OAKDALE IRRIGATION DISTRICT

AGRICULTURAL WATER MANAGEMENT PLAN

JANUARY 2021

PUBLIC REVIEW DRAFT

prepared by

DAVIDS ENGINEERING, INC

www.davidsengineering.com

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 California Water Code, as modified by the Water Conservation Act of 2009 (SBx7-7) and the 2018 Water Management Planning Legislation (Assembly Bill 1668, or AB 1668).

In 2009, SBx7-7 modified 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), with the overarching goal of improving water use efficiency. Among its provisions, SBx7-7 allowed the California Department of Water Resources (DWR) to update the efficient water management practices (EWMPs) that suppliers must implement[1], and led to the passage of agricultural water measurement regulations. SBx7-7 also required agricultural water suppliers to prepare and adopt an updated AWMP, as set forth in the CWC and the California Code of Regulations (CCR), every five years, beginning with a Plan adopted on or before December 31, 2015.

AB 1668 modifies Water Code §531.10 *et seq.* and Water Code §10820 *et seq.* to address water conservation issues more adequately and to improve the management and evaluation of agricultural water suppliers' systems. Specifically, AB 1668 requires updated AWMPs to:

(1) Include an annual water budget (CWC §10826(c)),

(2) Identify water management objectives (CWC §10826(f)),

(3) Quantify water use efficiency (CWC §10826(h)), and

(4) Revise the supplier's Drought Plan to describe both drought resilience planning and drought response planning (CWC §10826.2).

AB 1668 also modifies AWMP submittal and compliance requirements, requiring the updated AWMP to be submitted to DWR on or before April 1, 2021 (and no later than 30 days after adoption), and thereafter on or before April 1 in the years ending in six and one.

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 2020 Agricultural Water Management Plan (Guidebook), a public draft version of which was released in August 2020. Other primary resources used to develop this 2020 update were OID's 2015 AWMP, the CWC itself, and relevant sections of the CCR.

[1] Critical EWMPs must be implemented by all agricultural water suppliers. Conditional EWMPs must be implemented if they are locally cost-effective and technically feasible.

Cross Reference Table of Oakdale Irrigation District's 2020 Agricultural Water Management Plan to Relevant Sections of the California Water Code

AWMP Section	Guidebook Location	Description	Water Code Section (or as identified)
3.2	1.4	At least 25,000 irrigated acres	10853
N/A	1.4	10,000 to 25,000 acres and funding provided	10853
Preface	1.4	April 1, 2021 update	10820 (a)
Preface, 2	1.4 A.2	**Added to the Water Code:** Added to the Water Code: AWMP submitted to DWR no later than 30 days after adoption; AWMP submitted electronically	**New to the Water Code:** 10820(a)(2)(B)
Preface	1.4 B	5-year cycle update	10820 (a)
1, 3, 4, 7	3.1A	Description of previous water management activities	10826(d)
2	3.1 B.1	Was each city or county within which supplier provides water supplies notified that the agricultural water supplier will be preparing or amending a plan?	10821(a)
2	3.2 B.2	Was the proposed plan available for public inspection prior to plan adoption?	10841
2	3.1 B.2	Publicly-owned supplier: Prior to the hearing, was the notice of the time and place of hearing published within the jurisdiction of the publicly owned agricultural water supplier in accordance with Government Code 6066?	10841
2	3.1 B.2	14 days notification for public hearing	GC 6066
2	3.1 B.2	Two publications in newspaper within those 14 days	GC 6066
2	3.1 B.2	At least 5 days between publications? (not including publication date)	GC 6066
2	3.1 C.1	After hearing/equivalent notice, was the plan adopted as prepared or as modified during or after the hearing?	10841

AWMP Section	Guidebook Location	Description	Water Code Section (or as identified)
2	3.1 C.2	Was a copy of the AWMP, amendments, or changes, submitted to the entities below, no later than 30 days after the adoption?	10843(a)
2	3.1 C.2	The department.	10843(b)(1)
2	3.1 C.2	Any city, county, or city and county within which the agricultural water supplier provides water supplies.	10843(b)(2)
2	3.1 C.2	Any groundwater management entity within which jurisdiction the agricultural water supplier extracts or provides water supplies.	10843(b)(3)
2	3.1 C.3	Adopted AWMP availability	10844
2	3.1 C.3	Was the AWMP available for public review on the agricultural water supplier's Internet Web site within 30 days of adoption?	10844(a)
7	3.1 D.1	Implement the AWMP in accordance with the schedule set forth in its plan, as determined by the governing body of the agricultural water supplier.	10842
3	3.3	Description of the agricultural water supplier and service area including:	10826(a)
3.2	3.3 A.1	Size of the service area.	10826(a)(1)
3.3	3.3 A.2	Location of the service area and its water management facilities.	10826(a)(2)
3.4	3.3 A.3	Terrain and soils.	10826(a)(3)
3.5	3.3 A.4	Climate.	10826(a)(4)
3.6	3.3 B.1	Operating rules and regulations.	10826(a)(5)
3.7	3.3 B.2	Water delivery measurements or calculations.	10826(a)(6)
3.8	3.3 B.3	Water rate schedules and billing.	10826(a)(7)
3.9, Attachment D	3.3 B.4	Water shortage allocation policies and detailed drought plan	10826(a)(8) 10826.2
5.5	3.4	Water uses within the service area, including all of the following:	10826(b)(5)

AWMP Section	Guidebook Location	Description	Water Code Section (or as identified)
5.5.1	3.4 A	Agricultural.	10826(b)(5)(A)
5.5.2	3.4 B	Environmental.	10826(b)(5)(B)
5.5.3	3.4 C	Recreational.	10826(b)(5)(C)
5.5.4	3.4 D	Municipal and industrial.	10826(b)(5)(D)
5.5.5	3.4 E	Groundwater recharge, including estimated flows from deep percolation from irrigation and seepage	10826(b)(5)(E)
4, 5	3.5 A	Description of the quantity of agricultural water supplier's supplies as:	10826(b)
4.2.1	3.5 A.1	Surface water supply.	10826(b)(1)
4.2.2	3.5 A.2	Groundwater supply.	10826(b)(2)
4.2.3	3.5 A.3	Other water supplies, including recycled water	10826(b)(3)
5.6	3.5 A.4	Drainage from the water supplier's service area.	10826(b)(6)
4.3	3.5 B	Description of the quality of agricultural waters suppliers supplies as:	10826(b)
4.3.1	3.5 B.1	Surface water supply.	10826(b)(1)
4.3.2	3.5 B.2	Groundwater supply.	10826(b)(2)
4.3.3	3.5 B.3	Other water supplies.	10826(b)(3)
4.3.4	3.5 C	Source water quality monitoring practices.	10826(b)(4)
5.7	3.6	**Added to Water Code:** Annual water budget based on the quantification of all inflow and outflow components for the service area.	**Added to Water Code** 10826(c)
5.9	3.7 C	**Added to Water Code:** Identify water management objectives based on water budget to improve water system efficiency	**Added to Water Code** 10826(f)
5.10	3.8 D	**Added to Water Code** Quantify the efficiency of agricultural water use	**Added to Water Code** 10826(h)

AWMP Section	Guidebook Location	Description	Water Code Section (or as identified)
6	3.9	Analysis of climate change effect on future water supplies analysis	10826(d)
7	4	Water use efficiency information required pursuant to § 10608.48.	10826(e)
7, 7.4	4.1	Implement efficient water management practices (EWMPs)	10608.48(a)
7, Attachment B	4.1 A	Implement Critical EWMP: Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of §531.10 and to implement paragraph (2).	10608.48(b)
7.2, 7.4	4.1 A	Implement Critical EWMP: Adopt a pricing structure for water customers based at least in part on quantity delivered.	10608.48(b)
7.3, 7.4	4.1 B	Implement additional locally cost-effective and technically feasible EWMPs	10608.48(c)
7.3, 7.4	4.1 C	If applicable, document (in the report) the determination that EWMPs are not locally cost- effective or technically feasible	10608.48(d)
7.4	4.1 C	Include a report on which EWMPs have been implemented and planned to be implemented	10608.48(d)
7.5	4.1 C	Include (in the report) 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.	10608.48(d)
N/A	5	USBR water management/conservation plan may meet requirements for EWMPs	10608.48(f)
N/A	6 A	Lack of legal access certification (if water measuring not at farm gate or delivery point)	CCR§597.3(b)(2)(A)
N/A	6 B	Lack of technical feasibility (if water measuring not at farm gate or delivery point)	CCR§597.3(b)(1)(B), §597.3(b)(2)(B)

AWMP Section	Guidebook Location	Description	Water Code Section (or as identified)
N/A	6 A, 6 B	Delivery apportioning methodology (if water measuring not at farm gate or delivery point)	CCR§597.3.b(2)(C),
Attachment B	6 C	Description of water measurement BPP	CCR §597.4(e)(2)
Attachment B	6 D	Conversion to measurement of volume	CCR §597.4(e)(3)
N/A	6 E	Existing water measurement device corrective action plan? (if applicable, including schedule, budget and finance plan)	CCR §597.4(e)(4))

Contents

Tables

Figures

Attachments

Acronyms and Abbreviations

AB 3616	Assembly Bill 3616, the Agricultural Efficient Water Management Act of 1990
AB 1668	Assembly Bill 1668 - 2018 Water Management Planning Legislation
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
BCSD	bias comparison and spatial disaggregation
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
CMIP3	Coupled Model Intercomparison Project Phase 3
CNRA	California Natural Resources Agency
CSJWCD	Central San Joaquin Water Conservation District
CVP	Central Valley Project
CWC	California Water Code
DF	Delivery Fraction
DMP	Drought Management Plan
DMS	Database Management System
DSO	Distribution System Operator
DSS	Decision Support System
DWR	California Department of Water Resources
EIR	Environmental Impact Report
EQIP (through NRCS)	the NRCS Environmental Quality Incentives Program (EQIP)
ESJGA	Eastern San Joaquin Groundwater Sustainability Agency
ESJWQC	East San Joaquin Water Quality Coalition
ET	Evapotranspiration
ET_a	Actual Evapotranspiration
ET_{aw}	Crop Evapotranspiration of Applied Water
ET_o	Reference Evapotranspiration
ET_{pr}	Crop Evapotranspiration of Precipitation
EWMP	Efficient Water Management Practice
FWUA	Friant Water Users Authority

GAR	Groundwater Quality Assessment Report
GCMs	global climate models
GDD	growing degree day
GMP	Groundwater Monitoring Plan
gpm	Gallons per Minute
GQMP	Groundwater Quality Management Plan
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
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
MID	Modesto Irrigation District
MOU	Memorandum of Understanding Regarding Efficient Water Management Practices by Agricultural Water Suppliers in California
mph	Miles per Hour
NASS	National Agricultural Statistics Service
NIWR	net irrigation water requirements
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
PU607	Planning Unit 607
PVC	Polyvinyl Chloride
RWQCB	Regional Water Quality Control Board
SB1938	Groundwater Management Planning Act of 2002
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

TMDL total maximum daily load

TSS total suspended solids

USBR United States Bureau of Reclamation

USGS United States Geological Survey

VAMP Vernalis Adaptive Management Plan

VFD Variable Frequency Drive

WCRP World Climate Research Program

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 2018 Water Management Planning Legislation (Assembly Bill 1668, or AB 1668, and Senate Bill 606). This AWMP updates the District's 2015 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 the development and ongoing implementation 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 updating 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 budgets spanning the period from 2010 to 2019 for the distribution system, the farmed lands, and the drainage system of OID and its customers[2]. 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. Also, per newly mandated requirements for AWMPs in AB 1668, the 2020 AWMP includes a detailed drought management plan, a section identifying water management objectives, additional quantification of water use efficiency, and an annual water budget presented by water year, in addition to calendar year, as has been reported previously[3].

Water Resources Plan

The OID distribution system infrastructure and operating policies evolved primarily to satisfy the needs of forage crops, and are still 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

[2] Although the water budgets in the body of the report are presented for the period from 2010 to 2019, detailed water budget results dating back to 2005 are available in Attachment J.
[3] The 2015 AWMP also included some of these features, but they have been organized and updated per AB 1668 requirements for the 2020 AWMP.

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. To date, over $94 million have been dedicated to projects in OID associated with the WRP.

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 and regional 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 and developed standards for using USBR metergates and constant head orifice (CHO) metergates where applicable and other types of new standardized turnout measurement devices where not applicable. 2. Dedicated annual budget line-item for turnout replacement and initiated replacement of turnouts requiring corrective actions following completion of WRP development in 2007. 3. Implementation of SCADA in distribution system and at select delivery points to identify potential operational issues and increase accuracy of delivery measurement. 4. Implementation of Storm water ordering and delivery management software. 5. Implementation of a QA/QC process to review delivery measurement volumes prior to billing, which occurs three times throughout the irrigation season. 6. Development and implementation of a Water Measurement Plan for customer deliveries (Attachment B); implementation is currently about 90% complete (62,468 acres of 69,890 acres).	1. Continue to dedicate annual budget line-item for turnout replacement and continue replacement of turnouts requiring corrective actions. 2. 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, conducted Proposition 218 rate update, and established and implemented a rate structure based in part on volume of water delivered. 2. Use volumetric billing for out-of-district water sales and future annexations. 3. Implemented Storm volumetric billing software.	1. Continue utilization 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 exceptionally 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 discharge is captured year-round in the District distribution system. 2. Food processing water is applied directly to lands within the District. 3. The utilization of treated M&I discharge from the City of Oakdale within OID is being evaluated.	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.	1. Continue technical assistance to growers implementing on-farm improvements through the NRCS EQIP 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. The rate structure is a tiered rate system, with higher rates for higher water use. Volumetric bills are distributed three times each season, allowing customers to monitor water usage as it relates to tiered water rates throughout the season and encouraging more efficient water use. 2. OID promotes conjunctive use of groundwater by setting water rates to promote use of available surface water. 3. In recent years, OID has continued operating its distribution system further into October, allowing for growers to use surface water for post-harvest irrigations in lieu of private pumping. Additionally, OID deep wells can be rented outside of the irrigation season at cost by growers for irrigation purposes.	1. Continue to encourage efficient farm water use. 2. Continue to promote use of available surface water supplies. 3. Continue operating distribution system later in the year to allow growers to use surface water for post-harvest irrigations in lieu of private pumping.
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. Repaired 0.55 miles of deteriorating concrete lining in 2019. 4. Replaced 100 miles of canals with buried pipeline, including roughly one mile between 2016 and 2019. 5. Constructed Robert Van Lier Reservoir in 2001 and constructed the North Side Regulating Reservoir in 2010. 6. Constructed Two Mile Bar Tunnel in 2017 (operational in 2019), bypassing 1.3 miles of canal. This project reduces seepage, decreases maintenance, and bypasses a high hazard section of canal. 7. Invested $63.9 million in main canal and tunnel improvements, canal and lateral rehabilitation, and pipeline replacement since 2006 ($33.4 million since 2014). 8. Implemented TCC on over 34 miles of 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.

Water Code Reference No.	EWMP	Implementation Status	Implemented Activities	Planned Activities
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 $13.3 million in flow control and measurement improvements including TCC, $6.3 million in construction of the north side regulating reservoir and nearly $3.4 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, and to system improvements and modernization, arranged deliveries have increased from approximately 23k acres in 2012 to over 42k acres (and 65% of District) in 2019. 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. 6. In recent years, OID has continued operating its distribution system further into October, allowing for growers to use surface water for post-harvest irrigations in lieu of private pumping. Additionally, OID deep wells can be rented outside of the irrigation season at cost by growers for irrigation purposes.	1. Continue transition to arranged demand ordering and delivery schedule for irrigators who request increased delivery flexibility. As facility constraints are eased by facility modernization program, service constraints will continue to 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. 5. Continue operating distribution system later in the year to allow growers to use surface water for post-harvest irrigations in lieu of private pumping, and continue at cost rentals of OID deep wells outside of the irrigation season.

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. OID coordinates with and supports private landowners with an interest in capturing and reusing drainwater in OID drainage facilities. 3. Reclamation pumping within OID to recover approximately 5,600 af annually. 4. Interception and reuse of approximately 2,100 af per year of tailwater entering the OID distribution system, 5. Gravity flow and lift pumping of approximately 19,500 af per year to the neighboring districts of MID, SSJID, and CSJWCD. 6. Automation of the District's laterals to provide downstream control has the potential to dramatically reduce spillage through spillage prevention. Implementation of TCC is estimated to have reduced spillage by up to 5,000 to 7,000 af annually. 7. OID has implemented nearly $1.8 million in outflow management and reclamation projects since 2006.	1. Continue to support private landowners in capturing and reusing drainwater in OID drainage facilities. 2. Continue to implement WRP outflow management projects. 3. Continue to implement WRP reclamation projects. 4. Continue with next phases of District-wide TCC implementation.

Water Code Reference No.	EWMP	Implementation Status	Implemented Activities	Planned Activities
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 participation in SGMA-related activities and GSP development and implementation in both the Eastern San Joaquin and Modesto Subbasins and the development of the USGS groundwater model of the Modesto Subbasin. 4. OID and the City of Oakdale are evaluating delivery of OID surface water for irrigation of city parks, which otherwise depend on groundwater pumping. 5. Potential groundwater recharge areas have been identified as part of the STRGBA Recharge Characterization Report. 6. OID has maintained and enhanced groundwater production capability, investing nearly $4.1 million since 2006. 7. In recent years, OID has continued operating its distribution system further into October, allowing for growers to use surface water for post-harvest irrigations in lieu of private pumping. Additionally, OID deep wells can be rented outside of the irrigation season at cost by growers for irrigation purposes. 8. OID makes district pumps available for frost protection outside of the irrigation season when surface water is not available. 9. Automated TCC canal reaches are continuously ponded throughout the irrigation season, which is a change from historical practice of lowering canal water levels in between rotations. The continuously ponded water in the canals potentially increase seepage flow from canals down to the groundwater system. Ongoing studies are evaluating the impacts of this. 10. OID has achieved in-lieu groundwater recharge through annexation of over 10,000 acres since 2006. 11. Updated Surface Water Shortage Policy to allow in-district surface water and private groundwater transfers between customers in a Level Two water shortage.	1. Continue active participation in GSP development and implementation in both the Eastern San Joaquin and Modesto Subbasins. 2. Utilize groundwater models and GSPs to continue 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. 3. Continue improving flexibility in water ordering and delivery to encourage use of surface water and discourage surface users from converting to groundwater. 4. Continue to implement WRP groundwater well, reclamation, and outflow management projects. 5. Continue with next phases of District-wide TCC implementation and evaluation of impacts. 6. Continue operating the distribution system into October to provide surface water for post-harvest irrigations and to make district pumps available to growers for either post-harvest irrigations or frost protection. 7. Review and revise Surface Water Shortage Policy as needed to provide flexibility to customers and increase planned conjunctive use of surface water and groundwater.

Water Code Reference No.	EWMP	Implementation Status	Implemented Activities	Planned Activities
10608.48.c(9)	Automate canal control structures	Being Implemented	1. Automated inlets and outlets to the regulating reservoirs. 2. Installed and automated 119 headgates, lateral control structures, turnouts and boundary out flow sites for flow, level, and position control. 67 of these sites operate in downstream control and fully automate 34 miles of canals. 3. Installed an additional 107 flow monitoring devices on headgates, lateral control structures, turnouts and boundary out flow sites. 4. OID has invested more than $13.3 million in flow control and measurement structure projects since 2006 (and nearly $4.8 million since 2015).	1. Continue to automate or install additional flow monitoring devices on canals and pipelines when and where beneficial to do so. 2. Continue with next phases of District-wide TCC implementation. 3. Continue to implement other WRP flow control and measurement structure projects.
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 website.	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. A link to the California Irrigation Management Information System (CIMIS) is provided on the OID website. 2. OID helps maintain the local Oakdale CIMIS station in conjunction with DWR staff. 3. Links to the cooperative extension and other agricultural information is provided on the OID website. 4. A periodic newsletter is provided to customers. 5. OID offers no-cost on-farm irrigation consultations and review by OID staff upon request and as associated circumstances arise. 6. Developed an online portal through which historical and current water use information is available to customers, and through which online bill pay is possible. 7. Updated Surface Water Shortage Policy to allow in-district surface water and private groundwater transfers between customers during Level Two water shortages.	1. Continue to provide links to CIMIS and other resources on the OID website. 2. Continue periodic newsletter to customers. 3. Continue to offer no-cost on-farm irrigation consultations and review. 4. Continue to promote and develop online portal that provides water use information and options for customers. 5. Continue to review and revise Surface Water Shortage Policy as needed to provide water management services and flexibility to customers.
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 USBR to promote carryover storage in New Melones Reservoir to provide greater flexibility when water shortages occur. 2. Identified mechanisms for voluntary transfers of water that facilitate greater water supply flexibility and storage and initiated discussions with DWR and USBR regarding policies that impede voluntary water transfers. 3. Active participation in initiatives that affect its water users. 4. Updated Surface Water Shortage Policy to allow in-district surface water and private groundwater transfers between customers during Level Two water shortages.	1. Continue discussions with USBR to promote carryover storage in New Melones Reservoir to provide greater flexibility when water shortages occur. 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. 4. Continue to review and revise Surface Water Shortage Policy as needed to provide flexibility to customers.

Water Code Reference No.	EWMP	Implementation Status	Implemented Activities	Planned Activities
10608.48.c(14)	Evaluate and improve the efficiencies of the supplier's pumps.	Being Implemented	1. Regular testing and evaluation of 70 pumps within OID boundaries by qualified staff. 2. Monitoring of water levels for groundwater pumps twice per year, including a comparison to pump level to ensure pumping head and efficiency of the pump are not compromised. 3. Integrated 6 pumps into the OID SCADA system. 4. Completed infrared thermographic survey of pumps to identify potential issues with pump operations. 5. 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. 3. Install sounding tubes on wells without them to allow for measurement of water levels for both monitoring and operational efficiency review. 4. Evaluate opportunities to improve pump efficiencies through further SCADA system integration (incorporating additional pump sites or incorporating remote control at existing sites). 5. Evaluate the costs and benefits of installation of Variable Frequency Drives (VFDs) on pumps. 6. Continue annual maintenance and improvements as part of WRP implementation.

1. Introduction

The Oakdale Irrigation District (OID or District) 2020 Agricultural Water Management Plan (AWMP or Plan) describes water use and water management activities within OID. A primary function of the AWMP for OID is to also 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 Water Management Planning Bill 1668 (AB 1668), which was passed on May 31, 2018 and includes further modifications and additions to the CWC. This AWMP updates OID's previous 2015 AWMP adopted by the Board of Directors in March 2016.

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 AB 1668, 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 the United States Bureau of Reclamation's (USBR) 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 the USBR recognizing and protecting the rights of the districts. This agreement dictates the obligations and responsibilities of the USBR in the delivery of the districts' water rights through the New Melones facility. The agreement provides the districts a

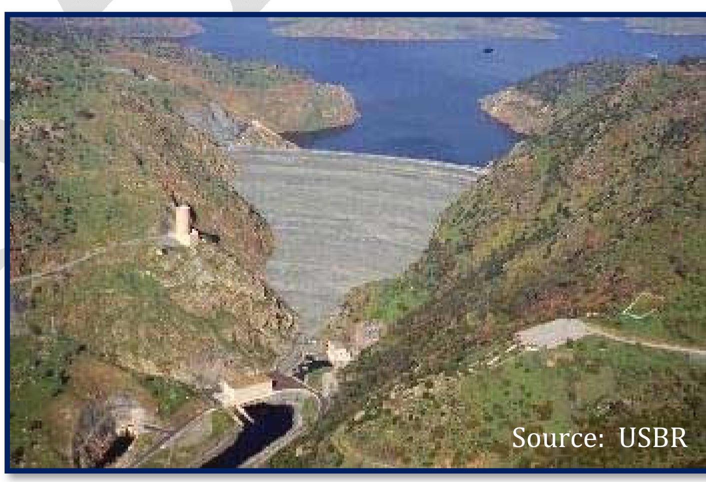


Figure 1-1. New Melones Dam and Reservoir.

combined supply of up to 600,000 acre-feet (af) of water annually, subject to availability, representing one of the most reliable water supplies in California.

Despite a secure 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 OID's distribution system began to reach the end of their service lives.

Throughout the long history of irrigation in Oakdale, forage crops[4] grown to support the substantial dairy and livestock operations in the region have dominated the irrigated cropping pattern; however, permanent crops, particularly almonds, have expanded within OID in recent years and surpassed forage crops. In 2019, approximately 52% of the irrigated lands in the district were permanent crops (44% almonds), while forage crops accounted for about 42%. The OID distribution system infrastructure and operating policies originally evolved to satisfy the needs of forage crops, and are still generally adequate to meet those needs. Improved water delivery strategies have been implemented more recently to also 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 ownership of and increased revenue from hydropower generation as well as increases in revenue from water transfers, the District undertook the development of the comprehensive 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, improved water control and storage within the distribution system have reduced system losses and advanced delivery practices. This has allowed OID to accommodate an increased number of low-volume deliveries on more flexible, high-frequency schedules, while continuing to meet the demand for traditional high-volume deliveries on

Figure 1-2. OID Water Resources Plan.

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

low-frequency schedules. These activities are described in greater detail in Section 8 of this AWMP.

1.2 Requirements of the California Water Code

The Water Conservation Bill of 2009 (SBx7-7) and the Water Management Planning Bill of 2018 (AB 1668) amended the California Water Code (CWC) Division 6 with regards to agricultural and urban water management. SBx7-7 added Part 2.55 (commencing with §10608) and replaced Part 2.8 (commencing with §10800), requiring all agricultural water suppliers to prepare and adopt an AWMP as set forth in the Bill on or before December 31, 2012. Under SBx7-7, the plans were required to be updated by December 31, 2015 and then every five years thereafter (§10820 (a)). With AB 1668, AWMPs continue to be required to be updated every five years; however, the deadline has been extended to April 1 of the following year (i.e. April 1, 2021 for the 2020 update).

Included in the consolidation of various Acts under CWC §10608.48, agricultural water suppliers are still required to implement certain efficient water management practices (EWMPs), including the two "critical" EWMPS outlined below.

(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.

AB 1668 amended various sections of the CWC by adding §1846.5, §10826.2, Chapter 9 (commencing with §10609), and Chapter 10 (commencing with §10609.40) to Part 2.55 of Division 6 of the CWC.

These changes to the CWC resulting from AB 1668 include the following requirements for an AWMP:

- Development of an annual water budget based on quantification of all inflows and outflows to the supplier's service area (§10826(c)).
- Identification of water management objectives based on the water budget to improve water system efficiency or meet other water management objectives (§10826(f)).
- Quantification of water use efficiency within the supplier's service area (§10826(h)).
- Inclusion of a Drought Management Plan containing resilience planning and drought response planning components (§10826.2).
- New adoption and submission date requirements and submittal requirements (§10820):
  - The 2020 AWMP adoption deadline is 4/1/2020, and adopted AWMPs must be submitted to DWR within 30 days of adoption.
  - Adopted AWMPs must be submitted electronically to DWR, including standardized forms, tables, or displays specified by DWR.

Agricultural water suppliers not in compliance with the provisions of the CWC 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. 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, distribution 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 WRP 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.

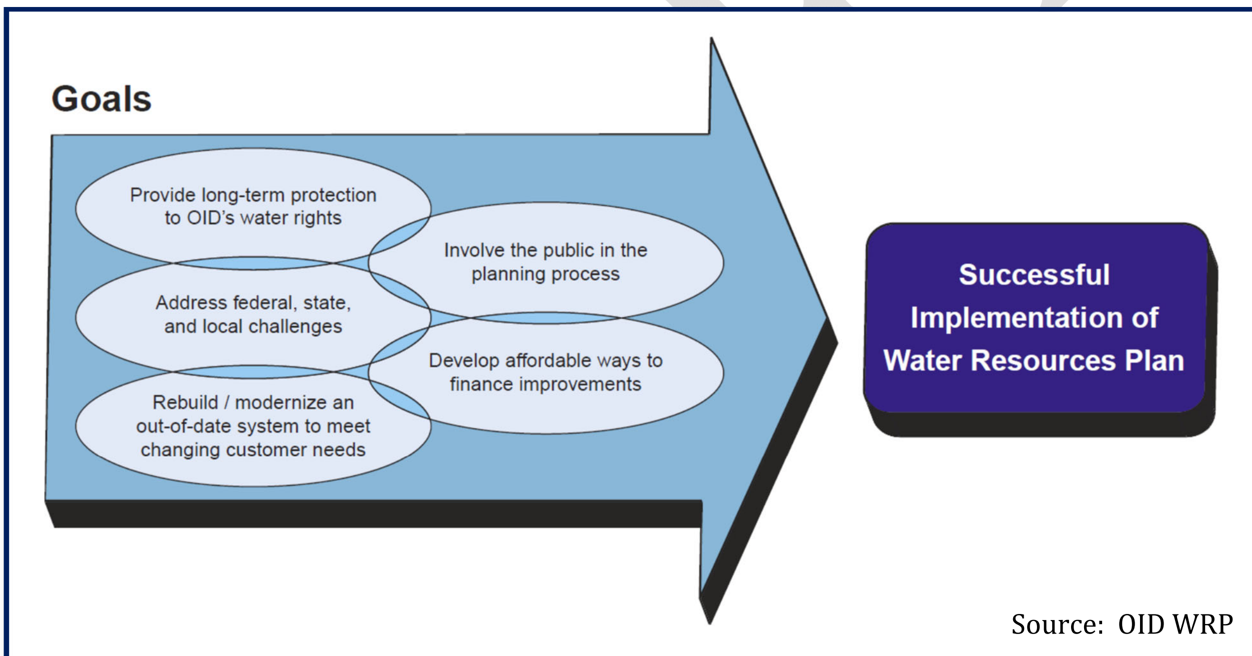


Figure 1-3. Goals of the OID Water Resources Plan.

Development of the WRP included comprehensive analysis of OID's Stanislaus River water rights, current and future groundwater levels, irrigation practices, and the OID distribution 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.

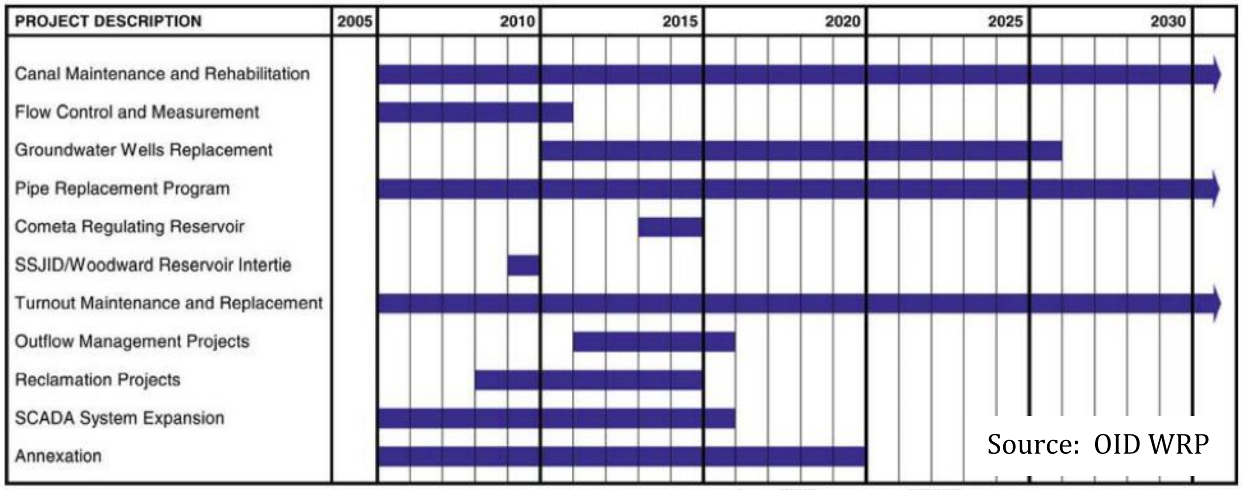


Figure 1-4. OID WRP Implementation Schedule.

As indicated by the schedule, improvements proposed under the WRP included more aggressive 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. The WRP was always envisioned as a pay-as-you-go program. When water sales slow down due to drought or limited water transfer opportunities, infrastructure investments similarly slow down until revenues improve again.

The estimated cost of distribution system 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 have been funded through annexation of new lands and through local and regional water sales and transfers. As water is conserved and transferred, OID receives revenue and implements additional improvements, resulting in additional water conservation. In 2009, OID pushed forward on 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 to continue future project implementation in accordance with the WRP. More information on OID's WRP and its implementation to date can be found in Section 8 of this AWMP.

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 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 AB 3616, which established the Agricultural Water Management Council (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.
- **2015 Agricultural Water Management Plan.** OID prepared and adopted a substantial update of its 2012 AWMP in 2015. The updated AWMP was developed to meet the Governor's Executive Order B-29-15 and to continue 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), a 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[5] 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

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

by agricultural, industrial, and municipal users while protecting the environment. The District adopted the plan by resolution on August 2nd, 2005. The STRGBA supported the development of a long-term USGS hydrologic model of the Modesto area that was completed in 2015 (USGS 2015). OID also continues to actively participate in groundwater management for the Modesto Subbasin as part of the implementation of the Sustainable Groundwater Management Act of 2014 (SGMA), as described below.

- **Stanislaus and Tuolumne Rivers Groundwater Basin Association Groundwater Sustainability Agency (www.strgba.org).** The Modesto Subbasin, within which all OID lands south of the Stanislaus River lie, is designated as a high-priority groundwater basin. Due to that designation, SGMA requires the adoption and implementation of a GSP no later than January 31, 2022. The District is one of seven agencies comprising the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA) Groundwater Sustainability Agency (GSA), which was formed in 2017. Along with the Tuolumne County GSA, which represents a small section of the Modesto Subbasin that falls within Tuolumne County, the STRGBA GSA is working to develop and implement a single Groundwater Sustainability Plan (GSP) under SGMA to ensure the long-term sustainability of groundwater resources across the entire Modesto Subbasin. The STRGBA GSA is currently conducting studies and implementing projects to aid the development of a GSP. OID is actively involved in these activities and in coordination and planning for the development and implementation of the Modesto Subbasin GSP.
- **Eastern San Joaquin Groundwater Authority (www.esjgroundwater.org).** The Eastern San Joaquin Subbasin (ESJ Subbasin), within which all OID lands north of the Stanislaus River lie, is designated as a high-priority basin in critical overdraft. Due to that designation, SGMA required the adoption and implementation of a GSP no later than January 31, 2020. In 2017, the Eastern San Joaquin Groundwater Authority (ESJGWA) was formed to establish a formal structure for future collaboration and coordination amongst GSAs within the ESJ Subbasin. Formation of the ESJGWA ultimately allowed for the completion of a single GSP to comply with SGMA and ensure the long-term sustainability of groundwater resources across the entire ESJ Subbasin. The OID GSA was formed in 2017 to actively manage and monitor groundwater resources in OID's service area within the ESJ Subbasin and is one of sixteen GSAs comprising the ESJGWA. The Eastern San Joaquin Groundwater Subbasin GSP was developed, adopted, and ultimately submitted to DWR on January 29, 2020 and is currently being implemented across the subbasin, including within the OID GSA boundary.
- **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 landowners 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.

- **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 landowners 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, but also provide other subordinate benefits for recreation and associated water activities in the upper basin.
- **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.** 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, 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.
- **Stanislaus River Basin Plan.** OID and SSJID are currently developing a collaborative Stanislaus River Basin Plan to address anticipated state and federal regulatory challenges and support sustainable use of the Stanislaus River basin's water resources. The plan will present alternatives for public input and final consideration by the districts' Board of Directors in an effort to protect the districts' senior water rights while maximizing the benefits of surface water resources for the districts' constituents by supporting long-term economic vitality of the region and sustainable water management in the basin. While currently still under development, the plan is nearing completion.

2. Plan Preparation

2.1 AWMP as Water Resources Plan "Report Card"

As described previously, this AWMP has been prepared in accordance with the CWC, including modifications resulting from enactment of SBx7-7 andAB1668. 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 Directors describing the AWMP update on [Date];
- Notification of OID's intent to update its AWMP was made via letters to required agencies and a notice in the Modesto Bee on [Date] and [Date];
- Posting of the draft Plan on the District's web page on [Date];
- Review of the publicly noticed presentation of the draft Plan at a special hearing on [Date]; and
- Approval and adoption of the final Agricultural Water Management Plan at a regularly scheduled Board of Directors meeting on [Date].
- Submittal of the final Agricultural Water Management Plan to DWR through the online portal on [Date].

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 subbasins 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 Power Authority Board and the Tri-Dam Project Board of Directors together with Directors from the SSJID.

The General Manager is the 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 81 full-time District employees and one part-time employee with 26 employees in Support Services/Operations and Maintenance, 38 employees in Water Operations, and 13 employees under the Chief Financial Offer including finance employees and employees who work in the warehouse and shop. Additionally, there is a Safety Coordinator, Human Resource Analyst. and Executive Assistant (who is supported by another part-time employee) that also report to the General manager. An organizational chart of the District is provided in Figure 3-1 that shows the roles and responsibilities within each department.

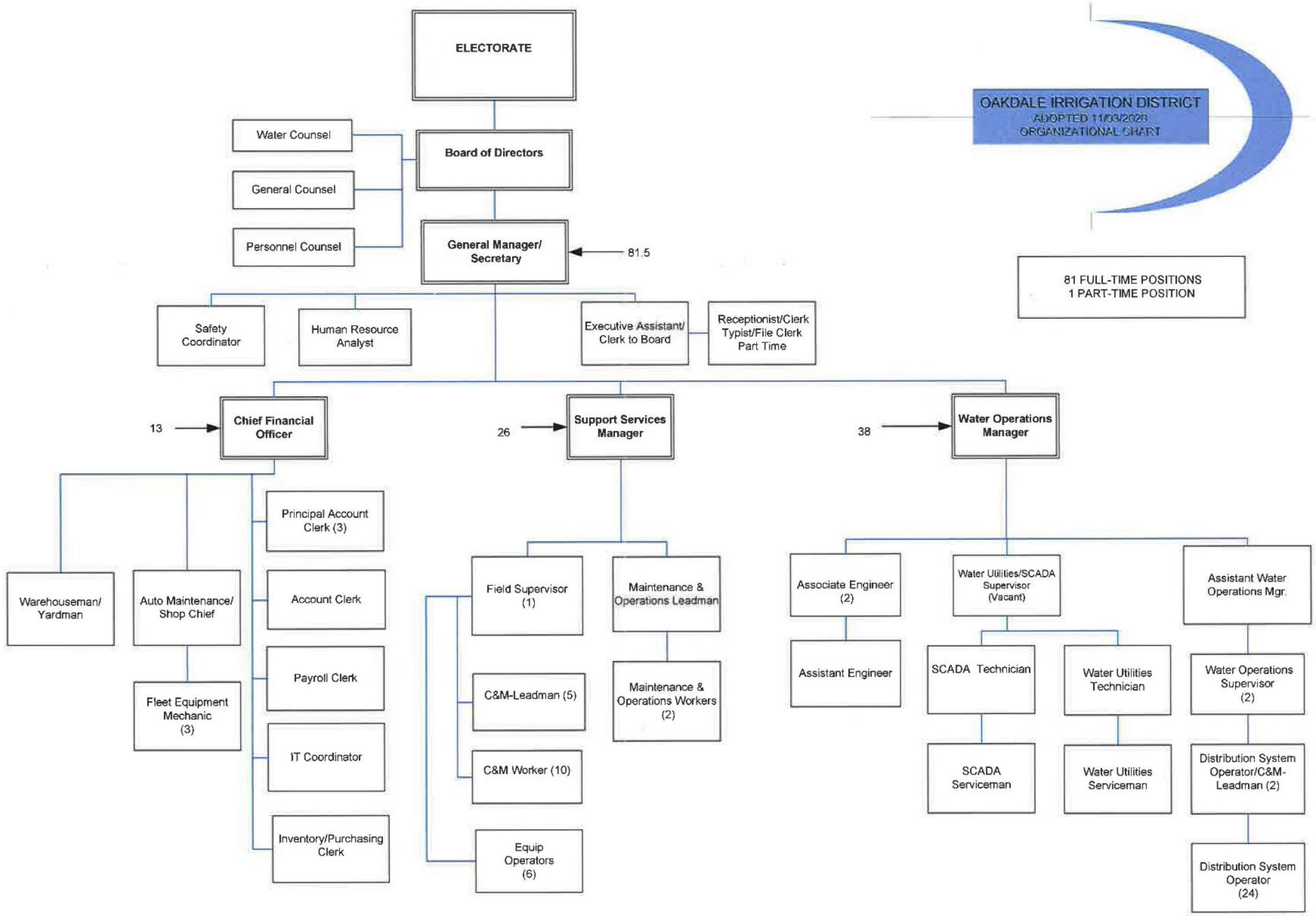


Figure 3-1. OID Organizational Chart.

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.

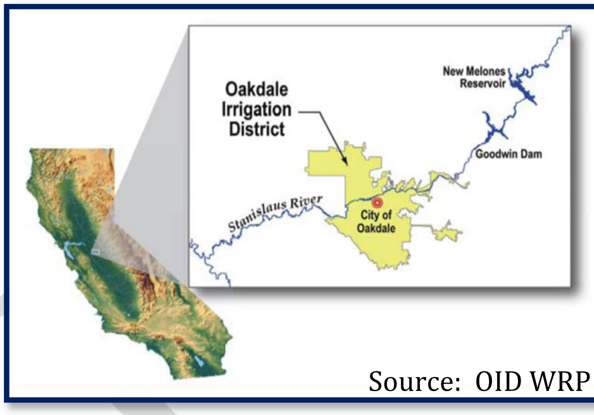


Figure 3-2. Location of OID.

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 82,000 acres[6], of which 69,890 acres were assessed an irrigation charge in 2019.

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, which is diverted from the Joint Main Canal upstream of the Joint Main Division, with the Tri-Dam Project but controls the headgate remotely. 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 28,524 acres, or 41% of OID's service area.

Figure 3-3. North Main Canal.

The South Main Canal serves the remaining 41,367 acres, or 59%, of OID's irrigated area. The South Main breaks

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

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 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 2,001 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 better 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.
- Following successful automation of 16 miles of canal on OID's Cometa and Claribel Laterals in 2011 as part of a pilot automation project, a total of 18 miles of additional canal have

been automated and are currently being operated using downstream flow control. Similar automation is anticipated to be extended to other parts of the distribution system in the future.

The District maintains 90 miles of drains, along which are located 41 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. The District also owns and operates 3 pumps along the Stanislaus River with separate water rights that allow the District to divert water directly from the river during the irrigation season when conditions permit. Finally, the District owns and operates 25 groundwater production wells, which are used for operational convenience and to provide supplemental water supply, primarily in water short years.

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

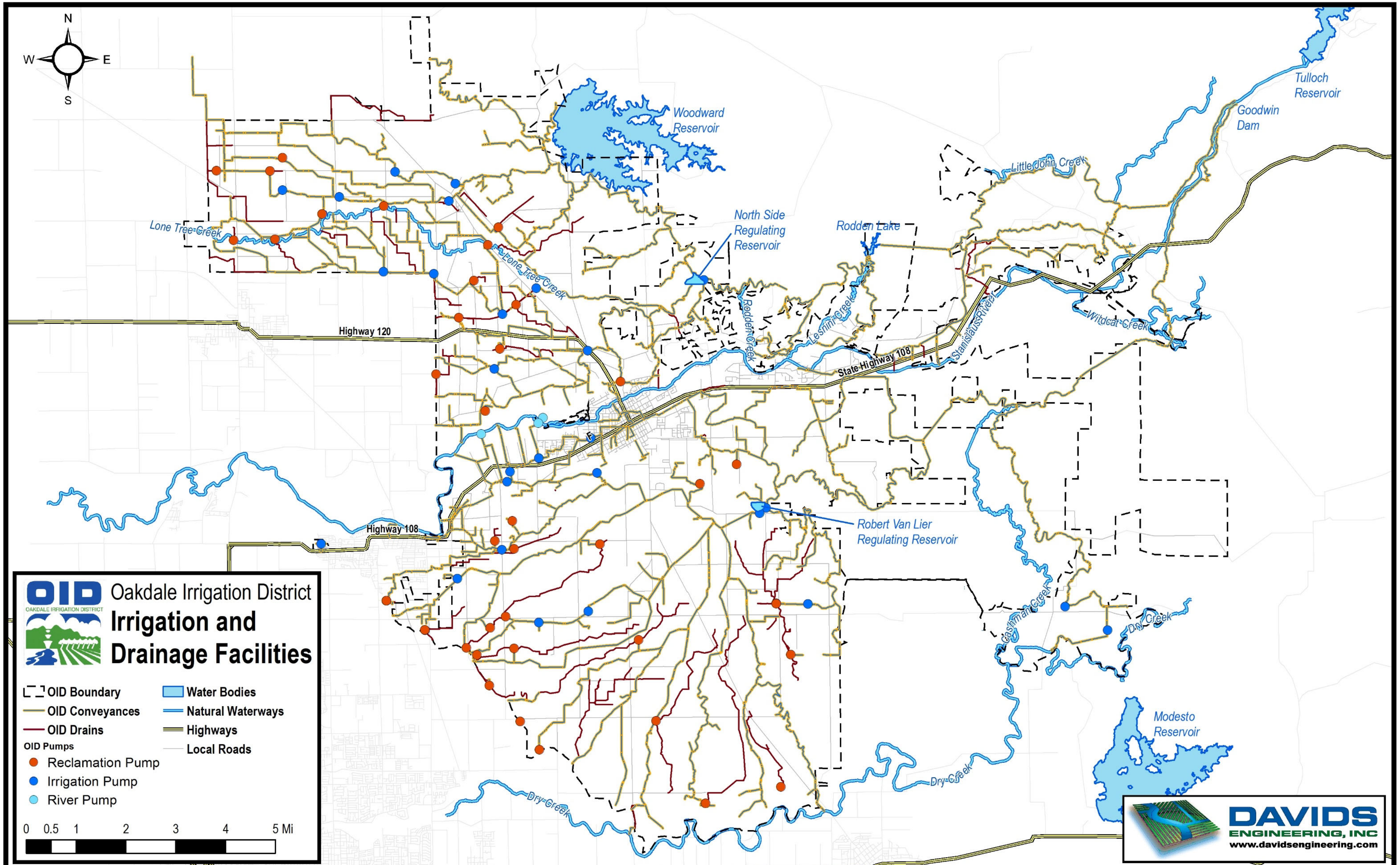


Figure 3-5. Oakdale Irrigation District Irrigation and Drainage Facilities.

The District is currently divided into 8 Distribution System Operator (DSO) divisions, including 4 north of the Stanislaus River and 4 south of the River. The divisions operate under the supervision of the Water Operations Supervisors and Assistant Water Operations Manager as directed by the Water Operations Manager. Within divisions, actual field operations are executed by the DSOs. OID has a total of 26 DSOs, including 16 to cover the regular day shift, and 8 to cover the regular night shift with 2 additional night rovers (DSO not assigned to a specific division who are available to assist wherever needed). DSOs work 7 days on, 7 days off, 11.5 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 2019 irrigation season.

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

Statistic	Division 1	Division 2	Division 3	Division 4
Total Area (acres)	13,483	15,834	7,871	4,179
No. of Parcels*	314	372	397	471
Avg. Parcel Size (acres)	43	43	20	9

* 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 5	Division 6	Division 7	Division 8
Total Area (acres)	8,277	5,130	4,692	10,425
No. of Parcels	360	419	368	424
Avg. Parcel Size (acres)	23	12	13	25

Division size ranges from 4,179 acres to 15,834 acres and average 8,736 acres. The number of parcels ranges to 314 to 471 and average 391 per division. The average parcel size ranges from 9 to 43 acres, and averages about 24 acres. The divisions have generally been delineated to achieve a uniform division of workload among DSOs. To the extent possible, divisions are also 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, though a majority of these cases occur on canals that are automated to ensure a steady flow is provided to the downstream division. Though automated, the upstream and downstream division DSOs need to coordinate with one another regarding their 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 12 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 whenever and wherever requested 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 4 hours advance notification to the DSO. The District provides 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.

Historically, DSOs have used "rotation sheets" to organize and track water deliveries. One rotation sheet is prepared for each division, with the customers generally 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, irrigator's 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[7] in 2015. This enables electronic versions of rotation sheets to be distributed, viewed, and remotely updated by the DSOs through a tablet.

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 5 DSOs act as main canal tender for the South and North 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. Generally each afternoon, 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, Assistant Water Operations Manager, or Water Operations Manager. The Water Operations Supervisors, Assistant Water Operations Manager, or Water Operations Manager then submit a request to the operator at the Tri-Dam Project to make the scheduled change.

Flow changes are also sometimes needed within the operating day and can be accommodated by Tri-Dam whenever needed with a minimum of four hours advance notice. The Robert Van Lier Regulating Reservoir on the south side or Rodden Lake in conjunction with 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

[7] More information available at: www.cvss.com/products-storm

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 and email.

In addition, an emergency phone is carried by the Water Operations Manager, Assistant Water Operations Manager, a Water Operations Supervisor, or a DSO leadman during the day and at night the emergency phone is rotated amongst the night DSOs or carried by the roving DSO. During the non-irrigation season, a Water Operations Supervisor or the Assistant Water Operations Manager carry the emergency phone.

