausen rules, and stilling wells with staff gauges. Prior to the start of each irrigation season, DSOs are provided refresher training in water measurement devices and techniques. During the season, the DSOs measure and report the amount of water entering their divisions on a daily basis, or more frequently as needed.

The majority of farm deliveries are measured by rated gates (Constant Head Orifice or Meter-gate) or, in some cases, by determining the difference in flow between measurements points in the lateral upstream and downstream of the farm turnout. Records of water deliveries to farms are recorded in the District's STORM water ordering and delivery volume recording software. OID's delivery measurement plan is described in detail in Attachment B.

System spillage and on-farm tailwater are collected by a system of private and District drains and are captured by OID for reuse or flow out of OID at numerous locations. Drainwater outflows contribute to water supplies for MID, SSJID, CSJWCD and private parties (see Section 5.6 for additional information regarding outflows and their recipients). OID undertook and completed a systematic evaluation and ranking of the boundary flow measurement sites in 2003 for the purpose of identifying the improvements needed at each site and prioritizing the sites to maximize cost effectiveness. Pursuant to the ranking of outflow sites, OID has established reliable flow measurement at 10 operational spillage sites and 9 drain outflow sites since that time. The monitored operational and drain outflow sites represent approximately 60% of the total boundary outflows from OID. The District plans to continue to increase the number of measured operational spills and boundary outflow sites over time.

As part of the preparation of the 2012 AWMP, a detailed analysis was conducted by OID operations staff to delineate drainage watersheds within the District. Drainage from a given area leaves the District at a single location in most cases. Additionally, some areas do not have any surface outflow. The area of each drainage watershed was used in conjunction with boundary outflow data to estimate the total boundary outflows from OID. Additionally, the analysis enables OID to better evaluate potential projects to reduce or recover boundary outflows for use within OID, effectively increasing the District's available surface water supply.

3.8 Water Rate Schedules and Billing

Historically, OID billed for irrigation water deliveries to OID customers on a flat rate, per-acre basis. Rates were established annually by the Board of Directors. The per-acre rate varied depending on the size of the parcel. In October 2014, OID adopted a new rate structure based in part on the volume of water delivered. Under the new water rate, a fixed (per-acre) rate component of $27.00 is applied (with a minimum of $54 per parcel). Then, an additional volumetric rate component is applied based on actual usage as follows:

- $3.15 per af for usage from 0 to 3 af/ac
- $6.25 per af for usage from 3 to 5 af/ac
- $8.30 per af for usage from 5 to 7 af/ac
- $10.40 per af for usage from 7 to 8 af/ac
- $20.75 per af for usage greater than 8 af/ac

Additionally, OID's water rate allows for a drought surcharge of $6.10 per acre to be applied in years declared to be a drought, subject to the discretion of the BOD. Finally, an annual increase of 3% can be applied to each component to the rate to account for inflation, again subject to the discretion of the BOD.

Out-of-District Surface Irrigation Agreements are annual contracts for the delivery of OID surface water which must be approved by the BOD each year before the start of the irrigation season. Each year, OID makes a determination on the availability of any "surplus" surface irrigation water for Out-of-District Surface Irrigation Agreements. There is no guarantee that Out-of-District water will

be available every year, and the water is provided at a premium rate as set annually by the BOD. The Out-of-District water rate is assessed volumetrically (per acre-foot) and provided only if a District acceptable measuring device has been installed. Several conditions must also be met prior to the receipt of Out-of-District water, including but not limited to a required minimum on-farm irrigation efficiency of seventy (70) percent and assurance that no tail water will leave the property. For additional information describing the conditions for receipt of Out-of-District service, refer to the Out-of-District Surface Irrigation Agreement included in Attachment C.

Additionally, the pricing structure for Tier II lands annexed into OID and future annexations into OID will be based at least in part on quantity delivered and assessed through volumetric measurement at the delivery point.

3.9 Water Shortage Allocation Policies and Drought Management Plan

OID recognizes that there will be times when the surface water supplies available to the District are insufficient to meet the water demands of the crops grown. As a result, OID's drought management actions and Surface Water Shortage Policy have been developed to address years of water shortage and vary based on the severity of the shortage. The District recognizes the need for fair, consistent policies to address periods when customer demands exceed available OID supplies. The District previously updated its Surface Water Shortage Policy in 2008 and, with ongoing implementation of the WRP and the experience of the ongoing drought from 2012 through 2015, is in the process of reviewing and revising the policy.

On April 1, 2015 Governor Brown issued Executive Order B-29-15, mandating agricultural water suppliers to include a detailed Drought Management Plan (DMP) describing actions and measures taken to manage water demand during drought. In response, OID has prepared a DMP and included it as Attachment D of this AWMP. The DMP builds upon OID's Surface Water Shortage Policy (Attachment E), describing a broad range of actions undertaken during drought to manage available water supplies and meet customer demands to the maximum extent possible. The DMP includes components recommended by DWR in its 2015 AWMP Guidebook (DWR 2015). OID's DMP describes the determination of available water supply, drought responses, and water shortage impacts. The description of water shortage impacts includes a summary of 2012 to 2015 supply and demand conditions available at the time of preparation of the DMP.

Please refer to Attachments D and E for additional information describing OID's DMP and Surface Water Shortage Policy.

3.10 Policies Addressing Wasteful Use of Water

OID actively prohibits the wasteful use of water, as described throughout its Rules and Regulations. Enforcement actions include withholding water for willful wasteful use. The District's policies regarding unauthorized uses of water and enforcement are described in detail in the Rules and Regulations (Attachment A).

Refer to the following rules related to prohibitions on wasteful use of water: 3030 - 3031, 3038, 3046, 4001 - 4003, 4009, 5004, 5017 - 5018, 6009 - 6010, 6013.

Refer to the following rules describing enforcement actions by the District for the wasteful use of water: 2004 - 2009, 3052, 3085, 4011, 5013, 5038 – 5039.

The cited rules above may not be exhaustive. The complete OID Rules and Regulations are available in Attachment A.

4. Inventory of Water Supplies

4.1 Introduction

The District has highly reliable surface water rights that serve as the primary supply source. In addition, both the District and private landowners have constructed groundwater production wells that serve primarily to supplement surface water supplies and to provide water for frost protection or other agronomic uses outside of the irrigation season. Surface water and groundwater supplies are discussed in the following sections.

4.2 Surface Water Supply

The Stanislaus River is the primary source of water supply for the District. The District's use of water is based on pre-1914 adjudicated and post-1914 appropriative rights that are shared with SSJID. After the construction of New Melones Reservoir by the U. S. Bureau of Reclamation (USBR), the District entered into an agreement with the USBR on how water was to be allocated between the Districts and the USBR. Under the 1988 Agreement, the District's receive a maximum of 600,000 acre-feet per year, as described previously in Section 1.1.

In 1858, Mr. Charles Tulloch (Figure 4-1), visionary and entrepreneur, built a small diversion dam immediately downstream of the current Tulloch Dam to distribute water to the Knights Ferry area. The system was extended down to the valley to serve 6,000 acres reaching as far downstream as Manteca (an area now served by SSJID) and a small area around Oakdale.

Figure 4-1. Charles Tulloch.

The District entered into an agreement with the SSJID to purchase the "Tulloch Rights" for diversion of up to 1,816 cfs from the San Joaquin Canal and Irrigation Company and the Consolidated Stanislaus Water and Power Company for the sum of $650,000 on April 28th, 1910. The District then deeded one-half interest to its sister district, the SSJID.

After purchasing the "Tulloch Rights", the districts abandoned the old miners' diversion dam and began construction of Goodwin Dam (Figure 4-2) in 1912. Goodwin Dam was completed in 1913 with a finished height of 80 feet above the bed of the Stanislaus River and a crest length of 500 feet. Main canals were constructed by both districts to deliver water to customers in the valley. The Oakdale Irrigation District constructed a main canal on both sides of the river, one 15 miles in length and one 22 miles in length to make deliveries to its customers.

In 1915, the District constructed Rodden Dam on the North Main Canal. It provides little storage and historically served primarily as a re-regulation reservoir. The role of Rodden Dam was essentially replaced by the North Side Regulating Reservoir, which was completed in 2010. The reservoir is more strategically located to allow for balancing of short-term supply demand

mismatch and increases the operational pool from 100 acre-feet (effective storage for Rodden Dam) to 300 acre-feet.

Figure 4-2. Goodwin Dam.

In 1925, the two districts began construction on Melones Reservoir with a storage capacity of 112,500 af. This dam was completed by the end of 1926, and each District was provided with 51,250 af of stored water. This was a post-1914 appropriation. The water supply from Melones Reservoir was sufficient for the needs of SSJID but became in insufficient for the needs of OID when ladino clover became the District's primary crop in the 1930's. To further augment its surface water supply, the District constructed 25 groundwater production wells between 1931 and 1938.

By 1938 the District was again searching for additional reservoir storage capacity to serve its constituents. In 1948, three reservoir sites were selected and named the Tri-Dam Project. Donnells and Beardsley Reservoirs were constructed on the Middle Fork of the Stanislaus River with storage capacities of 64,500 and 97,500 af, respectively. Tulloch Reservoir was constructed above Goodwin Diversion Dam with a storage capacity to 68,400 af. Goodwin Diversion Dam was also raised 7 feet in 1957 to bring its total storage capacity to 500 af. Donnells and Beardsley Reservoirs have post-1914 rights to store water.

Prior to the construction of the New Melones Dam and Reservoir by the USBR, and as part of the condemnation of the (Old) Melones Reservoir, the joint districts entered into a 1972 Stipulation and Agreement, whereby the joint districts' water rights were converted to an allocation agreement between the USBR and the districts for 654,000 af per year. In 1988, the joint Districts renegotiated the 1972 Stipulation and Agreement with the USBR. In the 1988 Agreement, the districts receive a maximum of 600,000 af per year. Based on an even split of the available supply, this equates to 300,000 af that are available to both OID and SSJID each year. In reaching this Agreement, the joint Districts agreed to relinquish 54,000 af per year of water in exchange for an obligation from the USBR to make up 33 percent of any deficiency below 600,000 af per year. In years when the inflow into New Melones Reservoir is less than 600,000 af, the District's entitlement is determined as set forth in Equation 4-1:

$$\text{Annual SSJID + OID Entitlement} = \text{Inflow} + [600{,}000 - \text{Inflow}] / 3 \qquad [4\text{-}1]$$

In addition, the District has 3 Stanislaus River pumps with a license for diversion and use of up to 2,260 af per year between the months of May and November. These pumps have post-1914 appropriative water rights. The District also has reclamation pumps to reclaim water from drains

for reuse within the District. These pumps have a capacity of approximately 32,560 af per year, although actual pumping in recent years has been much less.

An analysis of the probability that OID's entitlement will be less than 300,000 af (after splitting the total supply with SSJID) was conducted as part of OID's Water Resources Plan for the period from 1922 to 1998. Based on the analysis, it was estimated that OID will receive its full supply in 79 out of 100 years and will receive at least 249,000 af in 95 out of 100 years. The minimum supply OID will likely receive in any year is approximately 190,000 af. The exceedance probability of the OID Stanislaus River water supply is shown in Figure 4-3.

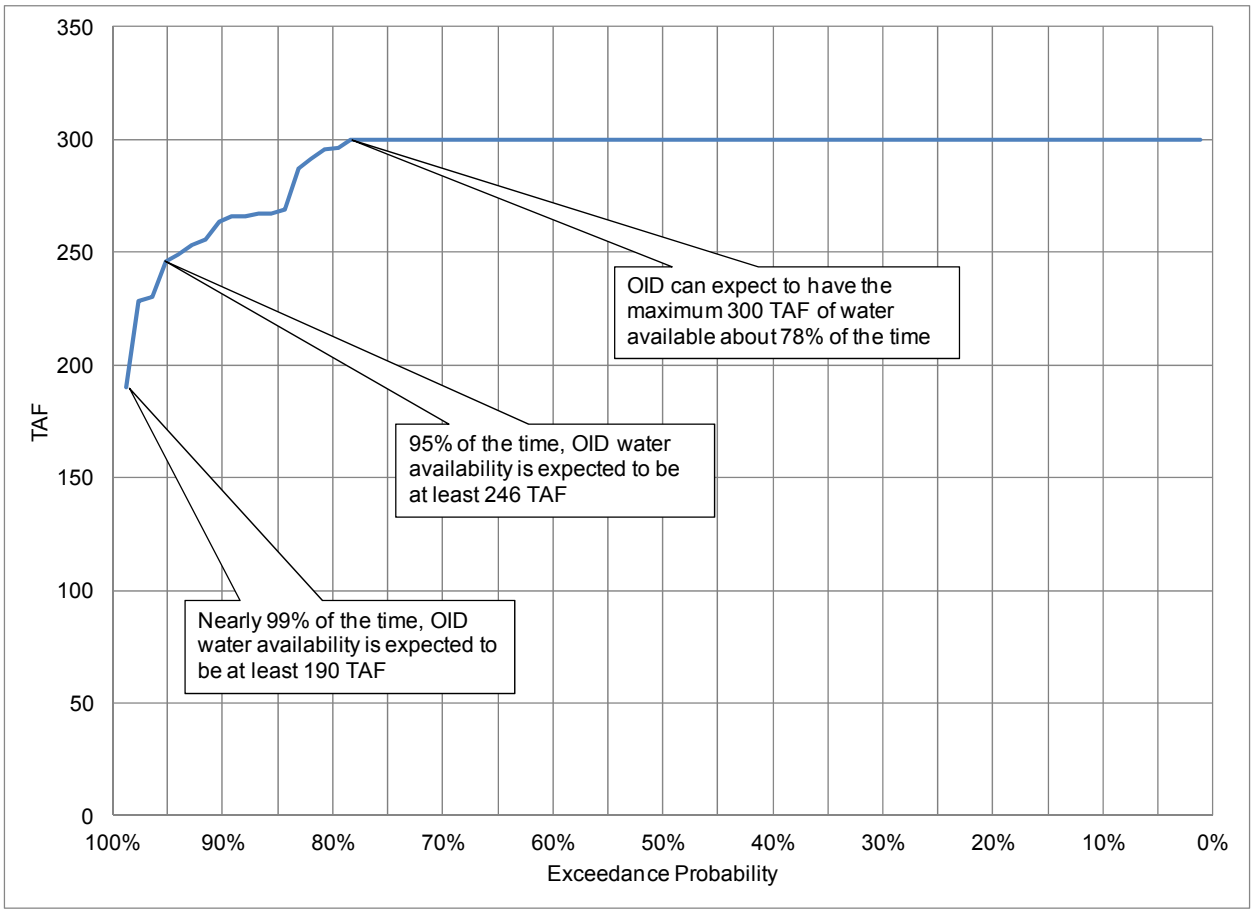

Figure 4-3. Exceedance Probability of OID Stanislaus River Water Supply.

4.3 Groundwater Supply

Most of OID lies over the Riverbank and Turlock Lake Formations, which are characterized as unconsolidated deposits of sands, gravels and silts, with groundwater occurring under unconfined and semi-confined conditions (USGS 2004). The Riverbank Formation varies in thickness from 150 feet to 250 feet and generally sustains moderate well yields. The Turlock Lake Formation varies in thickness from 300 feet to 850 feet and generally sustains large well yields, up to 2,000 gallons per minute (gpm).

The Riverbank and Turlock Lake Formations lie over the consolidated Mehrten Formation, which outcrops to the east of OID. The Corcoran Clay Formation, which is present throughout much of the San Joaquin Valley, is not present beneath OID. This explains why groundwater beneath OID occurs under unconfined and semi-confined conditions rather than confined conditions.

OID lies over two groundwater subbasins as defined by the Department of Water Resources (DWR 2003) (Figure 4-4). On the south side of the Stanislaus River, the District overlies the Modesto Groundwater Subbasin which is bounded on the west by the San Joaquin River, on the north by the Stanislaus River, on the south by the Tuolumne River and by the foothills on the east. On the north

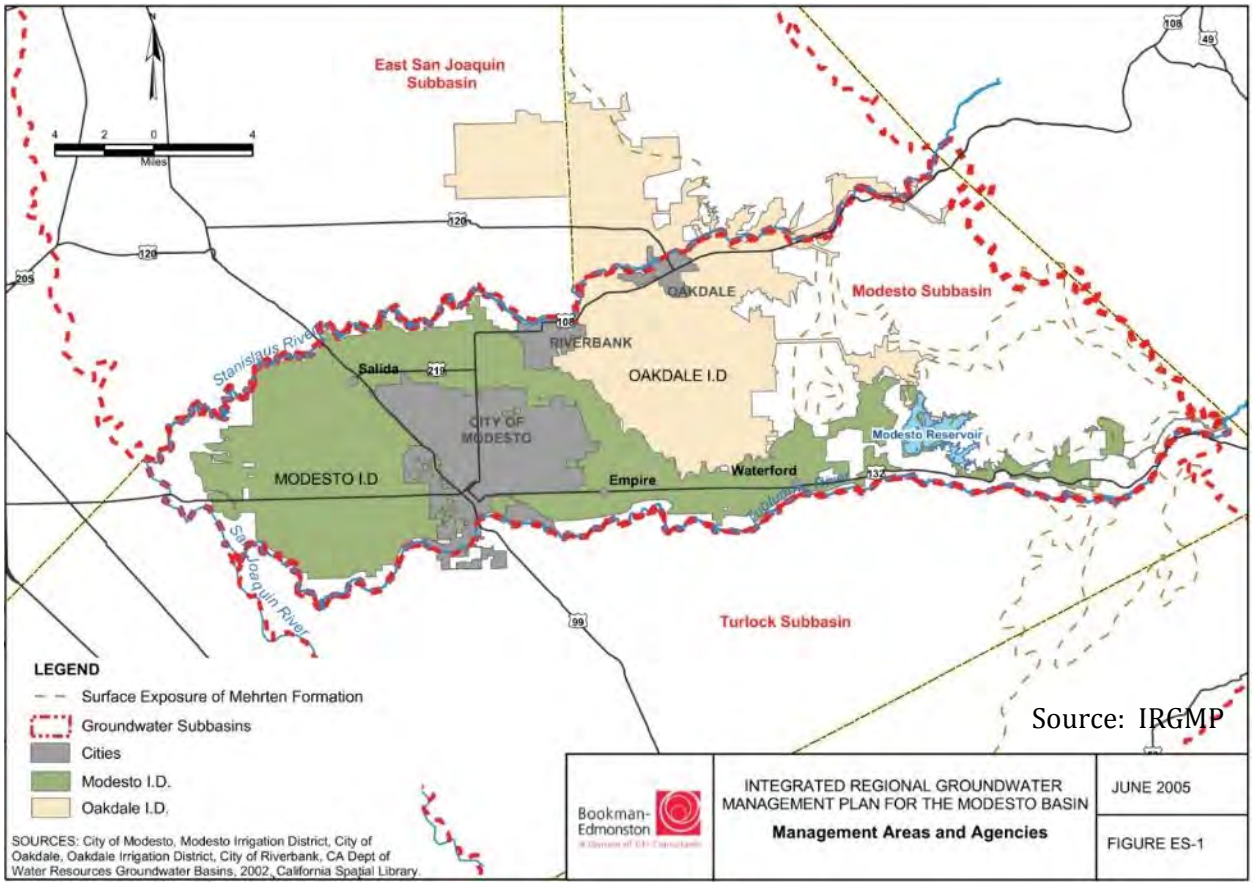

Figure 4-4. Groundwater Basins Underlying OID and Surrounding Areas.

side of the Stanislaus River, the District is in the southern portion of the Eastern San Joaquin Subbasin bounded by the San Joaquin River on the west, the Sacramento/San Joaquin County line on the north, the Stanislaus River on the south and the foothills on the east. About 60% of the District overlies the Modesto Subbasin with the remainder overlying the East San Joaquin Subbasin. The direction of groundwater flow in both of these basins is generally to the west and southwest.

On average, groundwater levels in the Modesto Subbasin declined by nearly 15 feet in the 30-year period from 1970 to 2000 (DWR 2003). This has not been a steady decline, rather one characterized by marked declines during dry periods and stabilization and recovery during wet periods.

In the Eastern San Joaquin Subbasin, groundwater levels have declined significantly and nearly continuously over the past 40 years (DWR 2003). During this period, the average drop across the subbasin has been about 70 feet, or 1.7 feet per year, although water levels have dropped by more than 100 feet in some areas. However, in the portion of the subbasin beneath OID, water levels have decreased much less due to the steady recharge that occurs from OID's diversion and delivery of Stanislaus River water. The conjunctive management of surface water and groundwater resources in the subbasins underlying OID is an important consideration in evaluating the OID water balance and opportunities and potential impacts related to conservation at the farm, district, and basin scales.

In April 1994, OID joined with five neighboring agencies to form the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA or Association). The City of Waterford joined the Association on 2015. The 7 agencies comprising the Association are:

- Oakdale Irrigation District
- City of Modesto
- Modesto Irrigation District
- City of Oakdale
- City of Riverbank
- Stanislaus County
- City of Waterford

6 of the 7 members of the Association rely on groundwater for all or a portion of their supply. The exception is Stanislaus County, which does not supply water but represents individual groundwater users.

The STRGBA developed an Integrated Regional Groundwater Management Plan (IRGMP) in 2005. The IRGMP builds on an original Groundwater Management Plan prepared by the Association in 1995, and includes additional elements to achieve compliance with the Groundwater Management Planning Act of 2002 (SB1938). The IRGMP covers the entire Modesto Groundwater Subbasin and the portion of the East San Joaquin Groundwater Subbasin underlying OID, thereby covering the entirety of OID. The IRGMP identifies Basin Management Objectives (BMOs) addressing:

- Maintenance of groundwater levels
- Control of groundwater quality degradation
- Protection against potential inelastic land subsidence
- Groundwater monitoring and assessment
- Evaluation of feasible water conservation measures
- Coordination and cooperation (with local, State and Federal agencies)

For additional detail, the IRGMP is included as Attachment F of this AWMP.

The STRGBA supported the development of a long-term USGS hydrologic model of the Modesto area that was completed in 2015 (USGS 2015). The model supports the development and evaluation of strategies to manage groundwater supplies and quality.

All District wells and selected private wells are monitored in spring (May) and fall (November). This information is reported to the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA) and is used to map and evaluate water levels. STRGBA is the recognized local groundwater reporting agency for the California Statewide Groundwater Elevation Monitoring System (CASGEM). In the Modesto subbasin. OID independently uploads groundwater monitoring data from its wells within the northern triangle north of the Stanislaus River into the CASGEM system.

The District has 25 deep wells with a combined output of approximately 96 cfs and a maximum annual production capacity of approximately 38,130 af based on a 214-day irrigation season. Actual annual production ranged between approximately 1,500 and 18,300 af between 2005 and 2014 because the wells are not operated continuously. All deep well pumps are equipped with flowmeters.

In 2007, STRGBA conducted a comprehensive well field optimization study (Well Field Optimization Phase I) for OID and the Modesto Irrigation District (MID) (GEI 2007). The study was funded through a grant from the Department of Water Resources Local Groundwater Assistance Program and completed as one of the BMOs of the 2005 IRGMP with the goal of improving understanding of the groundwater system and its infrastructure and to develop tools for optimizing operation of the well field in conjunction with available surface water resources. The study consisted of the following primary tasks:

Figure 4-5. OID Irrigation Well.

- Well facilities inventory and mapping
- Production well evaluations
- Development of a database management system (DMS)
- Development of a decision support system (DSS)

As part of the production well evaluations, pump efficiency tests were completed for all OID and MID deep well pumps (Figure 4-5). Additionally, the need for replacement or rehabilitation of each well was assessed, and improvement actions were prioritized to provide the greatest benefit relative to the cost. The pump efficiency tests completed as part of the study compliment and contribute to a database of tests OID has performed periodically in the past over the life of each well. Moving forward, OID has continued to periodically test its production wells to identify the need for additional maintenance to maintain acceptable levels of production and pumping efficiency, as it has done historically.

OID reclamation pumps are tested for pump efficiency when a noticeable decrease in production is observed. If a pump falls significantly below its design capacity, it is rebuilt or replaced before the following irrigation season. Services for pump efficiency testing on private agricultural wells are available through various local vendors.

4.4 Other Water Supplies

In addition to Stanislaus River water and groundwater supplies, the District accepts process water from the Sconza Candy Company (Figure 4-6), which is discharged under an NPDES permit between Sconza and the Regional Water Quality Control Board (RWQCB) and a discharge agreement between OID and Sconza. The discharge occurs year-round at an approximate rate of 1,300 gpm, producing approximately 2,100 af annually. The water is discharged into the Riverbank Lateral, and commingles with District water during the irrigation season, thereby becoming a source of up to approximately 1,230 af during the typical 214-day irrigation season. During the non-irrigation season this water is conveyed to downstream landowners for irrigation and stock water supply upon request. Otherwise, it flows to the Stanislaus River.

In addition to direct reuse of water by the District, approximately 1,200 af per year of discharge from food processing facilities within OID is provided directly to growers, partially offsetting OID irrigation demands.

4.5 Water Quality Monitoring

OID monitors surface water and groundwater quality within its service area and the surrounding areas under a combination of District and regional water management activities. These activities are described in greater detail below.

Figure 4-6. Sconza Candy Manufacturing Complex north of OID Riverbank Lateral.

4.5.1 Surface Water

Currently, monitoring of surface water quality in OID is conducted primarily by the East San Joaquin Water Quality Coalition (ESJWQC) and the San Joaquin County and Delta Water Quality Coalition (SJCDWQC) as part of satisfying the requirements of the Central Valley Regional Water Quality Control Board's Irrigated Lands Program, also known as the Ag Waiver. OID is a member of both water quality coalitions in order to include District-owned lands in Stanislaus County and San Joaquin County, respectively. Historically, OID performed extensive water quality monitoring as an individual discharger to comply with the Ag Waiver.

In 2011, OID became a member of the East San Joaquin Water Quality Coalition and the San Joaquin County and Delta Water Quality Coalition. The East San Joaquin Water Quality Coalition represents District-owned lands south of the Stanislaus River, while the San Joaquin County and Delta Water Quality Coalition represents District-owned lands north of the Stanislaus River. As a member of the coalitions, costs of complying with monitoring and reporting activities are shared. Activities of the coalitions include:

- developing and implementing a water quality monitoring program for area rivers and drains;
- communicating and working with landowners to solve water quality problems, if found; and
- preparing and filing required reports with the RWQCB.

The ESJWQC monitors 33 assessment monitoring sites and 6 core monitoring sites. Based on the coalition's monitoring plan as of April 2012, the core sites are monitored every 3 years to assess water quality trends, while the assessment sites rotate to new locations every 2 years to ensure that all subwatersheds are fully characterized with respect to water quality.

The SJCDWQC monitors 53 assessment monitoring sites and 5 core monitoring sites. Based on the coalition's monitoring plan as of April 2012, the core sites are monitored every 3 years to assess water quality trends, while the assessment sites rotate to a new location every year to ensure that all subwatersheds are fully characterized with respect to water quality.

4.5.2 Groundwater

A groundwater monitoring plan (GMP) was developed as part of the IRGMP described previously and included as Attachment F of this AWMP. In addition to monitoring groundwater hydrology, specific goals of the GMP include developing a better understanding of the spatial variability of groundwater quality and monitoring changes in water quality over time.

Wells identified as part of the GMP include 15 wells included in the USGS National Water Quality Assessment Program, as well as an additional 20 wells within OID's service area. Under the GMP, electrical conductivity has been measured by the District for 12 OID deep wells and 8 private wells.

In January 2014 the ESJWQC completed a Groundwater Quality Assessment Report (GAR) in response to Water Discharge Requirement General Order R5-2012-0116 adopted by the Central Valley Regional Water Quality Control Board in December 2012 (ESJWQC 2014). The GAR identifies vulnerable groundwater areas and delineates areas of relatively higher and lower vulnerability. The vulnerability assessment considers a number of factors, including hydrogeologic sensitivity, overlying land uses and practices, and observed groundwater quality.

In February 2015 the ESJWQC completed a draft Comprehensive Groundwater Quality Management Plan (GQMP) (ESJWQC 2015). The GQMP describes a proposed approach to reduce or eliminate impairments to beneficial uses of groundwater. Specifically, three activities to accomplish this goal are identified and proposed. First, a determination of whether the source of constituents of

concern is related to agriculture will be made. Second, outreach to those coalition members overlying areas where water quality exceedances have occurred will be conducted, and recommendations will be provided to improve groundwater quality conditions. Third, monitoring will be performed to evaluate the efficacy of management practices implemented to improve groundwater quality.

5. Water Balance

5.1 Introduction

This section describes the various uses of water within OID, followed by a detailed description of OID's water balances for key accounting centers within the District. For each accounting center, a detailed, multi-year water balance covering the period from 2005 to 2014 is presented. The water balance quantifies all significant inflows and outflows of water to and from the OID service area during the irrigation season. The irrigation season varies from year to year based on water needs, but approximately covers the period from March through October. Historical water uses may differ from those presented in OID's 2012 AWMP as a result of refinements to analyses used to develop the estimates, but are generally consistent with prior estimates.

The water uses and water balances are discussed in relation to hydrologic conditions within OID, which vary from year to year. Key hydrologic drivers of water management in a given year include available surface water supply under the 1988 agreement with USBR, which is based on New Melones Reservoir inflows; precipitation within the OID service area; and evaporative demand.

5.2 Water Balance Overview

The OID water balance includes separate accounting centers for the OID distribution system, the farmed lands served by OID, and the OID drainage system. A total of twenty-nine individual flow paths are quantified as part of the water balance. A schematic of the water balance structure is provided in Figure 5-1.

In general, flow paths are quantified on a monthly basis. For each accounting center, all but one flow path is determined independently based on measured data or calculated estimates, and the remaining flow path is then calculated based on the principal of conservation of mass (Equation 5-1), which states that the difference between total inflows and outflows to an accounting center for a given period of time is equivalent to the change in stored water within that accounting center. Over the course of a year, it is assumed that the change in storage is zero (Equation 5-2).

$$\text{Inflows} - \text{Outflows} = \text{Change in Storage (monthly time step)} \qquad [5\text{-}1]$$

$$\text{Inflows} - \text{Outflows} = 0 \text{ (annual time step)} \qquad [5\text{-}2]$$

The flow path that is calculated using Equation 5-2 is referred to as the "closure term" because the mass balance equation is solved or "closed" for the unknown quantity. The closure term is selected based on consideration of the availability of data or other information to support an independent estimate as well as the volume of water representing the flow path relative to the size of other flow paths. Generally speaking, the largest, most uncertain flow path is selected as the closure term.

Figure 5-1. OID Water Balance Structure.

5.3 Flow Path Estimation and Uncertainty

Individual flow paths were estimated based on direct measurements or based on calculations using measurements and other data. As described previously, those flow paths not estimated independently were calculated as the closure term of each accounting center.

For the OID distribution system accounting center, farm deliveries were calculated as the closure term. Farm deliveries were selected because farm deliveries represent the largest outflow from the distribution system, and detailed information describing farm deliveries is not readily available for the full water balance period of record. In the future, as a result of OID's implementation of SBx7-7, it is anticipated that farm delivery measurements will be used directly as part of water balance updates.

For the farmed lands accounting center, deep percolation of applied water was calculated as the closure term. Deep percolation of applied water was selected because it is a relatively large flow path and difficult to estimate otherwise. In the future, deep percolation of applied water may be estimated through refinements to OID's root zone water balance model, described below.

For the OID drainage system accounting center, tailwater was calculated as the closure term. Tailwater was selected because it represents a major source of inflow to the drainage system and few quantitative measurements of tailwater are currently available, whereas other major drainage system flow paths such as operational spillage and total boundary outflows are measured for approximately 60% of OID and can be used to estimate totals for the entire district.

The results of the water balance for each flow path are reported with a high level of precision (nearest whole acre-foot) that implies a higher degree of accuracy in the values than is actually attainable. An estimated percent uncertainty (approximately equivalent to a 95% confidence interval) in each measured or calculated flow path has been estimated. Then, based on the relative magnitude of each flow path, the resulting uncertainty in each closure term can be estimated by assuming that errors in estimates are random (Clemmens and Burt 1997). Errors in estimates for individual flow paths may cancel each other out to some degree, but net error , if any, due to uncertainty in the various estimated flow paths is ultimately expressed in the closure term.

Table 5-1 lists each flow path included in the water balance, indicating which accounting center(s) it belongs to, whether it is an inflow or an outflow, whether it was measured or calculated, the supporting data used to determine it, and the estimated uncertainty, expressed as a percent. As indicated, estimated uncertainties vary by flow path from 5% to 50% of the estimated value, with uncertainties generally being less for measured flow paths and greater for calculated flow paths. The estimated uncertainty of each closure term, calculated based on the concept of propagation of random errors as described above, is also shown.

As indicated, the estimated uncertainty in farm deliveries is 9%. This uncertainty is relatively small due to the relatively low uncertainty in system inflows from the Stanislaus River, which represent the largest flow path in the distribution system balance. The estimated uncertainty in deep percolation of applied water is nearly 100%. This relatively large percent uncertainty reflects the

fact that deep percolation of applied water is a relatively small flow path as compared to farm deliveries and crop evapotranspiration of applied water. As a result, a relatively small percent uncertainty in the large flow paths results in a relatively large uncertainty in the smaller, closure term. The estimated percent uncertainty in tailwater is 26%, which is similar to the other drainage system flow paths. Despite appreciable uncertainty in some flow path quantities, the water balance provides useful insights into OID's water management.

5.4 Hydrologic Year Types in OID

Development of a multi-year water balance allows for evaluation of water management impacts of surface water supply variability, precipitation variability, and other changes in the hydrology of OID and its surrounding area over time. Specifically, a multi-year water balance that includes both dry and wet years is essential to evaluate and implement "planned conjunctive use of surface water and groundwater", an EWMP included in the CWC and discussed in Section 7. To support review and interpretation of water uses and overall water balance results over time, USBR surface water allocation, total water year precipitation[4], and total water year reference evapotranspiration (ET_o) are presented, and year types are assigned.

As discussed previously, OID has a reliable source of supply due to its senior water rights on the River and subsequent 1988 Stipulation Agreement with USBR, which is based on inflows into New Melones Reservoir. According to an analysis conducted as part of the WRP, OID is expected to receive a full allotment in approximately eight of ten years. Based on the analysis, the amount of reduction expected in partial allotment years is relatively small (Section 4.2). During the 2005 to 2014 period, a partial allocation was provided in 2007, 2008, 2013, and 2014, with full allocations in the remaining years.

Reduced inflows into New Melones due to reduced precipitation and snow accumulation in the watershed typically correspond to years with reduced precipitation and increased evaporative demand in the OID service area. Based on allotment, total water year precipitation, and irrigation season reference evapotranspiration, the years 2005 to 2014 have been assigned to wet or dry year types for purposes of discussion of water uses in OID over time and the corresponding water balances. These factors along with the year types by year are listed in Table 5-2.

[4] Total water year precipitation refers to precipitation falling within OID during the period from October through September. Precipitation beginning around October at the end of the irrigation season in a given year runs off or accumulates in the soil during the fall to winter to early spring period and is available to support crop ET in the following irrigation season. Thus, for example, the period from October 2004 to September 2005 is referred to as the 2005 water year, and precipitation occurring between October 2004 and September 2005 is referred to as 2005 total water year precipitation.

Table 5-1. OID Water Balance Flow Paths, Supporting Data, and Estimated Uncertainty.

Accounting Center	Flowpath Type	Flowpath	Source	Supporting Data	Average Value (af)	Estimated Uncertainty (%)
Distribution System	Inflows	System Inflows	Measurement	TriDam report, OID river pump flows	230,300	5%
		OID Groundwater Pumping	Measurement	OID deep well pump discharge measurements	8,500	5%
		OID Drainwater Reuse	Measurement	OID reclamation pump discharge measurements	8,800	5%
		OID Tailwater Reuse	Calculation	Area draining via gravity to OID distribution system, estimated tailwater production per acre as a fraction of ET of applied water	2,100	50%
		Recycled to Distribution System	Calculation	Average flow rate from discharge agreement with Sconza Candy	2,100	25%
		Precipitation	Calculation	Quality-controlled precipitation from Oakdale CIMIS station, estimated canal surface area	100	15%
	Outflows	**OID Farm Deliveries**	**Closure (Distribution System)**	**Difference of total inflows and measured/estimated outflows for Distribution System accounting center**	**188,500**	**9%**
		Deliveries to Annual Contracts	Calculation	Area served under annual contracts, OID average ET of applied water (ET_{aw}), OID average Crop Consumptive Use Fraction (CCUF)	4,600	25%
		Deliveries to Knights Ferry	Measurement	OID operational data	2,600	10%
		Transfers (VAMP Pulse Flows)	Measurement	OID operational data	900	10%
		Canal Riparian ET	Calculation	CIMIS reference ET, estimated crop coefficient based on SEBAL, estimated riparian area	1,500	20%
		Canal Seepage	Calculation	NRCS soils data, published seepage rates by soil type, estimated wetted area, estimated wetted duration	36,100	35%
		Operational Spillage	Calculation	OID operational spill measurements, estimated area represented by measurement sites (approx. 60% of District)	15,800	25%
		Canal Evaporation	Calculation	CIMIS reference ET, estimated evaporation coefficient, estimated wetted surface area	1,800	20%
Farmed Lands	Inflows	OID Farm Deliveries	See Above			
		Private Groundwater Pumping	Calculation	Estimated groundwater only area based on Water Resources Plan and recent annexations, average OID ET_{aw} and CCUF	23,100	25%
		Private Drainwater Reuse	Calculation	OID list of properties irrigated via gravity with drainwater only, average ET_{aw} and CCUF	3,800	30%
		Recycled to Farmed Lands	Calculation	Grower estimate of water received from food processing operation	1,200	20%
		Precipitation	Calculation	Quality-controlled precipitation from Oakdale CIMIS station, OID cropped area	51,100	10%
	Outflows	Crop ET of Applied Water (ET_{aw})	Calculation	CIMIS reference ET, estimated crop coefficients based on SEBAL/METRIC analysis, cropped area by crop, Integrated Water Flow Model (IWFM) Demand Calculator (IDC) analysis to divide total ET into applied water and precipitation components	138,400	10%
		Tailwater to Drainage System	See Below			
		Deep Percolation of Applied Water	**Closure (Farmed Lands)**	**Difference of total inflows and measured/estimated outflows for Farmed Lands accounting center applied water balance**	**27,500**	**99%**
		OID Tailwater Reuse	See Above			
		Crop ET of Precipitation (ET_{pr})	Calculation	CIMIS reference ET, estimated crop coefficients based on SEBAL/METRIC analysis, cropped area by crop, IDC analysis to divide total ET into applied water and precipitation components	33,700	10%
		Deep Percolation of Precipitation	Calculation	IDC analysis, NRCS soils characteristics, CIMIS precipitation data	13,600	25%
		Runoff of Precipitation	Calculation	IDC analysis, CIMIS precipitation data, NRCS curve number method	3,200	30%
Drainage System	Inflows	**Tailwater to Drainage System**	**Closure (Drainage System)**	**Difference of total inflows and measured/estimated outflows for Drainage System accounting center**	**48,600**	**26%**
		Operational Spillage	See Above			
		Runoff of Precipitation	See Above			
		Precipitation	Calculation	Quality-controlled precipitation from Oakdale CIMIS station, estimated drain surface area	10	15%
	Outflows	Drainwater Outflow	Calculation	OID boundary outflow measurements, estimated area represented by measurement sites (approx. 60% of District)	48,600	25%
		Drain Seepage	Calculation	NRCS soils data, published seepage rates by soil type, estimated wetted area, estimated wetted duration	6,000	35%
		OID Drainwater Reuse	See Above			
		Private Drainwater Reuse	See Above			
		Drain Evaporation	Calculation	CIMIS reference ET, estimated evaporation coefficient, estimated wetted surface area	300	20%
		Drain Riparian ET	Calculation	CIMIS reference ET, estimated crop coefficient, estimated riparian area	190	20%

Based on the analysis of USBR allotment, precipitation, and ET_o, four years between 2005 and 2014 were assigned to wet year types, and six years were assigned to dry year types. The wet years of 2005, 2006, 2010, and 2011 each had a full allotment and precipitation greater than the average of 11.6 inches. Irrigation season ET_o was least for the wet years, averaging approximately 40.7 inches. The dry years of 2007, 2008, 2013, and 2014 had a partial allotment, while 2009 and 2012 had full allotments. Each of the dry years had below normal precipitation, averaging approximately 9 inches. The dry years also exhibited above average ET_o of 44 inches or more, averaging approximately 46 inches.

In addition to having reduced surface water supplies in some dry years, these years have below normal precipitation, resulting in increased crop irrigation requirements. Thus, in dry years OID faces increased irrigation demands. These increased demands are coupled with reduced surface water supply in partial allocation years.

Table 5-2. 2005 to 2014 OID Allotment, Water Year Precipitation, and Irrigation Season ETo, and Hydrologic Year Type.

Year	Irriga-tion Start	Irriga-tion End	Number of Days	USBR Allotment	Precipita-tion, in	ETo, in	Hydrologic Year Type
2005	16-Apr	13-Oct	181	Full	18.0	39.9	Wet
2006	21-Apr	12-Oct	175	Full	13.6	39.8	Wet
2007	16-Mar	15-Oct	214	Partial	8.2	46.3	Dry
2008	20-Mar	10-Oct	205	Partial	10.6	45.4	Dry
2009	25-Mar	10-Oct	200	Full	8.7	44.5	Dry
2010	25-Mar	15-Oct	205	Full	15.1	42.0	Wet
2011	4-Apr	12-Oct	192	Full	16.7	39.7	Wet
2012	7-Mar	10-Oct	218	Full	8.8	45.9	Dry
2013	11-Mar	10-Oct	214	Partial	9.6	47.9	Dry
2014	17-Mar	10-Oct	208	Partial	7.2	46.1	Dry
				Wet Year Average	15.9	40.7	
				Dry Year Average	8.8	46.4	
				Overall Average	11.6	44.1	

5.5 Water Uses

The District supplies irrigation water for agriculture as well as domestic drinking water for subdivisions outside of the City of Oakdale service area[5]. The District co-owns three reservoirs with the SSJID that are managed by the Tri-Dam Project and Power Authority for storage, power generation, recreation, and water sports. OID continues to beneficially use available water supplies in a variety of ways, those water uses are described in greater detail in the remainder of this section.

[5] OID surface water is provided for agriculture. OID owns and operates a rural water system to provide groundwater for domestic drinking water and acts as the trustee for several Improvement Districts to do the same.

5.5.1 Agricultural

Figure 5-2. Pasture near Oakdale.

Agricultural irrigation is by far the dominant water use in OID. Between 2005 and 2014, there were an average of 51,468 acres of crop land, including an average of 1,002 acres of fallow or idle lands. As indicated in Table 5-3 the dominant crop in OID is pasture (Figure 5-2), averaging 29,451 acres while double-cropped summer corn and winter grain (primarily oats) was grown on an average of 7,890 acres. Both of these crops are associated with the area's extensive livestock and dairy operations, and together account for an average of 73% of the District's total cropped area. Permanent crops in OID, including almonds, fruit trees, grapes and walnuts account for an average of 9,765 acres or 19% of the total cropped area. Almond acreage increased nearly three-fold between 2005 and 2013, from approximately 3,500 acres to 9,400 acres. Rice was grown on an average of 3,258 acres or 6% of the cropped area. The District total cropped area significantly increased from 2013 to 2014 from 52,011 to 59,008 due to annexation of approximately 6,700 additional acres of almond orchards.

The WRP identifies annexation of approximately 4,250 acres within the OID sphere of influence by 2020 as part of the preferred alternative currently being implemented. Annexation provides additional funding to finance various infrastructure and operational improvements under the WRP while providing additional benefits of decreased reliance on groundwater for irrigation and increased groundwater recharge from deep percolation of surface water used for irrigation. As of 2015, OID has annexed approximately 9,349 acres, surpassing WRP goals, with an additional 1,149 acres of additional annexation expected in early 2016. The crop area associated with annexations is reflected in the OID crop acreages presented in Table 5-3 and Figure 5-3[6].

For purposes of estimating crop water requirements, an analysis of crop water use coefficients was conducted using spatially distributed estimates of actual crop evapotranspiration (ET_a[7]) developed by SEBAL North America and the Irrigation Training and Research Center (ITRC). SEBAL North America applied the Surface Energy Balance Algorithm for Land (SEBAL), and ITRC applied the energy balance approach referred to as Mapping EvapoTranspiration at high Resolution with Internalized Calibration (METRIC) to estimate ET_a using Landsat satellite imagery. A total of four years of spatially distributed ET_a results were available with spatial cropping data, including 2008,

[6] Crop acres in Table 5-3 and Figure 5-3 are somewhat less than reported in annual crop reports prepared by OID due to those reports being based on assessed acres rather than crop acres. Assessed acres have be decreased by 7.5 percent to estimate irrigated acres for purpose of preparation of this AWMP.

[7] Note that actual ET, or ET_a, is equivalent to crop ET, or ET_c, for purposes of this AWMP. In some instances, ET_c represents optimal growing conditions due to the manner in which it is estimated and may be greater than ET_a.

2009, 2010, and 2013. Total 2009 SEBAL irrigation season ET_a for the OID service area is shown in Figure 5-4.

Table 5-3. OID Crop Acreages, 2005 to 2014.