3.4 Terrain and Soils

OID is located along the eastern side 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 above mean sea level on the east side near the Community of Knights Ferry to about 100 feet above mean sea level 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.

There are 11 soil map units, as defined by the Natural Resource Conservation Service (NRCS), that comprise over 75 percent of the lands within the OID service area boundary. A summary of the characteristics of these soils is provided in Table 3-2. The most common soil texture within the district is sandy loam, comprising over two thirds of the lands within the OID service area boundary. For soils characterized as sandy loam, available water holding capacity is typically three to nine inches in the top five feet, and they are moderately well or well drained. A restrictive layer comprised of bedrock, duripan, or an abrupt textural change to a clay layer occurs throughout much of the district. As described above, deep ripping has allowed the production of tree crops in these areas, which were previously typically used to production of pasture and forage crops.

Table 3-2. Summary of Characteristics of Dominant Soils.

Soil Map Unit	Percent of Area	Land-form(s)	Slope Range	Parent Material	Available Water Holding Capacity	Drainage	Saturated Hydraulic Conductivity Class	Restrict-ive Layer	Depth to Water Table	Typical Profile[1]	
San Joaquin sandy loam	23%	fan remnants on valleys & terraces on valleys	0 and 3 percent	alluvium derived from granite	7.0 inches in the top five feet	Moderately well drained	very low	abrupt textural change at 15 to 21 inches	10 inches	0 - 9 inches:	sandy loam
										9 - 15 inches:	sandy clay loam
										15 - 21 inches:	clay
										21 - 37 inches:	clay loam
										37 - 79 inches:	loam
Madera sandy loam	17%	terraces on valleys	0 to 2 percent	alluvium derived from granitic rock sources	3.1 inches in top five feet	Moderately well drained	very low	abrupt textural change at 23 to 29 inches	none within soil profile	0 - 19 inches:	sandy loam
										19 - 23 inches:	sandy clay loam
										23 - 29 inches:	clay
										29 - 60 inches:	indurated material
Montpellier coarse sandy loam	8%	alluvial plains & fan remnants	0 and 3 percent	alluvium derived from granite	6.7 inches in top five feet	Well drained	moderately low	none	none within soil profile	0 - 18 inches:	sandy loam
										18 - 39 inches:	sandy clay loam
										39 - 60 inches:	sandy loam
	5%	foothills & hills		colluvium and/or		Well drained	moderately low	bedrock at 12 to	none within	0 - 12 inches:	silt loam

Soil Map Unit	Percent of Area	Land-form(s)	Slope Range	Parent Material	Available Water Holding Capacity	Drainage	Saturated Hydraulic Conductivity Class	Restrict -ive Layer	Depth to Water Table	Typical Profile[1]	
Peters-Pentz Complex			15 and 50 percent	residuum derived from water-reworked basic tuff	1.9 inches in top five feet			22 inches	soil profile	12 - 22 inches: 22 - 79 inches:	Fine sandy loam sandy clay loam
Peters clay	4%	foothills & hills	2 and 8 percent	colluvium and/or residuum derived from water-reworked basic tuff	2.2 inches in top five feet	Well drained	moderately low	bedrock at 15 to 25 inches	none within soil profile	0 - 25 inches:	clay
Snelling sandy loam	4%	alluvial plains & fan remnants	0 and 3 percent	alluvium derived from granite	9.0 inches in top five feet	Well drained	moderately low	none	none within soil profile	0 - 19 inches: 19 - 56 inches: 56 - 60 inches:	sandy loam sandy clay loam sandy loam
Whitney and Rocklin sandy loams	4%	alluvial plains & fan remnants	3 and 8 percent	alluvium derived from granite	4.4 inches in top five feet	Well drained	low	bedrock at 28 to 34 inches	none within soil profile	0 - 31 inches: 31 - 35 inches:	sandy loam weathered bedrock

Soil Map Unit	Percent of Area	Land-form(s)	Slope Range	Parent Material	Available Water Holding Capacity	Drainage	Saturated Hydraulic Conductivity Class	Restrict-ive Layer	Depth to Water Table	Typical Profile[1]	
Hanford sandy loam	4%	alluvial fans & alluvial plains	0 and 3 percent	alluvium derived from igneous rock	8.1 inches in top five feet	Well drained	moderately high	none	none within soil profile	0 - 60 inches:	sandy loam
Honcut sandy loam	3%	flood plains on valleys	0 and 2 percent	coarse-loamy alluvium derived from granite	6.6 inches in top five feet	Well drained	moderately high	none	none within soil profile	0 - 60 inches:	sandy loam
Tujunga loamy sand	3%	alluvial fans & alluvial plains	0 and 3 percent	sandy alluvium derived from granite	4.3 inches in top five feet	Somewhat excessively drained	high	none	none within soil profile	0 - 60 inches:	loamy sand
Exeter sandy clay loam	3%	fan remnants on alluvial plains	0 and 2 percent	coarse-loamy alluvium derived from igneous, metamorphic and sedimentary rock	5.3 inches in top five feet	Moderately well drained	very low	duripan at 36 to 60 inches	none within soil profile	0 - 12 inches:	sandy loam
										12 - 36 inches:	sandy clay loam
										36 - 60 inches:	cemented & indurated material

3.5 Climate

The climate statistics presented in this section are based on the Oakdale CIMIS station (#194), established in 2004. Due to modifications to surrounding on-farm irrigation and cultivation practices, the Oakdale CIMIS station was relocated in 2017 approximately 0.85 miles northwest of its original location. 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, comprised of mild winters with moderate precipitation and warm, dry summers. Mean daily maximum temperatures range from about 56°F in December and January to nearly 93°F in July (Table 3-3). Mean daily minimum temperatures range from 36°F in January to about 59°F in July. Average annual reference evapotranspiration (ET_o) is approximately 55 inches, ranging from a low of 1 inch in December and January to a high of over 8 inches in June and July. Approximately three quarters of the annual ET_o occurs in the six-month period from April through September.

Average annual precipitation is 14.4 inches, with 11.8 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 nearly 77%, 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 (3.8 miles per hour) and highest in the summer (6.2 mph in June and July).

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

Table 3-3. Mean Daily Weather Parameters by Month at Oakdale CIMIS Station (December 2004 through December 2019).

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	45.5	36.4	56.3	84.1	65.2	95.9	4.2
February	2.0	2.0	49.5	38.5	61.9	77.4	54.5	94.7	4.7
March	3.5	2.0	53.6	41.4	66.9	74.2	49.8	94.4	4.9
April	4.9	1.3	57.7	44.3	72.0	67.4	43.4	92.2	5.2
May	6.8	0.5	64.3	49.5	79.8	58.0	35.2	86.8	5.7
June	8.1	0.1	71.3	54.9	87.6	51.6	30.9	81.0	6.2
July	8.7	0.0	75.8	59.4	92.8	49.6	29.8	76.9	6.2
August	7.6	0.0	73.7	58.2	90.5	52.8	31.7	80.2	6.0
September	5.6	0.1	69.9	55.0	86.5	54.8	32.3	82.3	5.1
October	3.7	0.6	61.7	48.1	77.8	60.8	36.5	86.3	4.4
November	1.8	1.2	52.3	40.7	66.3	75.1	50.5	93.2	3.8
December	1.1	2.4	45.8	36.9	56.2	82.7	63.1	95.3	4.5
Annual	54.8	14.4	60.5	47.2	75.1	65.2	43.0	88.0	5.1

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 February 2021. 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 completed 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 budget 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. Cashman Dam, an automated upstream level control and flow measurement structure in OID, is pictured in Figure 3-6.

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 Project to U.S. Geological Survey standards. Tri-Dam engages outside services to conduct monthly checks and to refine the ratings of these boundary inflow gages as necessary throughout the year.

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 (Meter-gates or Constant Head Orifice gates) 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 measurement 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 of improvements. Pursuant to the ranking of outflow sites, as of 2019, OID has established reliable flow measurement at 14 operational spillage sites and 15 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 is applied (with a minimum per parcel charge) followed by an additional volumetric rate component based on actual usage. During the 2020 irrigation season, the fixed (per-acre) rate was $29.50 (with a minimum of $59 per parcel), and the volumetric rates are as follows:

- $3.39 per af for usage from 0 to 3 af/ac
- $6.73 per af for usage from 3 to 5 af/ac
- $8.94 per af for usage from 5 to 7 af/ac
- $11.20 per af for usage from 7 to 8 af/ac
- $22.34 per af for usage greater than 8 af/ac

Additionally, OID's water rate allows for a drought surcharge of $6.67 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 set annually by the BOD, and 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 tailwater 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 are, and future annexations into OID will be, based at least in part on quantity delivered and assessed through volumetric measurement at the delivery point. During the 2020 irrigation season, the volumetric charge for water delivery to these lands was $58.51 per af.

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. With ongoing implementation of the WRP and the experience of the recent drought from 2012 through 2016, the District updated its Surface Water Shortage Policy in 2016 and again most recently in June 2020. The Surface Water Shortage Policy is included as Attachment E of this AWMP.

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 2015 AWMPs. In 2018, with the passage of AB1668, the CWC was amended to require a DMP in subsequent AWMP updates. In response to this legislation, 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 in preparation for and in response to times of drought to manage available water supplies and meet customer demands to the maximum extent possible. The DMP includes components recommended by DWR in its 2020 AWMP Guidebook (DWR 2020). OID's DMP describes the determination of available water supply, potential vulnerabilities to drought, drought resilience opportunities and constraints, various drought responses, and water shortage impacts. The description of water shortage impacts includes a summary of the 2012 to 2016 drought. .

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: 3.2.7.1 – 3.2.7.2, 3.2.8.2, 3.3.2.1, 4.1.1 – 4.1.3, 4.2.1, 5.1.3, 5.2.10 – 5.2.11, 6.2.1 – 6.2.2, 6.2.5.

Refer to the following rules describing enforcement actions by the District for the wasteful use of water: 2.2.1 – 2.4.1, 3.3.2.7, 3.4.1, 4.2.3, 5.2.6, 5.6.1 – 5.6.2.

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. The quantity and quality of surface water and groundwater supplies are discussed in the following sections.

4.2 Water Supply Quantity

4.2.1 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 Districts 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 on the north and one 22 miles in length on the south 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 allotment 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 a maximum 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 three 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. 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.

An analysis of the probability that OID's entitlement will be less than 300,000 af (after splitting the total supply with SSJID) was originally conducted as part of OID's Water Resources Plan and subsequently updated in 2013 for the period from 1922 to 2003. Based on the analysis, it was estimated that OID will receive its full supply in 78 out of 100 years and will receive at least 246,000 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.

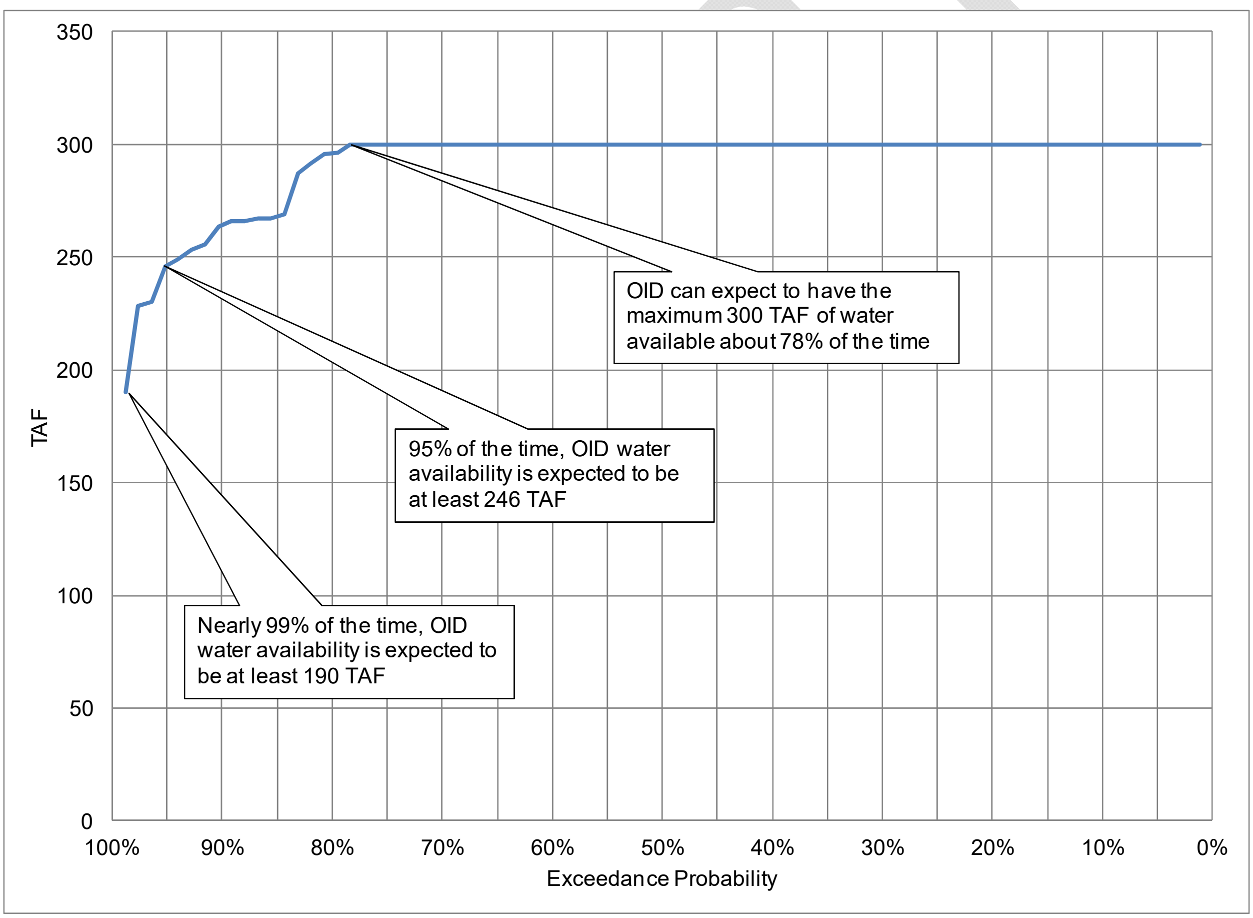


Figure 4-3. Exceedance Probability of OID Stanislaus River Water Supply.

4.2.2 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 within 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 side of the Stanislaus River, the District is in the southern portion of the Eastern San Joaquin Subbasin, which is 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 subbasins 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 historically shown nearly continuous and substantial overall decline (DWR 2003). Overall average declines from 1940 through 2018 in the subbasin exceed 100 feet; based on 10 selected wells distributed throughout the subbasin, the recent average decline from 1996 through 2015 was roughly 10 feet (ESJGA 2019). Additionally, groundwater elevations and trends vary throughout the subbasin. Most notably, there is a large pumping depression in the center of the subbasin, to the east of the City of Stockton. However, in the portion of the subbasin beneath OID, groundwater levels are supported by recharge that occurs from OID’s diversion and delivery of Stanislaus River water. In OID’s monitoring wells within its service area north of the Stanislaus River, average groundwater level declines from 2005 to 2020 were roughly 1.3 feet per year. Prior to the drought (2005-2012), declines were roughly 0.5 feet per year; following the drought (2016-2020), they were roughly 0.7 feet per year. From 2012 through 2020 (a period that includes the drought and a substantial increase in irrigated area to the east of OID dependent on groundwater), the average declines were roughly 1.9 feet per year. The conjunctive management of surface water and groundwater resources in the subbasins underlying OID is an important consideration in evaluating the OID water budget and opportunities and potential impacts related to conservation at the farm, district, and basin scales.

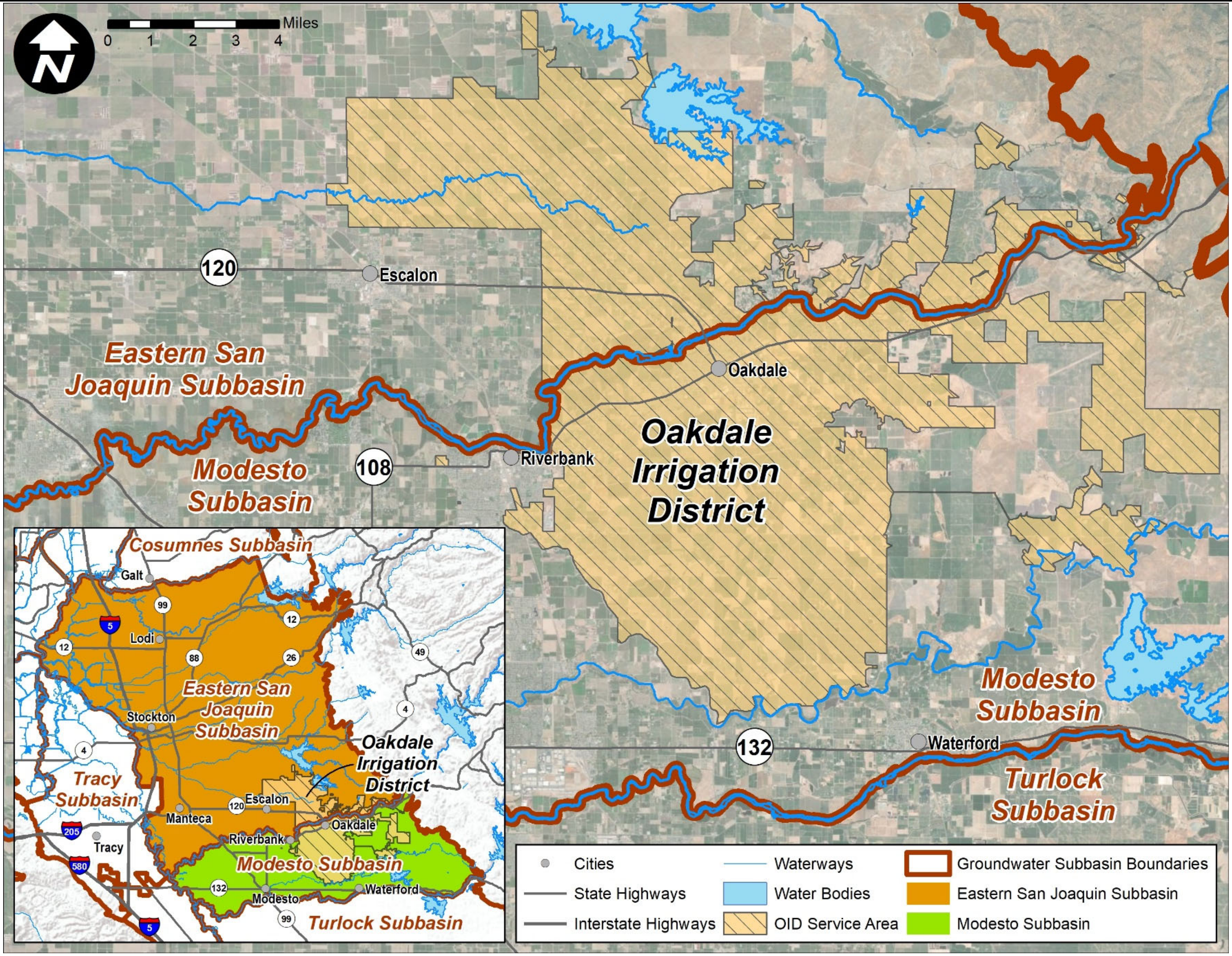


Figure 4-4. Groundwater Basins Underlying OID and Surrounding Areas.

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 in 2015. The seven agencies currently comprising the Association are:

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

Six of the seven 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 also 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. Finally, in 2017 the STRGBA formed a GSA to develop and implement a GSP under SGMA to ensure the long-term sustainability of groundwater resources within the Modesto Groundwater Subbasin. The STRGBA GSA is currently conducting studies and implementing projects to aid the development of a GSP, with OID actively involved in the process.

In the Eastern San Joaquin (ESJ) Subbasin, OID is one of 16 GSAs comprising the Eastern San Joaquin Groundwater Authority (ESJGWA), which was formed in 2017 to develop and implement a GSP under SGMA to ensure the long-term sustainability of groundwater resources within the subbasin. The OID GSA was formed in 2017 to actively manage and monitor groundwater resources in OID's service area within the ESJ subbasin. The ESJ Subbasin GSP was developed, adopted, and submitted to DWR on January 29, 2020 and is currently being implemented across the subbasin, including within the OID GSA boundary. The ESJ Subbasin GSP is included as Attachment I.

Groundwater levels in the District's wells and selected private wells are measured in spring (May) and fall (November). This information is reported to the STRGBA as 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 its service area north of the Stanislaus River into the CASGEM system.

The District has 25 deep wells with a combined output of approximately 107 cfs and a theoretical maximum annual production capacity of approximately 45,393 af based on a 214-day irrigation season. Actual annual production ranged between approximately 1,700 and 12,600 af between 2015 and 2019 because the wells are not operated continuously and the length of each irrigation season varies. Annual groundwater pumping volumes by OID in each subbasin are available in Attachment J. 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:

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

Figure 4-5. OID Irrigation Well.

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 complement and contribute to a database of tests OID has performed periodically in the past over the life of each well. OID continues to periodically test its production wells to identify the need for additional maintenance to sustain acceptable levels of production and pumping efficiency, as it has done historically. Services for pump efficiency testing on private agricultural wells are also available through various local vendors.

4.2.3 Other Water Supplies (Including Recycled Water)

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 roughly 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 via private distribution systems, partially offsetting OID irrigation demands. Finally, the use of treated M&I discharge water from the City of Oakdale within the OID service area is currently being evaluated. Evaluation and utilization of other potential sources of recycled water will continue to be considered on a case-by-case basis.

4.3 Water Supply Quality

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 as the need arises to ensure the quality of water is sufficient for its end use. In general, water quality of surface water, groundwater, and other water supplies are excellent for purposes of irrigation and crop production, which is the end use for an overwhelming majority of OID's water supply. OID also provides domestic water through a rural water system (RWS) and serves as the trustee for five improvement districts (IDs) that provide domestic water; all domestic water provided through the RWS and IDs is groundwater. OID monitors water quality for the RWS and IDs according to state and local law to confirm its quality. The monitoring activities by OID and its regional partners are described in greater detail below.

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

4.3.1 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.

Per the Monitoring Plan Update for the 2019 water year (ESJWQC 2018), the ESJWQC conducts monthly water quality monitoring at core sites to assess a number of field parameters, including nutrients, pathogens, metals and toxicity. Monitoring at core sites is for two consecutive years, alternating between two core sites in each zone every four years. If monitoring at a core site results in a parameter exceeding a defined threshold, additional monitoring is completed at represented sites. In addition to monthly monitoring, ESJWQC attempts to sample two storm events each year. Finally, the ESJWQC conducts special project monitoring, which includes site-specific monitoring for sites included in a management plan, monitoring during high total suspended solids (TSS) events, and monitoring for parameters associated with a total maximum daily load (TMDL) with a source of agriculture. The ESJWQC produces annual reports for the RWQCB and for members. The member annual report includes a summary of monitoring results for the past year, along with other content. The Member annual reports are available through the ESCWQC website (www.esjcoalition.org) and the annual water quality monitoring reports for the RWQCB are available through the SWRCB website (www.waterboards.ca.gov).

Per the Monitoring Plan Update for the 2019 water year (SJCDWQC 2018), the SJCDWQC conducts monthly water quality monitoring at core sites to assess a number field parameters, including nutrients, pathogens, metals and toxicity. Monitoring at core sites is for two consecutive years, alternating between two core sites in each zone every four years. In addition to monthly monitoring, SJCDWQC attempts to sample two storm events each year. The SJCDWQC also conducts water quality monitoring at Represented sites, based on either a site-specific management plan or an exceedance of defined water quality thresholds at a core site. Finally, the SJCDWQC conducts special project monitoring, which includes site-specific monitoring for sites included in a management plan and TMDL monitoring. The SJCDWQC produces annual reports for the RWQCB with a summary of monitoring results; the reports are available through the SWRCB website (www.waterboards.ca.gov).

Members of both the SJCDWQC and ESCWQC are required to attend an annual membership meeting during which they are briefed on these statistics, notified of any issues or anticipated changes and reminded of applicable on-farm best management practices.

4.3.2 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 comprehensive Groundwater Quality Management Plan (GQMP) (ESJWQC 2015), which was most recently revised and updated in June 2017. 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.

Under SGMA, groundwater quality is also addressed for the portion of OID north of the Stanislaus River in the Eastern San Joaquin Subbasin in the GSP developed by ESJGA. Per the GSP, a threshold of 1,000 mg/L Total Dissolved Solids (TDS) for degraded water quality was set for the subbasin, but areas of concern and monitoring wells are all to west and northwest of the OID service area. Groundwater quality is also being assessed and will be addressed by the GSP that is currently in development by the STRGBA GSA for the Modesto Subbasin, which the portion of OID south of the Stanislaus River lies within.

Finally, as described previously, OID monitors groundwater quality for the RWS and IDs according to state and local law to confirm its quality.

4.3.3 Other Water Supplies (Including Recycled Water)

The quality of recycled process water from the Sconza Candy Company is monitored and maintained per the NPDES permit between Sconza and the RWQCB and discharge agreement between OID and Sconza. The quality of discharge water from food processing facilities is also monitored to ensure its quality is sufficient for the irrigation of the lands to which it is applied.

4.3.4 Source Water Quality Monitoring Practices

Monitoring practices for OID's various water supplies are described above.

5 Water Budget

5.1 Introduction

This section describes the various uses of water within OID, followed by a detailed description of OID's water budgets for key accounting centers within the District. For each accounting center, a detailed, multi-year water budget covering the previous 10-year period from 2010 to 2019 is presented[8]. The water budget quantifies all significant inflows and outflows of water to and from the OID service area with a focus on those occurring 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 2015 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 budgets 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 Budget Overview

The OID water budget 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 budget. A schematic of the water budget 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).

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

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

[8] Detailed water budget results are also available in Attachment J. As described in Section 5, the annual results for 2010-2019 are presented for the calendar year from January to December. In Attachment J, the results are presented on a water year basis, per the requirements of CWC §10826(c) and presented for the fifteen year period from 2005-2019 to provide more historical context. Furthermore, in Attachment J, water budget results are also subdivided into distinct water budgets for the portion of OID to the north of the Stanislaus River in the East San Joaquin Subbasin and the portion of OID to the south of Stanislaus River in the Modesto Subbasin.

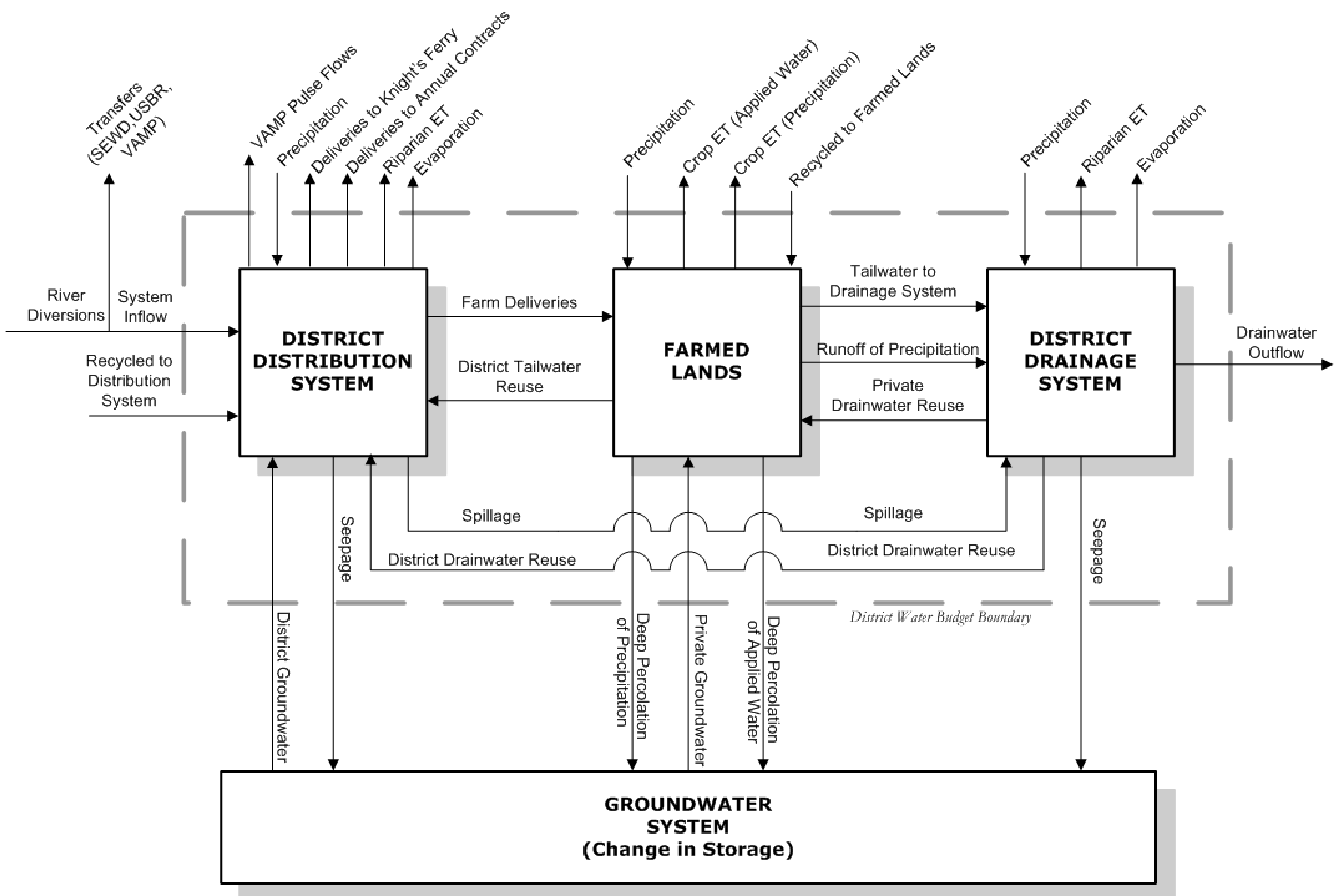


Figure 5-1. OID Water Budget Structure.

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.

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 budget period of record. In recent years, as a result of OID's implementation of SBx7-7, farm delivery measurements have improved and delivery records have served as an important point of reference for review and evaluation of water budget results and operational efficiency. In future years as farm delivery measurement accuracy continues to improve, it is anticipated that farm delivery measurements will be used directly as part of water budget 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 budget 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 more than 60% of OID and can be used to estimate totals for the entire district.

The results of the water budget 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 budget, indicating which accounting center(s) it belongs to, whether it is an inflow or an outflow, whether it was measured or calculated[9], 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 8%. 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 budget. The estimated uncertainty in deep percolation of applied water is over 90%. 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 28%, which is similar to the other drainage system flow paths. Despite appreciable uncertainty in some flow path quantities, the water budget provides useful insights into OID's water management.

5.4 Hydrologic Year Types in OID

Development of a multi-year water budget 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 budget 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 budget results over time, USBR surface water allotment, total water year precipitation[10], 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 2010 to 2019 period, a partial allotment was received in 2013, 2014, and 2015, with full allotments in the

---

[9] Calculated flow paths include calculations based on modeling or estimates using best available information and management practices.

[10] Total water year precipitation refers to precipitation falling within OID during the period from October 1st through September 30th. 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.

remaining years. Furthermore, 2015 was the only year that OID had to implement and enforce a water allocation for its water users due to a reduction in OID's allotment.

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 2010 to 2019 have been assigned to wet or dry year types for purposes of discussion of water uses in OID over time and the corresponding water budgets. These factors along with the year types by year are listed in Table 5-2.

Based on the analysis of surface water allotment, precipitation, and ET_o, four years between 2010 and 2019 were assigned to wet year types, and six years were assigned to dry year types. The wet years of 2010, 2011, 2017, and 2019 each had a full allotment and precipitation greater than the average of 13.1 inches. Irrigation season ET_o tended to be lower for the wet years, averaging approximately 43.1 inches. The dry years of 2013, 2014, and 2015 had partial allotments, while 2012, 2016, and 2018 had full allotments. Although 2016 had above average precipitation and a full allotment, it was selected as a dry year due to its occurrence following four previous dry years and three subsequent years with a partial allotment; it was also noted as a dry year on the San Joaquin Valley Water Year Index. Each of the other dry years had below normal precipitation, with all dry years averaging approximately 10.4 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 allotment years.

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

Accounting Center	Flow-path Type	Flow Path	Source	Supporting Data	2010-2019 Average Value (af)	Estimated Uncertainty (%)
Distribution System	Inflows	System Inflows	Measurement	TriDam report, OID river pump flows	208,000	5%
		OID Groundwater Pumping	Measurement	OID deep well pump discharge measurements	6,600	5%
		OID Drainwater Reuse	Measurement	OID reclamation pump discharge measurements	5,600	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	2,000	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**	**175,000**	**8%**
		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)	3,100	25%
		Deliveries to Knights Ferry	Measurement	OID operational data	2,600	10%
		Transfers (VAMP Pulse Flows)	Measurement	OID operational data (The VAMP program ended in 2011, and the last flow was in 2008.)	0	0%
		Canal Riparian ET	Calculation	CIMIS reference ET, estimated crop coefficient based on SEBAL, estimated riparian area	1,400	20%
		Canal Seepage	Calculation	NRCS soils data, published seepage rates by soil type, estimated wetted area, estimated wetted duration	27,700	35%
		Operational Spillage	Calculation	OID operational spill measurements, estimated area represented by measurement sites (approx. 60% of District)	13,200	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	42,600	25%
		Private Drainwater Reuse	Calculation	OID list of properties irrigated via gravity with drainwater only, average ET_{aw} and CCUF	4,300	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	64,200	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	152,200	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 budget**	**25,100**	**94%**
		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	39,400	10%
		Deep Percolation of Precipitation	Calculation	IDC analysis, NRCS soils characteristics, CIMIS precipitation data	17,400	25%
		Runoff of Precipitation	Calculation	IDC analysis, CIMIS precipitation data, NRCS curve number method	4,700	30%
Drainage System	Inflows	**Tailwater to Drainage System**	**Closure (Drainage System)**	**Difference of total inflows and measured/estimated outflows for Drainage System accounting center**	**43,900**	**28%**
		Operational Spillage	See Above			
		Runoff of Precipitation	See Above			

Account-ing Center	Flow-path Type	Flow Path	Source	Supporting Data	2010-2019 Average Value (af)	Estimated Uncertainty (%)
		Precipitation	Calculation	Quality-controlled precipitation from Oakdale CIMIS station, estimated drain surface area	20	15%
	Outflows	Drainwater Outflow	Calculation	OID boundary outflow measurements, estimated area represented by measurement sites (approx. 60% of District)	45,100	25%
		Drain Seepage	Calculation	NRCS soils data, published seepage rates by soil type, estimated wetted area, estimated wetted duration	6,200	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	200	20%

Table 5-2. 2010 to 2019 OID Allotment, Water Year Precipitation, and Irrigation Season ET_o, and Hydrologic Year Type.

Year	Irrigation Start	Irrigation End	Number of Days	Surface Water Allotment	Precipitation, in	ET_o, in	Hydrologic Year Type
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
2015	18-Mar	10-Oct	207	Partial	11.3	44.3	Dry
2016	29-Mar	27-Oct	213	Full	15.9	46.7	Dry
2017	31-Mar	27-Oct	211	Full	21.9	46.1	Wet
2018	29-Mar	26-Oct	212	Full	9.8	46.2	Dry
2019	1-Apr	29-Oct	212	Full	15.1	43.2	Wet
Wet Year Average					17.2	43.1	
Dry Year Average					10.4	46.0	
Overall Average					13.1	44.9	

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[11]. 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.

5.5.1 Agricultural

Agricultural irrigation is by far the dominant water use in OID. Between 2010 and 2019, there were an average of approximately 58,500 acres of crop land, including an average of roughly 1,200 acres of fallow or idle lands. As shown in Table 5-3, the dominant crop in OID has transitioned from pasture (Figure 5-2) to almonds. Over this period, pasture averaged roughly 25,800 acres and double-cropped summer corn and winter grain (primarily oats) was grown on an average of 7,900 acres. Both

Figure 5-2. Pasture near Oakdale.

[11] 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.

of these crops are associated with the area's extensive livestock and dairy operations, and together accounted for an average of 58% of the District's total cropped area during this period. Permanent crops in OID, including almonds, fruit trees, grapes and walnuts accounted for an average of 21,800 acres or 37% of the total cropped area. Almond acreage increased nearly five-fold between 2010 and 2019, from 5,800 acres to 28,700 acres; in 2017, it surpassed pasture acreage to become the most common crop grown in OID. Rice was grown on an average of 1,900 acres or 3% of the cropped area, although the rice acreage has seen a dramatic reduction in recent years and there were less than 400 acres in 2018 and 2019. The District total cropped area significantly increased from 2013 to 2014 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 2019 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 public benefits of decreased groundwater use for irrigation and increased groundwater recharge from deep percolation of surface water used for irrigation. As of 2019, OID has annexed nearly 10,500 acres, surpassing WRP goals. The crop area associated with annexations is reflected in the OID crop acreages presented in Table 5-3 and Figure 5-3[12].

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[13]) 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. Additionally, recognizing the importance of quantifying ET_a, OID funded a study applying METRIC to develop spatially distributed estimates of ET_a for 2016. A total of five years of spatially distributed ET_a results were available with spatial cropping data, including 2008, 2009, 2010, 2013, and 2016. Total 2009 SEBAL irrigation season ET_a for the OID service area is shown in Figure 5-4.

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.

[12] 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.
[13] 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.

Table 5-3. OID Crop Acreages, 2010 to 2019.

Crop	Crop Acreage by Year										Average
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
Pasture	29,845	28,925	27,772	27,660	28,064	26,981	24,438	22,816	20,919	20,458	25,788
Oats and Corn	8,150	7,852	7,954	7,954	7,954	8,103	8,523	8,569	7,042	6,924	7,902
Almonds	5,825	7,614	9,320	9,388	16,080	17,503	22,774	24,348	27,647	28,658	16,916
Walnuts	2,508	2,936	3,240	3,287	3,310	3,427	4,636	4,895	4,918	5,134	3,829
Rice	3,364	2,666	2,571	2,567	2,556	2,556	1,313	723	350	350	1,902
Other	1,134	1,175	1,154	1,154	1,043	1,039	1,040	1,036	534	1,160	1,047
Idle	739	1,677	851	827	862	845	948	1,528	1,405	1,965	1,165
Total Cropped	50,827	51,168	52,011	52,011	59,008	59,610	62,724	62,386	61,410	62,683	57,384
Total w/Idle	51,565	52,845	52,861	52,837	59,870	60,455	63,672	63,915	62,814	64,648	58,548

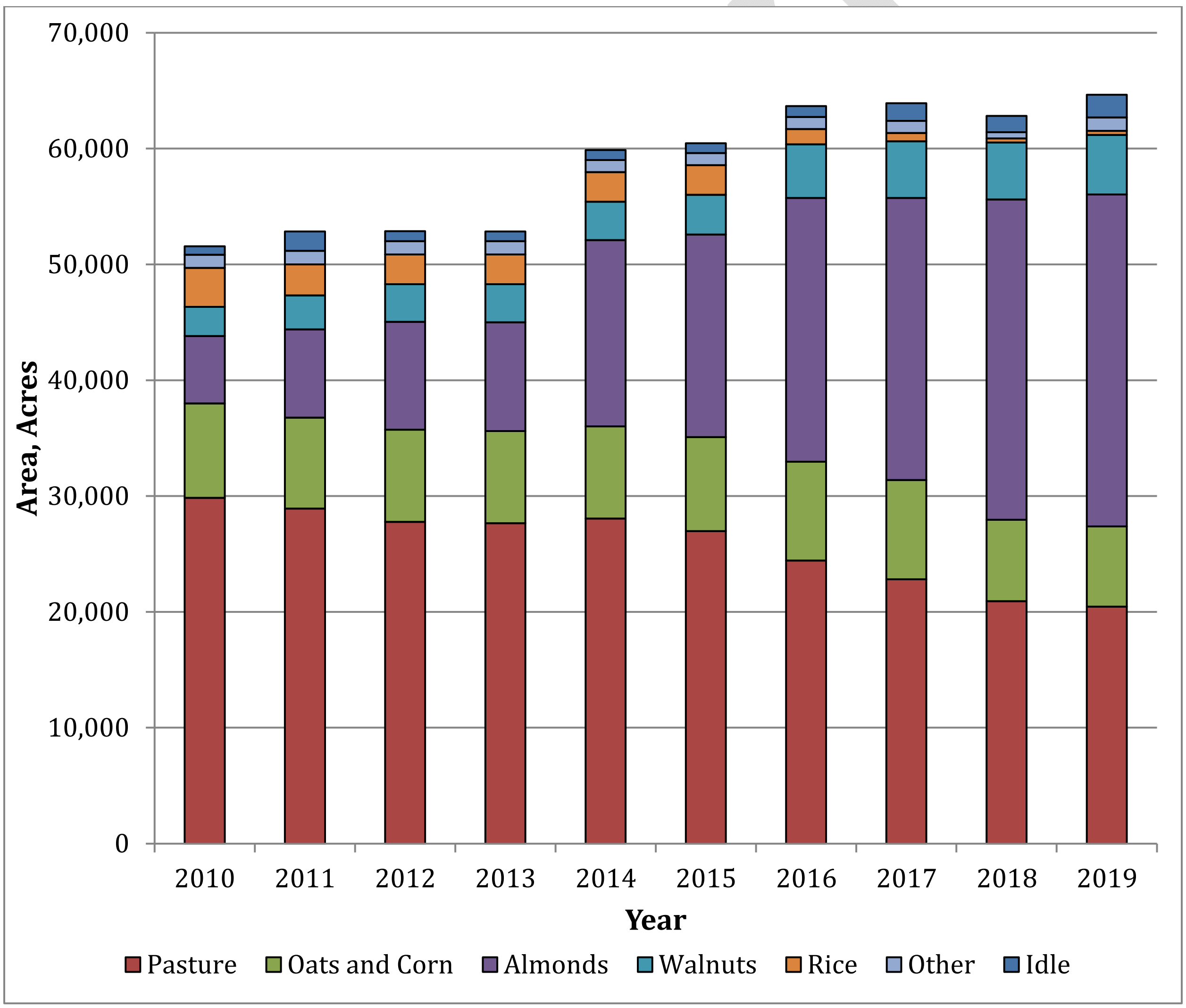


Figure 5-3. OID Cropping, 2010 to 2019.

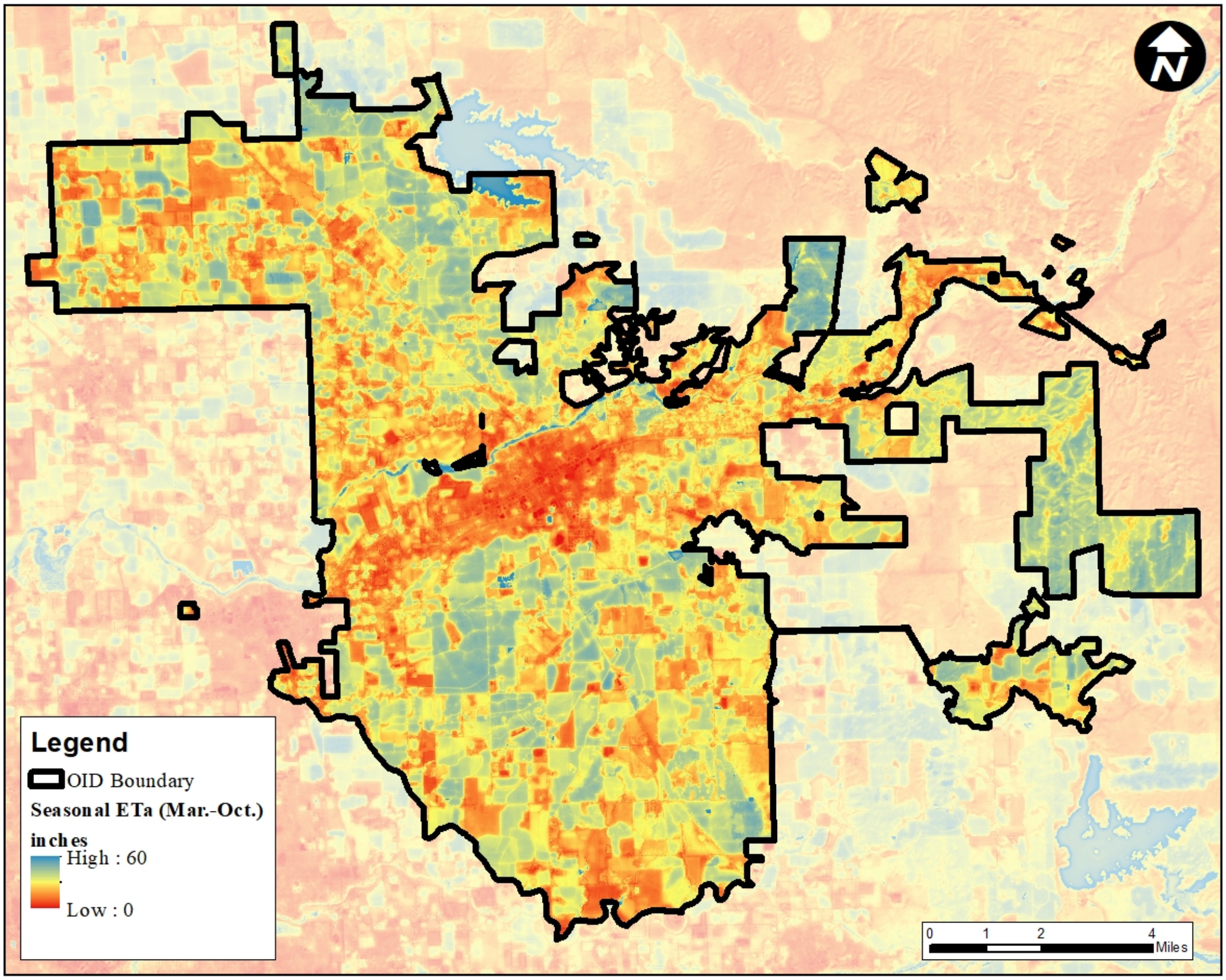


Figure 5-4. OID Spatially Distributed Seasonal Actual ET from METRIC, 2016 Irrigation Season.

The California Department of Water Resources Integrated Water Flow Model (IWFM) Demand Calculator (IDC), a daily root zone water budget 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 50.6 inches for rice (Table 5-4)[14]. ET_{aw} ranges from approximately 24.1 inches for other to 41.4 inches for rice. OID's two major crops

[14] 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.

are pasture and almonds. Average total crop ET for pasture is 40.5 inches with approximately 31.8 inches derived from applied irrigation water, and average total crop ET for almonds is 40.2 inches with approximately 31.6 inches derived from applied irrigation water. As an area-weighted average, total crop ET in OID is 39.6 inches, with approximately 31.1 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	25,788	40.5	31.8	8.7
Oats and Corn	7,902	36.6	29.3	7.3
Almonds	16,916	40.2	31.6	8.6
Walnuts	3,829	44.0	35.1	9.0
Rice	1,902	50.6	41.4	9.2
Other	1,047	31.3	24.1	7.2
Idle	1,165	7.2	0.0	7.2
Totals	58,548	39.6	31.1	8.5

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 2010 to 2019 period, wet year ET_c averaged approximately 34 inches while dry year ET_c averaged approximately 36 inches. Wet year ET_{aw} averaged approximately 25 inches while dry year ET_{aw} averaged approximately 29 inches.

Additional information describing crop ET over time is included in Section 5.7. Total irrigation season crop ET varied between approximately 141,000 af and 197,000 af during the 2010 to 2019 period, with an average annual volume of 166,000 af. Approximately 135,000 af were derived from applied irrigation water (81%) and 31,000 af were derived from precipitation (19%).

Other agronomic uses of applied water in OID include pre-irrigation of corn and oats and ensuring late season deep moisture and providing frost protection for orchards and vineyards. Due to the low salinity of OID irrigation water, the required leaching fraction is negligible for the crops grown in the District. Agronomic water use is estimated and described in greater detail in Section 5.10.

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 allotment years of 2007 and 2008.

Additionally, OID partnered with the USFWS starting in 2010 to complete the Honolulu Bar Floodplain Enhancement Project on the Stanislaus River. Since completion, the District has continued work with Fishbio and River Partners to ensure native habitat establishment and revegetation and is scheduled to do so through 2022. Also, 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 also constructed and managed wetlands as part of the Union Slough Water Quality Enhancement Project.

Table 5-5. Annual OID Supplemental Water and Additional Water released to USBR under VAMP, 2000 – 2010[15].

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[16]	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. As part of its Federal Energy Regulatory Commission relicensing of the Tri Dam Project (2006), Tulloch Lake was required to develop a Shoreline Management Plan and a Recreation Plan to, among other things, protect and enhance the scenic, environmental, and public recreational value of the reservoir.

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.

[15] 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.
[16] Based on technical reports, it is unclear whether the 26,000 ac-ft released to USBR in 2006 were released for environmental benefits.

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 five 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.