Crop	Crop Acreage by Year										Avg
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Pasture	31,158	31,158	30,081	30,081	29,853	29,845	28,882	27,725	27,660	28,064	29,451
Oats and Corn	7,623	7,623	7,819	7,819	8,150	8,150	7,852	7,954	7,954	7,954	7,890
Almonds	3,544	3,544	4,908	4,908	5,975	5,825	7,600	9,320	9,388	16,080	7,109
Walnuts	1,983	1,983	2,391	2,391	2,529	2,508	2,936	3,240	3,287	3,310	2,656
Rice	4,287	4,287	3,427	3,427	3,425	3,364	2,666	2,571	2,567	2,556	3,258
Other	1,087	1,087	1,024	1,024	1,172	1,134	1,175	1,154	1,154	1,043	1,105
Idle	886	886	1,272	1,272	744	739	1,677	851	827	862	1,002
Total Cropped	49,681	49,681	49,648	49,648	51,104	50,827	51,111	51,964	52,011	59,008	51,468
Total w/Idle	50,568	50,568	50,921	50,921	51,848	51,565	52,788	52,815	52,837	59,870	52,470

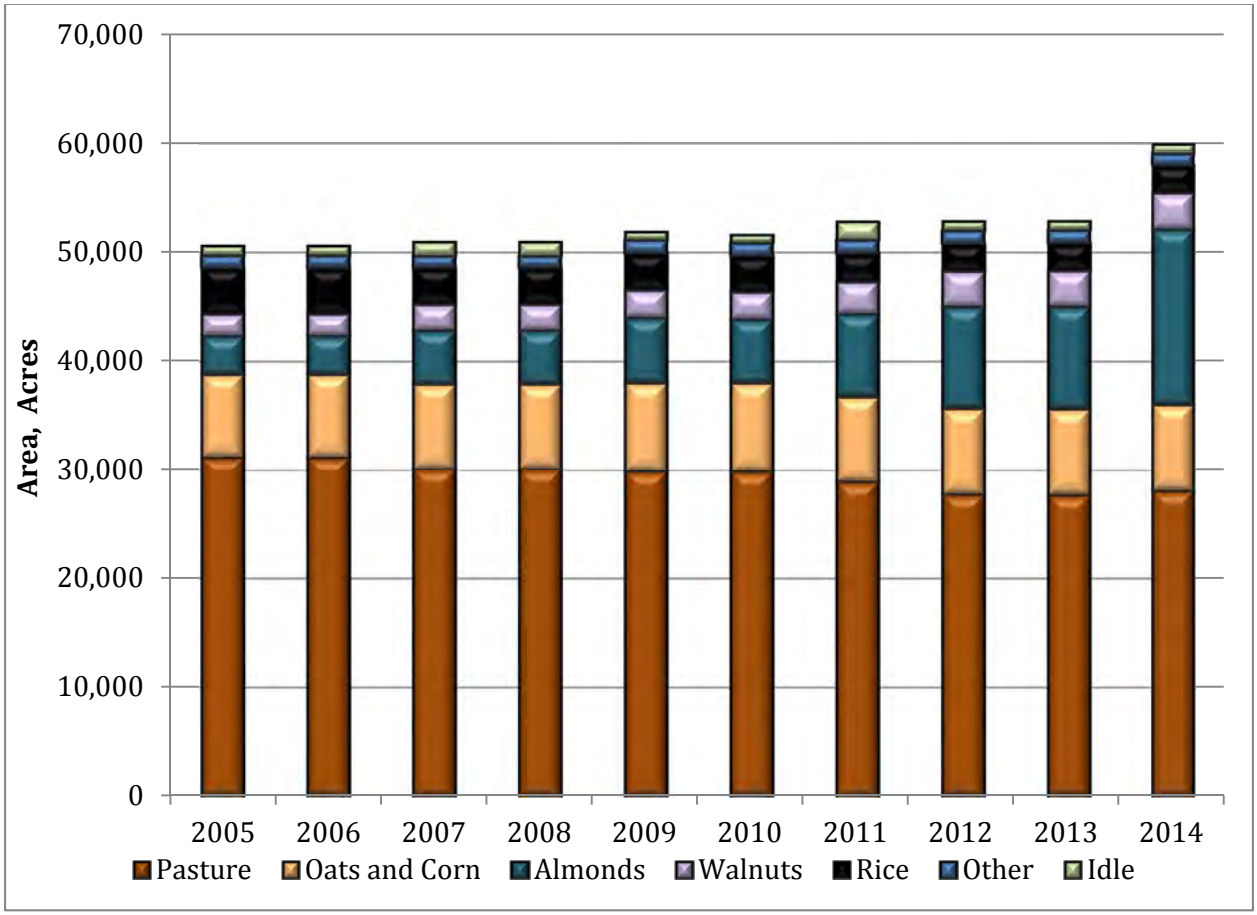

Figure 5-3. OID Cropping, 2005 to 2014.

Based on the ET_a results and spatial crop data obtained from the USDA's National Agricultural Statistics Service (NASS) Cropland Data Layer program and the California Department of Water

Resources (DWR), consumptive use patterns of OID crops over time were analyzed. ET_a rates were then divided by quality-controlled reference evapotranspiration (ET_o) data from the Oakdale CIMIS station to calculate crop coefficients for the irrigation season. These crop coefficients were then combined with ET_o from other years to estimate crop ET_a over time.

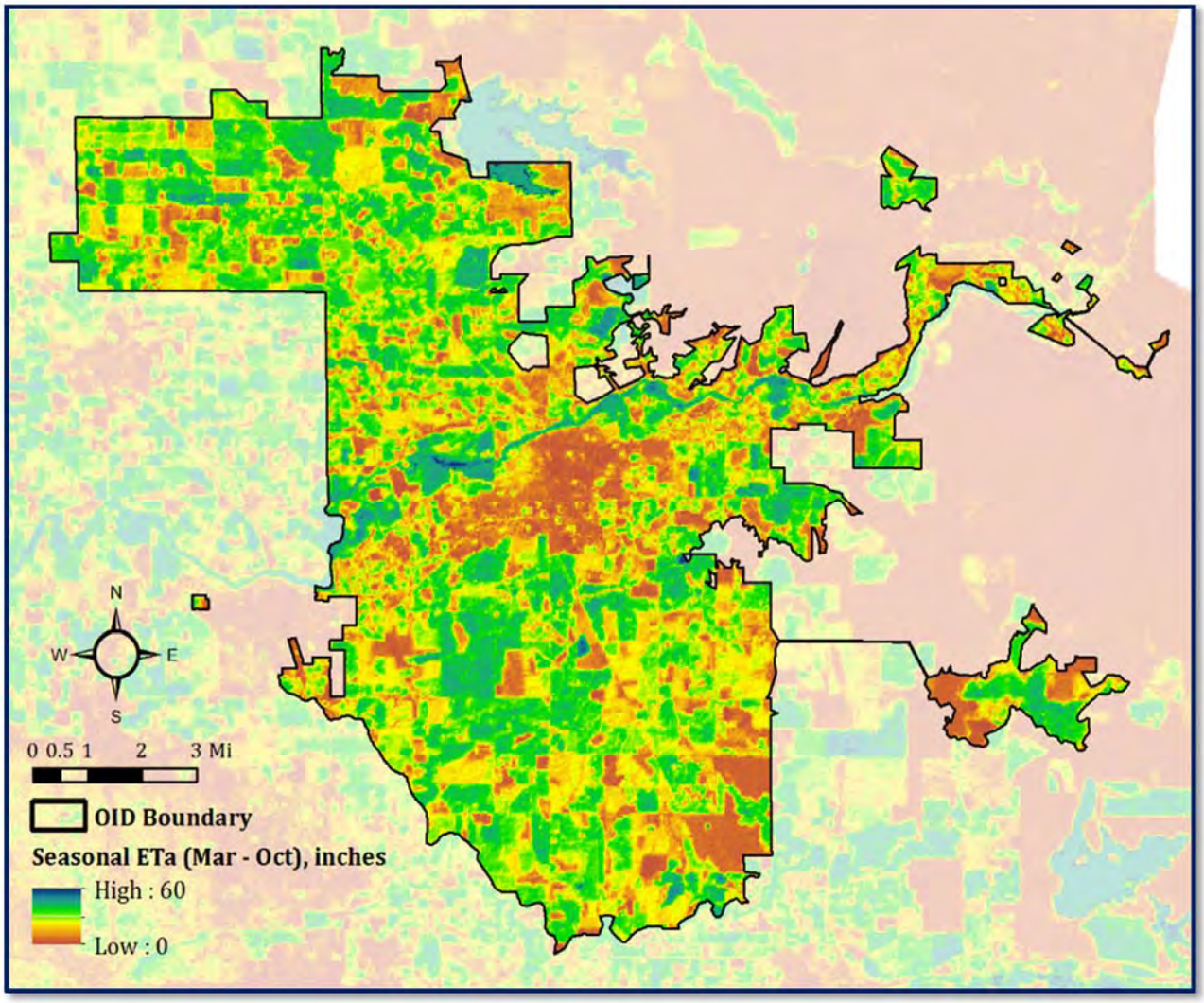

Figure 5-4. OID Spatially Distributed Seasonal Actual ET from SEBAL®, 2009 Irrigation Season.

The California Department of Water Resources Integrated Water Flow Model (IWFM) Demand Calculator (IDC), a daily root zone water balance simulation model, was run for each crop-soil combination within the District to estimate the portions of total ET supplied from applied water (ET_{aw}) and from precipitation (ET_{pr}). Seven crop groups (pasture, oats and corn, almonds, walnuts, rice, other, and idle) and four soil types (clay, clay loam, sandy clay loam, and sandy loam) were modeled using IDC, resulting in 28 different crop-soil combinations. Unit ET values for each crop-soil combination were multiplied by the corresponding cropped acres by soil type in each year to compute total water volumes consumed for agricultural purposes.

The consumptive use of water by crops in OID ranges from approximately 31.3 inches of total crop ET for 'other' (i.e., grapes, winter wheat, cotton) to approximately 49.5 inches for rice (Table 5-4)[8]. ET_{aw} ranges from approximately 24.2 inches for other to 42.0 inches for rice. Average total crop ET for pasture, OID's primary crop, is 40.1 inches with approximately 31.9 inches derived from applied irrigation water. As an area-weighted average, total crop ET in OID is 39.4 inches, with approximately 31.6 inches derived from applied irrigation water. The remainder of the crop ET is derived from precipitation, as described previously.

Table 5-4. Average Acreages and Annual Evapotranspiration Rates for OID Crops.

Crop	Average Acres	Average Evapotranspiration (in)		
		ETc	ETaw	ETpr
Pasture	29,451	40.1	31.9	8.2
Oats and Corn	7,890	35.7	29.5	6.2
Almonds	7,109	39.5	31.6	7.9
Walnuts	2,656	44.2	36.2	8.0
Rice	3,258	49.5	42.0	7.4
Other	1,105	31.3	24.2	7.0
Idle	1,002	6.9	0.0	6.9
Totals	52,470	39.4	31.6	7.8

ET_c and ET_{aw} vary substantially between wet and dry years due to differences in overall evaporative demand and differences in the amount of accumulated rainy season precipitation available to support crop growth and offset crop irrigation requirements. For the 2005 to 2014 period, wet year ET_c averaged approximately 34 inches while dry year ET_c averaged approximately 36 inches. Wet year ET_{aw} averaged nearly 25 inches while dry year ET_{aw} averaged over 30 inches.

Additional information describing crop ET over time is included in Section 5.7. Total irrigation season crop ET varied between approximately 139,000 af and 177,000 af during the 2005 to 2014 period, with an average annual volume of 150,000 af. Approximately 124,000 af were derived from applied irrigation water (83%) and 26,000 af were derived from precipitation (17%).

Other uses of applied irrigation water include insuring late season deep moisture and frost protection for orchards and vineyards. Due to the low salinity of OID irrigation water, the required leaching fraction is small for the crops grown in the District and its insignificance use has not been estimated as part of this Plan. Additionally, water applied for frost protection is typically applied outside of the irrigation season and has not been estimated at this time.

[8] Crop ET values are presented in Table 5-4 on a calendar year basis to capture total ET_c, ET_{aw}, and ET_{pr} within OID. The vast majority of ET_c and ET_{aw} occurs during the March to October irrigation season, with some residual ET occurring following cessation of irrigation in November, particularly on pasture and orchard ground.

5.5.2 Environmental

The District was a member of the San Joaquin River Group Authority along with Merced Irrigation District (Merced ID), Modesto Irrigation District (MID), Turlock Irrigation District (TID), South San Joaquin Irrigation District (SSJID), Friant Water Users Authority (FWUA), the San Joaquin River Exchange Contractors Water Authority (Exchange Contractors) and its member districts, and the Public Utilities Commission of the City and County of San Francisco. The San Joaquin River Agreement was a cooperative effort developed by urban, agricultural, environmental and governmental agencies to meet flow obligations at Vernalis on the San Joaquin River southeast of Tracy. Under the Agreement, the Vernalis Adaptive Management Plan (VAMP) was developed as an experimental adaptive management program designed to protect juvenile Chinook salmon during migration through the River while also evaluating the effects of flows on salmon survival. VAMP was initiated in 2000 and ended in 2011.

Under VAMP, OID and other member agencies were responsible for releasing supplemental water to provide spring (April – May) pulse flows to encourage outmigration of young fall run Chinook salmon. The required supplemental pulse flows varied from year to year depending on existing flow conditions in the River and previous year conditions. Additionally, OID made available 15,000 af of water each year to the U.S. Bureau of Reclamation (USBR), plus the difference between 11,000 af and the OID supplemental flow releases.

Thus, OID made available approximately 26,000 af in each year of the agreement, with a portion of the water used to provide spring pulse flows, which were conveyed through the OID distribution system to the Stanislaus River. The remainder of the water was made available to USBR at New Melones Reservoir to be used at the Bureau's discretion for authorized purposes. Typically USBR released the additional water during other times of the year or carried it over in storage to the following year and then released it. Objectives of releases of the additional water included various fish and wildlife benefits such as additional instream flows on the Stanislaus River during the months when fish are present, ramping of flow changes on the River following high flow periods, implementing pre-VAMP and post-VAMP ramping objectives during the spring flow period, water for fall attraction flows, temperature control in the lower Stanislaus River during the summer and fall periods, and/or storage in New Melones Reservoir for the purpose of using the additional water to augment flows in subsequent dry years.

The total volume of water provided by OID for pulse flows or to USBR for other environmental purposes on the Stanislaus and San Joaquin rivers from 2000 to 2010 is summarized in Table 5-5.

As suggested by Table 5-5, the need for OID supplemental water to increase river flows is correlated to years with partial allotments due to reduced inflow into New Melones Reservoir. During the 2005 to 2011 period, the two years in which OID provided supplemental water were the partial allocation years of 2007 and 2008.

Table 5-5. Annual OID Supplemental Water and Additional Water released to USBR under VAMP, 2000 – 2010[9].

Year	OID Supplemental Water (af)	OID Additional Water Released by USBR (af)	Total
2000	7,300	18,785	26,085
2001	7,365	18,635	26,000
2002	3,795	17,752	21,547
2003	5,039	25,424	30,463
2004	5,880	17,696	23,576
2005	0	26,033	26,033
2006[10]	0	26,000	26,000
2007	2,185	23,815	26,000
2008	7,260	18,740	26,000
2009	0	26,000	26,000
2010	0	26,000	26,000
Average	3,529	22,262	25,791

5.5.3 Recreational

The District co-owns three reservoirs with SSJID that are managed by the Tri-Dam Project and Power Authority for storage, power generation, recreation and water sports. These reservoirs include the Beardsley Reservoir and Donnells Reservoir (Figure 5-5) above New Melones Reservoir and Tulloch Reservoir below New Melones. All of these reservoirs lie outside of OID's service area. Water stored in the reservoirs is not "used" for recreation, per se, as it is not consumed to support recreation activities. Rather, the storage of water in the reservoirs supports recreational activities.

Figure 5-5. Donnells Reservoir.

5.5.4 Municipal and Industrial

The District currently provides domestic water from District owned groundwater wells for 476 service connections within the rural water system (RWS) it owns and operates. OID also serves as the trustee of six separate improvement districts (291 connections) in which water is provided from deep wells that are individually owned by each improvement district. OID staff monitors the water quality in both the RWS and improvement districts as required by state and local law.

[9] Based on San Joaquin River Group Authority annual technical reports from 2000 through 2011, available at www.sjrg.org/technicalreport/default.htm. Although OID made 26,000 af of additional water available, no water was released by USBR for VAMP in 2011.
[10] Based on technical reports, it is unclear whether the 26,000 ac-ft released to USBR in 2006 were released for environmental benefits.

The homes within the rural water systems are metered and charged accordingly based on usage. The homes within the improvement districts are not metered but have metered pumps. Annual use for the RWS is summarized in Table 5-6. A map of rural water system and improvement districts is provided in Figure 5-6.

Table 5-6. Annual Use of Domestic Water for OID Rural Water System.

Year	Annual Use (af)
2005	577
2006	546
2007	593
2008	609
2009	623
2010	482
2011	487
2012	533
2013	606
2014	535
Average	559

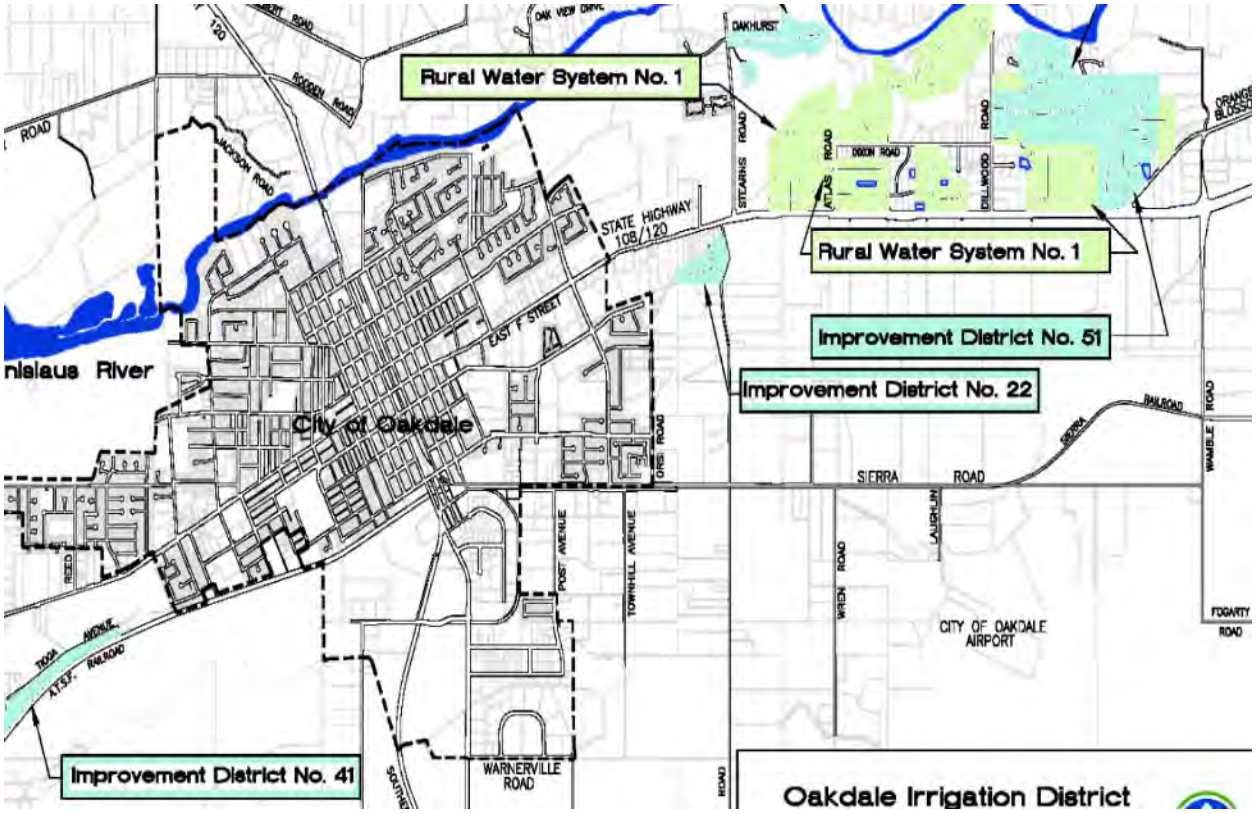

Figure 5-6. OID Improvement Districts and Rural Water Systems.

The rural water systems and domestic water improvement districts are outside the city limits of Oakdale. Within the city limits, water is provided by the City of Oakdale (City) through a series of groundwater wells.

OID ceased deliveries of irrigation water within the city limits of Oakdale in 2005. The old age of the distribution system, disproportionately high maintenance costs, and compliance with California Government Code Title 17 were factors contributing to the discontinuation of service.

5.5.5 Groundwater Recharge

Groundwater recharge that occurs within OID consists of passive seepage from OID canals and deep percolation of precipitation and applied irrigation water. Conditions are generally not conducive to artificial recharge due to the presence of hardpan within many portions of OID. Rather, distributed, passive recharge replenishes the East San Joaquin and Modesto subbasins to the benefit of OID water users, communities within OID and surrounding areas that share the groundwater resource.

Estimates of recharge of irrigation water were derived from the water balance analysis. Canal and drain seepage were calculated based on soil characteristics along with estimated canal and drain wetted perimeters, overall lengths, and wetting frequency. Deep percolation of applied irrigation water was calculated as the closure term of the farmed lands water balance. Seepage and deep percolation volumes for 2005 to 2014 are summarized in Table 5-7 along with total recharge expressed as a volume and as a depth of water relative to the cropped area in each year.

Table 5-7. OID Total Groundwater Recharge, 2005 to 2014.

Year	USBR Allot-ment	Hydro-logic Year Type	Canal Seepage (af)	Drain Seepage (af)	Deep Percolation of Applied Water (af)	Deep Percolation of Precipitation (af)	Total Recharge	
							(af)	(af/ac)
2005	Full	Wet	33,230	5,364	37,269	25,709	101,572	2.0
2006	Full	Wet	32,129	5,186	34,043	15,686	87,044	1.8
2007	Partial	Dry	39,289	6,342	46,064	6,613	98,308	2.0
2008	Partial	Dry	37,636	6,076	31,835	11,339	86,886	1.7
2009	Full	Dry	36,718	5,927	29,960	7,473	80,079	1.6
2010	Full	Wet	35,952	6,076	27,951	20,508	90,487	1.8
2011	Full	Wet	33,672	5,690	23,309	17,599	80,271	1.6
2012	Full	Dry	38,232	6,461	11,614	11,359	67,666	1.3
2013	Partial	Dry	37,531	6,342	19,398	7,474	70,745	1.4
2014	Partial	Dry	36,479	6,164	13,294	12,074	68,011	1.2
Wet Year Average			33,746	5,579	30,643	19,876	89,844	1.8
Dry Year Average			37,647	6,219	25,361	9,389	78,616	1.5
Overall Average			36,087	5,963	27,474	13,584	83,107	1.6

Total recharge between 2005 and 2014 ranged from approximately 68,000 af to 102,000 af per year, or from 1.2 af to 2.0 af per cropped acre per year. On average, total recharge was estimated to

be approximately 83,000 ac-ft per year (1.6 af/ac-yr), with approximately 44% of recharge originating from canal seepage, 33% of recharge originating from deep percolation of applied water, 16% of recharge originating from deep percolation of precipitation and 7% of recharge originating as seepage from drains.

Groundwater recharge net of groundwater pumping[11] was calculated by subtracting estimated OID and private pumping volumes from total recharge volumes. Net recharge estimates for the study period are provided in Table 5-8.

Table 5-8. OID Net Groundwater Recharge, 2005 to 2014.

Year	USBR Allotment	Hydrologic Year Type	Total Recharge (af)	Groundwater Pumping (af)	Net Recharge	
					(af)	(af/ac)
2005	Full	Wet	101,237	21,284	80,288	1.6
2006	Full	Wet	86,683	24,447	62,598	1.3
2007	Partial	Dry	98,042	33,254	65,055	1.3
2008	Partial	Dry	86,607	41,284	45,602	0.9
2009	Full	Dry	79,730	41,245	38,835	0.8
2010	Full	Wet	90,266	26,938	63,549	1.3
2011	Full	Wet	80,077	23,258	57,013	1.1
2012	Full	Dry	67,427	31,366	36,300	0.7
2013	Partial	Dry	70,420	38,050	32,694	0.6
2014	Partial	Dry	67,640	67,429	583	0.0
Wet Year Average			89,566	23,982	65,862	1.3
Dry Year Average			78,311	42,105	36,511	0.7
Overall Average			82,813	34,855	48,252	1.0

Net recharge varied from approximately 1,000 af to 80,000 af per year between 2005 and 2014, or 0.0 af to 1.6 af per cropped acre per year. On average, net recharge was estimated to be approximately 48,000 af per year (1.0 af/ac-yr).

Net groundwater recharge tends to be greater in wet, full allocation years due to increased deep percolation of precipitation. Additionally, all else equal, groundwater pumping increases in dry years to supplement decreased surface water supplies and to satisfy increased crop irrigation requirements. Net recharge was relatively large in 2005, primarily due to well above average rainfall that resulted in additional deep percolation of precipitation, as compared to other years. Net wet year groundwater recharge averaged approximately 66,000 af between 2005 and 2014, while net dry year recharge averaged approximately 37,000 af.

[11] Total groundwater pumping includes OID and private pumping for irrigation, as well as recycled water used by OID for farmed lands (see Section 4.4), which is assumed to have originated as groundwater.

5.5.6 Transfers and Exchanges and Releases

Voluntary transfers of water provide a basis for funding improvements to the OID distribution system under the District's WRP. OID uses this funding mechanism in lieu ofwater rate increases to OID customers to accomplish this same purpose. OID has participated in numerous water transfers in the past, and continues to seek opportunities for mutually beneficial temporary transfer agreements with water users (agricultural, urban, and others) outside of the District.

OID began participating in temporary water transfers in 1992 with a 20,000 af transfer to the State Drought Water Bank (Bank), and by the end of 2004, had transferred a total volume of 289,454 af to four different recipients, including the Bank, Stockton East Water District (SEWD), the USBR, and VAMP. Water transferred to SEWD is primarily for municipal and industrial use by the City of Stockton and the Lincoln Village and Colonial Heights Maintenance Districts. The VAMP and USBR transfers were primarily for environmental uses, such as to encourage outmigration of fall run Chinook salmon smolt (Figure 5-7), as described previously in Section 5.2.2. In addition to environmental uses, transfers to USBR are integrated into Central Valley Project (CVP) operations, enabling USBR to meet contractual water supply obligations more reliably and to comply with Delta outflow and water quality requirements.

Figure 5-7. Chinook Salmon Smolt.

From 2005 to 2014, transfers included SEWD, USBR, San Luis & Delta-Mendota Water Authority, DWR, and VAMP, as described in Table 5-9. Over this period, the District has transferred approximately 325,000 af, or an average of 32,500 af per year.

Table 5-9. OID Water Transfers, 2005 to 2014.

		Annual Transfer Volume, acre-feet				
Year	SEWD	VAMP Pulse Flows	USBR	San Luis & Delta-Mendota Water Authority	DWR	Total
2005	15,117	0	26,033	0	0	41,150
2006	14,934	0	26,000	0	0	40,934
2007	13,820	2,185	23,815	0	0	39,820
2008	15,000	7,260	18,740	0	0	41,000
2009	9,390	0	26,000	20,000	0	55,390
2010	15,000	0	26,000	0	0	41,000
2011	0	0	26,000	0	0	26,000
2012	0	0	0	0	0	0
2013	0	0	0	20,000	20,000	40,000
2014	0	0	0	0	0	0
Totals	83,261	9,445	172,588	40,000	20,000	325,294

5.5.7 Other Water Uses

Other incidental uses of water within OID include watering of roads for dust abatement, construction water, private ponds, agricultural spraying, and stock watering by OID water users. The volume of water used for such purposes is small relative to other uses and has not been quantified as part of this AWMP.

5.6 Drainage

5.6.1 Reclamation Pumping within OID

In OID, runoff from precipitation and applied irrigation water is collected in a system of private and District drains that typically follow natural drainage paths. The District has 42 reclamation pumps (Figure 5-8) located along these drains that are operated during the irrigation season to capture and reuse drainwater or to lift drainwater for reuse by MID and SSJID. Additionally, some lands within OID are irrigated all or in part through private reclamation pumping. Reclamation pumping by OID and private landowners within OID between 2005 and 2014 is summarized in Table 5-10.

Figure 5-8. Reclamation Pump.

Table 5-10. Reclamation Pumping within OID, 2005 to 2014.

Year	USBR Allotment	Hydrologic Year Type	Reclamation Pumping (ac-ft)		
			OID	Private	Total
2005	Full	Wet	10,068	3,168	13,236
2006	Full	Wet	8,956	3,256	12,212
2007	Partial	Dry	10,099	3,782	13,881
2008	Partial	Dry	11,154	3,794	14,948
2009	Full	Dry	9,669	3,692	13,361
2010	Full	Wet	7,729	3,208	10,937
2011	Full	Wet	7,430	3,108	10,539
2012	Full	Dry	8,219	4,480	12,700
2013	Partial	Dry	7,705	4,935	12,640
2014	Partial	Dry	6,518	4,624	11,142
Wet Year Average			8,546	3,185	11,731
Dry Year Average			8,894	4,218	13,112
Overall Average			8,755	3,805	12,559

Between 2005 and 2014, OID reclamation pumping varied between approximately 6,500 af and 11,200 af per year with an average of 8,800 af per year, and private reclamation pumping varied between 3,100 af and 4,900 af per year with an average of 3,800 af per year. Total reclamation pumping within OID varied from 10,500 af to 14,900 af per year with an average of 12,600 af per year.

In general, reclamation pumping is greater in dry years than wet years in order to supplement decreased surface water supplies and/or satisfy increased crop irrigation requirements. Wet year reclamation pumping averaged approximately 11,700 af between 2005 and 2014, while dry year reclamation averaged approximately 13,100 af.

5.6.2 OID Boundary Outflows

As previously discussed, OID undertook and completed a systematic evaluation and ranking of the boundary flow measurement sites in 2003 for the purpose of identifying the improvements needed at each site and prioritizing measurement improvements among the sites to maximize cost effectiveness. Pursuant to the ranking of outflow sites, OID has established flow measurement at seven operational spillage sites and nine drain outflow sites. The drain outflow sites represent approximately 60% of the total boundary outflows from OID. Similarly, it is estimated that the operational spillage sites represent approximately 60% of total operational spillage from the OID distribution system. The district plans to continue to increase the number of operational spill and boundary outflow sites measured over time.

More recently, a detailed analysis has been conducted by OID operations staff to delineate drainage watersheds within the District. All drainage from a given watershed leaves the District at a single location. Additionally, some "no drainage" areas exist that do not have any surface outflow. In other areas, drainage is completely captured and reused by OID or OID water users. The area of each drainage watershed was used in conjunction with boundary outflow data to estimate the total boundary outflows from OID. Additionally, the delineation of drainage watersheds enables OID to estimate drainage from individual areas, allowing for better evaluation of potential projects to reduce or recover boundary outflows for use within OID, effectively increasing the District's available surface water supply.

Estimated total boundary outflows from OID for 2005 to 2014 are summarized in Table 5-11. Irrigation season boundary outflows ranged from approximately 41,000 af to 57,000 af, with an average of 49,000 af.

Based on the period from 2005 to 2014, boundary outflows do not vary substantially, on average, between wet and dry years. This is likely due in part to contrasting changes in inflows to and outflows from the district drainage system that vary depending on the hydrologic characteristics of a given year. These flow path changes are summarized qualitatively in Table 5-12.

Table 5-11. OID Boundary Outflows, 2005 to 2014.

Year	USBR Allotment	Hydrologic Year Type	Seasonal Drainwater Outflow (af)
2005	Full	Wet	52,312
2006	Full	Wet	46,204
2007	Partial	Dry	46,556
2008	Partial	Dry	41,964
2009	Full	Dry	47,138
2010	Full	Wet	48,956
2011	Full	Wet	52,322
2012	Full	Dry	57,238
2013	Partial	Dry	52,232
2014	Partial	Dry	41,127
		Wet Year Average	49,948
		Dry Year Average	47,709
		Overall Average	48,605

Table 5-12. General Effects of Hydrologic Year Type on OID Drainage System Flow Paths.

Drainage System Flowpath	Wet Year Change	Dry Year Change	Notes
Operational Spillage (Inflow)	Little or No Change	Little or No Change	Operational spillage does not appear strongly related to hydrologic year type based on currently available data. Longer irrigation seasons during dry years may offset spillage reduction from more careful operation of the distribution system.
Farm Tailwater (Inflow)	Little or No Change	Little or No Change	Farm tailwater does not appear strongly related to hydrologic year type based on currently available data. Improved on-farm irrigation efficiencies may offset increased applied water in dry years.
Runoff of Precipitation and Direct Precipitation (Inflow)	More	Less	Greater precipitation tends to occur during the irrigation season of wet years, resulting in increased runoff or precipitation and direct precipitation in the drains.
OID and Private Reclamation Pumping (Outflow)	Slightly Less	Slightly More	Increased reclamation pumping occurs in dry years to mitigate reduced surface water supply and/or increase crop irrigation requirements.
Drain Seepage (Outflow)	Slightly Less	Slightly More	Seepage tends to be greater during dry years due to a longer irrigation season.
Riparian ET and Evaporation (Outflow)	Slightly Less	Slightly More	Riparian ET and evaporation from drains tend to be slightly greater in dry years due to increased evaporative demand.

Based on the OID analysis of drainage watersheds, the destination of boundary outflows was assigned to each drainage watershed, and the volume of outflow to each drainage destination was estimated. The areas contributing to each outflow destination are shown in Figure 5-9, along with an estimate of the average seasonal boundary outflow volume.

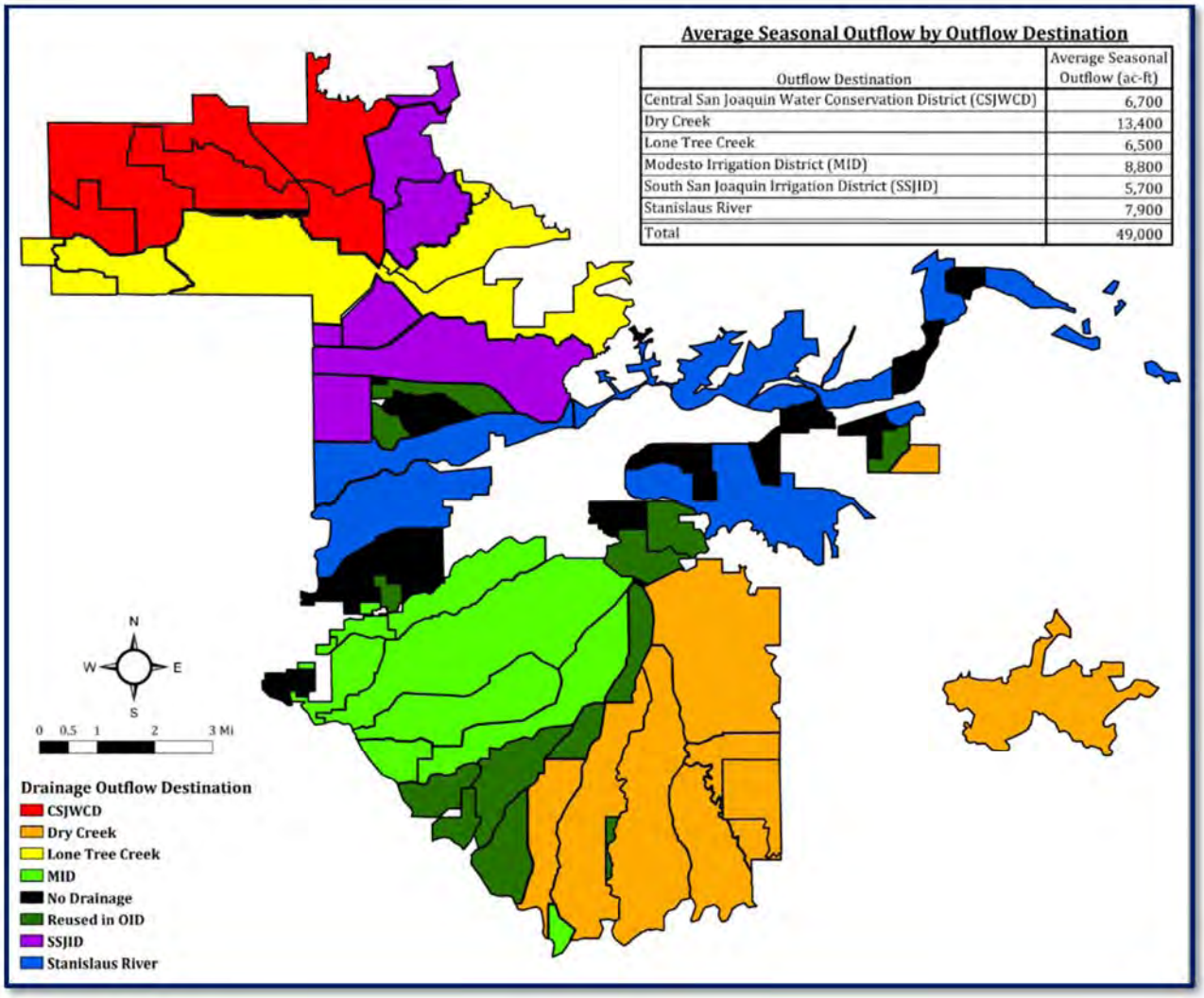

Figure 5-9. OID Drainage Watersheds, Outflow Destinations, and Average Seasonal Boundary Outflow Volume[12].

The quality of OID drainwater has not been documented; however, it is considered suitable for agricultural purposes, having been used for irrigation for many years in MID and SSJID.

5.7 Water Accounting (Summary of Water Balance Results)

The OID water balance structure was shown previously in Figure 5-1. The water balance was prepared for three accounting centers: (1) the OID distribution system, (2) farmed lands within

[12] Figure 5-9 does not incorporate changes in OID's service area resulting from annexations in 2014. Areas annexed in 2014 are not believed to produce significant drainage.

OID, and (3) the OID drainage system. Additionally, the water balance can be summarized for the OID service area as a whole ("District Water Balance Boundary" shown in Figure 5-1). An accounting center representing the groundwater system is also included in Figure 5-1 to account for exchanges between the vadose zone and the aquifers underlying OID; however, a complete balance for the underlying aquifer is not calculated because not all subsurface inflows and outflows have been estimated. Tabulated water balance results for each accounting center are provided in Tables 5-13, 5-14, and 5-15, followed by the water balance for the OID service area as a whole (Table 5-16).

As depicted in Figure 5-1, extensive interconnection occurs among the accounting centers due to recapture and reuse of water by both OID and directly by the water users. Specifically, surface runoff of water applied to farmed lands flows directly back into the District distribution system in some cases, as well as into the District drainage system. Within the drainage system, reuse of water originating as system spillage and surface runoff from farms is practiced by both the District and individual water users. These methods of water recovery and reuse result in higher levels of aggregate performance (i.e., efficiency) than would otherwise occur.

The water balance is presented on an annual time step (January through December). Underlying the annual time step is a more detailed water balance in which all flow paths are determined on a monthly or more frequent time step. Unmeasured intercepted stormwater through the district conveyance and drainage system in the winter months is not accounted for within the water balance, as winter storm flows do not directly pertain to OID's water management activities.

5.7.1 Distribution System Water Balance

Over the 2005 to 2014 period, the District's distribution system total inflows from Goodwin Dam ranged from 200,000 af to 262,000 af with a wet year average of 222,000 af and a dry year average of 236,000 af. The overall average for the ten year period was 230,000 af. These surface water inflows from the Stanislaus River are net of external transfers to SEWD or USBR. Diversions are greater in dry years due to the fact that less precipitation is available to support crop water demands in OID and evaporative demands tend to be greater. As a result, additional irrigation deliveries are needed to maintain crop production.

Other sources of supply include OID groundwater pumping, drainwater reuse, tailwater reuse, recycled water discharged to the OID distribution system, and precipitation directly entering the distribution system. As indicated in Table 5-13, OID groundwater pumping ranged from 1,500 af to 18,300 af between 2005 and 2014 with a wet year average of 2,900 af and a dry year average of 12,200 af. The overall average for the ten year period was 8,500 af. Additional pumping in dry years reflects increased crop water demand due to dry conditions and increased evaporative demand, as well as operation of wells by OID to offset reduced surface water supply.

OID drainwater reuse ranged from 6,500 af to 11,200 af between 2005 and 2014 with a wet year average of 8,500 af and a dry year average of 8,900 af. The overall average for the ten year period of the water balance was 8,800 af. The annual reuse of drainwater by OID is relatively steady because the cost of pumping to reclaim the water is relatively low, and the pumps are located in the

lower portions of the distributions system, providing a readily available source of supply without the need to route water through the system from Goodwin Dam. Despite the relatively steady reuse of drainwater over time, pumping does tend to be greater during dry years, primarily due to increased irrigation demand.

Table 5-13. OID Distribution System Annual Water Balance Results, 2005 to 2014.

Year	Irrigation Season Number of Days	USBR Allocation	Hydro-logic Year Type	Inflows (ac-ft)						Outflows (ac-ft)							
				System Inflows	District Ground-water Pumping	District Drain-water Reuse	Precipi-tation	District Tail-water Reuse	Recycled to Distribution System	Transfers (VAMP Pulse Flows)	Deliveries to Knights Ferry	Deliveries to Annual Contracts	Riparian ET	Evapo-ration	Operational Spillage	Seepage	**Farm Deliveries (Closure)**
2005	181	Full	Wet	223,867	2,057	10,068	83	2,433	2,097	0	2,788	5,950	1,377	1,600	13,522	33,230	**182,140**
2006	175	Full	Wet	226,202	1,527	8,956	49	1,849	2,097	0	2,495	5,508	1,373	1,596	18,222	32,129	**179,358**
2007	214	Partial	Dry	262,185	7,505	10,099	133	2,006	2,097	2,185	2,997	5,663	1,604	1,863	19,407	39,289	**211,017**
2008	205	Partial	Dry	244,610	14,862	11,154	15	1,957	2,097	7,260	2,876	8,382	1,600	1,859	14,969	37,636	**200,113**
2009	200	Full	Dry	234,565	15,690	9,669	93	2,088	2,097	0	2,754	5,689	1,552	1,803	14,356	36,718	**201,328**
2010	205	Full	Wet	216,957	5,683	7,729	197	2,028	2,097	0	2,390	4,573	1,479	1,718	14,958	35,952	**173,621**
2011	192	Full	Wet	219,154	2,311	7,430	153	2,215	2,097	0	2,324	6,344	1,410	1,638	15,677	33,672	**172,295**
2012	218	Full	Dry	231,531	6,634	8,219	168	2,367	2,097	0	2,383	3,666	1,608	1,868	15,908	38,232	**187,352**
2013	214	Partial	Dry	244,206	10,112	7,705	55	2,221	2,097	0	2,550	234	1,660	1,929	16,579	37,531	**205,914**
2014	208	Partial	Dry	199,945	18,298	6,518	76	1,362	2,097	0	1,988	217	1,607	1,867	14,291	36,479	**171,847**
			Minimum	199,945	1,527	6,518	15	1,362	2,097	0	1,988	217	1,373	1,596	13,522	32,129	**171,847**
			Maximum	262,185	18,298	11,154	197	2,433	2,097	7,260	2,997	8,382	1,660	1,929	19,407	39,289	**211,017**
			Wet Year Average	221,545	2,894	8,546	121	2,132	2,097	0	2,499	5,594	1,410	1,638	15,595	33,746	**176,853**
			Dry Year Average	236,174	12,184	8,894	90	2,000	2,097	1,574	2,591	3,975	1,605	1,865	15,918	37,647	**196,262**
			Overall Average	230,322	8,468	8,755	102	2,053	2,097	945	2,554	4,623	1,527	1,774	15,789	36,087	**188,498**

Table 5-14. OID Farmed Lands Annual Water Balance Results, 2005 to 2014.

Year	Irriga-tion Season Num-ber of Days	USBR Allocation	Hydro-logic Year Type	Applied Water Balance										Precipitation Balance				
				Inflows (af)				Outflows (af)						Inflows (af)	Outflows (af)			
				OID Farm Deliveries	Private Drain-water Reuse	Private Ground-water Pumping	Recycled to Farm Lands	Crop ET of Applied Water	Tail-water to Drainage System	District Tail-water Reuse	**Deep Percolation of Applied Water (Closure)**	Change in Storage (af)	Crop Consump-tive Use Fraction (CCUF)	Precipitation	Crop ET of Precipi-tation	Runoff of Precipi-tation	Deep Percolation of Precipi-tation	**Change in Storage (Closure, af)**
2005	181	Full	Wet	182,140	3,168	15,962	1,168	109,013	53,723	2,433	**37,269**	0	0.54	64,895	49,952	4,095	25,709	**-14,861**
2006	175	Full	Wet	179,358	3,256	19,655	1,168	125,829	41,714	1,849	**34,043**	0	0.62	53,638	37,140	4,096	15,686	**-3,283**
2007	214	Partial	Dry	211,017	3,782	22,484	1,168	143,846	46,535	2,006	**46,064**	0	0.60	37,724	27,625	1,330	6,613	**2,156**
2008	205	Partial	Dry	200,113	3,794	23,157	1,168	148,477	45,964	1,957	**31,835**	0	0.65	41,076	27,710	2,562	11,339	**-535**
2009	200	Full	Dry	201,328	3,692	22,290	1,168	146,150	50,279	2,088	**29,960**	0	0.64	39,448	27,858	2,272	7,473	**1,845**
2010	205	Full	Wet	173,621	3,208	17,990	1,168	118,667	47,340	2,028	**27,951**	0	0.61	82,032	42,332	4,114	20,508	**15,077**
2011	192	Full	Wet	172,295	3,108	17,683	1,168	118,230	50,498	2,215	**23,309**	0	0.61	49,621	45,069	2,804	17,599	**-15,851**
2012	218	Full	Dry	187,352	4,480	21,467	1,168	142,672	57,815	2,367	**11,614**	0	0.67	58,669	27,385	3,158	11,359	**16,766**
2013	214	Partial	Dry	205,914	4,935	24,673	1,168	160,870	54,201	2,221	**19,398**	0	0.68	18,537	24,369	952	7,474	**-14,258**
2014	208	Partial	Dry	171,847	4,624	45,866	1,168	170,493	38,355	1,362	**13,294**	0	0.76	65,408	27,461	6,285	12,074	**19,587**
			Minimum	171,811	3,108	15,962	1,168	109,013	38,355	1,362	**11,614**	0	0.54	18,537	24,369	952	6,613	**-15,851**
			Maximum	210,995	4,935	45,866	1,168	170,493	57,815	2,433	**46,064**	0	0.76	82,032	49,952	6,285	25,709	**19,587**
			Wet Year Average	176,776	3,185	17,823	1,168	117,935	48,319	2,132	**30,643**	0	0.59	62,546	43,623	3,777	19,876	**-4,729**
			Dry Year Average	196,231	4,218	26,656	1,168	152,085	48,858	2,000	**25,361**	0	0.67	43,477	27,068	2,760	9,389	**4,260**
			Overall Average	188,449	3,805	23,123	1,168	138,425	48,642	2,053	**27,474**	0	0.64	51,105	33,690	3,167	13,584	**664**

Table 5-15. OID Drainage System Annual Water Balance Results, 2005 to 2014.

Year	Number of Days	USBR Allocation	Hydro-logic Year Type	Inflows (af)				Outflows (af)					
				Opera-tional Spillage	**Tailwater to Drainage System (Closure)**	Runoff of Precipi-tation	Precipi-tation	Drain-water Outflow	District Drain-water Reuse	Seepage	Private Drain-water Reuse	Evapo-ration	Riparian ET
2005	181	Full	Wet	13,522	**53,723**	4,095	10	52,312	10,068	5,364	3,168	266	171
2006	175	Full	Wet	18,222	**41,714**	4,096	6	46,204	8,956	5,186	3,256	265	171
2007	214	Partial	Dry	19,407	**46,535**	1,330	17	46,556	10,099	6,342	3,782	309	200
2008	205	Partial	Dry	14,969	**45,964**	2,562	2	41,964	11,154	6,076	3,794	309	199
2009	200	Full	Dry	14,356	**50,279**	2,272	12	47,138	9,669	5,927	3,692	299	193
2010	205	Full	Wet	14,958	**47,340**	4,114	25	48,956	7,729	6,076	3,208	285	184
2011	192	Full	Wet	15,677	**50,498**	2,804	19	52,322	7,430	5,690	3,108	272	176
2012	218	Full	Dry	15,908	**57,815**	3,158	28	57,238	8,219	6,461	4,480	310	200
2013	214	Partial	Dry	16,579	**54,201**	952	9	52,232	7,705	6,342	4,935	320	207
2014	208	Partial	Dry	14,291	**38,355**	6,285	13	41,127	6,518	6,164	4,624	310	200
			Minimum	13,522	**38,355**	952	2	41,127	6,518	5,186	3,108	265	171
			Maximum	19,407	**57,815**	6,285	28	57,238	11,154	6,461	4,935	320	207
			Wet Year Average	15,595	**48,319**	3,777	15	49,948	8,546	5,579	3,185	272	176
			Dry Year Average	15,918	**48,858**	2,760	13	47,709	8,894	6,219	4,218	310	200
			Overall Average	15,789	**48,642**	3,167	14	48,605	8,755	5,963	3,805	295	190

Table 5-16. OID Overall Water District Water Balance Results, 2005 to 2014.