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 the groundwater pumps supplying water are metered. 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)
2010	482
2011	487
2012	533
2013	606
2014	535
2015	470
2016	458
2017	516
2018	540
2019	533
Average	516

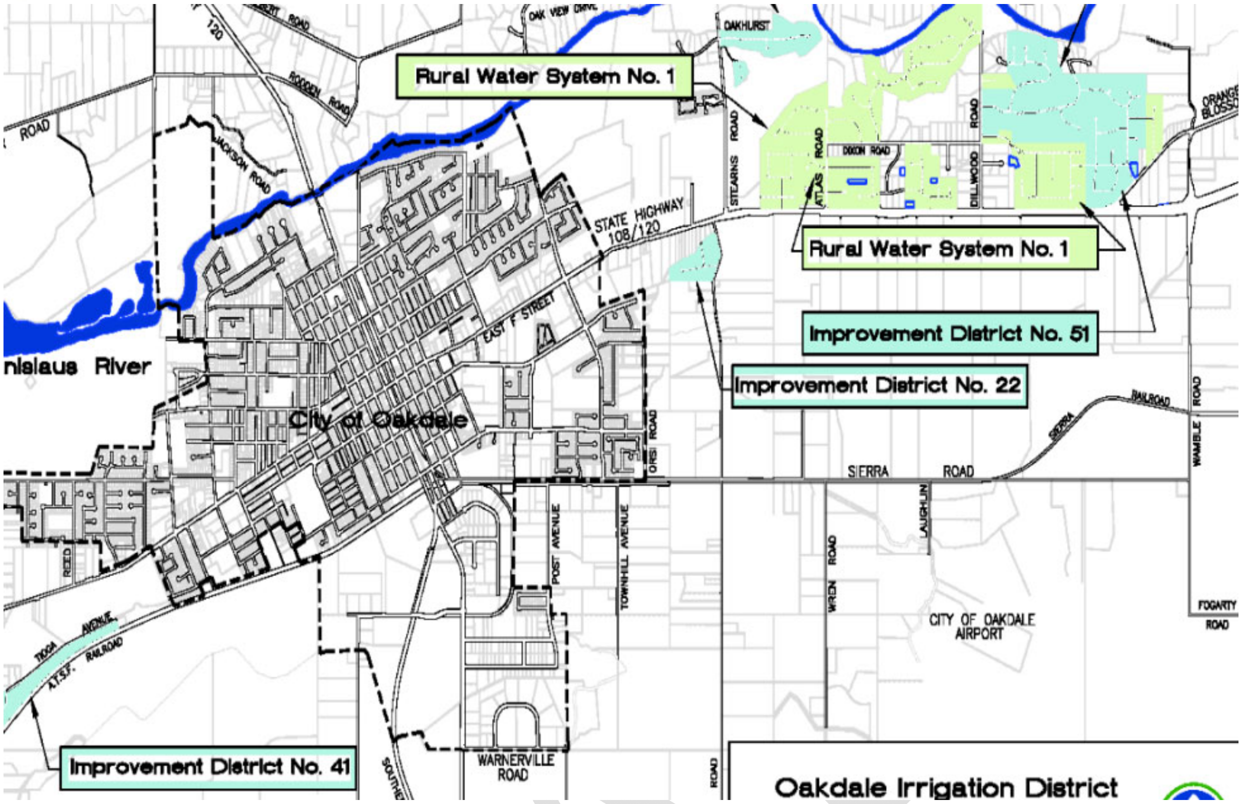


Figure 5-6. OID Improvement Districts and Rural Water Systems.

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 cost of compliance with California Government Code Title 17 were factors contributing to the discontinuation of service. However, OID is currently working with the city of Oakdale to evaluate opportunities to utilize surface water for irrigation of city parks.

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.

Irrigation water recharge estimates were derived from the water budget 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 budget. Seepage and deep percolation volumes for 2010 to 2019 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, 2010 to 2019.

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)	(af/ac)
2010	Full	Wet	27,181	6,076	36,908	20,517	90,682	1.8
2011	Full	Wet	25,458	5,691	31,578	17,623	80,349	1.6
2012	Full	Dry	28,905	6,461	22,196	11,372	68,934	1.3
2013	Partial	Dry	28,375	6,343	29,919	7,472	72,109	1.4
2014	Partial	Dry	27,579	6,165	22,431	12,027	68,202	1.2
2015	Partial	Dry	27,446	6,135	15,035	10,976	59,592	1.0
2016	Full	Dry	28,242	6,313	36,615	29,396	100,566	1.6
2017	Full	Wet	27,977	6,254	17,318	31,580	83,128	1.3
2018	Full	Dry	28,085	6,283	15,537	12,170	62,076	1.0
2019	Full	Wet	27,961	6,283	23,449	20,970	78,664	1.3
Wet Year Average			27,144	6,076	27,313	22,672	83,206	1.5
Dry Year Average			28,105	6,283	23,622	13,902	71,913	1.2
Overall Average			27,721	6,200	25,098	17,410	76,430	1.3

Total recharge between 2010 and 2019 ranged from approximately 60,000 af to 101,000 af per year, or from 1.0 af to 1.8 af per cropped acre per year. On average, total recharge was estimated to be approximately 76,000 ac-ft per year (1.3 af/ac-yr), with approximately 33% of recharge originating from deep percolation of applied water, 36% of recharge originating from canal seepage, 23% of recharge originating from deep percolation of precipitation and 8% of recharge originating as seepage from drains.

Groundwater recharge net of groundwater pumping[17] 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.

The only year with negative net recharge during this period was 2015, which was a historic year with the first ever allotment to OID farmed lands in OID history. 2015 was an extremely dry year, the third subsequent year with a partial allotment, and the fourth subsequent Dry year. Excluding 2015, net recharge varied from approximately 2,000 af to 65,000 af per year between 2010 and 2019, or less than 0.1 af to approximately 1.3 af per cropped acre per year. On average, net recharge was estimated to be approximately 25,000 af per year (0.5 af/ac-yr).

[17] 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.

Table 5-8. OID Net Groundwater Recharge, 2010 to 2019.

Year	Surface Water Allotment	Hydrologic Year Type	Total Recharge (af)	Groundwater Pumping (af)	Net Recharge (af)	Net Recharge (af/ac)
2010	Full	Wet	90,682	25,770	64,912	1.3
2011	Full	Wet	80,349	22,090	58,258	1.1
2012	Full	Dry	68,934	30,199	38,735	0.7
2013	Partial	Dry	72,109	36,880	35,228	0.7
2014	Partial	Dry	68,202	66,261	1,941	0.0
2015	Partial	Dry	59,592	90,516	-30,924	-0.5
2016	Full	Dry	100,566	60,419	40,147	0.6
2017	Full	Wet	83,128	65,613	17,516	0.3
2018	Full	Dry	62,076	60,307	1,769	0.0
2019	Full	Wet	78,664	55,243	23,421	0.4
Wet Year Average			83,206	42,179	41,027	0.8
Dry Year Average			71,913	57,430	14,483	0.3
Overall Average			76,430	51,330	25,100	0.4

Net groundwater recharge tends to be greater in wet, full allotment 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. The maximum total groundwater pumping within OID occurred in 2015, the third subsequent year with a partial allotment and the year with the lowest allotment in OID's history. Net wet year groundwater recharge averaged approximately 41,000 af between 2010 and 2019, while net dry year recharge averaged approximately 14,000 af.

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 of water 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 2010 to 2019, transfers included SEWD, USBR, San Luis & Delta-Mendota Water Authority, and DWR, as shown in Table 5-9. Over this period, the District has transferred approximately 200,000 af, or an average of 20,000 af per year.

Table 5-9. OID Water Transfers, 2010 to 2019.

Year	Annual Transfer Volume, acre-feet				
	SEWD	USBR	San Luis & Delta-Mendota Water Authority	DWR	Total
2010	15,000	26,000	0	0	41,000
2011	0	26,000	0	0	26,000
2012	0	0	0	0	0
2013	0	0	20,000	20,000	40,000
2014	0	0	0	0	0
2015	0	0	5,750	5,750	11,500
2016	0	0	25,250	25,250	50,500
2017	0	0	0	0	0
2018	0	0	15,655	15,655	31,310
2019	0	0	0	0	0
Totals	15,000	52,000	66,655	66,655	200,310

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 very small relative to other uses and, thus, not itemized, but is accounted for in the water budget as part of the volume of farm deliveries..

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 41 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 2010 and 2019 is summarized in Table 5-10.

Figure 5-8. Reclamation Pump.

Table 5-10. Reclamation Pumping within OID, 2010 to 2019.

Year	Surface Water Allotment	Hydrologic Year Type	Reclamation Pumping (ac-ft)		
			OID	Private	Total
2010	Full	Wet	7,729	3,676	11,405
2011	Full	Wet	7,430	3,894	11,325
2012	Full	Dry	8,219	4,480	12,699
2013	Partial	Dry	7,705	4,935	12,640
2014	Partial	Dry	6,518	4,625	11,143
2015	Partial	Dry	3,337	4,473	7,811
2016	Full	Dry	4,413	3,845	8,258
2017	Full	Wet	3,978	4,397	8,375
2018	Full	Dry	3,616	4,908	8,525
2019	Full	Wet	3,508	4,263	7,771
Wet Year Average			5,661	4,058	9,719
Dry Year Average			5,635	4,545	10,179
Overall Average			5,645	4,350	9,995

Between 2010 and 2019, OID reclamation pumping varied between approximately 3,300 af and 8,200 af per year with an average of 5,600 af per year and showing an overall decreasing trend over this period, and private reclamation pumping varied between 3,700 af and 4,900 af per year with an average of 4,400 af per year. Total reclamation pumping within OID varied from 7,800 af to 12,700 af per year with an average of 10,000 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 9,700 af between 2010 and 2019, while dry year reclamation averaged approximately 10,200 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 14 operational spillage sites and 15 drain outflow sites. The drain outflow sites represent more than 60% of the total boundary outflows from OID. Similarly, it is estimated that the operational spillage sites represent more than 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 2010 to 2019 are summarized in Table 5-11. Irrigation season boundary outflows ranged from approximately 34,000 af to 57,000 af, with an average of 45,000 af.

Based on the period from 2010 to 2019, irrigation season 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. However, boundary outflows do appear to show a decreasing trend over time. This decreasing trend is influenced by a variety of factors, but provides evidence that OID’s efforts to reduce or recover boundary outflows for use within OID are progressing.

Table 5-11. OID Irrigation Season (March to October) Boundary Outflows, 2010 to 2019.

Year	Surface Water Allotment	Hydrologic Year Type	Seasonal Drainwater Outflow (af)
2010	Full	Wet	48,705
2011	Full	Wet	52,153
2012	Full	Dry	57,277
2013	Partial	Dry	52,291
2014	Partial	Dry	41,173
2015	Partial	Dry	40,359
2016	Full	Dry	39,831
2017	Full	Wet	41,789
2018	Full	Dry	43,566
2019	Full	Wet	33,899
		Wet Year Average	44,136
		Dry Year Average	45,750
		Overall Average	45,104

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

Drainage System Flow Path	Wet Year Change	Dry Year Change	Notes
Operational Spillage (Inflow)	Little or No Change	Little or No Change	Operational spillage fluctuates from year to year but 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.

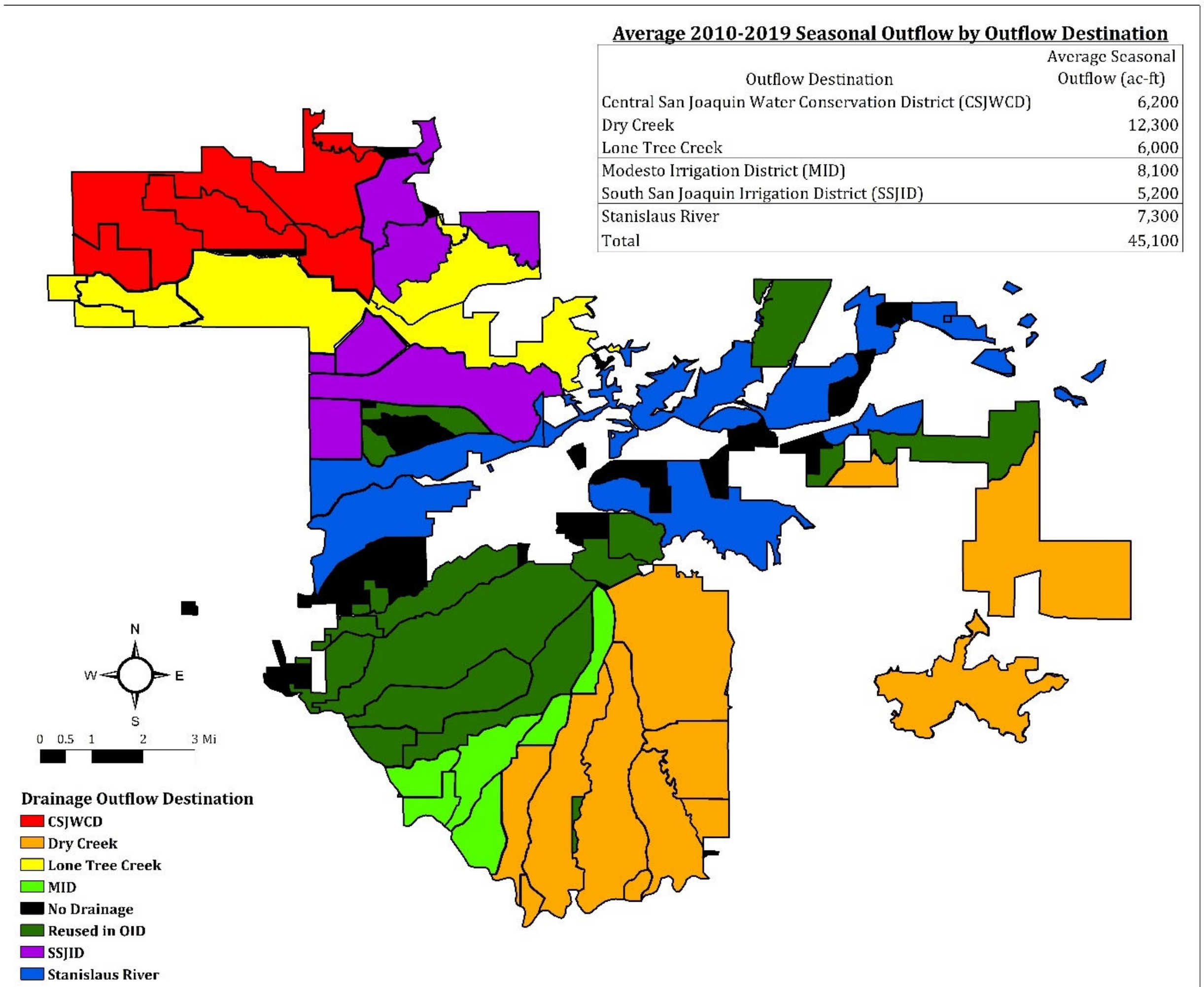


Figure 5-9. OID Drainage Watersheds, Outflow Destinations, and Average Seasonal Boundary Outflow Volume[18].

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. In recent years, OID has coordinated and cooperated with SSJID and MID to share boundary flow estimates from OID that serve as inflows to the other districts to aid them in their water budgets and water management and ensure consistent water accounting and that the best available information is used.

[18] Figure 5-9 does not incorporate changes in OID's service area resulting from recent annexations. Areas annexed in 2014 and 2016 are not believed to produce significant drainage.

5.7 Water Accounting (Summary of Water Budget Results)

The OID water budget structure was shown previously in Figure 5-1. The water budget was prepared for three accounting centers: (1) the OID distribution system, (2) farmed lands within OID, and (3) the OID drainage system. Additionally, the water budget can be summarized for the OID service area as a whole ("District Water Budget 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 budget for the underlying aquifer is not calculated because not all subsurface inflows and outflows have been estimated. Tabulated water budget results for each accounting center are provided in Tables 5-13, 5-14, and 5-15, followed by the water budget 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 budget is presented on an annual calendar year time step (January through December)[19]. Underlying the annual time step is a more detailed water budget 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 budget, as winter storm flows do not directly pertain to OID's water management activities.

5.7.1 Distribution System Water Budget

Over the 2010 to 2019 period, the District's distribution system total inflows from Goodwin Dam[20] ranged from 165,000 af to 246,000 af with an overall average for the ten year period of 208,000 af. These surface water inflows from the Stanislaus River are net of external transfers to SEWD or USBR. The wet and dry year average for this period was roughly 208,000 af. Although they are roughly equivalent here, in some instances system inflows will be 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. However, this can be counteracted by a partial allotment, which will result in reduced system inflows during certain dry years.

---

[19] Water budget results on a water year basis (October through September) are also available in Attachment J.
[20] This system inflow total includes up to 2,260 af diverted from the Stanislaus River downstream of Goodwin Dam through three pumps. This is described in more detail in Section 4.2.1.

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 1,700 af to 18,300 af between 2010 and 2019 with a wet year average of 3,000 af and a dry year average of 9,000 af. The overall average for the ten year period was 6,600 af. However, over the past four years District groundwater pumping on average has drastically decreased to 2,700 af. This decrease in pumping can be attributed to distribution system improvements including but not limited to canal automation. 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 in times of significant water shortages.

Table 5-13. OID Distribution System Annual Calendar Year (January to December) Water Budget Results, 2010 to 2019.

Year	Irrigation Season Number of Days	USBR Allotment	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)**
2010	205	Full	Wet	216,957	5,683	7,729	148	1,887	2,097	0	2,390	4,573	1,479	1,718	14,958	27,181	**182,200**
2011	192	Full	Wet	219,154	2,311	7,430	114	2,012	2,097	0	2,324	6,340	1,401	1,628	15,677	25,458	**180,289**
2012	218	Full	Dry	232,934	6,634	8,219	168	2,098	2,097	0	2,383	3,666	1,608	1,868	15,908	28,905	**197,814**
2013	214	Partial	Dry	245,621	10,112	7,705	55	1,915	2,097	0	2,550	234	1,660	1,929	16,579	28,375	**216,178**
2014	208	Partial	Dry	200,232	18,298	6,518	76	1,641	2,097	0	1,988	217	1,607	1,867	14,291	27,579	**181,313**
2015	207	Partial	Dry	164,988	12,590	3,337	75	2,189	2,097	0	2,430	1,908	1,499	1,742	7,665	27,446	**142,588**
2016	213	Full	Dry	193,139	3,577	4,413	100	1,478	2,097	0	2,430	2,577	1,404	1,631	9,138	28,242	**159,382**
2017	211	Full	Wet	195,975	2,451	3,978	77	2,080	2,097	0	1,775	2,512	1,217	1,886	10,306	27,977	**160,987**
2018	212	Full	Dry	209,347	2,874	3,616	106	2,296	2,097	0	1,771	3,860	1,225	1,897	13,510	28,085	**169,988**
2019	212	Full	Wet	201,210	1,686	3,508	99	1,947	2,097	0	1,862	4,768	1,132	1,754	13,902	27,961	**159,168**
Minimum				164,988	1,686	3,337	55	1,478	2,097	0	1,771	217	1,132	1,628	7,665	25,458	**142,588**
Maximum				245,621	18,298	8,219	168	2,296	2,097	0	2,550	6,340	1,660	1,929	16,579	28,905	**216,178**
Wet Year Average				208,324	3,033	5,661	110	1,981	2,097	0	2,087	4,548	1,307	1,747	13,711	27,144	**170,661**
Dry Year Average				207,710	9,014	5,635	97	1,936	2,097	0	2,259	2,077	1,500	1,822	12,848	28,105	**177,877**
Overall Average				207,956	6,622	6,479	102	1,954	2,097	0	2,190	3,065	1,423	1,792	13,193	27,721	**174,991**

Table 5-14. OID Farmed Lands Annual Calendar Year (January to December) Water Budget Results, 2010 to 2019.

Year	Irriga-tion Season Num-ber of Days	USBR Allotment	Hydro-logic Year Type	Applied Water Budget										Precipitation Budget				
				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 Percolati on of Precipi-tation	**Change in Storage (Closure, af)**
2010	205	Full	Wet	182,200	3,676	17,990	1,168	118,682	47,558	1,887	**36,908**	0	0.58	82,032	42,331	4,114	20,517	**15,069**
2011	192	Full	Wet	180,289	3,894	17,683	1,168	118,334	51,110	2,012	**31,578**	0	0.58	49,674	45,117	2,806	17,623	**-15,872**
2012	218	Full	Dry	197,814	4,480	21,467	1,168	142,783	57,852	2,098	**22,196**	0	0.63	58,720	27,410	3,160	11,372	**16,778**
2013	214	Partial	Dry	216,178	4,935	24,671	1,168	160,857	54,260	1,915	**29,919**	0	0.65	18,537	24,373	952	7,472	**-14,260**
2014	208	Partial	Dry	181,313	4,625	45,866	1,168	170,483	38,416	1,641	**22,431**	0	0.73	65,408	27,424	6,272	12,027	**19,685**
2015	207	Partial	Dry	142,588	4,473	75,830	1,168	162,730	44,105	2,189	**15,035**	0	0.73	45,694	33,580	2,999	10,976	**-1,861**
2016	213	Full	Dry	159,382	3,845	54,744	1,168	144,666	36,380	1,478	**36,615**	0	0.66	89,565	47,605	9,313	29,396	**3,251**
2017	211	Full	Wet	160,987	4,397	61,065	1,168	169,163	39,055	2,080	**17,318**	0	0.74	80,053	56,136	7,559	31,580	**-15,222**
2018	212	Full	Dry	169,988	4,908	55,336	1,168	173,549	40,016	2,296	**15,537**	0	0.75	68,782	36,954	5,350	12,170	**14,309**
2019	212	Full	Wet	159,168	4,263	51,459	1,168	160,594	30,068	1,947	**23,449**	0	0.74	83,989	53,345	4,449	20,970	**5,225**
Minimum				142,588	3,676	17,683	1,168	118,334	30,068	1,478	**15,035**	0	0.58	18,537	24,373	952	7,472	**-15,872**
Maximum				216,178	4,935	75,830	1,168	173,549	57,852	2,296	**36,908**	0	0.75	89,565	56,136	9,313	31,580	**19,685**
Wet Year Average				170,661	4,058	37,049	1,168	141,693	41,948	1,981	**27,313**	0	0.66	73,937	49,232	4,732	22,672	**-2,700**
Dry Year Average				177,877	4,545	46,319	1,168	159,178	45,171	1,936	**23,622**	0	0.69	57,784	32,891	4,674	13,902	**6,317**
Overall Average				174,991	4,350	42,611	1,168	152,184	43,882	1,954	**25,098**	0	0.68	64,245	39,428	4,697	17,410	**2,710**

Table 5-15. OID Drainage System Annual Calendar Year (January to December) Water Budget Results, 2010 to 2019.

				Inflows (af)				Outflows (af)					
Year	Number of Days	USBR Allotment	Hydrologic Year Type	Operational Spillage	**Tailwater to Drainage System (Closure)**	Runoff of Precipitation	Precipitation	Drainwater Outflow	District Drainwater Reuse	Seepage	Private Drainwater Reuse	Evaporation	Riparian ET
2010	205	Full	Wet	14,958	**47,558**	4,114	25	48,705	7,729	6,076	3,676	285	184
2011	192	Full	Wet	15,677	**51,110**	2,806	19	52,153	7,430	5,691	3,894	270	174
2012	218	Full	Dry	15,908	**57,852**	3,160	28	57,277	8,219	6,461	4,480	310	200
2013	214	Partial	Dry	16,579	**54,260**	952	9	52,291	7,705	6,343	4,935	320	207
2014	208	Partial	Dry	14,291	**38,416**	6,272	13	41,173	6,518	6,165	4,625	310	200
2015	207	Partial	Dry	7,665	**44,105**	2,999	13	40,359	3,337	6,135	4,473	289	187
2016	213	Full	Dry	9,138	**36,380**	9,313	17	39,831	4,413	6,313	3,845	271	175
2017	211	Full	Wet	10,306	**39,055**	7,559	13	41,789	3,978	6,254	4,397	313	202
2018	212	Full	Dry	13,510	**40,016**	5,350	18	43,566	3,616	6,283	4,908	315	204
2019	212	Full	Wet	13,902	**30,068**	4,449	17	33,899	3,508	6,283	4,263	293	189
Minimum				7,665	**30,068**	952	9	33,899	3,337	5,691	3,676	270	174
Maximum				16,579	**57,852**	9,313	28	57,277	8,219	6,461	4,935	320	207
Wet Year Average				13,711	**41,948**	4,732	18	44,136	5,661	6,076	4,058	290	187
Dry Year Average				12,848	**45,171**	4,674	16	45,750	5,635	6,283	4,545	303	195
Overall Average				13,193	**43,882**	4,697	17	45,104	5,645	6,200	4,350	298	192

Table 5-16. OID Overall Water District Annual Calendar Year (January to December) Water Budget Results, 2010 to 2019.

				Inflows (af)					Outflows (af)										
Year	Number of Days	USBR Allotment	Hydrologic Year Type	System Inflows	District Groundwater Pumping	Precipitation	Private Groundwater Pumping	OID and Private Recycled	Transfers (VAMP Pulse Flows)	Deliveries to Knights Ferry	Deliveries to Annual Contracts	Drainwater 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	Change in Storage (af)
2010	205	Full	Wet	216,957	5,683	82,205	17,990	3,265	0	2,390	4,573	48,705	33,257	36,908	20,517	3,667	118,682	42,331	15,069
2011	192	Full	Wet	219,154	2,311	49,808	17,683	3,265	0	2,324	6,340	52,153	31,148	31,578	17,623	3,475	118,334	45,117	-15,872
2012	218	Full	Dry	232,934	6,634	58,916	21,467	3,265	0	2,383	3,666	57,277	35,366	22,196	11,372	3,986	142,783	27,410	16,778
2013	214	Partial	Dry	245,621	10,112	18,601	24,671	3,265	0	2,550	234	52,291	34,717	29,919	7,472	4,116	160,857	24,373	-14,260
2014	208	Partial	Dry	200,232	18,298	65,497	45,866	3,265	0	1,988	217	41,173	33,744	22,431	12,027	3,984	170,483	27,424	19,685
2015	207	Partial	Dry	164,988	12,590	45,782	75,830	3,265	0	2,430	1,908	40,359	33,582	15,035	10,976	3,717	162,730	33,580	-1,861
2016	213	Full	Dry	193,139	3,577	89,681	54,744	3,265	0	2,430	2,577	39,831	34,555	36,615	29,396	3,481	144,666	47,605	3,251
2017	211	Full	Wet	195,975	2,451	80,143	61,065	3,265	0	1,775	2,512	41,789	34,231	17,318	31,580	3,618	169,163	56,136	-15,222
2018	212	Full	Dry	209,347	2,874	68,905	55,336	3,265	0	1,771	3,860	43,566	34,369	15,537	12,170	3,641	173,549	36,954	14,309
2019	212	Full	Wet	201,210	1,686	84,104	51,459	3,265	0	1,862	4,768	33,899	34,245	23,449	20,970	3,368	160,594	53,345	5,225
Minimum				164,988	1,686	18,601	17,683	3,265	0	1,771	217	33,899	31,148	15,035	7,472	3,368	118,334	24,373	-15,872
Maximum				245,621	18,298	89,681	75,830	3,265	0	2,550	6,340	57,277	35,366	36,908	31,580	4,116	173,549	56,136	19,685
Wet Year Average				208,324	3,033	74,065	37,049	3,265	0	2,087	4,548	44,136	33,220	27,313	22,672	3,532	141,693	49,232	-2,700
Dry Year Average				207,710	9,014	57,897	46,319	3,265	0	2,259	2,077	45,750	34,389	23,622	13,902	3,821	159,178	32,891	6,317
Overall Average				207,956	6,622	64,364	42,611	3,265	0	2,190	3,065	45,104	33,921	25,098	17,410	3,705	152,184	39,428	2,710

OID drainwater reuse ranged from 3,300 af to 8,200 af between 2010 and 2019 with a wet year average of 5,700 af and a dry year average of 5,600 af. The overall average for the ten year period of the water budget was 6,500 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 distribution 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 can tend to be greater during some dry years, primarily due to increased irrigation demand.

OID tailwater reuse is a minor flow path that has been quite steady over time, varying between 1,500 af and 2,300 af between 2010 and 2019 with an average of approximately 2,000 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 2010 and 2019. The estimated contribution of direct precipitation to the OID water supply is very small, ranging from about 50 af to 200 af between 2010 and 2019, with an average of 100 af.

Overall, OID groundwater pumping, drainwater reuse, tailwater reuse, and recycled water reuse represent a total supply of approximately 17,000 af in dry years (8% of average dry year supply) and 13,000 af in wet years (6% 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 0.79 to 0.82 between 2010 and 2019 with an average of 0.81. 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. 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 downgradient water users. Between 2010 and 2019, seepage ranged between 25,500 and 28,900 af with an average of 27,700 af for the irrigation season. The primary driver of seepage is the irrigation season length, though seepage losses have additionally been reduced through recent projects to rehabilitate and reline portions of the OID distribution system.

OID drainwater reuse ranged from 3,300 af to 8,200 af between 2010 and 2019 with a wet year average of 5,700 af and a dry year average of 5,600 af. The overall average for the ten year period of the water budget was 5,600 af.

Losses from operational spill ranged from 7,700 af to 16,600 af between 2010 and 2019 with a wet year average of 13,700 af and a dry year average of 12,800 af. The overall average for the ten year period of the water budget was 13,200 af per year. Spillage losses fluctuate from year to year; they may be slightly lower during dry years due to efforts to drastically reduce spillage and conserve water during times of reduced availability. 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 2010 and 2019, evaporation losses varied from 1,600 af to 1,900 af, with an average of 1,800 af in losses per year. Riparian ET losses are similar; between 2010 and 2019, riparian ET losses varied from 1,100 af to 1,700 af, with an average of 1,400 af per year.

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 for the distribution system. This fraction is calculated as the ratio of farm deliveries and other recoverable flows (operational spillage and seepage) to total irrigation supply. Over the period from 2010 to 2019, the WMF was consistently greater than 0.98, indicating that essentially all of OID's water supply is used to meet demands or is recoverable for beneficial use by downgradient water users. The WMF is described in greater detail in Section 5.10 and calculated at the water supplier scale.

5.7.2 Farmed Lands Water Budget

Over the 2010 to 2019 period, OID farm deliveries ranged from 143,000 af to 216,000 af for the irrigation season with a wet year average of 171,000 af and a dry year average of 178,000 af. The overall average for the ten year period was 175,000 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 18,000 af to 76,000 af between 2010 and 2019 with a wet year average of 37,000 af and a dry year average of 46,000 af. The overall average for the ten year period was 43,000 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. This period, dominated by a deep drought, also shows a trend of increasing private groundwater pumping within OID.

Private drainwater reuse ranged from 3,700 af to 4,900 af between 2010 and 2019 with a wet year average of 4,100 af and a dry year average of 4,500 af. The overall average for the ten year period of the water budget was 4,400 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 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 52,000 af in dry years (23% of total applied water supply) and 43,000 af in wet years (20% of total applied water 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 0.58 to 0.75 between 2010 and 2019 with an average of 0.68. The CCUF has been greater in dry years than wet years, averaging 0.69 and 0.66; 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 2010 and 2019, tailwater to the drainage system ranged between 30,000 and 58,000 af with an average of 44,000 af. Tailwater to the distribution system ranged from 1,500 af to 2,300 af with an average of 2,000 af.

Deep percolation of applied water varied from 15,000 af to 37,000 af between 2010 and 2019 with an average of 25,000 af per year. Deep percolation losses are greater in wet years than dry years, averaging 27,000 af and 24,000 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 continues to improve.

5.8 Water Supply Reliability

OID requires a reliable water supply to meet crop irrigation demand. The major crops grown in OID are pasture (and other forage crops) and orchards (primarily almonds). The pasture and forage crops are needed as a food supply to sustain beef cattle and dairy herds in the District, and the remaining orchard crops, as well as vineyards, also require a steady water supply. The reliability of OID's water supplies is discussed in detail in Section 4.

The Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary and SGMA and GSPs have the potential to substantially affect OID's water supply reliability; these are discussed in greater detail below.

5.8.1 Bay-Delta Plan

The State Water Board is responsible for adopting and updating the Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary (Bay-Delta Plan), which establishes water quality control measures and flow requirements needed to provide reasonable protection of beneficial uses in the watershed.

On December 12, 2018, the State Water Board adopted an update to the Bay-Delta Plan which established Lower San Joaquin River flow objectives and revised southern Delta salinity objectives. These initial amendments to the Plan ("Phase 1") apply to three tributaries to the San Joaquin River: the Merced, Tuolumne, and Stanislaus Rivers.

The new flow objectives for the three tributary rivers would require the release of 40 percent of the unimpaired flows from February 1 through June 30 for anadromous fish and salinity control in the Delta.

Currently, the river is operated by USBR per the requirements of the 2019 Biological Opinion, developed in consultation with US Fish and Wildlife Service. The Districts that divert and use water from these rivers and USBR will need to meet and determine whose water and in what proportions need to be released when flows from the 2019 Biological Opinion do not align with the flow requirements under Phase I and vice versa.

The impacts of Phase 1 of the Bay-Delta Plan on OID and its growers could be significant in some years. Water available for diversion for farmland irrigation may see impacts in dry and critically dry years, with little to no impacts in wetter years.
In adopting the amendments to the Bay-Delta Plan, the State Water Board agreed to support efforts by the California Natural Resources Agency to negotiate a Delta watershed-wide settlement agreement. On the Stanislaus River, the Voluntary Settlement Agreement (VA) process would hopefully grant some relief from the unimpaired flow requirements of the Bay-Delta Plan by offsetting that flow requirement through implementation of non-flow measures by the District. Throughout 2019 and 2020, OID staff were in discussions with various State agencies regarding alternative measures that could be incorporated into a VA. To date, no resolution has been reached.

The new flow objectives under the Bay-Delta Plan will affect the future reliability of water supplies, significantly reducing the volume of water available for diversion by OID in dry and critically dry years and reducing the water supply available to growers. While a VA would require the District to release water to the Stanislaus River for ecosystem benefits, a VA offers the District the best opportunity to mitigate the impacts of the Bay-Delta Plan on its growers.

5.8.2 Sustainable Groundwater Management Act and Groundwater Sustainability Plan

The Sustainable Groundwater Management Act of 2014 (SGMA) provides for local control of groundwater resources while requiring sustainable management of these resources. Specifically, SGMA requires groundwater subbasins to establish governance by forming local Groundwater Sustainability Agencies (GSAs) with the authority to develop, adopt, and implement a Groundwater Sustainability Plan (GSP). Under the GSP, GSAs must adequately define and monitor groundwater conditions in the subbasin and establish criteria to maintain or achieve sustainable groundwater management within 20 years of GSP adoption. The OID service area lies within two groundwater subbasins: The Eastern San Joaquin Subbasin and the Modesto Subbasin.

Agencies within the Eastern San Joaquin Subbasin have formed 17 GSAs to comply with SGMA. The Oakdale Irrigation District GSA includes the area within the OID's irrigation boundaries north of the Stanislaus River. The District is an active member of the OID GSA, with staff helping to facilitate GSA activities. In 2017, the GSAs signed a Joint Powers Agreement that resulted in the formation of the Eastern San Joaquin Groundwater Authority (ESJGWA). Through the ESJGWA, the OID GSA actively contributed to the development of the Eastern San Joaquin GSP. The OID GSA adopted the GSP prior to its January 2020 submittal, and is now actively engaged in GSP implementation, monitoring, and reporting efforts.

A total of 7 agencies, including OID, in the Modesto Subbasin have coordinated to form the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA) GSA, which includes the area within the OID's irrigation boundaries south of the Stanislaus River. The District is an active member of the STRGBA GSA which is currently developing a single GSP for the Modesto Subbasin. It is anticipated that the GSP will be adopted and submitted prior to the January 2022 deadline and, following adoption and submission, the GSP will be implemented.

In accordance with SGMA, the Eastern San Joaquin Subbasin GSAs must work together to achieve sustainable groundwater management in the Eastern San Joaquin Subbasin by 2040. Correspondingly, the STRGBA GSA (including OID) must work to achieve sustainable groundwater management in the Modesto Subbasin by 2042. Although OID has effectively implemented conjunctive management of groundwater and surface water supplies, groundwater is not an unlimited supply. Achievement of groundwater sustainability in the Eastern San Joaquin and Modesto Subbasins may require changes in the way that OID has historically conjunctively managed surface water with groundwater to serve its customers. Projects and management actions were developed for the Eastern San Joaquin Subbasin GSP and will be developed for the Modesto Subbasin GSP with the goal of achieving long-term groundwater sustainability. These actions may impact the future availability and reliability of OID water supplies.

5.9 Water Management Objectives

Since its formation in 1909, OID has sought to fulfill its mission 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, while serving as a good steward of local water resources and providing high levels of customer satisfaction.

To achieve this mission today and in the future, the District completed the OID Water Resources Plan (WRP) in 2007, which had the overall objective of identifying 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 its stakeholders and serve the region. The WRP is described further in Section 1.3.1 and an update on WRP implementation is provided in Section 8. The implementation of the WRP includes the following goals, or objectives:

- Provide long-term protection for OID's water rights and supply
- Address federal, state, and local challenges in water management
- Develop affordable ways to finance District improvements
- Modernize OID infrastructure and operations to improve system operations and meet changing customer demands

To implement the WRP and achieve these objectives, OID has completed water planning efforts and implemented a variety of water management strategies, including the following:

- **Conjunctive Management.** As described throughout the AWMP, OID practices conjunctive management of surface water and groundwater to provide reliable water supplies to its customers both now and into the future. Examples of conjunctive management are described in Section 7.4.8 and include annexing lands into the District that were previously dependent solely on groundwater for irrigation, encouraging use of surface water supplies, and investing in groundwater production capability. Water budget results showed greater volumes of deep percolation of applied water and lesser volumes of groundwater pumping in wet years demonstrating conjunctive management.
- **Affordable, Tiered Rate Structure.** As described in Section 3.8, OID adopted a new rate structure comprised of a fixed rate component and a volumetric component based on actual water usage. The volumetric rate includes five tiers, with increased costs for increased water use, which encourages the on-farm conservation of water supplies. The rate is also designed to be affordable to encourage growers to utilize OID surface water instead of groundwater. During years with "surplus" surface water, the District can utilize surface supplies and generate additional revenue through Out-of-District Surface Water Agreements. When possible, OID provides this out-of-district water at a premium rate, measures deliveries and bills volumetrically, and ensures that no tailwater will leave property to which water is delivered.
- **Annexation of Adjacent Lands and Participation in Voluntary Water Transfers.** As described in Section 5.5.1, OID has annexed over 10,000 acres as part of WRP implementation. Annexation of adjacent lands provides increased revenue to the District to fund WRP implementation and modernization of OID infrastructure and operations, and it encourages increased surface water use and decreases reliance on groundwater in the areas in and around the District. As described in Section 5.5.6, OID also participates in voluntary transfers of water. This provides additional funding and minimizes increasing water rates to customers for distribution system improvements and repair; it also provides water to address water management challenges faced by others locally or in other parts of California.
- **Improve Operational System Flexibility and Efficiency.** As described in Section 8.3, OID has invested over $94 million and enacted substantial measures to improve its distribution system's operations and flexibility to better serve customers as part of WRP

implementation since 2006. These improvements include construction of two regulating reservoirs, implementation of TCC (i.e., canal automation) on over 34 miles of laterals, implementation of a turnout measurement plan (including implementation of STORM water ordering and delivery management software), expansion of the SCADA system, and transitioning from rotational deliveries to arranged demand deliveries for customers who require a increased delivery flexibility to meet their irrigation requirements.

Additionally, Section 1.3.2 describes various other water management activities that OID has and is engaged in to help them meet their water management objectives.

5.10 Water Use Efficiency

Water use efficiency is a critical in OID's operations. Efficient water use at all levels within OID helps the District achieve its mission to protect and develop OID water resources for the maximum benefit of the OID community by providing excellent irrigation and domestic water service, while serving as a good steward of local water resources and providing high levels of customer satisfaction.

Key water use components and water use efficiency in OID are quantified in the sections below.

5.10.1 Water Use Efficiency Components

Four types of water use serve as the basis for water use efficiency calculations: crop water use, agronomic water use, environmental water use, and recoverable flows. These water use efficiency components are quantified in Table 5-17 and are described in the sections below.

5.10.1.1 Crop Water Use

Crop water use, or crop consumptive use, in OID represents the portion of total applied water withdrawn by crops that is evaporated, transpired, incorporated into products or crops, or otherwise utilized by the crop for consumptive use.

In the water budget presented in this AWMP, crop water use of applied water is referred to as evapotranspiration of applied water (ET_{aw}). ET_{aw} is quantified as an outflow of the Farmed Lands water budget described in Section 5.7.2. Table 5-17 summarizes the ET_{aw} in OID in 2010 through 2019.

5.10.1.2 Agronomic Water Use

Agronomic water use in OID represents the portion of total applied water that is directly used for crop cultivation practices, but that is not consumed by crops (i.e., excluding ET_{aw}). Sample agronomic water uses include soil leaching, seedbed preparation, chemigation, and climate control. In OID, agronomic water uses mainly include pre-irrigation of corn and oats for germination, and additional small water volumes used for frost protection.

Agronomic water use for pre-irrigation of corn and oats was estimated based primarily on data used in the water budget and the assumptions documented below. The volume of water used for pre-irrigation is included in the total Farm Deliveries calculated in the water budget, but needs to be estimated as a fraction of farm deliveries. The following assumptions were used to estimate the agronomic water use for pre-irrigation:

- The first and last irrigation event of each season was pre-irrigation for corn and oats, respectively
- A total depth of 8 inches per acre was used for pre-irrigation on each field for each crop (UCCE, 2015)
- 50% of the pre-irrigation volume is used consumptively as ET_{aw}, resulting in 4 inches per acre of agronomic water use per crop for pre-irrigation

By combining these assumptions with the cropped acreage of corn and oats, the volume of agronomic water use in pre-irrigation for corn and oats can be estimated. The pre-irrigation volumes for corn were combined with the frost protection volumes described below and are reported in aggregate as Agronomic Water Use in Table 5-17.

Agronomic water use for frost protection was estimated assuming a typical, average required frost protection application rate of 0.15 inches per hour for cold-sensitive crops on days when the minimum, average, or maximum temperature was below 32°F (assuming 12, 18, or 24 hours of potential frost protection is needed, based on which temperature, respectively, was below 32°F). The crops in OID assumed to require frost protection were almonds, walnuts, and other crops (primarily vineyards and fruit trees) and the period for frost protection was assumed to be January through March. The total estimated volume of frost protection was then adjusted to not exceed private and District groundwater pumping estimates. Estimates of frost protection are combined with the pre-irrigation volumes and reported in aggregate as Agronomic Water Use in Table 5-17.

Water used within OID typically has very high quality, with low salinity and TDS, and leaching is not normally required.

5.10.1.3 Environmental Water Use

Although there are some ponded areas within the OID distribution and drainage system (i.e. Rodden Lake, Union Slough Reclamation Pond, private recreational and aesthetic ponds, incidental riparian areas, etc.) that may have the potential to provide some environmental benefit, there are no documented environmental water uses within the District.

5.10.1.4 Recoverable Flows

Recoverable flows in OID are comprised of the portion of total applied water, or total water supply, neither consumed by crops nor evaporated from the distribution system, but that are recoverable for other beneficial uses within OID or by others downgradient or downstream of the District. Recoverable flows of applied water are represented in the water budget through deep percolation of applied water (DP_{aw}), seepage, and drainwater outflows. These flow paths are described in greater detail in Section 5. Total recoverable flows are presented in Table 5-17. In Section 5.8.2, the recoverable flow paths of seepage and operational spillage are used in a calculation to determine the Water Management Fraction (WMF) through the ratio of total deliveries and recoverable flows to total water supply.

Table 5-17. OID Water Use Efficiency Components

Year	Water Use Efficiency Components (af)			
	Crop Water Use	Agronomic Water Use	Environmental Water Use	Recoverable Flows
2010	118,682	5,774	0	118,870
2011	118,334	6,130	0	114,879
2012	142,783	7,341	0	114,839
2013	160,857	6,560	0	116,927
2014	170,483	6,398	0	97,349
2015	162,730	6,384	0	88,975
2016	144,666	5,994	0	111,001
2017	169,163	7,111	0	93,337
2018	173,549	5,575	0	95,517
2019	160,594	6,737	0	91,592
Average	152,184	6,400	0	104,124

5.10.2 Water Use Efficiency Fraction

The water use efficiency fraction most applicable to OID is the water management fraction (WMF). As depicted in Figure 5-1, there is extensive interconnection between the three accounting centers. This is due to recapture and reuse of water by OID and directly by water users. Additionally, conjunctive management efforts by the District promote the sustainable recharge of groundwater in wetter years and recovery in drier years. Finally, other users outside of OID are also able to recover surface water and groundwater made available from spillage and seepage of OID water supplies. These methods of water recovery, recharge, and reuse result in higher levels of system performance and water use efficiency than would otherwise occur.

The water management fraction (WMF) is calculated and provided. It is calculated by comparing the consumptive use of applied water (ET_{aw}) and recoverable flows from applied water and the OID distribution system (i.e., deep percolation of applied water, seepage, and drainwater outflows) to total water supply. Recoverable flows were calculated as the volume remaining after ET_{aw} and irrecoverable losses are subtracted from the total water supply. The components of the WMF ratio are shown, along with the calculated WMF, for the period from 2010 to 2019 below in Table 5-18. During this period, the WMF varied from 98 to 99 percent. This high WMF indicates that essentially all of OID's water supply is used to meet irrigation demands or is recoverable for beneficial use by downgradient surface water and groundwater users. The only water budget flow paths not recoverable or consumed by crops in OID are evaporation and riparian ET from the District distribution system.

Table 5-18. OID Distribution System Water Management Fraction.

Year	Evapotranspiration of Applied Water (af)	Recoverable Flows (af)	Total Water Supply (af)	Water Management Fraction
2010	118,682	121,546	243,894	98%
2011	118,334	120,603	242,412	99%
2012	142,783	117,531	264,300	98%
2013	160,857	118,695	283,668	99%
2014	170,483	93,193	267,661	99%
2015	162,730	90,226	256,672	99%
2016	144,666	106,578	254,726	99%
2017	169,163	89,974	262,755	99%
2018	173,549	95,675	272,865	99%
2019	160,594	93,658	257,620	99%
Average	152,184	104,768	260,657	99%

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 sources of information and 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 Sources of Information Describing Potential Climate Change Effects

Potential climate change effects are evaluated based on existing historical data and projections of future hydrology and climate parameters, such as temperature and precipitation. The information sources used to quantify these historical values and projected effects are described below.

Although not described below, the GSP for the East San Joaquin subbasin includes an evaluation of the potential impacts of climate change through a projected future water budget that includes the northern portion of OID. The GSP for the Modesto subbasin that is currently in development will also include an evaluation of the potential impacts of climate change through a projected future water budget that includes the southern portion of OID. The findings and recommendations from these GSPs serve as another source of information describing potential effects of climate change within OID and the surrounding areas.

6.2.1.1 Hydrology

In this AWMP, the potential impacts of climate change on OID water supplies are evaluated using historical data for full natural flow (unimpaired runoff) in the Stanislaus River at Goodwin Dam[21], along with projected changes to Stanislaus River hydrology over the next 100 years.

Historical full natural flows along the Stanislaus River are available through the California Data Exchange Center. Projected changes to Stanislaus River flows are derived from studies prepared by USBR, DWR, and others.

Projections of future flows in the Stanislaus River at New Melones Dam by Gangopadhyay and Pruitt (2011) are presented to evaluate potential future changes in the hydrology of the Stanislaus River watershed; these projected future flows were obtained from projections developed using global climate models (GCMs) reported by USBR. More recent projections of future streamflow along the Stanislaus River at New Melones Reservoir were also extracted from climate change models described by Pierce et al. (2018) in contribution to California's Fourth Climate Change Assessment. These projected future monthly and annual flows were quantified from 32 coarse-resolution (~100 km) GCMs, similar to Gangopadhyay and Pruitt (2011). Results of the GCMs were bias corrected, downscaled, and then applied to a land surface model to estimate soil moisture, runoff, surface energy fluxes, and other parameters. Results were reported for a number of models across two key climate change scenarios: scenario RCP 4.5, in which emissions peak around 2040 and then decline thereafter, with projected statewide warming of 2-4°C; and scenario RCP 8.5, in which emissions continue to rise through 2050 and plateau around 2100, with projected statewide warming of 4-7°C. These provide another reference for evaluation of potential future climate change trends affecting surface water supply. Key results of these studies are summarized in Section 6.2.2.

6.2.1.2 Climate Parameters

The potential impacts of climate change on crop water demand in OID are evaluated using historical and projected data for precipitation, temperature, and ET_o in the vicinity of OID.

Historical precipitation data are reported by the National Oceanic and Atmospheric Administration (NOAA) weather station #23258 "Modesto City Co Airport" for the period 1928[22]-2019. Historical temperature and ET_o data in an agricultural setting are reported by the Modesto CIMIS station (#71; 1987-2020), located in the vicinity of OID. The Oakdale CIMIS station (#194; November 2004 – 2020) also reports historical temperature and ET_o data in an agricultural setting within the OID service area, but with shorter periods of record. To prevent differences in station locations from obscuring changes in temperature and ET_o over time, only the Modesto CIMIS station is evaluated in this section.

[21] Unimpaired Stanislaus River flows at Goodwin Dam are considered analogous to inflows to New Melones Reservoir for purposes of this analysis.
[22] Incomplete precipitation data from NOAA weather station #49073 are available at beginning in 1893, though the generally complete data record begins in 1927.

Potential effects of climate change on crop evapotranspiration (ET) are evaluated based on results from the study developed by USBR titled: "West-Wide Climate Risk Assessment: Irrigation Demand and Reservoir Evaporation Projections" (USBR, 2015).

6.2.2 Summary of Potential Climate Change Effects

6.2.2.1 Changes in Timing of Runoff

Based on available historical data and projected future streamflow, the amount of annual runoff occurring during the spring-summer period from April through July has decreased over the past century and will likely continue to decrease in the next century.

Evaluation of available data for unimpaired flow (e.g. full natural flow) in the Stanislaus River between 1900 to 2019 shows a decreasing trend (Figure 6-1), suggesting that more runoff is occurring outside of the irrigation season during the fall-winter period due to greater snowmelt.

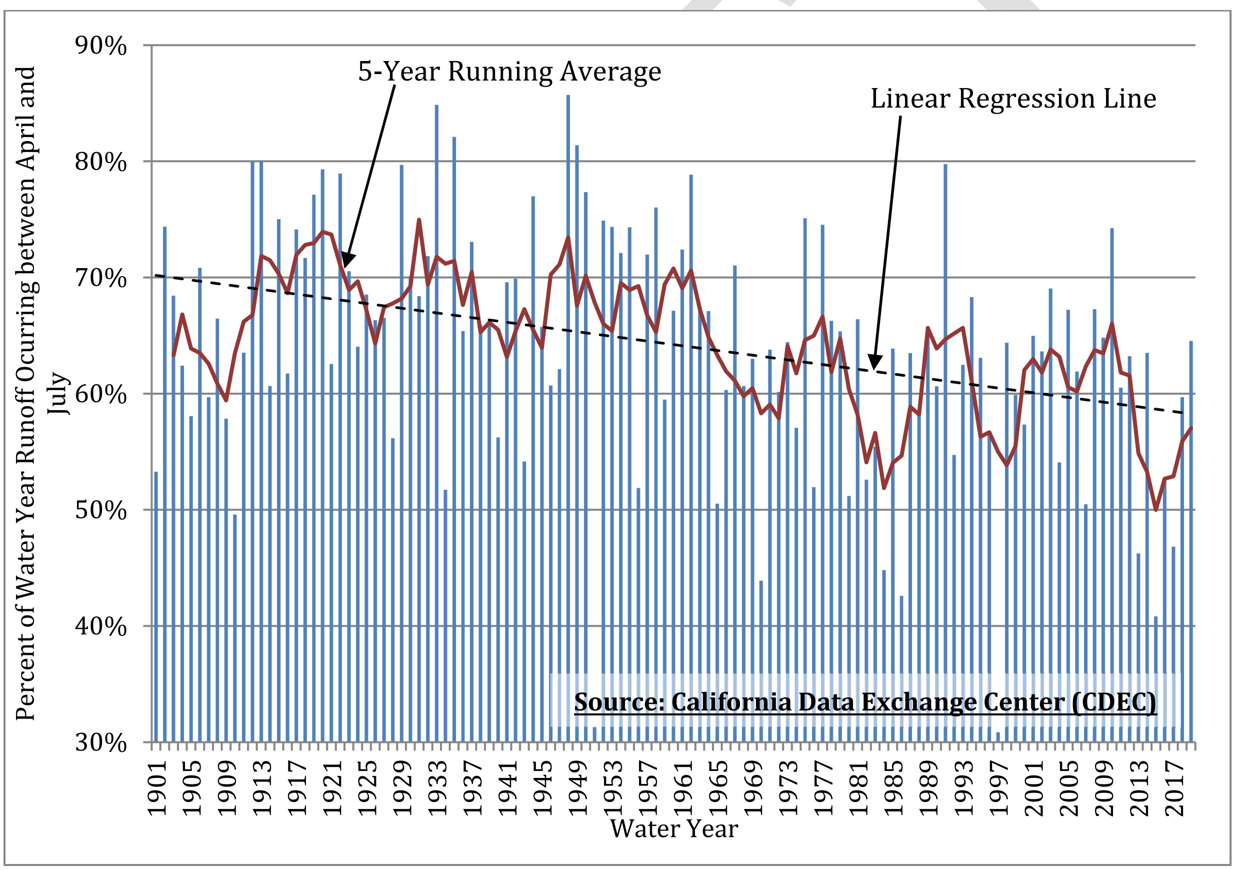


Figure 6-1. Annual April through July Unimpaired Runoff for Stanislaus River at New Melones Reservoir, 1901 – 2019.

Additionally, streamflow projections by Pierce et al. (2018) for California's Fourth Climate Change Assessment suggest similar future trends in Stanislaus River flows under average climate change condition scenario of CanESM2 (Figure 6-2). Although they vary from year-to-year and decade-to-decade, a decreasing trend is observed over the full projection period. If emissions continue to rise through 2050 and plateau around 2100 (scenario RCP 8.5, with projected statewide warming of 4-

7°C), flows in April to July are expected to decrease from approximately 60 percent of total runoff in 2010 to approximately 40 percent, on average, by 2099. However, if emissions peak around 2040 and then decline thereafter (scenario RCP 4.5, with projected statewide warming of 2-4°C), flows in April to July are expected to decrease to approximately 50 percent, on average, by 2099. Streamflow projections by Gangopadhyay and Pruitt (2011) with USBR also suggest a similar decreasing trend between 2010 and 2100.

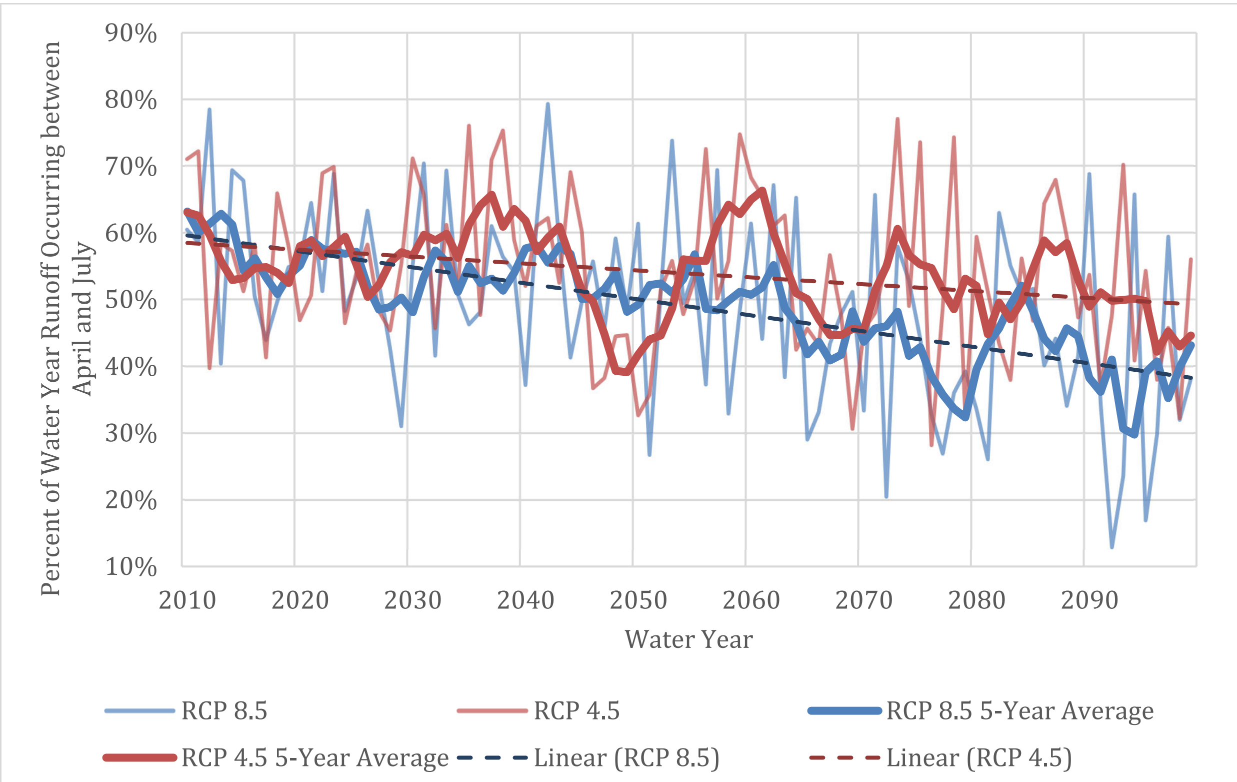


Figure 6-2. Projected Annual April through July Unimpaired Runoff for Stanislaus River for Stanislaus River under Two Climate Change Scenarios (Pierce et al. 2018).

6.2.2.2 Changes in Total Runoff

Based on available data for unimpaired flow (e.g. full natural flow) in the Stanislaus River between 1900 to 2019, total water year runoff does not appear to have decreased substantially over the 120 years. However, recent projections reported by USBR suggest that total runoff could decrease over the course of the 21st century (Gangopadhyay and Pruitt 2011), as shown in Figure 6-3. 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.

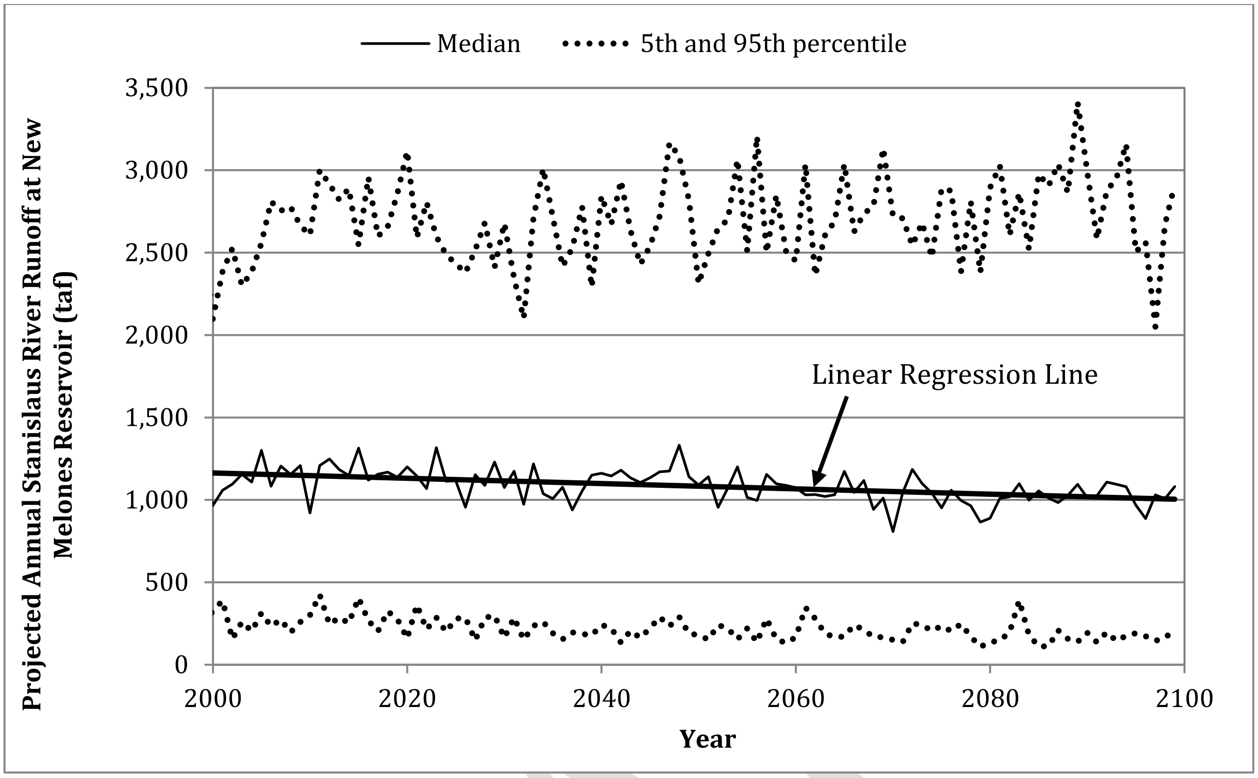


Figure 6-3. Annual Stanislaus River Runoff at New Melones Reservoir Based on 112 Hydrologic Projections (Gangopadhyay and Pruitt 2011).

Additionally, Pierce et al. (2018) provides projected estimates of Stanislaus River runoff at New Melones Reservoir in each water year through 2099 using a number of alternative climate change simulations. Of these simulations, four were selected by California's Climate Action Team as priority models for research contributing to California's Fourth Climate Change Assessment:

- HadGEM2-ES – A "warmer/drier" simulation
- CNRM-CM5 – A "cooler/wetter" simulation
- CanESM2 – An "average" simulation
- MIROC5 – A "complement" simulation that is most unlike the first three, providing the best coverage of all possibilities

The total water year runoff from these simulations was averaged and summarized across each decade between the 2010s (2010-2019) and the 2090s (2090-2099) for the previously described climate change scenarios RCP 8.5 and RCP 4.5. As shown in Figure 6-4, the total water year runoff in the Stanislaus River varies greatly between periods and among simulations, with the highest expected runoff in the "cooler/wetter" (CNRM-CM5) simulation and the lowest expected runoff in the "warmer/drier" (HadGEM2-ES) and "complement" (MIROC5) simulations. Across all climate change scenarios, periods, and simulations, the mean water year runoff is expected to vary between roughly 85% and 105% of the runoff in the 2010s. Only one decade has a higher mean water year runoff than the 2010s, four have a mean water year runoff between 90% and 100% of the 2010s, and three have a mean water year runoff between 80% and 90% of the 2010s. These results demonstrate the uncertainty in climate change projections, but also suggest that although total runoff will vary over time, it has the potential to decrease over the 21st century.

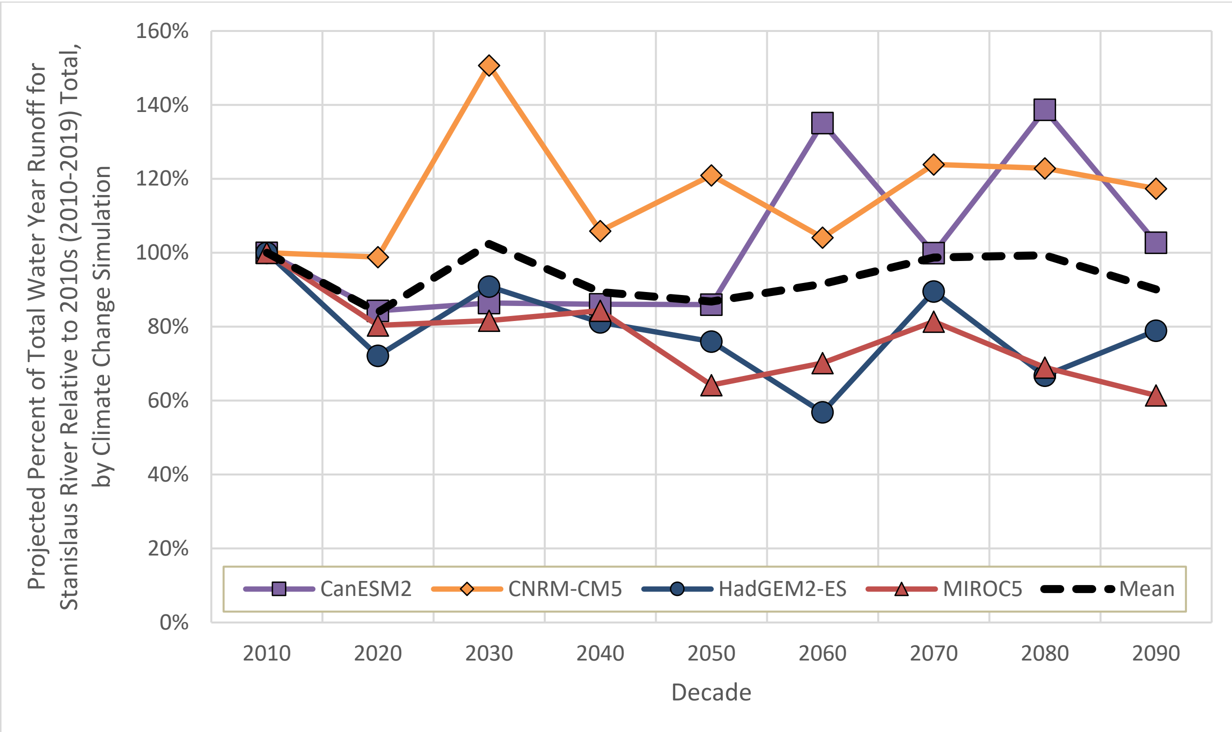


Figure 6-4. Average Projected Total Water Year Runoff in the Stanislaus River, by Decade and Climate Change Simulation and averaged across Climate Change Scenarios RCP 8.5 and RCP 4.5 (Pierce et al. 2018).

6.2.2.3 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 each affect crop evapotranspiration (ET) and net irrigation water requirements (NIWR).

Historical precipitation, air temperature, and reference ET (ET_o) are first summarized to provide context for the projected changes in climate parameters due to climate change. Precipitation records in OID, including annual precipitation, mean annual precipitation, and cumulative departure[23] from the mean annual precipitation, are shown in Figure 6-5. Between water years 1928 and 2019, the mean annual precipitation was approximately 12 inches per year in OID. As shown, wet periods (indicated by a positive slope in the cumulative departure from mean curve)

[23] Cumulative departure curves are useful to illustrate long-term hydrologic characteristics and trends during drier or wetter periods relative to the mean annual values. Downward slopes of the cumulative departure curve represent drier periods relative to the mean, while upward slopes represent wetter periods relative to the mean. A steep slope indicates a drastic change in dryness or wetness during that period, whereas a flat slope indicates average conditions during that period, regardless of whether the total cumulative departure falls above or below zero.

have historically occurred over a shorter duration within OID than drier periods (indicated by a negative slope in the cumulative departure from mean curve), even since the 1930s and 1940s. Notable recent drought periods, including 1976-1977, 1987-1992, and 2012-2015, are seen as generally falling at the end of extended drier periods and end with the beginning of a significantly wetter period.

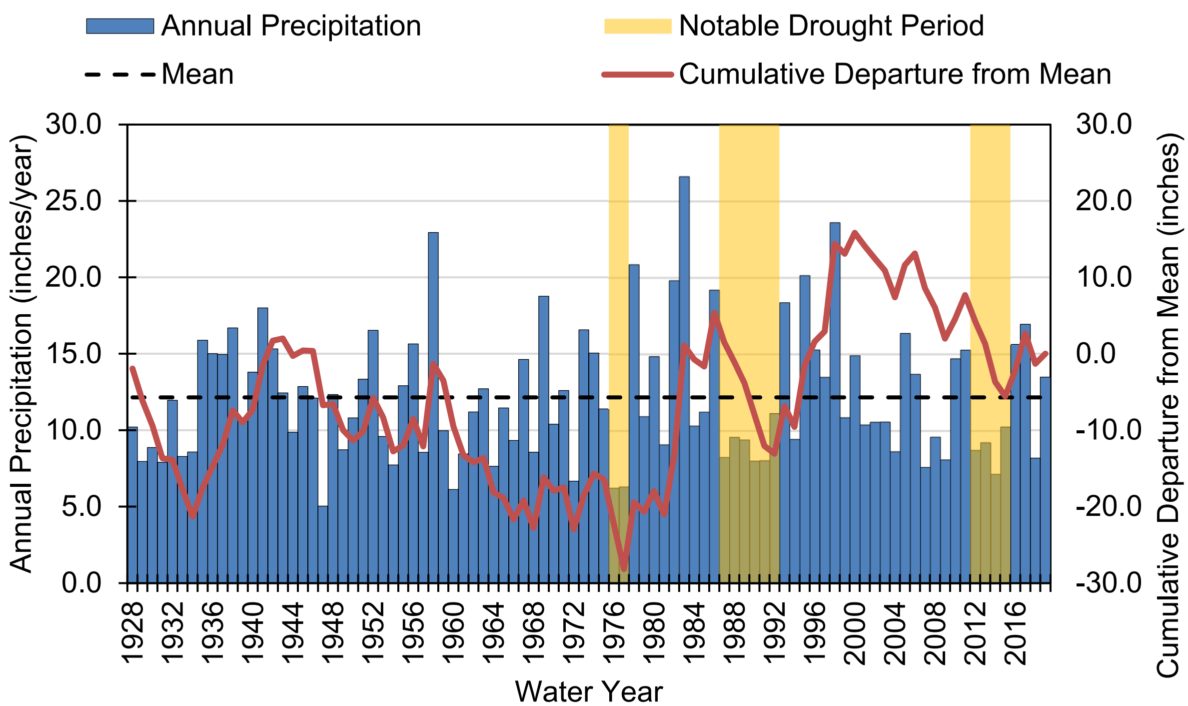


Figure 6-5. Historical Annual Precipitation, Cumulative Departure from the Mean Annual Precipitation and Notable Periods of Recent Drought.

Figure 6-6 shows the mean daily temperatures at the Modesto CIMIS station near OID. CIMIS stations are specially sited within agricultural areas to provide climate parameters that are most representative of the conditions experienced by irrigated agriculture. Between water years 1988 and 2019, the average daily air temperatures have averaged approximately 59°F, while the maximum and minimum daily temperatures have averaged 73°F and 45°F, respectively.

Although temperatures vary from year to year at the Modesto CIMIS station, average air temperatures have slightly increased in the last 10 years compared to earlier averages. Between water years 1988 and 1997 – the first 10 complete years of available data at the Modesto CIMIS station – average air temperatures were similar to the 1988-2019 averages. Between water years 2010 and 2019 – the most recent 10 years of available data – average temperatures increased by about one degree, with an average daily air temperature of approximately 60°F, and with maximum and minimum daily temperatures averaging 74°F and 46°F, respectively.

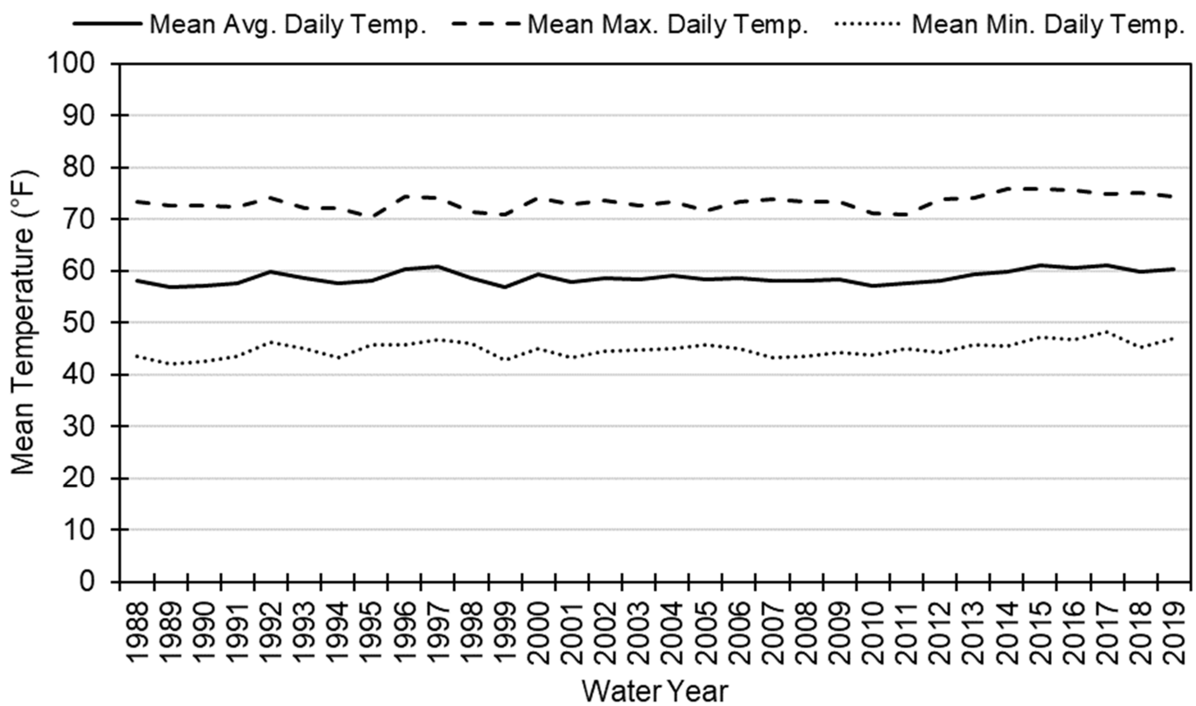


Figure 6-6. Historical Mean Daily Temperatures at the Modesto CIMIS Station.

Figure 6-7 shows the annual reference evapotranspiration (ET_o) rate reported at the Modesto CIMIS station near OID. Between water years 1988 and 2019, the average annual ET_o was approximately 53 inches per year, ranging from a high of nearly 58 inches in 2014 to a low of 46 inches in 2005. The total ET_o in every water year since 2012 has been at or above the average ET_o between 1988 to 2019.

While a number of methods have been used to project future climate change and related impacts on crop water demands, Global climate models (GCMs) are considered a standard for climate change analyses and 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 (WWCRA) in February 2015, with the goal of providing a consistent baseline assessment of climate change impacts to water supply and demand across the American West (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 6-8. 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.

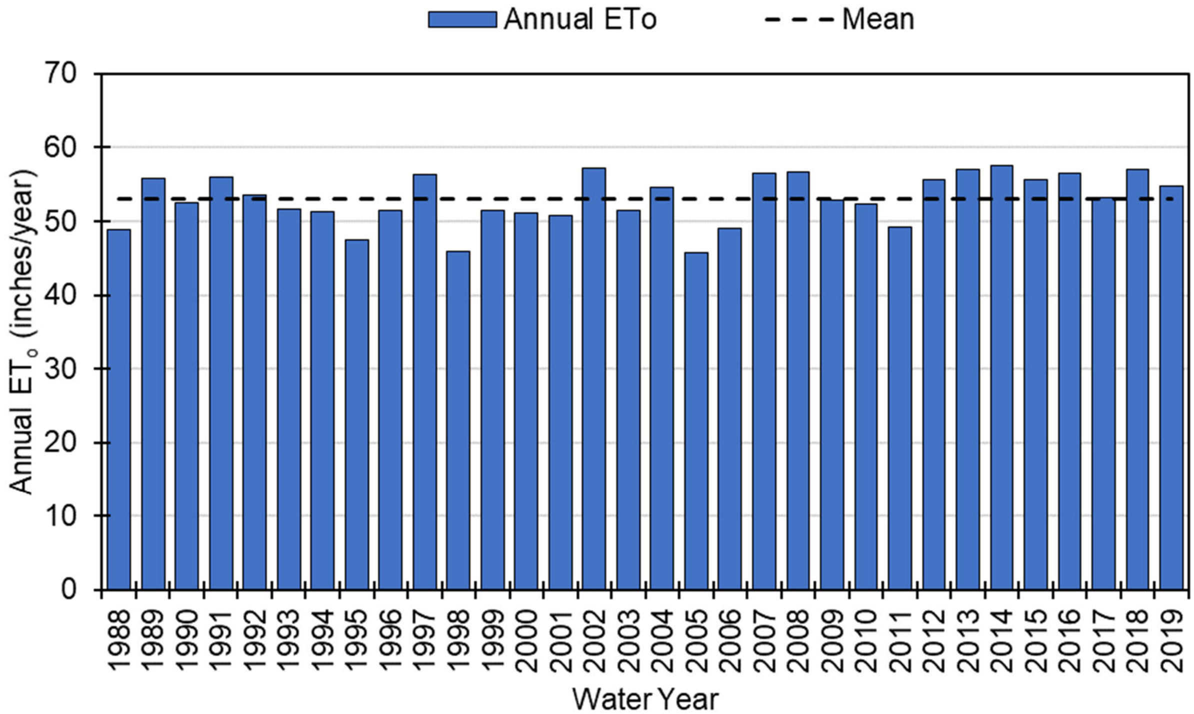


Figure 6-7. Historical Annual Reference ET at the Modesto CIMIS Station.

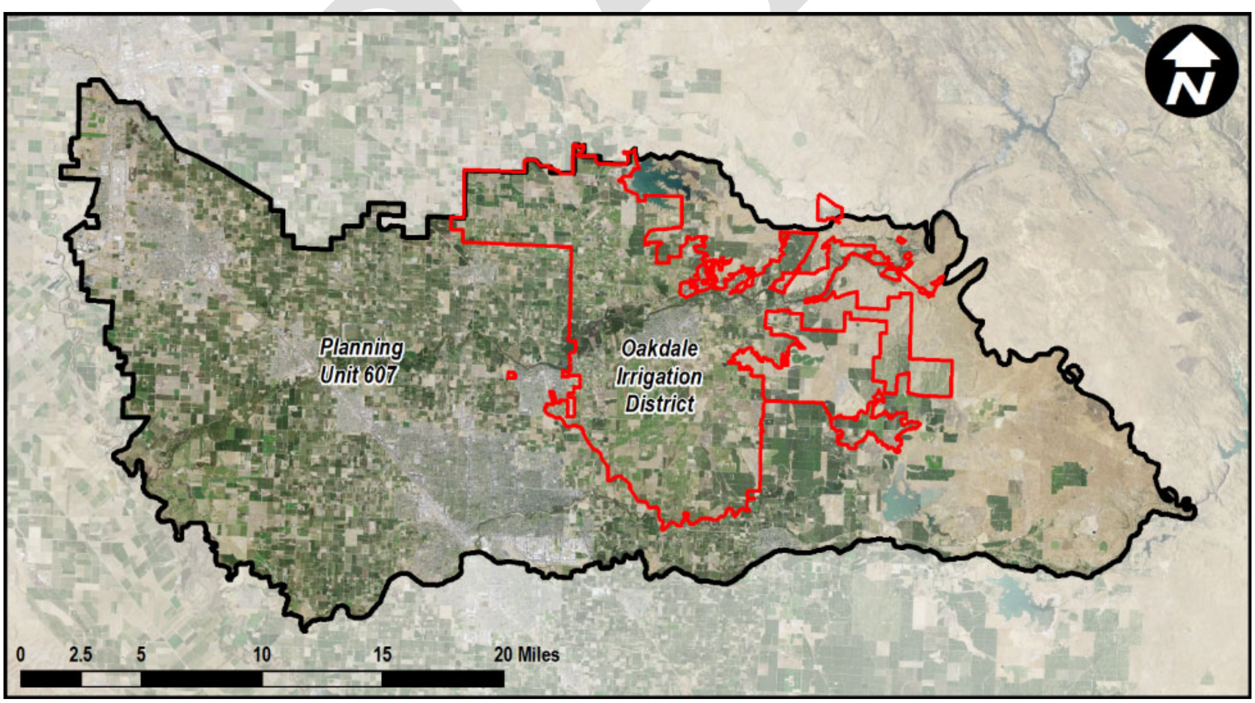


Figure 6-8. Planning Unit 607 and Oakdale Irrigation District Boundary.

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 FAO-56 dual crop coefficient approach (Allen et al. 1998), 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 6-9, in which temperature increases are shown in reference to current temperatures at the time of the study. 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 6-10, in which percent changes are shown in reference to current precipitation at the time of the study. 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.

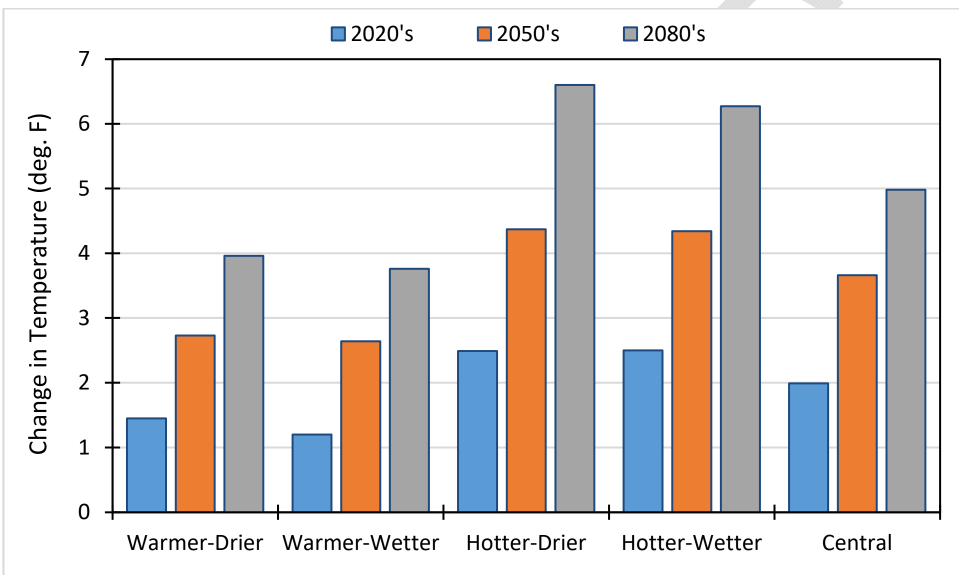


Figure 6-9. WWCRA Projected Temperature Change.

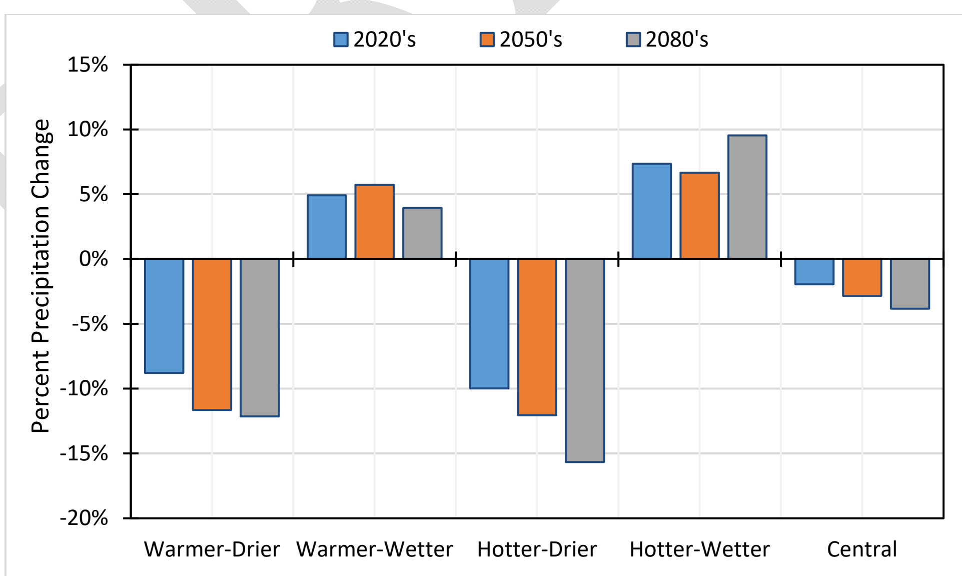


Figure 6-10. WWCRA Projected Precipitation Change.

From the projected temperature and precipitation results, WWCRA developed estimates of projected reference ET and actual ET. The results are shown below in Figures 6-11 and 6-12, respectively, with changes in reference to current values at the time of the study. 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.

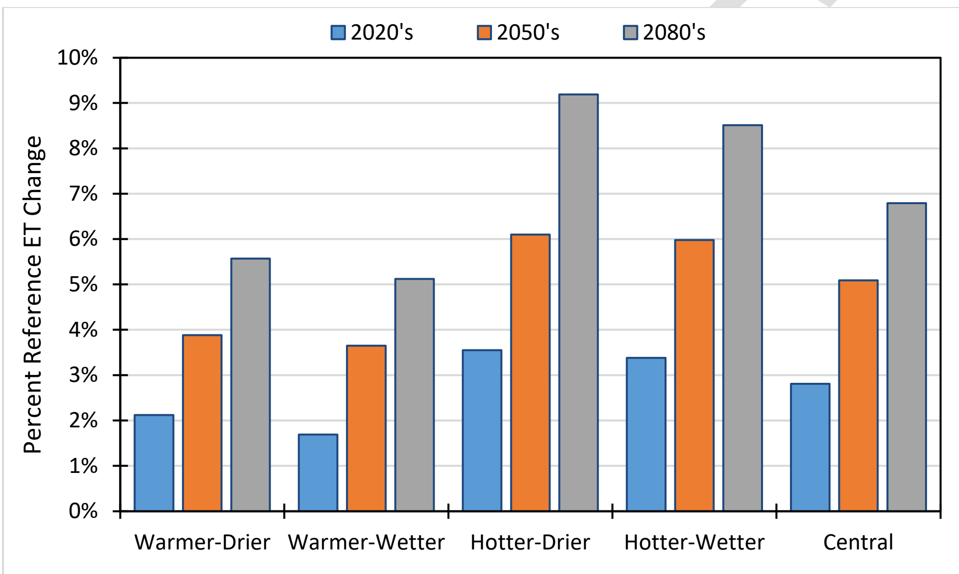


Figure 6-11. WWCRA Projected Reference ET Change.

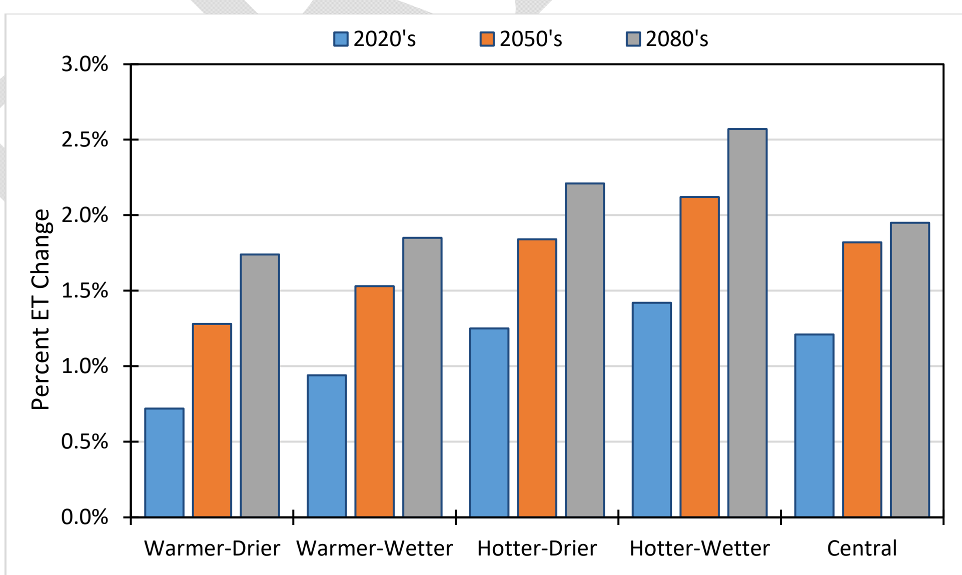


Figure 6-12. WWCRA Projected Crop ET Change Assuming Non-Static Phenology.

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 fall-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 in the Stanislaus River watershed upstream of OID 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 also pose challenges to filtering OID canal water for micro-irrigation.

According to the Eastern San Joaquin Integrated Regional Water Management Plan (ESJGBA 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 natural recharge in the long term. However, Groundwater Sustainability Plan (GSP) design and implementation under SGMA will also include projects designed to increase groundwater recharge in the coming years. Groundwater pumping volumes are at their greatest during droughts because there is less surface water available to meet water demands. The inevitable times of drought increase the difficulty of sustainably managing groundwater basins and preventing negative impacts to water quality. OID's role in GSP development and implementation under SGMA in both the East San Joaquin and Modesto subbasins will allow it to play an active role in addressing these challenges.

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 6-13. 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 (as described in Section 6.2.2.3).

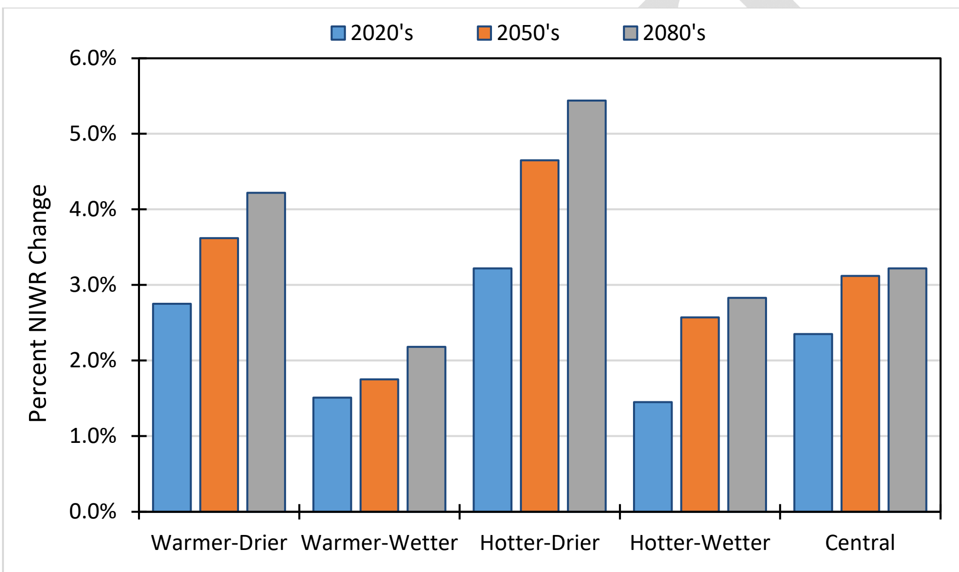


Figure 6-13. WWCRA Projected Net Irrigation Water Requirement Change Assuming Non-Static Phenology.

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 (USBR 2015).

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. OID 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 published in 2009 and updated in 2013 and 2018 (DWR 2010a, 2014, and 2019), as well as strategies identified as part of the California Climate Adaptation Strategy (CNRA 2009) and as part of the Sacramento and San Joaquin Basins Study (USBR 2016). 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, 2014 and 2019)	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 is an equal owner of the Tri Dam 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 and recharge 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.

Source	Strategy	Status
	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. Since completion, the District has continued work with Fishbio and River Partners to ensure native habitat establishment and revegetation and is scheduled to do so through 2022. Also, 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. Finally, 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.
	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 have already enhanced water management capabilities and will continue to do so in the future as implementation continues.
	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.
Sacramento and San Joaquin Basins Study (USBR 2016)	Reduce water demand	Described above under "Reduce water demand."
	Increase water supply	Described above under "Increase water supply."
	Improve operational efficiency	Described above under "Improve operational efficiency and transfers" and "Preserver, upgrade, and increase monitoring, data analysis, and management."
	Improve resource stewardship	Described above under "Practice resource stewardship."

Source	Strategy	Status
	Improve institutional flexibility	OID coordinates with SSJID to run the Tri-Dam Project and Power Authority, including consideration of opportunities to improve institutional flexibility. It also has continuing discussions with USBR to promote carryover storage in New Melones Reservoir to provide greater dry year flexibility, and has identified mechanisms for voluntary transfers of water that facilitate greater water supply flexibility and storage and initiated discussions with DWR and USBR regarding policies that impede voluntary water transfers.
	Improve data and management	Described above under "Preserve, upgrade, and increase monitoring, data analysis, and management."

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. (IPCC 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)
- California Adaptation Planning Guide: Planning for Adaptive Communities. California Emergency Management Agency and California Natural Resources Agency. July 2012 (Cal EMA & CNRA 2012)

- Managing an Uncertain Future. California Water Plan Update 2013. Volume 1, Chapter 5. October 2014. (DWR 2014)
- 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)
- 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)
- Perspectives and Guidance for Climate Change Analysis. August 2015. California Department of Water Resources Climate Change Technical Advisory Group. (DWR-CCTAG, 2015)
- SECURE Water Act Section 9503(c) – Reclamation Climate Change and Water 2016. March 2016. (USBR, 2016a).
- Sacramento and San Joaquin Rivers Basin Study. March 2016. (USBR, 2016b)
- Actions for Sustainability. California Water Plan Update 2018. Chapter 3. 2018. (DWR, 2018a)
- Safeguarding California Plan: 2018 Update, California's Climate Adaptation Strategy. California Natural Resources Agency. January 2018. (CNRA, 2018)
- Indicators of Climate Change in California. Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. May 2018. (Cal EPA, 2018)
- Resource Guide: DWR-Provided Climate Change Data and Guidance for Use During Groundwater Sustainability Plan Development. July 2018. (DWR 2018b)
- Climate, Drought, and Sea Level Rise Scenarios for California's Fourth Climate Change Assessment. Report #CCCA4-CEC-2018-006. August 2018. Pierce, D.W., J.F. Kalansky, and D.R. Cayan. (Pierce et al. 2018)
- Climate Action Plan—Phase 2: Climate Change Analysis Guidance. California Department of Water Resources. September 2018. (DWR, 2018c)
- Climate Action Plan—Phase 3: Climate Change Vulnerability Assessment. California Department of Water Resources. February 2019. (DWR, 2019)
- San Joaquin Valley Summary Report, Preview. California's Fourth Climate Change Assessment. 2018. Available at: https://climateassessment.ca.gov/regions/.
- Eastern San Joaquin Groundwater Subbasin Groundwater Sustainability Plan. Eastern San Joaquin Groundwater Authority. November 2019. Available at: http://www.esjgroundwater.org/.
- Climate Action Plan—Phase 1: Greenhouse Gas Emissions Reduction Plan. California Department of Water Resources. July 2020. (DWR, 2020)
- Cal-Adapt website tools, data, and resources for exploring California's climate change research and developing adaption plans. Available at https://cal-adapt.org/

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 are 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 as described 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.

7.2 Delivery Measurement (10608.48.b(1))

OID is **implementing** the EWMP to measure the volume of water delivered to customers with sufficient accuracy, in compliance with 23 CCR §597. OID currently has 2,001 turnouts; since the adoption of OID's 2015 AWMP, the number of turnouts needing corrective action has decreased from 476 to 296. The turnouts in compliance serve 89% of acreage within OID, and by continuing with OID's planned implementation approach (as described in Attachment B) this percentage is anticipated to improve to 98% compliancy within four years. OID's Delivery Measurement Plan is included as Attachment B.

7.3 Volumetric Pricing (10608.48.b(2))

OID is **implementing** the EWMP to adopt a pricing structure based at least in part on quantity delivered. 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. In order to help facilitate management of delivery measurements and the new rate structure, OID has implemented STORM water ordering, delivery management, and volumetric billing software since 2015.

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

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 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 approved 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 with OID surface water 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. Recycled food processing water is also applied directly to lands within the District.

In addition to existing uses of recycled water in the District, the utilization of treated M&I discharge from the City of Oakdale in the northern OID service area is being evaluated.

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 Natural Resource Conservation Service (NRCS) to facilitate on-farm improvements through the NRCS Environmental Quality Incentives Program (EQIP) program. The District often supplies technical assistance to facilitate these improvements.

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. The water rate structure is a tiered rate system, with higher rates for higher water use. Volumetric bills are distributed three times each season, allowing customers the opportunity to monitor water use as it relates to tiered water rates throughout the season and encouraging more efficient farm water use. OID is also implementing this EWMP 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. Finally, in recent years, OID has continued operating its distribution system further into October, allowing for growers to continue to use surface water for post-harvest irrigations in lieu of private pumping.

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 $35.5 million in main canal and tunnel improvements, $14.5 million in canal and lateral rehabilitation, and $13.9 million in pipeline replacement. A total of $20.6 million, $5.6 million, and $7.1 million have been invested in these projects, respectively, since 2014. 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 Total Channel Control (TCC) canal automation programs on District laterals increase the distribution system flexibility, steadiness, and capacity while also enabling operational spillage reduction. Spillage reduction associated with current implementation of TCC is estimated to be up to 5,000 to 7,000 af annually.

After the successful completion of the District's pilot Total Channel Control (TCC) programs on the Claribel and the Cometa laterals, OID continues to strategically implement TCC and other improvements throughout the District with plans to continue implementing improvements to the District distribution system as funding becomes available. To date, OID has implemented TCC on over 34 miles of laterals within the District. This further enhances the District's ability to control and regulate distribution system operational flows.

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 41,000 acres (63% of the District) between 2012 and 2019. 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 $4 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 $13.3 million in flow control and measurement improvements. In many cases these flow control and measurement improvement projects also provided outflow management and reclamation project benefits, which were not accounted for independently from the $13.3 million invested. Specifically, this occurs where TCC has been implemented on laterals that capture drainwater and tailwater as well as on laterals where TCC has been implemented downstream to the lateral outfall structure. Additionally, OID has invested nearly $3.4 million in turnout replacement projects over the same period. OID has also implemented STORM water ordering and delivery management software to better track cropping and water deliveries. Finally, in recent years, OID has continued operating its distribution system further into October, providing opportunities for growers to use surface water for post-harvest irrigations in lieu of private pumping. OID deep wells can also be rented at cost by growers for this purpose outside of the irrigation season when surface water is no longer available.

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 5,600 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 19,500 af per year to the neighboring districts of MID, SSJID, and CSJWCD (43 percent of total boundary outflows; see Section 5.6.2),
- Continuing irrigation of the annexed, 760-acre V.A. Rodden property with recovered drainwater, and surface water.
- Implementation of nearly $1.8 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 4,400 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). 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 continued consideration of additional groundwater pumping facilities (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, updating surface water shortage policies to allow in-district transfers between customers during Level Two water shortages and provide increased flexibility, rental of OID wells to landowners for use outside of the irrigation season, and participation in local groundwater management initiatives including SGMA-related activities and GSP development and implementation in both the Eastern San Joaquin and Modesto subbasins, the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA) GSA, the San Joaquin County Groundwater Basin Authority JPA, 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 also 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.

The implementation of TCC also results in canal reaches that are continuously ponded throughout the irrigation season, which is a change from historical practice of lowering canal water levels in between rotations. Having the canals continuously ponded increases flow from canals down to the groundwater system. Ongoing studies are evaluating and quantifying the benefits of this.