Year	Num-ber of Days	USBR Allocation	Hydro-logic Year Type	Inflows (af)					Outflows (af)										Change in Stor-age (af)
				System Inflows	District Ground-water Pumping	Precipi-tation	Private Ground-water Pumping	OID and Private Recycled	Transfers (VAMP Pulse Flows)	Deliveries to Knights Ferry	Deliveries to Annual Contracts	Drain-water Outflow	Canal and Drain Seepage	Deep Percolation of Applied Water	Deep Percolation of Precipitation	Riparian ET and Evaporation	Crop ET of Applied Water	Crop ET of Precipitation	
2005	181	Full	Wet	223,867	2,057	64,988	15,962	3,265	0	2,788	5,950	52,312	38,594	37,269	25,709	3,414	109,013	49,952	-14,861
2006	175	Full	Wet	226,202	1,527	53,694	19,655	3,265	0	2,495	5,508	46,204	37,315	34,043	15,686	3,405	125,829	37,140	-3,283
2007	214	Partial	Dry	262,185	7,505	37,873	22,484	3,265	2,185	2,997	5,663	46,556	45,631	46,064	6,613	3,976	143,846	27,625	2,156
2008	205	Partial	Dry	244,610	14,862	41,093	23,157	3,265	7,260	2,876	8,382	41,964	43,712	31,835	11,339	3,967	148,477	27,710	-535
2009	200	Full	Dry	234,565	15,690	39,552	22,290	3,265	0	2,754	5,689	47,138	42,646	29,960	7,473	3,848	146,150	27,858	1,845
2010	205	Full	Wet	216,957	5,683	82,254	17,990	3,265	0	2,390	4,573	48,956	42,028	27,951	20,508	3,667	118,667	42,332	15,077
2011	192	Full	Wet	219,154	2,311	49,792	17,683	3,265	0	2,324	6,344	52,322	39,363	23,309	17,599	3,495	118,230	45,069	-15,851
2012	218	Full	Dry	231,531	6,634	58,865	21,467	3,265	0	2,383	3,666	57,238	44,693	11,614	11,359	3,986	142,672	27,385	16,766
2013	214	Partial	Dry	244,206	10,112	18,601	24,673	3,265	0	2,550	234	52,232	43,873	19,398	7,474	4,116	160,870	24,369	-14,258
2014	208	Partial	Dry	199,945	18,298	65,497	45,866	3,265	0	1,988	217	41,127	42,643	13,294	12,074	3,984	170,493	27,461	19,587
			Minimum	199,945	1,527	18,601	15,962	3,265	0	1,988	217	41,127	37,315	11,614	6,613	3,405	109,013	24,369	-15,851
			Maximum	262,185	18,298	82,254	45,866	3,265	7,260	2,997	8,382	57,238	45,631	46,064	25,709	4,116	170,493	49,952	19,587
			Wet Year Average	221,545	2,894	62,682	17,823	3,265	0	2,499	5,594	49,948	39,325	30,643	19,876	3,495	117,935	43,623	-4,729
			Dry Year Average	236,174	12,184	43,580	26,656	3,265	1,574	2,591	3,975	47,709	43,866	25,361	9,389	3,979	152,085	27,068	4,260
			Overall Average	230,322	8,468	51,221	23,123	3,265	945	2,554	4,623	48,605	42,050	27,474	13,584	3,786	138,425	33,690	664

OID tailwater reuse has been quite steady over time, varying between 1,400 af and 2,400 af between 2005 and 2014 with an average of approximately 2,100 af per year regardless of the year type. Similarly, the reuse of recycled water by OID has been relatively steady over time and is estimated to be 2,100 af annually between 2005 and 2014. The estimated contribution of direct precipitation to the OID water supply is very small, ranging from 15 af to 200 af between 2005 and 2014, with an average of 100 af.

Overall, OID groundwater pumping, drainwater reuse, tailwater reuse, and recycled water reuse represent a total supply of approximately 25,000 af in dry years (10% of average dry year supply) and 16,000 af in wet years (7% of average wet year supply).

The objectives of OID's water operations are to meet demands for farm irrigation (including deliveries to Knights Ferry water users and annual contracts for outside water sales). Comparing total deliveries to meet irrigation demand and transfers of water through the OID distribution system to total water supply, net of precipitation (which is small and essentially impossible to manage for), a Delivery Fraction (DF) may be calculated to provide an indicator of distribution system performance. The DF is calculated by dividing total deliveries from the distribution system to meet various objectives by total supply, net of precipitation. For OID, the DF ranged from 0.77 to 0.80 between 2005 and 2014 with an average of 0.79. The DF has been similar in wet and dry years.

Losses from the distribution system at the water supplier scale include seepage, spillage, evaporation, and riparian ET[13]. Of the four loss types, only evaporation and riparian ET are non-recoverable, as seepage recharges the underlying groundwater system and spillage is available for beneficial use within OID or by down-gradient water users. Between 2005 and 2014, seepage ranged between 32,000 and 39,000 af with an average of 36,000 af for the irrigation season. The primary driver of seepage is the irrigation season length, though seepage losses have additionally been reduced following the 2009 irrigation season as a result of rehabilitating and relining portions of the South Main Canal.

Losses from operational spill varied from 14,000 af to 19,000 af between 2005 and 2014 with an average of 16,000 af per year. Spillage losses appear similar in wet and dry years. In the future, all else equal, it is anticipated that spillage losses will decrease as a result of increased regulating storage and as additional flow control and measurement structures are installed and operated; however, these reductions may be partially or fully offset by additional spillage occurring due to increased delivery flexibility to water users, which will make operation of the system more challenging for OID staff.

Evaporation losses are relatively small and constant over time. Variations from irrigation season to irrigation season result primarily from differences in season length and evaporative demand (i.e., weather) over time. Between 2005 and 2014, evaporation losses varied from 1,600 af to 1,900 af, with an average of 1,800 af in losses per year.

[13] Although riparian ET is not an intended use of OID water supplies and can be considered a loss, removal of riparian vegetation could result in environmental impacts.

Comparing total inflows to the OID distribution system available to meet irrigation and other demands (i.e., total supply) to total outflows to meet demands plus recoverable losses to seepage and spillage, a Water Management Fraction (WMF) may be calculated at the water supplier scale. This fraction is calculated as the ratio of farm deliveries, operational spillage, and seepage to total irrigation supply. Over the period from 2005 to 2014, the WMF was consistently 0.99, indicating that essentially all of OID's water supply is used to meet demands or is recoverable for beneficial use by downgradient water users.

5.7.2 Farmed Lands Water Balance

Over the 2005 to 2014 period, OID farm deliveries ranged from 172,000 af to 211,000 af for the irrigation season with a wet year average of 177,000 af and a dry year average of 196,000 af. The overall average for the ten year period was 188,000 af. Deliveries are greater in dry years due to the fact that less precipitation is available to support crop water demands in OID and evaporative demands tend to be greater. As a result, additional irrigation deliveries are needed to maintain crop production.

Other sources of farm supply include private groundwater pumping, private drainwater pumping, and recycled water delivered directly to farms. As indicated in Table 5-14, private groundwater pumping ranged from 16,000 af to 46,000 af between 2005 and 2014 with a wet year average of 18,000 af and a dry year average of 27,000 af. The overall average for the ten year period was 23,000 af. Additional pumping in dry years reflects increased crop water demand due to dry conditions and increased evaporative demand, as well as operation of wells by growers to offset reduced surface water supply from OID.

Private drainwater reuse ranged from 3,100 af to 4,900 af between 2005 and 2014 with a wet year average of 3,200 af and a dry year average of 4,200 af. The overall average for the ten year period of the water balance was 3,800 af. Additional drainwater reuse in dry years reflects increased crop water demand due to dry conditions and increased evaporative demand, as well as grower needs to offset reduced surface water supply from OID.

Recycled water reuse is relatively steady over time due to steady generation of discharge by food processors who provide recycled water directly to growers. Recycled water reuse is relatively steady over time due to steady generation of discharge by food processors who provide recycled water directly to growers. Recycled water use is estimated to be 1,200 af per year.

Overall, private groundwater pumping, private drainwater reuse, and recycled water reuse represent a total supply of approximately 32,000 af in dry years (14% of total supply) and 22,000 af in wet years (11% of total supply).

The objective of irrigation is to meet crop consumptive demand (ET_{aw}) along with any other agronomic on-farm water needs. Comparing total applied irrigation water to ET_{aw}, a Crop Consumptive Use Fraction (CCUF) may be calculated to provide an indicator of on-farm irrigation performance. The CCUF is calculated on an annual basis by dividing total ETaw by total applied irrigation water. For OID, the CCUF ranged from 0.54 to 0.76 between 2005 and 2014 with an

average of 0.64. The CCUF has been greater in dry years than wet years, averaging 0.67 and 0.59; respectively.

Losses from the farmed lands include tailwater (flowing to either the drainage system or back into the OID distribution system) and deep percolation of applied water. All of the losses are recoverable, as tailwater may be used by downstream water users for irrigation or other purposes, and deep percolation of applied water recharges the underlying groundwater system. Between 2005 and 2014, tailwater to the drainage system ranged between 39,000 and 58,000 af with an average of 49,000 af. Tailwater to the distribution system ranged from 1,400 af to 2,400 af with an average of 2,100 af.

Deep percolation of applied water varied from 12,000 af to 46,000 af between 2005 and 2014 with an average of 27,000 af per year. Deep percolation losses are greater in wet years than dry years, averaging 30,000 af and 25,000 af, respectively. Annual fluctuations in deep percolation estimates result from differences in rainfall patterns and resulting applied water demands, as well as from uncertainty in the flow paths used to calculate the deep percolation amount. Due to the relatively large uncertainty in the deep percolation of applied water estimate, it is difficult to identify clear trends resulting from changes in hydrology or other factors over time. Moving forward, it is anticipated that the confidence with which deep percolation of applied water can be estimated will improve as delivery measurement accuracy improves.

5.8 Water Supply Reliability

OID requires a reliable water supply to meet crop irrigation demand. The primary crops grown in OID of pasture and other forage crops are needed as a food supply to sustain beef cattle and dairy herds in the District. The remaining crops are primarily orchard and vineyard crops that additionally require a steady water supply. The reliability of OID's water supplies is discussed in detail in Section 4.

6. Climate Change

6.1 Introduction

Climate change has the potential to directly impact OID's surface water supply and to indirectly impact groundwater supplies. OID is committed to adapting to climate change in a manner that protects the water resources for the maximum benefit of the Oakdale Irrigation District community while continuing to provide excellent irrigation and domestic water service. This section includes a discussion of the potential effects of climate change on OID and its water supply, followed by a description of the resulting potential impacts on water supply and quality and on water demand. Finally, actions currently underway or that could be implemented to help mitigate future impacts are identified.

6.2 Potential Climate Change Effects

Several potential effects of climate change have been identified by the scientific community, including reduced winter snowpack, more variable and extreme weather conditions, shorter winters, and increased evaporative demand. Additionally, climate change could affect water quality through increased flooding and erosion; greater concentration of contaminants, if any, in the water supply; and warmer water which could lead to increased growth of algae and other aquatic plants. Rising sea level and increased flooding are also potential effects of climate change. OID does not serve a flood management role and is not located in the Sacramento-San Joaquin River Delta. As a result, this discussion of climate change focuses on climate change effects and impacts related to OID water supply and demand and does not discuss potential effects of rising sea level and increased flooding.

6.2.1 Changes in April-July Runoff

Some climate change impacts are suggested by available data describing unimpaired Stanislaus River flows from 1900 to 2014 at Goodwin Dam[14]. Over the last 100 years, April to July unimpaired runoff as a percentage of total water year flows shows a decreasing trend (Figure 6-1), suggesting that more runoff is occurring during the winter period.

6.2.2 Changes in Total Runoff

Total water year runoff does not appear to have decreased substantially over the last century; however, recent projections reported by USBR suggest that total runoff could decrease over the next 100 years (USBR 2011), as shown in Figure 6-2. The figure shows the 5th percentile, median, and 95th percentile annual Stanislaus River runoff at New Melones Reservoir for 2010 to 2100 based on 112 separate hydrologic projections.

[14] Unimpaired Stanislaus River flows at Goodwin Dam are considered analogous to inflows to New Melones Reservoir for purposes of this analysis.

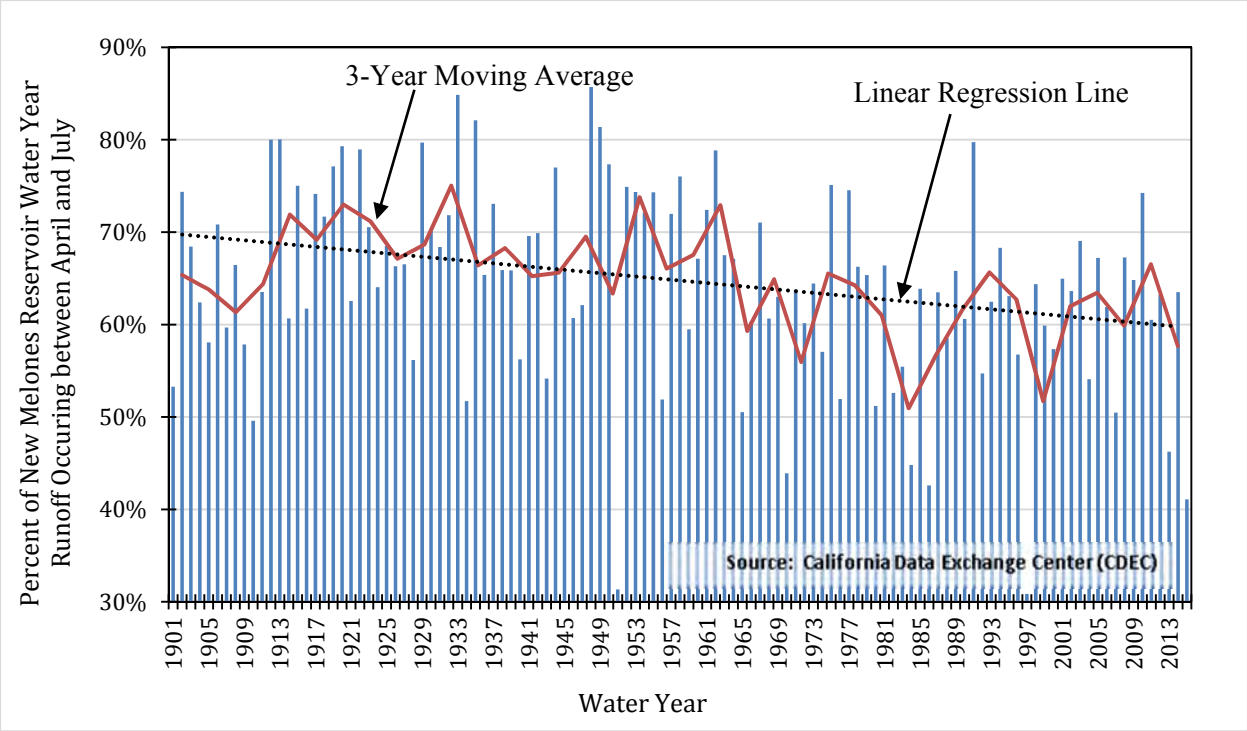

Figure 6-1. Annual April through July Unimpaired Runoff for Stanislaus River at New Melones Reservoir, 1901 – 2014.

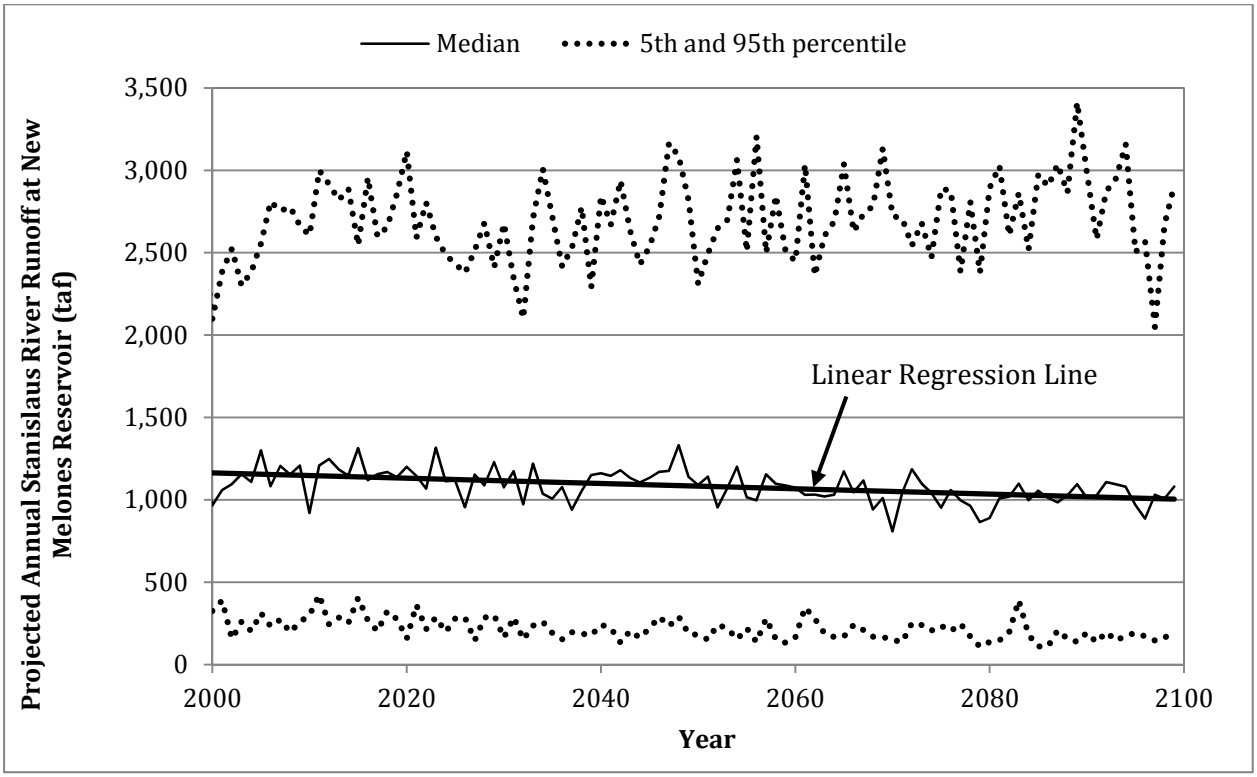

Figure 6-2. Annual Stanislaus River Runoff at New Melones Reservoir Based on 112 Hydrologic Projections (USBR 2011).

6.2.3 Changes in Temperature, Precipitation, and Evapotranspiration

Climate change has the potential to affect crop evapotranspiration and resulting irrigation water demands within OID. Changes in precipitation, temperature, and atmospheric CO_2 affect crop evapotranspiration (ET) and net irrigation water requirements (NIWR). Global climate models (GCMs) have been used to project future climate change and impacts on crop water demands. In particular, the Bureau of Reclamation released a report entitled West-Wide Climate Risk Assessment: Irrigation Demand and Reservoir Evaporation Projections in February 2015 (USBR 2015). The study uses climate change projections to calculate future ET and NIWR throughout the Western U.S., including California's Central Valley. Projections for the Central Valley were developed for DWR planning units used to evaluate statewide water supplies and demands as part of the California Water Plan. OID's service area falls within Planning Unit 607 (PU607), as shown in Figure 6-3. This section describes potential changes in crop ET, a climate change effect, while climate change impacts on NIWR are described in Section 6.4, below.

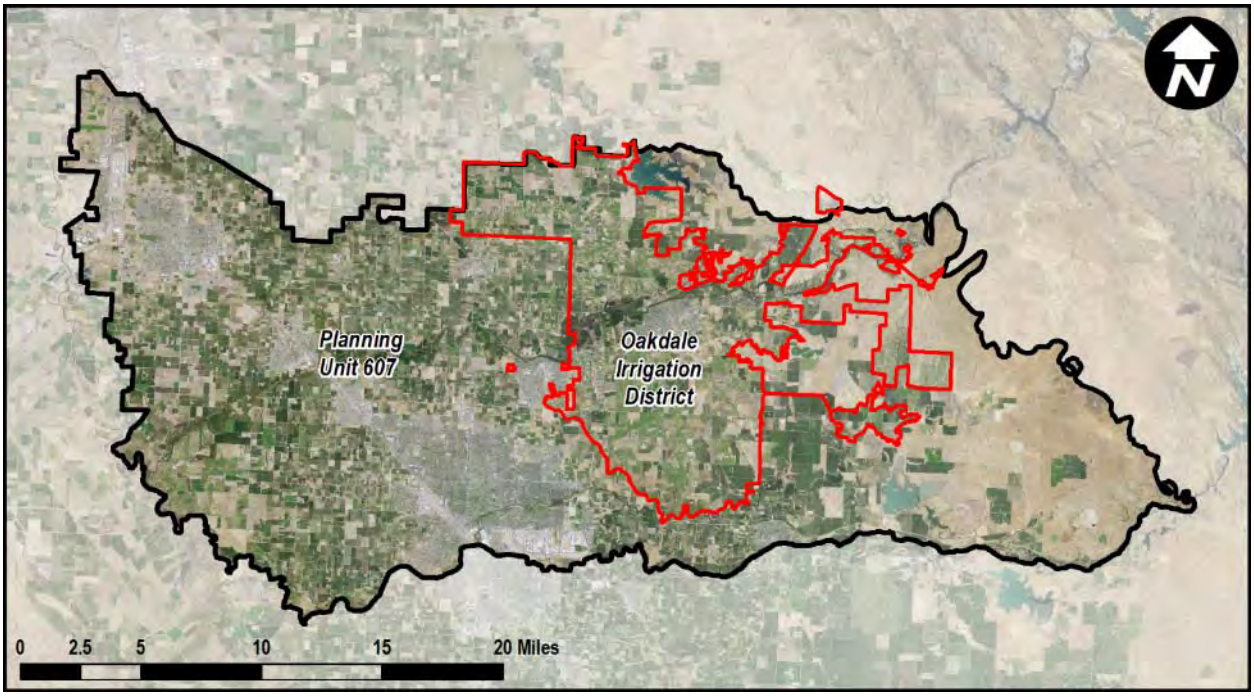

Figure 6-3. Planning Unit 607.

The USBR study utilizes future climate projections from GCMs to simulate potential future crop evapotranspiration and to estimate resulting net irrigation water requirements. The specific dataset selected for predicting future irrigation demands was the World Climate Research Program (WCRP) Coupled Model Intercomparison Project Phase 3 (CMIP3) GCM projections. Original GCM projections are developed at a spatial resolution of 100 to 250 km. In order to develop projections on a usable scale to support local and regional planning, CMIP3 projections were downscaled to 12 km square sections using the statistical algorithm known as bias comparison and spatial disaggregation (BCSD). One hundred and twelve BCSD-CMIP3 projections were created based on combinations of GCM and potential future greenhouse gas emission scenarios.

Crop ET and NIWR were estimated using a model simulating crop growth and irrigation demands over time under baseline and modified climate scenarios. Specifically, the ET Demands model, a daily root zone water balance simulation applying the FAO56 dual crop coefficient approach, was used to estimate crop ET and NIWR. Reference ET was calculated based on climate projections for each of the five modeled climate scenarios using the FAO-56 reference ET approach. The GCM output climate variables used were limited to daily maximum and minimum temperature and daily precipitation. Other climate parameters needed to estimate reference ET, such as solar radiation, humidity, and wind speed were approximated for baseline and future time periods using empirical equations. In order to evaluate potential impacts of changes in temperature on the timing of crop growth and overall season length, simulations were conducted assuming both static and dynamic crop phenology. To simulate dynamic phenology, growing degree day (GDD) based crop curves were used. By incorporating GDD into the analysis, projected changes in temperature influence the timing and speed of crop growth. Increased temperatures result in earlier, shorter growing seasons for annual crops. Crop evapotranspiration is projected to increase in areas where perennial crops are grown, and smaller increases are projected for areas where annual crops are grown.

Potentially, each of the 112 climate projections could be simulated in the ET Demands model to develop projections of future ET and NIWR; however, due to the wide variety of crop types and agricultural practices in the West this would create enormous computation and data handling requirements. Instead, five different climate change scenarios were created using the ensemble hybrid formed delta method. The future conditions of warm-dry, warm-wet, hot-dry, hot-wet and central tendency were used. Three future periods for the five conditions were selected to project climate change, including the 2020's (2010-2039), 2050's (2040-2069) and 2080's (2070-2099).

Average air temperature in PU607 is projected to increase for each of the five scenarios and for each future period as shown in Figure 6-4. Projected temperature increases range from 1.2 to 2.5 deg. F during the 2020's period, 2.6 to 4.4 deg. F during the 2050's period, and 3.8 to 6.6 deg. F during the 2080's period.

Potential changes in precipitation resulting from climate change are relatively uncertain for California's Central Valley due to uncertainty in the future position of the jet stream. As a result some GCMs and emission scenario combinations predict increased precipitation under climate change while other combinations predict decreased precipitation. Percent changes in projected average annual precipitation for PU607 are shown in Figure 6-5. Under wetter conditions increases in precipitation of 3.9 to 9.5 percent between the 2020's and the 2080's are predicted, while under drier conditions decreases in precipitation of 8.8 to 15.7 percent between the 2020's and the 2080's are predicted. The central tendency results in a predicted slight decrease in precipitation of 2.0 to 3.8 percent between the 2020's and the 2080's.

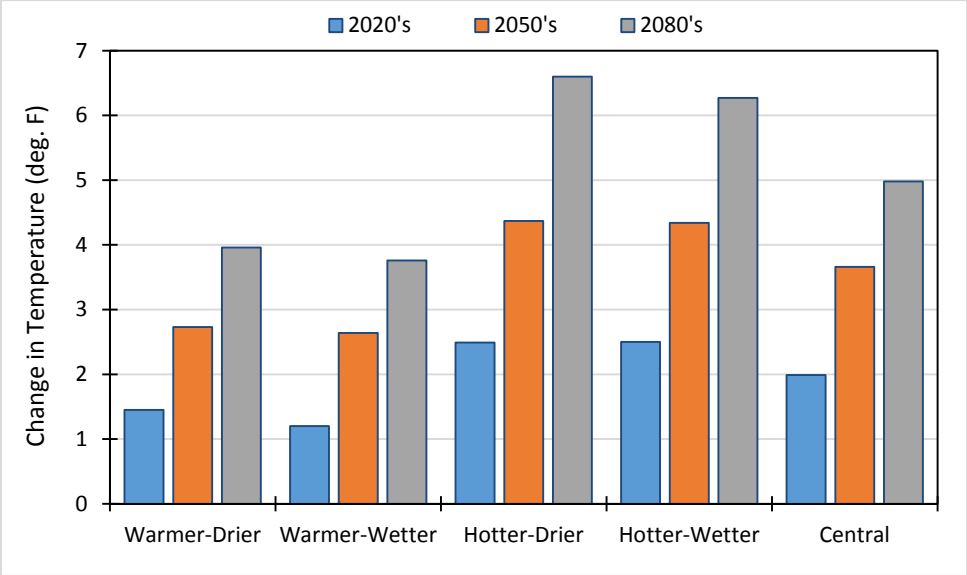

Figure 6-4. WWCRA Projected Temperature Change.

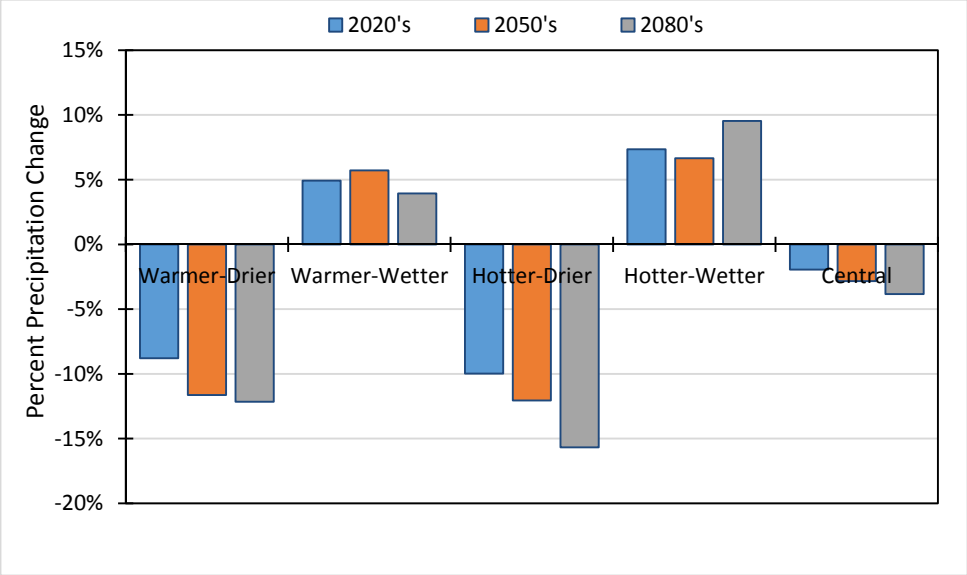

Figure 6-4. WWCRA Projected Precipitation Change.

From the projected temperature and precipitation results, WWCRA developed estimates of projected reference ET and actual ET. The results are shown below in Figures 6-5 and 6-6, respectively. Increases in both reference ET and actual ET are projected. Projected reference ET increases range from 1.7 to 3.6 percent during the 2020's period, 3.7 to 6.1 percent during the 2050's period, and 5.1 to 9.2 percent during the 2080's period. Projected actual ET increases range from 0.7 to 1.4 percent during the 2020's period, 1.3 to 2.1 percent during the 2050's period, and 1.7 to 2.6 percent during the 2080's period. Reference ET is expected to increase significantly more than actual ET due to changes in phenology of annual crops, as discussed in the following paragraph.

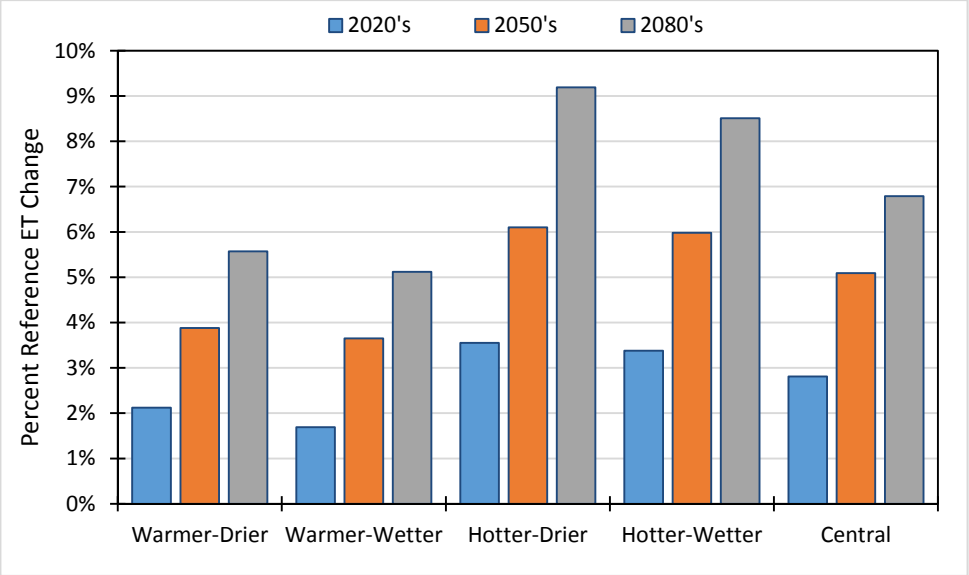

Figure 6-5. WWCRA Projected Reference ET Change.

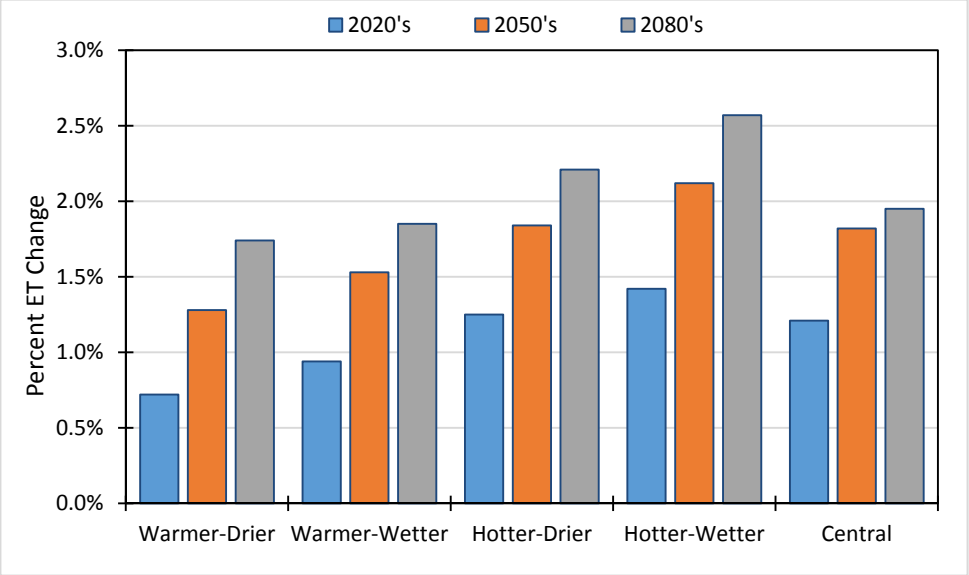

Figure 6-6. WWCRA Projected Crop ET Change Assuming Non-Static Phenology.

Projected actual ET estimates assume non-static phenology for annual crops rather than static phenology. Non-static phenology may be more accurate as plant growth depends heavily on temperature. With temperature increases, crop growing seasons are expected to be shorter, which is accounted for in non-static phenology by using growing degree days. There is less projected impact on actual ET with non-static phenology than when static phenology is assumed. If static crop phenology is assumed, percent changes in actual ET are similar to projected changes in reference ET. Reference ET is expected to increase significantly more due to projected temperature increases.

6.3 Potential Impacts on Water Supply and Quality

The shift in runoff to the winter period and projected reduction in total runoff have the potential to impact surface water supply in the future if sufficient storage is not available to retain winter runoff until it is needed to meet irrigation demands and to provide additional carryover storage from wet years to dry years. OID's annual entitlement is based on total annual inflows to New Melones Reservoir, so the timing of runoff may not strongly affect OID's annual allotment.

Reduced total inflows to New Melones Reservoir in the future would increase the probability that total inflows to the reservoir would be less than 600,000 af in a given year, resulting in allotments less than 300,000 af more often than predicted based on analysis of historical data.

Increased erosion and turbidity under climate change, if it occurred, would likely not significantly affect the water quality of the Stanislaus River as it affects agricultural irrigation. Additionally, there are no known contaminants that could be concentrated to levels that would affect agricultural irrigation if spring runoff were to decrease, particularly due to the dilution of such contaminants in reservoirs upstream of the District. Increased water temperature could result in additional challenges to OID in controlling aquatic plants in its distribution system to maintain capacity, to the extent that the increase is great enough to result in substantially increased plant growth. Increased turbidity and algae growth, if substantial, could pose challenges to filtering OID canal water for micro-irrigation.

According to the Eastern San Joaquin Integrated Regional Water Management Plan (ESJ IRWMP 2014) and other sources, climate change is expected to bring more frequent and more severe droughts in the future. With changing rainfall patterns, groundwater basins may experience less recharge in the long term. Groundwater pumping volumes are at their greatest during droughts because there is less surface water to meet water demands. This increases the difficulty of sustainably managing groundwater basins and preventing negative impacts to water quality.

6.4 Potential Impacts on Water Demand

The WWCRA suggests that crop ET will increase in coming decades due to temperature increase and other factors (USBR 2015). Additionally, changes in precipitation timing and amounts could result in greater irrigation requirements to meet ET demands. Changes in the timing of crop planting, development, and harvest could also result in changes to the timing of irrigation demands during the year; all impacting the NIWR. Net irrigation water requirements (NIWR) are expected to increase for all climate scenarios presented, as shown in Figure 6-7. Projected NIWR increases range from 1.5 to 3.2 percent during the 2020's period, 1.8 to 4.7 percent during the 2050's period, and 2.2 to 5.4 percent during the 2080's period. Projected NIWR are based on non-static crop phenology for annual crops.

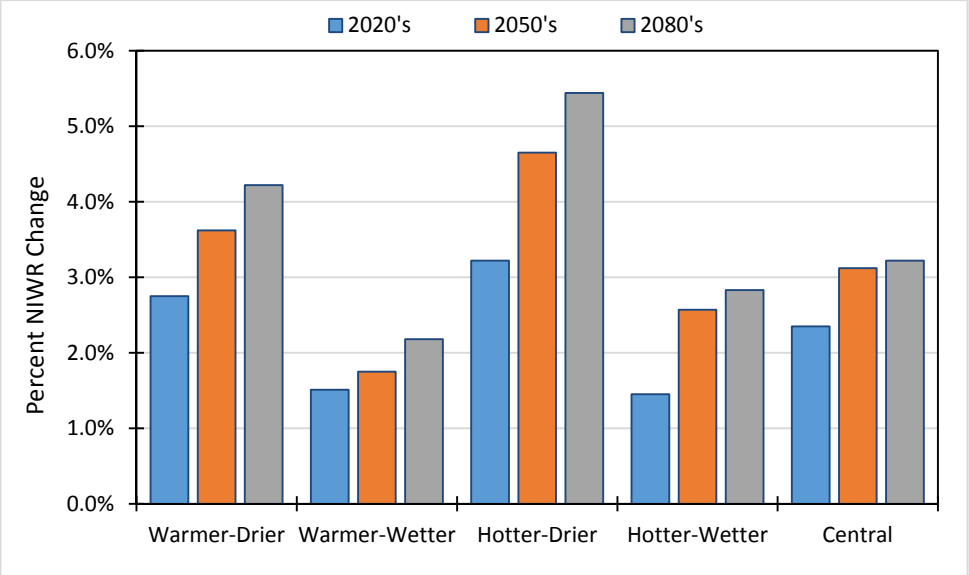

Figure 6-7. WWCRA Projected Net Irrigation Water Requirement Change Assuming Non-Static Phenology.

When interpreting results, several uncertainties must be accounted for. Estimating the effects of CO_2 on irrigation demand requires the use of physiological crop growth models and was not included in the WWCRA. In general, increased atmospheric CO_2 is expected to reduce stomatal conductance and transpiration, which would lead to reduced ET, all else equal. Changes in the types of crop grown, irrigated area, and irrigation efficiencies also affect NIWR. For further information, please refer to the WWCRA.

6.5 Potential Strategies to Mitigate Climate Change Impacts

Although there is growing consensus that climate change is occurring, and many scientists believe the effects of climate change are being observed, the timing and magnitude of climate change impacts remains uncertain. The District will mitigate climate change impacts with this uncertainty in mind through an adaptive management approach in cooperation with other regional stakeholders, including municipalities within the District, neighboring irrigation districts, and other affected parties. Under adaptive management, key uncertainties will be identified and monitored (e.g., April – July runoff as a percentage of annual runoff, total runoff, average temperature, reference evapotranspiration), and strategies will be developed to address the related climate change impacts. As the impacts are observed to occur, the strategies will be prioritized, modified as needed, and implemented.

Several strategies for agricultural water providers and other water resources entities to mitigate climate change impacts have been identified (DWR 2008, CDM 2011). These strategies include those identified as part of the California Water Plan 2009 and 2013 Update (DWR 2010a and 2014) as well as strategies identified as part of the California Climate Adaptation Strategy (CNRA 2009). Many of these strategies applicable to irrigation districts are already being implemented by the District in an appropriate manner to meet local water management objectives and will continue to serve the District well as climate change impacts occur.

Resource strategies that are being implemented or could be implemented by the District to adapt to climate change are summarized in Table 6-1.

Table 6-1. OID Position on Strategies to Mitigate Climate Change Impacts.

Source	Strategy	Status
California Water Plan (DWR 2010a and 2014)	Reduce water demand	The District is implementing all technically feasible and locally cost-effective EWMPs identified by SBx7-7 to achieve water use efficiency improvements in District operations and to encourage on-farm improvements. Additional actions to reduce water demand are considered on an ongoing basis as part of OID's water management activities.
	Improve operational efficiency and transfers	As described above and elsewhere in this AWMP, OID is aggressively implementing improvements to increase operational efficiency within OID. Additionally, OID an equal owner of the TriDam Project and Authority with SSJID as well as the San Joaquin River Tributaries Authority, which seek to maximize the efficiency of system storage operations at the regional scale. OID actively transfers water under willing seller-willing buyer agreements to satisfy agricultural, environmental, urban, and other water needs while reinvesting the income in capital improvements to modernize and rehabilitate District facilities.
	Increase water supply	OID has increased its available water supply through conservation, recycling and reuse of industrial and drainage water. In the future, OID will continue to seek additional opportunities to increase available water supply, including consideration of opportunities to increase conjunctive management programs to enhance available groundwater supplies during wet years in order to compensate for reduced recharge potential during drier years.
	Improve water quality	OID will continue to monitor groundwater quality as an IRGMP participant as well as monitoring the quality of surface water through its aquatic plant management activities and participation in the East San Joaquin Water Quality Coalition and San Joaquin and Delta Water Quality Coalition.
	Practice resource stewardship	OID intrinsically supports the stewardship of agricultural lands within and surrounding its service area through its irrigation operations. OID is a net contributor to the groundwater aquifer and has been an active participant in the Stanislaus and Tuolumne Rivers Groundwater Basin Association since its formation in 2006. Additionally, OID has actively supported protection of ecosystems through its participation in water transfers/releases effectuated on a fish-friendly schedule to assist in meeting the requirements of the OCAP Biological Opinion set forth by the National Marine Fisheries Service, while also benefiting other water agencies downstream. On the Stanislaus River, OID partnered with the USFWS starting in 2010 to complete the Honolulu Bar Floodplain Enhancement Project on the Stanislaus River. OID, through the Tri Dam Project, invests nearly $750,000 annually in fishery studies, habitat surveys, predatory monitoring, in-migration and out-migration fish counts, etc. on the Stanislaus River. During the winter of 2011-2012, OID constructed a managed wetlands as part of the Union Slough Water Quality Enhancement Project.
	Improve flood management	OID does not serve a formal flood management role, although its irrigation and drainage systems provide a passive system to collect and convey winter runoff at a limited capacity. If runoff characteristics change substantially within OID in the future, modifications to the irrigation and/or drainage system to mitigate any impacts will be considered.
	Other strategies	Other strategies include crop idling, irrigated land retirement, and rain-fed agriculture. Under severely reduced water supplies, growers could consider these strategies; however, it is anticipated that climate change impacts will be mitigated through the other strategies described.
California Climate Adaptation Strategy (CNRA 2009)	Aggressively increase water use efficiency	Described above under "Reduced water demand" and "Improve operational efficiency and transfers."
	Practice and promote integrated flood management	Described above under "Improve flood management."
	Enhance and sustain ecosystems	Described above under "Practice resource stewardship."
	Expand water storage and conjunctive management	Described above under "Increase water supply."
	Fix Delta water supply	Not applicable to the District.

Source	Strategy	Status
	Preserve, upgrade, and increase monitoring, data analysis, and management	Through implementation of OID's Water Resources Plan, the boundary flow measurement program, the well field optimization study implemented as an action of the IRGMP, and other OID activities, the amount of information and analysis available to support OID's water management continues to increase substantially. For example, improved delivery measurement and additional operational data resulting from modernization of the distribution system will enhance water management capabilities in the future.
	Plan for and adapt to sea level rise	Projections indicate that sea levels could rise by 2 to 5 feet by 2100. However, Direct impacts on the District are not anticipated.

6.6 Additional Resources for Water Resources Planning for Climate Change

Work has been completed at State and regional levels to evaluate the effects of climate change and to develop strategies to manage available water resources effectively under climate change. The following resources provide additional information describing water resources planning for climate change:

- Progress on Incorporating Climate Change into Planning and Management of California's Water Resources. California Department of Water Resources Technical Memorandum. July 2006. (DWR 2006)
- Climate Change and Water. Intergovernmental Panel on Climate Change. June 2008. (IPC 2008)
- Managing An Uncertain Future: Climate Change Adaptation Strategies for California's Water. California Department of Water Resources Report. October 2008. (DWR 2008)
- 2009 California Climate Change Adaptation Strategy. California Natural Resources Agency Report to the Governor. December 2009. (CNRA 2009)
- Climate Change and Water Resources Management: A Federal Perspective. U.S. Geological Survey. (USGS 2009)
- Managing an Uncertain Future. California Water Plan Update 2009. Volume 1, Chapter 5. March 2010. (DWR 2010a)
- Climate Change Characterization and Analysis in California Water Resources Planning Studies. California Department of Water Resources Final Report. December 2010. (DWR 2010b)
- Climate Change Handbook for Regional Water Planning. Prepared for U.S. Environmental Protection Agency and California Department of Water Resources by CDM. November 2011. (CDM 2011)
- Climate Action Plan—Phase 1: Greenhouse Gas Emissions Reduction Plan. California Department of Water Resources. May 2012. (DWR 2012a)
- Climate Change and Integrated Regional Water Management in California: A Preliminary Assessment of Regional Perspectives. Department of Environmental Science, Policy and Management. University of California at Berkeley. June 2012. (UCB 2012)
- Managing an Uncertain Future. California Water Plan Update 2013. Volume 1, Chapter 5. October 2014. (DWR 2014)

- U.S. Bureau of Reclamation (Reclamation). 2015. West-Wide Climate Risk Assessments: Irrigation Demand and Reservoir Evaporation Projections. Technical Memorandum No. 86-68210-2014-01. Available at http://www.usbr.gov/watersmart/wcra/index.html. (USBR 2015)
- 2014 Eastern San Joaquin Integrated Regional Water Management Plan Update. Eastern San Joaquin County Groundwater Basin Authority. June 2014. Available at http://www.water.ca.gov. (ESJ IRWMP 2014)
- California Climate Adaption Planning Guide. 2012. California Natural Resources Agency. Available at http://resources.ca.gov/climate/.
- Perspectives and Guidance for Climate Change Analysis. August 2015. California Department of Water Resources Climate Change Technical Advisory Group.

7. Efficient Water Management Practices

7.1 Introduction

This section describes the actions that OID has taken and plans to take to continue to improve efficient water management. These actions are organized with respect to the Efficient Water Management Practices (EWMPs) described in California Water Code §10608.48 (listed previously in Section 1.2). The Code lists two types of EWMPs: those that are mandatory for all agricultural water suppliers subject to the Code and those that are mandatory if found to be technically feasible and locally cost effective.

Two mandatory EWMPs for all water suppliers are included in the Code. These include measurement of the volume of water delivered to customers with sufficient accuracy for aggregate reporting and adoption of a pricing structure based at least in part on the quantity delivered. OID is implementing the delivery measurement EWMP to comply with the agricultural water delivery measurement regulation California Code of Regulations (CCR) 23 §597 in Attachment B and OID has adopted and implemented a rate structure based in part on the volume of water delivered.

OID has implemented and plans to continue implementing all additional EWMPs that are technically feasible and locally cost effective. Table 7-1 describes each critical and additional EWMP and summarizes OID's implementation status.

Table 7-1. Summary of EWMP Implementation Status (Water Code Section 10608.48 b and c).

Water Code Reference No.	EWMP Description	Implementation Status
Critical (Mandatory) Efficient Water Management Practices		
10608.48.b(1)	Measure the volume of water delivered to customers with sufficient accuracy.	Being Implemented
10608.48.b(2)	Adopt a pricing structure based at least in part on quantity delivered.	Being Implemented
Additional (Conditional) Efficient Water Management Practices		
10608.48.c(1)	Facilitate alternative land use for lands with exceptionally high water duties or whose irrigation contributes to significant problems, including drainage.	Not Technically Feasible
10608.48.c(2)	Facilitate use of available recycled water that otherwise would not be used beneficially, meets all health and safety criteria, and does not harm crops or soils.	Being Implemented
10608.48.c(3)	Facilitate financing of capital improvements for on-farm irrigation systems.	Being Implemented
10608.48.c(4)	Implement an incentive pricing structure that promotes one or more of the following goals: (A) More efficient water use at farm level, (B) Conjunctive use of groundwater, (C) Appropriate increase of groundwater recharge, (D) Reduction in problem drainage, (E) Improved management of environmental resources, (F) Effective management of all water sources throughout the year by adjusting seasonal pricing structures based on current conditions.	Being Implemented
10608.48.c(5)	Expand line or pipe distribution systems, and construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance and reduce seepage.	Being Implemented
10608.48.c(6)	Increase flexibility in water ordering by, and delivery to, water customers within operational limits.	Being Implemented
10608.48.c(7)	Construct and operate supplier spill and tailwater recovery systems.	Being Implemented
10608.48.c(8)	Increase planned conjunctive use of surface water and groundwater within the supplier service area.	Being Implemented
10608.48.c(9)	Automate canal control structures.	Being Implemented

Water Code Reference No.	EWMP Description	Implementation Status
10608.48.c(10)	Facilitate or promote customer pump testing and evaluation.	Being Implemented
10608.48.c(11)	Designate a water conservation coordinator who will develop and implement the water management plan and prepare progress report.	Being Implemented
10608.48.c(12)	Provide for the availability of water management services to water users.	Being Implemented
10608.48.c(13)	Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional changes to allow more flexible water deliveries and storage.	Being Implemented
10608.48.c(14)	Evaluate and improve the efficiencies of the supplier's pumps.	Being Implemented

7.2 Delivery Measurement Accuracy (10608.48.b(1))

OID initiated a voluntary educational pilot program of turnout measurement in the 2004 irrigation season. Following the passage of SBx7-7 in November 2009, OID evaluated and categorized all turnouts with respect to measurability. The District subsequently developed standards for using USBR meter gates and constant head orifice (CHO) meter gates where applicable and other types of new standardized turnout measurement devices where CHO gates are not applicable, recognizing that all turnouts and associated measurement techniques must meet the accuracy requirements of CCR 23 §597.

To meet the new requirements, OID initiated an annual program to replace turnouts beginning with those categorized as unmeasurable. Approximately $150,000 has been allocated annually as a budget line item for turnout replacement. OID has since evaluated a new turnout measurement gate, known as a "SlipMeter," developed by Rubicon Water. The District's approach to compliance with CCR 23 §597 is included as Attachment B.

7.3 Volumetric Pricing (10608.48.b(2))

In response to the requirements of SBx7-7, OID conducted a rate study in 2014 to determine water rates required to support the District's cost of service. Following a Proposition 218 process, OID adopted a pricing structure based in part on the volume of water delivered in December 2014. OID's water rate includes a fixed (per-acre) and volumetric (per af) component, as described in Section 3.8 of this AWMP. Additionally, a drought surcharge, applied on a per-acre basis, can be applied as part of the water rate in any given year, subject to declaration of drought conditions by the BOD.

Out-of-District Surface Irrigation Agreements are annual contracts for the delivery of OID surface water which must be approved by the BOD each year before the start of the irrigation season. Each year, OID makes a determination on the availability of any "surplus" surface irrigation water for Out-of-District Surface Irrigation Agreements. There is no guarantee that Out-of-District water will be available every year, and the water is provided at a premium rate as set annually by the BOD. The Out-of-District water rate is assessed volumetrically (per acre-foot) and a District acceptable measuring device is required to be installed and maintained at the recipient's cost.Several other conditions must also be met prior to the receipt of Out-of-District water, including but not limited to a required minimum on-farm irrigation efficiency of seventy (70) percent and assurance that no tail water will leave the property. For additional information describing the conditions for receipt of Out-of-District service, refer to the Out-of-District Surface Irrigation Agreement included in Attachment C.Additionally, the pricing structure for existing and proposed Tier II annexations into OID will be based at least in part on quantity delivered and assessed through volumetric measurement at the delivery point.

7.4 Additional Locally Cost Effective EWMPs

CWC §10608.48.c requires agricultural water suppliers to implement 14 additional EWMPs "if the measures are locally cost effective and technically feasible." As part of WRP implementation and general operation of the District, OID is implementing all of these measures, except one that is not technically feasible, as described in the following sections.

7.4.1 Alternative Land Use (10608.48.c(1))

The facilitate alternative land use EWMP is ***not technically feasible*** for OID because lands with exceptionally high water duties or whose irrigation contributes to significant problems (required conditions for considering this EWMP) are not found within the District boundaries, nor within the District Sphere of Influence. Furthermore, OID's rules and regulations prohibit wasteful use of water, preventing exceptional water duties or significant problems from occurring (see Section 3.10). Given the benefits to the local economy from irrigation with OID surface water and the contribution of groundwater recharge from irrigation to sustaining the regional aquifer for agricultural and municipal uses, alternative land uses are not desirable.

7.4.2 Recycled Water Use (10608.48.c(2))

OID is ***implementing*** the EWMP to facilitate use of available recycled water. The District accepts recycled water from industrial users within its service area into its system provided that the dischargers have the appropriate NPDES or other permits. Sconza Candy is a local industrial user discharging cooling water to the District distribution system as described in Sections 4 and 5 of this AWMP. OID considers requests from all qualifying permitted dischargers. Tomato processing water is also applied directly to lands within the District.

In addition to existing uses of recycled water in the District, OID is currently evaluating the opportunity and pursuing grant funding opportunities to utilize treated M&I discharge from the City of Oakdale in its northern service area.

7.4.3 Capital Improvements for On-Farm Irrigation Systems (10608.48.c(3))

OID is ***implementing*** the EWMP to facilitate capital improvements for on-farm irrigation systems. Past District actions have included active cooperation with OID water users and the NRCS to facilitate on-farm improvements through the NRCS EQIP program. The District often supplies technical assistance to facilitate these improvements.

OID is currently pursuing the implementation of a District program to promote and finance capital improvements and irrigation management improvements by its customers. In 2014, OID announced the development of a program to assist landowners in implementing a wide array of water conservation measures. Through voluntary enrollment, landowners would idle their land for one year. The reduction in crop water needs resulting from the idling would be marketed as part of a temporary water transfer with 20% of the revenue provided to the participant as a cash incentive, 75% of the revenue provided to the participant to fund on-farm conservation improvements, and

5% of the revenue retained by OID to cover program administration. Eligible projects would include the following:

- Installation of volumetric meters and gates;
- Replacement of open ditches with pipelines;
- Replacement of existing leaky pipelines;
- Installation of tailwater return systems;
- Land improvements such as deep ripping, laser leveling, and reseeding; and
- Conversions to low water use crops or high efficiency irrigation systems.

OID is currently preparing CEQA documentation to support the project and working with DWR and USBR to agree on the reduction in crop water needs resulting from voluntary idling in OID. Implementation of the program has been impeded by existing DWR and USBR policies that do not recognize the decrease in consumptive use of applied irrigation water resulting from idling for certain crops including pasture. This reduction in consumptive use provides the technical basis for determining transferrable water for the proposed program.

7.4.4 Incentive Pricing Structures (10608.48.c(4))

OID is ***implementing*** this EWMP by implementing a water rate based in part on the volume of water delivered, thereby incentivizing efficient farm water use, and by promoting conjunctive management of surface water and groundwater supplies by setting water rates below the cost of groundwater pumping to promote the use of surface water to provide direct and in-lieu recharge of the underlying groundwater system.

7.4.5 Lining or Piping of Distribution System and Construction of Regulating Reservoirs (10608.48.c(5))

OID is ***implementing*** this EWMP and has 105 miles of concrete lined canals and 100 miles of buried pipeline that reduce seepage relative to the original unlined condition. As part of the WRP, OID has invested and plans to continue to invest nearly $80 million in main canal and tunnels improvements and canal and lateral rehabilitation as well as $45 million in pipeline replacement through 2030. Since 2006, OID has invested $14.9 million in main canal and tunnel improvements, $5.7 million in canal and lateral rehabilitation, and $6.8 million in pipeline replacement. A total of $1.2 million, $0.3 million, and $1.5 million have been invested in these projects, respectively, since 2012. These projects reduce seepage in aging canals and pipelines that would otherwise occur, as well as providing maintenance and operational benefits. The District has determined that additional lining or pipeline conversion of the 125 miles of earthen canals that remain is not cost effective based on reduced seepage losses alone given the benefits of distributed groundwater recharge provided by unlined canals.

In addition to lining and pipeline conversion, the District completed the Robert Van Lier Regulating Reservoir in 2001 and the North Side Regulating Reservoir in 2010. SCADA controls on the reservoirs together with the phased installation of automated canal headings and the District's pilot

Total Channel Control (TCC) programs on the Claribel and the Cometa laterals increase the distribution system flexibility, steadiness, and capacity while also enabling operational spillage reduction. Spillage reduction associated with initial implementation of TCC is estimated to be 5,000 to 7,000 af annually.

OID plans to continue to strategically implement TCC and other improvements throughout the District in the future as funding becomes available. This will further enhance the District's ability to control and regulate distribution system operational flows. It is estimated that the remaining effort will significantly reduce operational spillage and will require the installation of 227 new canal structures, rehabilitation of 57 existing structures, and installation of 350 automated gates and associated controls at a cost of approximately $35 million.

7.4.6 Increased Water Ordering and Delivery Flexibility (10608.48.c(6))

The District is ***implementing*** this EWMP by transitioning to an arranged demand ordering and delivery process for irrigators who require increased delivery flexibility, such as growers of orchards and corn or irrigators of small parcels. A primary goal of the WRP is to improve infrastructure to meet changing customer needs. As a result of increased land conversion to permanent crops and annexation, arranged deliveries have increased from approximately 23,000 acres to almost 30,000 acres between 2012 and 2014. A majority of these land conversion projects involve on-farm irrigation improvements to convert from flood to micro or drip irrigation. OID has worked closely with local irrigation design companies to ensure existing OID operational constraints and capacities are identified and taken into consideration from the early stages of design of private irrigation systems to ensure growers are able to utilize surface water from OID as much as possible. Regulating reservoirs, automated lateral headings, and TCC have been and are continuing to be constructed and operated to facilitate this transition as well. Under arranged demand, growers are typically provided water within 72 hours of placing their order with OID. As part of the WRP, OID identified more than $6 million in flow control and measurement improvement projects in the distribution system and $5 million in turnout replacement projects to enable increased delivery flexibility. Since beginning implementation of the WRP in 2006, OID has invested more than $8.4 million in flow control and measurement improvements, exceeding WRP goals. Additionally, OID has invested $1.5 million in turnout replacement projects over the same period.

7.4.7 Supplier Spill and Tailwater Recovery Systems (10608.48.c(7))

OID is ***implementing*** this EWMP. OID recovers spillage and tailwater for reuse as follows:

- Reclamation pumping within OID to recover approximately 8,800 af annually (Section 5.6.1),
- Interception and reuse of approximately 2,100 af per year of tailwater entering the OID distribution system (Section 5.7.1),

- Gravity flow and lift pumping of approximately 22,100 af per year to the neighboring districts of MID, SSJID, and CSJWCD (46 percent of total boundary outflows; see Section 5.6.2),
- Irrigation of the recently annexed, 760-acre V.A. Rodden property with recovered drainwater, and
- Implementation of $1.7 million in outflow management and reclamation projects as part of the WRP (Section 8).

Additionally, private drainwater recovery in OID results in the reuse of approximately 3,800 af of tailwater and spillage annually. Spillage and tailwater leaving OID and not recaptured by neighboring districts are available for beneficial use by other downstream water users.

OID has evaluated the cost-effectiveness of additional drainwater collection. Due to tailwater being a relatively unreliable source of supply, the capital cost of capturing and recirculating tailwater exceeds the benefits. Automation of the District's laterals to provide downstream control has the potential to dramatically reduce spillage through spillage prevention (as opposed to spillage recovery). Implementation of TCC on the Claribel and Cometa laterals is estimated to result in spillage reduction of 5,000 to 7,000 af per year. As a result, OID is pursuing additional reduction of operational spillage through implementation of TCC and promoting improved on-farm water management to reduce tailwater through improved delivery flexibility and implementation of a voluntary on-farm water conservation program. Additional detail describing canal automation is provided in Section 7.4.9.

7.4.8 Increase Planned Conjunctive Use (10608.48.c(8))

The District is ***implementing*** increased planned conjunctive use through a combination of actions including construction of an additional groundwater pumping facility (to increase available groundwater supply), implementation of outflow management projects to increase effective surface water supply, maintenance of existing groundwater and reclamation pumping facilities, strategic pricing and customer service improvements to encourage use of available surface water supplies, rental of OID wells to landowners for winter use, and participation in local groundwater management initiatives including the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA), the San Joaquin County Groundwater Basin Authority Work Group, and the Stanislaus County Groundwater Technical Advisory Committee. As a means of achieving in-lieu groundwater recharge, OID has annexed over 10,000 acres of lands formerly reliant solely on groundwater for irrigation since 2006. Deep percolation of applied OID surface water and seepage from OID canals and drains are a critical source of groundwater recharge to maintain a sustainable groundwater supply for users within and surrounding OID.

The STRGBA has supported USGS in the development of a simulation/optimization model that consists of a transient model of groundwater flow coupled with optimization tools. Potential areas for recharge have also been identified as part of the STRGBA Recharge Characterization Report .

OID is enhancing groundwater production capability within the District to augment surface water supplies through replacement, construction and rehabilitation of OID groundwater production wells. The goals of these improvements are to improve the reliability of groundwater production capacity within the District and to implement a coordinated strategy for groundwater production. As part of the WMP, OID identified $14 million in groundwater well projects and has invested nearly $1 million since 2006.

7.4.9 Automate Canal Control (10608.48.c(9))

OID is ***implementing*** this EWMP by automating inlets and outlets to the District regulating reservoirs described earlier. Additional automation has been implemented at the Cashman Dam and Little John Creek Diversion Dam. OID installed 31 automated flow control gates, 6 automated turnouts, and replaced 28 check structures as part of a pilot Total Channel Control (TCC) program on the Claribel and Cometa laterals. Currently, OID has installed a total of 68 Rubicon FlumeGates, 22 Rubicon SlipMeters, and 8 Rubicon FlumeMeters, all of which are integrated into the District's SCADA system. These gates allow for automation and remote monitoring of 33 lateral headings, 47 inline structures, 15 turnouts, and 3 outflow locations. In addition to the Rubicon sites, 12 gates are controlled remotely via actuators. SonTek IQ acoustic Doppler flowmeters have been installed at 5 sites since 2012. These improvements contribute to increased delivery flexibility and steadiness as well as reduced operational spills from the OID distribution system. As part of the WRP, OID has invested more than $8.4 million in flow control and measurement structure projects.

OID plans to continue to strategically implement TCC and other improvements throughout the District in the future as funding becomes available. This will further enhance the District's ability to control and regulate distribution system operational flows. It is estimated that the remaining effort will significantly reduce operational spillage and will require the installation of 227 new canal structures, rehabilitation of 57 existing structures, and installation of 350 automated gates and associated controls at a cost of approximately $35 million.

7.4.10 Facilitate Customer Pump Testing (10608.48.c(10))

OID is ***implementing*** this EWMP and facilitating pump testing by encouraging private pumpers within the District to utilize the Advanced Pumping Efficiency Program funded by PG&E and administered by the Center for Irrigation Technology at Fresno State University. OID provides a link to the program (www.pumpefficiency.org) on the OID web site (www.oakdaleirrigation.com).

Additionally, through participation in the STRGBA, OID together with Modesto ID received a grant to evaluate groundwater pumping efficiencies for irrigation and domestic supply. A well-field optimization study (Phase I) was completed that included pump tests for OID wells, recommendations for improvements at each well site and prioritization of energy efficiency improvements (GEI 2007).

7.4.11 Designate Water Conservation Coordinator (10608.48.c(11))

OID is ***implementing*** this EWMP by continuing to have a designated Water Conservation Coordinator (to develop and implement the water management plan and progress reports). This position was established in October 1997 and is currently filled by the District's Water Operations Manager.

7.4.12 Provide for Availability of Water Management Services (10608.48.c(12))

OID is ***implementing*** this EWMP by supporting the Oakdale CIMIS station, including assisting in station installation in 2004, assisting with continued maintenance at the site and providing a link to CIMIS on the District's website (Figure 7-1). Additionally, OID disseminates cooperative extension and other agricultural information through web site links and in periodic newsletters (Figure 7-2) mailed to customers.

Figure 7-1. OID Website with Link to CIMIS.

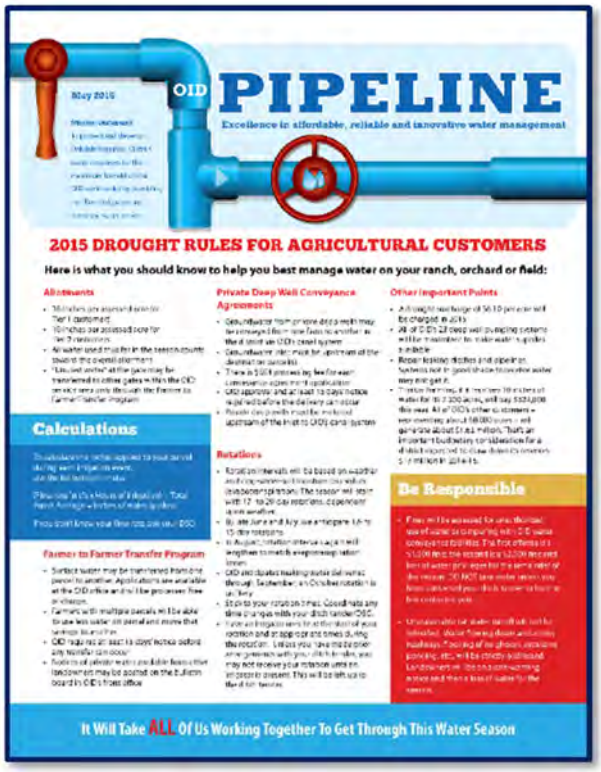

Figure 7-2. Excerpt from May 2015 Issue of OID Pipeline Newsletter.

OID's on-farm water conservation program described in Section 7.4.3 will enhance landowner water management capabilities as a result of providing funding for capital improvements to increase irrigation efficiency.

7.4.13 Evaluate Supplier Policies to Allow More Flexible Deliveries and Storage (10608.48.c(13))

OID is ***implementing*** this EWMP through ongoing cooperation and discussion with the USBR. One example is OID's pursuit of a Warren Act Contract with Reclamation to gain carryover storage in New Melones Reservoir to provide greater dry year flexibility. OID actively attempts to identify mechanisms that allow for voluntary transfers of water within and outside of its sphere of influence that facilitate greater water supply flexibility and storage. OID actively participates in initiatives that affect its water users including the process to implement the Water Conservation Act of 2009 (SBx7-7).

Additionally, OID partnered with SSJID and together with the TriDam Project launched Save the Stan, a public education program to inform the public about the NOAA Biological Opinion (BO) for the protection of Central Valley steelhead from the operations of New Melones Reservoir. In particular, the district is concerned that the BO reasonable and prudent alternatives would result in an empty New Melones Reservoir in approximately 1 of 6 years.

OID is engaging DWR and USBR in discussion aimed at removing impediments to voluntary water transfers. These transfers provide an opportunity for OID and its landowners to fund infrastructure improvements that result in increased water use efficiency but are not otherwise locally cost-effective.

7.4.14 Evaluate and Improve Efficiencies of Supplier's Pumps (10608.48.c(14))

OID is ***implementing*** this EWMP by employing a pump tester through OID's well established program to test and evaluate the 74 pumps within the OID boundaries. These pumps include:

1. 25 deep wells to supplement surface water deliveries (conjunctive use EWMP),
2. 44 reclamation pumps to reuse drainwater within OID or lift water to the neighboring distribution systems of MID and SSJID (spill and tailwater recovery EWMP),
3. One deep well with a variable frequency drive (VFD) pump added (Furtado) (conjunctive use EWMP),
4. One VFD booster pump (Clavey), and
5. Three pumps from the Stanislaus River, one of which is equipped with a VFD.

As previously discussed, through participation in the STRGBA, OID together with Modesto ID received a grant to evaluate groundwater pumping efficiencies for irrigation and domestic supply. A well-field optimization study (Phase I) was completed that included pump tests for OID wells, recommendations for improvements at each well site and prioritization of energy efficiency improvements (GEI 2007).

OID has budgeted $14 million under its WRP for maintenance and ongoing development of groundwater production through strategic identification of deep well sites to supplement surface water supplies and increase flexibility for water users. Between 2012 and 2015, OID completed the following pump projects:

- Construction of a new deep well at the Northside Regulating Reservoir
- Installation of a new 125 HP submersible well pump at Sierra Sunset
- Inspection and installation of a new 50 HP pump at the Wyatt deep well
- Inspection and installation of a new pump at the Oakdale deep well
- Replacement of 150 HP VFD at the Furtado deep well

7.5 Summary of EWMP Implementation Status

OID has taken many actions throughout its history to promote efficient water management and continues to accomplish improved and more efficient water management. Water conservation is

foundational to OID's history and 30-year WRP. Under the WRP, the temporary transfer of water made available through conservation is the mechanism by which infrastructure and operational improvements are funded. For purposes of this AWMP, OID actions have been organized and are reported with respect to the Efficient Water Management Practices (EWMPs) listed in Water Code §10608.48. A summary of the implementation status of each listed EWMP is provided in Table 7-2.

Table 7-2. Summary of OID Implementation Status for EWMPs Listed Under CWC10608.48c.

Water Code Reference No.	EWMP	Implementation Status	Implemented Activities	Planned Activities
Critical (Mandatory) Efficient Water Management Practices				
10608.48.b(1)	Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of Section 531.10 and to implement paragraph (2).	Being Implemented	1. Evaluated and categorized all turnouts with respect to measurability. 2. Developed standards for using USBR meter gates and constant head orifice (CHO) meter gates where applicable and other types of new standardized turnout measurement devices where not applicable. 3. Dedicated annual budget line item for turnout replacement and initiated replacement of turnouts requiring corrective actions. 4. Development and implementation of a Water Measurement Plan for customer deliveries (Attachment B). 5. Implementation of STORM water ordering and delivery management software	1. Continue to dedicate annual budget line item for turnout replacement 2. Continue replacement of turnouts requiring corrective actions. 3. Continue implementation of Water Measurement Plan (Attachment B).
10608.48.b(2)	Adopt a pricing structure for water customers based at least in part on quantity delivered.	Being Implemented	1. Conducted a rate study to determine rates required to cover cost of service. 2. Conducted Proposition 218 rate update. 3. Established rate structure based in part on volume of water delivered. 4. Volumetric billing for out-of-district water sales and future annexations. 5. Implementation of STORM volumetric billing software 6. Mock volumetric billing statements provided to customers throughout the 2015 water season	1. Continue implementation of rate structure based in part on volume delivered. 2. Continue volumetric billing for out-of-district water sales and annexed lands.
Additional (Conditional) Efficient Water Management Practices				
10608.48.c(1)	Facilitate alternative land use for lands with exception-ally high water duties or whose irrigation contributes to significant problems, including drainage.	Not Technically Feasible	Lands with exceptionally high water duties or whose irrigation contributes to significant problems are not found within the District boundaries, nor within the District Sphere of Influence. Furthermore, OID's rules and regulations prohibit wasteful use of water, preventing exceptional water duties or significant problems from occurring.	
10608.48.c(2)	Facilitate use of available recycled water that otherwise would not be used beneficially, meets all health and safety criteria, and does not harm crops or soils	Being Implemented	1. Sconza Candy cooling water is captured in the District distribution system. 2. Tomato processing water is applied directly to lands within the District. 3. OID is evaluating the utilization of treated M&I discharge from the City of Oakdale	1. Continue existing use of recycled water within OID. 2. Consider requests from all qualifying permitted dischargers for additional use of recycled water. 3. Continue to evaluate the utilization of treated M&I discharge from the City of Oakdale.
10608.48.c(3)	Facilitate financing of capital improvements for on-farm irrigation systems	Being Implemented	1. OID provides technical assistance to growers implementing on-farm improvements through the NRCS EQIP program. 2. OID has developed a comprehensive, innovative voluntary on-farm water conservation program and proceeding with environmental permitting and policy discussions with DWR and USBR.	1. Continue technical assistance to growers implementing on-farm improvements through the NRCS EQIP program. 2. Continue development and implementation of on-farm water conservation program.

Water Code Reference No.	EWMP	Implementation Status	Implemented Activities	Planned Activities
10608.48.c(4)	Implement an incentive pricing structure that promotes one or more of the following goals: (A) More efficient water use at farm level, (B) Conjunctive use of groundwater, (C) Appropriate increase of groundwater recharge, (D) Reduction in problem drainage, (E) Improved management of environmental resources, (F) Effective management of all water sources throughout the year by adjusting seasonal pricing structures based on current conditions.	Being Implemented	1. A water rate based in part on the volume of water delivered encourages efficient farm water use. 2. OID promotes conjunctive use of groundwater by setting water rates to promote use of available surface water.	1. Continue to encourage efficient farm water use. 2. Continue to promote use of available surface water supplies.
10608.48.c(5)	Expand line or pipe distribution systems, and construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance and reduce seepage	Being Implemented	1. Concrete lined approximately 3.3 miles of South Main Canal and tunnels in 2010 2. Concrete lined 105 miles of canals 3. Replaced 100 miles of canals with buried pipeline 4. Constructed Robert Van Lier Reservoir in 2001 5. Constructed the North Side Regulating Reservoir in 2010 6. Invested $27.3 million in main canal and tunnel improvements, canal and lateral rehabilitation, and pipeline replacement since 2006 ($3 million since 2012). 7. Implemented TCC on Cometa and Claribel laterals to better regulate system flows and increase distribution system flexibility.	1. Continue to implement WRP main canal and tunnels improvement projects. 2. Continue to implement WRP canal and lateral rehabilitation projects. 3. Continue to implement WRP pipeline replacement projects. 4. Continue with next phases of District-wide TCC implementation.
10608.48.c(6)	Increase flexibility in water ordering by, and delivery to, water customers within operational limits	Being Implemented	1. Planned and initiated transition, within facility constraints, to an arranged demand ordering and delivery schedule for irrigators who require increased delivery flexibility. Under arranged demand, growers are typically provided water within 72 hours of placing their order with OID. 2. Implemented STORM water ordering and delivery management software to better track cropping and water deliveries. 3. Invested more than $8.4 million in flow control and measurement improvements including TCC and $1.5 million in turnout replacement since 2006, resulting in increased water ordering and delivery flexibility. 4. Due to land conversion and annexation, arranged deliveries have increased from approximately 23k acres in 2012 to almost 30k acres in 2014. 5. OID has worked closely with local irrigation design companies to ensure existing OID operational constraints and capacities are identified and taken into consideration during the design of private irrigation systems to allow growers to utilize surface water from OID as much as possible.	1. Continue transition to arranged demand ordering and delivery schedule for irrigators who require increased delivery flexibility. As facility constraints are eased by facility modernization program, service constraints will also ease. 2. Continue to implement WRP flow control and measurement structures projects. 3. Continue to implement WRP turnout replacement projects. 4. Continue to work with local irrigation design companies during their design of private irrigation systems.

Water Code Reference No.	EWMP	Implementation Status	Implemented Activities	Planned Activities
10608.48.c(7)	Construct and operate supplier spill and tailwater recovery systems	Being Implemented	1. Two drainwater recovery systems irrigate more than 760 acres. 2. Reclamation pumping within OID to recover approximately 8,800 af annually 3. Interception and reuse of approximately 2,100 af per year of tailwater entering the OID distribution system 4. Gravity flow and lift pumping of approximately 22,100 af per year to the neighboring districts of MID, SSJID, and CSJWCD 5. Automation of the District's laterals to provide downstream control has the potential to dramatically reduce spillage through spillage prevention. Implementation of TCC on the Cometa and Claribel laterals is estimated to have reduced spillage by 5,000 to 7,000 af annually. 6. OID has implemented $1.7 million in outflow management and reclamation projects since 2006.	1. Continue to implement WRP outflow management projects. 2. Continue to implement WRP reclamation projects. 3. Continue with next phases of District-wide TCC implementation.
10608.48.c(8)	Increase planned conjunctive use of surface water and groundwater within the supplier service area	Being Implemented	1. OID water rates encourage use of available surface water supplies. 2. OID improvements in flexibility in water ordering by and delivery to customers encourages use of surface water and discourages conversion to or reliance solely on groundwater. 3. OID actively participates in local and regional groundwater management initiatives, including development of the USGS groundwater model of the Modesto Subbasin. 4. Potential groundwater recharge areas have been identified as part of the STRGBA Recharge Characterization Report. 5. OID has maintained and enhanced groundwater production capability, investing nearly $1 million since 2006. 6. OID make district pumps available for frost protection during the irrigation season when surface water is not available. 7. OID has achieved in-lieu groundwater recharge through annexation of over 10,000 acres since 2006.	1. Utilize regional groundwater model as a planning tool to develop optimized conjunctive use strategies to: (1) enhance groundwater production and uniformity of availability of GW supplies, (2) consider annexation, out of district water sales and transfers to provide in lieu recharge and decrease reliance on groundwater. 2. Continue improving flexibility in water ordering and delivery to encourage use of surface water and discourage surface users from converting to groundwater. 3. Continue to implement WRP groundwater well, reclamation, and outflow management projects.
10608.48.c(9)	Automate canal control structures	Being Implemented	1. Automated inlets and outlets to the regulating reservoirs 2. Automated Cashman Dam and Little John Creek Diversion Dam 3. Installed 31 automated flow control gates, 6 automated turnouts and 28 automated check structures as part of TCC. 4. District-wide, automation includes 98 Rubicon gates and meters. 5. 12 actuator-controlled automated gates have been installed. 6. SonTek IQ flowmeters have been installed at 12 sites since 2012. 7. OID has invested more than $8.4 million in flow control and measurement structure projects since 2006.	1. Continue to automate the remaining canal and pipeline headings. 2. Continue with next phases of District-wide TCC implementation. 3. Continue to implement other WRP flow control and measurement structure projects.

Water Code Reference No.	EWMP	Implementation Status	Implemented Activities	Planned Activities
10608.48.c(10)	Facilitate or promote customer pump testing and evaluation	Being Implemented	1. OID promotes the use of the PG&E pump testing program by private pumpers within the District. 2. A link to the PG&E Advanced Pump Efficiency Program is provided on the OID web site. 3. As part of STRGBA, OID evaluated groundwater pumping efficiencies for irrigation and domestic supply and completed a well-field optimization study.	1. Continue to promote use of the PG&E pump testing program by private pumpers within the District.
10608.48.c(11)	Designate a water conservation coordinator who will develop and implement the water management plan and prepare progress report.	Being Implemented	1. Designated a Water Conservation Coordinator in October 1997.	1. Continue to employ a designated Water Conservation Coordinator.
10608.48.c(12)	Provide for the availability of water management services to water users.	Being Implemented	1. Link to CIMIS on OID web site. 2. Links to cooperative extension and other agricultural information on OID web site. 3. Newsletter provided to customers. 4. Offer no-cost on-farm irrigation consultations and review by OID staff upon request and as associated circumstances arise. 5. Developed and in process of implementing voluntary farm water conservation program.	1. Continue link to CIMIS and other resources on OID web site. 2. Continue newsletter to customers. 3. Proceed with development and implementation of on-farm water conservation program. 4. Post current and historical water use information on OID website and initiate online bill pay.
10608.48.c(13)	Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional changes to allow more flexible water deliveries and storage.	Being Implemented	1. Continued discussions with Reclamation to obtain a Warren Act Contract with the USBR to gain carryover storage in New Melones Reservoir to provide greater dry year flexibility. 2. Identified mechanisms for voluntary transfers of water that facilitate greater water supply flexibility and storage. 3. Active participation in initiatives that affect its water users.	1. Continue discussions with Reclamation to obtain a Warren Act Contract with the USBR to gain carryover storage in New Melones Reservoir to provide greater dry year flexibility. 2. Continue discussions with DWR and USBR regarding policies that impede voluntary water transfers. 3. Continue active participation in initiatives that affect its water users.
10608.48.c(14)	Evaluate and improve the efficiencies of the supplier's pumps.	Being Implemented	1. Regular testing and evaluation of 74 pumps within OID boundaries by qualified staff. 2. As part of STRGBA, evaluated groundwater pumping efficiencies for irrigation supply and completed a well-field optimization study. 3. Annual maintenance and improvements as part of WRP implementation.	1. Continue testing and evaluation program for existing pumps. 2. Continue to include new wells and pumps in the existing program to evaluate and improve pump efficiencies.

7.6 Evaluation of Water Use Efficiency Improvements

CWC §10608.48(d) requires that AWMPs include:

> *… a report on which efficient water management practices have been implemented and are planned to be implemented, an estimate of the water use efficiency improvements that have occurred since the last report, and an estimate of the water use efficiency improvements estimated to occur five and 10 years in the future.*

A description of which EWMPs have been implemented has been provided previously in Section 7. This section provides an evaluation of EWMP implementation and an estimate of water use efficiency (WUE) improvements that have occurred in the past and are expected to occur in the future.

The value of evaluating water use efficiency (WUE) improvements (and EWMP implementation in general) from OID's perspective is to identify what the benefits of EWMP implementation are and to identify those additional actions that hold the potential to advance OID's mission and water management objectives. OID's mission has been and continues to be to protect and develop OID water resources for the maximum benefit of the community by providing excellent irrigation and domestic water service. Underlying this mission are the objectives of providing OID customers with a reliable, affordable, high quality supply of water. To that end, OID has taken action to develop and maintain reliable surface water and groundwater supplies, to prevent or reduce losses from the distribution system in order to increase operational efficiency, to promote the efficient use of water at the farm level, and to meet changing environmental and other demands that affect the flexibility with which the District can deliver and store water. A result of these efforts is that OID has embarked on a 25-year, comprehensive Water Resources Plan to improve the District's infrastructure and service to its customers.

First and foremost among the issues that must be considered in any evaluation of the benefits of EWMP implementation and resulting WUE improvements is how water management actions affect the water balance (Davenport and Hagan, 1982; Keller, et al., 1996; Burt, et al., 2008; Clemmens, et al., 2008; Canessa, et al., 2011). Accordingly, any evaluation of EWMP implementation and WUE improvements for OID must consider how water balance changes relate to the District's mission and water management objectives. For example, flows to deep percolation and seepage that could be considered losses in some settings are critical to maintain the long-term sustainability of the underlying groundwater basin. Reductions in these flows resulting from EWMP implementation could be considered WUE improvements at the farm or District scale, but have the consequential effect of diminishing recharge of the underlying groundwater system. Other flows that could be considered losses at the District or farm scale such as spillage and tailwater, respectively, are also recoverable. For example, spillage from the OID distribution system is available for beneficial use by downgradient water users and is actively used by MID, SSJID, and CSJWCD. The only distribution system or on-farm losses that are not recoverable within OID, the underlying groundwater basin, or the San Joaquin River Basin as a whole are canal and reservoir water surface evaporation and evaporation from irrigation application. These components represent a small portion of OID's

water supply (less than one percent as indicated in Table 5-13). An implication of this is that very little "new" water can be made available through water conservation in OID.

An essential first step in evaluating EWMP implementation and water use efficiency improvements is a comprehensive, quantitative, multi-year water balance (see Section 5). The quantitative understanding of the water balance flow paths enables identification of targeted flow paths for WUE improvements, along with improved understanding of the beneficial impacts and consequential effects of EWMP implementation at varying spatial and temporal scales. The water balance enables evaluation of potential changes in flow path quantities and timing for any given change in water management.

Even where comprehensive, multi-year water balances have been developed, evaluating water balance impacts and WUE improvements is not a trivial task. Issues of spatial and temporal scale and relatively small changes in flow paths resulting from many water management improvements (relative to day to day and year to year variation in water diversions and use) coupled with inaccuracies inherent in even the best water measurement greatly complicate the evaluation of water balance impacts. The implications of recoverable and irrecoverable losses at varying scales complicate the evaluation of WUE improvements, and consequential, potentially unintended consequences must be considered. (Burns et al. 2000, AWMC 2004)

As part of assembling this AWMP, OID has identified the targeted flow paths associated with implementation of each EWMP, the water management benefits of each EWMP, along with the potential consequential effects of implementation. A brief discussion of the benefits associated with implementation of each EWMP is provided, along with a brief discussion of consequential effects that must be considered. A summary of targeted flow paths, beneficial impacts, and consequential effects associated with implementation of each EWMP by OID is provided in Table 7-3.

Table 7-3. Summary of WUE Improvements by EWMP.

Water Code Reference No.	EWMP	Implementation Status	Targeted Flow Path(s)	Benefits	Consequential Effects	Notes (See End of Table)
10608.48.b (1)	Measure the volume of water delivered to customers with sufficient accuracy	Being Implemented	None	Supports Evaluation of EWMPs	Not Applicable	1
10608.48.b (2)	Adopt a pricing structure based at least in part on quantity delivered	Being Implemented	Farm Deliveries, Tailwater, Deep Percolation of Applied Water, System Inflows, Drainage Outflows	Volumetric pricing could create a modest incentive to reduce on-farm deliveries, primarily through reduced tailwater and deep percolation. In aggregate, reduced deliveries result in decreased system inflows and corresponding reductions in drainage outflows. Available water not diverted could allow for service area expansion (annexation) or be available for transfer. Additionally, water quality benefits may occur through reduced tailwater and deep percolation.	Reduced deep percolation results in reduced beneficial recharge of the underlying groundwater system. Reduced drainage outflows from tailwater result in reduced water available for beneficial use by downgradient agricultural or environmental water users.	2
10608.48.c (1)	Facilitate alternative land use for lands with exceptionally high water duties or whose irrigation contributes to significant problems, including drainage.	Not Technically Feasible	Not Applicable	Not Applicable	Not Applicable	3
10608.48.c (2)	Facilitate use of available recycled water that otherwise would not be used beneficially, meets all health and safety criteria, and does not harm crops or soils.	Being Implemented	System Inflows, Farm Deliveries	Recycled water use by OID provides a limited reduction in required surface supply. Recycled water use directly by irrigators reduces the demand for OID deliveries, further reducing required surface supply. Available water not diverted could allow for service area expansion (annexation) or be available for transfer.	Recycled water is of diminished quality as compared to OID surface water supplies.	
10608.48.c (3)	Facilitate financing of capital improvements for on-farm irrigation systems	Being Implemented	Farm Deliveries, Tailwater, Deep Percolation of Applied Water, System Inflows, Drainage Outflows	OID in-kind technical assistance to support on-farm improvements could result in limited reductions in on-farm deliveries through reduced tailwater and deep percolation. In aggregate, reduced deliveries result in decreased system inflows and corresponding reductions in drainage outflows. Available water not diverted could allow for service area expansion (annexation) or be available for transfer. Additionally, water quality benefits may occur through reduced tailwater and deep percolation.	Reduced deep percolation results in reduced beneficial recharge of the underlying groundwater system,. Reduced drainage outflows from tailwater result in reduced water available for beneficial use by downgradient agricultural or environmental water users.	2
10608.48.c (4)	Implement an incentive pricing structure that promotes one or more of the following goals: (A) More efficient water use at farm level, (B) Conjunctive use of groundwater, (C) Appropriate increase of groundwater recharge, (D) Reduction in problem drainage, (E) Improved management of environmental resources, (F) Effective management of all water sources throughout the year by adjusting seasonal pricing structures based on current conditions.	Being Implemented	Varies	Volumetric pricing will incentivize goal (A), resulting in on-farm benefits as described for the volumetric pricing EWMP (10608.48.b(2)). Provision of surface water at lower rates than the cost of groundwater pumping incentivizes goals (B) and (C) and improves the reliability of regional water supplies.	Consequential effects of volumetric pricing are the same as described for the volumetric pricing EWMP (10608.48.b(2)). Many of these efficiency improvements require the use of electricity as a component, increasing the need for greater energy demands.	2

Water Code Reference No.	EWMP	Implementation Status	Targeted Flow Path(s)	Benefits	Consequential Effects	Notes (See End of Table)
10608.48.c (5)	Expand line or pipe distribution systems, and construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance and reduce seepage	Being Implemented	System Inflows, Operational Spillage, Canal Seepage, Farm Deliveries, Tailwater, Deep Percolation of Applied Water, Drainage Outflows	OID regulating reservoirs allow for improved on-farm delivery steadiness and flexibility, potentially providing a modest reduction in on-farm deliveries due to reduced deep percolation and tailwater. Reservoirs allow operators to reduce operational spillage. Lining and pipeline conversion provide maintenance and operational benefits while also substantially reducing seepage in some areas. OID's ambitious program to spend $80 million on main canal and tunnel improvements and canal and lateral rehabilitation as well as $45 million in pipeline replacement over the 25-year WRP will ensure the long-term reliability of the distribution system. In aggregate, reduced recoverable losses at the farm and district scale result in decreased system inflows. Available water not diverted could allow for service area expansion (annexation) or be available for transfer. Additionally, water quality benefits may occur through reduced tailwater and deep percolation.	Reduced deep percolation and seepage result in reduced beneficial recharge of the underlying groundwater system. Reduced drainage outflows result in reduced water available for beneficial use by downgradient agricultural or environmental water users.	2
10608.48.c (6)	Increase flexibility in water ordering by, and delivery to, water customers within operational limits	Being Implemented	System Inflows, Operational Spillage, Farm Deliveries, Tailwater, Deep Percolation of Applied Water, Drainage Outflows	Changes in ordering and delivery practices, coupled with improvements to the OID distribution system and operation result in increased control for DSOs and improved farm delivery steadiness and flexibility. Farm deliveries could be reduced a modest amount due to reduced deep percolation and tailwater. System improvements result in greater operational efficiency and, potentially, substantial reductions in spillage. In aggregate, reduced recoverable losses at the farm and district scale result in decreased system inflows. Available water not diverted could allow for service area expansion (annexation) or be available for transfer. Additionally, water quality benefits may occur through reduced tailwater and deep percolation.	Reduced deep percolation results in reduced beneficial recharge of the underlying groundwater system. Reduced drainage outflows result in reduced water available for beneficial use by downgradient agricultural or environmental water users.	2
10608.48.c (7)	Construct and operate supplier spill and tailwater recovery systems	Being Implemented	System Inflows, Drainage Outflows	Current levels of reclamation pumping, tailwater interception, and spillage prevention and planned implementation of approximately $17 million in outflow management and reclamation projects as part of the WRP have and will continue to substantially reduce drainage outflows from OID. As a result, reduced outflows results in decreased system inflows. Available water not diverted could allow for service area expansion (annexation) or be available for transfer. Additionally, water quality benefits may occur through reduced tailwater outflow from OID.	Reduced drainage outflows result in reduced water available for beneficial use by downgradient agricultural or environmental water users. Many of these efficiency improvements require the use of electricity as a component, increasing the need for greater energy demands.	
10608.48.c (8)	Increase planned conjunctive use of surface water and groundwater within the supplier service area	Being Implemented	System Inflows, District Groundwater Pumping	Increased conjunctive management benefits OID by improving long-term water supply reliability through the following: 1. Reliance primarily on surface water in wet years to minimize withdrawals from the groundwater system. 2. Strategic operation of OID groundwater wells in dry years to reduce demand for limited surface water supplies and to allow for potential increases in reservoir carryover storage.	Not Significant	2

Water Code Reference No.	EWMP	Implementation Status	Targeted Flow Path(s)	Benefits	Consequential Effects	Notes (See End of Table)
10608.48.c (9)	Automate canal control structures	Being Implemented	System Inflows, Operational Spillage, Farm Deliveries, Tailwater, Deep Percolation of Applied Water, Drainage Outflows	Automation of the OID distribution system results in increased control for DSOs and improved farm delivery steadiness and flexibility. Farm deliveries could be reduced a modest amount due to reduced deep percolation and tailwater. System improvements result in greater operational efficiency and, potentially, substantial reductions in spillage. In aggregate, reduced recoverable losses at the farm and district scale result in decreased system inflows. Available water not diverted could allow for service area expansion (annexation) or be available for transfer. Additionally, water quality benefits may occur through reduced tailwater and deep percolation.	Reduced deep percolation results in reduced beneficial recharge of the underlying groundwater system. Reduced drainage outflows result in reduced water available for beneficial use by downgradient agricultural or environmental water users.	2
10608.48.c (10)	Facilitate or promote customer pump testing and evaluation	Being Implemented	None	Improved pumping efficiency by OID's customers does not affect the OID water balance but results in decreased energy demand and reduced pumping costs for customers. There are no direct benefits to OID.	Not Significant	
10608.48.c (11)	Designate a water conservation coordinator who will develop and implement the water management plan and prepare progress report.	Being Implemented	Varies	See Comment	See Comment	4
10608.48.c (12)	Provide for the availability of water management services to water users.	Being Implemented	Farm Deliveries, Tailwater, Deep Percolation of Applied Water, System Inflows, Drainage Outflows	Farm water management support by OID could result in limited reductions in on-farm deliveries through reduced tailwater and deep percolation. In aggregate, reduced deliveries result in decreased system inflows and corresponding reductions in drainage outflows. Available water not diverted could allow for service area expansion (annexation) or be available for transfer. Additionally, water quality benefits may occur through reduced tailwater and deep percolation.	Reduced deep percolation results in reduced beneficial recharge of the underlying groundwater system. Reduced drainage outflows from tailwater result in reduced water available for beneficial use by downgradient agricultural or environmental water users.	2
10608.48.c (13)	Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional changes to allow more flexible water deliveries and storage.	Being Implemented	System Inflows	Changes in the policies of agencies that affect OID's flexibility and storage in using its surface water supply could allow for limited improvements in system operation and reductions in system losses. Available water not diverted could allow for service area expansion (annexation) or be available for transfer.	Reduced drainage outflows from operational spillage could result in reduced water available for beneficial use by downgradient agricultural or environmental water users.	
10608.48.c (14)	Evaluate and improve the efficiencies of the supplier's pumps.	Being Implemented	None	Improved pumping efficiency of OID's pumps and prioritizing repairs and replacement based on pump evaluations results in decreased energy demand and reduced pumping costs for OID and increases pump reliability. There are no direct impacts to water balance flow paths.	Not Significant	

Notes:

1. Although delivery measurement does not directly affect any flow paths, it will provide the basis for improved understanding of the overall water balance in the future.
2. OID works to balance tradeoffs between incentivizing on-farm water conservation and maintaining long-term surface water and groundwater reliability for the region.
3. Such lands do not exist in OID. As a result, it is not technically feasible to implement this EWMP.
4. Implementation of the AWMP and WRP by OID's Water Conservation Coordinator/Water Operations Manager, General Manager, and other staff as appropriate is the mechanism by which all EWMPs are implemented and targeted benefits are realized.

WUE definitions vary. For purposes of evaluating WUE improvements associated with EWMP implementation by OID, specific WUE improvement categories or objectives, as described by CALFED and DWR (CALFED 2006, DWR 2012b), have been identified that correspond to each EWMP. Potential WUE improvements include reduction of irrecoverable losses, increased local supply, increased local flexibility, increased in-stream flow, improved water quality, and improved energy efficiency. Definitions for each of the WUE improvement categories have been developed and are provided in Table 7-4. Note that the WUE improvement categories are not mutually exclusive in many cases. For example, reductions in irrecoverable losses could be used to increase local supply. The applicability of each EWMP to each WUE improvement category based on OID's water management activities has been identified and is presented in Table 7-5.

Table 7-4. WUE Improvement Categories.