Finally, 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 WRP, OID identified $14 million in groundwater well projects and has invested nearly $4.1 million since 2006.

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

OID is ***implementing*** this EWMP by automating distribution facilities through TCC implementation and other various automation controls including flow control and upstream level control. . To date, OID has installed and automated 119 headgates, inline lateral control structures, turnouts, and boundary outflow sites for flow, level, and position control. Additionally, 67 of these operate in TCC and fully automate 34 miles of canals. Allowing for automation and remote monitoring of 37 headgates, 74 inline lateral control structures, seven turnouts, and one boundary outflow facility. In addition to these automated distribution facilities, OID has installed 114 flow monitoring facilities equipped with remote monitoring. These facilities consist of 14 headgates, 8 inline lateral structures, 72 turnouts, 13 boundary outflow facilities and six pumps. 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 $13.3 million in flow control and measurement structure projects since 2006 and nearly $5 million since 2014.

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 have the potential to substantially reduce operational spillage and will require the installation or rehabilitation of over 170 canal structures, and installation of over 220 automated gates and associated controls at a cost of approximately $30 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 and station relocation in 2017 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.

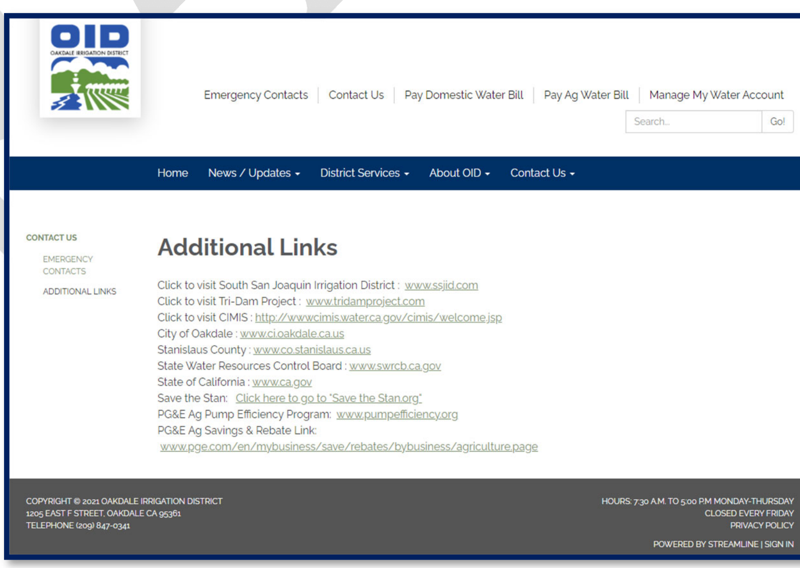


Figure 7-1. OID Website with Link to CIMIS.

OID also offers no-cost on-farm water irrigation consultations and review upon request and as associated circumstances arise and recently developed an online portal through which historical and current water use information is available to customers and with online bill pay capabilities. Finally, OID's recently updated Surface Water Shortage Policy for Level Two shortages to allows in-district transfers between customers when their allocation is exhausted.

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).


SAVE THE STAN
SSJID
SOUTH SAN JOAQUIN IRRIGATION DISTRICT

Jan. 10, 2019

Contact: Steve Knell, OID general manager, (209) 840-5508 or srknell@oakdaleirrigation.com
Peter Rietkerk, SSJID general manager, (209) 249-4645 or prietkerk@ssjid.com

OID, SSJID join in lawsuit filed against state over plan to increase river flows

The Oakdale and South San Joaquin Irrigation Districts today joined with other members of the San Joaquin Tributaries Authority (SJTA) in a lawsuit challenging the state's right to arbitrarily increase flows in the Stanislaus and two other rivers.

The injunction request was filed in Tuolumne County Superior Court against the State Water Resources Control Board over its proposed Bay-Delta Phase 1 unimpaired flow proposal, adopted Dec. 12, 2018. The plaintiffs are OID, SSJID, the Turlock Irrigation District, and the City and County of San Francisco. (To read the lawsuit, please go to www.SavetheStan.org)

The lawsuit contends that the water board's plan to require 40% in unimpaired flows, with a range of 30% to 50% between February and June, "directly and irreparably" harms the SJTA members. The plan "will cause substantial losses to the surface water supply relied upon by the SJTA member agencies for agricultural production, municipal supply, recreational use, hydropower generation, among other things. Implementation will also cause direct impacts to groundwater resources relied upon by the SJTA member agencies." These impacts will devastate local water supplies for ag and urban communities and severely impact the regional economy.

"We file suit not because we prefer conflict over collaboration. On the contrary, we continue to encourage and participate in settlement discussions on our rivers, and support science on the Stanislaus. But we also have an indisputable responsibility to reserve our legal rights and protect our ag and urban customers," said Peter Rietkerk, General Manager of the SSJID.

The lawsuit claims that "the board's own analysis estimates the project will impact more than 1 million acres of agricultural land in the San Joaquin Valley, the majority of which, 65% is designated as 'prime' or 'unique farmland,' or 'farmland of statewide importance.' "

"It's the decimation of a large portion of agriculture in the middle of the nation's most productive food belt that should concern everyone," said Steve Knell, General Manager of the OID. "All this loss of productive agriculture to gain 1,103 more salmon a year -- per the state's own analysis -- doesn't make sense."

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

Additionally, OID partnered with SSJID and, together with the TriDam Project and Power Authority, 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 has identified mechanisms for voluntary transfers of water that facilitate greater water supply flexibility and storage and 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 technician through OID's well established program to test and evaluate the 70 pumps within the OID boundaries. These pumps include:

1. 24 deep wells to supplement surface water deliveries (conjunctive use EWMP),
2. 41 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)
5. Three pumps from the Stanislaus River, one of which is equipped with a VFD.

OID has also integrated six pumps into the District SCADA system. Additionally, for deep wells with sounding tubes, water levels are monitored twice per year (spring and fall), which includes a comparison to pump level to ensure that pumping head and the efficiency of the pump are not compromised by fluctuations in groundwater level. OID typically inspects and rebuilds or repairs 3-5 reclamation pumps annually to ensure proper and efficient performance. These components include but are not limited to bearings, impeller shaft, and impeller replacement. . Finally, an infrared thermographic survey of electrical components supplying power to OID's pumps was recently completed. This survey allowed OID to identify energy losses occurring within the pumps electrical components and take corrective action to reduce these losses.

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. Since 2006 OID has spent $4.1 million on its deep well sites and plans to continue to make improvements to these locations by installing sounding tubes on existing wells without them to allow for measurement of water levels for both monitoring and operational efficiency review, evaluating the costs and benefits of installing VFDs on these pumps and planning for VFD installation when financially feasible and beneficial opportunities are found, and SCADA integration.

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 visionary in its future, as supported by the goals in its 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	7. Evaluated and categorized all turnouts with respect to measurability and developed standards for using USBR metergates and constant head orifice (CHO) metergates where applicable and other types of new standardized turnout measurement devices where not applicable. 8. Dedicated annual budget line-item for turnout replacement and initiated replacement of turnouts requiring corrective actions following completion of WRP development in 2007. 9. Implementation of SCADA in distribution system and at select delivery points to identify potential operational issues and increase accuracy of delivery measurement. 10. Implementation of Storm water ordering and delivery management software. 11. Implementation of a QA/QC process to review delivery measurement volumes prior to billing, which occurs three times throughout the irrigation season. 12. Development and implementation of a Water Measurement Plan for customer deliveries (Attachment B); implementation is currently about 90% complete (62,468 acres of 69,890 acres).	3. Continue to dedicate annual budget line-item for turnout replacement and continue replacement of turnouts requiring corrective actions. 4. 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	4. Conducted a rate study to determine rates required to cover cost of service, conducted Proposition 218 rate update, and established and implemented a rate structure based in part on volume of water delivered. 5. Use volumetric billing for out-of-district water sales and future annexations. 6. Implemented Storm volumetric billing software.	3. Continue utilization of rate structure based in part on volume delivered. 4. 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 exceptionally 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	4. Sconza Candy cooling water discharge is captured year-round in the District distribution system. 5. Food processing water is applied directly to lands within the District. 6. The utilization of treated M&I discharge from the City of Oakdale within OID is being evaluated.	4. Continue existing use of recycled water within OID. 5. Consider requests from all qualifying permitted dischargers for additional use of recycled water. 6. 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	2. OID provides technical assistance to growers implementing on-farm improvements through the NRCS EQIP program.	2. Continue technical assistance to growers implementing on-farm improvements through the NRCS EQIP 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	4. A water rate based in part on the volume of water delivered encourages efficient farm water use. The rate structure is a tiered rate system, with higher rates for higher water use. Volumetric bills are distributed three times each season, allowing customers to monitor water usage as it relates to tiered water rates throughout the season and encouraging more efficient water use. 5. OID promotes conjunctive use of groundwater by setting water rates to promote use of available surface water. 6. In recent years, OID has continued operating its distribution system further into October, allowing for growers to use surface water for post-harvest irrigations in lieu of private pumping. Additionally, OID deep wells can be rented outside of the irrigation season at cost by growers for irrigation purposes.	4. Continue to encourage efficient farm water use. 5. Continue to promote use of available surface water supplies. 6. Continue operating distribution system later in the year to allow growers to use surface water for post-harvest irrigations in lieu of private pumping.
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	9. Concrete lined approximately 3.3 miles of South Main Canal and tunnels in 2010. 10. Concrete lined 105 miles of canals. 11. Repaired 0.55 miles of deteriorating concrete lining in 2019. 12. Replaced over 100 miles of canals with buried pipeline, including roughly one mile between 2016 and 2019. 13. Constructed Robert Van Lier Reservoir in 2001 and constructed the North Side Regulating Reservoir in 2010. 14. Constructed Two Mile Bar Tunnel in 2017 (operational in 2019), bypassing 1.3 miles of canal. This project reduces seepage, decreases maintenance, and bypasses a high hazard section of canal. 15. Invested $63.9 million in main canal and tunnel improvements, canal and lateral rehabilitation, and pipeline replacement since 2006 ($33.4 million since 2014). 16. Implemented TCC on over 34 miles of laterals to better regulate system flows and increase distribution system flexibility.	5. Continue to implement WRP main canal and tunnels improvement projects. 6. Continue to implement WRP canal and lateral rehabilitation projects. 7. Continue to implement WRP pipeline replacement projects. 8. Continue with next phases of District-wide TCC implementation.

Water Code Reference No.	EWMP	Implementation Status	Implemented Activities	Planned Activities
10608.48.c(6)	Increase flexibility in water ordering by, and delivery to, water customers within operational limits	Being Implemented	7. 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. 8. Invested more than $13.3 million in flow control and measurement improvements including TCC, $6.3 million in construction of the north side regulating reservoir and nearly $3.4 million in turnout replacement since 2006, resulting in increased water ordering and delivery flexibility. 9. Implemented STORM water ordering and delivery management software to better track cropping and water deliveries. 10. Due to land conversion and annexation, and to system improvements and modernization, arranged deliveries have increased from approximately 23k acres in 2012 to over 42k acres (and 65% of District) in 2019. 11. 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. 12. In recent years, OID has continued operating its distribution system further into October, allowing for growers to use surface water for post-harvest irrigations in lieu of private pumping. Additionally, OID deep wells can be rented outside of the irrigation season at cost by growers for irrigation purposes.	6. Continue transition to arranged demand ordering and delivery schedule for irrigators who request increased delivery flexibility. As facility constraints are eased by facility modernization program, service constraints will continue to ease. 7. Continue to implement WRP flow control and measurement structures projects 8. Continue to implement WRP turnout replacement projects 9. Continue to work with local irrigation design companies during their design of private irrigation systems. 10. Continue operating distribution system later in the year to allow growers to use surface water for post-harvest irrigations in lieu of private pumping, and continue at cost rentals of OID deep wells outside of the irrigation season.

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	8. Two drainwater recovery systems irrigate more than 760 acres. 9. OID coordinates with and supports private landowners with an interest in capturing and reusing drainwater in OID drainage facilities. 10. Reclamation pumping within OID to recover approximately 5,600 af annually. 11. Interception and reuse of approximately 2,100 af per year of tailwater entering the OID distribution system, 12. Gravity flow and lift pumping of approximately 19,500 af per year to the neighboring districts of MID, SSJID, and CSJWCD. 13. Automation of the District's laterals to provide downstream control has the potential to dramatically reduce spillage through spillage prevention. Implementation of TCC is estimated to have reduced spillage by up to 5,000 to 7,000 af annually. 14. OID has implemented nearly $1.8 million in outflow management and reclamation projects since 2006.	5. Continue to support private landowners in capturing and reusing drainwater in OID drainage facilities. 6. Continue to implement WRP outflow management projects. 7. Continue to implement WRP reclamation projects. 8. Continue with next phases of District-wide TCC implementation.

Water Code Reference No.	EWMP	Implementation Status	Implemented Activities	Planned Activities
10608.48.c(8)	Increase planned conjunctive use of surface water and groundwater within the supplier service area	Being Implemented	12. OID water rates encourage use of available surface water supplies. 13. 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. 14. OID actively participates in local and regional groundwater management initiatives, including participation in SGMA-related activities and GSP development and implementation in both the Eastern San Joaquin and Modesto Subbasins and the development of the USGS groundwater model of the Modesto Subbasin. 15. OID and the City of Oakdale are evaluating delivery of OID surface water for irrigation of city parks, which otherwise depend on groundwater pumping. 16. Potential groundwater recharge areas have been identified as part of the STRGBA Recharge Characterization Report. 17. OID has maintained and enhanced groundwater production capability, investing nearly $4.1 million since 2006. 18. In recent years, OID has continued operating its distribution system further into October, allowing for growers to use surface water for post-harvest irrigations in lieu of private pumping. Additionally, OID deep wells can be rented outside of the irrigation season at cost by growers for irrigation purposes. 19. OID makes district pumps available for frost protection outside of the irrigation season when surface water is not available. 20. Automated TCC canal reaches are continuously ponded throughout the irrigation season, which is a change from historical practice of lowering canal water levels in between rotations. The continuously ponded water in the canals potentially increase seepage flow from canals down to the groundwater system. Ongoing studies are evaluating the impacts of this. 21. OID has achieved in-lieu groundwater recharge through annexation of over 10,000 acres since 2006. 22. Updated Surface Water Shortage Policy to allow in-district surface water and private groundwater transfers between customers in a Level Two water shortage.	8. Continue active participation in GSP development and implementation in both the Eastern San Joaquin and Modesto Subbasins. 9. Utilize groundwater models and GSPs to continue 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. 10. Continue improving flexibility in water ordering and delivery to encourage use of surface water and discourage surface users from converting to groundwater. 11. Continue to implement WRP groundwater well, reclamation, and outflow management projects. 12. Continue with next phases of District-wide TCC implementation and evaluation of impacts. 13. Continue operating the distribution system into October to provide surface water for post-harvest irrigations and to make district pumps available to growers for either post-harvest irrigations or frost protection. 14. Review and revise Surface Water Shortage Policy as needed to provide flexibility to customers and increase planned conjunctive use of surface water and groundwater.

Water Code Reference No.	EWMP	Implementation Status	Implemented Activities	Planned Activities
10608.48.c(9)	Automate canal control structures	Being Implemented	5. Automated inlets and outlets to the regulating reservoirs. 6. Installed and automated 119 headgates, lateral control structures, turnouts and boundary out flow sites for flow, level, and position control. 67 of these sites operate in downstream control and fully automate 34 miles of canals. 7. Installed an additional 107 flow monitoring devices on headgates, lateral control structures, turnouts and boundary out flow sites. 8. OID has invested more than $13.3 million in flow control and measurement structure projects since 2006 (and nearly $4.8 million since 2015).	4. Continue to automate or install additional flow monitoring devices on canals and pipelines when and where beneficial to do so. 5. Continue with next phases of District-wide TCC implementation. 6. Continue to implement other WRP flow control and measurement structure projects.
10608.48.c(10)	Facilitate or promote customer pump testing and evaluation	Being Implemented	3. OID promotes the use of the PG&E pump testing program by private pumpers within the District. 4. A link to the PG&E Advanced Pump Efficiency Program is provided on the OID website.	2. 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	2. Designated a Water Conservation Coordinator in October 1997.	2. 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	8. A link to the California Irrigation Management Information System (CIMIS) is provided on the OID website. 9. OID helps maintain the local Oakdale CIMIS station in conjunction with DWR staff. 10. Links to the cooperative extension and other agricultural information is provided on the OID website. 11. A periodic newsletter is provided to customers. 12. OID offers no-cost on-farm irrigation consultations and review by OID staff upon request and as associated circumstances arise. 13. Developed an online portal through which historical and current water use information is available to customers, and through which online bill pay is possible. 14. Updated Surface Water Shortage Policy to allow in-district surface water and private groundwater transfers between customers during Level Two water shortages.	6. Continue to provide links to CIMIS and other resources on the OID website. 7. Continue periodic newsletter to customers. 8. Continue to offer no-cost on-farm irrigation consultations and review. 9. Continue to promote and develop online portal that provides water use information and options for customers. 10. Continue to review and revise Surface Water Shortage Policy as needed to provide water management services and flexibility to customers.
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	5. Continued discussions with USBR to promote carryover storage in New Melones Reservoir to provide greater flexibility when water shortages occur. 6. Identified mechanisms for voluntary transfers of water that facilitate greater water supply flexibility and storage and initiated discussions with DWR and USBR regarding policies that impede voluntary water transfers. 7. Active participation in initiatives that affect its water users. 8. Updated Surface Water Shortage Policy to allow in-district surface water and private groundwater transfers between customers during Level Two water shortages.	5. Continue discussions with USBR to promote carryover storage in New Melones Reservoir to provide greater flexibility when water shortages occur. 6. Continue discussions with DWR and USBR regarding policies that impede voluntary water transfers. 7. Continue active participation in initiatives that affect its water users. 8. Continue to review and revise Surface Water Shortage Policy as needed to provide flexibility to customers.

Water Code Reference No.	EWMP	Implementation Status	Implemented Activities	Planned Activities
10608.48.c(14)	Evaluate and improve the efficiencies of the supplier's pumps.	Being Implemented	6. Regular testing and evaluation of 70 pumps within OID boundaries by qualified staff. 7. Monitoring of water levels for groundwater pumps twice per year, including a comparison to pump level to ensure pumping head and efficiency of the pump are not compromised. 8. Integrated 6 pumps into the OID SCADA system. 9. Completed infrared thermographic survey of pumps to identify potential issues with pump operations. 10. Annual maintenance and improvements as part of WRP implementation.	7. Continue testing and evaluation program for existing pumps. 8. Continue to include new wells and pumps in the existing program to evaluate and improve pump efficiencies. 9. Install sounding tubes on wells without them to allow for measurement of water levels for both monitoring and operational efficiency review. 10. Evaluate opportunities to improve pump efficiencies through further SCADA system integration (incorporating additional pump sites or incorporating remote control at existing sites). 11. Evaluate the costs and benefits of installation of Variable Frequency Drives (VFDs) on pumps. 12. Continue annual maintenance and improvements as part of WRP implementation.

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 (described in greater detail in Section 5.9). 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 implementation of its 25-year, comprehensive Water Resources Plan (WRP) 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 budget (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 budget 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[24] and evaporation from irrigation application. These components represent a small portion of OID's water supply (less than two percent as indicated by the WMF). 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 budget (see Section 5). The quantitative understanding of the water budget 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 budget enables evaluation of potential changes in flow path quantities and timing for any given change in water management.

Even where comprehensive, multi-year water budget have been developed, evaluating water budget 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 budget 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.

[24] This also includes riparian ET.

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 and for a longer period 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 and drainage outflows. 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, Operational Spillage, Tailwater, 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 budget 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 budget 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 budget 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.

Definitions of WUE 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 2015). Future WUE improvements are estimated for five years in the future (2025) relative to 2020 and for ten years in the future (2030) relative to 2020. 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	Modest	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 (2015).

5. WUE Improvements expected in 2025 (five years in the future) and 2030 (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 physical and operational improvements for OID 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.

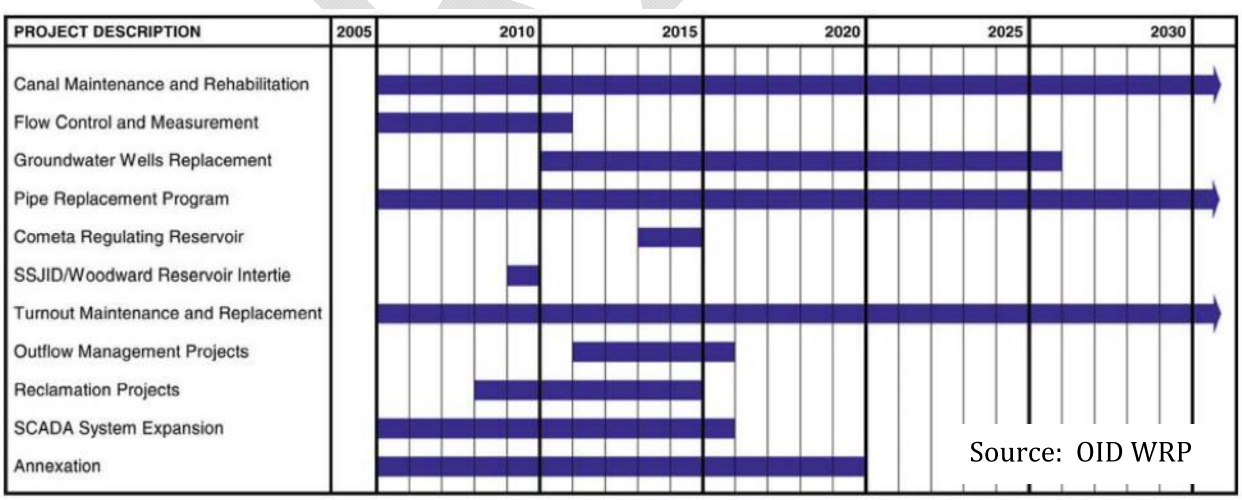


Figure 8-1. OID WRP Implementation Schedule.

In addition to the projects shown 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 2019, OID completed nearly 900 individual capital improvement projects, including over 330 projects since the 2015 AWMP update. In Table 8-1, the number of projects implemented by improvement category is presented for the period from 2006 to 2014, each year between 2015 and 2019, and the overall total from 2006 to 2019. Costs associated with WRP projects to date total more than $94 million, with more than $42.5 million in improvements completed since the 2015 AWMP update. 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. A general decrease in implementation cost between 2011 and 2015 relative to previous years occurred due to expended bond proceeds and lack of firm long-term water transfers resulting in decreased capital expenditures. Implementation costs have increased again after 2015 in recent years, although not to the same level as the period between 2006 and 2010. Recent expenditures were enabled by temporary water transfers, annexations, and the Agricultural Water Use Efficiency 2015 Grant (Grant) that OID applied for and was awarded in 2018 for canal modernization. The Grant provided a cost share between OID and DWR, up to $6 million, for canal modernization. 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 2019 totaling more than $1 million have included canal maintenance and rehabilitation ($14.5 million), flow control and measurement structures ($13.3 million), pipeline replacement ($13.9 million), turnout maintenance and replacement ($3.4 million), reclamation projects ($1.4 million), main canal and tunnel improvements ($35.5 million), the North Side regulating reservoir ($6.3 million), and miscellaneous in-system improvements ($1.3 million).

Table 8-1. OID WRP Number of Projects Initiated by Year, 2006 to 2019.

Improvement Category	Number of Projects by Year Started						Total
	2006 to 2014	2015	2016	2017	2018	2019	
Canal Maintenance and Rehabilitation	29	16	13	10	15	9	92
Flow Control and Measurement	102	0	3	7	5	6	123
Groundwater Well Replacement, Construction, or Rehabilitation	17	0	0	0	0	0	17
Pipeline Replacement	60	19	22	10	21	11	143
Turnout Maintenance and Replacement	283	25	43	44	20	15	430
Outflow Management Projects	10	1	0	1	0	2	14
Reclamation Projects	22	0	0	0	0	0	22
Main Canal and Tunnel Improvement Projects	21	2	5	1	0	3	32
North Side Regulating Reservoir	3	0	0	0	0	0	3
Miscellaneous In-System Improvements	17	0	1	2	2	1	23
Total	564	63	87	73	63	47	899

Table 8-2. OID WRP Project Costs by Project Initiation Year, 2006 to 2019 (Millions).

Improvement Category	Total Project Costs by Year Started						Total
	2006 to 2014	2015	2016	2017	2018	2019	
Canal Maintenance and Rehabilitation	$8.90	$0.97	$1.54	$1.49	$0.93	$0.66	$14.49
Flow Control and Measurement	$8.43	$0.00	$0.56	$3.22	$0.68	$0.36	$13.25
Groundwater Well Replacement, Construction, or Rehabilitation	$2.86	$0.46	$0.25	$0.20	$0.20	$0.18	$4.14
Pipeline Replacement	$6.77	$0.89	$1.34	$3.53	$0.59	$0.80	$13.92
Turnout Maintenance and Replacement	$1.43	$0.26	$0.59	$0.63	$0.24	$0.24	$3.38
Outflow Management Projects	$0.29	$0.03	$0.00	$0.05	$0.00	$0.01	$0.37
Reclamation Projects	$1.41	$0.00	$0.00	$0.00	$0.00	$0.00	$1.41
Main Canal and Tunnel Improvement Projects	$14.86	$0.01	$0.15	$18.68	$0.00	$1.78	$35.48
North Side Regulating Reservoir	$6.32	$0.00	$0.00	$0.00	$0.00	$0.00	$6.32
Miscellaneous In-System Improvements	$0.25	$0.00	$0.02	$0.55	$0.27	$0.19	$1.28
Total	$51.51	$2.60	$4.45	$28.34	$2.91	$4.22	$94.04

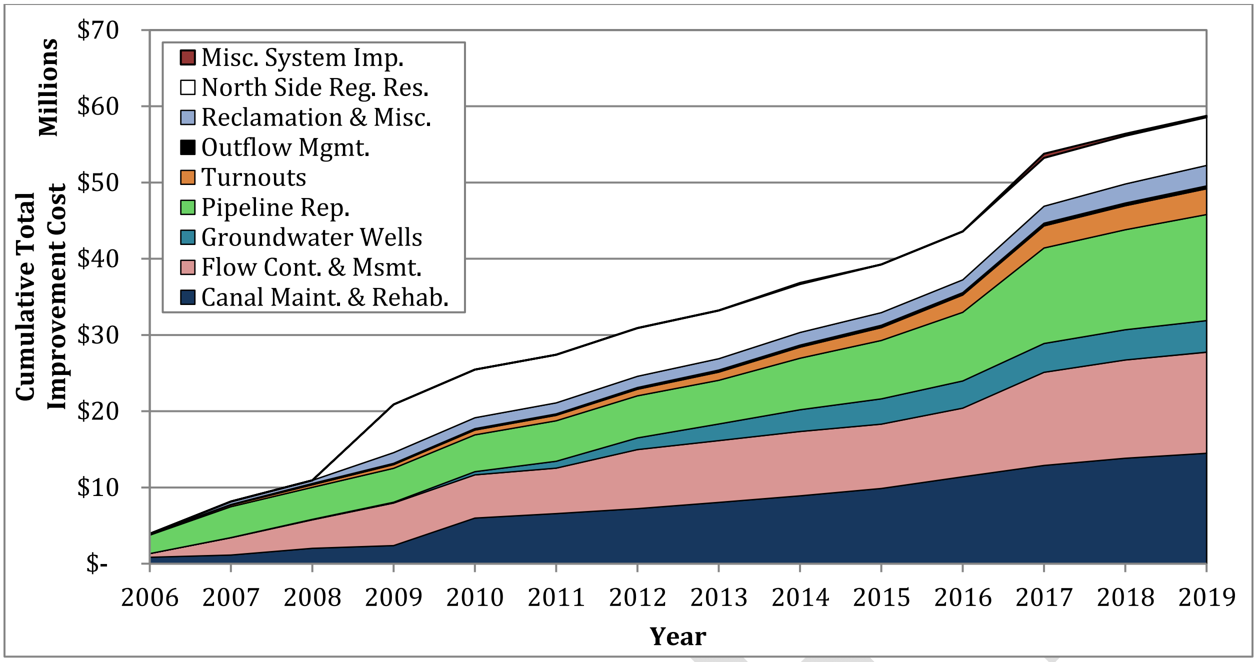


Figure 8-2. OID WRP Cumulative Implementation Costs by Improvement Category.

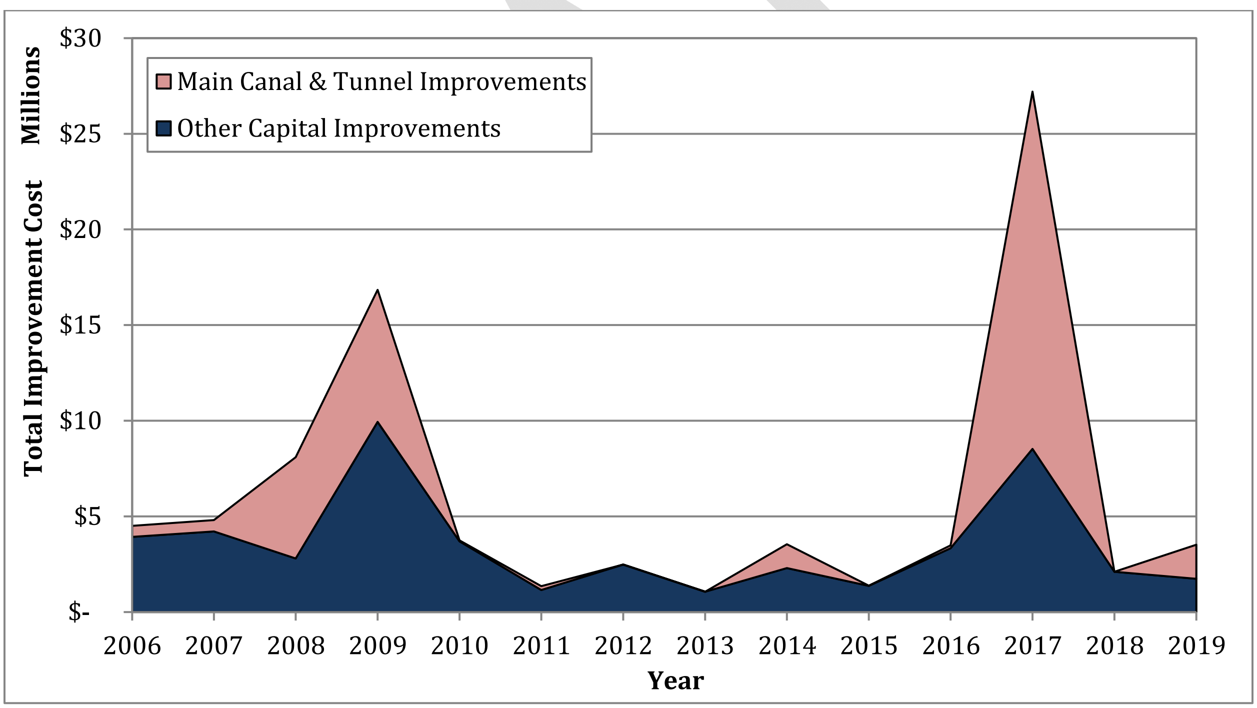


Figure 8-3. OID WRP Annual Implementation for Main Canal and Tunnel Improvements as Compared to Other Capital Improvement Projects.

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. Turnout replacement costs have been separated for those projects comprised of turnout maintenance and replacement and an additional improvement category. However, other projects that may include components of multiple improvement categories (excluding turnout maintenance and replacement) have not been separated.

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 2019, OID has annexed nearly 10,500 acres, surpassing WRP goals.

Expansion of OID's SCADA system as part of WRP implementation has also progressed in recent years. Since the start of WRP implementation, OID has installed a total of 119 SCADA sites (i.e. headgates, inline lateral control structures, turnouts, boundary outflow sites) for remote monitoring and automated flow and water level control. Of these 119 sites, 67 of them are Total Channel Control sites for the fully automated operation of 34 miles of canals. for the balance consists of 37 headgates, 74 inline lateral control structures, 7 turnouts, and 1 boundary outflow site. In addition to these automated distribution sites and facilities, OID has installed 114 flow measurement devices equipped radios and antennas to allow for remote monitoring via OID's SCADA system. These facilities consist of 14 headgates, 8 inline lateral structures, 72 turnouts, 13 boundary outflow facilities and 6 pumps. These improvements contribute to increased delivery flexibility and water level control as well as reduced operational spill from the OID distribution system. As part of the WRP, OID has invested more than $13.3 million in flow control and measurement projects since 2006 and nearly $4.8 million since 2014.

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 2020 and 2025

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, the recycling and utilization of tertiary treated M&I discharge from the City of Oakdale within OID is being evaluated, along with evaluation of using OID surface water for irrigation of city parks.

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 between 2011 and 2015 relative to previous and subsequent 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, passed in 2009, and associated regulations as discussed elsewhere in this AWMP. The average expenditures on turnout replacement in the years since the passage of SBx7-7 are more than double those in the years prior to SBx7-7, from $117,000 per year to $292,000, and spending in each of the years from 2014 to 2019 was greater than all of the prior years. OID is currently on track and slightly ahead of schedule to be compliant with SBx7-7 and associated regulations in regards to farm gate delivery measurement by 2028. 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

Agricultural Water Management Council (AWMC). 2004. Monitoring and Verification: Canal Seepage. Sacramento, CA.

Allen, R.G., L.S. Pereira, D. Raes, and M. Smith. 1998. Crop Evapotranspiration: Guidelines for Computing Crop Water Requirements. FAO Irrigation and Drainage Paper 56 (FAO-56). Rome, Italy: Food and Agriculture Organization.

Bookman-Edmonston. 2005. Integrated Regional Groundwater Management Plan for the Modesto Subbasin-Final Draft.

Burns, J.I., G.G. Davids, A.K. Dimmitt and J. Keller. 2000. Verification-Based Planning for Modernizing Irrigation Systems. USCID International Conference on Challenges Facing Irrigation and Drainage in the New Millennium. Fort Collins, CO. Vol. 1, pp. 51-63.

Burt, C., Canessa, P., Schwankl, L. and D. Zoldoske. 2008. Agricultural Water Conservation and Efficiency in California - A Commentary. October 2008. 13 pp.

CALFED Bay Delta Program. 2006. Water Use Efficiency Comprehensive Evaluation. Final Report. CALFED Bay-Delta Program Water Use Efficiency Element. August 2006.

California Department of Water Resources (DWR). 2003. California's Groundwater: Bulletin 118 Update 2003.

California Department of Water Resources (DWR). 2006. Progress on Incorporating Climate Change into Planning and Management of California's Water Resources.

California Department of Water Resources (DWR). 2008. Climate Change Adaptation Strategies for California's Water.

California Department of Water Resources (DWR). 2010a. Managing an Uncertain Future. California Water Plan Update 2009. Volume 1, Chapter 5.

California Department of Water Resources (DWR). 2010b. Climate Change Characterization and Analysis in California Water Resources Planning Studies.

California Department of Water Resources (DWR). 2012a. Climate Action Plan—Phase 1: Greenhouse Gas Emissions Reduction Plan.

California Department of Water Resources (DWR). 2012b. 2012 Agricultural Water Use Efficiency Draft Proposal Solicitation. Powerpoint Presentation. September 20, 2012.

California Department of Water Resources (DWR). 2014. Investing in Innovation & Infrastructure. California Water Plan Update 2013. Volume 1, Chapter 5.

California Department of Water Resources (DWR). 2018. Guidance Document for the Sustainable Management of Groundwater: Guidance for Climate Change Data Use During Groundwater Sustainability Plan Development.

California Department of Water Resources (DWR). 2019. Managing Water Resources for Sustainability. California Water Plan Update 2018. Volume 1, Chapter 5.

California Department of Water Resources (DWR). 2020. A Guidebook to Assist Agricultural Water Suppliers to Prepare a 2020 Agricultural Water Management Plan. DRAFT. August 2020.

California Emergency Management Agency (CEMA) and California Natural Resources Agency (CNRA). 2012. California Adaptation Planning Guide: Planning for Adaptive Communities.

California Natural Resources Agency (CNRA). 2009. 2009 California Climate Adaptation Strategy.

Camp Dresser McKee (CDM). 2011. Climate Change Handbook for Regional Water Planning. Prepared for U.S. Environmental Protection Agency and California Department of Water Resources.

Canessa, P., S. Green and D. Zoldoske. 2011. Agricultural Water Use in California: A 2011 Update. Staff Report, Center for Irrigation Technology, California State University, Fresno. November 2011. 80 pp.

CH2MHill. 2005. Oakdale Irrigation District Water Resources Plan.

Clemmens, A.J. and Burt, C.M. 1997. Accuracy of Irrigation Efficiency Estimates. Journal of Irrigation and Drainage Engineering. 123(6), 443-453.

Clemmens, A.J., R.G. Allen, and C.M. Burt. 2008. Technical Concepts Related to Conservation of Irrigation and Rainwater in Agricultural Systems. Water Resources Research. Vol. 44. W00E03, doi:10.1029/ 2007WR006095.

Davenport, D.C. and R.M. Hagan. 1982. Agricultural Water Conservation in California, With Emphasis on the San Joaquin Valley. Department of Land, Air, and Water Resources. University of California at Davis. Davis, CA. October 1982.

Eastern San Joaquin County Groundwater Authority (ESJGA). 2014. Integrated Regional Water Management Plan. Prepared by GEI Consultants (GEI).

Eastern San Joaquin County Groundwater Authority (ESJGA). 2019. Eastern San Joaquin Groundwater Subbasin Groundwater Sustainability Plan. November 2019.

East San Joaquin Water Quality Coalition. 2014. East San Joaquin Water Quality Coalition Groundwater Quality Assessment Report. Prepared by Luhdorff and Scalmanini Consulting Engineers (LSCE).

East San Joaquin Water Quality Coalition (ESJWQC). 2017. Groundwater Quality Management Plan.

East San Joaquin Water Quality Coalition (ESJWQC). 2018. Monitoring Plan Update: 2019 WY (October 2018 – September 2019). Prepared by MLJ Environmental.

GEI Consultants, Bookman-Edmonston Division (GEI). 2007. Well Field Optimization Project. Final Report.

Intergovernmental Panel on Climate Change (IPC). 2008. Climate Change and Water.

Keller, A., J. Keller, and D. Seckler. 1996. Integrated Water Resource Systems: Theory And Policy Implications. IIMI Res. Rep. 3. International Irrigation Management Institute. Colombo, Sri Lanka.

Oakdale Irrigation District (OID). 2012. 2011 Comprehensive Annual Financial Report.

Pierce, D.W., J.F. Kalansky, and D.R. Cayan. August 2018. Climate, Drought, and Sea Level Rise Scenarios for California's Fourth Climate Change Assessment. Report #CCCA4-CEC-2018-006.

San Joaquin County and Delta Water Quality Coalition (SJCDWQC). 2018. Monitoring Plan Update: 2019 WY (October 2018 – September 2019). Prepared by MLJ Environmental.

University of California at Berkeley (UCB). 2012. 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 Cooperative Extension (UCCE). 2015. Sample Costs to Produce Silage Corn in the Northern San Joaquin Valley.

U.S. Geological Survey (USGS). 2004. Hydrogeologic Characterization of the Modesto Area, San Joaquin Valley, California.

U.S. Geological Survey (USGS). 2009. Climate Change and Water Resources Management: A Federal Perspective.

U.S. Bureau of Reclamation (USBR). 2011. West-Wide Climate Risk Assessments: Bias-Corrected and Spatially Downscaled Surface Water Projections.

U.S. Bureau of Reclamation (USBR). 2015. West-Wide Climate Risk Assessment: Irrigation Demand and Reservoir Evaporation Projections.

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 H: Public Participation
- Attachment I: Eastern San Joaquin Groundwater Subbasin Groundwater Sustainability Plan
- Attachment J: Annual Water Budget Results

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

Rules & Regulations

Governing the Operation and Distribution of Water

Within the Oakdale Irrigation District Service Area

Adopted by the OID Board of Directors (Board) on February 2, 2021. These rules and regulations may be changed at any time by order of the Board with or without notice.

Rules & Regulations

Governing the Operation and Distribution of Water

Within the Oakdale Irrigation District Service Area

PREAMBLE

These Rules and Regulations Governing the Operation and Distribution of Water (Rules and Regulations) within the Oakdale Irrigation District are established pursuant to Section 22257 of the California Water Code which states in part that, "each district shall establish equitable rules for the distribution and use of water, which shall be printed in convenient form for distribution in the district." Oakdale Irrigation District has established these rules and regulations to ensure equitable, economical, and efficient distribution, use, and conservation of water resources available to the District. The Oakdale Irrigation District is dedicated to and will strive for the orderly and timely delivery of those water resources through every effort possible within the physical and operational constraints of the distribution facilities and distribution system operators. The District is committed to excellence in water resource management and all aspects of operation.

MISSION STATEMENT

"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."

\- **OAKDALE IRRIGATION DISTRICT**

GENERAL INFORMATION

Oakdale Irrigation District (OID or District) was formed on November 1, 1909 as an irrigation district of the State of California formed pursuant to the provisions of Division 11 of the California Water Code (CWC) for the purpose of delivering irrigation water to the agricultural lands within its boundaries. Geographically, the District encompasses parts of Stanislaus and San Joaquin Counties, about 12 miles northeast of Modesto and 30 miles southeast of Stockton. Urban areas in the District include the city of Oakdale and the unincorporated area of Valley Home located in Stanislaus County. Water to supply the District comes principally from the Stanislaus River under well-established adjudicated water rights but also from water reclamation and drainage recovery systems and pumping from deep wells. The District's distribution systems include the Goodwin Diversion Dam on the Stanislaus River below the Tulloch Dam, at which point water is diverted into the District's main canal systems.

Currently the District operates and maintains over 330 miles of laterals, pipelines, and tunnels, 25 deep wells, and 41 lift pumps to serve local agricultural customers. Secondary easements as defined in Section 22438 of the CWC are maintained for all District facilities other than those with easements evidenced by a written grant or judgment providing a legal description. In addition to providing surface irrigation (raw) water to over 2,900 parcels in its 82,000 acre service area, the District also supplies domestic water to over 700 customers. The District does not presently operate a domestic water treatment plant or provide municipal or industrial water.

The District is governed by a 5-member Board who are elected by the residents of the District to staggered four-year terms. To facilitate matters, most business coming before the District's Board is first considered by one of its committees. Each committee then reports and/or provides a recommendation to the full Board, which makes the final decision. There are seven standing committees that include Domestic Water, Finance, Personnel, Planning and Public Relations, San Joaquin Tributary Authorities, Tri-Dam Project, and Water/Engineering. In accordance with Section 21377 of the CWC, regular board meetings are held on the first Tuesday of each month at the District office. Special board meetings are also held on occasion. Board meeting dates, agendas and minutes are available on the District's website (www.oakdaleirrigation.com).

Day-to-day operations of the District are managed by the General Manager who is appointed and reports directly to the Board. Reporting to the General Manager are four departments: Engineering, Finance, Water Operations and Construction/Maintenance.

The Board endeavors to carry on the affairs of the District in an economical, businesslike, and orderly manner and to distribute water equitably to all constituents. To assist in this effort and to secure the greatest good to the greatest number, the following rules and regulations are adopted pursuant to Section 22257 of the CWC and related sections. Each Landowner, Water User, and Tenant, as a party directly interested in the welfare of the District, should make every effort to comply with the District's rules and regulations.

TABLE OF CONTENTS

SECTION 1: DEFINITIONS

As used herein, the following words, whether or not initially capitalized, shall have the following meanings:

1.01 "**Board**" means the Board of Directors of the District.

1.02 "**Conduits**" includes canals, laterals, ditches, flumes, pipelines, and their appurtenances.

1.03 "**Construction/Maintenance Manager**" means the District employee serving under the general direction of the General Manager in regard to the management and supervision of the Construction/Maintenance Department.

1.04 "**District**" means the Oakdale Irrigation District functioning under Irrigation District Laws of the CWC.

1.05 "**District Engineer**" means the District employee serving under the direction of the General Manager in regard to the management and supervision of any and all engineering activities.

1.06 "**District Facilities**" includes drains, dams, bridges, structures, wells, conduits, pumps, reservoirs, valves, gates, weirs, and any other facilities owned by the District as identified by both District records and Board action, but do not include Improvement District Facilities.

1.07 "**DSO**" means distribution system operator and is the District employee serving under the direction of the Water Operations Manager in regard to the control and delivery of water.

1.08 "**General Manager**" means the District employee who oversees the day-to-day operations of the District. The General Manager is appointed by and reports directly to the Board.

1.09 "**Improvement District**" means an improvement district formed under the CWC pursuant to the Irrigation Improvement Act.

1.10 "**Improvement District Facilities**" include conduits, pumps, wells, structures, and other facilities owned by an Improvement District.

1.11 "**Landowner**" means holder of title or evidence of title to land.

1.12 "**Person**" means any person, firm, association, organization, partnership, business trust, corporation, or company.

1.13 "**Pollutant**" means any foreign or deleterious substance or material including, but not limited to, garbage, rubbish, refuse, animal carcasses, matter from any barnyard, stable, dairy or hog pen, herbicides, pesticides, or any other material which is offensive to the senses or injurious to health, or which pollutes or degrades the quality of the receiving water as defined by federal, state or local law.

1.14 "**Private**" means any interest belonging to, restricted to, or intended for an individual or group of individuals benefit.

1.15 "**Private Facilities**" includes drains, dams, bridges, structures, wells, conduits, pumps, reservoirs, valves, gates, weirs, and any other facilities not owned by the District belonging to, restricted to, or intended for an individual or group of individuals benefit.

1.16 "**Shall**" is mandatory and "may" is permissive.

1.17 "**Tenant**" means a person or entity that leases, rents, or sharecrops land from a Landowner.

1.18 "**Vehicle**" means any motor vehicle, self-propelled vehicle, motorcycle, motorized bicycle, or all-terrain vehicle.

1.19 "**Water Allotment**" means the maximum quantity of water which is set annually whenever necessary by the Board for each acre of land within the District which can receive District water from District Facilities directly or through Improvement District or Private Facilities.

1.20 "**Water Operations Manager**" means the District employee serving under the general direction of the General Manager in regard to the management and supervision of the Water Operations Department. Used interchangeably with "Watermaster".

1.21 "**Water User**" means the person responsible for the distribution and control of water applied to the irrigated parcel.

SECTION 2: ENFORCEMENT OF RULES & REGULATIONS

2.1 General

2.1.1 Landowners, Water Users, and Tenants should realize that it is in their interest that District personnel perform their duties and maintain order and control in the distribution of water. Cooperation in this effort is the key to satisfactory service to all. District personnel have been instructed to carry out their duties without favor or bias to any person and to do so in a courteous and respectful manner.

2.1.2 All Landowners, Water Users, and Tenants, by applying for or receiving water service from the District, agree to be bound by and to comply with all rules and regulations of the District, as adopted from time to time by the Board.

2.1.3 All District employees are charged with enforcing the rules and regulations as established by the District and its Board.

2.2 Failure to Comply with Rules & Regulations

2.2.1 Failure or refusal by any Landowner, Water User, or Tenant, to comply with the rules and regulations governing the distribution of water within the District's service area, or any part thereof, may be sufficient cause for curtailment or termination of District water delivery.

2.2.2 Interference by any Landowner, Water User, or Tenant with a District employee, officer, Board of Director or authorized agent in the discourse of their assigned duties may be sufficient cause for curtailment or termination of District water delivery to any and all lands of such Landowner, Water User, or Tenant.

2.2.3 The District reserves the right to terminate or discontinue the delivery of District water supplied to any parcel of land if the condition of the land or conduits present an immediate danger to any person, to the general public, or to any property, including, but not limited to, the flooding of property.

2.2.4 Compliance with each and all of these rules and regulations shall be a condition precedent to the delivery of District water. The Board retains the authority to rule in all circumstances that are not specifically contained or addressed in these rules and regulations.

2.3 Restoration of Service

2.3.1 District water delivery that has been curtailed or terminated shall be restored upon full compliance with the rules and regulations.

2.4 DISPUTES

2.4.1 Where a DSO or other District employee and a Landowner, Water User, or Tenant cannot agree, the matter shall be referred to the Water Operations Manager. If the decision of the Water Operations Manager is unacceptable to the Landowner, Water User, or Tenant the dispute may be taken to the General Manager and if not settled by the General Manager the matter may be presented to the OID Water/Engineering Committee and/or the Board for hearing and discussion. The decision of the Board in all cases shall be final and binding in the absence of court proceedings.

SECTION 3: FACILITIES

3.1 Control of Facilities

3.1.1 All District Facilities are under the exclusive control, direction, and management of authorized District personnel. At no time shall any unauthorized person, private or public, interfere with, regulate, or control any District Facility.

3.1.2 Facility inquiries in regard to control shall be directed to the Water Operations Manager.

3.1.3 No opening or connection shall be made in any District facilities until an application, in writing, has been submitted to the District and approved by the General Manager.

3.2 Operation of Facilities

3.2.1 Limits of Liability

3.2.1.1 The District's responsibility for water shall cease when the water is diverted into any Private or Improvement District Facility.

3.2.1.2 The District shall not be liable for any nuisance or neglect, wasteful or other use, or handling of water by any recipient or user thereof.