Water Use Efficiency Improvement Category	Definition
Reduce Irrecoverable Losses	Reduce losses that cannot be recovered and used by the water supplier or downgradient users (e.g. evaporation and flows to salt sinks).
Increase Local Supply	Reduce losses and/or increase storage locally to increase supply available to meet demands, including both near-term (within an irrigation season) and long-term (over more than one year).
Increase Local Flexibility	Improve the supplier's ability to divert, pump, convey, control, and deliver available water supplies to meet customer demands.
Increase In-Stream Flow	Increase flow in natural waterways to benefit fisheries or meet other environmental objectives.
Improve Water Quality	Increase the quality of targeted water bodies (i.e. streams, lakes, or aquifers).
Improve Energy Efficiency	Increase the efficiency of water supplier or customer pumps.

Table 7-5. Applicability of EWMPs to WUE Improvement Categories.

Water Code Reference No.	EWMP	Implementation Status	Water Use Efficiency Improvement Category					
			Reduce Irrecoverable Losses	Increase Local Supply	Increase Local Flexibility	Increase In-Stream Flow[1]	Improve Water Quality	Improve Energy Efficiency
10608.48. b (1)	Measure the volume of water delivered to customers with sufficient accuracy	Being Implemented	No Direct WUE Improvements					
10608.48. b (2)	Adopt a pricing structure based at least in part on quantity delivered	Being Implemented		✓			✓	
10608.48.c (1)	Facilitate alternative land use for lands with exceptionally high water duties or whose irrigation contributes to significant problems, including drainage.	Not Technically Feasible	Not Applicable to OID					
10608.48.c (2)	Facilitate use of available recycled water that otherwise would not be used beneficially, meets all health and safety criteria, and does not harm crops or soils.	Being Implemented		✓				
10608.48.c (3)	Facilitate financing of capital improvements for on-farm irrigation systems	Being Implemented		✓			✓	
10608.48.c (4)	Implement an incentive pricing structure that promotes one or more of the following goals: (A) More efficient water use at farm level, (B) Conjunctive use of groundwater, (C) Appropriate increase of groundwater recharge, (D) Reduction in problem drainage, (E) Improved management of environmental resources, (F) Effective management of all water sources throughout the year by adjusting seasonal pricing structures based on current conditions.	Being Implemented		✓			✓	
10608.48.c (5)	Expand line or pipe distribution systems, and construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance and reduce seepage	Being Implemented	✓	✓	✓		✓	
10608.48.c (6)	Increase flexibility in water ordering by, and delivery to, water customers within operational limits	Being Implemented		✓	✓			
10608.48.c (7)	Construct and operate supplier spill and tailwater recovery systems	Being Implemented		✓			✓	
10608.48.c (8)	Increase planned conjunctive use of surface water and groundwater within the supplier service area	Being Implemented		✓				
10608.48.c (9)	Automate canal control structures	Being Implemented		✓	✓		✓	
10608.48.c (10)	Facilitate or promote customer pump testing and evaluation	Being Implemented						✓
10608.48.c (11)	Designate a water conservation coordinator who will develop and implement the water management plan and prepare progress report.	Being Implemented	The activities of the Water Conservation Coordinator and other OID staff to achieve WUE improvements through implementation of the EWMPs are described individually by EWMP.					
10608.48.c (12)	Provide for the availability of water management services to water users.	Being Implemented		✓			✓	
10608.48.c (13)	Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional changes to allow more flexible water deliveries and storage.	Being Implemented		✓	✓			
10608.48.c (14)	Evaluate and improve the efficiencies of the supplier's pumps.	Being Implemented						✓

1. Water generated by EWMPs through WUE improvements is stored in New Melones (NM) in a "Conservation Account" set up for SSJID and OID under the 1988 Agreement with the USBR. The account has a total limit of 200,000 acre feet. Water in excess of demand after each irrigation season (ending September 30th of each year) is placed in that account. Withdrawals or access to the account are contingent upon certain parameters, one of which being inflow to NM. When the account is full there can be no more savings and all excess water above the account limit goes into the USBR storage account for NM. At that point, SSJID and OID have no control over how the water is managed. It can be used to meet fish flows, water quality objectives or made available to CVP Contractors.

In order to more explicitly report an estimate of WUE improvements that have occurred since the last AWMP and an estimate of WUE improvements expected to occur five and ten years in the future, OID has estimated the qualitative magnitude (expressed as None, Limited, Modest, or Substantial in order of increasing relative magnitude) for the targeted flow paths associated with each EWMP relative to the applicable WUE improvement categories identified in Table 7-5. Past WUE improvements are estimated relative to no historical implementation and relative to the time of the last plan (adopted in 2012). Future WUE improvements are estimated for five years in the future (2020) relative to 2015 and for ten years in the future (2025) relative to 2015. The result of this evaluation is provided in Table 7-6.

OID will continue to seek out and implement water management actions that meet its overall water management objectives and result in WUE improvements. OID staff regularly attend water management conferences and evaluate technological advances in the context of OID's water management objectives and regional setting. The continuing review of water management within OID, coupled with exploration of innovative opportunities to improve water management will result in future management improvements by OID and additional WUE improvements.

Table 7-6. Evaluation of Relative Magnitude of Past and Future WUE Improvements by EWMP.

Water Code Reference No.	EWMP	Implementation Status	Marginal WUE Improvements[1,2]			
			Past		Future	
			Relative to No Historical Implementation[3]	Since Last AWMP[4]	5 Years in Future[5]	10 Years in Future[5]
10608.48.b (1)	Measure the volume of water delivered to customers with sufficient accuracy	Being Implemented	No Direct WUE Improvements			
10608.48.b (2)	Adopt a pricing structure based at least in part on quantity delivered	Being Implemented	Limited	Limited	None	
10608.48.c (1)	Facilitate alternative land use for lands with exceptionally high water duties or whose irrigation contributes to significant problems, including drainage.	Not Technically Feasible	Not Applicable to OID			
10608.48.c (2)	Facilitate use of available recycled water that otherwise would not be used beneficially, meets all health and safety criteria, and does not harm crops or soils.	Being Implemented	Limited (approx. 2,500 af annually)	None	None to Modest, Depending on Opportunities	
10608.48.c (3)	Facilitate financing of capital improvements for on-farm irrigation systems	Being Implemented	Limited	Limited	Substantial	
10608.48.c (4)	Implement an incentive pricing structure that promotes one or more of the following goals: (A) More efficient water use at farm level, (B) Conjunctive use of groundwater, (C) Appropriate increase of groundwater recharge, (D) Reduction in problem drainage, (E) Improved management of environmental resources, (F) Effective management of all water sources throughout the year by adjusting seasonal pricing structures based on current conditions.	Being Implemented	Substantial (Goals B & C)	Limited (Goal A)	None	
10608.48.c (5)	Expand line or pipe distribution systems, and construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance and reduce seepage	Being Implemented	Substantial	Substantial	Substantial	Substantial
10608.48.c (6)	Increase flexibility in water ordering by, and delivery to, water customers within operational limits	Being Implemented	Substantial	Substantial	Substantial	Substantial
10608.48.c (7)	Construct and operate supplier spill and tailwater recovery systems	Being Implemented	Substantial	Limited	Limited	
10608.48.c (8)	Increase planned conjunctive use of surface water and groundwater within the supplier service area	Being Implemented	Substantial	Substantial	Substantial	Substantial
10608.48.c (9)	Automate canal control structures	Being Implemented	Substantial	Substantial	Substantial	Substantial
10608.48.c (10)	Facilitate or promote customer pump testing and evaluation	Being Implemented	Modest	Limited	None	None
10608.48.c (11)	Designate a water conservation coordinator who will develop and implement the water management plan and prepare progress report.	Being Implemented	The activities of the Water Conservation Coordinator and other OID staff to achieve WUE improvements through implementation of the EWMPs are described individually by EWMP.			
10608.48.c (12)	Provide for the availability of water management services to water users.	Being Implemented	Modest	None	Substantial	Substantial
10608.48.c (13)	Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional changes to allow more flexible water deliveries and storage.	Being Implemented	Substantial	Limited	None to Substantial, Depending on Outcomes	
10608.48.c (14)	Evaluate and improve the efficiencies of the supplier's pumps.	Being Implemented	Substantial	Modest	Limited	Limited

1. As noted herein and throughout this analysis, reductions in losses that result in WUE improvements at the farm or district scale do not result in WUE improvements at the basin scale, except in the case of evaporation reduction. All losses to seepage, spillage, tailwater, and deep percolation are recoverable within OID or by downgradient water users within the basin.

2. In most cases, quantitative estimates of improvements are not available. Rather, qualitative estimates are provided as follows, in increasing relative magnitude: None, Limited, Modest, and Substantial.

3. WUE Improvements occurring in recent years relative to if they were not being implemented.

4. WUE Improvements occurring in recent years relative to the level of implementation at time of last AWMP (2012).

5. WUE Improvements expected in 2020 (five years in the future) and 2025 (ten years in the future), relative to level of implementation in recent years.

8. Water Resources Plan Report Card

8.1 Introduction

As discussed previously, the District's Board of Directors initiated the development of the OID Water Resources Plan (WRP) in November of 2004. The WRP represents a comprehensive study of the District's water resources, delivery system, and operations. The overall objective of the WRP is to identify how the District can best protect its water rights while meeting the needs of all its stakeholders and serve the region. The Draft Plan was completed in November 2005 and finalized following the completion of a draft Programmatic Environmental Impact Report (EIR) in January 2007. The WRP provides specific, prioritized recommendations for OID physical and operational improvements as well as a plan to phase the implementation of improvements consistent with available financial resources.

This section of OID's AWMP provides a review of improvement actions identified under the WRP, a summary of actions completed to date, and projections of near- and long-term actions to be completed.

8.2 Summary of WRP Identified Actions and Implementation Schedule

Improvements under the WRP include canal maintenance and rehabilitation, flow control and measurement, groundwater well replacement, pipe replacement, regulating reservoir construction, a Woodward Reservoir intertie (not currently planned), turnout maintenance and replacement, outflow management projects (i.e. spillage and runoff reduction and reuse), reclamation projects, SCADA system expansion, and annexation. The general WRP implementation schedule is shown in Figure 8-1.

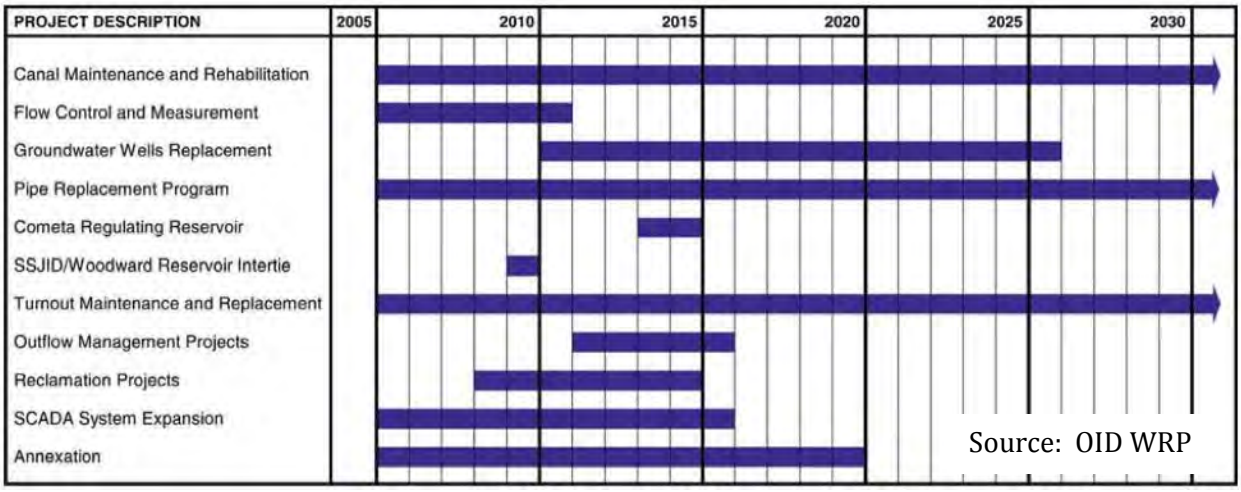

Figure 8-1. OID WRP Implementation Schedule.

In addition to the projects listed in Figure 8-1, OID recognized the need for critical improvements to main canals and tunnels to ensure supply reliability by reducing the risk of catastrophic failures

that could cut off water supply to large portions of the District. As a result, these improvements have been implemented concurrently with the additional projects identified as part of the WRP.

8.3 WRP Actions Implemented to Date

Between the start of implementation of the WRP in 2006 and 2014, OID completed more than 510 individual capital improvement projects, including 175 projects since 2012. The number of projects implemented by improvement category between 2006 and 2014 is summarized in Table 8-1, along with the total number of projects implemented each year. Costs associated with WRP projects to date total more than $46 million, with more than $7.1 million in improvements completed since 2012. Total costs by improvement category between 2006 and 2014 are summarized in Table 8-2, along with the total cost of projects implemented each year. A summary of WRP documents is provided in Attachment G.

Cumulative implementation costs by improvement category (other than main canal and tunnel improvements) from 2006 to 2014 are shown in Figure 8-2. Total annual costs for main canal and tunnel improvements, as compared to other WRP projects, are shown in Figure 8-3. The general decrease in implementation cost following 2010 relative to previous years is due to expended bond proceeds and lack of firm long-term water transfers resulting in decreased capital expenditures. Capital improvements in 2014 were enabled by a temporary water transfer in 2013. OID continues to consider and evaluate opportunities for water transfers, annexations, and other potential revenue sources.

With respect to cost, projects implemented between 2006 and 2014 totaling more than $1 million have included canal maintenance and rehabilitation ($5.7 million), flow control and measurement structures ($8.4 million), pipeline replacement ($6.8 million), turnout maintenance and replacement ($1.5 million), reclamation projects ($1.4 million), main canal and tunnel improvements ($14.9 million), and the North Side regulating reservoir ($6.3 million).

Table 8-1. OID WRP Number of Projects Initiated by Year, 2006 to 2014.

Improvement Category	Number of Projects by Year Started									Total
	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Canal Maintenance and Rehabilitation	10	6	2	3	1	0	0	0	7	29
Flow Control and Measurement	14	15	10	15	10	10	6	3	8	91
Groundwater Well Replacement, Construction, or Rehabilitation	0	1	1	3	5	2	1	2	1	16
Pipeline Replacement	13	12	4	7	4	5	0	6	7	58
Turnout Maintenance and Replacement	26	11	22	31	31	17	10	43	59	250
Outflow Management Projects	1	1	1	2	1	1	0	1	1	9
Reclamation Projects	5	5	5	1	4	2	0	0	0	22
Main Canal and Tunnel Improvement Projects	5	3	3	1	1	2	3	0	3	21
North Side Regulating Reservoir	0	0	0	3	0	0	0	0	0	3
Miscellaneous In-System Improvements	0	1	0	0	1	0	0	1	13	16
Total	74	55	48	66	58	39	20	56	99	515

Table 8-2. OID WRP Project Costs by Project Initiation Year, 2006 to 2014 (Millions).

Improvement Category	Total Project Costs by Year Started									Total
	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Canal Maintenance and Rehabilitation	$0.86	$0.28	$0.89	$0.35	$3.01	$0	$0	$0	$0.33	$5.71
Flow Control and Measurement	$0.48	$1.79	$1.47	$1.84	$0.09	$0.30	$1.78	$0.36	$0.33	$8.43
Groundwater Well Replacement, Construction, or Rehabilitation	$0	$0.02	$0.03	$0.07	$0.03	$0.26	$0.28	$0.22	$0.06	$0.97
Pipeline Replacement	$2.42	$1.64	$1.53	$2.39	$0.36	$0.49	$0.21	$0.23	$1.03	$6.77
Turnout Maintenance and Replacement	$0.14	$0.06	$0.13	$0.14	$0.16	$0.10	$0.19	$0.19	$0.37	$1.48
Outflow Management Projects	$0.03	$0.06	$0.08	$0.01	$0.01	$0	$0.05	$0.04	$0.01	$0.29
Reclamation Projects	$0.02	$0.35	$0.05	$0.97	$0.02	$0	$0	$0	$0	$1.41
Main Canal and Tunnel Improvement Projects	$0.58	$0.59	$5.30	$6.91	$0.05	$0.20	$0	$0	$1.24	$14.86
North Side Regulating Reservoir	$0	$0	$0	$6.32	$0	$0	$0	$0	$0	$6.32
Miscellaneous In-System Improvements	$0	$0.01	$0	$0	$0.01	$0	$0.02	$0.03	$0.18	$0.25
Total	$4.51	$4.81	$8.10	$16.84	$3.75	$1.35	$2.53	$1.07	$3.54	$46.49

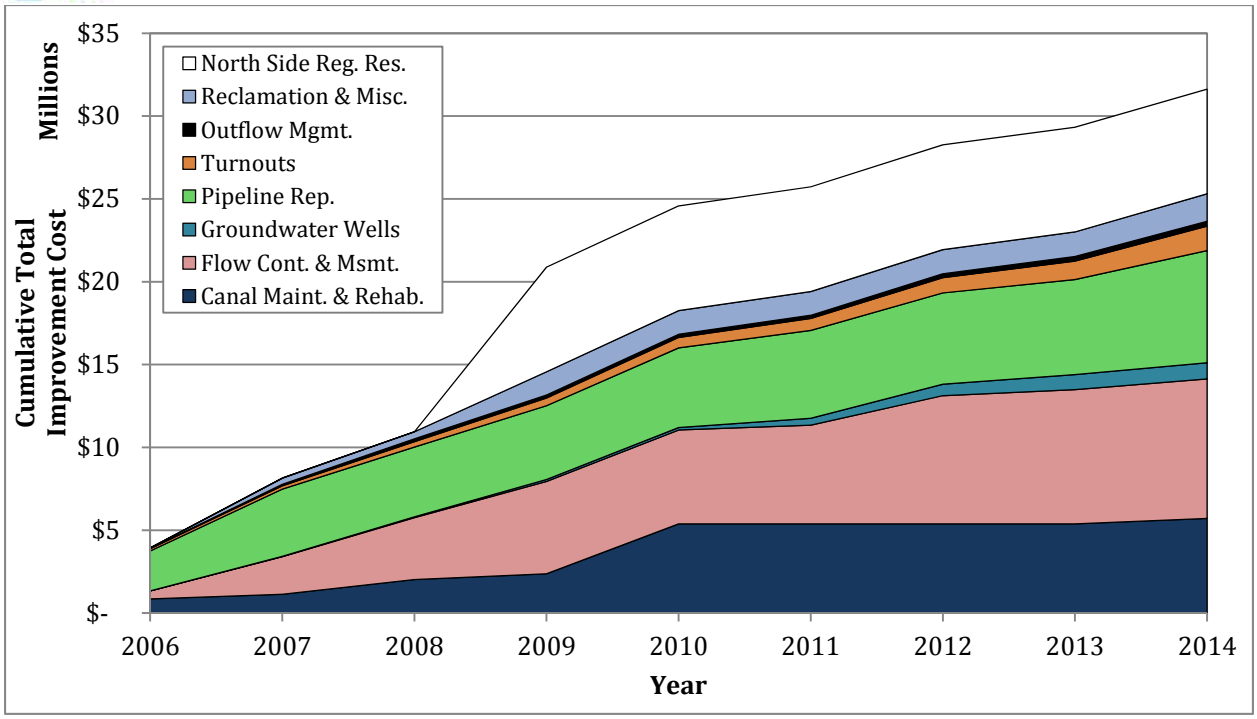

Figure 8-2. OID WRP Cumulative Implementation Costs by Improvement Category.

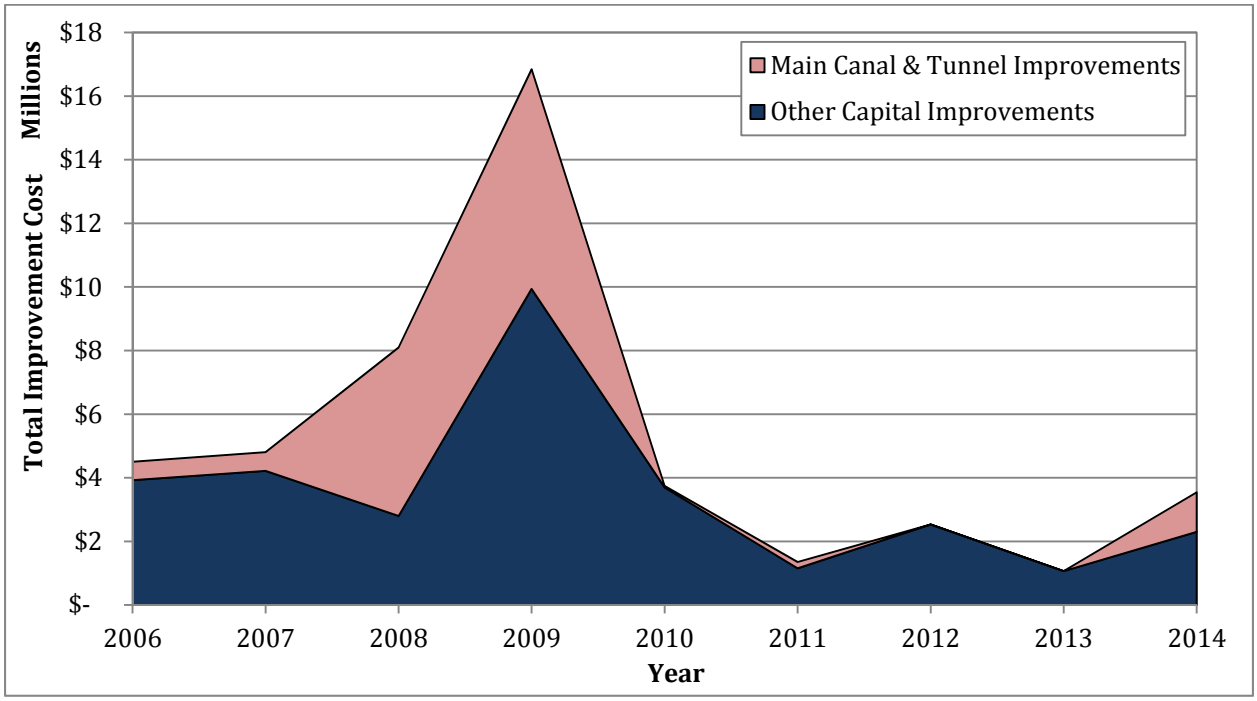

Figure 8-3. OID WRP Annual Implementation for Main Canal and Tunnel Improvements as Compared to Other Capital Improvement Projects.

Projects within any given improvement category may include components of other improvement categories. For example, canal and lateral rehabilitation projects and pipeline replacement projects often include turnout replacement. For purposes of this report, project costs have not been split for those projects which include components of multiple improvement categories in all cases.

Additionally, implementation of projects under the WRP has not strictly followed the specific schedule developed as part of the WRP in 2005. As time progresses, OID reprioritizes projects based on current conditions to best meet the needs of the District and its water users. A result of these two considerations is that the specific projects and associated costs implemented since completion of the WRP do not match exactly with the initial schedule and projected costs associated with the WRP; however, cumulative costs and projects completed since completion of the WRP are consistent with projected costs and are focused on the goals of the WRP. These goals include rebuilding and modernizing the OID distribution system to improve water supply reliability while also improving operability and operation of the system. Improved operation is expected to result in reduced losses primarily to spillage. Additionally, the quality of delivery service to customers continues to improve, including increased delivery steadiness, improved delivery measurement, and increased flexibility in water ordering by and delivery to water customers.

The WRP identifies annexation of approximately 4,250 acres within the OID sphere of influence by 2020 as part of the preferred alternative currently being implemented. Annexation provides additional funding to finance various infrastructure and operational improvements under the WRP while providing additional benefits of decreased reliance on groundwater for irrigation and increased groundwater recharge from deep percolation of surface water used for irrigation. As of 2015, OID has annexed approximately 9,349 acres, surpassing WRP goals, with an additional 1,149 acres of additional annexation expected in early 2016.

Expansion of OID's SCADA system as part of WRP implementation has also progressed in recent years. Inlets and outlets of District regulating reservoirs have been automated and integrated into the SCADA system. Additional automation has been implemented at the Cashman Dam and Little John Creek Diversion Dam. OID installed 31 automated flow control gates, six automated turnouts, and replaced 28 check structures as part of a pilot Total Channel Control (TCC) program on the Claribel and Cometa laterals. Currently, OID has installed a total of 68 Rubicon FlumeGates, 22 Rubicon SlipMeters, and 8 Rubicon FlumeMeters, all of which are integrated into the District's SCADA system. These gates allow for automation and remote monitoring of 33 headings, 47 inline structures, 15 turnouts, and 3 outflow locations. In addition to the Rubicon sites, twelve gates are controlled remotely via actuators. SonTek IQ acoustic Doppler flowmeters have been installed at five sites since 2012. These improvements contribute to increased delivery flexibility and steadiness as well as reduced operational spills from the OID distribution system.

The linkage between projects implemented under the WRP and the EWMPs identified in SBx7-7 and being implemented by OID is described in Table 8-3.

8.4 Near Term Actions Planned for Implementation between 2015 and 2020

OID is currently developing plans for the next phases of implementation of TCC and has prioritized laterals for future automation, inventoried sites to be replaced or improved, and developed supporting cost estimates in pursuit of funding opportunities through grants or other means. Additionally, OID is evaluating the feasibility of and pursuing funding opportunities for recycling tertiary treated M&I discharge from the City of Oakdale.

As has been the case since 2006, future projects will be closely aligned with the WRP, but actual projects implemented in a given year will be based on the evolving specific needs of OID and its customers to maximize cost-effectiveness and to achieve supply reliability and operational benefits within available budgets. As discussed previously, the decrease in implementation cost in 2011 relative to previous years reflects expended bond proceeds and lack of firm long-term water transfers resulting in decreased capital expenditures. As part of the WRP, OID has pursued opportunities for water transfers across multiple potential water markets. These markets include agricultural markets (e.g., existing, adjacent agricultural groundwater users), local and regional areas (e.g., nearby municipal and industrial water users), and metropolitan areas. By evaluating and implementing transfer opportunities across a range of markets, OID is able to meet the financial requirements of implementing the WRP while also maximizing the local beneficial use of available surface water supplies.

There has been a shift in focus to some extent to turnout replacement and delivery measurement corrective actions in recent years due to the requirements of SBx7-7 and associated regulations as discussed elsewhere in this AWMP. Additionally, there has been a shift from reclamation projects to projects aimed at preventing tailwater and operational spillage (reducing the need for drainwater recovery) such as on-farm conservation and increased SCADA monitoring.

Table 8-3. Linkage of SBx7-7 EWMPs to WRP Improvement Categories and Associated Projects.

Water Code Reference No.	EWMP	Water Resources Improvement Categories									
		Canal Maintenance and Rehabilitation	Flow Control and Measurement	Groundwater Wells Replacement, Construction or Rehabilitation	Pipe Replacement	North Side Regulating Reservoir	Turnout Maintenance and Replacement	Outflow Management Projects	Reclamation Projects	SCADA System Expansion	Annexation
10608.48.b(1)	Delivery measurement accuracy		✓				✓				
10608.48.b(2)	Adopt pricing structure based in part on volume delivered		✓				✓				
10608.48.c(1)	Facilitate Alternative Land Use	Not Technically Feasible									
10608.48.c(2)	Facilitate Use of Available Recycled Water								✓		
10608.48.c(3)	Facilitate financing of capital improvements for on-farm irrigation systems										
10608.48.c(4)	Implement an incentive pricing structure										
10608.48.c(5)	Expand line or pipe distribution systems, and construct regulatory reservoirs	✓	✓		✓	✓				✓	
10608.48.c(6)	Increase flexibility in water ordering by, and delivery to, water customers	✓	✓	✓	✓	✓		✓	✓	✓	
10608.48.c(7)	Construct and operate supplier spill and tailwater recovery systems							✓	✓		
10608.48.c(8)	Increase planned conjunctive use of surface water and groundwater within the supplier service area			✓				✓	✓		✓
10608.48.c(9)	Automate canal control structures		✓			✓		✓		✓	
10608.48.c(10)	Facilitate or promote customer pump testing and evaluation										
10608.48.c(11)	Designate a water conservation coordinator										
10608.48.c(12)	Provide for the availability of water management services to water users										
10608.48.c(13)	Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional changes to allow more flexible water deliveries and storage.										
10608.48.c(14)	Evaluate and improve the efficiencies of the supplier's pumps.			✓							

8.5 Long Term Improvement Actions

OID identifies and plans for specific capital improvement projects on an approximately 5-year planning horizon, allowing for modifications over time as priorities of specific projects shift and financial status changes. OID plans to update the WRP based on experience to date as well as emerging factors such as the ongoing implementation of improved delivery measurement, system automation, and volumetric billing; new water transfers and other financial considerations; and other factors.

9. References

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10. Supplemental Information

The following attachments are included as part of this AWMP:

- Attachment A: Rules and Regulations Governing the Operation and Distribution of Irrigation Water within the Oakdale Irrigation District Service Area
- Attachment B: Oakdale Irrigation District Water Measurement Plan
- Attachment C: Out-of-District Surface Irrigation Agreement
- Attachment D: Drought Management Plan
- Attachment E: Oakdale Irrigation District Surface Water Shortage Policy
- Attachment F: Stanislaus and Tuolumne Rivers Groundwater Basin Association Integrated Regional Groundwater Management Plan
- Attachment G: Oakdale Irrigation District 2006 Water Resources Plan

Attachment A: Rules and Regulations Regarding the Operation and Distribution of Irrigation Water within the Oakdale Irrigation District Service Area

TO VIEW THE COMPLETE RULES AND REGULATIONS,

VISIT:

www.oakdaleirrigation.com/sections/waterops/agwater/rules

Attachment B: Oakdale Irrigation District Water Measurement Plan

Introduction

District (OID or District) recognizes the need for farm delivery measurement and uniform standards and procedures for measuring and recording farm water deliveries in order to: (1) provide cost-effective service to customers, and (2) generate improved operational records for planning and analysis. Regulations requiring a specified level of delivery measurement accuracy were incorporated into California Code of Regulations Title 23 Division 2 Chapter 5.1 Article 2 Section 597 (23 CCR §597) in July 2012.

OID measures water deliveries primarily with meter gates. Various other flow measurement devices including constant head orifice gates and totalizing meters (magnetic flow meters, Rubicon SlipMeters and FlumeMeters, etc.) are also utilized. Given this water delivery measurement infrastructure, OID has elected to certify delivery measurement accuracy through the laboratory certification option for the new (installed after July 2012) totalizing meters and the field inspection option for the meter gates and constant head orifice gates. OID has completed inspection of all turnouts, including recording of as built dimensions, and plans to complete an operations analysis to certify that all meter gates are operating within the conditions required for flow measurement within the accuracy standards prescribed by 23 CCR §597. The operations analysis will be completed before the 2020 Plan update and used to certify that all metergates are operating within the conditions specified to be accurate within +/-5 percent as described for metergates by tests performed at the Irrigation Training and Research Center (ITRC) gate calibration facility (ITRC, 2015). If the operations analysis identifies turnouts that do not conform to the specified conditions, OID will include the appropriate corrective actions on those turnouts in the prioritization of capital improvements to turnouts within funding made available annually.

This attachment describes the compliance requirements of 23 CCR §597, provides an overview of OID delivery facilities as they relate to delivery measurement, describes best professional practices followed by OID, and describes the field inspection certification process and the status of OID's delivery measurement program corrective action.

Compliance Requirements (23 CCR §597.1)

Briefly summarized, 23 CCR §597 requires that on or before July 31, 2012 agricultural water suppliers providing water to 25,000 irrigated acres or more measure the volume of water delivered to customers. Existing measurement devices must be certified to be accurate to within ±12 percent by volume (23 CCR §597.3(a)(1)). New or replacement measurement devices must be certified to be accurate to within ±5 percent by volume in the laboratory if using a laboratory certification, or ±10 percent by volume in the field if using a non-laboratory certification (23 CCR §597.3(a)(2)). The regulation includes specific requirements for certifying and documenting accuracy for existing and new devices (23 CCR §597.4). Additionally, suppliers subject to the regulation are required to report certain information in their Agricultural Water Management Plan (AWMP) (23 CCR

§597.4(e)). OID serves more than 25,000 irrigated acres and is therefore subject to these regulations.

OID Delivery Facilities and Operations Overview (23 CCR §597.3)

Turnout Standards

OID has assembled a comprehensive set of Standard Construction Details specific to OID's construction and maintenance activities. These Standard Construction Details include details for OID's approved surface water delivery turnouts. Each of these delivery types has been designed in accordance with published industry standards and guidelines or specific manufacturer recommendations and has been approved by OID's District Engineer. All OID delivery turnouts are constructed in accordance with OID's standards and specifications and operated under the appropriate conditions meet the measurement requirements of §597.3(a)(1) and §597.3(a) (2) of the Regulation. These details are available on OID's website (www.oakdaleirrigation.com) and include; (1) STD-1-06, (2) STD-1-07, (3) STD-1-08, (4) STD-1-09, (5) STD-1-12, (6) STD-4-02, (7) STD-4-03 and (8) STD-4-04.

Metergates

Metergate turnout structures consist of round canal gates with a hole in the top of the pipe on the downstream side of the gate which is attached to a stilling well. The hole and the stilling well provide access for downstream water level measurement, so that the flow can be determined from standard manufacturer gate tables using the gate opening and difference between the upstream and downstream water levels. OID's standard detail for the metergate was designed in accordance with the United States Bureau of Reclamation (USBR) guidelines, and a majority of the original ARMCO Flow Measurement Tables continue to be used to determine discharge values in cubic feet per second (CFS). However, OID has determined that OID metergate standards STD-1-06, STD-1-07, STD-1-09 and STD-1-12 satisfy the criteria which the Irrigation and Training Research Center (ITRC) (2015) found necessary to be accurate to +/- 5 percent. To ensure the highest accuracy, OID has initiated use of the updated water measurement tables provided in that study. Additionally, as referenced on OID's standard drawings, the International Institute for Land Reclamation and Improvement (ILRI) found metergates to be accurate to between three and six percent (Bos, 1989).

Constant-Head Orifices

Constant-head orifice turnout structures consist of a concrete box structure with a square or rectangular gate on the upstream wall and a canal gate on the downstream wall. A constant head differential is maintained across the submerged orifice on the upstream wall of the concrete box by setting the upstream gate opening and adjusting the downstream gate opening to maintain a constant head differential (water level) at the flow rate desired. The flow rate is determined from standard rating tables. OID's standard detail for the constant-head orifice turnout (STD-1-08) was designed in accordance with the United States Bureau of Reclamation (USBR) guidelines. Final design and construction of each structure as well as the operations and measurement follow the criteria set forth in the USBR Water Measurement Manual (2001). As such, measurement at these turnout structures is accurate to +/- 3 percent for flow (USBR, 2001). When the accuracy of the

duration recorded is considered, the result is well within the accuracy standard of plus or minus 12 percent by volume for existing turnouts.

Totalizing Meters

OID's standard inline gate and flow meter detail is applicable when deliveries are provided from a stub on an OID pipeline. An inline gate is installed on the pipeline stub as a positive point of shutoff and a flow meter with a totalizer is installed, or planned to be installed, within OID's right of way immediately upstream or downstream of the inline gate. In these applications the pipeline must flow full and a minimum length of unobstructed flow (no elbows, valves, etc.) upstream and downstream of the meter must be maintained according to the appropriate manufacturer's specifications for accurate flow measurement. In 2014 OID added three additional flow meters (McCrometer McMag 3000, Khrone Enviromag 2000 magnetic inductive flow meter, and MACE FloSeries3 AgriFlo XCI) to the list of approved equivalents and alternatives to the meter specified in OID STD-4-02. Each of these meters come with a calibration certificate (Attachment B-1, B-2 and B-3) direct from the manufacturer indicating the results of the laboratory testing which allows staff to verify that it meets or exceeds the accuracy requirements of §597.3(a)(2)(a) when installed according to manufacturer specifications. A total of twelve of these pipeline flow meters will have been installed prior to the start of the 2016 irrigation season, five of which will be installed at delivery points. The performance, installation costs and maintenance requirements for each of these meters will continue to be evaluated as alternatives for further utilization at delivery points in the future.

While a majority of corrective action is taken according to OID's Standard Construction Details, OID has and will continue to explore alternative measurement options at the delivery point that are compliant with the Regulation. Currently, six Rubicon SlipMeters™ have been installed for flow control and measurement at delivery points. In addition, a total of five Rubicon FlumeMeters, which use the same Sonaray ultrasonic array flow measurement technology as Rubicon's SlipMeters without the added electronic gate actuation for remote flow, level and position control, have also been installed for flow measurement at delivery points. These flow measurement devices are bolted to the delivery turnout structure. The velocity through the meter is measured along with the upstream water level to confirm the cross-sectional flow area to determine the flow rate. These devices are equipped with a totalizer and are typically integrated into OID's SCADA system. These devices have been tested in the laboratory and certified to be accurate to ±2.5 percent flow rate accuracy (Judge, 2011). Field tests in California irrigation district conditions found that the Sonaray measurement was within ±2.0 percent of an NIST certified magnetic flow meter (Hopkins and Johansen, 2011). Both of these test results are well within the accuracy standard of ±5 percent for new measurement devices.

Irrigation Deliveries

Turnouts[15] are the delivery points through which water is delivered from OID canals and laterals to customers. OID customers are the individual landowners (or land tenants) to whom OID delivers water, served either directly from the OID distribution system or through facilities owned by groups of landowners which may or may not be organized under Improvement Districts (IDs). OID measures water deliveries at the turnout, where responsibility for water control and management is passed from OID to its customers. In accordance with 23 CCR §597.3(b)(2), definition and documentation for OID's access to lands and facilities is described in OID's Rules and Regulations adopted by OID's governing Board of Directors in 2005. Rules and Regulations Section 3, No. 3085 and No. 3086 describe the District's right for OID DSOs and other authorized agents to have free access to all private conduits and lands being irrigated to ensure efficient use of water and to respond to emergency situations. However, as stated in No. 3087, if the District holds a right-of-way or easement across private land for the operation and maintenance of a canal or other facility, the law provides that the District shall have certain secondary rights, such as the right to enter upon a property on which the right-of-way or easement is located; to make repairs; and do such things reasonably necessary for the efficient and economical operation and maintenance of the system. As stated in No. 3001 and No. 3004, all District facilities are under the exclusive control, direction and management of authorized District personnel and the District's responsibility for water shall cease when water is diverted into any private or Improvement District facility.

Water Orders and Recordkeeping

Written documentation of deliveries and measurement throughout the system has always been important and necessary to support efficient water management within OID's service area. The terms of measurement within OID's service area are provided within OID's Rules and Regulations. Rules and Regulations Section 5, No. 5023 and No. 5024 provide clarification to OID's water users that the District's measurements of water delivered are made at the diverting gate or valve in the District's canal and that the DSO will measure and maintain documentation of flow rates, delivered volume, and other pertinent irrigation event statistics as determined by the Water Operations Manager.

One of OID's first actions to comply with 23 CCR §597 was to transition to electronic input of delivery and operational data into a new STORM application and database software (STORM). The method for tracking deliveries remained substantially unchanged during this transition. Each DSO continues to carry a mobile phone that is used to notify customers of when they will receive irrigation water or to confirm scheduling requests from those with specialty crops that are not on the standard rotational schedule and to whom to pass the water when their irrigation time is complete. The mobile phones are transferred between the day shift and night shift DSOs so that customers have only one number to call per division, any time of the day or night. Customers typically call to request schedule changes, or to report unusual conditions, such as delivery

[1]"Turnout" is the term that is used in OID for the "delivery point" defined in 23 CCR§597 as "…the location at which the agricultural water supplier transfers control of delivered water to a customer or group of customers…." (23 CCR §597.2(a)(6))

fluctuation or interruption. All of the information that was previously only available to the DSOs on the hard copy "rotation sheets" such as the landowner, acreage, flow rate, duration, crop type, etc. has now been made available electronically on tablets. A tablet has been provided for each DSO division which allows the DSOs to have to access STORM remotely throughout their shift using a custom built application. All delivery, landowner and crop data is now required to be kept up to date in STORM. Additional tools such as District maps, measurement charts and tables, a camera, aerial photos and email have also been made available to the DSOs in the process. If and when hard copies of the rotation sheets are also requested, the printout is now generated from a report using data from STORM.

Best Professional Practices (23 CCR §597.4(e)(2 and 3))

Collection of Water Measurement Data

Recognizing that water measurement at strategic locations throughout the delivery system is a prerequisite to accurate water delivery, this section provides a brief description of both OID's system-wide and turnout specific water measurement data collection. OID collects water measurement data from over 100 SCADA sites, including 19 turnouts. Operational data such as upstream and downstream water levels, gate openings, volumes and measured flows are collected at each of these sites and transmitted back to the OID office at regular intervals. OID also collects water measurement data from various spill sites at the end of OID laterals and canals, many of which have also been integrated into OID's SCADA system. OID DSOs collect daily spot flow rate measurements at the turnouts with running deliveries along with start and end times. In addition, cumulative volumetric readings are recorded at turnouts with totalizing flow meters.

Frequency of Measurements

For turnouts, start and end dates and times are noted, daily gate openings and upstream and downstream levels are measured, and flow is calculated. All data is recorded by DSOs for each water delivery event. For turnouts with totalizing meters, start and end dates and times are collected and recorded by DSOs for each water delivery event for operational efficiency and quality control and quality assessment purposes. Totalizer readings are also recorded, at a minimum, prior to the close of each billing period. A majority of the turnouts with totalizing meters are also equipped with radios and antennas and have been integrated into OID's SCADA system. SCADA data is transmitted from each site back to OID's servers on a regular basis based on change of state (flow, velocity, water level, etc.) and/or a maximum time interval (5 to 15 minutes depending on the site and parameter).

Method for Determining Irrigated Acres

OID maintains a database of irrigated parcels that receive water deliveries. The total parcel acreage is provided from the County Assessor's Maps. Satellite imagery during the mid-summer months was reviewed over the water balance period to determine that actual irrigated area, on average, is about 92.5% of the total area. As such, for water balance calculations, OID reduces the assessed

area by 7.5 percent to reflect actual irrigated acres. Field review along with aerial imagery is used throughout the year to confirm irrigated acreage on specific parcels as the need arises.

Quality Control and Quality Assurance Procedures

Prior to the start of each irrigation season, an orientation is held for all DSOs primarily to provide a refresher training on proper measurement techniques, a review of new or rehabilitated facilities, and any operational changes that are expected to occur as a result. All of OID's DSOs are also sent to Cal Poly ITRC's Irrigation District School of Irrigation for a 3 day course on canal operations, flow measurement principals and techniques for both pipelines and canals and SCADA.

OID regularly reviews all water measurement data collected. Billing to customers provides pertinent water delivery information such as dates, duration, flow rate and volume delivered during each irrigation event along with the volumetric rate and the total fee assessment based on their water usage during the billing cycle. Prior to the bills being issued QA/QC procedures are performed by staff that include review of the data along with a series of reports that have been created to identify potential issues and erroneous information. Upon receipt by the customer, they are expected to contact OID if there is an apparent error in the water delivery volume data. If an error is found, OID staff promptly correct the error.

Water data collected by OID is also used in a District-wide water balance. Prior to using these data in the water balance, the data is reviewed for out-of-range values and other possible errors. When assembled in the water balance, the data is again checked to ensure the highest possible data quality.

Field Inspection Certification (23 CCR §597.4(a)(1)(B) and (b)(3))

Overview

The first step in determining where OID stood in relation to meeting the requirements of the Regulation when it initially went into effect was to complete an assessment of the District's existing delivery points. As part of the assessment process, OID elected to certify delivery measurement accuracy as required by the Regulation through field inspection (CCR §597.4(a)(1)(B)) and analysis. Trained OID staff inspected all OID turnouts to identify those that met OID's standard design and installation requirements and thus would satisfy the delivery measurement accuracy standards of the Regulation and those which required corrective action to be taken. The following sections briefly describe the inventory and inspection procedures and results.

Inventory Procedures

During the summer of 2012, OID initiated a comprehensive inventory of existing turnouts in response to 23 CCR §597 and as part of a larger asset management assessment. That work culminated in September 2013 with a complete inventory of District turnouts. Data was collected using a Leica CS15 hand held GPS Data Collector with a predefined set of attributes established by

OID Engineering Department staff. Engineering Department staff, under the supervision and guidance of the District's licensed engineer, were trained on the proper use of the survey equipment and OID's standard turnout delivery structures. Data collected daily was downloaded at the end of each work day to a series of spreadsheets and organized by facility. As part of the inventory and specific to existing turnouts, staff collected the following data:

1. Spatial location
2. Top of structure elevation
3. Type of turnout (i.e., metergate, constant-head orifice, etc.)
4. Gate size(s)
5. Condition of turnout (on a predetermined scale of 1 → 5)
6. Site photo (upstream looking downstream)
7. Measurability assessment

With respect to measurement accuracy, field staff completed an analysis in the field to verify that existing gates on constant-head orifice turnouts and stilling wells on metergate turnouts were properly installed per OID's standards and specifications, free of debris and in all cases in good working order. After the field analysis was completed further data processing was done to link each turnout through a unique identifier to a specific parcel. Close interaction between the Water Operations Supervisors and Distribution System Operators provided feedback and confirmation of the measurement status at each turnout from the DSO's operational experience. While a majority of this data existed in various forms throughout the District's records, it did not reside in one comprehensive electronic database. As a result of these efforts, turnouts were assigned an attribute of "measurable" (compliant) based on published accuracy values for a given device type under a defined set of best management practices (BMP's) related to construction, maintenance and operation.

Inventory Results

The findings of the inventory with respect to turnout measurement device type are summarized below in Figure B-1.

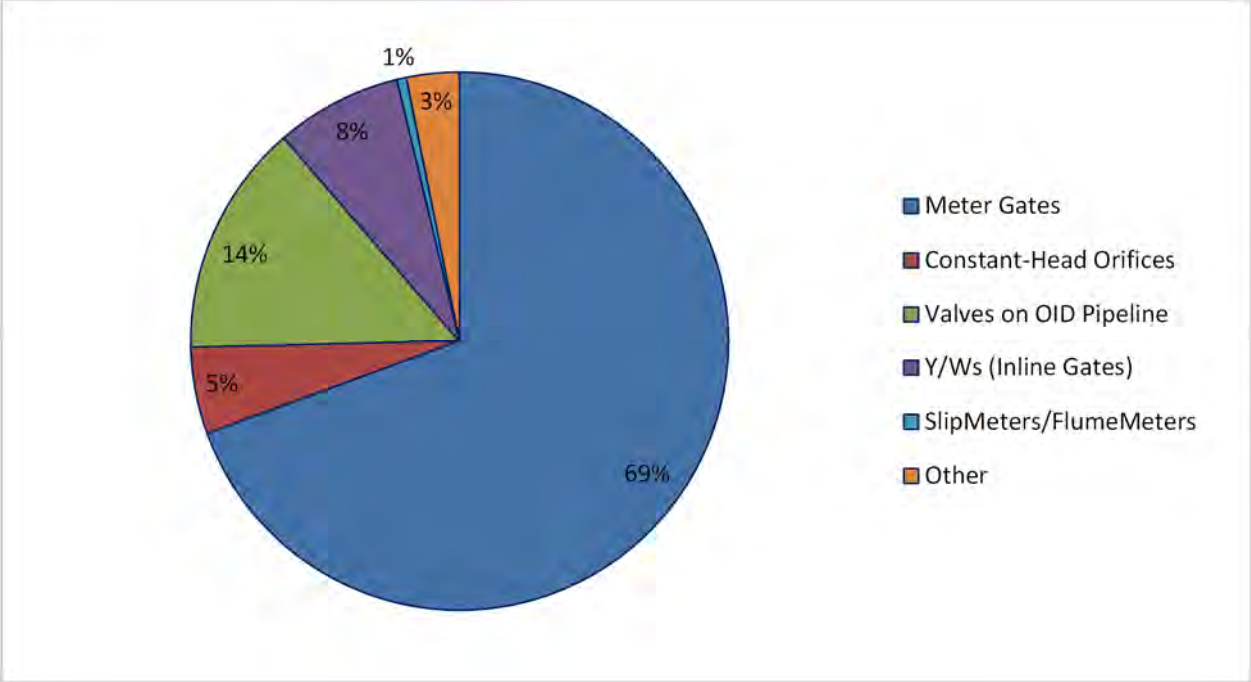

Figure B-1. Percentage of Turnout Type.