3.2.1.3 The District shall not be responsible for any trash, debris, or other matter that may flow or accumulate in the water. The District shall not be responsible for any interference with, decrease in the operation or capacity of, or damage to facilities, public or Private, as a result of such trash, debris, or other matter.

3.2.1.4 The District is not a guarantor of service and shall not be liable for any damage any person may suffer as a result of insufficient water, water fluctuations, untimely delivery of water nor water not delivered.

3.2.2 District Facilities

3.2.2.1 The operation of District Facilities shall be at the discretion of the DSO. This includes the determination of the safe operating level, capacity or pressure in any District Facility.

3.2.2.2 Operation of the District Facilities are subject to change at any time without prior notice.

3.2.3 District Control Structures

3.2.3.1 The District's center gates, valves, weirs, flashboards, and other control devices not listed here, are to be operated by the DSO. The DSO may adjust any such facility at any time without prior notice to ensure their safe operation.

3.2.3.2 DSO's authorized to operate control structures within their defined service area may at their own discretion authorize trained non-district personnel permission to adjust the settings themselves. Permission is granted to perform the activity once, and shall not establish any precedence for future consideration.

3.2.3.3 District personnel are authorized to take any measure necessary to secure control structures including, but not limited to, the use of locks and chains.

3.2.4 District Reservoirs

3.2.4.1 Reservoirs, including reclamation ponds, shall be operated by the appropriate DSO. The District does not maintain specific water levels in any reservoir or holding pond. The reservoirs are to be operated in conjunction with water deliveries and to supplement said deliveries to provide efficient and economical delivery of water.

3.2.4.2 Inflow and outflow rates of reservoirs shall be determined by the DSO in order to maximize efficiency of operations.

3.2.5 District Pumps

3.2.5.1 The District owns and operates a number of deep well pumps, river pumps, and reclamation pumps to supplement the water supply diverted from the Stanislaus River at Goodwin Dam. During the water season these pumps will be operated at the discretion of the District and coordinated by the DSOs with the operation of the District's Facilities.

3.2.5.2 The operation of District owned pumps depend on a variety of circumstances. The DSOs shall determine the most efficient and appropriate times to operate these pumps.

3.2.6 District Reclamation Pump Facilities

3.2.6.1 Reclamation pumps shall be used as a method of water conservation.

3.2.7 District Drainage Pump Facilities

3.2.7.1 District drainage pumps are to be operated when upstream water levels threaten or have the potential to cause significant damage to public or Private Facilities or where significant problems could result from the presence of the water.

3.2.7.2 The District shall be notified prior to Private drainage pump operation and discharge into District Facilities. Non-emergency operation notification shall be at least 24 hours prior to pumping event. Emergency operation notification shall be given as early as possible before the pump is put into operation.

3.2.8 District Deep Wells

3.2.8.1 Deep wells may be used as a permanent or supplemental source of water. Operation of deep wells to deliver water shall not constitute or set precedence for future deliveries.

3.2.9 District Booster Pumps

3.2.9.1 The DSO shall determine the most efficient and appropriate use of the District's booster pumps in order to deliver scheduled water to maximize the benefit of booster pump operation.

3.2.9.2 District booster pumps shall only be used when it is impractical or not possible to deliver gravity water.

3.2.10 District Turnouts

3.2.10.1 The operation of turnouts from District Facilities shall be at the discretion of the responsible DSO.

3.2.10.2 All turnouts from District Facilities shall have a positive shut-off mechanism easily accessible to the DSO within the District rights-of-way.

3.2.10.3 The Water Operations Manager has the authority to lock or secure any and all turnouts from District Facilities at any time.

3.2.10.4 DSOs have the authority to allow for the operation of turnouts by Landowners, Water Users, and Tenants. Upon granting permission, the DSO will strive to ensure that the turnout was operated appropriately and as directed, as soon as time permits. Permission to operate turnouts from District Facilities shall not establish any precedence for future events.

3.2.10.5 Any turnouts constructed in a District Facility at the Landowners' expense shall thereafter, at the option of the District, become the property of the District. Private turnout ownership on District Facilities shall be specified in writing.

3.2.11 Private Facilities

3.2.11.1 All Private Facilities shall be constructed and maintained by the owner in accordance with acceptable industry standards and approved by the District at the District's discretion.

3.2.11.2 The operation of Private Facilities is the sole responsibility of the Landowner, Water User, or Tenant and shall be in such a manner as to prevent any unreasonable or non-beneficial use of water and damage to third parties.

3.2.11.3 All Private pumps that operate out-of-District Facilities shall be coordinated through the District with respect to time and extent of use. Lack of coordination may result in a cessation of water to the Private pump. All such pumps shall be operated solely at the owner's risk and the District shall not be liable for any failure of such installation.

3.2.11.4 The DSO shall deliver the scheduled amount of water to the Private Facility. It shall be incumbent of the Landowner, Water User, or Tenant to control the actions of individuals taking water from the Private Facilities. Any disputes of water allocation downstream of the District delivery point shall be resolved among the owners of the Private Facility. The District does not guarantee or ensure the apportionment of deliveries among people on Private Facilities.

3.2.11.5 The District shall not be responsible for any damages to Private Facilities caused by water hammer. Water hammer is a result of poor system design, for which, the District shall not be liable.

3.2.11.6 All Private Facilities shall be free from obstructions and properly maintained to allow sufficient capacity to convey the reasonable flow of water requested by any Landowner, Water User, or Tenant in an effort to minimize the potential for evident damage, overflow, undue seepage, and any other unreasonable or non-beneficial use of water.

3.2.11.7 In the event that an owner(s) of a Private or Shared Private Facility that is in disrepair has been notified of the inadequacy of the facility by the District and has failed to make the necessary improvements of said facility, the District, at its discretion, may complete the necessary improvements in order to protect the various interests of the District. In such an event, the District shall bill the owner(s) of the Private Facility for any and all costs associated with making the necessary improvements and assess any non-payment penalties as considered appropriate.

3.2.11.8 The District may refuse to deliver water to any person not complying with an obligation to maintain or help maintain any Private Facility and may deliver water to other people through the Private Facility who have met the maintenance obligations.

However, the District shall maintain the right to discontinue the delivery of any water to all people through the Private Facility until such time when the facility is back in proper condition as determined solely by the Water Operations Manager.

3.2.11.9 The District will not contribute to the cost of improving Private Facilities or improve District Facilities for the benefit of Landowners, Water Users, or Tenants unless approved by the Board. Work shall not begin on cooperative improvements until a written agreement is approved by the Board and the Landowner's, Water User's, or Tenant's share of the improvement cost is paid to the District.

3.2.11.10 Any operation and maintenance of Private Facilities by the District shall not establish any ownership or set any precedence for any future operation or maintenance of said facility.

3.2.12 Improvement District Facilities

3.2.12.1 All Improvement District Facilities shall be constructed and maintained in accordance with District Standards.

3.2.12.2 All Improvement District Facilities shall be free from obstructions and properly maintained to allow sufficient capacity to convey the reasonable flow of water requested by any Landowner, Water User, or Tenant in an effort to minimize the potential for evident damage, overflow, undue seepage, and any other unreasonable or non-beneficial use of water.

3.2.12.3 The District may shut off the delivery of water to any Improvement District Facility not meeting the conditions of Rule and Regulation No. 3.2.8.2 above and require the Improvement District Facility to be cleaned, repaired, or reconstructed before delivery of water is reinstated.

3.2.12.4 Improvement District Facilities may be cleaned or repaired by the District at the expense of the Improvement District when deemed necessary by the District.

3.3 Use of District Facilities

3.3.1 General

3.3.1.1 Absent of the District's express written approval, Private use of District Facilities is strictly prohibited.

3.3.1.2 Any and all use of District Facilities by any person or agency, public or private, shall be solely permitted by written permission of the District and shall be in compliance with any and all applicable federal, state, and local laws, statutes, regulations, and other terms and conditions properly established.

3.3.1.3 At no time shall District Facilities be used for recreation purposes, including but not limited to, swimming, diving, hunting, or fishing.

3.3.1.4 Except as otherwise specifically permitted by written agreement with the District, water contained within District Facilities, either flowing or non-flowing, shall at no time be used for purposes of stock water. It is the sole responsibility of livestock owners to provide a source of water for livestock outside District rights-of-way.

3.3.1.5 Livestock permitted on District canal banks frequently cause damage thereto. The owners of the livestock and the land on which they are pastured are liable for such damage and shall promptly make repairs in a good and workmanlike manner. If after notification has been given repairs are not promptly so made, the District may make them and bill the owner of the livestock or land involved for the cost thereof. Unpaid balances on invoices for damages to District property will be collected in accordance with the Irrigation Water Service and Related Fees Policy. Additionally, Rule and Regulation No. 4.3.5 shall immediately become applicable.

3.3.2 Drainage Facilities

3.3.2.1 No surplus irrigation water, storm water, wastewater, tile drainage, nor any other water or substance shall be drained, dumped, pumped, siphoned, or otherwise discharged directly or indirectly into any District Facility without the prior written permission of the District. In granting permission to discharge, the District may impose conditions, including, without limitation, the right of the District to approve and monitor the discharger's measurement facilities. Permission to discharge shall be revocable at any time at the District's discretion.

3.3.2.2 Water and other substances, permitted through written agreement that are discharged into District Facilities shall meet all applicable federal, state, and local water quality standards and provisions.

3.3.2.3 District approval to discharge into District Facilities shall only be granted to those parties who have coverage from the Regional Water Quality Control Board under a waiver or waste discharge permit. Proof of coverage shall be provided to District upon request. Having coverage from the Regional Water Quality Control Board does not guarantee approval or establish a right to discharge into District Facilities.

3.3.2.4 The rate and quantity of discharge into any District Facility may be subject to limitations based on the capacity of the conduit. The

Water Operations Manager shall set such limitations whenever necessary.

3.3.2.5 All Private discharge facilities shall be constructed at the sole expense of the discharger, and must be in accordance with the most current District Standards.

3.3.2.6 All approved Private discharges into District Irrigation Facilities shall be limited to one 6 inch diameter outlet per 40 acres of irrigated land. All approved Private discharges into District Drainage Facilities shall be limited to one 8 inch diameter outlet per 40 acres of irrigated land, unless otherwise dictated by topography as determined by the District Engineer. Smaller parcels may be permitted a proportionately sized surface drain outlet. The District, at its discretion may require the outlet to be gated such that any authorized District employee may close and/or lock the outlet in the event that such control is warranted to protect water quality or for the benefit of the District's operations.

3.3.2.7 Where excessive runoff from lands receiving District water is entering District Facilities, the District may reduce the quantity of water delivered in an effort to reduce the drainage flows or require the Landowner, Water User, or Tenant to install special drainage facilities to regulate the flow into the District Facilities. The District may also require a Landowner, Water User, or Tenant to cease all such runoff into District Facilities whenever necessary for the District's or the public's interest, including, but not limited to, ensuring water quality standards, implementation of drought response measures, preventing injury or damage, or performing repairs or maintenance.

3.3.2.8 All existing discharges into District Facilities, not currently covered by a written agreement, shall be subject to the District's current terms and conditions.

3.3.2.9 Dischargers are solely liable and responsible for meeting and complying with all local, state, and federal regulations for water quality and groundwater pumping. Dischargers agree to indemnify, defend, and hold harmless the District, its Board, officers, employees, and agents against all liability, claims, damages, and costs (including reasonable attorney fees) relating to the quality of water discharged by the discharger.

3.3.3 Transportation Use of Canals and Drains

3.3.3.1 No person or agency, public or private, shall transport any water or other substance through District Facilities without the prior written approval of the District. In granting permission to transport water or other substances, the District may impose reasonable conditions, including, without limitation, the right of the District to set flow and water quality limits and to require monitoring at the dischargers expense. Permission to transport shall be revocable at any time and as determined by the General Manager.

3.3.3.2 Water and other substances, permitted through written agreement to be transported via District Facilities, shall meet all applicable federal, state, and local water quality standards and provisions.

3.3.3.3 All transport facilities shall be constructed at the sole expense of the transporter, and must be in strict accordance with the most current District Standards.

3.3.3.4 All existing transportations through District Facilities not currently covered by a written agreement shall be subject to the District's current terms and conditions.

3.3.4 Pumps

3.3.4.1 No person or agency, public or private, shall be allowed to operate or control any District owned pumps without the written approval of the Water Operations Manager. Written authorization to operate District owned pumps shall be considered a distinct and solitary event and shall not establish any right or precedence for future events or requests.

3.3.4.2 A written request shall be submitted to the Water Operations Manager at a minimum of ten (10) days in advance of the proposed pumping event. The use of District owned pumps is subject to termination at any time for any reason as determined by the Water Operations Manager.

3.3.4.3 The Water Operations Manager is to ensure that the person granted permission to operate the District owned pump is properly trained by District staff and knowledgeable regarding the safe and responsible operation of the pump and its components.

3.3.4.4 During periods when the District is not using a District pump, requests may be made with the District for Private rental of the pump in accordance with the following:

a. Pump rentals will be granted in the order in which requests with accompanying payment are received.
b. Rental time will be determined and assigned by the Water Operations Manager.
c. No extensions of rental time assigned will be granted unless there is no one waiting for the use of the pump.

d. No renter will be allowed to rent the same pump for a second period until all those on the waiting list have had the opportunity to use the pump.

3.3.4.5 Once a District pump is rented and started, no refunds will be made for water pumped that is not used by the renter unless regular scheduled gravity water or District pumped water becomes available, thereby causing an early termination of the rental period. A refund of the unused portion may be provided at the District's discretion upon request. All requests for refunds must be made in writing within fifteen (15) days of the termination of delivery.

3.3.4.6 The District may at its discretion limit water supplied by the District pump rental to not more than 2.4 inches per acre per irrigation if that pump is in demand by other water users.

3.3.4.7 The District reserves the right to not rent a pump or to cancel a rental and refund the deposit made if the District pump use will interfere with District maintenance or other District operations.

3.3.4.8 The District will have complete control of turning District pumps on and off and servicing them.

3.3.4.9 The District has complete control of setting up and operating any other District Facilities that will be used during pump operations. The pump renter shall be responsible for monitoring and reporting to the District any interruption in delivery.

3.3.4.10 If the District pump is off due to power failure, breakdowns, or other causes, the down time will be added at the end of the rental period.

3.3.4.11 The charges for all District pump rentals will be determined solely by the District.

3.3.4.12 The rental period begins with the "time on" and ends with "time off" at the District pump. No allowances will be made for time required to fill District and/or Private Facilities; however, the time required to fill District and/or Private Facilities may at the District's discretion be prorated among those using the water.

3.3.4.13 Payment of the District pump rental application fee must accompany the application for the pump rental. No application will be recognized until the payment is received in whole.

3.3.5 Rights-of-Way

3.3.5.1 The standard District rights-of-way are as follows:

Main Canals	100' (centered on canal)
Canals/Drains	60' (centered on canal/drain)

Pipelines	30' (centered on pipeline)
Pipelines adjacent to roadways	20'
Pipelines adjacent to PUE	15'
Pump Sites	40' (square centered on pump)

3.3.5.2 District canal roads, rights-of-way, easements, and lands owned by the District are for the exclusive use by authorized District employees and agents, and other authorized persons permitted by the District in accordance with these rules and regulations. No unauthorized vehicle shall be permitted on or within District canal roads, rights-of-way, easements, or lands owned by the District.

3.3.5.3 Persons requiring a specific use of a District canal road, right-of-way, easement, or land owned by the District may apply to the District for written permission prior to such use. Notwithstanding any permission granted by the District, use of District canal roads, rights-of-way, easements, and lands owned by the District is at the sole risk of the user.

3.3.5.4 The following persons are authorized to operate a vehicle upon a District canal road, right-of-way, easement or land owned by the District: (1) Persons whose property is directly adjacent to the District canal and to whom permission for ingress and egress to the property has been granted by the District; and (2) Any sheriff, police, fire, or public safety personnel on official business with the underlying landowner's permission.

3.3.5.5 Any person entering upon a District canal road, right-of-way, easement or land owned by the District with or without authorization does so at their own risk and assumes all risks associated therewith and by such action accepts the responsibility for any resulting damage to District and/or Private property.

3.3.6 Crossings/Culverts/Bridges

3.3.6.1 Except as otherwise specifically permitted by the District in writing, no person shall cross any District Facility, including without limitation any canal, pipeline, weir, bridge, or other crossing, except those clearly marked for public use.

3.3.6.2 No improvements such as buildings, bridges, gates, cross canal pipes, facilities, etc., shall be constructed or placed in or over any District Facility without the District's prior written approval.

3.3.6.3 All such permitted buildings, bridges, gates, cross canal pipes, or other cross canal facilities shall be the responsibility of the Landowner and constructed, erected, installed, and maintained at the Landowner's expense and built in accordance with the most current District Standards.

3.3.6.4 If a culvert crossing is necessary for efficient District operational and maintenance needs, and no other more economical means exists to provide such economical service, the Districts may, at its discretion, provide the labor and equipment necessary for such an installation if the landowner provides the pipe. This is not applicable for circumstances involving parcel splits, subdivisions, or development of lands.

3.3.6.5 The District, at its discretion, may contribute proportionately to the maintenance cost of crossings essential for use by the District. This contribution shall not establish any ownership or set any precedence for any future contribution.

3.3.7 Charges

3.3.7.1 Any person or agency, public or private, shall pay any and all charges established by the District for the non-District use of District Facilities. Payment must accompany the request for approval prior to use. Therefore any request submitted without accompanying payment will be deemed incomplete and discarded.

3.3.7.2 The District shall bill for any and all additional charges resulting from the non-District use of District Facilities that are not covered by original payment.

3.3.7.3 The District assumes that the user is properly prepared to use the specific District Facility for the duration of the requested time. The District shall not refund or credit any user for downtime resulting from operational decisions made by the user. In the event of a District Facility failure not resulting from inappropriate use or ill-treatment of the District Facility, a credit shall be established that is directly proportional to the duration of the downtime.

3.3.7.4 A written petition for a partial refund or credit may be submitted to the Board within fifteen (15) days of the nonscheduled termination of use.

3.4 Access to Lands

3.4.1 The DSOs and other authorized agents of the District shall have free access at all times to all Private Facilities and lands being irrigated for the purpose of determining whether or not they are in satisfactory condition to handle the water and whether the water is being used reasonably and beneficially. Where access is denied by the Landowner, Water User, or Tenant, water delivery may be curtailed or terminated until the request for access has been granted.

3.4.2 The District shall be granted access to any lands within its sphere of influence when responding to an emergency upon notification from law enforcement or other person.

3.4.3 If the District holds a right-of-way or easement across Private land for the operation and maintenance of a District Facility, the law provides that the District shall have certain secondary rights, such as the right to enter upon the 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.

3.5 Encroachments

3.5.1 No trees, vines, shrubs, corrals, fences, buildings, bridges, or any other type of encroachment shall be planted or placed in, on, over, or across any District Facility; or the right-of-way therefor except pursuant to specific written authority from the District.

3.5.2 Any encroachment, authorized or otherwise; in, on, over, under, along, or across any District Facility or right-of-way that interferes with the operation or maintenance of said facility may be removed by the District, at the sole expense of the encroacher. Authorization for an encroachment will end if and when said encroachment is determined by the District to be in interference with District operations.

3.6 Construction of Private Irrigation Facilities

3.6.1 No Private stop gates, stand pipes, turn out pipes, valves, pumps or other Privately owned facilities shall be connected to or placed through or on District Facilities unless and until all the following have occurred:

a. A written application setting forth the type and specification of the installation to be made is filed with the District.
b. The application and specifications are approved in writing by the District prior to start of construction.
c. If any of the work is to be performed by District personnel or under District contract, the full estimated cost inclusive of any contingencies is to be paid to the District by the applicant in advance; however, the applicant shall be responsible for the actual costs of construction irrespective of the amount of the estimate. Upon completion, the applicant shall pay the difference between the estimated amount and the actual costs if the estimate is exceeded. If the actual cost is less than the estimate, the applicant will receive a refund from the District in the amount of the overpayment.
d. In order that all involved be protected, in instances and to the extent the Board deems appropriate, a written contract is entered into

specifying the conditions of performing the work and conditions applicable to the use of the District's Facilities.

e. If the work can affect the flow of water in District Facilities, the work shall only be performed during times approved in advance by the District. Ordinarily, in the absence of an emergency, such work will not be permitted during the water season which can start as early as March 1st and end as late as October 31st.

3.6.2 No Private irrigation system improvements, including without limitation diverting gates, weirs, pump intakes, mechanical screens or structures of similar nature, shall be installed, constructed or placed in, on, over, under, along, or across any District Facility or right-of-way unless prior written permission, in the form of an encroachment permit, has been granted therefor by the District. No permitted person or agency, public or private, shall acquire any rights in the District's Facilities or rights-of-way other than those set forth in a written agreement with the District. Permittees shall, at their sole expense, upon receipt of notice from the District, promptly relocate or remove any improvement. In the event that the permittee fails to do so, the District reserves the right to perform such relocation or removal at the permittee's sole expense.

3.6.3 No Private improvements, including without limitation buildings, bridges, culverts, gates, corrals, landscaping, recreational pools, cross-canal conduits, or structures of similar nature, shall be planted, installed, constructed, or placed in, on, over, under, along, or across any District Facility or right-of-way unless prior written permission has been granted therefor by the District. No permitted person or agency, public or private, shall acquire any rights in the District's Facilities or rights-of-way other than those set forth in a written agreement with the District. Permittees shall, at their sole expense, promptly upon receipt of notice from the District, relocate or remove any improvement. In the event that the permittee fails to do so, the District reserves the right to perform such relocation or removal at the permittee's sole expense.

3.6.4 Except where otherwise specified by a written agreement with the District, all permitted Private improvements, irrigation or otherwise, shall be installed, constructed or placed in, on, over, under, along, or across any District Facility or right-of-way at the sole expense of the permittee and constructed in accordance with the most current District Standards.

3.7 Design of Irrigation Facilities

3.7.1 All new Private or Improvement District Facilities are to be approved, in writing, by the District Engineer prior to the start of construction. Plans and construction details shall be submitted to the District along with payment of any charges and a written request.

3.7.2 The District Engineer shall have the authority to approve any new Private or Improvement District Facilities. The design of said facilities shall be required to meet the flow requirements of the land being served without impacting operations of the District or other Landowners, Water Users, or Tenants. The District's rights hereunder to review and accept the plans shall not impose any duties or obligations on the District, nor shall such rights relieve the Landowner, Water User, or Tenant of the sole responsibility for the facilities' plans, schedules and installations, and construction and placement of work.

3.7.3 Landowners, Water Users, or Tenants shall be required to install, operate, and maintain pumps, at their sole expense, for all irrigation improvements that cannot utilize District delivered gravity water.

3.8 Improvements/Relocation of Irrigation Facilities

3.8.1 If extensions of District facilities, increases in capacity or additional outlets are desired, prior approval by the District is required and the desired construction or modification must be done in accordance with the most current District policy and District's Standards and Specifications at the sole expense of the person desiring the work to be done. The estimated cost inclusive of any contingencies shall be deposited with the District prior to commencement of work. Where pipelines are installed in lieu of open ditches, one outlet per 40 acres shall be installed at District expense. All improvements shall become the property of the District, unless otherwise agreed in writing.

3.8.2 Any person desiring to build on or develop the area over a District Conduit or to move or relocate a District Facility, must apply in writing to the District and receive written approval from the District prior to commencement of work. Once permission from the District is granted, all construction shall be performed at the sole expense of the applicant by the District or the landowner or the landowner's contractor at the District's discretion and in accordance with the most current District Standards and Specifications.

SECTION 4: DUTIES OF WATER USERS

4.1 Responsibilities

4.1.1 All land to be irrigated shall be properly prepared to reasonably and beneficially receive water.

4.1.2 Landowners, Water Users, and Tenants shall maintain Private Facilities in a manner that is conducive to the reasonable and beneficial use of supplied water. The Landowner, Water User, or Tenant is responsible for ensuring that all Private Facilities are in an acceptable working condition, able to receive water at the established start time, and capable of continued use for the duration of the irrigation event.

4.1.3 Landowners, Water Users, and Tenants shall be responsible for the control and distribution of water to their lands at all times after the water is diverted from a District Facility. As determined by the District, where control is not appropriately exercised by the Landowner, Water User, or Tenant, the District may require that a person be present at all times during irrigation events.

4.1.4 Landowners, Water Users, and Tenants shall be responsible to open and close all Private Facilities at the conclusion of the irrigation event.

4.1.5 Landowners, Water Users, and Tenants are responsible for communicating with the DSO. The District requires that the DSO be notified of any planned or unplanned changes that may occur during the irrigation event. At a minimum, the Landowner, Water User, or Tenant is responsible for notifying the DSO four (4) hours prior to any change in, or termination of, the irrigation event.

4.1.6 The DSO may require any Landowner, Water User, or Tenant, at the end of an irrigation event, to notify the Landowner, Water User, or Tenant next in line for the receipt of water.

4.1.7 For the purposes of determining operation schedules and water demand, the District requests that Landowners, Water Users, and Tenants submit a crop declaration to the DSO prior to or during the first watering event of the water season whenever changing crop types from year-to-year. The crop declaration would ideally include without limitation the type of crop, number of acres of each crop type and an estimate of the annual crop water requirement.

4.1.8 All Landowners, Water Users, and Tenants are responsible for providing the District with the most current and accurate contact information. At a minimum the District requires that Landowners, Water Users, and Tenants provide a mailing address and telephone number.

4.2 Use of Water

4.2.1 All District supplied water must be applied efficiently and used reasonably and beneficially.

4.2.2 All District supplied water shall be used for irrigation purposes, except where a written agreement has been entered into between the Landowner, Water User, or Tenant and the District.

4.2.3 Any Landowner, Water User, or Tenant who wastes water on roads, vacant land, or land previously irrigated, either willfully, carelessly, or on account of defective or inadequate conduits or facilities, or inadequately prepared land, or who floods a portion of the land to an unreasonable depth or amount in order to irrigate other portions, or floods across one parcel to irrigate another parcel, may be refused District water until such conditions are remedied.

4.2.4 Water shall not be used on lands outside of the District boundaries except where agreed upon in writing with the District. Landowners, Water Users, and Tenants shall not use water on lands outside the District that was originally applied on lands within the District, whether by routing through a Private Facility, first flowing it across land within the District, recapturing it from drains, or otherwise. The District has the authority to terminate any current or future water use if it is determined that the aforementioned event has occurred. The District may also require that Private Facilities be constructed to ensure that future deliveries are maintained on the property to which it was originally diverted.

4.3 Charges

4.3.1 The Board shall, annually, establish the rates of charges for water and the payment due dates.

4.3.2 All water charges, Improvement District charges, and other irrigation or drainage related charges shall be due and payable as stated by Board resolution and notices in billing statements. Typically, water charges are billed annually in early November and may be paid in two installments. The first installment is due on December 20th and the second installment is due on June 20th pursuant to §26076 of the California Water Code.

4.3.3 Accounts with delinquencies will be charged penalties and interest in accordance with the Irrigation Water Service and Related Fees Policy and the current Agricultural Water Users Rates District Resolution.

4.3.4 Landowners are responsible for all charges regardless of whether or not the land is being rented, leased, or farmed by a third party.

SECTION 5: DISTRIBUTION OF WATER

5.1 Allocations & Entitlements

5.1.1 Irrigation water is made available each year starting as early as March 1st and ending as late as October 31st. The start and end of the irrigation season shall be approved by the Board.

5.1.2 Water shall be distributed equitably and fairly to Landowners, Water Users, and Tenants within the District who have paid all charges and penalties therefrom.

5.1.3 No Landowners, Water Users, and Tenants shall receive or be entitled to a greater amount of water than can be reasonably and beneficially used.

5.1.4 The District does not and cannot guarantee the quality of water that is delivered to any Landowner, Water User, and Tenant, and will not be liable for any damages that may result from the application of the supplied water.

5.1.5 The District may, if operational conditions warrant, vary the duration and flow rate so long as the Landowner, Water User, or Tenant is afforded a reasonable opportunity to utilize a fair allotment of irrigation water.

5.2 Scheduling & Notification

5.2.1 General

5.2.1.1 Distribution of water shall generally be by rotation, but where appropriate, the Water Operations Manager has the authority to implement variations to the delivery schedule and/or method.

5.2.2 Rotational Deliveries

5.2.2.1 Rotation schedules which establish the general duration between each rotational delivery shall be prepared by the Water Operations Manager under the direction and supervision of the General Manager. Preliminary rotation schedules shall be prepared prior to the start of the irrigation season. Upon request, rotation schedules shall be made available to Landowners, Water Users, and Tenants taking delivery and utilizing water from District Facilities. The District reserves the right to revise the rotation schedule at any time during the irrigation season.

5.2.2.2 Water deliveries under the rotation schedule shall be made on the basis of continuous and steady use of water during all days and nights, including holidays. It shall be incumbent upon the Landowner, Water User, and Tenant to fully utilize water during the allotted time and to relinquish the water at the end of the scheduled time period unless otherwise approved by the DSO. In order to prevent the waste of water and damage to District Facilities it is mandatory that every Landowner, Water User, and Tenant notify the DSO a minimum of 4 hours prior to the originally scheduled end time if an irrigation event is requested to be discontinued or extended.

5.2.2.3 The DSO shall provide as much advance notice as possible to Landowners, Water Users, and Tenants regarding the approximate time that water will be delivered. However, there is potential for unforeseen operational issues and interruptions to occur which may require that the Landowners, Water Users, and Tenants, on short notice, take the delivered water at the time it is available by the DSO or declare a pass on the rotation. The DSO will strive to provide a minimum of twelve (12) hours' notice whenever feasible to do so.

5.2.2.4 In the event that the Landowner, Water User, or Tenant cannot be contacted, located, or otherwise notified of the availability of water, the DSO shall declare that the Landowner, Water User, or

Tenant has passed and will not receive water until the next regularly scheduled rotation.

5.2.2.5 Any person who takes water out of turn without the permission of the DSO forfeits the right to water at the next regular rotation and may become subject to criminal prosecution and/or civil liability under Penal Code §498 and §592.

5.2.3 Non-Rotational Deliveries

5.2.3.1 Landowners, Water Users, and Tenants may request to receive water on a non-rotational delivery schedule. The request may be required to be made in writing and submitted to the Water Operations Manager for review and approval if deemed appropriate.

5.2.3.2 Authorization of non-rotational or "steady head" delivery is not a standard operation. Non-rotational deliveries shall be considered a special accommodation and shall not establish any precedent or create any right for future deliveries.

5.2.3.3 The Water Operations Manager reserves the right and has the authority to establish a non-rotational delivery. In consideration of establishing a non-rotational delivery, the Water Operations Manager shall determine the potential impacts of the delivery adjustment. Non-rotational deliveries shall not impact the District's ability to equitably distribute water to all Landowners, Water Users, and Tenants.

5.2.3.4 Non-rotational deliveries shall not be allowed to negatively impact the District's ability to deliver water economically and efficiently. In the event that any adverse impact is identified the Water Operations Manager may suspend the non-rotational delivery and re-establish a rotational delivery schedule.

5.2.3.5 At no time shall non-rotational Landowners, Water Users, and Tenants be permitted to use water in a manner that is not reasonable and beneficial. In the event that excessive ponding, runoff, or any other waste of water is identified, the DSO shall reduce the delivered flow and/or duration and notify the Water Operations Manager. If the issue persists the Water Operations Manager shall provide a written warning to the Landowner, Water User, and Tenant, and is authorized to enact the necessary sanctions to ensure the reasonable and beneficial use of water.

5.2.4 Specialty Crop Deliveries

5.2.4.1 Any Landowner, Water User, and Tenant who desires irrigation water on a tailored delivery schedule in order to grow a specialty crop may be required to submit a detailed application to the District for consideration.

5.2.4.2 Surface irrigation water is not available between November 1st and March 1st due to water right limitations. Water Users desiring to utilize District Facilities to facilitate groundwater or storm water conveyance and delivery to grow winter crops shall submit a request for off-season services. The District reserves the right to approve or deny any request for Private use of any District Facility for any reason at any time.

5.3 Measurement

5.3.1 All measurements of water delivered by the District to a Landowner, Water User, or Tenant shall be made at the last point of control from a District Facility, or at other appropriate locations as determined by the Water Operations Manager.

5.3.2 The DSO is required to measure and maintain documentation of flow rates, duration and other pertinent irrigation event statistics as determined by the Water Operations Manager.

5.3.3 All water measurements performed and documented by the District shall be considered correct in the absence of evidence to the contrary.

5.3.4 The District shall maintain, calibrate, and otherwise properly care for all District measurement structures, equipment, and devices.

5.3.5 The District, as provided by the CWC §22083, has the authority to install or require the installation of irrigation flow measurement devices, equipment or structures at all District turnouts.

5.3.6 District measurement equipment is the property of the District and shall not be tampered with, removed, or otherwise inhibited by any person unauthorized to do so. Any unauthorized person that performs such acts is subject to criminal prosecution under Penal Code §498c.

5.4 Interruption or Refusal of Service

5.4.1 The DSO will make every effort to maintain an adequate flow of water in each District Facility to meet anticipated demands. However, changes in water use due to temperature variation, improper coordination by upstream users during water changes, private booster pump flow variation, local runoff from precipitation, spill water from other facilities, canal breaks, and other emergencies may cause unavoidable fluctuations and interruptions in flow. It is expected that a Landowner, Water User, or Tenant will notify the DSO if water is not available at the time the rotation is scheduled to begin or if the flow is interfered with during the irrigation event. It is also expected that all Landowners, Water Users, and Tenants will cooperate with the Water Operations Manager and/or the DSO in determining the cause of the interruption and will, to the extent practical, assist in correcting the problem.

5.4.2 No additional time shall be granted to Landowners, Water Users, and Tenants who fail to use the water continuously when available during the allotted time. If a Landowner, Water User, or Tenant fails, neglects, or refuses to use the water during the period assigned, it shall not be a valid basis for claiming the right to use water at any other subsequent time. However, if such failure to use water is due to circumstances beyond the control of the Landowner, Water User, or Tenant, particularly if caused by the unavailability of water, the District shall endeavor to make up the lost time insofar as it can be done without unreasonably interfering with the scheduled and equitable delivery of water to other Landowners, Water Users, and Tenants. Any such Landowner, Water User, or Tenant which is unable to divert the full allotment of water shall promptly notify the Water Operations Manager of the desire to divert the remainder of the entitlement.

5.5 Out-of-District Service Agreements

5.5.1 All water delivered to lands outside of the District boundary shall be subject to, without limitation, any and all of the rules and regulations established by the District and provided within this document.

5.5.2 Persons interested in or currently receiving water for application onto lands outside of the current District boundaries are required to submit an application for water service. The application shall be accompanied by any and all fees, charges, or deposits as required by the District.

5.5.3 Applications will be reviewed by the General Manager, Water Operations Manager, District Engineer, and Chief Financial Officer. Upon completion of the review process a recommendation will be made by District Staff and presented to the Board. The Board reserves the right to approve or deny any application for out-of-District water for any reason.

5.5.4 Out-of-District water service is established on an annual basis and is not guaranteed for the duration of any irrigation season. Out-of-District water is declared surplus water for that purpose and is made available, without obligation, to Board approved recipients. Water supplied to out-of-District Landowners, Water Users, and Tenants is a non-guaranteed availability and may be suspended at any time by the District.

5.5.5 The District shall not be liable for any damages that occur from the negligent use or misuse of water supplied to out-of-District Landowners, Water Users, and Tenants.

5.5.6 The District shall not be liable for any damages, economic hardships, or otherwise unfavorable consequences resulting from the suspension of an out-of-District service agreement. Persons entering into agreements for out-of-District water service assume and shall be knowledgeable of all risks associated with not receiving anticipated flows, durations and/or volume of water. The District does not and cannot guarantee any degree or level of service to any out-of-District Water Users.

5.5.7 Approval of out-of-District service agreements are considered conditional and only valid for the term specified on the applicable agreement for out-of-District water, typically 1-year. Approval to receive out-of-District water shall be considered a distinct and solitary event and shall not establish any right or precedence for future events.

5.6 Unauthorized Use of Water

5.6.1 Any person who uses District water without the District's permission may become subject to criminal prosecution and/or civil liability under Penal Code §498 and §592.

5.6.2 Use of District water without the District's permission may result in a forfeiture of the Landowner's, Water User's, and/or Tenant's right to receive water on the next scheduled rotation or planned irrigation event.

SECTION 6: LIABILITY

6.1 District Liability

6.1.1 The District will not be liable for any damages resulting directly or indirectly from any Private Facility or the water flowing therein or by reason of lack of capacity in any Private or District Facility or for negligent, wasteful, careless, or other use of handling of water by Landowners, Water Users, and Tenants.

6.1.2 Nothing in these rules shall be construed as an assumption of liability on the part of the District, its Board, officers, or employees for any damage occasioned by the use of water by any Landowner, Water User, or Tenant or for failure to enforce any of the provisions of these rules.

6.1.3 Most of the water furnished by the District flows through many miles of open ditches, and is subject to pollution, shortages, fluctuation in flow, and interruption in services. District employees are forbidden to make any agreements binding the District to serve an uninterrupted, constant supply of water. All water furnished by the District will be on the basis of irrigation deliveries and every Landowner, Water User, and Tenant putting the water to other uses does so at their own risk and by doing so assumes all liability for, and agrees to hold the District and its officers and employees free and harmless from liabilities and damages that may occur as a result of defective water quality, shortages, fluctuation in flow and interruptions in service.

6.1.4 The District sells water as a commodity only and not as a guaranteed service and will not be liable for defective quality of water, shortage of water, either temporary or permanent, or for failure to deliver water or delay in doing so.

6.1.5 Private pumping by Landowners, Water Users, and Tenants of District supplied surface water is done at the their risk and the District assumes no liability for damages to private pumping equipment or other damages as a result of turbulent water or shortage or excess of water or other causes.

6.1.6 The District assumes no liability for damages to persons or property occasioned through defective Private Facilities.

6.1.7 District Facilities are to be used solely for the purpose of conveying water for use on land and for conveying drainage water away from the land. The use of District Facilities for recreation purposes or play is prohibited.

6.1.8 The water in many District Facilities is cold, swift and deep, and the District Facilities cover so many miles that continuous District supervision of their use in illegal recreational activities is impossible. Landowners, Water Users, and Tenants are prohibited from using District Facilities and canal roads, rights-of-way, easements, or lands owned by the District for swimming or play.

6.2 Water User Liability

6.2.1 Each Landowner, Water User, and Tenant shall be responsible to the District and to third parties for all damages caused by his or her neglect, malicious, and/or careless acts.

6.2.2 It is the duty of each Landowner, Water User, and Tenant to regulate and control the water delivered to his or her land so as to avoid damage to the District or third persons.

6.2.3 Any persons who cause damages or injury to District Facilities as a result of doing or permitting any of the following to be done:

a. Permitting livestock, poultry, or waterfowl to go on or in District Facilities.
b. Burning or otherwise injuring or destroying District Facilities.
c. Dumping or flowing into the District Facilities any rubbish, soil, filth, or other substances that would pollute or impede the flow of water therein.
d. Erecting signs, fences, or other structures on or across or otherwise obstructing District rights-of-way without written permission of the District.
e. Shutting off or reducing the flow of water from a District Facility into a Private Facility or field without giving reasonable prior notice of such proposed action to the Water Operations Manager or DSO in charge.

shall pay to the District all costs incurred by the District in repairing the damage or removing the obstructions.

6.2.4 Under the Penal Code §588, §592, and §607, it is unlawful to do any of the following without authority of the District:

a. Take water from a District Facility with intent to defraud.
b. Disturb any District Facility for the control or measurement of water.
c. Cause to be emptied or placed into any District Facility any rubbish, filth, or obstruction to the free flow of water.
d. Willfully and maliciously cut, break, injure, or destroy any District Facility.

6.2.5 The Landowner, Water User, or Tenant are responsible and liable for any damage caused by the their negligence or careless use of water, or the result or failure by them to properly operate or maintain any ditch, pipeline, or other facility for which they are wholly or partially responsible.

6.2.6 The District's responsibility for water and its associated characteristics, including quality, shall cease when the water is diverted into any Private or Improvement District Facility or property. The District shall not be liable for any damages that occur once the water is diverted from District Facilities.

6.3 Claims for Damages

6.3.1 Claimants must submit claims to the District office on a District claim form within the timeframes established in California Government Code §911.2. Claims will be processed in accordance with California Government Code §§ 900-949.

Attachment B: Oakdale Irrigation District Delivery Measurement Plan

Introduction

Oakdale Irrigation District (OID or District) recognizes the benefits of having farm delivery measurement and uniform standards and procedures for measuring and recording farm water deliveries in order to: (1) provide equitable service to customers, and (2) generate improved operational records for planning and analysis. Regulations requiring a specified level of delivery measurement accuracy were also 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 metergates. Various other flow measurement devices including constant-head orifice (CHO) 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 metergates and CHO gates. OID has completed a field inspection of all turnouts, which in many cases included recording as-built dimensions, and plans to complete an operations analysis to certify that all metergates are operating within the conditions required for flow measurement within the accuracy standards prescribed by 23 CCR §597. Under certain operating conditions, metergates have been specified to be accurate within +/-5 percent through testing performed at the Irrigation Training and Research Center (ITRC) gate calibration facility (ITRC, 2016). Similarly, the published accuracy of CHO turnout structures when operating conditions and structure design follow the criteria set forth in the USBR Water Measurement Manual (2001) is +/-3 percent (USBR, 2001). If the operations analysis identifies turnouts that do not meet the specified conditions, OID will incorporate the appropriate corrective actions on those turnouts into the prioritization of capital improvements to turnouts from internal 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 Distribution System Operators (DSOs) are trained to operate turnouts under the appropriate conditions to meet the measurement requirements of §597.3(a)(1) and §597.3(a) (2) of the Regulation. The upcoming operations analysis will verify correct operations and identify potential locations where further corrective actions are needed. 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 also 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) (2016) found necessary to be accurate to +/- 5 percent which surpasses the +/- 10 percent compliance requirement (23 CCR §597.3(a)(2)). To ensure the highest accuracy, OID has initiated use of the updated water measurement tables provided in that study and checks periodically to see if the ITRC has released new flow measurement tables. 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 (CHO) 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. OID's standard details. Each of these meters come with a calibration certificate (Attachment B-1, B-2, B-3 and B-4) 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.

Rubicon SlipMeters™ and 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.

While a majority of any necessary corrective action is taken according to OID's Standard Construction Details, OID has and will continue to explore other alternative measurement options at the delivery point that are compliant with the Regulation.

Irrigation Deliveries

Turnouts[25] 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 2021. Rules and Regulations Section 3 Subsection 3.4, No. 3.4.1 and No. 3.4.2 describe the District's right for OID Distribution System Operators (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. 3.4.3, 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

[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))

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 the Rules and Regulations No. 3.1.1 and No. 3.2.1.1, 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 Subsection 5.3, No. 5.3.1 and No. 5.3.2 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 that are not on a rotational schedule and, if applicable, to whom to pass the water to 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 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 and the District's SCADA system remotely throughout their shift using a custom-built application. All delivery, landowner and crop data are 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 and are accessible at any time by the DSO via a tablet. 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 and efficient water management and 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 250 SCADA sites, which includes a total of 85 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 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 any turnouts equipped with totalizing flow meters.

Frequency of Measurements

For turnouts, start and end dates and times are noted, gate openings and upstream and downstream levels are measured, and flow is calculated. Pertinent data is recorded by DSOs for each water delivery event; spot flow rate calculations based on measurements are also routinely performed, especially during multi-day delivery events. 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, every 2-3 months 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 according to site-specific change-of-state thresholds (flow, velocity, water level, etc.) and/or a maximum time interval (ranging from 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. As noted in Section 5.5.1 of the AWMP, satellite imagery during the mid-summer months was reviewed over the water budget period to determine that actual irrigated area, on average, is about 92.5% of the total area. As such, for water budget 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 structures and facilities, and any operational changes that are expected to occur as a result. All of OID's DSOs, generally upon hire, also attend 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 open channels, and SCADA. DSOs are typically sent back to the 3 day training course every ±10 years as a refresher. Additionally, OID Water Operations Supervisors and Managers conduct field measurement review bi-annually with the DSOs to ensure proper measurement techniques are being used.

OID regularly reviews all water measurement data collected. Customer bills provide 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 assessed 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. Customers are expected to contact OID if there is an apparent error in the volumetric water delivery data. If upon further review an error is found, OID staff promptly correct the error and issue a revised billing statement. Totalizer meters that provide measurement at delivery points serving multiple customers are also reviewed at the end of the irrigation season to ensure bills to those customers are within +/- 5 percent accuracy. Water data collected by OID throughout the District is used in a District-wide water budget and prior to using these data in the water budget, the data is reviewed for out-of-range values and other possible errors. When assembled in the water budget, the data is again evaluated 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, as well as 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 conveyance system. 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)

With respect to measurement accuracy, field staff completed an analysis in the field to verify that existing gates on CHO 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 DSOs helped to facilitate a comprehensive review to confirm the measurement status at each turnout during the water season. While a majority of these data previously existed in various forms throughout the District's records, it had not been assembled into one comprehensive electronic database. As a result of these efforts, turnouts were assigned an attribute of "measurable" (compliant) when found to be within the published thresholds that ensure accuracy for a given device type under a defined set of best management practices (BMP's) related to construction, maintenance and operation. For the remaining turnouts, the corrective action plan described herein outlines OID strategy to achieve delivery measurement compliant with 23 CCR §597.

OID continuously updates the electronic database as necessary and performs a comprehensive review on an annual basis to ensure correct spatial location, turnout type, parcel assignment, gate size, and "measurable" status. Also, turnouts are removed, adjusted, and/or added to the database as field/irrigation conditions change and as corrective action is taken. An independent spreadsheet is maintained to track turnouts that require corrective action denoting the year action was taken and what specific measures were taken to meet compliance for a given turnout. These measures include installing a new turnout, retro-fitting an existing turnout, removing or plugging a turnout as it is no longer needed, and reviewing a turnout service area to confirm whether it only services parcels owned by individuals whose purpose is landscaping or growing self-consumed crops (which are not subject to the Regulation). In 2020 OID began the process of linking its electronic database to a GIS-based asset management program called CityWorks which will provide OID field staff remote access to the database for real time edits, photo documentation, and collection of any other pertinent data related to the turnout.

Updated Inventory of Results

Since the adoption of OID's 2015 AWMP the District's total number of turnouts has increased by 82 mainly as a result of an additional 4,533 acres of newly annexed and connected lands. Corrective action has been completed on 180 turnouts, with 296 turnouts still in need of corrective action. A comparison between the current turnout inventory and the 2015 turnout inventory is summarized below in Table B-1.

Table B-1. Summarization of Current Turnout Inventory Compared to 2015 Inventory.

Meter Style	**2015 AWMP**		**Current Inventory**	
	Quantity	**Percent of Turnouts**	**Quantity[26]**	**Percent of Turnouts**
Compliant Turnouts and Turnouts Not Subject to the Regulation				
Metergates	1,332	69%	1,275	63%
Constant-Head Orifices	100	5%	92	4%
SlipMeters/FlumeMeters	11	1%	35	2%
Krohne Enviromag 2000	0	0%	37	2%
McCrometer Meter	0	0%	2	0%
Valves on OID Pipeline	0	0%	152	8%
Y/Ws (Inline Gates)	0	0%	78	4%
Other	0	0%	34	2%
Subtotal	*1,443*	*75%*	*1,705*	*85%*
Non-Compliant Turnouts, Corrective Action Needed				
Slide Gate	0	0%	12	1%
Valves on OID Pipeline	269	14%	122	6%
Y/Ws (Inline Gates)	146	8%	104	5%
Other	61	3%	58	3%
Subtotal	*476*	*25%*	*296*	*15%*
Total	***1,919***	***100%***	***2,001***	***100%***

While OID currently delivers water through a total of 2,001 turnouts (Table B-1), approximately sixty (60) percent of OID's active accounts are for parcels that are ten (10) acres or less which cumulatively comprise only twelve (12) percent of OID-served land. Further, only twelve (12) percent of the OID's active accounts are for parcels that are forty (40) acres or more, but these customers represent about sixty (65) 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. Outside of those existing turnouts each year requiring immediate replacement to allow for continued efficient and effective operations and deliveries, the priority for corrective action has been the turnouts that serve the greatest acreage and thus account for the largest total volume of water delivered. Since the completion of OID's 2015 AWMP, staff has compiled a list of the acreage that each turnout serves and organized a prioritized list of turnouts where corrective action is required based on the field inspection and acres serviced.

[26] For Metergates and Constant-Head Orifices, the numbers have decreased from the 2015 AWMP to the current inventory due to replacement of some of these meters with a totalizing flowmeter and the determination that some of these delivery locations serve landscaping or self-consumed crops and are not subject to the regulation.

Of the total 2,001 turnouts, 471 turnouts only deliver water to parcels that irrigate landscaping, gardens, or crops for self-consumption. These parcels are generally 5 acres or less, are typically served on a rotational irrigation schedule and account for 2,254 acres or 3 percent of OID's serviced acreage. 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." Thus, 1,530 of the 2,001 total turnouts are subject to the Regulation. Although DWR does not require delivery measurement for the other 471 turnouts, over 200 of these turnouts meet the accuracy standards of the Regulation and OID continues to search for cost effective and accurate delivery measurement solutions for the remaining turnouts as well. Table B-2 below shows the total number of turnouts in OID and the total number of each associated type of turnout delivery structure that has been installed.

A total of 89% of the service area, or 62,106 acres, within the OID boundaries is delivered water through 1,705 turnouts that are either compliant or not subject to the Regulation. The remaining 11% of the service area, or 7,422 acres, within the OID boundaries that are subject to the regulation is delivered water through 296 unmeasurable turnouts. All unmeasurable turnouts listed in Table B-2 will be modified or replaced with the most appropriate application for measurement that meets the accuracy standards of the Regulation.

Table B-2. Turnouts and Associated Acreage by Meter Type

Meter Style	Quantity	Percent of Turnouts	Gross Acreage Served	Percentage of Total District Acreage	Accuracy	Accuracy Source
Turnouts Not Subject to the Regulation						
Metergates	205	10%	1,093	2%	+/- 5%	ITRC (2016)
Constant-Head Orifices	2	0%	10	0%	+/- 3%	USBR (2001)
Valves on OID Pipeline	152	8%	521	1%	N/A	N/A
Y/Ws (Inline Gates)	78	4%	522	1%	N/A	N/A
Other	34	2%	108	0%	N/A	N/A
Subtotal	*471*	*24%*	*2,254*	*3%*		
Measurable Turnouts Compliant with Regulation						
Metergates	1070	53%	39,464	56%	+/- 5%	ITRC (2016)
Constant-Head Orifices	90	4%	6,051	9%	+/- 3%	USBR (2001)
SlipMeters/FlumeMeters	35	2%	11,649	17%	+/- 2.5%	Judge (2011)
Krohne Enviromag 2000	37	2%	2,539	4%	+/- 2%	Krohne Group (2019)
McCrometer Meter	2	0%	148	0%	+/- 2%	McCrometer (2019)
Subtotal	*1,234*	*61%*	*59,852*	*86%*		
Non-Measurable Turnouts Subject to the Regulation, Corrective Action Needed						
Slide Gate	12	1%	669	1%	N/A	N/A
Valves on OID Pipeline	122	6%	2,009	3%	N/A	N/A
Y/Ws (Inline Gates)	104	5%	2,759	4%	N/A	N/A
Other	58	3%	1,985	3%	N/A	N/A
Subtotal	*296*	*15%*	*7,422*	*11%*		
Total	***2,001***	***100%***	***69,528***	***99%****		

**Remaining 1%, 362 acres, of District Acreage has no turnouts and is not currently utilizing OID water.*

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 by maintaining 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 has shifted focus as much as financially feasible 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 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 the 2015 AWMP, OID modified or replaced more than 284 turnouts totaling more than $1,490,000 in capital construction costs. Since the 2015 AWMP OID has modified or replaced an additional 294 turnouts totaling $1,953,000. This cost does not include all turnout replacements that occurred as part of other larger projects (i.e. structure replacement, automation, lateral rehabilitation, etc.). Even excluding turnouts replaced as part of larger projects, the total number of turnouts replaced on an annual basis since the WRP was adopted have exceeded that which was proposed.

Budget

As outlined in the WRP turnout replacement program, a budget of $150-300,000 per year was proposed to be spent taking corrective action on at least 15 turnouts per year. Actual total OID expenditures dedicated to corrective action on turnouts since the completion of OID's 2015 AWMP through the end of 2019 was over $390,000 per year, on an average of 59 turnouts per year, and at an average cost of approximately $6,600 per turnout. 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 allow OID to continue to accelerate implementation of its turnout replacement program. Regardless, OID plans to continue to allocate between $150,000 and $300,000 annually to modification and replacement of existing turnouts.

Financing Plan

A total in excess of $94 million in capital improvements have been completed to date in accordance with the WRP. The WRP proposed that the cost of these improvements be funded by revenues from water sales, connection charges levied on annexed land within the District's sphere of influence, borrowing, revenue from the sale of captured and conserved drain water, and water rate increases. These WRP improvements, which include the turnout replacement program budget, will continue to be implemented in accordance with the WRP and accounted for in the District's budgeting process and paid through General Fund revenues.

Schedule

With a budget in place each year consistent with that outlined in the WRP, OID anticipates being at or near full compliance with the Regulation by 2028. To do so, modification or replacement would need to continue to be completed on an average of 33 turnouts per year. With the exception of corrective action to those turnouts incorporated into other larger projects (i.e. structure replacement, automation, lateral rehabilitation, etc.), turnouts will generally continue to be selected for modification or replacement in descending order of the acreage served. In progressing with that approach, in less than 4 years an additional 6,000 acres would be provided service from a compliant delivery point and only 2% (approximately 1,400 acres) of OID's service area would remain for continued corrective action.

Oakdale Irrigation District Corrective Action Implementation Summary		
Total Oakdale Irrigation District (OID) Turnouts	2,001	
Oakdale Irrigation District (OID) Turnouts subject to Regulation	1,530	
Unmeasurable Turnouts	296	
Average Turnout Modification/Replacement Cost	$7,000	each
Annual Turnout Modification/Replacement Budget	$150,000 - $300,000	per year
Average Turnout Modifications/Replacements	33	per year
Estimated Duration of Corrective Action Plan (2028 Completion)	9	years
Total Estimated Cost of Corrective Action Plan Implementation	$2,079,000	

Attachments

Mace AgriFlow Calibration Certificate (x2)

Krohne Calibration Certificate

McCrometer Calibration Certificate (x2)

McCrometer Mc Mag 3000 Flow Meter Specification Sheet 30121-41 Rev. 1.8 – Page 3

OPTIFLUX 2000: Technical Datasheet R11 – Page 15 mace Water Monitoring Solutions

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. [signature] 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. Lytell Date Issued : 30/01/2016

KROHNE
PO Box 56
ZIP Code 06835-080
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 | KA: 1.7682

205.3336 mm | KL's Used?: Yes

Calibration Report

	Volumetric Flow Rate (GPM) min	Volumetric Flow Rate (GPM) 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: [signature]
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

Propeller Meter

CERTIFIED TEST REPORT

CUSTOMER: OAKDALE I.D.

MODEL NO: MD310

METER SERIAL NO: 99-07212

CONFIGURATION

METER INSIDE DIAMETER: 9.75

METER OUTSIDE DIAMETER: 10

TEST DATE: 9/17/2019

TEST FACILITY: Volumetric

IDEAL TEST CONSTANT: 2374

CALIBRATION DATA

	Tested TC	GPM	Accuracy
1	2381	1869	100.3

CERTIFIED BY: Robert Galusha **ID#:** 176785 **DATE:** 9/23/2019

This calibration was performed on a gravimetric or volumetric test facility, traceable to the National Institute of Standards and Technology, USA. The estimated flow measurement uncertainty of the calibration facilities are:
Gravimetric +/- 0.15% Volumetric +/- 0.5%

McCROMETER
3255 WEST STETSON AVENUE
HEMET, CA 92545 USA
PHONE (951) 652-6811 / FAX (951) 652-3078
WEB SITE: http://www.mccrometer.com E-MAIL: customerservice@mccrometer.com

99-07212

9/23/2019 12:13:52 PM
Version 1.2 (4/18/2007)

Specification Sheet
Mc Mag3000™ Flow Meter

Flow Meter Specifications

Description and Operating Specifications	
Pipe Sizes	4", 6", 8", 10", 12"
Body Style	Saddle mount
Pressure	150 psi (10.3 bar) working pressure
Accuracy	± 2% with default calibration ± 1% with custom Factory calibration
Conductivity	Minimum conductivity of 50µS/cm, for lower conductive fluid consult Factory.
Empty Pipe Detection	Hardware/Software, conductivity-based (optional)
Electrical connects	Optional shielded cable for 10-32VDC/4-20 mA output Optional shielded cable for pulse out
Pipe Run Requirements	3D Upstream / 1D Downstream
Display and Measurement	
Display	2-Line LCD display (no backlight), 16 characters per line • Non-volatile memory • Anti-reverse totalizer (standard) • Total (to 9 digits of precision) • Flow Rate and Velocity (to 5 digits of precision) • Two alarms: low battery and empty pipe (optional) To preserve battery life, a push-button on the housing activates the display.
Digits	5 Rate, 9 Total
Units	US gallons, US gallons x1000, US gallons x1,000,000, cubic inches, cubic feet, cubic feet x1000, cubic centimeters, cubic decimeters, milliliters, liters, deciliters, hectoliters, kiloliters, megaliters, cubic meters, cubic meters x1000, acre feet, acre inches, imperial gallons, imperial gallons x1000, imperial gallons x1,000,000, standard barrels, oil barrels, and miner inch days. Rate scales: seconds, minutes, hours, and days.
Power	
Battery	Standard: three 3.6V lithium-thionyl chloride (Li-$SOCl_2$) D size batteries. Batteries are field replaceable
DC Power	Linear power supply 10-35VDC, 2.4W
Battery Life	Five-year expected battery life (three-year battery warranty)
Environmental	
Operating Temperature	-4° to 140°F (-20° to 60°C) sensor
Storage Temperature	-40° to 149°F (-40° to 65°C) **Note:** During freezing conditions and when meter is not in use, sensor must be removed from pipe and stored in dry conditions. ***NOTE: Damage to the sensor caused by allowing the sensor freeze in the pipe is not covered by the warranty.***
Operating Pressure	150 PSI
Water Impermeability	IP68 (submersible sensor)

McCrometer Mc Mag 3000 Flow Meter Specification Sheet 30121-41 Rev. 1.8 – Page 3

Specification Sheet
Mc Mag3000™ Flow Meter

Flow Meter Specifications

Outputs	
Pulse Output	Digital pulse (open collector) output for volumetric and/or alarm • Battery power only: 1 pulse output maximum • DC powered version: 2 pulse outputs available
Analog Output	4-20mA (not galvanically separated from the power supply). DC powered option only.
Options and Accessories	
	• Data Logger - included as standard with five years of data storage at default (12hr) interval. (Cable sold separately) • Epoxy coated carbon steel flanged spool piece • DC power w/battery backup: (Pulse & 4 20mA Out) • Annual verification / calibration • Stainless Steel ID tag
Materials	
Sensor Body	Fusion bonded epoxy coated stainless steel (316)
Electrodes	Stainless steel (316)
Saddle Mount	Stainless steel (304)
Saddle Hardware	Stainless steel (304)
Electronic Housing	IP-67 Certified diecast aluminum, powder coated enclosure w/ tamper resistant seal, 6½" x 6½" x 4³/₈" tall
O-Ring	SBR rubber D-ring
Boot Cover	EPDM rubber
Warranty	
Meter	5-year standard warranty
Battery	5-year warranty

OPTIFLUX 2000: Technical Datasheet – Page 15

2.2 Legal metrology

*OIML R49 and MID Annex MI-001 is **only** available in combination with the signal converter IFC 300!*

2.2.1 OIML R49

The OPTIFLUX 2300 has a certificate of conformity with the international recommendation OIML R49 (edition). The certificate has been issued by NMi (Dutch board of weight and measures).

The OIML R49 recommendation concerns water meters intended for the metering of cold potable and hot water. The measuring range of the flowmeter is determined by Q3 (nominal flow rate) and R (ratio).

The OPTIFLUX 2300 meets the requirements for water meters of accuracy class 1 and 2.

- For accuracy class 1, the maximum permissible error for water meters is ± 1% for the upper flow rate zone and ± 3% for the lower flow rate zones.
- For accuracy class 2, the maximum permissible error for water meters is ± 2% for the upper flow rate zone and ± 5% for the lower flow rate zones.

According to OIML R49, accuracy class 1 designation shall be applied only to flowmeter with $Q3 \geq 100\ m^3/h$.

Q1 = Q3 / R

Q2 = Q1 * 1.6

Q3 = Q1 * R

Q4 = Q3 * 1.25

Figure 2-1: ISO flow rates added to figure as comparison towards OIML
X: Flow rate
Y [%]: Maximum measuring error

① ± 3% for class 1, ± 5% for class 2 devices
② ± 1% for class 1, ± 2% for class 2 devices

References

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

Burt, C. and D. Howes. 2016. Practical Guide for Metergates. ITRC. California Polytechnic State University, San Luis Obispo, California.

Burt, C. and E. Geer. 2012. SBx7 Flow Rate Measurement Compliance for Agricultural Irrigation Districts. ITRC. California Polytechnic State University, San Luis Obispo, California.

Hopkins, J.D. and K.R. Johansen. 2011. In-Situ Testing of a 600 mm Rubicon SlipMeter™ in Oakdale Irrigation District, CA. Provost & Pritchard Consulting Group. Clovis CA.

Judge, A. 2011. Laboratory Testing of a 600 mm Rubicon SlipMeter™ February-March 2011. Manly Hydraulics Laboratory. Manly Vale, NSW. Australia.

Krohne Group. 2019. OPTIFLUX 2000: Technical Datasheet R11. Available online at: https://cdn.krohne.com/dlc/TD_OPTIFLUX2000_en_191017_4000086807_R11.pdf

McCrometer. 2019. McCrometer Mc Mag 3000 Flow Meter Specification Sheet 30121-41 Rev. 1.8. Available online from: https://www.mccrometer.com/mc-mag3000/product-downloads?id=52003823658

U.S. Dept. of the Interior Bureau of Reclamation. 2001. Water Measurement Manual. Third Edition. U.S. Government Printing Office, Washington, D.C.

Attachment C: Out of District Surface Irrigation Agreement

AGREEMENT ESTABLISHING TERMS AND CONDITIONS

FOR IRRIGATION OF LANDS

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 ("District") using "surplus water" in 2020, 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 water" be made available for irrigation to APN _________________, located at ________________________, ___________, CA for the 2020 irrigation season.

Terms and Conditions

1. Eligible Lands:
   a) Water for irrigation of lands outside the District's boundaries will only be made available to lands that are already irrigated and developed and can receive OID water from existing permanent or proposed temporary delivery facilities.
      i. The area within the real property proposed for water service must be cultivated with crops and under irrigation as of August 31, 2018 with access to a water source other than OID surplus water.
      ii. All water delivery turn-out locations are anticipated to have an accurate measurable metering device to record water flow and or volume. If there is no such device, at the determination of the Water Operations Manager, water usage will be determined using Evapotranspiration (ET) data and applying a 70% irrigation application efficiency to all deliveries of water.
      iii. Installation of new "temporary" private turn-out and irrigation facilities located within District's rights-of-way or on private property for the purpose of the diversion of surplus water shall be so installed with the prior approval of OID's Water Operations Manager. Such installations shall not impede the District's on-going operations and maintenance programs.
      iv. Any unauthorized private facilities or private facilities found to impede OID's operations and maintenance will be removed by the Applicant(s) or by the District at the Applicant's expense. The Applicant shall be responsible for any damage to OID facilities caused by the Applicant(s) or the Applicant(s) operations.
   b) Water for irrigation of lands outside the District's boundaries will only be

made available to individual parcels that are 10 acres or larger in size, or a group of parcels under the same ownership that receive water through a single point of delivery and have a total combined parcel acreage of 10 acres or larger in size. The only exceptions to this requirement are APNs: 010-027-005 & 010-027-007 (Orange Blossom Park) and fringe parcels in accordance with the Fringe Parcels Water Allocation Policy adopted by Resolution No. 2017-07 on January 18, 2017.

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. Upon request, those with lands partially or completely outside the OID Sphere of Influence must provide proof to OID that another district/agency's services will not be impacted.
4. This Agreement is subject to delivery of "surplus water" for the 2020 irrigation season only. The District is under no obligation in the future to enter into subsequent agreements for the irrigation of lands outside the District's boundaries.
5. The District made a determination at its March 3, 2020 Board of Directors meeting that "surplus water" for any OID allocation above 235,000 AF was available for out of District use in 2020. Resolution No. 2020-07.
6. The above described property shall demonstrate that an on-farm irrigation efficiency of seventy (70) percent or greater will be achieved. The ability to achieve this efficiency will be evaluated by the District's Water Operations Department. The burden is on the Applicant(s) to prove that a seventy (70) percent, or better, on-farm irrigation efficiency will be maintained.
7. Upon request, the Applicant(s) shall provide a plan to ensure that no agricultural tail water will leave the property. This plan will be evaluated by the District's Water Operations Department and requires the approval by the District's General Manager.
8. The use of "surplus water" shall be for agricultural purposes only 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 benefit, 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.
9. Should the Applicant(s) wish to be billed by volume (per acre-foot), a measuring device approved by the OID Water Operations Manager and accessible to OID employees must be installed for the receipt of water.
    a) Applicants without a measurable delivery will be subject to the measurement options provided and made available by the OID's Water Operations Manager on a case-by-case basis for billing purposes.
10. All private facilities intended to be located within District's rights of way beyond the term of this agreement shall be so installed under a District Encroachment Permit.
11. Applicant(s) 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 will result in immediate cessation of water delivery by the District.
12. Upon request, Applicant(s) must provide proof of membership in the appropriate

Water Quality Coalition.

13. Applicant(s) agree to provide direct vehicle ingress and egress to the District's agents during the term of this agreement, to ensure the terms and conditions of this agreement are being met.
14. **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.**
15. **The District is under no future obligation beyond the term of this agreement to deliver water to any diversion or service structures or facilities on behalf of the above described property.**
16. Out of District lands will only be provided surface water from OID's pre-1914 water right. Based on unimpaired flow and OID water use in average years, OID anticipates having pre-1914 water available through June for out of District use. However, availability will vary from year to year with in District demand and hydrology.
17. The Applicant(s), in its application, has made a request for water delivery of ______ af for the time-period from April 7, 2020 to June 30, 2020. The District has agreed to make the requested water available subject to the following conditions:
    (a) The amount of water reserved will not be permitted to be adjusted.
    (b) After June 30, 2020 and subject to hydrology, water availability in accordance with Condition No. 16 above, and a capacity to deliver, OID may reopen the opportunity for Applicant(s) to request additional surplus water.
    (c) Applicant(s) must provide a non-refundable deposit to the District for any and all water reserved at the time it is reserved. The amount of deposit will be $125 multiplied by the water requested of ______ af for an amount of $________.
    (d) Water purchased/delivered may not be re-sold.
    (e) Water purchased/delivered may not be used to expand irrigated acreage.
    (f) If the District is unable to deliver the amount of water requested for whatever reason, then the Districts will refund the money to Applicant(s) for the water that was not delivered by June 30, 2020. This Agreement does not permit any use or delivery of water in October 2020.
    (g) If there is CEQA challenge to the delivery of out-of-district water deliveries for 2020, or any other legal, administrative or regulatory action against the out-of-district delivery, then the District will immediately cease 2020 out-of-district water deliveries. The District will refund within 30 days of the cessation of such deliveries in 2020, pursuant to a CEQA challenge, the amount due for water not delivered.
    (h) If the Applicant(s) does not take the water requested and paid for and made available by the Districts, for whatever reason, except force majeure, then the District shall keep the amount deposited by Applicant(s).
18. 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.
19. 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.

20. This Agreement shall terminate at the conclusion of the above described irrigation season, September 30, 2020; notwithstanding any violations of this Agreement as described above.

Water Charge for Surplus Water in 2020

The Charge for the receipt of "surplus water" shall include:

1. A $100 annual filing fee for the processing of the application.
2. $125 an acre foot multiplied by the amount requested by Applicant _____, af for a total amount of $_________.

OAKDALE IRRIGATION DISTRICT

______________________________ ________________

Steve Knell, P.E. Date

General Manager/Secretary

OWNER(S)

______________________________ ________________

Owner Date

____

Address:

Telephone:

DISTRICT USE ONLY

- Prepare deposit allocation sheet for multiple parcel agreements to attach to payment.
- If parcel(s) are not in Storm, then setup in Storm.
- Add Out-of-District billing code to Storm parcel(s).
- Scan and email agreement to the Water Operations Manager

Adopted by Resolution No. 2020-__ on April 7, 2020

Attachment D: Drought Management Plan

Introduction

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 their 2015 Agricultural Water Management Plan (AWMP) update. Three years later Assembly Bill 1668 (AB 1668) was passed on May 31, 2018. AB 1668 amended the California Water Code and requirements for AWMPs, including detailing requirements for a Drought Plan, or DMP (CWC 10826.2). This DMP builds upon OID's existing Water Shortage Policy, which was the foundation of the 2015 DMP. The 2020 DMP includes the components required by CWC 10826.2 and recommended by DWR in its 2020 AWMP Guidebook for inclusion (DWR 2020). Additionally, it provides a reflection on and evaluation of the 2012-2016 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 periods 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's 2008 water shortage policy, with ongoing implementation of the comprehensive OID Water Resources Plan (WRP) and the experience of the 2012 to 2016 drought, was updated in 2016 and again, most recently, in June 2020. This DMP supplements OID's Water Shortage Policy and describes drought resiliency planning actions undertaken to prepare for drought, along with a broad range of actions undertaken during drought to manage available water supplies and meet customer demands to the maximum extent possible.

Drought Resilience Planning (§10826.2(a))

This section describes actions and activities undertaken by OID to prepare for drought and effectively manage and mitigate the effects of surface water shortages. It includes discussion of the information used to determine water supply availability and drought severity, identification and analyses of potential vulnerability to drought, and opportunities and constraints for improvements to drought resiliency planning.

Determination of Water Supply Availability and Drought Severity (§10826.2(a)(1))

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 levels and 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 each year is determined 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 Project and 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.

In addition to monitoring water supply availability, OID regularly reviews information on current or forecasted drought conditions on a local and regional scale, drought planning or mitigation strategies, and more through a variety of sources. These sources include but are not limited to, the United States Drought Monitor, Western Regional Climate Center, National Weather Service-Climate Prediction Center, DWR, and USBR. This allows for improved understanding of potential future drought conditions and severity through forecasts, and current drought conditions and severity through current information, as well as additional information on drought planning and response that can be used to improve OID's drought planning and response.

Potential Vulnerability to Drought (§10826.2(a)(2))

Generally, OID water supplies have been sufficient in all but the driest of years. As described above, under the 1988 agreement with USBR, OID and SSJID have an allocation of up to 600,000 af per year, of which 300,000 af are available to OID based on an even split with SSJID. As part of OID's Water Resources Plan, an analysis of the probability that OID's entitlement will be less than 300,000 af was conducted 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. This analysis shows that OID's surface water supplies (which include pre-1914 water rights) are relatively reliable.

In addition to available surface water supplies, OID owns and operates reclamation pumps that pump water from drains for reuse into District laterals and deep wells that pump groundwater from the aquifer beneath the district. The reclamation pumps have a capacity of approximately 32,560 af per year, although pumping in all prior years is below this capacity. These pumps can be utilized more extensively during times of drought to provide supplemental water supplies, although the amount of drain water available during times of drought will be reduced and this supplemental water source may be minimal. In total, OID's 25 deep wells have a capacity of of approximately 45,393 af, although actual annual production between 2015 and 2019 ranged from approximately

1,700 to 12,600 af with an average of 4,600 af. These deep wells enable conjunctive use and have the potential to provide supplemental water supplies for OID during years of reduced surface water supplies. Additionally, the District has three 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 three additional sources reduce OID's potential vulnerability to drought.

The predominate crop today in OID is almonds followed by followed by pasture, corn and grains and then walnuts. Pasture, corn and grains are grown to support the area's extensive livestock and dairy operations. Although it is critical that enough feed is grown to support local livestock and dairy operations, these crops are more adaptable to reduced or variable water supplies than permanent crops. However, the acreage of permanent crops (primarily almonds) has continued to increase in recent years. If this trend continues, this relatively inflexible demand it could present a new potential vulnerability to drought within the District Drought Resilience Opportunities and Constraints: Availability of New Technology or Information (§10826.2(a)(3)(A))

OID has prioritized implementation of new technology and improvements in the District and in recent years has made substantial improvements to both distribution system infrastructure and operational practices to increase operational efficiency through the reduction of operational spillage. These improvements have been accomplished as part of implementation of the WRP. 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 the last decade to increase operational efficiency include the following:

- In 2010, OID completed the new Northside Regulating Reservoir, allowing for the capture and reregulation of substantial amounts of diverted water that may have otherwise been spilled.
- In 2012 Total Channel Control (TCC) was fully implemented on the Claribel and Cometa laterals, essentially eliminating operational spillage on these laterals. In the time since successful completion of that project, TCC has been implemented on over 34 miles of laterals in the District. 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 water outflows was achieved as a result of progress in prior years and extraordinary actions. OID continues working to increase water use efficiency and reduce surface water outflows.
- 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 water users 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.

OID plans to continue implementing new technologies to improve drought resiliency and operational efficiency and is continually exploring new technologies and information to achieve these ends. The largest constraint to implementing new technologies and information is cost, which can be both controlling and restrictive to implementation in some cases.

Drought Resilience Opportunities and Constraints: Availability of Additional Water Supplies (§10826.2(a)(3)(B))

As described above, OID owns and operates 25 deep wells. 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 its water users actively utilize available drainage water to supplement primary water supplies. The District also receives discharge water from the Sconza Candy Company that is available for reuse within the District, recycled water from a food processing facility is directly applied to lands within the District, and the use of treated M&I discharge water from the City of Oakdale within the OID service area is currently being evaluated. Evaluation and utilization of other potential sources of recycled water is considered by OID on a case-by-case basis.

Finally, OID's deep well rental and 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 outside the irrigation season.

Drought Resilience Opportunities and Constraints: Other Planned Actions (§10826.2(a)(3)(C))

The planned implementation of the District's WRP, which is ongoing, will continue to improve its drought resilience over time as physical and operational improvements are accomplished per the WRP. The District also plans to continue evaluating opportunities to reduce potential vulnerability to drought. As opportunities are identified, planning efforts will begin to incorporate feasibility studies, scoping, and a timeline for implementation of feasible opportunities.

One additional action to promote drought resiliency, which has been implemented in the past and which OID continues to implement, is water management. OID encourages water management through on-farm water conservation on an ongoing basis. During water shortage years, these efforts are enhanced as outlined in OID's 2020 Surface Water Shortage Policy[27] (Policy). 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 itswater users. During periods of reduced water 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 from the 2012-2016 drought 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 water users 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.

Water Allocation Program. 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 byOID and their water users, the apportionment was periodically increased, with a final apportionment in August of 44 inches for tier 1 (14 inches for tier 2). Since 2015 OID has updated its Water Shortage Policy to detail the Water Allocation Program noting within the policy that the Water Allocation Program will be implemented when available water supplies are below 190,000 Acre-feet. OID considers this a Level Three water shortage, the highest water shortage level within the policy.

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

27

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 water users 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. The season start and end dates can be adjusted to reduce the season length as an extraordinary action to reduce demand in reduced water supply years.

Drought Response Planning (§10826.2(b))

This section describes actions and activities undertaken by OID in response to drought to address surface water shortage. It includes discussion of the policies and process for declaring a water shortage and implementing water shortage allocation, methods and procedures for the enforcement or appeal of triggered shortage responses, methods and procedures for monitoring and evaluating the drought management plan, communication protocols and procedures, and potential financial impacts of drought and proposed measures to overcome those impacts.

Policies and Processes for Water Shortage Declaration and Water Shortage Allocation and Implementation (§10826.2(b)(1))

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 2020 Surface Water Shortage Policy[28] (Policy) identifies three levels of shortage based on available surface water supplies from New Melones. In response to unprecedented surface water shortage in 2015 (according to the 2008 Surface Water Shortage Policy), the third level of shortage was reached, prompting the District to allocate water for the first time in its history. In response to the 2015 drought, OID has since updated its Policy twice, once in 2016 and most recently in June 2020. Various actions are defined depending upon the level of shortage; any and all can be implemented by the District, depending on circumstances. 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 include Tier 1 customers, Tier 2 customers (annexed lands), out of district applicants, and water transfers. The actions described in the Policy include the following:

- Establishment of a water allocation to each assessed acre
- Allocation reductions or suspensions starting with lower priority users
- Modified District groundwater pumping operations
- Extended delivery rotations
- Limiting irrigation water usage to agricultural purposes only
- 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
- Facilitation of a farmer-to-farmer water allocation transfer program

The Surface Water Shortage Policy is included as Attachment E to the 2020 AWMP.

Methods and Procedures for Water Shortage Response Actions (§10826.2(b)(2))

As described above and in the Surface Water Shortage Policy (2020 AWMP Attachment E), there are three levels of water shortage identified based on the District's allocation under the 1988 Stipulation with the Bureau of Reclamation (USBR). Each level of shortage has corresponding OID response actions, which are described in the Policy and include suspension of out of District water service agreements, increased use of OID groundwater wells, extended delivery rotations, suspension of all non-agricultural irrigation service, and an enforced zero discharge policy.

Additionally, the OID Board of Directors has the ability to formally declare a drought, based on water supply availability and drought severity indicators monitored by OID, and to announce and implement the Water Allocation Program within the Policy. In response to the unprecedented surface water shortage in 2015, the third level of shortage was reached, prompting the District to

28

allocate water for the first time in its history. The Board of Directors, during times of drought, is able to adjust and adapt OID water shortage response actions as water supply availability and drought conditions change.

OID's water shortage response actions are enforced as described in the Policy or other drought-related materials developed and disseminated by OID and the Board of Directors. Failure to comply will typically result in a fine and warning for the first violation; a second violation will typically result in an additional fine and loss of water delivery for the remainder of the irrigation season. Appeals of enforcement actions or for exemption from enforcement are accepted and will be considered by OID and the Board of Directors on a case-by-case basis.

Monitoring and Evaluation of Drought Plan (§10826.2(b)(3))

Continual monitoring of hydrologic conditions, water supply, water deliveries, operational efficiency and other metrics is an important part of OID's water management in any year, but especially in times of drought. As water supply availability and drought severity change, OID is able to adapt and align management per the Drought Management Plan and Policy to best distribute and manage available water resources for the mutual benefit of lands within the District's service area boundaries.

Additionally, review of these metrics following a period of drought allows for evaluation of the impacts of drought and the effectiveness of the DMP; it also provides opportunities to revise the DMP and improve drought management within the District. To this end, the Evaluation of 2012-2016 Drought section below includes a review of the most recent drought and its impacts to OID.

Communication Protocols and Procedures (§10826.2(b)(4))

This section describes communication protocols and procedures within OID and also wider communication and collaboration with regional stakeholders beyond OID during times of drought.

Communication Protocols and Procedures within OID
OID strives to have clear communication protocols and procedures with landowners within the District and recognizes the importance of this, especially in times of drought. Typically, informational materials are made available through multiple channels; for example, both being posted on the District website and available in paper form to water users at the front office. Important announcements or notices related to drought are also delivered by physical mailings.

Some examples of OID's communication of extraordinary drought efforts from the 2012-2016 drought 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 water users at the front office and via links on the OID website. A special water user notice from early 2014 has also been included (Attachment D.3). Special newsletters and Board of Directors press releases are also made available on the OID website and included here in Attachments D.4 and D.5, respectively.

Finally, OID office staff are available during business hours to answer questions from landowners and water users related to water supply availability or drought management.

Coordination and Collaboration with Regional and Statewide Entities
OID also coordinates and collaborates extensively with other districts, agencies, and entities 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
- Coordination and cooperation with 15 other GSAs comprising the Eastern San Joaquin Groundwater Authority, which was formed to develop and implement a GSP under SGMA to ensure the long-term sustainability of groundwater resources within the Eastern San Joaquin Groundwater Subbasin.
- Coordination and cooperation with six other agencies comprising the Stanislaus and Tuolumne Rivers Groundwater Basin Association GSA, which was formed to develop and implement a GSP under SGMA to ensure the long-term sustainability of groundwater resources within the Modesto Groundwater Subbasin.

Additionally, the District participates in the Stanislaus County Groundwater Technical Advisory Committee to further coordinate, plan and manage groundwater resource issues with local cities, counties and water agencies.

Potential Financial Impacts of Drought and Proposed District Management Measures (§10826.2(b)(5))

Decreased water supply availability and periods of drought impact both decrease revenue and increase expenses for OID. However, the District has designed its rate structure to mitigate these effects. OID'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 and water deliveries. In addition to reduced power generation and water charges to water users, 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 per acre in years when a drought is declared by the Board of Directors.

Increased expenditures during times of drought 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

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

The District periodically reviews the financial status of OID and potential impacts of drought to identify opportunities to improve mitigation techniques and the financial resiliency of the District during periods of drought.

Evaluation of 2012-2016 Drought

Impacts on Water Supplies

To illustrate actions by OID and its water users to manage available water supplies during drought, water supplies for the five year period from 2012 to 2016 are summarized. The year 2012 represents the most recent year prior to 2015 with OID receiving a full water supply, while the 2013 to 2015 period represent years of consecutive, decreasing surface water supplies (increasing shortages). OID received a full water supply in 2016 as well, which is included as the last full year of statewide drought in California before the wet winter of 2016-2017. All sources of supply are summarized for the period from March to October during each year; sources of supply include 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 233 thousand acre-feet (taf) and 246 taf, respectively (Figure D.1). Although water supplies from New Melones were reduced in 2013 as a result of insufficient inflows under the 1988 Stipulation Agreement, they remained sufficient to meet OID water user 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 that 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 2012 and 2013. During 2015, surface water inflows were 165 taf, a reduction of 18 percent from 2014 and 31 percent from 2012 and 2013. During 2016, surface water inflows increased to 193 taf, returning to levels slightly below those in 2014 but still 19 percent lower than the 2012 and 2013 average.

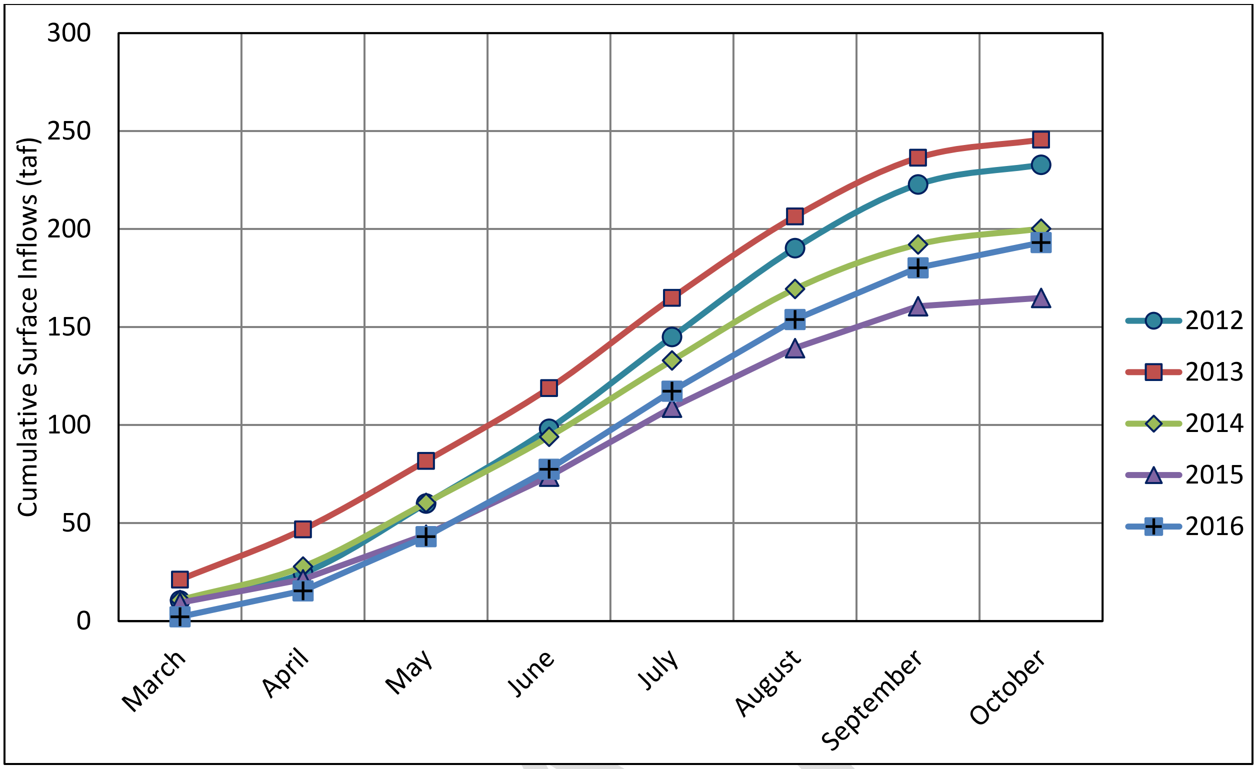


Figure D.1. OID Cumulative March to October Surface Inflows, 2012-2016.

OID total district pumping was lowest during 2012 and 2016 at slightly more than six and less than four taf (Figure D.2). 2012 was the last full supply year before reductions in surface water supply due to drought, and 2016 was the first full supply year after three subsequent years of reduced surface water supplies. OID pumping increased to 10 taf in 2013 in response to increased crop water demands. 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.

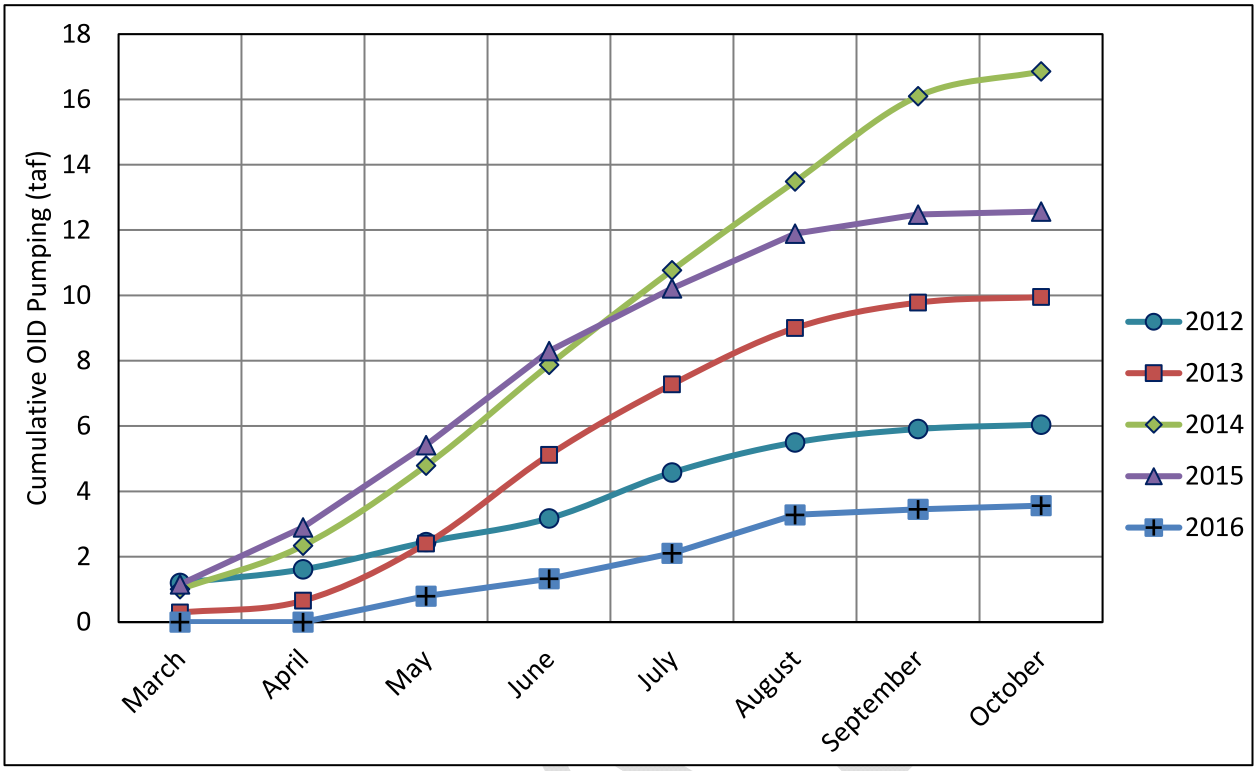


Figure D.2. Cumulative March to October District Groundwater Pumping, 2012-2016.

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 in this year 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. In 2015, private pumping increased to approximately 70 taf. This number is reflective of increased private groundwater pumping to supplement substantially reduced surface water supplies within OID, but also includes the increase in private pumping due to annexed lands. In 2016, private pumping was approximately 50 taf, representing a reduction from 2015 but an increase from 2014.

Other water supplies include water reuse and recycling by OID and its water users. Sources include OID and private drainwater reuse, recaptured tailwater, and recycled M&I water. Reuse and recycling were approximately 15 taf in 2012 and 2013, decreased to approximately 13 taf in 2014, and further decreased to approximately 10 taf in 2015 and 2016 (Figure D.4). Reduced reuse and recycling in 2014, 2015, and 2016 may have been the result of less availability of drain water due to reduced operational spillage and tailwater from increased operational and on-farm efficiencies in response to drought.

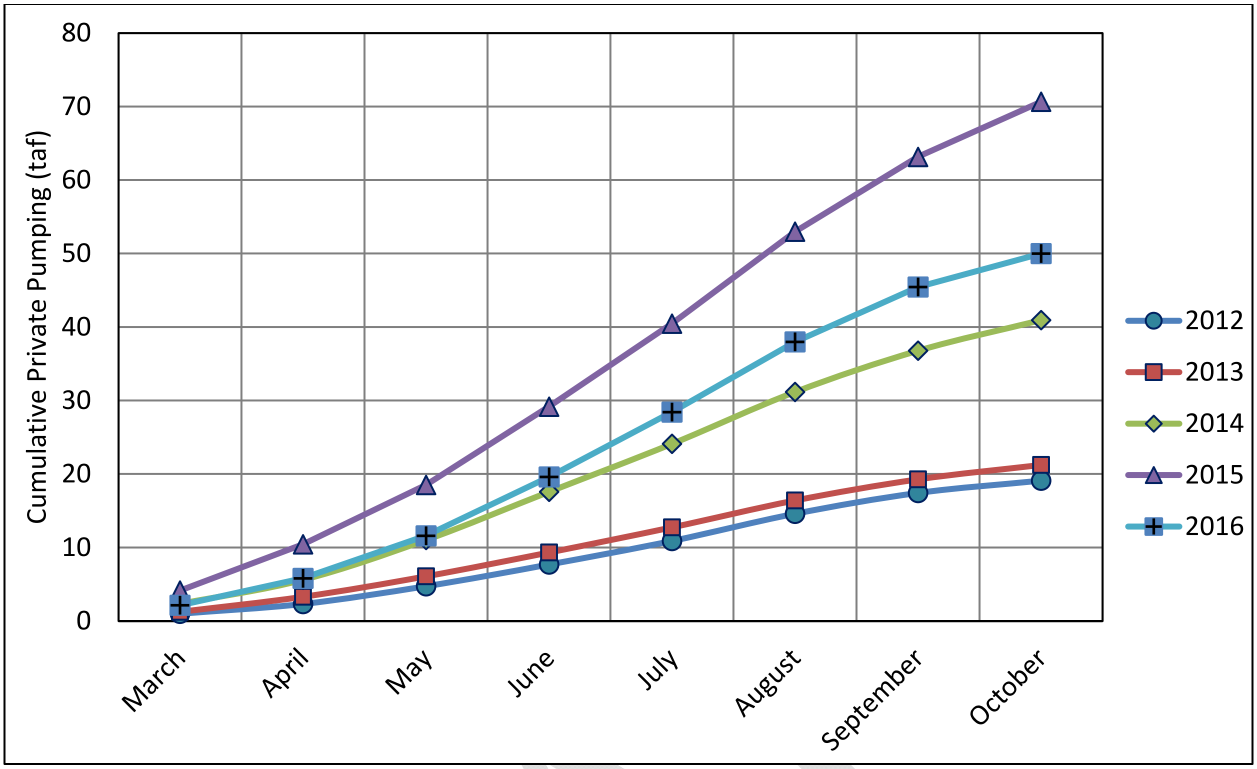


Figure D.3. Cumulative March to October Private Groundwater Pumping, 2012-2016.

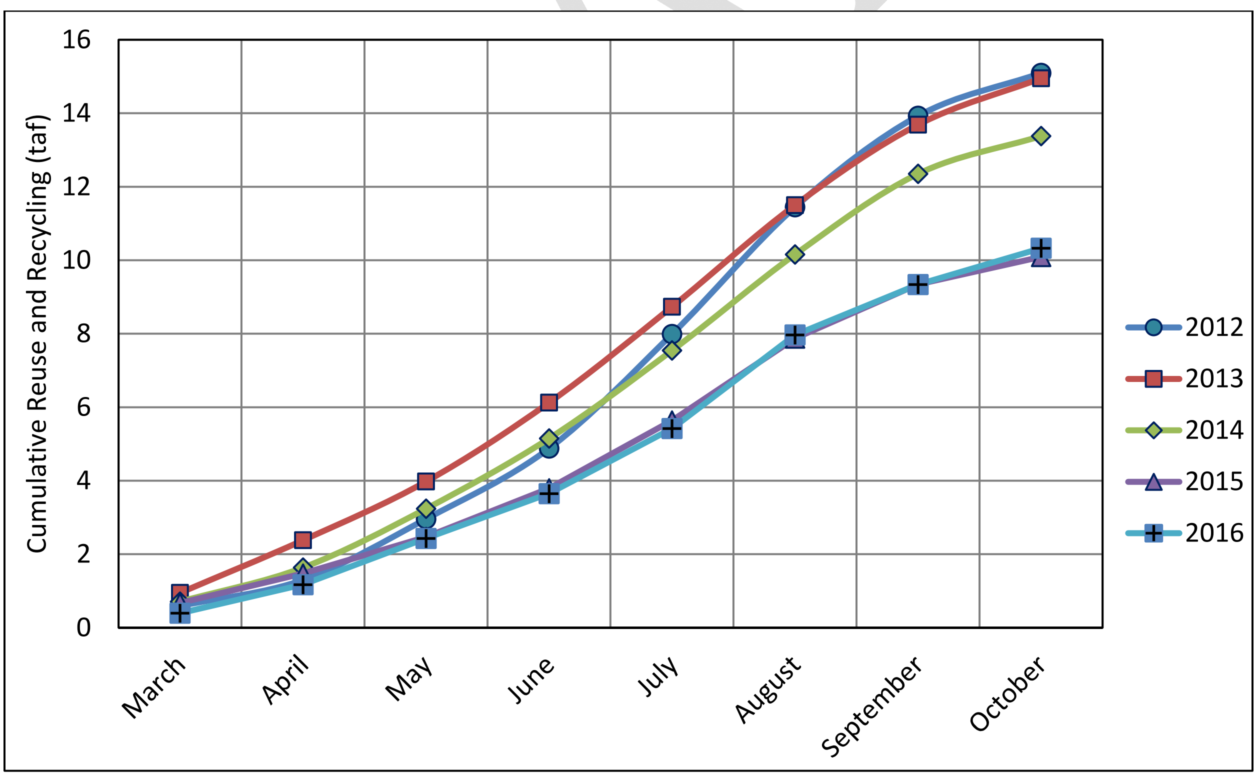


Figure D.4. Cumulative March to October Reuse and Recycling, 2012-2016.

OID total water supplies combine surface water inflows, District and private groundwater pumping, and District and private reuse and recycling. Total irrigation supplies were at a minimum in 2015 and 2016 with an average of approximately 258 taf and at a maximum in 2013 with approximately 292 taf, resulting in a difference between minimum and maximum supply of approximately 34 taf (Figure D.5). As expected, total irrigation supplies decrease over the course of the drought period. A combination of factors influence the trends seen. Irrigation supplies in 2013, which were approximately 291 taf and greater than supplies in 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 271,000 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). Irrigation supplies in 2015 were lower than prior years primarily due to reduced surface water availability; groundwater pumping increased above 2014 levels, but total irrigation supplies were roughly 15 taf less than in 2012 and 2014 and 35 taf less than in 2013. Irrigation supplies in 2016 were roughly equivalent to 2015 supplies although surface water availability increased and groundwater pumping decreased relative to 2015 volumes.

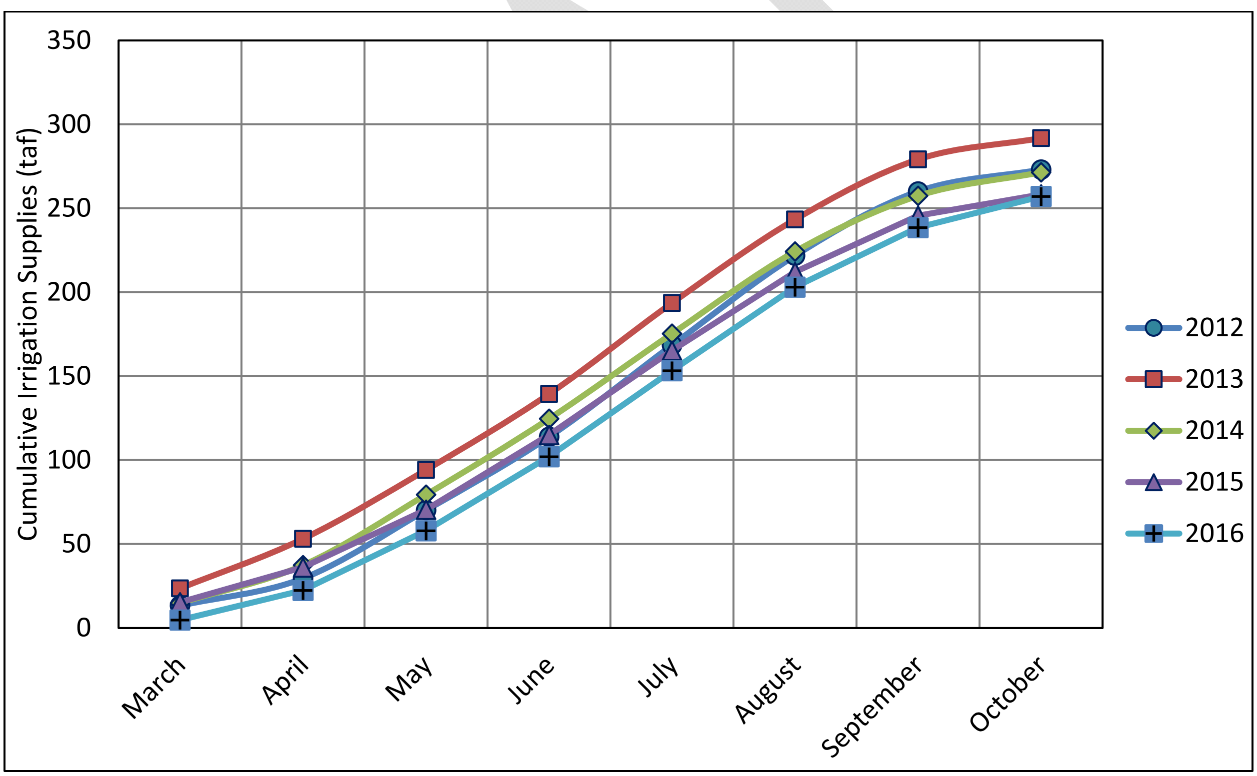


Figure D.5. Cumulative March to October Total Irrigation Supplies, 2012-2016.