While OID delivers water through a total of 1,919 turnouts (Table B-1), approximately sixty (60) percent of OID's active accounts are for parcels that are ten (10) acres or less and comprise only twelve (12) percent of OID-served land. Further, only four (4) percent of the OID's active accounts are for parcels that are forty (40) acres or more, but these customers represent about sixty (60) percent of OID-served land. As such, a majority of the OID-served land is provided water through a small percentage of OID's total number of turnouts. Corrective action will focus first on those turnouts that serve the greatest acreage and thus account for the largest total volume of water delivered. Table B-1 below shows the total number of turnouts in OID and the total number of each type of turnout delivery structure that has been installed. Staff is currently compiling the acreage that each turnout serves and organizing a prioritized list of turnouts where corrective action is required based on the field inspection.

Of the total 1919 turnouts, 345 turnouts deliver water to 1438 small parcels that only irrigate landscaping, gardens, or crops for self-consumption. These small parcels are generally 5 acres or less and are served on a rotational irrigation schedule. DWR's Final Statement of Reasons dated 5/31/2012 states in response G24: "Turnouts that serve parcels owned by individuals whose purpose is not agricultural or farming, but rather landscaping or growing self-consumed crops are not subject to this regulation." Although DWR does not require delivery measurement to these parcels, OID continues to actively search for cost effective and accurate delivery measurement solutions for these parcels.

Table B-1. Turnouts by Meter Type.

Meter Style	Quantity	Percent of Meters	Accuracy	Accuracy Source
Measurable Turnouts				
Metergates	1332	69%	± 5%	ITRC (2015)
Constant-Head Orifices	100	5%	± 3%	USBR (2001)
SlipMeters/FlumeMeters	11	1%	± 2.5%	Judge (2011)
Subtotal	*1443*	75%		
Unmeasurable Turnouts				
Valves on OID Pipeline	269	14%	N/A	N/A
Y/Ws (Inline Gates)	146	8%	N/A	N/A
Other	61	3%	N/A	N/A
Subtotal	*476*	25%		
Total	***1919***			

OID plans to replace all unmeasurable turnouts with the most appropriate measurable turnout that meets the accuracy standards. In addition, turnouts listed as measureable above that need to have corrective action performed to meet the accuracy, design and installation standards have been identified through the field inspection and assessment. Corrective action is also scheduled for those turnouts as described in the following section.

Corrective Action Status (23 CCR §597.4(b))

One of the focal points of OID's Water Resources Plan (WRP) is to replace OID's aging infrastructure while modernizing the system to improve operational efficiency and satisfy the evolving irrigation needs of its constituents to maintain a high level of service. While one of the infrastructure categories within the WRP prior to the Regulation was irrigation service turnout replacement, it was one of many general improvement categories planned to be implemented over the 25 year planning horizon. As turnouts were replaced each year, measurement at each new turnout was a standard requirement of each project in accordance with the plan. However, after enactment of the

Regulation, OID shifted focus as much as financially feasible over the last three years to accelerate turnout replacement without substantially impacting its constituents or any of the other equally important general improvement categories within the WRP.

Prior to the passage of SBx7-7, a plan to spend approximately $5 million to replace one-third of the existing turnouts (delivery points) on a 25-year schedule was included in the WRP. Between 2006 when the WRP was completed and 2014, OID replaced more than 284 turnouts totaling more than $1,490,000 in capital construction costs. This cost does not include turnout replacements that occurred as part of larger projects (i.e. structure replacement, automation, lateral rehabilitation, etc.). Even not considering turnouts replaced as part of lager projects, the funds expended on turnout replacement and the total number of turnouts replaced on an annual basis since the WRP was adopted have exceeded that which was proposed.

According to the budget and schedule set forth in OID's 2012 AWMP, a total of $468,000 was proposed to be spent on taking corrective action on a total of 45 turnouts (at least 15 per year). The actual total OID expenditures dedicated to corrective action on turnouts from 2012 to 2014 was $751,000 (over $250,000 per year) on a total of 138 turnouts (an average of 46 per year). OID continues to invest in and implement cutting edge technology and expects that the implementation of the Regulation will continue to result in technological innovation that will provide for economically feasible options for compliance with the Regulation and will continue to allow OID to consider accelerating its turnout replacement program. Regardless, OID plans to continue to allocate between $150,000 and $300,000 annually towards replacing turnouts as outlined in the WRP turnout replacement program in descending order of the acreage served.

Attachments

Mace AgriFlow Calibration Certificate

Krohne Calibration Certificate

McCrometer Calibration Report

Measuring & Control Equipment
(MACE) Pty Ltd
Unit 19 / 276 New Line Road
Dural, Sydney, NSW 2158, AUSTRALIA
Phone: +61 (02) 9658 1234
Fax: +61 (02) 9651 7989

CALIBRATION LABORATORY
CERTIFICATE OF TRACEABILITY

Customer:	**MACE USA LLC.**
Item Model:	**MACE FloSeries3 - AgriFlo XCi**
Item Part Number:	**850-365**
Item Serial Number:	**41925**
Certificate Serial Number:	**060715_01**
Date of Test:	**06/07/2015**
Calibration Period:	**12 months**

Measuring and Control Equipment Co. Pty Limited certifies that the instrument listed above meets or exceeds all published specifications and the calibration has been performed using instruments whose uncertainties are traceable to Australian National Standards. Test results are maintained on file and are available for inspection.

The quality system implemented by MACE Instruments is accredited to ISO9001 by BSI group ANZ.

This certificate may not be reproduced except in full, and with the approval in writing from the manager in charge of the laboratory.

Tested By: Sharon Nicholls

Signature : M. A. Lynch Date Issued : 30/01/2016

Measuring & Control Equipment
(MACE) Pty Ltd
Unit 19 / 276 New Line Road
Dural, Sydney, NSW 2158, AUSTRALIA
Phone: +61 (02) 9658 1234
Fax: +61 (02) 9651 7989

CALIBRATION LABORATORY
CERTIFICATE OF TRACEABILITY

Customer:	**MACE USA LLC.**
Item Model:	**2" Insert Velocity Sensor - 10m Cable – NPT**
Item Part Number:	**850-112**
Item Serial Number:	**41212**
Certificate Serial Number:	**140415_01**
Date of Test:	**14/4/2015**
Calibration Period:	**12 months**

Measuring and Control Equipment Co. Pty Limited certifies that the instrument listed above meets or exceeds all published specifications and the calibration has been performed using instruments whose uncertainties are traceable to Australian National Standards. Test results are maintained on file and are available for inspection.

The quality system implemented by MACE Instruments is accredited to ISO9001 by BSI group ANZ.

This certificate may not be reproduced except in full, and with the approval in writing from the manager in charge of the laboratory.

Tested By: Sharon Nicholls

Signature : M. A. Nicholls Date Issued : 30/01/2016

KROHNE
PO Box 56
ZIP Code 06835-060
Embu SP BR

KROHNE

CALIBRATION CERTIFICATE

Nr.1409-54409-01/22

Tag	:	
Type	: OPTIFLUX KC 2000F/18	
DN	: US STANDARD 400mm/ 16"	
Connection	: Flange / ASME 150 lbs RF	
Test Pressure	: 30 Bar	
Liner	: Hardrubber	GK : value 2.6745 (f=1/18)
Electrode Construction	: Standard	GKL : value 5.3416 (f=1/18)
Electrode Material	: HC22	
Protection Class	: IP68	
ISO Class	: H	
Serial Number	: C14502627	

The tested flow meter has been calibrated against a primary measurement standard.
This calibration certificate guarantee traceability of calibration results to units of the International System (SI).
Expanded measurement uncertainty of the primary measurement standard is 0.15%

The calibration fluid is water with conductivity of 160 S/cm and temperature of about 22° C
According to DIN 1944 is recommended an inlet section of 5D and an outlet section of 3D, measured from the electrode axis, with undisturbed flow.
The calibrations were carried out with an inlet section-length of 5D to 10D

CALIBRATION RESULTS:

Measurement range (=100%): 900 m³/h

Flow range in %	Deviation in%
90	+0.03
47	+0.02
26	-0.06

EMBU, 15/09/14

03/10

McCROMETER
Calibration Report

Serial Number: AG15-0995 Test Number: AG15-0995

Converter Serial Number:

Model: G308-4-00 Calibration Date: 10/13/2015

Report Date: 10/13/2015

Sold To: OAKDALE IRRIGATION DISTRICT

Description: MC MAG 3000, 8"

Notes:

Inside Diameter: 8.084 in 205.3336 mm KA: 1.7682 KL's Used?: Yes

Calibration Report

	Volumetric Flow Rate (GPM) min	max	PLBF Accuracy (as % of reading)
1	243.1797	496.7302	100.68
2	496.7302	750.2806	100.72
3	750.2806	1003.8311	100.75
4	1003.8311	1257.3815	100.78
5	1257.3815	1510.9319	100.80
6	1510.9319	1764.4824	100.82
7	1764.4824	2018.0328	100.85
8	2018.0328	2271.5833	100.87
9	2271.5833	2525.1337	100.89
10	2525.1337	2778.6841	100.91

Approved By: Vince H. Morton

Test Fluid: Water

Test Stand Instrumentation Traceability Kit Number: V0106

Standard Used: Secondary

Test Data

	Water Temperature (°C)	Test Time (seconds)	Air Temperature (°C)	Barometric Pressure (kPa)	Relative Humidity (%)	Average Rate of Flow (m3/sec)	Combined Uncertainty (%) at 95% confidence
1	26.50	60.843	27.97	96.33	43.7	0.1739	0.150
2	26.50	30.937	27.97	96.33	43.7	0.1133	0.150
3	26.50	48.484	27.97	96.33	43.7	0.0957	0.150
4	26.60	51.391	27.97	96.33	43.7	0.0741	0.150
5	26.50	31.767	27.97	96.33	43.7	0.0165	0.150

This calibration was performed using standards traceable to the National Institute of Standards and Technology (NIST), USA. Certificates of traceability for the individual test measurements listed in this report are documented and serialized by the Test Stand Instrumentation Traceability Kit Number identified above and are available upon request. Combined Uncertainty to a 95% confidence level is developed for each test point according to the methods described in the ANSI/NCSL Z540-2-1997. Methods and procedures used in this calibration are in accordance with the McCrometer Flow Laboratory Technical Manual, revision 2.0.

Page 1 of 1

McCrometer, Inc. • 3255 West Stetson Avenue, Hemet, CA 92545, USA
Tel (951) 652-6811 • Fax (951) 652-3078 • Website: http://www.mccrometer.com
Hours: 8am - 4:30pm PST, Monday – Friday

Serial Number: AG15-0995

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M.G. Bos (editor). 1989. Discharge Measurement Structures. Third Revised Edition. International Institute for Land Reclamation and Improvement. Wageningen, The Netherlands.

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Attachment C: Out of District Surface Irrigation Agreement

AGREEMENT ESTABLISHING TERMS AND CONDITIONS

FOR IRRIGATION OF LANDS, TEN (10) ACRES OR LARGER,

This AGREEMENT made and entered into as of this ___ day of _____, 20__, by and between _____ (hereinafter referred to as "Applicant(s)"), and Oakdale Irrigation District, an irrigation district organized and existing under and by virtue of Division Eleven of the Water Code of the State of California (hereinafter referred to as District).

The Applicant(s) has requested that surplus surface irrigation water be made available to APN _____, located at _____, _____, CA for the 20__ irrigation season.

Terms and Conditions

1. This agreement is only applicable to parcels 10 acres or larger in size. See Appendix A for those customers that are grand-fathered into this section.

2. Applicant(s) are the owner of the real property described above.

3. The above described property is within the District's sphere of influence.

4. This Agreement is subject to delivery of surplus surface irrigation water for the above described irrigation season only. The District is under no obligation in the future to subsequent agreements for the irrigation of lands outside the District's boundaries.

5. The determination by the District of the availability of adequate surplus surface irrigation water for out of district lands shall be made by the Board of Directors at the first Board meeting in March.

6. Surplus surface irrigation water deliveries are subject to termination at the sole discretion of the District during the water season.

7. The above described property shall demonstrate that an optimum overall irrigation efficiency of seventy (70) percent or greater will be achieved. The ability to achieve this efficiency will be evaluated by the District's Ag Water Department. The burden is on the Applicant(s) to prove that a seventy (70) percent or better irrigation efficiency will be maintained.

8. The Applicant(s) shall provide a Plan to insure that no agricultural tail water will leave the property. This plan will be evaluated by the District's Ag Water

Department and requires the approval by the District's General Manager.

9. The use of surplus surface irrigation water shall be for agricultural purposes and the Applicant(s) shall demonstrate that the water received is put to reasonable and beneficial uses at all times. Non-beneficial uses include, water for lawns, pasture without livestock, recreational ponds and other practices as determined by the Water Operations Department. Water shall not be used directly or indirectly for any domestic, commercial or industrial purposes.

10. The Applicant(s) shall be required to provide the following at his/her cost;

    a) Installation of a District standard delivery structure for the receipt of water (if not by pump).

    b) Provide a District acceptable measuring device to measure water by gallons per minute and to record by acre-feet delivered. Measuring device to have a factory certification no older than three years.
    c) Pump deliveries are to provide for the pump facility to be located off of District's easement or right of ways.
    d) All private facilities located within District's rights of way shall be so installed under a District Encroachment Permit.

    See Appendix A for those customers that are grand-fathered into this section. These lands may elect to comply with section 10 (a)-(d) in order to be charged the per-acre foot rate established annually by the District's Board of Directors.

11. Applicant(s) have received a copy of and agree to comply with the District's Rules and Regulations for the Distribution of Water in the Oakdale Irrigation District. Non-compliance with any policy or rules of the District could result in forfeiture of surplus surface irrigation water deliveries.

12. The District is under no obligation, either now or in the future, to furnish, construct or maintain any diversion or service structures or facilities on behalf of the above described property.

13. Applicant(s) agree to provide direct vehicle ingress and egress to the District's agents during the term of this agreement.

14. The District makes no representation, guarantee or warranty to Applicant regarding the availability of irrigation water or the quantity, quality, or delivery times of said water.

15. Upon termination of this agreement, the Applicant(s) agrees to pay all costs incurred with retiring those facilities that are no longer needed for water deliveries as determined by the District.

16. Applicant(s) hereby acknowledges that the District sells water as a commodity

only and not as a guaranteed service, and therefore agrees to hold the District, its officers, agents, and employees free and harmless from any liability or damage, including loss of profit or prospective business advantage, which may occur, arise or result from defective water quality, water shortage, fluctuation in flow or interruptions in service.

17. This Agreement shall terminate at the conclusion of the above described irrigation season; notwithstanding any violations of this Agreement as described above.

18. An application for renewal must be submitted annually by the landowner and approved by the District's Board of Directors.

Seasonal Water Charge

The Annual Seasonal Charge for the receipt of surplus irrigation water shall include:

1. A $100 annual filing fee for the processing of the application.

2. Water charges shall be set annually by the Board of Directors prior to the start of the above described irrigation season.

OAKDALE IRRIGATION DISTRICT

_____

Steve Knell, P.E.
General Manager/Secretary

OWNER(S)

_____

Owner

_____

Address:

Telephone:

Attachment D: Drought Management Plan

Background and Overview

On April 1, 2015 Governor Brown issued Executive Order B-29-15, mandating agricultural water suppliers to include a detailed Drought Management Plan (DMP) describing actions and measures taken to manage water demand during drought. OID has historically experienced relatively reliable water supplies with a full surface water supply of 300,000 acre-feet available in approximately four out of five years. OID's drought management actions and surface water shortage policies have been developed to address years of water shortage and vary based on the severity of the shortage. The District recognizes the need for fair, consistent policies to address periods when customer demands exceed OID available supplies. The District previously updated its water shortage policy in 2008 and, with ongoing implementation of the comprehensive OID Water Resources Plan and the experience of the ongoing 2012 to 2015 drought, is in the process of reviewing and revising these policies. This DMP supplements OID's shortage allocation policies and describes a broad range of actions undertaken during drought to manage available water supplies and meet customer demands to the maximum extent possible.

The DMP builds upon existing OID shortage allocation policies. The DMP includes components recommended by DWR in its 2015 AWMP Guidebook for inclusion (DWR 2015). OID's DMP describes the determination of available water supply, drought responses, and water shortage impacts. The description of water shortage impacts includes a summary of 2012 to 2015 supply and demand conditions available at the time of preparation of this DMP.

Determination of Available Water Supply

Monitoring of hydrologic conditions to assess available water supply is fundamental to OID's water management under the full range of hydrologic conditions experienced, including drought. To inform decisions related to available water supply, OID actively monitors water supply as reported by the Bureau of Reclamation (Reclamation) for New Melones Reservoir. OID's water supply depends on the New Melones Reservoir water season inflow as stipulated in the 1988 agreement. Reclamation monitors precipitation and snow forecasts, accumulated precipitation and snow, runoff, reservoir storage, and instream flows to assess water supply availability. Other sources of information include DWR snow surveys and available streamflow measurements. This data is incorporated into the Reclamation's real-time and firm yield models to forecast operations and inform decisions.

Available surface water from New Melones for OID and SSJID is determined each year based on October 1 to September 30 inflow and is projected by Reclamation starting with their February forecast. Although allocations are not officially determined until the end of September, preliminary estimates are made based on Reclamation's February and March forecasts. When inflow is greater than 600,000 af, 600,000 af is available jointly to OID and SSJID; when inflow is less than 600,000 af, the available surface water supply is determined according to the following formula:

$$\text{OID and SSJID Allocation} = \text{Inflow} + (600{,}000 - \text{Inflow})/3$$

Tri-Dam Authority water reports describing hydrologic conditions of the basin are also available and used to predict inflow to New Melones and monitor the condition of other reservoirs on the Stanislaus River including Tulloch, Donnells, and Beardsley.

Drought Responses

This section describes actions and activities undertaken by OID to address surface water shortage, including discussion of existing and emerging shortage allocation policies, coordination and collaboration, supply management and demand management.

Declaration of Drought and Surface Water Shortage Policies

During periods of surface water shortage, the District's Board of Directors can take action to formally declare a drought and determine if an allocation of available OID surface water and groundwater supplies is necessary. Under an allocation, water supplies and water use are reviewed each month, and allocations and operating plans are revised as necessary.

OID's 2008 Surface Water Shortage Policy (Policy) identified three levels of shortage based on available surface water supplies from New Melones. Various levels of action were defined depending upon the level of shortage, including suspension of out of District water service agreements, increased use of OID groundwater wells, extended delivery rotations, and suspension of all non-agricultural irrigation service.

In response to unprecedented surface water shortage in 2015, the third level of shortage was reached (available OID New Melones supplies less than 240,000 af), prompting the District to allocate water for the first time in its history. In response to the 2015 drought, OID is in the process of developing a new Policy that will define available water supplies based on defined thresholds of surface water availability. Within each surface water supply threshold, it is anticipated that available water supplies will be allocated by priority. Priorities for irrigation service, in order from greatest to least are generally anticipated to include tier 1 customers, tier 2 customers (annexed lands), out of district applicants, and water transfers. The updated Policy is anticipated to be in place prior to the 2016 irrigation season.

Similar to the 2008 Policy, water management principles that may be defined in the updated Policy include the following:

- Establishment of an water allocation to each assessed acre
- Allocation reductions starting with lower priority users
- Modified District groundwater pumping operations
- Extended delivery rotations
- Enhanced enforcement of tailwater policies
- Increased water theft enforcement and penalties
- Increased outreach and communications strategies
- Monthly supply assessments and allocation adjustments (as warranted)

- Conveyance agreements to permit use OID facilities for movement of groundwater from private wells

Coordination and Collaboration

OID coordinates and collaborates extensively with others regarding local and regional water management in all years. These activities intensify during periods of drought in order to minimize adverse drought impacts across a range of stakeholders. Examples of collaboration and coordination activities include the following:

- Participation in the Stanislaus County Drought Task Force and coordination with the State Office of Emergency Services to respond to local drought emergencies
- Reporting of information to the California Energy Commission, the California Department of Water Resources, and other governmental entities as necessary
- Coordination with the South San Joaquin Irrigation District (SSJID), Reclamation, and others with regard to Stanislaus River water supplies and demands
- Cooperation with SSJID as part of the Tri-Dam Project to operate and maintain the Donnells, Beardsley, and Tulloch reservoirs

Additionally, the District participates in the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA), the Eastern San Joaquin County Groundwater Basin Authority Work Group, and the Stanislaus County Groundwater Technical Advisory Committee to actively coordinate, plan and manage groundwater resource issueswith local cities, counties and water agencies.

Supply Management

Extraordinary Operational Measures. In recent years, OID has made substantial improvements to both distribution system infrastructure and operational practices to increase operational efficiency through the reduction of operational spillage. During periods of surface water shortage, OID takes additional, extraordinary measures to further increase operational efficiency and conserve available water supplies. Highlights of OID activities in recent years to increase operational efficiency include the following:

- In 2010, OID completed the new Northside Regulating Reservoir, allowing for the capture of substantial amounts of diverted water that could otherwise be spilled.
- In 2012 Total Channel Control (TCC) was fully implemented on the Claribel and Cometa laterals, essentially eliminating operational spillage on these laterals. Implementation of TCC on additional laterals is planned as funding becomes available. See Section 7 of this AWMP for additional detail.
- OID has continued to improve upon training and communications amongst staff to better coordinate operation of laterals and reduce spillage. Communications improvements have included tablets in each DSO division equipped with email, cameras, SCADA and Storm volumetric tracking and billing software and continued SCADA system expansion to provide operators with additional remote monitoring data and operational control of system flows and water levels at strategic locations in real time.

- In 2014 a 30 percent reduction in surface outflows as a result of progress in prior years and extraordinary actions. Additional reductions are anticipated in 2015.
- In 2015 OID implemented a farmer to farmer water transfer program, allowing growers to transfer water between parcels through private transactions within OID. The program enabled irrigation customers to work together to maximize available supplies to meet crop water requirements throughout the District. Transfer applications were administered free of charge, and District operators conveyed the transferred water using the OID distribution system.

Supply Augmentation. Generally, OID water supplies have been sufficient in all but the driest of years. Substantial historical contributions of surface water recharge to the underlying groundwater system allow OID to increase groundwater pumping in years of surface water shortage to augment available water supplies. Strategic operation of OID wells during these periods not only augments and increases overall water supply, but also provides operators with increased flexibility to more precisely match water supply to customer demands and reduce spills. The conjunctive management of surface water and groundwater supplies over time is a key component of OID's shortage and drought management strategy.

OID considers potential water transfers from others on a case-by-case basis; however, availability of transfers in drought years is limited and, if available, costly. OID and several of its irrigation customers actively utilize available recycled water and drainage water to supplement primary water supplies. The District is actively working with the City of Oakdale to obtain access to treated surface water for irrigation purposes. OID's private deep well conveyance program allows growers to optimize the use of additional groundwater supplies during drought by making the District's conveyance system available for conveying groundwater pumped from private wells.

Demand Management

OID encourages on-farm water conservation on an ongoing basis. During shortage years, these efforts are enhanced through several extraordinary actions, which may include the following:

- Additional Education and Outreach to Growers
- Allocation of Available Water Supplies
- Extended Rotation Intervals
- Enhanced Enforcement of Rules and Regulations
- Reduction in Season Length

These actions are summarized in the remainder of this section.

Outreach and Incentives. OID regularly provides educational resources and conducts outreach activities to support efficient water management by its irrigation customers. During periods of reduced supply, OID focuses these efforts on encouraging on-farm water conservation and keeping growers informed of hydrologic conditions and any changes to OID policies and practices to manage limited water supplies.

Examples of OID's extraordinary drought efforts include the attached Farmer to Farmer Transfer Program Application Agreement (Attachment D.1) and Temporary Permit for Conveyance Channel (Attachment D.2). These materials are made available to irrigation customers at the front office and via links on the OID webpage. Special newsletters and Board of Directors press releases are also made available on the OID website and included here in Attachments D.3 and D.4, respectively.

Allocation of Available Supplies. Under the extraordinary water shortage conditions of 2015, OID for the first time allocated available water supplies. At the start of the 2015 irrigation season, an initial apportionment of 30 inches of water per assessed acre was made for tier 1 customers (10 inches for tier 2). Over the course of the irrigation season, remaining water supplies were monitored and, as a result of extraordinary conservation efforts of OID's customers and staff, the apportionment was periodically increased, with a final apportionment in August of 44 inches for tier 1 (14 inches for tier 2). It is anticipated that similar actions will be incorporated into OID's shortage allocation policies in anticipation of future droughts.

Extended Rotation Intervals. OID customers farming pasture typically irrigate on a rotational basis, with a fixed period between irrigation events that varies over the course of the season. Under water shortage conditions, OID has historically extended the period between irrigation events as an extraordinary measure to conserve available supplies. In shortage years, the District often extends rotation intervals based on weather conditions and corresponding crop water use estimates. Generally, the season starts with 17- to 20-day rotations in shortage years, compared to 14- to 16-day rotations in full supply years. By late June and July, the District decreases the rotation intervals to 12- to 15-days in shortage years (10-day rotations in full supply years), consistent with the increased evaporative demand and crop water requirements during this time in the summer. As the evaporative demand of the crops drops later in the summer, the District again lengthens the rotation intervals.

It is anticipated that this action will continue in the future to the extent that water continues to be made available on a rotational basis. As OID continues to improve operational capabilities of the system, it is anticipated that deliveries will increasingly be made on an arranged-demand basis, providing enhanced flexibility to irrigation customers while continuing to control demand through allocation of available supplies when necessary.

Enhanced Enforcement of Rules and Regulations. OID's irrigation Rules and Regulations (AWMP Attachment A) require that all water be applied efficiently and used in a reasonable and beneficial manner. During an irrigation delivery, the irrigator is responsible for the water at all times after it leaves the OID distribution system. Irrigators who waste water intentionally or as a result of carelessness, improper field preparation, or neglected facility maintenance may be refused OID water until the cause of the condition is remedied.

During periods of water supply shortage, OID increases enforcement of rules related to the unauthorized or unreasonable use of water and unreasonable tailwater runoff. In 2014, the fine for unauthorized use of water as a first offense was increased to $1,500. For a second offense, the fine increased to $2,500 and included a loss of water privileges for the remainder of the year. For

unreasonable use and tailwater runoff including water flowing down and across roadways, flooding neighbors, excessive ponding, or other excessive runoff one warning was issued, with a second offense resulting in loss of water for the remainder of the year.

Reduction in Season Length. The District's Board of Directors determines the season start and end dates on an annual basis considering grower preferences and staff recommendations. In reduced water supply years the season start and end dates can be adjusted to reduce the season length as an extraordinary action to reduce demand.

Water Shortage Impacts

Supplier Revenues and Expenses

The District's rate structure bases a portion of water charges on a fixed (per-acre) component, which helps maintain revenue stability across years despite variability in power generation. In addition to reduced power generation and water charges to irrigation customers, revenues decrease as a result of decreased water sales through out of district agreements and water transfers. Under its existing rate structure, OID is able to help mitigate the increase in groundwater pumping costs by applying a drought surcharge in years when a drought is declared by the Board of Directors.

Increased expenditures that result from the implementation of extraordinary drought management actions are mitigated by a combination of measures, including the following:

- Temporarily reducing or eliminating expenditures for capital improvements
- Drawing on available reserves to cover costs
- Reduced staffing costs through departmental reorganizations

Increased expenditures include the following:

- Increased outreach to the public
- Increased groundwater pumping costs
- Increased reliance on outside legal and technical experts to address River operations and water rights issues

Impacts on Water Supplies

To illustrate actions by OID and its customers to manage available water supplies during drought, water supplies for 2012 to 2015 are summarized. The year 2012 represents the most recent year prior to 2015 with a full New Melones supply, while the 2013 to 2015 period represent years of consecutive, decreasing surface water supplies (increasing shortages). All sources of supply are summarized, to the extent available at the time of preparation of this DMP, including inflows from Goodwin Dam (system inflows and river pumping), District pumping, private pumping, and other supply sources (drain water reuse, tailwater reuse, and water recycled to the distribution system).

Surface water inflows during 2012 and 2013 were similar at 231 thousand acre-feet (taf) and 244 taf, respectively (Figure D.1). Although New Melones supplies were reduced in 2013 as a result of insufficient inflows under the 1988 Agreement, they remained sufficient to meet OID customer irrigation demands during that year. Surface inflows were greater in 2013 than in 2012 due to a combination of increased crop evapotranspiration and reduced precipitation which led to increased irrigation demands. Surface water inflows in 2014 were substantially less at approximately 200 taf, representing a reduction in surface water supplies of approximately 15 percent as compared to 2013 and 2014. During 2015, surface water inflows through September were 170 taf, compared to 192 taf in 2014 and an average of 228 taf in 2012 and 2013, representing reductions of 12 and 26 percent, respectively.

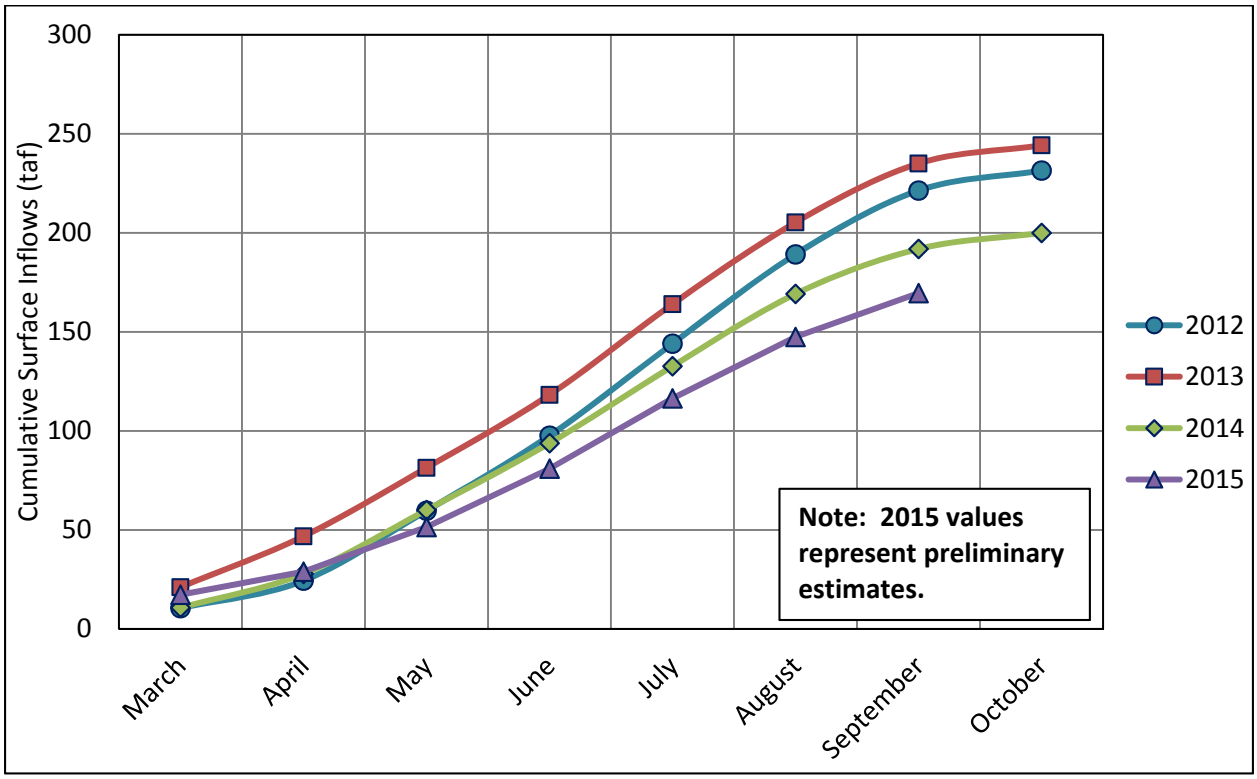


Figure D.1. OID Cumulative March to October Surface Inflows, 2012-2015.

OID total district pumping was least during 2012 at 6 taf, the last full supply year, and increased to 10 taf in 2013 in response to increased crop water demands (Figure D.2). In 2014 OID pumping increased to approximately 17 taf in response to substantial reductions in available surface water supplies. In 2015 OID pumping was approximately 13 taf, representing an increase compared to 2012 and 2013 and a decrease compared to 2014.

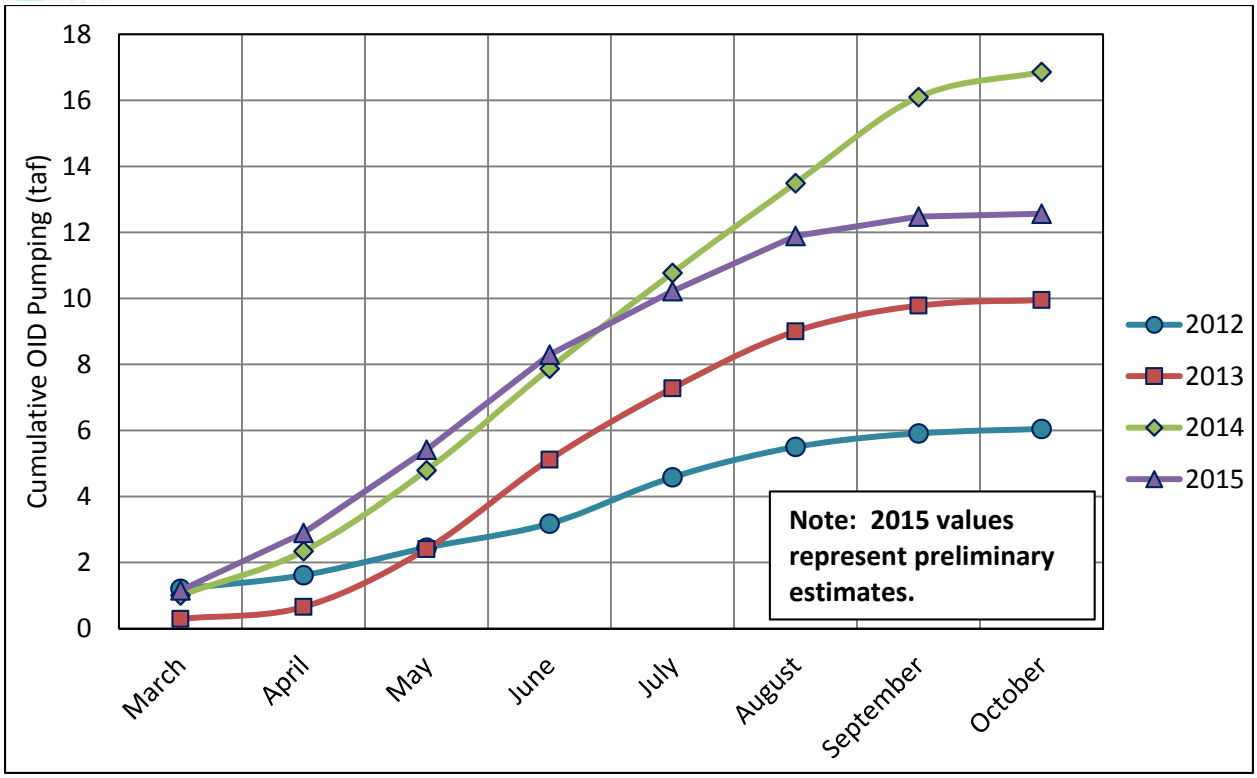


Figure D.2. Cumulative March to October District Groundwater Pumping, 2012-2015.

Private pumping within OID's service area was approximately 20 taf in 2012 and 2013 (Figure D.3). In 2014, private pumping increased to approximately 40 taf. The increase in pumping is primarily due to the annexation of new lands into the OID service area (this annexed land will use surface water when available, but continued to use primarily groundwater in 2014 due to the drought conditions), rather than additional pumping on historical OID lands. The annexed lands, which lie to the east of the historical OID service area, did not receive surface water from the District in 2014 and were solely reliant on private groundwater pumping for irrigation. The 2015 private pumping volume is not currently available as these volumes are estimated after the irrigation season is complete.

Other water supplies include water reuse and recycling by OID and its customers. Sources include OID drain water reuse and recaptured tailwater and water from private drain water reuse and recycled M&I wastewater. Reuse and recycling were between 11 and 12 taf in 2012 and 2013, and decreased to approximately 9 taf in 2014 (Figure D.4). Reduced reuse and recycling in 2014 may have been the result of less availability of drain water due to reduced operational spillage and tailwater in response to drought. Estimates of reuse and recycling for 2015 are not currently available, as these volumes are estimated after the irrigation season is complete.

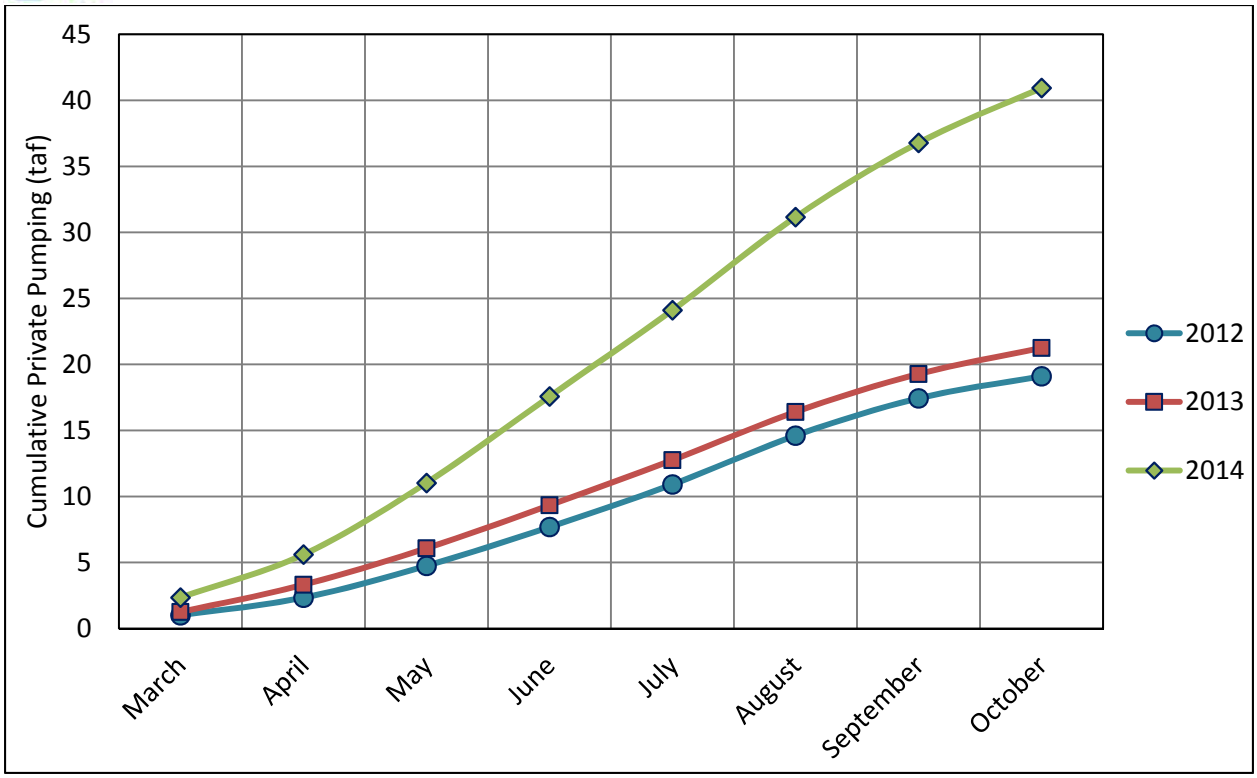


Figure D.3. Cumulative March to October Private Groundwater Pumping, 2012-2014.

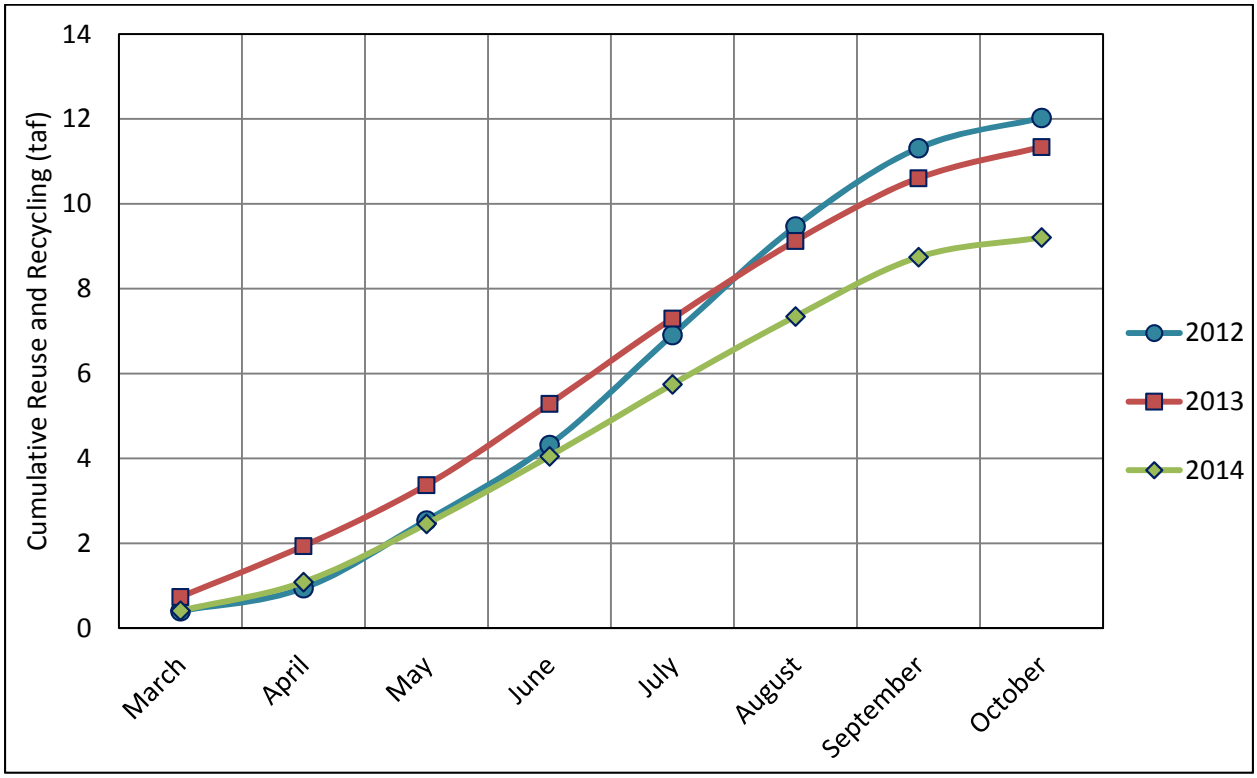


Figure D.4. Cumulative March to October Reuse and Recycling, 2012-2014.

OID total water supplies combine surface water inflows, District and private groundwater pumping, and District and private reuse and recycling. Total irrigation supplies were relatively similar between 2012 and 2014 due to a combination of factors (Figure D.5). Irrigation supplies in 2013, which were approximately 287 taf and somewhat greater than 2012 and 2014 reflect an increase in diversions during 2013 to meet increased crop water demands as compared to 2012, as described previously. Irrigation supplies in 2014, which were approximately 267,000 af reflect a decrease in surface water availability and diversions as compared to 2012 and 2013, which is substantially offset by increased private groundwater pumping resulting from the expansion of the OID service area to include newly annexed lands to the east of the historical service area (this annexed land will use surface water when available , but continued to use primarily groundwater in 2014 due to the drought conditions). Additionally, OID groundwater pumping was increased in 2014 to help offset reduced surface water supplies and maintain water supply reliability. Complete information describing 2015 total irrigation supplies is not currently available as these figures are estimated after the season is completed; however, total water supplies are projected to be less than those in 2014 based on the 2015 cumulative surface water inflows.

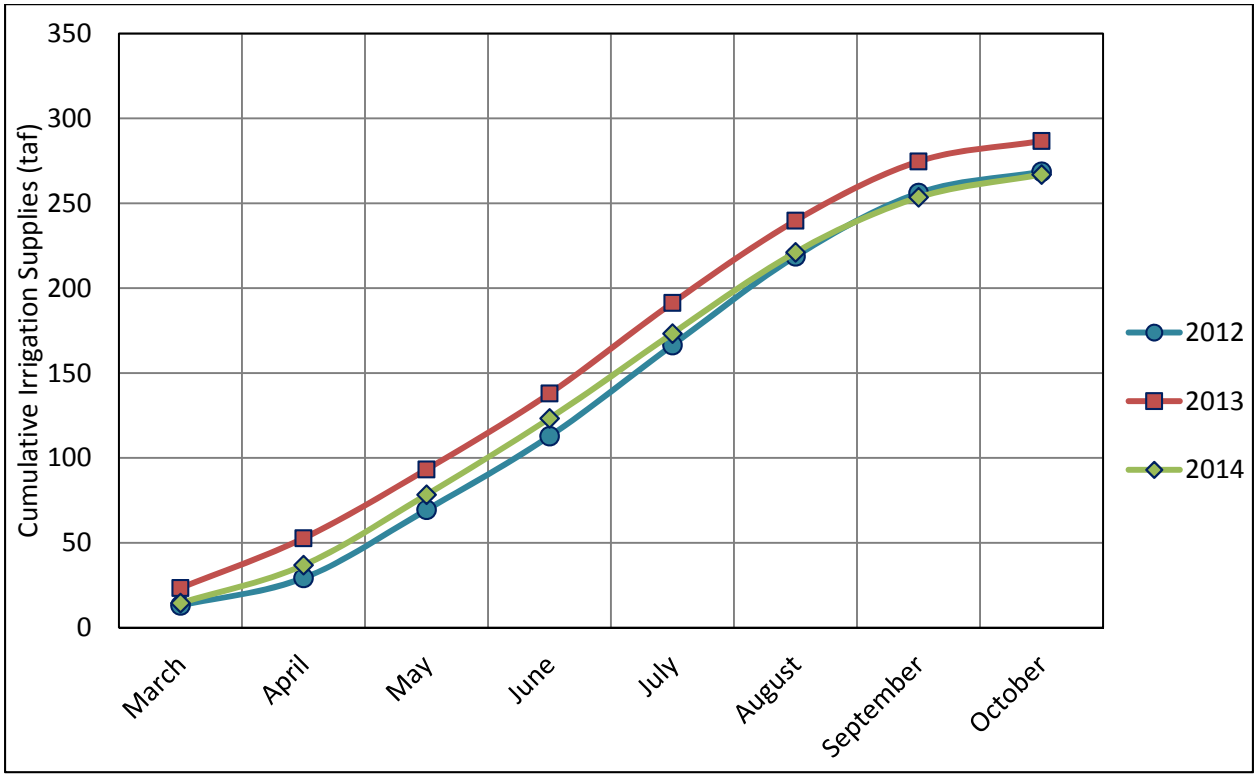


Figure D.5. Cumulative March to October Total Irrigation Supplies, 2012-2014.

Demand Impacts

To illustrate impacts to water demands during drought, demands for 2012 to 2015 are summarized. The year 2012 represents the most recent year prior to 2015 with a full New Melones supply, while the 2013 to 2015 period represents years of consecutive, decreasing surface water supplies (increasing shortages). Indicators of demand summarized, to the extent available at the

time of preparation of this AWMP, include farm deliveries; reference evapotranspiration (ET_o), a measure of atmospheric water demand; and evapotranspiration of applied water (ET_{aw}), a measure of crop consumptive irrigation water demands.

Farm deliveries were greatest in 2013 for the 2012 to 2014 period, reflecting increased crop irrigation requirements due to limited precipitation and increased ET_o (discussed below) (Figure D.6). OID was able to meet irrigation demands in 2013 due to only a small reduction in available surface water and through increased District groundwater pumping. Farm deliveries in 2014 were least during this period, reflecting a reduction in surface water supplies relative to 2013 and increased on-farm efficiency to reduce tailwater runoff and deep percolation.

March to October ET_o was 48, 51, and 50 inches in 2012, 2013, and 2014, respectively (Figure D.7). ET_o in 2015 through August tracked similar to 2014. Relatively consistent seasonal ET_o over the 2012 to 2015 irrigation seasons suggests that differences in crop consumptive irrigation water demands are influenced more by differences in year-to-year precipitation than reference ET.

Crop ET_{aw} was approximately 128 taf, 142 taf, and 154 taf in 2012, 2013, and 2014, respectively (Figure D.8). The increase in ET_{aw} from 2012 to 2013 results primarily from reduced precipitation in 2013, as compared to 2012. The additional increase in ET_{aw} from 2013 to 2014 results primarily from the annexation of additional lands into the OID service area.

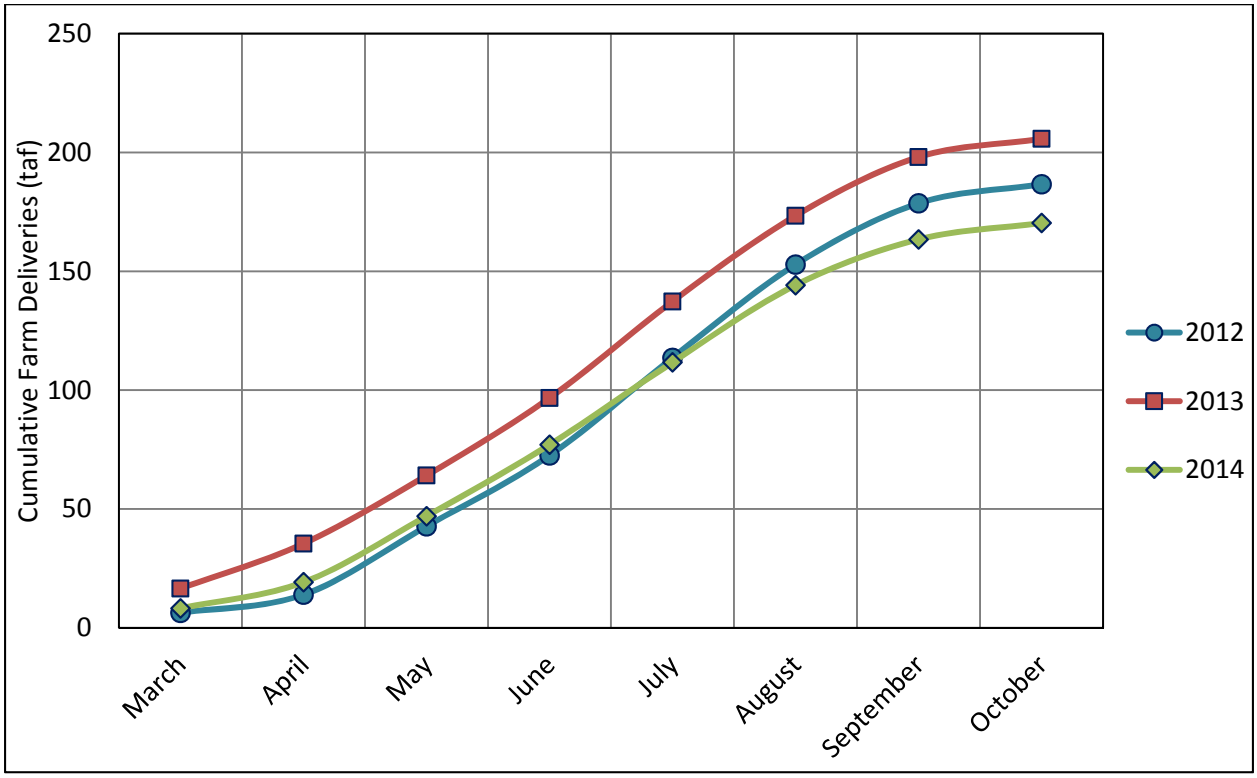


Figure D.6. Cumulative March to October Farm Deliveries, 2012-2014.

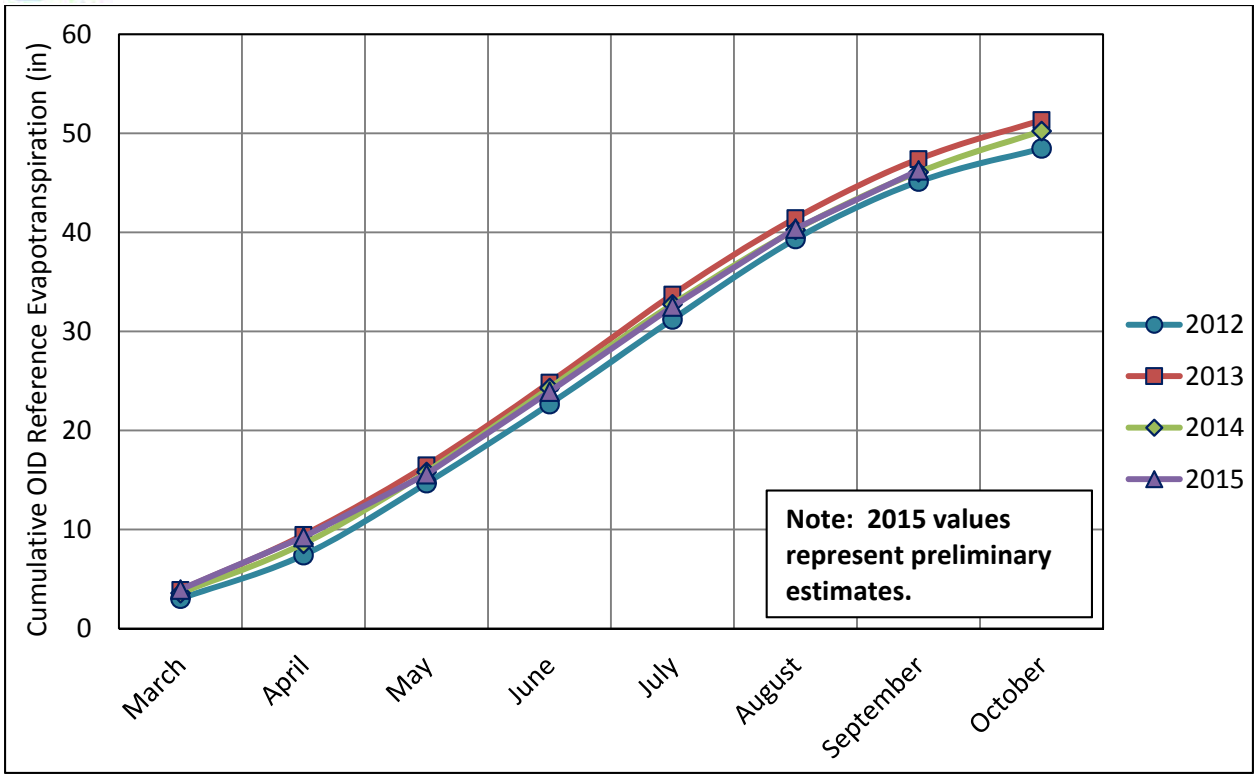


Figure D.7. Cumulative March to October Reference Evapotranspiration, 2012-2015.

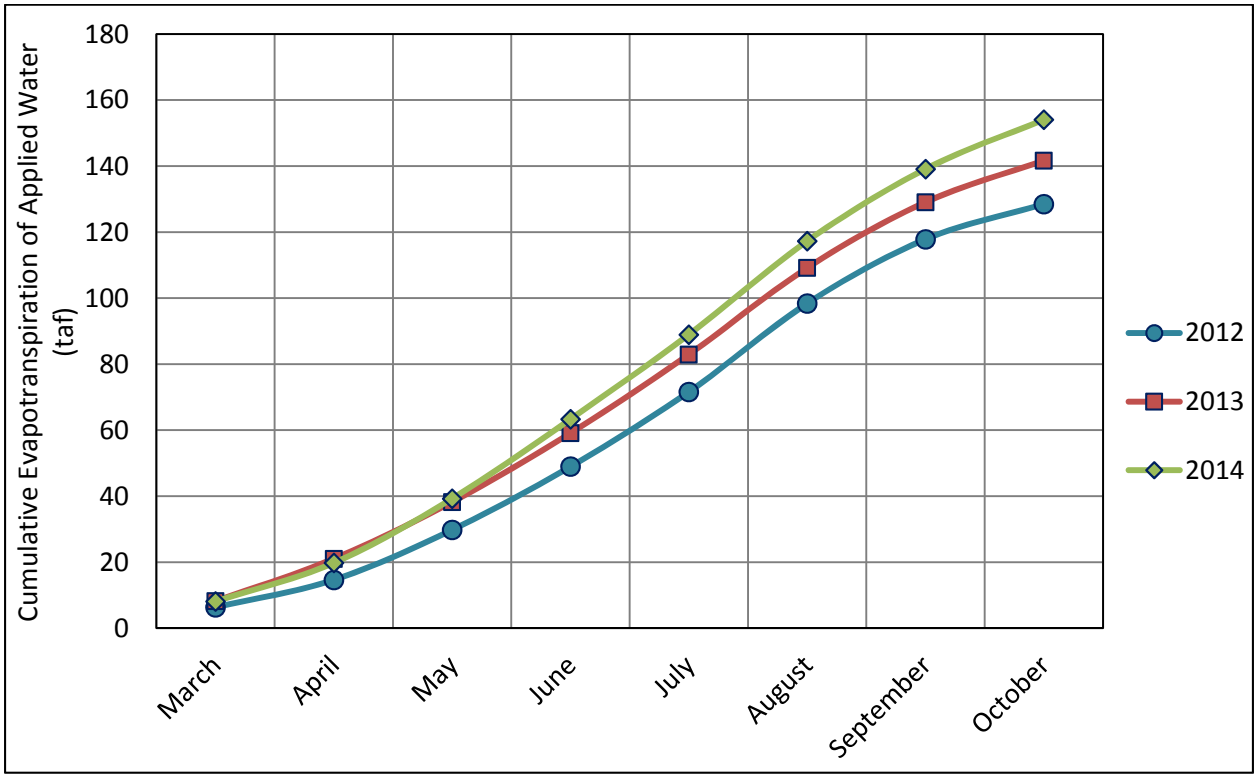


Figure D.8. Cumulative March to October Crop Evapotranspiration of Applied Water, 2012-2015.

References

DWR. 2015. A Guidebook to Assist Agricultural Water Suppliers to Prepare a 2015 Agricultural Water Management Plan. California Department of Water Resources.

Attachments

D.1. January 23, 2014 Water User Notice

D.2. Farmer to Farmer Transfer Program Application Agreement

D.3. Temporary Permit for Conveyance Channel

D.4. Special Newsletters

D.5. Selected Board of Directors Press Releases

D.1. January 23, 2014 Water User Notice

OAKDALE IRRIGATION DISTRICT

Water User Notice
January 23, 2014

This water user notice is being provided to you because of the current drought situation and the need to begin planning early for what is shaping up to be a critically dry winter. To get through this irrigation season will require all of us to do our part and more.

What OID will be doing;

- Unless a significant rain event occurs, irrigation water deliveries will begin March 1, 2014.
- All of OID's 22 deep well pumping systems will be maximized to make water supplies available.
- The first rotation will be a 12-day rotation. The goal is to irrigate all fields as quickly as possible to replace needed soil moisture.
- After this first rotation, OID will follow up with a longer rotation interval. That duration will be based on weather and crop-water-soil moisture loss values (evapotranspiration). That rotation duration may be 18, 20 or 22 days, again dependent on weather.
- OID will continue to manage rotation intervals until the system is on 14 day rotations; likely the end of April.
- We anticipate providing 2-10 day rotations in July, but that benefit is dependent on what OID's water picture looks like come the latter part of June.
- Come August, rotation intervals will be lengthening again to match evapotranspiration losses.
- OID anticipates making water deliveries through September.
- BE ADVISED, an October rotation may not be available this year. That issue will be addressed by the Board in September.
- OID will be issuing fines and a lock-out to any water user who takes water out of rotation, or unauthorized use of water, or theft of water, etc. DO NOT take water unless you have contacted your ditchtender or he/she has contacted you. Fines will be set by the Board of Directors in February. A first offense may cost you the loss of water for the season.

What YOU need to be doing;

- Have an irrigator on-site at the start of your rotation and at appropriate times during the rotation. Unless you have made prior arrangements with your ditchtender, you may not receive your rotation until an irrigator is present. This will be left up to the ditchtender.
- Stick to your rotation times. Be considerate! Coordinate any time changes with your ditchtender. Communicate, communicate, and communicate with your ditchtender.
- Unreasonable tail water runoff will not be tolerated. Water flowing down and across roadways, flooding of neighbors, excessive ponding, etc. will be strictly addressed this year. Landowners will be on a one-warning notice and then a loss of water for the season.
- Repair leaking ditches and pipelines NOW! We also ask that you clean your ditches to improve water flow as well. Systems not in good shape for receipt of water may not get water.

It's not about this year, it's about next YEAR;

OID has invested $55 million in modernization and improvement projects to its water delivery system. OID water users have seen the benefits of those investments with no cutbacks in service over the last two years of this drought. OID is in good shape and prepared to address this third year of drought in much better shape than others. However, the more we conserve this year, the less pain we will have to endure next year if the drought continues. Nearly all of OID's surplus supplies and tools it had available will have been spent this year. We need your help in being prepared to address the 2015 water season with as much carryover as possible. Together we need to all step up to the plate and get this done. Thank you.

D.2. Farmer to Farmer Transfer Program Application Agreement

OAKDALE IRRIGATION DISTRICT
1205 East F Street
Oakdale, CA 95361

FARMER TO FARMER TRANSFER PROGRAM

APPLICATION AGREEMENT

The Farmer to Farmer Transfer Program (FFTP) was adopted by Oakdale Irrigation District's (OID) Board of Directors during the 2015 irrigation season (Board Resolution 2015-NIL) to allow farmers to work together to fully utilize available surface water supplies as supply was not expected to be adequate to meet the normal demand of irrigators. Participation in the FFTP is optional and provides a mechanism for Eligible Landowners to request that OID change the delivery location of the Landowner's 2015 irrigation water allotment(s) from parcel to parcel.

FFTP Terms and Conditions:

1. The FFTP shall apply only to record owners of real property located within the OID irrigation boundaries who meet all of the requirements listed below ("Eligible Landowners").

    a. By execution of this Application Agreement certify to OID that they have all irrigation accounts current as of the date of this Agreement; and

    b. Have submitted properly completed and executed FFTP Application Agreements to OID no later than 3 weeks prior to the last day of the 2015 irrigation season as set by OID and as may be changed from time to time. It is the sole responsibility of the Landowner to know the last day of the 2015 irrigation season.

    c. Have submitted properly completed and executed FFTP Application Agreements to OID a minimum of 15 days before the delivery date of water.

2. Tenants or leaseholders are responsible for obtaining all Landowner approvals. In the event OID requires confirmation of property ownership, Eligible Landowners agree, upon request by OID, to provide a copy of the title or deed to real property referenced herein prior to any payment to Contributing Landowner or delivery to Receiving Landowner.

3. A "Contributing Landowner" is an Eligible Landowner who, for each identified parcel, elects to forego his or her entire OID irrigation water allocation, or portion thereof, for the 2015 irrigation season and hereby requests OID deliver that allocation to designated Receiving Landowner parcel as set forth in Exhibit A attached to and incorporated as part of this Agreement.

4. A "Receiving Landowner" is an Eligible Landowner who agrees to accept delivery of Contributing Landowner's 2015 irrigation water allocation at the parcel as set forth on the attached Exhibit A.

5. A "parcel" means a tract of land having a unique Assessor Parcel Number as reflected in current Stanislaus County Assessor records.

6. FFTP decisions, including decisions about Landowner eligibility, delivery allocations, and compliance or removal from the FFTP, shall be made solely at OID's discretion.

7. Upon the confirmation of eligibility by OID and execution of this Agreement by both the Contributing and Receiving Landowner, OID will change the delivery location of the Contributing Landowner's 2015 water allocation.

8. OID shall not participate in, be responsible for, or in any way liable to either the Contributing or Receiving Landowner for any agreement or breach of agreement between or among the Landowners, including agreements regarding the transfer of, payment for, or change in delivery location of the water allocation.

9. Landowner shall be solely responsible for any and all permitting necessary to participate in the FFTP, including environmental, state or local agency permitting.

10. The FFTP is an emergency drought measure and may be discontinued or modified at any time at OID's sole discretion. OID reserves the right to amend, add or otherwise withdraw the terms set-forth herein.

Agreement

To participate in the FFTP, Landowner agrees to comply with the terms and conditions set forth herein, which includes the FFTP Terms and Conditions and OID's Rules and Regulations Governing the Operation and Distribution of Irrigation Water Within the Oakdale Irrigation District Service Area, all of which are incorporated herein by reference. Landowner represents that they are legally entitled to enter into this Agreement.

This Agreement is entered into solely for the benefit of Landowner and OID; may be executed in counterparts with each deemed an original and all of which taken together shall constitute a single instrument; and constitutes the entire agreement between the parties on the matters contained herein.

Landowner agrees that any and all use of water delivered by OID shall be consistent with OID's water rights, jurisdictional boundaries, and all applicable laws, rules, regulations ordinances and policies.

Landowner shall indemnify and hold OID harmless for and from any and all liabilities, costs, demands or any other legal claims arising from or related to Landowner's conduct or activities arising from or related to FFTP participation. Neither OID nor any OID director, officer, employee, agent or representative shall be liable for damage ***of any kind*** resulting from Landowner's participation in the FFTP, from any non-OID works or the water flowing therein, or for any waste or other misuse of water by any end-user.

I, the undersigned, do hereby attest that I have accurately represented my identity; that I am the owner of the real property subject to this Application Agreement and am duly authorized to enter into this Application Agreement.

I declare under the penalty of perjury under the laws of the State of California that the foregoing is true and correct to the best of my knowledge and that this Application Agreement was executed in Stanislaus County on _____.
Date

The parties hereby execute this Agreement as of the date below. Landowner's signature below confirms that he/she is authorized to execute this Agreement on behalf of all other owners of record on each parcel Listed on Exhibit "A."

****LANDOWNER**	**OAKDALE IRRIGATION DISTRICT**
Name: _____	Name: Eric Thorburn, P.E.
Title: _____	Title: Water Operations Manager
Signature: _____	Signature: _____
Date: _____	Date: _____

FOR OID USE ONLY:

Circle one: Approval / Rejection

Exhibit A

Farmer to Farmer Delivery Program Reallocation Worksheet	
Contributing Owner(s):	
Mailing Address:	
Contact Number(s):	
Customer ID:	
Receiving Customer(s):	
Customer(s) Contact Number(s):	
Receiving Customer ID(s):	
Transfer Amount (AF):	

**Please complete one worksheet for each Receiving Customer ID.*
**If additional receiving parcels, please complete additional worksheets.*

D.3. Temporary Permit for Conveyance Channel

OAKDALE IRRIGATION DISTRICT
TEMPORARY PERMIT
FOR
CONVEYANCE CHANNEL USE

Date of Application: _____

Conveyance Lateral: _____ APN: _____

Property Address: _____

Name: _____

Mailing Address: _____

_____

Phone Number: _____

This application is intended for:

☐ Frost Protection

Applications will be accepted on a first come, first serve bases beginning February 1st to the start of the irrigation season. Applications submitted prior to this date will be rejected.

☐ Irrigation Purpose (Please check only one box)

Application fee: $354 per application.

OAKDALE IRRIGATION DISTRICT

LANDOWNER SIGNATURE

Approved: _____ _____

Exhibit A

2015 Private Groundwater Allocation Worksheet	
Contributing Owner(s):	
Mailing Address:	
Contact Number(s):	
Customer ID:	
Receiving Customer(s):	
Customer(s) Contact Number(s):	
Receiving Customer ID(s):	
Transfer Amount (AF):	

*Please complete one worksheet for each Receiving Customer ID.
*If additional receiving parcels, please complete additional worksheets.

For District Use Only:

Property Owner: _____ Beginning Date: _____

Ending Date: _____

District's Conveyance Channel Identity: _____

**RELEASE OF LIABILITY AND
TEMPORARY PERMIT FOR
USE OF DISTRICT "CONVEYANCE CHANNELS"**

The property owner, hereinafter referred to as the "UNDERSIGNED", has requested permission to temporarily utilize the OAKDALE IRRIGATION DISTRICT'S, hereinafter "DISTRICT", _____ Conveyance Channels, for the purpose of providing irrigation and/or frost water for use on land belonging to or under the control of the UNDERSIGNED.

In order to induce the DISTRICT to grant this temporary permit, the UNDERSIGNED agrees as follows:

1. Nature of Right Conferred. The UNDERSIGNED acknowledges that the lands upon which the conveyance channels of the DISTRICT are located may not be owned by the DISTRICT, and further acknowledge that the consent contained in this permit relates only to the rights of the DISTRICT by virtue of its Grant of Easements for the maintenance and operation of DISTRICT conveyance channels and it is understood that nothing in this permit shall be considered as a representation by the DISTRICT of the authority to grant a right-of-way across any property owned or controlled by any person other than the DISTRICT. It is further agreed that any right granted to the UNDERSIGNED hereunder shall be inferior to the rights of the DISTRICT. UNDERSIGNED understands and agrees that the DISTRICT and only the DISTRICT may enter into subsequent and overlapping permits for use of these facilities with others having similar needs.

2. Hold Harmless. To the maximum extent provided by law, the UNDERSIGNED on behalf of himself, his heirs, assigns, and successors agrees to hold forever harmless, indemnify and defend the DISTRICT and its officers, employees, successors, and assigns, from any and all claims or liability of whatever character and nature arising out of or in any way connected with the permission granted by this permit. UNDERSIGNED further releases acquits and discharges the DISTRICT and its officers, employees, successors and assigns, from any and all claims however designated, arising out of or in any way attendant to the operation, maintenance, alteration, construction or reconstruction activities of the DISTRICT or its successors within the right-of-way herein described. The UNDERSIGNED agrees and understands that termination of this permit whether automatic or mandated will not act to release the UNDERSIGNED from claims resulting from the operation and granting of this permit.

3. Third Party Indemnification. In the event any of the aforesaid activity is conducted by employees, servants or independent contractors employed or retained by the UNDERSIGNED, the UNDERSIGNED agrees to indemnify and hold the DISTRICT forever

Revised October 2014

harmless from any and all liability for any claim or demand of any nature whatsoever, arising out of or in any way connected with this permit, on behalf of any such third party, including attorney fees.

4. The UNDERSIGNED further agrees that the conveyance channels of the DISTRICT to which this permit applies will be left in as good or better condition than they were before this permit was granted. In the event the Manager of the DISTRICT, in his sole discretion, determines that the facilities are not left in as good or better condition than before this permit was granted, the UNDERSIGNED agrees to take such corrective action as the Manager directs, at the sole expense of the UNDERSIGNED and at no expense to the DISTRICT. The UNDERSIGNED agrees in the event that he fails to make corrections requested by the Manager of the DISTRICT that the DISTRICT may make such corrections at the UNDERSIGNED expense, and that the UNDERSIGNED agrees to pay the cost of such corrections in full upon demand by the DISTRICT. Further, the UNDERSIGNED agrees that unpaid bills and subsequent lien so created may either be enforced by the DISTRICT in the manner provided by law for the enforcement of Mechanics and Materialmen's Liens, or in the alternative, the DISTRICT may add the unpaid amount to the UNDERSIGNED'S water charge account and utilize the enforcement mechanism provided for collection of such accounts.

5. In the event the DISTRICT commences a legal action to enforce any of the terms and conditions of this permit, the UNDERSIGNED agrees to pay such reasonable and additional sums as and for consultants and attorney fees and costs incurred in such enforcement.

6. Except as herein expressly permitted, the UNDERSIGNED shall not place or permit to be placed on, in, across, or through said right of way any building, structure, explosive, guy wire, or any other obstruction, nor do or permit to be done, anything which may interfere with the full and exclusive enjoyment by the DISTRICT of the easement and right-of -way herein referenced. UNDERSIGNED'S use of subject conveyance channels shall cease if the Manager of the DISTRICT determines that such use conflicts with the DISTRICT'S maintenance and reconstruction activities and the activities of developers and others permitted to improve DISTRICT'S works in the completion of their projects.

7. The UNDERSIGNED shall comply with all the applicable requirements of the Clean Air Act, as amended (U.S.C. 1857, et seq., as amended by Public law 91-604) and the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq., as amended 'by Public Law 92-500), respectively, and all regulations and guidelines issued thereunder.

8. The UNDERSIGNED shall prosecute such measures as necessary or prudent to insure the safety, integrity, and maintainability of the DISTRICT'S conveyance channels and their appurtenances which are colored in red on the attached ~DISTRICT Map~ identified as Exhibit "A."

UNDERSIGNED understands that each occasional use of the DISTRICT conveyance channels shall follow the procedures established by this permit. Additionally, those procedures identified within the DISTRICT'S *Rules and Regulations for Distribution of Water in the Oakdale Irrigation District* shall also apply as conditions to the granting of this permit. In addition to the other procedures and conditions noted in this permit, the following shall also apply:

(a) The UNDERSIGNED shall insure that all conveyance channels and appurtenances are ready for the receipt of waters conveyed pursuant to this permit and shall monitor, control and be responsible for all such water during the period this permit is in effect.

(b) The UNDERSIGNED shall obtain the approval of the DISTRICT'S Water Operations Supervisors/Water Operations Manager a minimum of 24 hours prior the use of the DISTRICT'S conveyance channels.

9. UNDERSIGNED agrees to accept "as is" water conveyed within the DISTRICT'S conveyance channels. DISTRICT makes no guarantees that its conveyance channels are suitable for the intended use. UNDERSIGNED agrees that the DISTRICT, its Directors, officers and employees, shall not be responsible for "loss of" or "damage to" crops and property of either the UNDERSIGNED or others due to the quality or misappropriation of water conveyed by DISTRICT on behalf of UNDERSIGNED pursuant to this permit. UNDERSIGNED understands that others may have similar needs for use of the conveyance channels of DISTRICT and agrees to work with the DISTRICT towards assuring an adequate and timely water supply to others within the DISTRICT. Subsequently, it is understood that the rights granted herein are of a non-exclusive nature with the DISTRICT reserving the right to make allocations to others of the available capacity of the conveyance channels used by UNDERSIGNED pursuant to this permit.

10. As consideration for the DISTRICT granting this permit the UNDERSIGNED shall pay in advance of using the conveyance channel the current year's permit fee.

11. Expiration. This permit may be terminated by the Manager of the DISTRICT upon three (3) days' notice, either letter or verbal, to the UNDERSIGNED or may be terminated immediately in the event of an emergency or upon failure of the UNDERSIGNED to automatically be terminated on, at which time the UNDERSIGNED will discontinue use of the DISTRICT'S conveyance channels as authorized under this permit.

12. The UNDERSIGNED acknowledges that all of the foregoing constitutes conditions precedent to the DISTRICT granting the permit herein requested and understands that the permit would not have granted in the absence of said conditions.

DATED this ____ day of _____, 20___.

PROPERTY OWNER

_____

Address:

_____

_____

Phone: _____

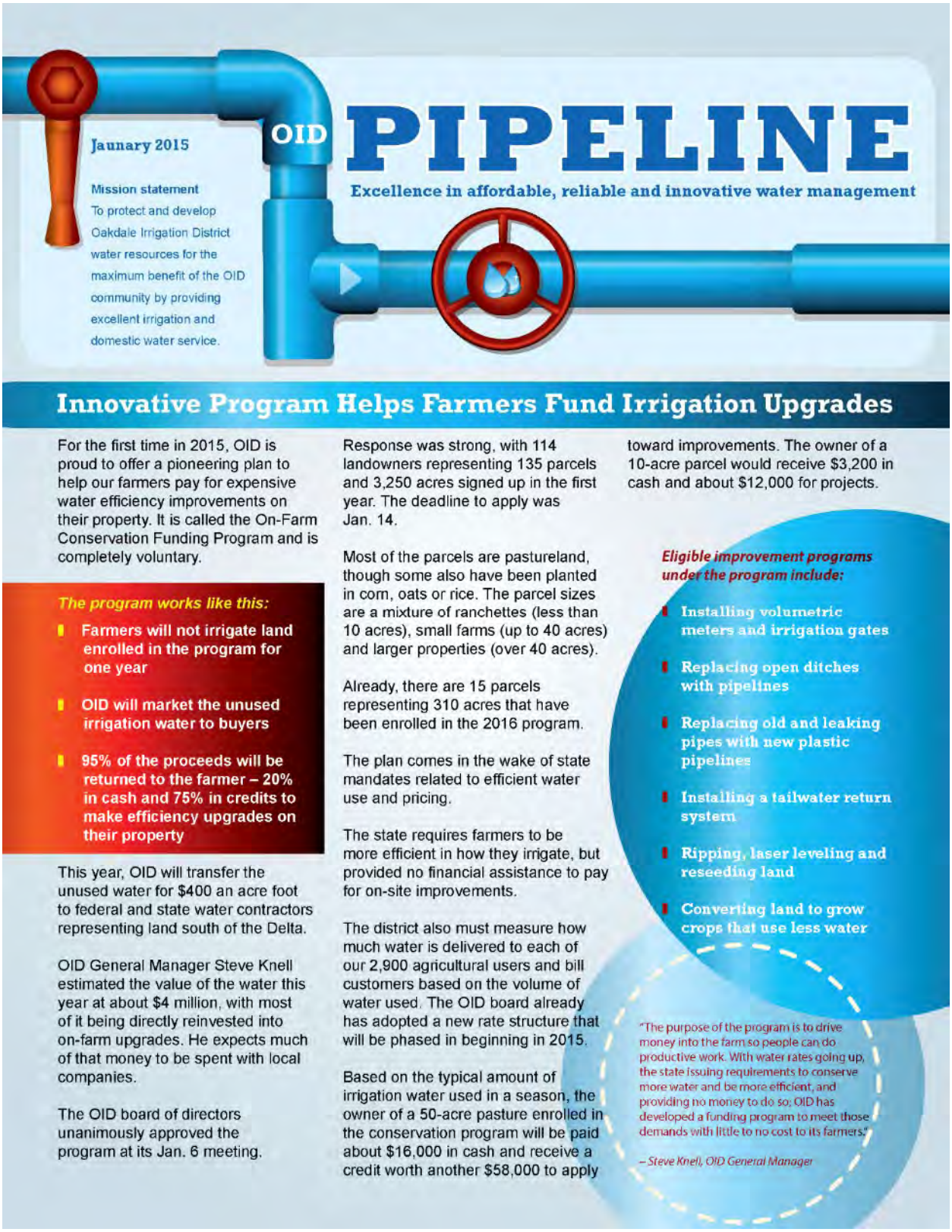
OAKDALE IRRIGATION DISTRICT

_____
General Manager
1205 East F Street
Oakdale, CA 95361

-3-

Revised October 2014

D.4. Special Newsletters



OID PIPELINE

Jaunary 2015

Mission statement
To protect and develop Oakdale Irrigation District water resources for the maximum benefit of the OID community by providing excellent irrigation and domestic water service.

Excellence in affordable, reliable and innovative water management

Innovative Program Helps Farmers Fund Irrigation Upgrades

For the first time in 2015, OID is proud to offer a pioneering plan to help our farmers pay for expensive water efficiency improvements on their property. It is called the On-Farm Conservation Funding Program and is completely voluntary.

The program works like this:

- **Farmers will not irrigate land enrolled in the program for one year**
- **OID will market the unused irrigation water to buyers**
- **95% of the proceeds will be returned to the farmer – 20% in cash and 75% in credits to make efficiency upgrades on their property**

This year, OID will transfer the unused water for $400 an acre foot to federal and state water contractors representing land south of the Delta.

OID General Manager Steve Knell estimated the value of the water this year at about $4 million, with most of it being directly reinvested into on-farm upgrades. He expects much of that money to be spent with local companies.

The OID board of directors unanimously approved the program at its Jan. 6 meeting.

Response was strong, with 114 landowners representing 135 parcels and 3,250 acres signed up in the first year. The deadline to apply was Jan. 14.

Most of the parcels are pastureland, though some also have been planted in corn, oats or rice. The parcel sizes are a mixture of ranchettes (less than 10 acres), small farms (up to 40 acres) and larger properties (over 40 acres).

Already, there are 15 parcels representing 310 acres that have been enrolled in the 2016 program.

The plan comes in the wake of state mandates related to efficient water use and pricing.

The state requires farmers to be more efficient in how they irrigate, but provided no financial assistance to pay for on-site improvements.

The district also must measure how much water is delivered to each of our 2,900 agricultural users and bill customers based on the volume of water used. The OID board already has adopted a new rate structure that will be phased in beginning in 2015.

Based on the typical amount of irrigation water used in a season, the owner of a 50-acre pasture enrolled in the conservation program will be paid about $16,000 in cash and receive a credit worth another $58,000 to apply toward improvements. The owner of a 10-acre parcel would receive $3,200 in cash and about $12,000 for projects.

Eligible improvement programs under the program include:

- **Installing volumetric meters and irrigation gates**
- **Replacing open ditches with pipelines**
- **Replacing old and leaking pipes with new plastic pipelines**
- **Installing a tailwater return system**
- **Ripping, laser leveling and reseeding land**
- **Converting land to grow crops that use less water**

"The purpose of the program is to drive money into the farm so people can do productive work. With water rates going up, the state issuing requirements to conserve more water and be more efficient, and providing no money to do so; OID has developed a funding program to meet those demands with little to no cost to its farmers."

– Steve Knell, OID General Manager

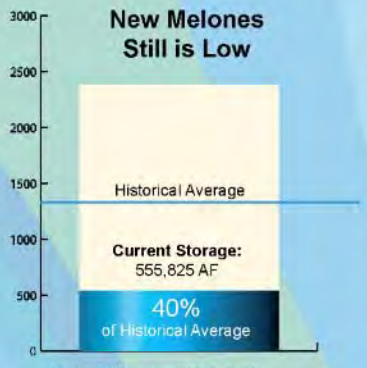
Water outlook: The drought is not over

In 2014, the third year of drought in California reminded everyone of the value of every drop of water and how it is used.

The OID and our 2,900 agricultural customers responded responsibly and proactively to the need to conserve. The district delivered 208,000 acre-feet of surface water to ag users, down from 230,000 to 235,000 acre-feet in a "normal" year. One acre-foot is about 326,000 gallons.

OID's long-term commitment to rebuild and modernize our infrastructure -- canals, pipelines, pumps, automated gates, deliveries, etc. -- helped save water. It is these improvements that allowed OID to meet our constituent's crop water requirements in 2014 while those around us struggled and had water allocation reductions. That is the benefit of all our past work in upgrading our system.

All those savings added up and allowed OID to end the 2014 irrigation season with some water still remaining behind New Melones Reservoir.



Current Storage: 555,825 AF
23% of Total Capacity
40% of Historical Avg. For This Date
(Total Capacity: 2,400,000 AF)
(Avg. Storage of Jan 19: 1,406,765)

A wet December was a welcome start to the winter, but the historic drought is not close to being over. It will take more than a few powerful storms to refill the state's depleted reservoirs.

The Stanislaus River watershed – which provides runoff into New Melones – was so dry that December's storms barely made a dent in the shortfall there. Instead, the parched ground in the mountains soaked up much of the moisture with little "extra" runoff making it to the reservoir.

On Jan. 19, New Melones held 555,825 acre-feet. That was just 40% of its historic average for the date – 1,406,765 acre-feet. It is the lowest the reservoir has been at this time of the year since the drought of the early 1990s and a vivid reminder about how little rain and snow have fallen the past three years.

Water experts predict it will take multiple years of above-average precipitation to recover from this drought. There still is a long ways to go. January was very dry. Whatever happens the rest of this winter, conserving and efficiently using water still will be critical in 2015.

River Restoration: Video Highlights Salmon Project

A salmon success story is taking shape on the Stanislaus River and a new video shines a light on the key players, including the Oakdale Irrigation District.

Entitled **"Replenishing a River: Stanislaus River Honolulu Bar Restoration,"** the 11-minute video uses underwater photography, still images and narration to illustrate an important fish habitat project completed in 2012. The Oakdale Irrigation District and U.S. Fish and Wildlife Service split the cost of the $1.1 million project. The work was done over two years by biologists, engineers and technicians at FISHBIO as well as OID employees.

Groundwater Pumping, Water Transfers Not Related

One local media outlet consistently has carried misleading stories inaccurately linking the amount of groundwater pumped annually by OID with the district's strategic business decision to transfer surplus water to willing buyers.

Let's be clear:

OID DOES NOT PUMP GROUNDWATER AND TRANSFER IT ELSEWHERE.

OID pumps groundwater to meet customer demands where there are constriction points in our canal system. We do this via a network of 28 deep wells, most of which were installed in the 1940s and early 1950s.

When the irrigation demands of our customers have been met and there is a declared surplus, the district transfers that surplus surface water to other water agencies in need. Those transfers began in 1998 as a means to protect that water under state law and to raise the funds necessary to do system improvements while not unreasonably burdening our constituents with higher water rates. All money received from water transfers goes into OID's capital construction budget to rebuild and modernize its infrastructure. That investment is paying off. Our drought resiliency the past three years is evidence of that.

Today, OID delivers water more efficiently than ever to our 2,900 agricultural customers – and pumps less groundwater than at any time in our history. The more we modernize and save water, the more water is available for our farmers, creating surpluses to transfer and money to reinvest in our conveyance system, saving more water and reducing how much we pump.

Using water transfers to pay for infrastructure upgrades is a winning formula that is reflected in our pumping data:

- **Between 1998 and 2014 – with water transfers in place – OID's deep wells pumped an average of 6,762 acre-feet of groundwater annually.**
- **From 1981 to 1997 – with no water transfers in place – OID's deep wells pumped an average of 8,513 acre-feet each year.**
- **And from 1964 to 1980 – again with no water transfers in place – OID's deep wells pumped an average of 10,827 acre-feet each year.**

In 2014 – in the third year of statewide drought – OID pumped about 17,000 acre-feet. But that was an anomaly. Similar short-term increases were seen last year in other San Joaquin Valley districts. OID also did not transfer water in 2014.

The fact is that OID pumps less water from the aquifer than during any comparative period in its history. We are committed to doing that moving forward.

Historically, tens of thousands of Chinook salmon returned to the Stanislaus River to spawn each fall. In contrast, only about 6,000 returned in 2014. Diminished habitat in the river is a key factor in the decline.

The Honolulu Bar project focused on a 2½-acre site that was part of a larger gravel dredge bar in the river about halfway between Oakdale and Knights Ferry. The intent was to restore and, in some cases, create vital habitat for adults to spawn and juvenile fish to thrive until they begin their journey downstream through the Delta and San Francisco Bay to the Pacific Ocean.

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Board of Directors
Frank Clark – District 1
Herman Doornenbal – District 2
Steve Webb – District 3
Al Bairos – District 4
Jack Alpers – District 5

The OID PIPELINE

Financial Support: The On-Farm Conservation Funding Program gives landowners an innovative way to pay for much-needed irrigation efficiency projects.

The Drought Isn't Over: It will take more than a rainy December to end California's three-year drought. OID continues to responsibly manage our water resources.

Trends in Pumping: OID pumps less groundwater than ever before thanks to long-term investments to modernize our water delivery systems.

River Restoration: A new video highlights an exciting project partially funded by OID to improve salmon habitat on the Stanislaus River.

How To Reach Us
Office: 847-0341
Emergency Irrigation Water: 988-3750
Emergency Domestic Water: 606-6582
Email: info@oakdaleirrigation.com

Address: 1205 East F St., Oakdale

March 2015

OID PIPELINE

Excellence in affordable, reliable and innovative water management

Mission statement

To protect and develop Oakdale Irrigation District water resources for the maximum benefit of the OID community by providing excellent irrigation and domestic water service.

Drought's Impact Far-Reaching in 2015

The early promise of a wet December has given way to harsh reality: Far from being over, the California drought, now in its fourth year, is worse than ever.

And though we at the Oakdale Irrigation District have strived to responsibly manage and conserve our water resources the past three years, there is no avoiding the impact of another winter of historically low Sierra snowpack.

Barring a miracle spring of significant rain and snow, the implications are clear across our 62,000-acre service area: Water will be at a premium this summer.

What does that mean for our 2,900 agricultural customers? Be very frugal. Conserve every drop. Plan ahead. Prepare to make some difficult decisions.

"The goal is to get through September with minimal impact."
– Steve Knell, OID general manager

New Melones and Tulloch reservoirs could drop to their lowest levels in 23 years as the combination of drought and government-mandated fish flows on the Stanislaus River take full effect.

The snowpack in the Central Sierra is forecast to be only 17% to 19% of normal – the worst since 1991. Normal runoff into New Melones is 1.1 million acre-feet of water. This year, 240,000 AF is predicted.

OID and the South San Joaquin Irrigation District share water storage rights at New Melones with the federal Bureau of Reclamation, which operates the reservoir. This year, each district expects to receive about 75,000 AF less than normal to deliver to farmers.

Federal and state rules for salmon and steelhead trout require water to be released down the river at specific temperatures at specific times. OID and SSJID are working with the bureau to relax flows for fish and water quality requirements in the river. Doing so could get us through one more drought year, but leaves few options for next year if the reservoirs in the basin do not begin to refill.

By the fall, New Melones – with a capacity of 2.4 million AF -- could be reduced to 80,000 AF. This would leave no water flowing in the Stanislaus River except for the 67,000 AF OID and SSJID own in Tulloch Lake. That reservoir would be the last usable water to meet fish flows or irrigation demand – or both.

Heads up for farmers

Our Board of Directors formally declared a drought at their March 3 meeting. Irrigation season began March 16. Here's what else farmers should know about 2015:

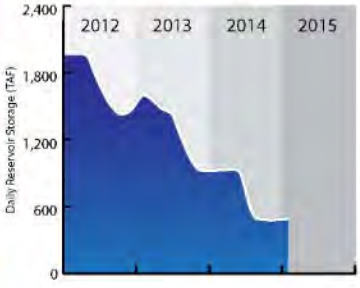
Waste will not be tolerated.
Minimal runoff will be allowed from fields, pastures and orchards. Customers will be given one warning. On the second offense of excessive runoff, their water privileges may be cut off for the rest of the season.

Fines will be enforced.
Proven cases of water theft or taking water outside of scheduled rotations will result in a $1,500 fine for the first offense, and a $2,500 fine and loss of water rights this year for the second.

Allotments are likely.
In April, our Board of Directors will consider whether to adopt appropriate water allotments for this irrigation season.

Surcharges possible.
The base rate for water this season is $27 per acre. In April, our Board of Directors will consider whether to impose a first-ever drought surcharge of $6.10 per acre to partially offset increased electrical costs related to groundwater pumping.

New Melones Storage



On-Farm Conservation Program likely delayed

Despite interest from more than 100 customers, a first-ever On-Farm Conservation Program appears unlikely to happen in 2015. OID directors put the program on hold because of the drought and a protest by former board member Louis Brichetto, who threatened legal action unless a study was completed to address "significant environmental effects."

The issue is the timing. An environmental impact report takes about 90 days, meaning farmers wouldn't know until July whether the program would be available to help them pay for water efficiency projects.

"I think the risk is not so much to OID, it's to the farmers who want to participate in the program. I don't think we should burden them with that," said Director Frank Clark at the March 3 board meeting.

The conservation program is the first of its kind in the region and is intended to meet new state mandates. In return for voluntarily taking their land out of production for one year, enrollees would be paid 95% of the value of the crop water they would have used – 20% in cash and 75% in credits to make long-term improvements.

The non-crop water the farmer would have applied – roughly 3,000 acre-feet -- would be put back into storage to offset drought-related water shortages.

The money would come from the California Department of Water Resources and San Luis & Delta Mendota Water Authority, which have agreed to buy an estimated 10,000 acre-feet of saved water for $400 an acre foot.

OID General Manager Steve Knell said the ongoing drought also compromised the effort. "I think there is substantial risk we won't have enough water this year for the program," he said.

Even if directors decide in April to delay the program this year while an environmental report is completed, it can be considered again in 2016, Knell said.

Distribution System Operator Divisions

DSO Contact Numbers

SOUTH SIDE

DIVISION 1 988-3532	DIVISION 2 988-2882	DIVISION 3 988-2881	DIVISION 4 988-2883	DIVISION 5 988-2884
Randy Walker	Chris Farris	Erik Peterson	Frank Coehlo	John Scheftic
Leon Van Diepen	Leon Van Diepen	Leon Van Diepen	Anthony Nunez	Anthony Nunez
Luke Bell	Jimmy Blase	Jimmy Blase	TBD	TBD
Jeff Dove	Jeff Dove	Jeff Dove	Jeff Dove	Jeff Dove

NORTH SIDE

DIVISION 6 988-3065	DIVISION 7 988-3066	DIVISION 8 988-3067	DIVISION 9 988-1802	DIVISION 10 988-3068
Josh Lovesill	Vince Rocha	Matt Dickens	Mike Ayers	Marc Oberkamper
Lori Hawkins	Lori Hawkins	Jim Long	Jim Long	Jim Long
Luke Bell	David Grenzebach	David Grenzebach	Richie Lertora	Richie Lertora
Gary Green	Gary Green	Gary Green	Gary Green	Gary Green

Day DSO Night DSO Day Relief Night Relief

Night Rover (All Districts) - Lance Amarante: 216-8628

PG&E offers rebates for pump repairs

PG&E has a special rebate program targeting farmers who need to fix their pumps. It can provide up to half the repair cost. For more information, call PG&E field representative Sarah Faridi at (209) 756-8835 or go to pge.com/drought. Funds are limited, so those interested are encouraged to act soon.

Health issues force longtime Director Jack Alpers to resign

Longtime Director Jack Alpers resigned Feb. 28 from the OID board, citing "serious health problems."

Alpers, 79, was first elected in November 2001 to represent District 5 southwest of Oakdale and was re-elected in 2005, 2009 and 2013. He is a retired large animal veterinarian who grew up in Oakdale and has a long history of civic involvement.

"Jack was a businessman, he knew how to balance the books and he knew what was needed financially for an organization of our size," praised Steve Knell, OID's general manager. "He had a passion for water and he was an important advocate a decade ago for water resources planning."

"Jack brought integrity and unique insight to this board," said Director Steve Webb. "He always had OID in mind when making decisions. He'll be missed."

Because Jack Alpers' term does not expire until 2017, the remaining four OID directors have decided to appoint a replacement until November – when District 5 voters can select someone to finish the final two years of Alpers' term.

Applicants must live in District 5, own land within the OID and be registered to vote. March 16 was the deadline for those to return completed applications. Selected applicants will be interviewed by the other directors April 7 at 1 p.m. and an appointment announced by the end of April.

Stanislaus County offers assistance to owners of failing domestic wells

One of the unfortunate side effects of the drought and increased groundwater pumping all across Stanislaus County are problems associated with shallow, residential wells. County officials are particularly interested in people whose domestic wells have gone dry or threaten to soon. Forms to report well problems can be obtained by calling the Environmental Resources Department at 525-6700 or by going to the county's website at www.stancounty.com and clicking on **"Report a Well Problem."** There also are low-interest loans available from the county for qualifying well owners. Forms in English or Spanish are available by calling Environmental Resources or by clicking on **"Water Well Loan Application"** on the county's website.

Students learn lessons about salmon lifespan

OID is proud to again support a popular lesson taught to fourth-graders in the Oakdale Joint Unified School District. This year, nearly 400 students at Cloverland, Fair Oaks, Magnolia and Sierra View elementary schools will learn about the lifespan of Chinook salmon in the Stanislaus River. The students combine classroom projects – including raising baby salmon in special chillers on campus – with field trips in November to see adults spawn and another in March to release the tiny fry into the river.

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Board of Directors
Frank Clark – District 1
Herman Doornenbal – District 2
Steve Webb – District 3
Al Bairos – District 4
Vacant – District 5

The OID
PIPELINE

In The Pipeline

Drought Getting Worse:
Barring a miracle of springtime rain and snow, the four-year drought will have major impact on farmers this summer.

On-Farm Program on Hold:
A threat of legal action by Louis Brichetto likely has delayed for one year an innovative program to that would help farmers pay for water-efficiency projects by voluntarily idling fields.

Moving Ahead to Replace Alpers:
Longtime Director Jack Alpers has resigned for health reasons. A successor is expected to be appointed by the end of April.

Help for Well Owners:
Stanislaus County has programs in place to assist owners of domestic wells that have gone dry or threaten to during the drought.

How To Reach Us
Office: 847-0341
Emergency Irrigation Water: 988-3750
Emergency Domestic Water: 606-6582
Email: info@oakdaleirrigation.com
Address: 1205 East F St., Oakdale

2015 DROUGHT RULES FOR AGRICULTURAL CUSTOMERS

Here is what you should know to help you best manage water on your ranch, orchard or field:

Allotments

- 36 inches per assessed acre for Tier 1 customers
- 10 inches per assessed acre for Tier 2 customers
- All water used thus far in the season counts toward the overall allotment
- "Unused water" at the gate may be transferred to other gates within the OID service area only through the Farmer to Farmer Transfer Program

Calculations

To calculate the inches applied to your parcel during each irrigation event, use the following formula:

(Flow rate in cfs x Hours of irrigation) ÷ Total Parcel Acreage = Inches of water applied

If you don't know your flow rate, ask your DSO.

Farmer to Farmer Transfer Program

- Surface water may be transferred from one parcel to another. Applications are available at the OID office and will be processed free of charge.
- Farmers with multiple parcels will be able to use less water on parcel and move that savings to another
- OID requires at least 15 days' notice before any transfer can occur
- Notices of private water available from other landowners may be posted on the bulletin board in OID's front office

Private Deep Well Conveyance Agreements

- Groundwater from private deep wells may be conveyed from one farm to another in the district via OID's canal system
- Groundwater inlet must be upstream of the destination parcel(s)
- There is $354 processing fee for each conveyance agreement application
- OID approval and at least 15 days' notice required before the delivery can occur
- Private deep wells must be metered upstream of the inlet to OID's canal system

Rotations

- Rotation intervals will be based on weather and crop-water-soil moisture loss values (evapotranspiration). The season will start with 17- to 20-day rotations, dependent upon weather.
- By late June and July, we anticipate 12- to 15-day rotations
- In August, rotation intervals again will lengthen to match evapotranspiration losses
- OID anticipates making water deliveries through September; an October rotation is unlikely
- Stick to your rotation times. Coordinate any time changes with your ditch tender/DSO.
- Have an irrigator on-site at the start of your rotation and at appropriate times during the rotation. Unless you have made prior arrangements with your ditch tender, you may not receive your rotation until an irrigator is present. This will be left up to the ditch tender.

Other Important Points

- A drought surcharge of $6.10 per acre will be charged in 2015
- All of OID's 23 deep well pumping systems will be maximized to make water supplies available
- Repair leaking ditches and pipelines. Systems not in good shape to receive water may not get it.
- Trinitas Farming, if it receives 10 inches of water for its 7,200 acres, will pay $524,000 this year. All of OID's other customers – representing about 60,000 acres – will generate about $1.62 million. That's an important budgetary consideration for a district expected to draw down its reserves $17 million in 2014-15.

Be Responsible

- Fines will be assessed for unauthorized use of water or tampering with OID water conveyance facilities. The first offense is a $1,500 fine; the second is a $2,500 fine and loss of water privileges for the remainder of the season. DO NOT take water unless you have contacted your ditch tender or he/she has contacted you.
- Unreasonable tail water runoff will not be tolerated. Water flowing down and across roadways, flooding of neighbors, excessive ponding, etc., will be strictly addressed. Landowners will be on a one-warning notice and then a loss of water for the season.

It Will Take ALL Of Us Working Together To Get Through This Water Season

The OID
PIPELINE

Drought requires OID to institute important changes in 2015

This fourth year of drought has been the driest yet in our region. It will require the Oakdale Irrigation District and its 2,900 agricultural customers to work together to responsibly manage, use and conserve water.

OID has invested $55 million since 2000 to improve, automate and meter its delivery system, all in an effort to keep water costs down while providing reliable, beneficial and innovative service. Our customers, too, have worked to increase irrigation efficiencies on their properties.

Those investments paid off the past three years when OID customers were spared water cuts while those around us managed on less. That will change in 2015.

For the first time ever, OID farmers will be limited in how much water they can have access to this year. They also will be allowed to sell or transfer water within the district. And, they will pay a small drought surcharge to help partially offset the costs of groundwater pumping.

There is no way to know when the drought may end. But one thing is certain: the more water we save now, the more potentially will be available in 2016.

D.5. Selected Board of Directors Press Releases

OAKDALE IRRIGATION DISTRICT

Feb. 3, 2015

Contact: Steve Knell, general manager
(209) 840-5508 or srknell@oakdaleirrigation.com

OID hopeful it can stretch water resources during one more year of drought

OAKDALE – After a historically dry January, Oakdale Irrigation District officials are bracing for a fourth year of drought and all its implications.

OID and its partner on the Stanislaus River – the South San Joaquin Irrigation District – met last week to frame a water operations plan that would offer farmers at least as much water as in 2014 while meeting minimum fish flows in the river.

OID officials will meet Thursday with the federal Bureau of Reclamation, which operates New Melones Dam. They hope to arrive at an operations plan that balances the needs of agriculture and the environment.

As of Tuesday, New Melones sat at just 40% of its historic average for the date. Snowfall has been far below average in the Central and Southern Sierra. And rainfall in January was scant – just 0.10 of an inch in Oakdale after more than 7 inches fell in early December.

The National Weather Service forecast for February and March is for at least average rainfall. That would not make up for January – normally the wettest month – but would help ease farmers' concerns for later this year, said OID General Manager Steve Knell.

"I think with a little bit of luck, we hope to deliver as least as much water as we delivered last year," he said.

In 2014, the district diverted 208,000 acre-feet of water from the Stanislaus River to 2,900 ag customers. In most years, OID diverts about 235,000 acre feet.

"I think the irrigation season is shaping up to be tough again. But with help from the Bureau of Reclamation, all water users being conscientious, we should be able to make it through this season with minimal impacts," Knell said.

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OAKDALE IRRIGATION DISTRICT

Feb. 17, 2015

Contact: Steve Knell, general manager
(209) 840-5508 or srknell@oakdaleirrigation.com

OID moves ahead with drought contingency plans for this year – and 2016

OAKDALE – Oakdale Irrigation District officials are moving on multiple fronts to contend with the ongoing impacts of the four-year California drought while simultaneously drawing up plans to deal with a fifth dry year.

The goal is to work cooperatively with federal and state officials to stretch what little water there is behind New Melones Reservoir and the other dams the district share to satisfy the crop needs of its 2,900 agricultural customers this year and still bank some water for 2016.

It's a difficult and delicate balancing act, and one fraught with uncertainty, OID directors were told Tuesday morning. Among the possible impacts on farmers and others this year:

- 14-day irrigation rotations (as opposed to 10- or 12-day summer rotations in a normal year). Projected savings between March and September: 10,000 acre feet of water.
- A prohibition on water running off fields, pastures and orchards, with potential $1,500 fines or loss of water rights as a penalty. Projected savings: 40,000 acre feet.
- Draining Tulloch Reservoir east of Knights Ferry by July or August. Projected savings: 40,000-50,000 acre feet, which would be equally split between OID and the South San Joaquin Irrigation District.

Those three options, which directors could adopt next month, could save about 70,000 acre feet this year, about a third of what OID delivers in a typical season, General Manager Steve Knell shared during a lengthy discussion about the drought. He estimated that snow and rain runoff New Melones will be only about 20% of normal this year, worsening an already critical storage situation.

A wet and relatively warm storm in early February offered little help for the reservoir, which as of Tuesday held just 42% of the water it typically has for the date. And as bad as it now, "We're already thinking about next year," Knell said.

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Knell expects that farmers could adapt to longer rotations and eliminate runoff with minimal impact. He also understands the implications of drawing down Tulloch Lake – popular with boaters and fishermen – down to levels not seen since the 1986-92 drought.

If directors choose to do that, residents with docks would receive 60-day notices to remove them, unless they are engineered to lie on the shore.

Tim O'Laughlin, OID's water attorney, estimated it would take about a month to reduce Tulloch to no more than a small pool behind the dam. The reasoning, he explained, is to keep colder water to benefit fish on the Stanislaus River behind the New Melones, which is much deeper than Tulloch.

Water levels at other dams on the Stanislaus – Beardsley, Lyons, Donnells and Spicer – also could be extremely low this summer, O'Laughlin said.

The environmental needs of salmon and other fish, plus salinity and oxygen requirements in the Delta, weigh heavily on how water is stored and apportioned on the Stanislaus, Knell and O'Laughlin stressed. OID and SSJID – which have rights to water behind New Melones – are in complex negotiations with state and federal regulators to meet the needs of farmers, fish and the Delta and still save some water for 2016.

"We don't want to run into a predicament where we're doing the right things and then they tell us we have to run more water down the river," O'Laughlin said.

Director Steve Webb expressed concern that farmers will have to sacrifice more than they should.

"Unless we get concessions from the state about how the feds use the water, saving water in New Melones is fruitless because they'll use it anyway," he said. "If us keeping water up there allows them to run water down the river, it doesn't seem very productive for us."

Low reservoir levels also reduce OID's ability to generate and sell hydroelectric power. O'Laughlin called the impact "substantial." The district expected to make about $7.5 million in power sales, but could see that cut in half.

In other action Tuesday, directors approved the language in contracts to be sent this week to more than 110 OID customers as part of the On-Farm Conservation Funding Program.

In return for taking their land out of production this year, eligible applicants will be paid 95% of the value of the water they would have used – 20% in cash and 75% in credits to make long-term improvements in water efficiency. The money will come from the California Department of Water Resources and San Luis & Delta Mendota Water Authority, which have agreed to buy the estimated 8,000 acre feet of saved water for $400 an acre foot.

Formal approval of the contracts and water transfer is expected at the OID board's March 3 meeting.

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OAKDALE IRRIGATION DISTRICT

March 17, 2015

Contact: Steve Knell, general manager
(209) 840-5508 or srknell@oakdaleirrigation.com

OID board moves closer to capping amount of water farmers can receive in 2015

OAKDALE – Even as water began filling its canals this week, the Oakdale Irrigation District board discussed ways Tuesday morning to ensure there is enough to last until September.

Among the ideas: A cap on how much each of OID's 2,900 agricultural customers can use this year – something that has never occurred in the district's 105-year history.

Allocations are an accepted fact of life in most irrigation districts, especially as the California drought stretches into a fourth year. Last week, the South San Joaquin Irrigation District – which, like OID, has rights to water from the Stanislaus River – for the first time set a 36-inch limit for its farmers in 2015.

The Modesto and Turlock irrigation districts, which share rights on the Tuolumne River, have indicated farmers should receive no more than 16 inches this year. Growers in the Merced Irrigation District and along many parts of the valley's West Side have gotten even worse news – no water.

OID directors didn't decide on a cap Tuesday, but directed staff to return with a plan in time for the board's April 7 meeting. Among the other options to be considered under the district's drought policy:

- **Waste will not be tolerated.** Minimal runoff will be allowed from fields, pastures and orchards. Customers will be given one warning for excessive runoff. On the second offense of unreasonable use, their water privileges may be cut off for the rest of the season.
- **Fines will be enforced.** Proven cases of water theft or taking water outside of scheduled rotations will result in a $1,500 fine for the first offense, and a $2,500 fine and loss of water rights this year for the second offense.
- **Surcharges possible.** The base rate for water this season is $27 per acre. In April, the board will consider whether to impose a first-ever drought surcharge of $6.10 per acre. It would partially offset OID's increased electrical costs related to groundwater pumping.

"We know this isn't going to be a great water season for anyone in California. We're going to have to take extraordinary measures to get through this drought," said Steve Knell, OID's general manager.

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The bulk of OID's water is stored behind New Melones Dam, which is managed by the federal Bureau of Reclamation. Monday, New Melones held about 597,000 acre-feet of water – only 40% of its historic average for the date. And no help is expected, with few storms in the short-term forecast and runoff projected to be 17% to 19% of average this spring.

OID and SSJID are negotiating with federal and state regulators to relax water flow requirements on the Stanislaus for fish as well as thresholds for salinity and dissolved oxygen in the Delta. The frustration of those discussions was apparent Tuesday. Knell doesn't expect to know until mid-April how much water will be available for OID's customers.

"We want to work cooperatively with fish agencies and the bureau to get us through the end point in December to meet all requirements of farmers and fish flows," he said. "But it's very difficult for us to manage the river when we have different scenarios we have to play with."

It's possible, Knell said, that New Melones – with a capacity of 2.4 million acre-feet -- could be drained to a "dead pool" of 80,000 acre-feet by the end of the year. Downstream, Lake Tulloch also could be significantly lowered for the first time since the drought of 1991.

In the meantime, OID's farmers should brace for likelihood that they will receive much less water for their orchards, fields and pastures this summer. Knell and his staff favor defined allotments measured by the district and scheduled through "arranged deliveries" as opposed to typical 12-, 14- or 16-day rotations.

"Once you get to your allocation, your gate is locked and you don't get any more," he said.

Director Frank Clark stressed the "accountability" needed from farmers and OID staff to operate in a drought environment, saying, "It's a different ballgame."

Director Al Bairos emphasized the need to reduce runoff from fields and spills at the end of OID's canals. "If we're asking landowners to do all these things, we have to make sure we're tight as well," he said.

The district expects to rely again on its network of 26 deep wells to provide groundwater to supplement its surface deliveries. Last year, OID pumped about 17,000 acre-feet – twice its normal average – and anticipates a similar amount this year.

Despite that, Knell said the district's most recent statistics show groundwater levels near its pumps dropped by an average of only 4.4 inches last year. Readings are taken in fall and spring. The largest drop was about 6 feet in the March-to-March comparison, he said, while the water table in other areas actually rose as much as 13 feet.

Particular attention was paid to groundwater levels at two wells near Valley Home, where many decades-old domestic wells either went dry or threatened to last summer.

The water table at the Campbell well dropped from 83.9 feet in March 2014 to 84.5 feet in this year. And the Valley Home well rose 2 feet, from 87.5 to 85.4 feet.

"It's going to be an interesting year, but if we all pull together, we'll get through it like we did last year," said Director Steve Webb.

Later in the meeting, Knell announced that two men have applied to replace District 5 Director Jack Alpers, who resigned last month for health reasons.

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Albert Deniz and Gary Osmundson returned their applications by Monday's deadline. Stanislaus County elections officials will determine that they are qualified before the other board members conduct interviews with them at 1 p.m. April 7. A choice is expected by the end of April.

Whoever is appointed will serve until November, when District 5 voters can select someone to finish the final two years of Alpers' term. District 5 represents the southwest portion of OID's 62,000-acre service area.

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OAKDALE IRRIGATION DISTRICT

June 2, 2015

Contact: Steve Knell, general manager
(209) 840-5508 or srknell@oakdaleirrigation.com

Good news for OID farmers: 2015 water allotments raised to 40 inches

OAKDALE – A couple of beneficial spring storms combined with cool weather and strong water conservation led to good news Tuesday morning for farmers in the Oakdale Irrigation District: A small bump in the amount of water they will receive in the fourth year of drought.

OID directors voted 4-0, with Al Bairos absent, to raise this year's allocation to 40 inches from 36. When the irrigation season began in March, OID told irrigators to expect 30 inches this year – the first time in its 105-year history it has put limits in place.

Directors also declined to rescind a decision they made in April to deliver 10 inches of water to Tier 2 customers.

General Manager Steve Knell said small storms in April and May provided an unexpected bonus: enough water to keep soil moisture high in the valley, plus additional runoff into Sierra reservoirs. He told directors that 2.8 inches of rain fell above Donnells and Beardsley lakes, which had plenty of room to capture it.

He said the rain comes on top of positive efforts by OID's 2,900 agricultural customers to use less water. The combination has the district to easily meet its goal of pushing at least 10,000 acre-feet of "saved" water into New Melones Reservoir. OID is on target to conserve about 17,000 acre-feet, Knell said.

"When you ask constituents to step up in this district, they do it," he said.

The 40 inches OID's irrigators will receive compares to 36 inches for those in the South San Joaquin Irrigation District and is more than double what farmers in the Modesto and Turlock districts will get this summer.

"Forty inches is an abundance of water," said Brian Lemons, who grows almonds and walnuts.

Still, the implications of the drought were on the minds of OID's staff and board.

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Knell said the district is discussing various 2016 water scenarios with the federal Bureau of Reclamation, which manages New Melones. And Director Frank Clark warned about the financial implications of the drought on the district, which has dug into its reserves to use $17 million to balance its budget the past two years.

"If these dry years continue and you have no income from hydro production and you have no excess water to sell and you keep drawing down from reserves, it looks bleak," Clark said. "We could be looking at ... raising irrigation rates."

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Sept. 1, 2015

Contact: Steve Knell, general manager
(209) 840-5508 or srknell@oakdaleirrigation.com

Good news for OID farmers: enough water remains for one final irrigation in October

OAKDALE – In the context of a fourth year of drought, the 2015 irrigation season has turned out to be much better than anticipated back in the spring for farmers in the Oakdale Irrigation District. So much so that OID directors decided Tuesday to make water available in October to farmers who need it.

"The world has changed since last April, for the good," General Manager Steve Knell told the board.

In early April, directors warned growers that first-ever water allocations were coming, and later set the initial cap at 30 inches. New Melones Reservoir, where the district stores most of its water, was forecast to be as low as 149,000 acre-feet by the end of September. There also were concerns about safely managing water temperatures in the Stanislaus River on behalf of salmon and rainbow trout.

Much has changed since then – all for the better, Knell said.

Aggressive water conservation by farmers, coupled with a few late-spring storms that generated unanticipated runoff, allowed grower allocations to be raised to 36 inches and then to 44. New Melones, still nearing historic lows, nonetheless is predicted to hold 259,000 acre-feet at the end of this month. Agreements have and continue to be worked out with state and federal agencies to put enough cold water in the river for fish.

That's good news for OID's 2,900 growers, who collectively farm more than 62,000 acres. If they want it, water will be available for one final irrigation cycle Oct. 1-12. Many of the almond growers and pasture owners are expected to take advantage. All or part of whatever water is used will count against their 2016 allocation, Knell said.

In April, OID expected to deliver about 208,000 acre-feet of water to its customers. But with a month to go in the irrigation system, that number will be closer to 175,000 acre-feet, Knell said. The district also will pump less groundwater this year than in 2015, he said – about 14,000 acre-feet this year compared to 18,000 acre-feet last year.

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The upshot is the district's growers will be spared many of the drastic cutbacks famers in other parts of the Central Valley have faced.

"We anticipated seeing all kinds of ugly things at the beginning of the year," Knell said. "Fortunately, they didn't materialize."

In other action, the board:

- Unanimously approved a motion to move forward with the process to consolidate Improvement Districts 45 and 49, which are side by side just north and east of Oakdale Country Club. Each district has a single well that serves a total of 49 residential customers. State law requires a backup well to be located within each district; merging them meets that standard. The homeowners all have been notified. A public hearing will be held Oct. 6. The vote was 4-0, with Director Frank Clark absent.

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Attachment E: Surface Water Shortage Policy

December 2008

Introduction:

When the Oakdale Irrigation District (OID) was formed in 1909 its' specific purpose and charge was and still is as trustee of the surface water rights of the District's constituents. The control and distribution of that water is controlled by the reasonable and beneficial standards under the California Water Code. With respect to those Codes and to the senior water rights of OID, the District is committed to managing this right to the mutual benefit of all lands within the District's service boundaries first and foremost. There will be times however where the quantity of the water right available to the District is insufficient to meet the water demands of the crops grown. In those instances, a policy has been developed to address such shortages.

The following draft Surface Water Shortage Policy is to be used as a guide to the District and its Board during periods of water shortages within the OID service area. Water shortages can occur for a variety of reasons due both to single and multiple events that may include; drought, an early start to the water season, a lack of spring rains, unseasonably high evapotranspiration, contractual obligations, canal failures on either the North or South Main, etc. To prepare for such events the OID has developed the following Surface Water Shortage Policy to address those issues.

Guiding Principles:

The guiding principles presented below are intended to illustrate the basic assumptions that were used to develop the plan. The guiding principles are as follows:

1. The District's obligation under California Water Code is to manage and deliver surface water resources under its charge in a reasonable and beneficial manner.
2. All lands within the District boundaries have an equal right to the availability of surface water, irrespective of crop(s) grown.
3. The District's options for allocating water are limited due to a nominal number of measureable turnouts within the District. Equality, at least for now, can only be determined by the number of rotations in a year provided to each delivery point.
4. District policy is to make surface water available when soil moisture depletion levels reach 2.4 inches.
5. Once the surface water resources of the District, as outlined under the 1988 Stipulation Agreement, are exhausted the District will suspend all water deliveries to its constituents.
6. Upon suspension of water deliveries by the District, landowners may secure other in-district opportunities for water delivery, from landowners with groundwater resources, in order to protect crops.
7. The District will permit intra-district water transfers between and among landowners within the District's service area. The District shall provide administrative and operation services to facilitate these transactions. Such arrangements are limited to groundwater resources within the District's service area only.
8. The District will make available the groundwater resources owned by the District on an at-cost-basis and as approved by the Board of Directors. Landowners may sign up to use a District Deep Well once surface water deliveries have been suspended.

Levels of Surface Water Shortages and OID's Response:

Under the 1988 Stipulation Agreement with the Bureau of Reclamation, OID can expect water shortages when the annual inflow into New Melones is less than 600,000 acre feet. The shortage levels and the subsequent OID actions to be taken for that shortage level are identified below:

1. Level One – The District allocation is between 299,000 acre feet and 270,000 acre feet. As soon as the shortage is known or discovered the District will take any or all of the following actions depending on the shortage:
    a. Suspension of Out of District Agreements
    b. Increase the use of District Deep Wells.
    c. Eliminate all ten (10) day rotations.
    d. Increase rotation intervals to meet 2.4 inch depletion policy (i.e. 16, 18 or 20 day rotations)

2. Level Two – The District allocation is between 269,000 acre feet and 240,000 acre feet. As soon as the shortage is known or discovered the District will take the following actions in the following order:
    a. All of Level One elements
    b. Implement a Rotation Allocation Program – described below
    c. Irrigation water available for agricultural purposes only

3. Level Three – The District allocation is below 240,000 acre feet. As soon as the shortage is known or discovered the District will take the following actions in the following order:
    a. All of Level One and Two elements
    b. Implement a zero discharge policy and issue monetary fines to all violators – described below.

Rotation Allocation Program

The Program would consist of taking the year's net Surface Water Available and dividing it by the *acre-foot per rotation value* (that number shall be determined by the Board based on historical use). The resultant number would be the number of rotations offered to each water user. It would be incumbent upon the water users to determine when they wanted to use their rotations. Under this Program, rotation times would be fixed at pre-water shortage durations. *Example, if the District's net Surface Water Available was 225,000 acre feet and the historical diversion per rotations value was 15,000 acre-feet per rotation, the number of rotations permitted per delivery point would be 15.*

Zero Discharge Policy & Subsequent Fines

Under a Level Three water shortage it will be incumbent upon all lands receiving surface irrigation water to ensure that no water leaves their property. A water user notice will be mailed out after such declaration by the Board of Directors, informing each water user of the discharge restriction. Should a landowner be found in violation of this rule they will be issued a notice and fined accordingly. If the landowner is found to be in violation of the rule a second time they will be fined again and lose all rights to future irrigations for the remainder of the irrigation season.

Fines for such violations shall be set and approved by the Board of Directors annually.

Water Resources & Current Obligations:

Table 1 – Water Resource Inventory & Expenditures

	Normal	Level One	Level Two	Level Three
Stanislaus River Allotment	**600,000 ac-ft**	**599K – 540K**	**539K – 480K**	**479 K – 420K**
OID's Allocation	**300,000 ac-ft**	**299K – 270K**	**269K – 240K**	**239K – 210K**
Stockton East Agreement	-15,000	-15,000	-15,000	-6,250
S.J. River Agreement	-26,000	-26,000	-26,000	-26,000
Knight's Ferry	-1,960	-1,960	-1,960	-1,960
Previous October Usage	-12,500	-12,500	-12,500	-12,500
Surface Water Available	**244,540 ac/ft**	**244K - 215K**	**214K - 185K**	**192K – 163K**
Groundwater	4,000	15,000	15,000	15,000
Reclaimed Water	12,500	6,250	1,000	0
River Water	1,000	1,000	1,000	1,000
Precipitation	14,600	10,000	7,300	0
Sub-Total	**276,000 ac-ft**	**276K – 250K**	**238K – 209K**	**208K – 179K**
Delivery Efficiency (+/-85%)	-42,000	-42,000	-36,000	-31,000
TOTAL (Delivery Available to Turnout)	**234,000 ac-ft**	**234K – 210K**	**202K – 176K**	**177K – 148K**
Shortfall from Normal		24K	58K	86K

Attachment F: Stanislaus and Tuolumne Rivers Groundwater Basin Association Integrated Regional Water Management Plan

TO VIEW THE COMPLETE PLAN,

VISIT:

www.strgba.org

Attachment G: Oakdale Irrigation District 2006 Water Resources Plan

TO VIEW THE COMPLETE PLAN,

VISIT:

www.oidwaterresources.org

Attachment H: Public Participation

- OID Board of Directors Agenda, January 5, 2016
- Notices of Intent to Prepare and Adopt an AWMP to City of Oakdale, Stanislaus County, and San Joaquin County, February 2, 2016.
- Modesto Bee Notice of Publication, February 3 and 10, 2016
- OID Board of Directors Agenda, March 1, 2016
- Resolution of Adoption, March 1, 2016

AGENDA
REGULAR MEETING OF THE
BOARD OF DIRECTORS OF THE
OAKDALE IRRIGATION DISTRICT
TUESDAY, JANUARY 5, 2016

Agendas and Minutes are on our website at www.oakdaleirrigation.com

CALL TO ORDER 9:00 a.m., the Boardroom of the District Office
1205 East F Street, Oakdale, California 95361

PLEDGE OF ALLEGIANCE

ROLL CALL Directors Webb, Doornenbal, Osmundson, Altieri, Santos

ADDITIONS OR DELETION OF AGENDA ITEMS

ACTION TO TAKE VARIOUS ITEMS OUT OF SEQUENCE

PUBLIC COMMENTS - ITEM 1

1. The Board of Directors welcomes participation in meetings. This time is provided for the public to address the Directors of the District on matters of concern that fall within the jurisdiction of the Board that are not on the agenda.

   Speakers are encouraged to consult District Management or Directors prior to agenda preparation regarding any District operation or responsibility as no action will be taken on non-agenda issues. Speakers must give their name and address.

   Because these are non-agenda matters, generally no discussion or comment by the Board should be expected except to properly refer the matter for review or action as appropriate.

   Public Comments will be limited to five minutes per speaker.

PUBLIC HEARING CALENDAR – ITEM 2

2. Public Hearing to **Accept Comments on Notice of Intent to Adopt a Negative Declaration on the Oakdale Irrigation District 2015 Applicants for Irrigation of Lands Outside District Boundaries**

CONSENT CALENDAR - ITEMS 3 - 19

Agenda items listed under the Consent Calendar may be acted upon individually, in whole or in part. Subsequently, should discussion on a particular item be desired, you should identify the item now so as to remove it from the list of items to be approved under one motion. Any items removed from the list on Consent Calendar items will be discussed and acted upon individually following action on the remaining Consent Calendar items if so moved.

3. Approve the **Board of Directors' Minutes of the Regular Meeting of December 15, 2015 and Resolutions 2015-106, 2015-107, 2015-108, 2015-109, 2015-110, 2015-111, 2015-112, and 2015-113**

4. Approve **Oakdale Irrigation District Statement of Obligations**

5. Approve **Assignment of Capital Work Order Numbers**

6. Approve the **Treasurer and Chief Financial Officer's Report for the Month November 30, 2015**

7. Approve **Amendment to Oakdale Irrigation District's Organizational Chart to Eliminate One Assistant Engineer and Add One Associate Engineer**

8. Approve **Attendance by the Directors at the California Irrigation Institute 2016 Conference**

9. Approve **Work Release No. 019 to General Services Agreement 2013-GSA-032 with Northern Steel, Inc. for Cutting, Bending, and Placement of Rebar for One (1) Standard Drop Structure Located on the Palmer Lateral**

10. Approve **Work Release No. 012 to General Services Agreement 2009-GSA-002 with CH2M for the Preparation of a CEQA Document for the On-Farm Water Conservation Funding Program**

11. Approve **Encroachment Permit on the Snedigar Pipeline (APN: 062-022-001 – Pacific West Communities, Inc.)**

12. Approve **Agricultural Discharge Permit on the Howard Pipeline (APN: 006-002-011 – O'Roark)**

13. Approve **Encroachment Permit on the Howard Pipeline and the Root Drain (APN: 006-002-011 – O'Roark)**

14. Approve **Encroachment Permit on the Root Drain (APN: 006-002-063 – O'Roark)**

15. Approve **Agricultural Discharge Permit on the Mootz Lateral (APN: 014-001-032 – Salazar)**

16. Approve **Encroachment Permit on the Mootz Lateral (APN: 014-001-032 – Salazar)**

17. Approve **Abandonment of a Portion of the Kearney Lateral (APN: 015-001-045 – Ramos)**

18. Approve **Quit Claim of a Portion of the Kearney Lateral (APN: 015-001-045 - Ramos)**

19. Approve **Request for New Irrigation Service to Substandard Parcels Served by Langworth Pipeline (APN: 062-005-031/032 – David E. Banducci and Charlene R. Banducci)**

ACTION CALENDAR - ITEMS 20 - 23

20. Review and take possible action on the **Appointment of Board Committees for 2016 and 2017**

21. Review and take possible action to **Provide Direction to Staff Regarding County Board of Supervisors' Intent to Submit an Application to the Department of Water Resources for Grant Funding Under a Sustainable Groundwater Planning Grant Program Entitled "Counties with Stressed Basins"**

22. Review and take possible action to **Provide Direction to Staff Regarding County Board of Supervisors' Intent to Submit an Application to the Department of Water Resources for Grant Funding Under the Regional Flood Control and Groundwater Recharge Master Planning Effort**

23. Review and take possible action to **Approve Agency Goals and Objectives for 2016**

DISCUSSION - ITEM 24

24. Discussion / Presentation on **Updated Ag Water Management Plan**

COMMUNICATIONS - ITEM 25

25. Oral Reports and Comments

A. **General Manager's Report on Status of OID Activities**

B. **Committee Reports**

C. **Directors' Comments/Suggestions**

CLOSED SESSION - ITEM 26

26. Closed Session to discuss the following:

A. *Government Code* §54956.9 – Significant Exposure to Litigation
Pursuant to Paragraph (2) and (3) of Subdivision (d) of §54956.9
One (1) Case

OTHER ACTION – ITEM 27

27. Adjournment:

A. The next Regular Board Meeting of the **Oakdale Irrigation District Board of Directors** is scheduled for **Tuesday, January 19, 2016 at 9:00 a.m.** in the board room at 1205 East F Street, Oakdale, CA.

B. The next Joint Board Meeting of the **South San Joaquin** and **Oakdale Irrigation Districts** serving the **Tri-Dam Projects** and **Tri-Dam Authority** and other joint business matters is scheduled for **Thursday, January 21, 2016 at 9:00 a.m.** in the board room of the Oakdale Irrigation District, 1205 East F Street, Oakdale, CA.

Writings distributed to Board Members in connection with the open session items on this agenda are available for public inspection in the office of the Board Secretary. Any person who has a question concerning any of the agenda items may call the Administrative Assistant at (209) 840-5507.

ADA Compliance Statement: In compliance with the Americans with Disability Act, if you need special assistance to participate in this meeting, please contact the Administrative Assistant at (209) 840-5507. Notification 48 hours prior to the meeting will enable the District to make reasonable arrangements to ensure accessibility to this meeting.

OAKDALE IRRIGATION DISTRICT

February 2, 2016

City of Oakdale
Community Development Department
120 South Sierra Avenue
Oakdale, CA 95361

Re: Draft 2015 OID AWMP Public Review and Comment

Dear Community Development Department:

Please be advised that the Oakdale Irrigation District (OID) has prepared a Draft 2015 Agricultural Water Management Plan (AWMP or Plan) in accordance with the requirements of the Water Conservation Act of 2009 (SBx7-7). This AWMP updates OID's 2012 AWMP. The OID Board of Directors will hold a public hearing on March 1, 2016 at 9:00 am, in the OID Board Room located at 1205 East F Street, Oakdale, CA, to receive comments from the Public on the Draft Plan. The Draft Plan will be available on or before February 3, 2016 for review on the Oakdale Irrigation District website (www.oakdaleirrigation.com) and/or purchase at the OID office. The OID Board of Directors invites and encourages interested parties to participate in this public hearing. Comments may also be made through the OID website or sent to the OID office at the previously noted address. Upon conclusion of the public comments the Board of Directors will consider the adoption of the updated Draft Agricultural Water Management Plan.

Sincerely,

OAKDALE IRRIGATION DISTRICT

Eric C. Thorburn, P.E.
Water Operations Manager

cc: Administration Files
Board of Directors (5)

1205 East F Street / Oakdale, CA 95361 / (209) 847-0341 / Fax (209) 847-3468
www.oakdaleirrigation.com

OAKDALE IRRIGATION DISTRICT

February 2, 2016

Stanislaus County
Environmental Review Committee
1010 – 10th Street, Suite 3400
Modesto, CA 95354

Re: Draft 2015 OID AWMP Public Review and Comment

Dear Environmental Review Committee:

Please be advised that the Oakdale Irrigation District (OID) has prepared a Draft 2015 Agricultural Water Management Plan (AWMP or Plan) in accordance with the requirements of the Water Conservation Act of 2009 (SBx7-7). This AWMP updates OID's 2012 AWMP. The OID Board of Directors will hold a public hearing on March 1, 2016 at 9:00 am, in the OID Board Room located at 1205 East F Street, Oakdale, CA, to receive comments from the Public on the Draft Plan. The Draft Plan will be available on or before February 3, 2016 for review on the Oakdale Irrigation District website (www.oakdaleirrigation.com) and/or purchase at the OID office. The OID Board of Directors invite and encourage interested parties to participate in this public hearing. Comments may also be made through the OID website or sent to the OID office at the previously noted address. Upon conclusion of the public comments the Board of Directors will consider the adoption of the updated Draft Agricultural Water Management Plan.

Sincerely,

OAKDALE IRRIGATION DISTRICT

Eric C. Thorburn, P.E.
Water Operations Manager

cc: Administration Files
Board of Directors (5)

1205 East F Street / Oakdale, CA 95361 / (209) 847-0341 / Fax (209) 847-3468
www.oakdaleirrigation.com

OAKDALE IRRIGATION DISTRICT

February 2, 2016

San Joaquin County
Community Development Department
1810 E. Hazelton Avenue
Stockton, CA 95205

Re: Draft 2015 OID AWMP Public Review and Comment

Dear Community Development Department:

Please be advised that the Oakdale Irrigation District (OID) has prepared a Draft 2015 Agricultural Water Management Plan (AWMP or Plan) in accordance with the requirements of the Water Conservation Act of 2009 (SBx7-7). This AWMP updates OID's 2012 AWMP. The OID Board of Directors will hold a public hearing on March 1, 2016 at 9:00 am, in the OID Board Room located at 1205 East F Street, Oakdale, CA, to receive comments from the Public on the Draft Plan. The Draft Plan will be available on or before February 3, 2016 for review on the Oakdale Irrigation District website (www.oakdaleirrigation.com) and/or purchase at the OID office. The OID Board of Directors invites and encourages interested parties to participate in this public hearing. Comments may also be made through the OID website or sent to the OID office at the previously noted address. Upon conclusion of the public comments the Board of Directors will consider the adoption of the updated Draft Agricultural Water Management Plan.

Sincerely,

OAKDALE IRRIGATION DISTRICT

Eric C. Thorburn, P.E.
Water Operations Manager

cc: Administration Files
Board of Directors (5)

1205 East F Street / Oakdale, CA 95361 / (209) 847-0341 / Fax (209) 847-3468
www.oakdaleirrigation.com

Received
FEB 16 2016
Oakdale ID

DECLARATION OF PUBLICATION
(C.C.P. S2015.5)

COUNTY OF STANISLAUS
STATE OF CALIFORNIA

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am a printer and principal clerk of the publisher of **THE MODESTO BEE,** which has been adjudged a newspaper of general circulation by the Superior Court of the County of **STANISLAUS,** State of California, under the date of **February 25, 1951, Action No. 46453.** The notice of which the annexed is a printed copy has been published in each issue thereof on the following dates, to wit:

FEBRUARY 3, 10, 2016

I certify (or declare) under penalty of perjury that the foregoing is true and correct and that this declaration was executed at **MODESTO,** California on

FEBRUARY 10, 2016

Cynthia C. Mackamon

(Signature)

Public Notice

Notice is hereby given that the Oakdale Irrigation District (OID) has prepared a draft Agricultural Water Management Plan (AWMP) in accordance with the requirements of the Water Conservation Act of 2009 (SBx7-7). This AWMP updates OID's 2012 AWMP. The OID Board of Directors will hold a public hearing on March 1, 2016 at 9:00 am, in the OID Board Room located at 1205 East F Street, Oakdale, CA, to receive comments from the Public on the Draft Plan. The Draft Plan will be available on or before February 3, 2016 for review on the Oakdale Irrigation District website (www.oakdaleirrigation.com) and/or purchase at the OID office. The Board of Directors of the Oakdale Irrigation District invite and encourage interested parties to participate in this public hearing. Comments may also be made through the OID website or sent to the OID office at the previously noted address. Upon conclusion of the public comments the Board of Directors will consider the adoption of the updated Agricultural Water Management Plan.
MOD- 2248540 2/3, 10

AGENDA
REGULAR MEETING OF THE
BOARD OF DIRECTORS OF THE
OAKDALE IRRIGATION DISTRICT
TUESDAY, MARCH 1, 2016

Agendas and Minutes are on our website at www.oakdaleirrigation.com

CALL TO ORDER 9:00 a.m., the Boardroom of the District Office
1205 East F Street, Oakdale, California 95361

PLEDGE OF ALLEGIANCE

ROLL CALL Directors Webb, Doornenbal, Osmundson, Altieri, Santos

ADDITIONS OR DELETION OF AGENDA ITEMS

ACTION TO TAKE VARIOUS ITEMS OUT OF SEQUENCE

PUBLIC COMMENTS - ITEM 1

1. The Board of Directors welcomes participation in meetings. This time is provided for the public to address the Directors of the District on matters of concern that fall within the jurisdiction of the Board that are not on the agenda.

   Speakers are encouraged to consult District Management or Directors prior to agenda preparation regarding any District operation or responsibility as no action will be taken on non-agenda issues. It is not required, but speakers may provide their name and address.

   Because these are non-agenda matters, generally no discussion or comment by the Board should be expected except to properly refer the matter for review or action as appropriate.

   Public Comments will be limited to five minutes per speaker.

PUBLIC HEARING – ITEM 2

1. Public Hearing on the Updated Ag Water Management Plan

CONSENT CALENDAR - ITEMS 3 - 22

Agenda items listed under the Consent Calendar may be acted upon individually, in whole or in part. Subsequently, should discussion on a particular item be desired, you should identify the item now so as to remove it from the list of items to be approved under one motion. Any items removed from the list on Consent Calendar items will be discussed and acted upon individually following action on the remaining Consent Calendar items if so moved.

3. Approve the **Board of Directors' Minutes of the Regular Meeting of February 16, 2016 and Resolution Nos. 2016-18, 2016-19, 2016-20, and 2016-21**

4. Approve **Oakdale Irrigation District Statement of Obligations**

5. Approve **Improvement District Statement of Obligations**

6. Approve **Assignment of Capital Work Order Numbers**

7. Approve **Denial of Request to Waive Late Charges (Richard Paslay)**

8. Approve **Board Attendance at the ACWA Spring Conference May 3-6, 2016 in Monterey, California**

9. Approve **Signature by the Board of Directors on the ACWA/JPIA Commitment to Excellence Certificate**

10. Approve **Amendment No. 03 to General Services Agreement 2013-GSA-003 with 7-11 Materials, Inc. for Revised Rate Schedule**

11. Approve **Amendment No. 03 to Professional Services Agreement 2009-PSA-002 with CH2M to Increase Rates**

12. Approve **Work Release No. 055 to Professional Services Agreement 2009-PSA-015 with Giuliani & Kull, Inc. for Professional Services to Prepare a Plat and Legal Description for a Thirty Foot Easement for the Campbell Lateral through APNS: 002-016-051/052**

13. Approve **Resolution Adopting the Updated Oakdale Irrigation District Surface Water Shortage Policy**

14. Approve **Request to Waive New Connection Fees and Associated Requirements (APN: 002-043-041 - Crawford)**

15. Approve **Request to Waive New Connection Fees and Associated Requirements (APN: 014-021-011 - Silveira)**

16. Approve **Request to Waive New Connection Fees and Associated Requirements (APN: 014-022-009 – Silveira)**

17. Approve **Request to Waive New Connection Fees and Associated Requirements (APN: 014-030-014 - Postma)**

18. Approve **Request to Waive New Connection Fees and Associated Requirements (APN: 014-006-034 – Postma)**

19. Approve **Request to Waive New Connection Fees and Associated Requirements for the 2016 Water Year (APN: 002-061-009/010 – Ruvalcaba)**

20. Approve **Request for New Irrigation Service to a Substandard Parcel (APN: 063-025-045 - Hedrick)**

21. Approve **Agricultural Discharge Permit on the Cree Pipeline (APN: 010-048-018 – Barbara L. Davis Boyd and David R. Boyd)**

22. Approve **Encroachment Permit on the Cree Pipeline (APN: 010-048-018 – Barbara L. Davis Boyd and David R. Boyd)**

ACTION CALENDAR - ITEMS 23 - 28

23. Review and take possible action to **Adopt the 2016 Budget**

24. Review and take possible action to **Adopt a Resolution Setting the Fixed Volumetric Charge for 2016**

25. Review and take possible action on the **Availability of Surplus Water for Out-of-District Applicants and Set the Water Rate**

26. Review and take possible action **Authorizing the General Manager to Determine the Start of the 2016 Irrigation Season**

27. Review and take possible action to **Approve Resolution Adopting Updated Ag Water Management Plan**

28. Review and take possible action to **Approve Amendment No. 001 to Work Release No. 004 to Professional Services Agreement 2011-PSA-008 with Davids Engineering, Inc. for Preparation of Technical Content for the Water Use Efficiency Grant Proposal for the Rubicon TCC Project**

COMMUNICATIONS - ITEM 29

29. **Oral Reports and Comments**

A. **General Manager's Report on Status of OID Activities**

B. **Committee Reports**

Finance Committee, February 23, 2016
- Draft 2016 Budget

C. **Directors' Comments/Suggestions**

CLOSED SESSION - ITEM 30

30. Closed Session to discuss the following:

A. ***Government Code* §54956.9 –** Significant Exposure
Pursuant to Paragraph (2) or (3) of Subdivision (d) of Section 45956.9
Three (3) Cases

OTHER ACTION – ITEM 31

31. Adjournment:

A. The next Regular Board Meeting of the **Oakdale Irrigation District Board of Directors** is scheduled for **Tuesday, March 15, 2016, at 9:00 a.m.** in the board room at 1205 East F Street, Oakdale, CA.

B. The next Joint Board Meeting of the **South San Joaquin** and **Oakdale Irrigation Districts** serving the **Tri-Dam Projects** and **Tri-Dam Authority** and other joint business matters is scheduled for **March 17, 2016 at 9:00 a.m.** in the board room of the Oakdale Irrigation District, 1205 East F Street, Oakdale, CA.

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OAKDALE IRRIGATION DISTRICT
RESOLUTION NO. 2016-26

RESOLUTION ADOPTING UPDATED
AGRICULTURAL WATER MANAGEMENT PLAN

WHEREAS, the Agricultural Water Management Planning Act (Act), codified in Section 10800 et seq. of the Water Code (CWC), requires all agricultural water suppliers equal to or great than 10, 000 acres in size to update its Agricultural Water Management Plan by December 31, 2015 and every five years thereafter; and

WHEREAS, Oakdale Irrigation District (District) prepared an Agricultural Water Management Plan in accordance with the Act (AWMP or Plan) and has prepared an updated Plan in accordance with the requirements of Section 20826 of the CWC and the regulations implementing the Plan adopted by the Department of Water Resources (DWR's Regulations); and

WHEREAS, the District provided notice of the March 1, 2016 hearing in accordance with Government Code Section 6066 by published notice in the Modesto Bee, a newspaper of general circulation for two consecutive weeks and notified the City of Oakdale and the Counties of Stanislaus and San Joaquin in accordance with CWC Section 10821, of the availability of the Plan and of the time and place of the public hearing to be held on the Plan at the March 1, 2016 meeting of the District's Board of Directors; and

WHEREAS, the District held a public hearing at the March 1, 2016 meeting of the District's Board of Directors and no public comments were made.

NOW, THEREFORE BE IT RESOLVED, that this Resolution supersedes any other previous resolution relating to the above subject matter.

NOW, THEREFORE BE IT FURTHER RESOLVED AND ORDERED, by the Board of Directors of the Oakdale Irrigation District as follows:

The 2015 update to the District's Agricultural Water Management Plan is hereby adopted and ordered filed with the District;

The District's Water Conservation Coordinator is hereby authorized and directed within 30 days to distribute copies of the Plan to the California Department of Water Resources and the other entities described in Section 10843 of the CWC and to cause the Plan to be posted on the District's website in accordance with Section 10844 of the CWC;

2362

The General Manager is hereby authorized and directed to take appropriate action to implement the updated Plan in accordance with the Act and DWR's Regulations, as such may be modified from time to time;

Upon Motion of Director Osmundson, seconded by Director Santos, and duly submitted to the Board for its consideration, the above-titled Resolution was adopted this 1st day of March 2016.

OAKDALE IRRIGATION DISTRICT

Steve Webb
President

Steve Knell, P.E.
Secretary

I HEREBY CERTIFY that the foregoing is a true and correct copy of the original on file with the Oakdale Irrigation District.

OAKDALE IRRIGATION DISTRICT

Steve Knell, P.E.
General Manager/Secretary