Water Demand Impacts

To illustrate impacts to water demands during drought, demands for 2012 to 2016 are summarized. The year 2012 represents the most recent year prior to 2015 with OID receiving a full water supply, while the 2013 to 2015 period represent years of consecutive, decreasing surface water supplies (increasing shortages). OID received a full water supply in 2016 as well, which is included as the last full year of statewide drought in California before the wet winter of 2016-2017. Indicators of demand are summarized for the period from March to October during each year; indicators 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 ranged from 44 inches in 2016 to 51 inches in 2013 and 2014; March to October ET_o was 49 inches and 48 inches in 2012 and 2015, respectively (Figure D.7). Although ET_o is noticeably lower in 2016, it is relatively consistent over the 2012 to 2015 irrigation seasons which suggests that differences in crop consumptive irrigation water demands are influenced more by differences in year-to-year precipitation than reference ET between 2012 and 2015.

Crop ET_{aw} was approximately 128 taf in both 2012 and 2016 to approximately 154 taf in 2013; Crop ET_{aw} was approximately 142 taf and 145 taf in 2013 and 2015, 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. The consecutive decreases from 2014 to 2015 and from 2015 to 2016 are largely influenced by ET_o.

This review of the impacts of the 2012 to 2016 drought on water supplies and water demand within OID demonstrates the variability from year-to-year for any given supply or demand and depicts trends and conditions that can occur during consecutive years of drought. It has the potential to reveal vulnerabilities to drought and can provide insight into how water management actions and decisions can enable the District to better manage times of drought and reduced water availability.

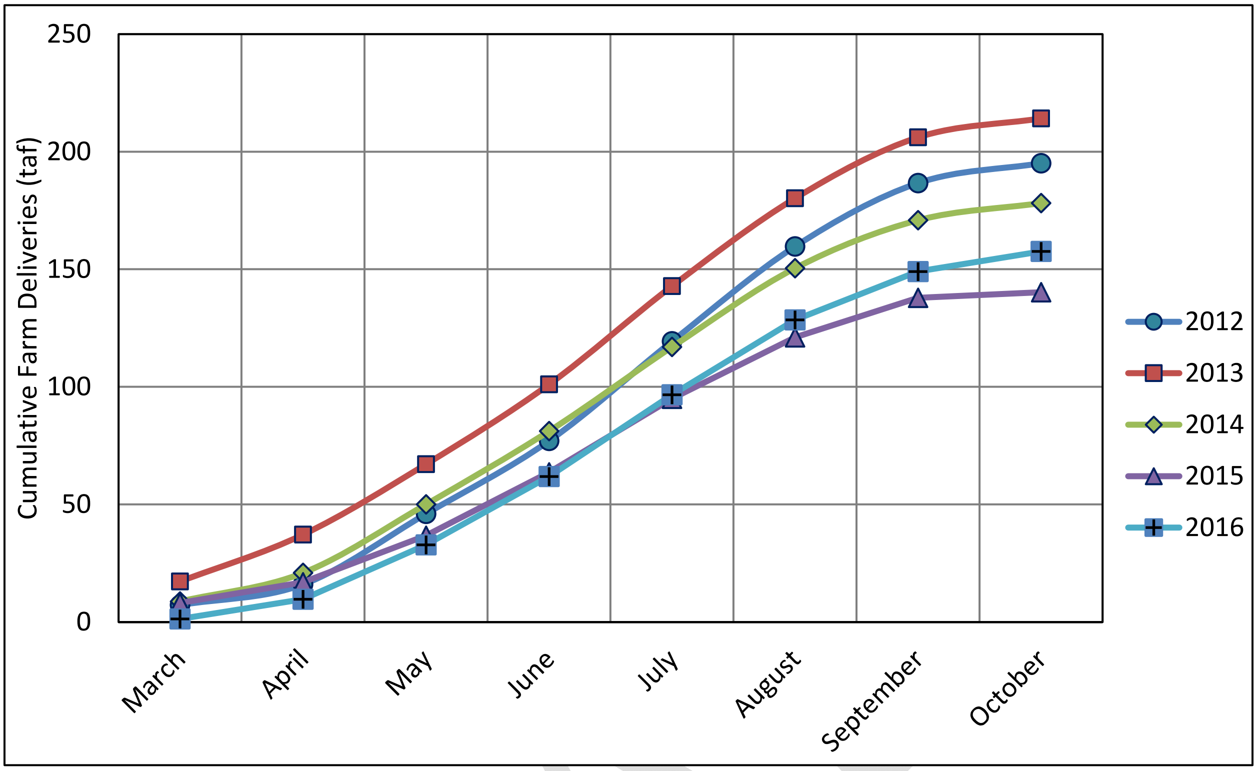


Figure D.6. Cumulative March to October Farm Deliveries, 2012-2016.

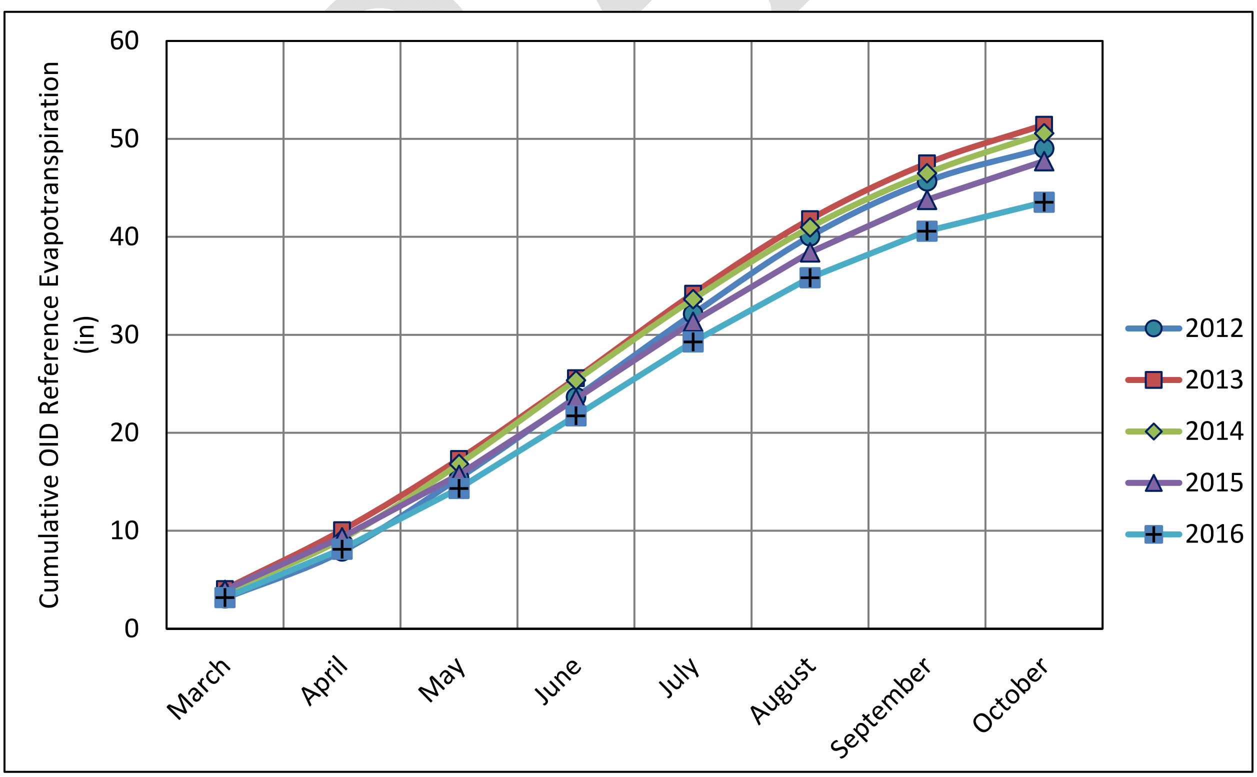


Figure D.7. Cumulative March to October Reference Evapotranspiration, 2012-2016.

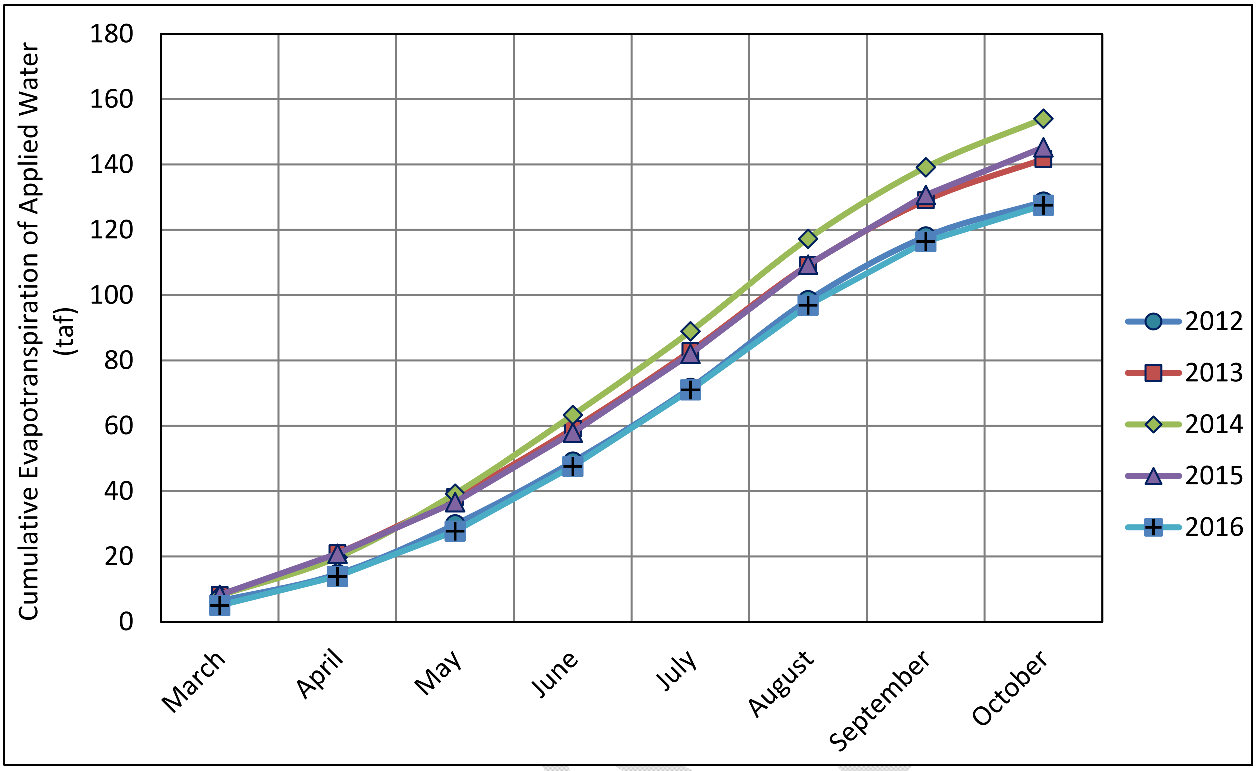


Figure D.8. Cumulative March to October Crop Evapotranspiration of Applied Water, 2012-2016.

References

DWR. 2020. A Guidebook to Assist Agricultural Water Suppliers to Prepare a 2020 Agricultural Water Management Plan. California Department of Water Resources.

Attachments

D.1. Farmer to Farmer Transfer Program Application Agreement

D.2. Temporary Permit for Conveyance Channel

D.3. January 23, 2014 Water User Notice

D.4. Special Newsletters

D.5. Selected Board of Directors Press Releases

D.1. 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.2. 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-basis 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)

- ☐ One time use per parcel(s) per landowner beginning the end of the irrigation season through December, or
- ☐ One time use per parcel(s) per landowner beginning January 1st to the start of the irrigation season.

Application fee:

In-District Landowner: $235.00 per application (adopted 11/03/20)
Out-of-District Landowner: $470.00 per application (adopted 11/03/20)

OAKDALE IRRIGATION DISTRICT LANDOWNER SIGNATURE

Approved: __________________________ __________________________

K:/generalpurposeforms/useofconveyancechanneluse2021 (Adopted 110320)

Exhibit A

2021 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

-1-

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.3. 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.4. Special Newsletters

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.

OID PIPELINE

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."

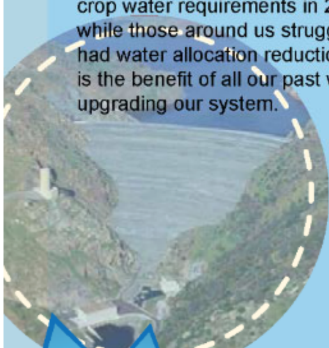
– Steve Knell, OID General Manager

Water outlook: The drought is not over

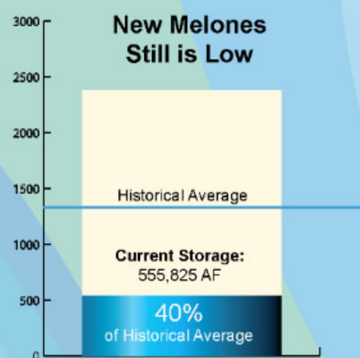
In 2014, the third year of drought in California reminded everyone of the value of every drop of water and how it is used.

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.

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

OID PIPELINE

Excellence in affordable, reliable and innovative water management

March 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.

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:

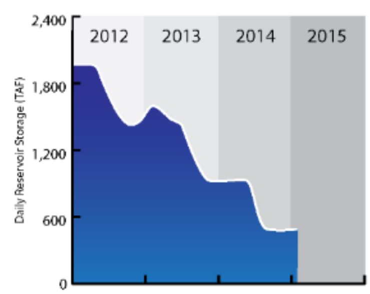
Waste will not be tolerated.
Minimal runoff will be allowed from fields, pastures and orchards. Customers will be given one warning. On the second offense of excessive runoff, their water privileges may be cut off for the rest of the season.

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.

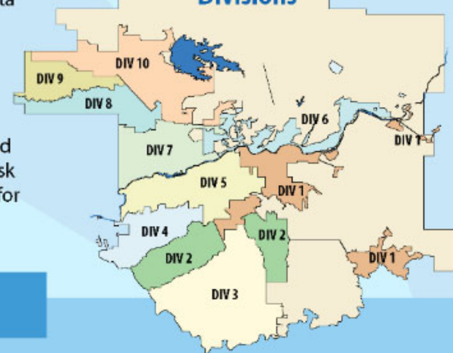
The non-crop water the farmer would have applied – roughly 3,000 acre-feet -- would be put back into storage to offset drought-related water shortages.

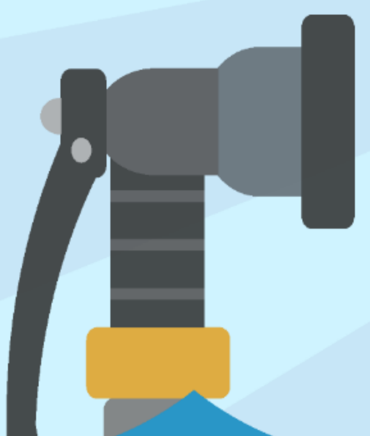
The money would come from the California Department of Water Resources and San Luis & Delta Mendota Water Authority, which have agreed to buy an estimated 10,000 acre-feet of saved water for $400 an acre foot.

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 Loveall	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.

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

OID PIPELINE

Excellence in affordable, reliable and innovative water management

May 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.

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

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.

###

1205 East F Street / Oakdale, CA 95361 / (209) 847-0341 / Fax (209) 847-3468
www.oakdaleirrigation.com

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.

1205 East F Street / Oakdale, CA 95361 / (209) 847-0341 / Fax (209) 847-3468
www.oakdaleirrigation.com

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.

###

1205 East F Street / Oakdale, CA 95361 / (209) 847-0341 / Fax (209) 847-3468
www.oakdaleirrigation.com

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.

1205 East F Street / Oakdale, CA 95361 / (209) 847-0341 / Fax (209) 847-3468
www.oakdaleirrigation.com

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.

1205 East F Street / Oakdale, CA 95361 / (209) 847-0341 / Fax (209) 847-3468
www.oakdaleirrigation.com

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.

###

1205 East F Street / Oakdale, CA 95361 / (209) 847-0341 / Fax (209) 847-3468
www.oakdaleirrigation.com

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.

1205 East F Street / Oakdale, CA 95361 / (209) 847-0341 / Fax (209) 847-3468
www.oakdaleirrigation.com

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."

###

1205 East F Street / Oakdale, CA 95361 / (209) 847-0341 / Fax (209) 847-3468
www.oakdaleirrigation.com

OAKDALE IRRIGATION DISTRICT

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.

1205 East F Street / Oakdale, CA 95361 / (209) 847-0341 / Fax (209) 847-3468
www.oakdaleirrigation.com

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.

###

1205 East F Street / Oakdale, CA 95361 / (209) 847-0341 / Fax (209) 847-3468
www.oakdaleirrigation.com

Attachment E: Surface Water Shortage Policy

OAKDALE IRRIGATION DISTRICT
Miscellaneous Policies and Procedures

Title	*Chapter*	*Section*
2 – OPERATIONS	1	2.109 Surface Water Shortage Policy
Adopted: December 2, 2008	Revised: March 1, 2016, June 2, 2020	Page 1 of 4

PURPOSE

The Board of Directors of the Oakdale Irrigation District ("District") adopted a Surface Water Shortage Policy to provide a guide to the District and its Board during periods of water shortages. Adoption of this policy was and is a critical component of water resource management.

SCOPE

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, this Surface Water Shortage Policy (Policy) has been developed to address such shortages.

This 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, a lack of spring rains, unseasonably high evapotranspiration, contractual obligations, canal failures on either the North or South Main, etc.

POLICY AND PROCEDURE

1. 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:

A. The District's obligation under the California Water Code is to manage and deliver surface water resources under its charge for reasonable and beneficial purposes.

B. All lands within the District boundaries have an equal right to the availability of surface water, irrespective of crop(s) grown.

C. District policy with regard to rotational deliveries of water is to make surface water available when soil moisture depletion levels reach 2.4 inches.

OAKDALE IRRIGATION DISTRICT
Miscellaneous Policies and Procedures

Title 2 – OPERATIONS	*Chapter* 1	*Section* 2.109 Surface Water Shortage Policy
Adopted: December 2, 2008	Revised: March 1, 2016, June 2, 2020	Page 2 of 4

D. Balancing the needs of agriculture to the financial needs of OID, in a time of water shortage, is a Board discretionary decision based on the facts at the time.

E. The District will permit intra-district water transfers between and among landowners within the District's service area upon approval of a Farmer-to-Farmer Transfer Agreement. The District shall provide administrative and operation services to facilitate these transactions.

F. OID will make its conveyance facilities available for the movement of water intra-district water, when able to do so without impacting OID operations and maintenance, upon approval of a Temporary Permit for Conveyance Channel Use.

G. 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. At that time, the District will make its groundwater resources available on an at-cost-basis when able to do so without impacting OID operations and maintenance.

H. During times of diminished or suspended drain water availability, all lands within the District boundaries that rely solely on drain water must secure a direct connection to a surface water conveyance facility or secure other opportunities for water delivery from landowners with groundwater resources.

2. 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:

A. Level One – The District allocation is less than 235,000 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. Partial utilization of District Deep Wells as required
   c. Extended rotation intervals (i.e. 18, 20 or 22 day rotations). Non-rotational deliveries that do not negatively impact the District's ability to deliver irrigation water equitably, economically and efficiently will continue to be accommodated upon request.

OAKDALE IRRIGATION DISTRICT
Miscellaneous Policies and Procedures

Title	*Chapter*	*Section*
2 – OPERATIONS	1	2.109 Surface Water Shortage Policy
Adopted: December 2, 2008	Revised: March 1, 2016, June 2, 2020	Page 3 of 4

B. <u>Level Two</u> – The District allocation is less than 220,000 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. Increased utilization of District Deep Wells
   c. Diminished allocation to Tier 2 constituents as may be necessary
   d. Facilitation of a Farmer to Farmer Transfer Program as described in Section 5 below
   e. Fines for unauthorized use or theft of water and lock-out for the remainder of the season after a second offense
   f. Fines for unreasonable tail water runoff as described in Section 3 below

C. <u>Level Three</u> – The District allocation is below 190,000 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 Level Two elements
   b. Full utilization of District Deep Wells
   c. Suspension of deliveries to Tier 2 constituents
   d. Implementation of a Water Allocation Program as described in Section 4 below
   e. Irrigation water availability limited to agricultural purposes only (no water to ornamental ponds, etc.)

3. <u>TAIL WATER DISCHARGE POLICY & SUBSEQUENT FINES</u>

Under a Level Two water shortage it will be incumbent upon all lands receiving surface irrigation water to ensure that little-to-no water leaves their property. A water user notice will be mailed out after a water shortage declaration has been made by the Board of Directors informing each water user of the discharge restrictions. 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 violations shall be set and approved by the Board of Directors annually as may be necessary.

OAKDALE IRRIGATION DISTRICT
Miscellaneous Policies and Procedures

Title 2 – OPERATIONS	*Chapter* 1	*Section* 2.109 Surface Water Shortage Policy
Adopted: December 2, 2008	Revised: March 1, 2016, June 2, 2020	Page 4 of 4

4. WATER ALLOCATION PROGRAM

The Water Allocation Program consists of taking the year's net surface water available in acre feet and dividing it equally amongst the assessed Tier I acreage within the District. The resultant number would be the maximum quantity of water allocated in inches per acre to each Tier I water user. It would be incumbent upon the water users to determine when they wanted to use the water available to them.

5. FARMER TO FARMER TRANSFER PROGRAM:

The Farmer to Farmer Transfer Program allows farmers to work together to fully utilize available surface water supplies when supply is not expected to be adequate to meet the normal demand of irrigators. Tier I water users may transfer their allocation, as determined by OID through the Water Allocation Program, to other OID Tier I or Tier II lands. Upon execution of a Farmer to Farmer Transfer Program Application Agreement by both the contributing landowner(s) and the receiving landowner(s), OID would facilitate the delivery. The water rate assessed by OID for all water transferred and delivered through the Farmer to Farmer Transfer Program will remain consistent with the OID water rate then in effect for the recipient's lands (Tier I or Tier II) regardless of the OID volumetric water rate (Tier I or Tier II) associated with the lands of the contributing landowner(s).

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, [Insert Date]
- Notices of Intent to Prepare and Adopt an AWMP to City of Oakdale, Stanislaus County, and San Joaquin County, [Insert Date]
- Modesto Bee Notice of Publication, [Insert Date]
- OID Board of Directors Agenda, [Insert Date]
- Resolution of Adoption, [Insert Date]

Note: Materials on the following pages are placeholders from 2015 AWMP update.

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 A. McNamara

(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.

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.

2361

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

Attachment I: Eastern San Joaquin Groundwater Subbasin Groundwater Sustainability Plan

TO VIEW THE COMPLETE PLAN,

VISIT:

www.esjgroundwater.org/

Attachment J: Annual Water Budget Results

The OID water budget is described in detail in Section 5 of the AWMP. In that section, annual water budget results are presented for the District on a calendar year basis (January through December) from 2010 through 2019 with an emphasis on the irrigation season (March through October), although detailed water budget results are available historically beginning in January 2005. The water budget design divides it into three separate accounting centers for the OID distribution system, the farmed lands served by OID, and the OID drainage system; these three can also be aggregated for the OID service area. Furthermore, each of the three accounting centers and the overall District water budget can also be divided spatially into a distinct water budget for the northern portion of the OID service area to the north of the Stanislaus River, within the Eastern San Joaquin subbasin, and the southern portion to the south of Stanislaus River, within the Modesto subbasin.

In this appendix, the following annual water budget results are provided:

- **Tables J-1 through J-4:** Annual calendar year (January through December) water budget results from 2005 through 2019 for the entire OID Service Area
- **Tables J-5 through J-8:** Annual calendar year (January through December) water budget results from 2005 through 2019 for the northern OID Service Area
- **Tables J-9 through J-12:** Annual calendar year (January through December) water budget results from 2005 through 2019 for the southern OID Service Area
- **Tables J-13 through J-16:** Annual water year (October through September) water budget results from 2006[29] through 2019 for the entire OID Service Area
- **Tables J-17 throughJ-20:** Annual water year (October through September) water budget results from 2006 through 2019 for the northern OID Service Area
- **Tables J-21 through J-24:** Annual water year (October through September) water budget results from 2006 through 2019 for the southern OID Service Area

[29] Since the 2005 water budget was originally assembled based on a calendar year basis, the data records begin in January 2005, rather than October 2004. Due to this data gap, water budget results presented on a water year basis begin with the 2006 water year.

Table J-1. OID Distribution System Annual Calendar Year (January to December) Water Budget Results, 2005 to 2019.

				Inflows (ac-ft)						Outflows (ac-ft)							
Year	Irrigation Season Number of Days	USBR Allotment	Hydro-logic Year Type	System Inflows	District Groundwater 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	62	2,616	2,097	0	2,788	5,950	1,377	1,600	13,522	23,999	**191,533**
2006	175	Full	Wet	226,202	1,527	8,956	37	1,948	2,097	0	2,495	5,508	1,373	1,596	18,222	23,204	**188,369**
2007	214	Partial	Dry	262,185	7,505	10,100	99	1,891	2,097	2,185	2,997	5,663	1,604	1,863	19,407	28,375	**223,968**
2008	205	Partial	Dry	244,610	14,862	11,155	11	1,769	2,097	7,260	2,876	8,384	1,600	1,859	14,969	27,181	**217,636**
2009	200	Full	Dry	234,565	15,689	9,669	69	1,960	2,097	0	2,754	5,689	1,552	1,803	14,356	26,518	**211,377**
2010	205	Full	Wet	216,957	5,683	7,729	148	1,887	2,097	0	2,390	4,573	1,479	1,718	14,958	27,181	**182,200**
2011	192	Full	Wet	219,154	2,311	7,430	114	2,012	2,097	0	2,324	6,340	1,401	1,628	15,677	25,458	**180,289**
2012	218	Full	Dry	232,934	6,634	8,219	168	2,098	2,097	0	2,383	3,666	1,608	1,868	15,908	28,905	**197,814**
2013	214	Partial	Dry	245,621	10,112	7,705	55	1,915	2,097	0	2,550	234	1,660	1,929	16,579	28,375	**216,178**
2014	208	Partial	Dry	200,232	18,298	6,518	76	1,641	2,097	0	1,988	217	1,607	1,867	14,291	27,579	**181,313**
2015	207	Partial	Dry	164,988	12,590	3,337	75	2,189	2,097	0	2,430	1,908	1,499	1,742	7,665	27,446	**142,588**
2016	213	Full	Dry	193,139	3,577	4,413	100	1,478	2,097	0	2,430	2,577	1,404	1,631	9,138	28,242	**159,382**
2017	211	Full	Wet	195,975	2,451	3,978	77	2,080	2,097	0	1,775	2,512	1,217	1,886	10,306	27,977	**160,987**
2018	212	Full	Dry	209,347	2,874	3,616	106	2,296	2,097	0	1,771	3,860	1,225	1,897	13,510	28,085	**169,988**
2019	212	Full	Wet	201,210	1,686	3,508	99	1,947	2,097	0	1,862	4,768	1,132	1,754	13,902	27,961	**159,168**
			Minimum	164,988	1,527	3,337	11	1,478	2,097	0	1,771	217	1,132	1,596	7,665	23,204	**142,588**
			Maximum	262,185	18,298	11,155	168	2,616	2,097	7,260	2,997	8,384	1,660	1,929	19,407	28,905	**223,968**
			Wet Year Average	213,894	2,619	6,945	90	2,082	2,097	0	2,272	4,942	1,330	1,697	14,431	25,963	**177,091**
			Dry Year Average	220,847	10,238	7,192	84	1,915	2,097	1,049	2,464	3,578	1,529	1,829	13,980	27,856	**191,138**
			Overall Average	218,066	7,190	7,093	87	1,982	2,097	630	2,387	4,123	1,449	1,776	14,161	27,099	**185,519**

Table J-2. OID Farmed Lands Annual Calendar Year (January to December) Water Budget Results, 2005 to 2019.

				Applied Water Budget										Precipitation Budget				
				Inflows (af)				Outflows (af)						Inflows (af)	Outflows (af)			
Year	Irriga-tion Season Num-ber of Days	USBR Allotment	Hydro-logic Year Type	OID Farm Deliveries	Private Drain-water Reuse	Private Ground-water Pumping	Recycled to Farm Lands	Crop ET of Applied Water	Tailwater to Drainage System	District Tail-water Reuse	**Deep Percolation of Applied Water (Closure)**	Change in Storage (af)	Crop Consumptive Use Fraction (CCUF)	Precipitation	Crop ET of Precipi-tation	Runoff of Precipi-tation	Deep Percolation of Precipitation	**Change in Storage (Closure, af)**
2005	181	Full	Wet	191,533	3,546	15,962	1,168	109,020	54,106	2,616	**46,466**	0	0.51	64,895	49,950	4,095	25,708	**-14,858**
2006	175	Full	Wet	188,369	3,860	19,655	1,168	125,821	42,181	1,948	**43,102**	0	0.59	53,638	37,159	4,095	15,691	**-3,308**
2007	214	Partial	Dry	223,968	4,479	22,488	1,168	143,866	47,042	1,891	**59,304**	0	0.57	37,724	27,623	1,330	6,613	**2,157**
2008	205	Partial	Dry	217,636	4,675	23,157	1,168	148,465	46,636	1,769	**49,765**	0	0.60	41,076	27,717	2,562	11,339	**-542**
2009	200	Full	Dry	211,377	4,409	22,290	1,168	146,110	50,800	1,960	**40,373**	0	0.61	39,448	27,845	2,272	7,476	**1,855**
2010	205	Full	Wet	182,200	3,676	17,990	1,168	118,682	47,558	1,887	**36,908**	0	0.58	82,032	42,331	4,114	20,517	**15,069**
2011	192	Full	Wet	180,289	3,894	17,683	1,168	118,334	51,110	2,012	**31,578**	0	0.58	49,674	45,117	2,806	17,623	**-15,872**
2012	218	Full	Dry	197,814	4,480	21,467	1,168	142,783	57,852	2,098	**22,196**	0	0.63	58,720	27,410	3,160	11,372	**16,778**
2013	214	Partial	Dry	216,178	4,935	24,671	1,168	160,857	54,260	1,915	**29,919**	0	0.65	18,537	24,373	952	7,472	**-14,260**
2014	208	Partial	Dry	181,313	4,625	45,866	1,168	170,483	38,416	1,641	**22,431**	0	0.73	65,408	27,424	6,272	12,027	**19,685**
2015	207	Partial	Dry	142,588	4,473	75,830	1,168	162,730	44,105	2,189	**15,035**	0	0.73	45,694	33,580	2,999	10,976	**-1,861**
2016	213	Full	Dry	159,382	3,845	54,744	1,168	144,666	36,380	1,478	**36,615**	0	0.66	89,565	47,605	9,313	29,396	**3,251**
2017	211	Full	Wet	160,987	4,397	61,065	1,168	169,163	39,055	2,080	**17,318**	0	0.74	80,053	56,136	7,559	31,580	**-15,222**
2018	212	Full	Dry	169,988	4,908	55,336	1,168	173,549	40,016	2,296	**15,537**	0	0.75	68,782	36,954	5,350	12,170	**14,309**
2019	212	Full	Wet	159,168	4,263	51,459	1,168	160,594	30,068	1,947	**23,449**	0	0.74	83,989	53,345	4,449	20,970	**5,225**
			Minimum	142,588	3,546	15,962	1,168	109,020	30,068	1,478	**15,035**	0	0.51	18,537	24,373	952	6,613	**-15,872**
			Maximum	223,968	4,935	75,830	1,168	173,549	57,852	2,616	**59,304**	0	0.75	89,565	56,136	9,313	31,580	**19,685**
			Wet Year Average	177,091	3,940	30,636	1,168	133,602	44,013	2,082	**33,137**	0	0.63	69,047	47,340	4,520	22,015	**-4,827**
			Dry Year Average	191,138	4,537	38,428	1,168	154,834	46,167	1,915	**32,353**	0	0.66	51,662	31,170	3,801	12,093	**4,597**
			Overall Average	185,519	4,298	35,311	1,168	146,342	45,306	1,982	**32,666**	0	0.65	58,616	37,638	4,089	16,062	**827**

Table J-3. OID Drainage System Annual Calendar Year (January to December) Water Budget Results, 2005 to 2019.

				Inflows (af)				Outflows (af)					
Year	Number of Days	USBR Allotment	Hydrologic Year Type	Operational Spillage	**Tailwater to Drainage System (Closure)**	Runoff of Precipitation	Precipitation	Drain-water Outflow	District Drain-water Reuse	Seepage	Private Drain-water Reuse	Evaporation	Riparian ET
2005	181	Full	Wet	13,522	**54,106**	4,095	10	52,317	10,068	5,365	3,546	266	171
2006	175	Full	Wet	18,222	**42,181**	4,095	6	46,066	8,956	5,187	3,860	265	171
2007	214	Partial	Dry	19,407	**47,042**	1,330	17	46,365	10,100	6,343	4,479	309	200
2008	205	Partial	Dry	14,969	**46,636**	2,562	2	41,755	11,155	6,076	4,675	309	199
2009	200	Full	Dry	14,356	**50,800**	2,272	12	46,942	9,669	5,928	4,409	299	193
2010	205	Full	Wet	14,958	**47,558**	4,114	25	48,705	7,729	6,076	3,676	285	184
2011	192	Full	Wet	15,677	**51,110**	2,806	19	52,153	7,430	5,691	3,894	270	174
2012	218	Full	Dry	15,908	**57,852**	3,160	28	57,277	8,219	6,461	4,480	310	200
2013	214	Partial	Dry	16,579	**54,260**	952	9	52,291	7,705	6,343	4,935	320	207
2014	208	Partial	Dry	14,291	**38,416**	6,272	13	41,173	6,518	6,165	4,625	310	200
2015	207	Partial	Dry	7,665	**44,105**	2,999	13	40,359	3,337	6,135	4,473	289	187
2016	213	Full	Dry	9,138	**36,380**	9,313	17	39,831	4,413	6,313	3,845	271	175
2017	211	Full	Wet	10,306	**39,055**	7,559	13	41,789	3,978	6,254	4,397	313	202
2018	212	Full	Dry	13,510	**40,016**	5,350	18	43,566	3,616	6,283	4,908	315	204
2019	212	Full	Wet	13,902	**30,068**	4,449	17	33,899	3,508	6,283	4,263	293	189
			Minimum	7,665	**30,068**	952	2	33,899	3,337	5,187	3,546	265	171
			Maximum	19,407	**57,852**	9,313	28	57,277	11,155	6,461	4,935	320	207
			Wet Year Average	14,431	**44,013**	4,520	15	45,821	6,945	5,809	3,940	282	182
			Dry Year Average	13,980	**46,167**	3,801	14	45,507	7,192	6,227	4,537	304	196
			Overall Average	14,161	**45,306**	4,089	14	45,632	7,093	6,060	4,298	295	190

Table J-4. OID Overall Water District Annual Calendar Year (January to December) Water Budget Results, 2005 to 2019.

				Inflows (af)					Outflows (af)										
Year	Number of Days	USBR Allotment	Hydro-logic Year Type	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 Precipi-tation	Change in Stor-age (af)
2005	181	Full	Wet	223,867	2,057	64,968	15,962	3,265	0	2,788	5,950	52,317	29,364	46,466	25,708	3,414	109,020	49,950	-14,858
2006	175	Full	Wet	226,202	1,527	53,681	19,655	3,265	0	2,495	5,508	46,066	28,390	43,102	15,691	3,405	125,821	37,159	-3,308
2007	214	Partial	Dry	262,185	7,505	37,840	22,488	3,265	2,185	2,997	5,663	46,365	34,717	59,304	6,613	3,976	143,866	27,623	2,157
2008	205	Partial	Dry	244,610	14,862	41,089	23,157	3,265	7,260	2,876	8,384	41,755	33,257	49,765	11,339	3,967	148,465	27,717	-542
2009	200	Full	Dry	234,565	15,689	39,529	22,290	3,265	0	2,754	5,689	46,942	32,446	40,373	7,476	3,848	146,110	27,845	1,855
2010	205	Full	Wet	216,957	5,683	82,205	17,990	3,265	0	2,390	4,573	48,705	33,257	36,908	20,517	3,667	118,682	42,331	15,069
2011	192	Full	Wet	219,154	2,311	49,808	17,683	3,265	0	2,324	6,340	52,153	31,148	31,578	17,623	3,475	118,334	45,117	-15,872
2012	218	Full	Dry	232,934	6,634	58,916	21,467	3,265	0	2,383	3,666	57,277	35,366	22,196	11,372	3,986	142,783	27,410	16,778
2013	214	Partial	Dry	245,621	10,112	18,601	24,671	3,265	0	2,550	234	52,291	34,717	29,919	7,472	4,116	160,857	24,373	-14,260
2014	208	Partial	Dry	200,232	18,298	65,497	45,866	3,265	0	1,988	217	41,173	33,744	22,431	12,027	3,984	170,483	27,424	19,685
2015	207	Partial	Dry	164,988	12,590	45,782	75,830	3,265	0	2,430	1,908	40,359	33,582	15,035	10,976	3,717	162,730	33,580	-1,861
2016	213	Full	Dry	193,139	3,577	89,681	54,744	3,265	0	2,430	2,577	39,831	34,555	36,615	29,396	3,481	144,666	47,605	3,251
2017	211	Full	Wet	195,975	2,451	80,143	61,065	3,265	0	1,775	2,512	41,789	34,231	17,318	31,580	3,618	169,163	56,136	-15,222
2018	212	Full	Dry	209,347	2,874	68,905	55,336	3,265	0	1,771	3,860	43,566	34,369	15,537	12,170	3,641	173,549	36,954	14,309
2019	212	Full	Wet	201,210	1,686	84,104	51,459	3,265	0	1,862	4,768	33,899	34,245	23,449	20,970	3,368	160,594	53,345	5,225
			Minimum	164,988	1,527	18,601	15,962	3,265	0	1,771	217	33,899	28,390	15,035	6,613	3,368	109,020	24,373	-15,872
			Maximum	262,185	18,298	89,681	75,830	3,265	7,260	2,997	8,384	57,277	35,366	59,304	31,580	4,116	173,549	56,136	19,685
			Wet Year Average	213,894	2,619	69,151	30,636	3,265	0	2,272	4,942	45,821	31,772	33,137	22,015	3,491	133,602	47,340	-4,827
			Dry Year Average	220,847	10,238	51,760	38,428	3,265	1,049	2,464	3,578	45,507	34,084	32,353	12,093	3,857	154,834	31,170	4,597
			Overall Average	218,066	7,190	58,717	35,311	3,265	630	2,387	4,123	45,632	33,159	32,666	16,062	3,711	146,342	37,638	827

Table J-5. Distribution System Annual Calendar Year (January to December) Water Budget Results for Northern OID Service Area, 2005 to 2019.

				Inflows (ac-ft)						Outflows (ac-ft)							
Year	Irrigation Season Number of Days	USBR Allotment	Hydro-logic Year Type	System Inflows	District Groundwater Pumping	District Drainwater 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	95,814	1,152	3,080	32	2,412	0	0	2,788	1,908	699	812	4,735	12,441	**79,105**
2006	175	Full	Wet	98,887	728	2,443	19	1,749	0	0	2,495	2,152	697	810	7,116	12,029	**78,526**
2007	214	Partial	Dry	116,202	3,460	3,172	51	1,647	0	1,093	2,997	2,298	814	946	8,322	14,710	**94,445**
2008	205	Partial	Dry	105,146	7,892	3,609	6	1,525	0	3,630	2,876	4,275	812	944	7,729	14,091	**87,449**
2009	200	Full	Dry	100,354	7,461	3,554	35	1,700	0	0	2,754	2,382	788	916	6,982	13,748	**85,535**
2010	205	Full	Wet	91,109	2,968	2,918	75	1,653	0	0	2,390	1,745	751	872	6,554	14,091	**72,319**
2011	192	Full	Wet	95,814	1,224	2,952	58	1,756	0	0	2,324	2,028	711	827	7,860	13,198	**74,855**
2012	218	Full	Dry	96,857	2,614	3,232	85	1,801	0	0	2,383	863	816	948	9,767	14,985	**74,826**
2013	214	Partial	Dry	102,690	4,535	2,055	28	1,617	0	0	2,550	234	843	979	10,171	14,710	**81,439**
2014	208	Partial	Dry	83,206	8,674	2,703	39	1,510	0	0	1,988	217	816	948	7,603	14,297	**70,262**
2015	207	Partial	Dry	69,331	6,978	1,332	38	2,071	0	0	2,430	1,066	761	884	3,331	14,229	**57,050**
2016	213	Full	Dry	80,685	1,292	1,694	51	1,354	0	0	2,430	1,345	713	828	3,703	14,641	**61,416**
2017	211	Full	Wet	81,151	961	1,730	39	1,849	0	0	1,771	1,932	618	957	5,554	14,504	**60,395**
2018	212	Full	Dry	91,449	1,123	1,695	54	2,038	0	0	1,768	2,991	621	963	7,452	14,548	**68,016**
2019	212	Full	Wet	88,934	555	1,718	50	1,733	0	0	1,862	4,012	576	892	7,148	14,528	**63,973**
			Minimum	69,331	555	1,332	6	1,354	0	0	1,768	217	576	810	3,331	12,029	**57,050**
			Maximum	116,202	8,674	3,609	85	2,412	0	3,630	2,997	4,275	843	979	10,171	14,985	**94,445**
			Wet Year Average	91,951	1,265	2,474	46	1,859	0	0	2,272	2,296	675	862	6,494	13,465	**71,529**
			Dry Year Average	93,991	4,892	2,561	43	1,696	0	525	2,464	1,741	776	928	7,229	14,440	**75,604**
			Overall Average	93,175	3,441	2,526	44	1,761	0	315	2,387	1,963	736	902	6,935	14,050	**73,974**

Table J-6. Farmed Lands Annual Calendar Year (January to December) Water Budget Results for Northern OID Service Area, 2005 to 2019.

				Applied Water Budget										Precipitation Budget				
				Inflows (af)				Outflows (af)						Inflows (af)	Outflows (af)			
Year	Irriga-tion Season Num-ber of Days	USBR Allot-ment	Hydro-logic Year Type	OID Farm Deliveries	Private Drain-water Reuse	Private Ground-water Pumping	Recycled to Farm Lands	Crop ET of Applied Water	Tailwater to Drainage System	District Tail-water Reuse	**Deep Percolation of Applied Water (Closure)**	Change in Storage (af)	Crop Consump-tive Use Fraction (CCUF)	Precipi-tation	Crop ET of Precipi-tation	Runoff of Precipi-tation	Deep Percolation of Precipi-tation	**Change in Storage (Closure, af)**
2005	181	Full	Wet	79,105	1,307	11,507	0	45,426	27,458	2,412	**16,624**	0	0.49	25,994	20,127	1,342	10,389	**-5,864**
2006	175	Full	Wet	78,526	1,406	14,169	0	52,247	18,670	1,749	**21,436**	0	0.56	21,486	15,082	1,362	6,316	**-1,273**
2007	214	Partial	Dry	94,445	1,631	16,223	0	61,707	18,595	1,647	**30,352**	0	0.55	16,030	11,859	504	2,726	**942**
2008	205	Partial	Dry	87,449	1,704	16,684	0	63,617	17,692	1,525	**23,004**	0	0.60	17,454	11,872	984	4,826	**-228**
2009	200	Full	Dry	85,535	1,604	16,064	0	64,952	20,581	1,700	**15,970**	0	0.63	17,168	12,306	853	3,190	**818**
2010	205	Full	Wet	72,319	1,343	12,970	0	52,462	19,749	1,653	**12,769**	0	0.61	35,402	18,499	1,462	8,873	**6,568**
2011	192	Full	Wet	74,855	1,461	12,764	0	52,343	20,566	1,756	**14,415**	0	0.59	21,266	19,581	981	7,580	**-6,877**
2012	218	Full	Dry	74,826	1,679	17,489	0	61,937	21,435	1,801	**8,821**	0	0.66	25,000	11,820	1,166	4,834	**7,180**
2013	214	Partial	Dry	81,439	1,849	17,798	0	69,648	19,275	1,617	**10,545**	0	0.69	7,890	10,467	349	3,174	**-6,100**
2014	208	Partial	Dry	70,262	1,733	27,403	0	69,772	19,685	1,510	**8,431**	0	0.70	26,311	11,147	2,295	4,904	**7,965**
2015	207	Partial	Dry	57,050	1,674	43,697	0	65,796	26,886	2,071	**7,668**	0	0.64	18,203	13,556	1,059	4,293	**-705**
2016	213	Full	Dry	61,416	1,440	30,619	0	58,773	18,054	1,354	**15,293**	0	0.63	36,122	19,327	3,569	11,918	**1,309**
2017	211	Full	Wet	60,395	1,646	34,635	0	69,073	13,160	1,849	**12,594**	0	0.71	32,300	22,870	2,860	12,778	**-6,208**
2018	212	Full	Dry	68,016	1,838	31,268	0	67,223	10,011	2,038	**21,850**	0	0.66	27,655	14,903	2,169	4,856	**5,728**
2019	212	Full	Wet	63,973	1,596	29,625	0	65,167	8,058	1,733	**20,236**	0	0.68	34,278	21,840	1,794	8,514	**2,130**
			Minimum	57,050	1,307	11,507	0	45,426	8,058	1,354	**7,668**	0	0.49	7,890	10,467	349	2,726	**-6,877**
			Maximum	94,445	1,849	43,697	0	69,772	27,458	2,412	**30,352**	0	0.71	36,122	22,870	3,569	12,778	**7,965**
			Wet Year Average	71,529	1,460	19,279	0	56,120	17,943	1,859	**16,346**	0	0.61	28,454	19,667	1,634	9,075	**-1,921**
			Dry Year Average	75,604	1,683	24,138	0	64,825	19,135	1,696	**15,770**	0	0.64	21,315	13,029	1,439	4,969	**1,879**
			Overall Average	73,974	1,594	22,194	0	61,343	18,658	1,761	**16,000**	0	0.63	24,170	15,684	1,517	6,611	**359**

Table J-7. Drainage System Annual Calendar Year (January to December) Water Budget Results for Northern OID Service Area, 2005 to 2019.

				Inflows (af)				Outflows (af)					
Year	Number of Days	USBR Allotment	Hydrologic Year Type	Operational Spillage	**Tailwater to Drainage System (Closure)**	Runoff of Precipitation	Precipitation	Drainwater Outflow	District Drain-water Reuse	Seepage	Private Drain-water Reuse	Evaporation	Riparian ET
2005	181	Full	Wet	4,735	**27,458**	1,342	4	26,851	3,080	2,128	1,307	105	68
2006	175	Full	Wet	7,116	**18,670**	1,362	2	21,070	2,443	2,058	1,406	105	68
2007	214	Partial	Dry	8,322	**18,595**	504	7	19,905	3,172	2,516	1,631	123	79
2008	205	Partial	Dry	7,729	**17,692**	984	1	18,482	3,609	2,410	1,704	122	79
2009	200	Full	Dry	6,982	**20,581**	853	5	20,716	3,554	2,352	1,604	119	77
2010	205	Full	Wet	6,554	**19,749**	1,462	10	20,917	2,918	2,410	1,343	113	73
2011	192	Full	Wet	7,860	**20,566**	981	8	22,568	2,952	2,257	1,461	107	69
2012	218	Full	Dry	9,767	**21,435**	1,166	11	24,703	3,232	2,563	1,679	123	79
2013	214	Partial	Dry	10,171	**19,275**	349	4	23,170	2,055	2,516	1,849	127	82
2014	208	Partial	Dry	7,603	**19,685**	2,295	5	22,504	2,703	2,446	1,733	123	79
2015	207	Partial	Dry	3,331	**26,886**	1,059	5	25,652	1,332	2,434	1,674	115	74
2016	213	Full	Dry	3,703	**18,054**	3,569	7	19,517	1,694	2,504	1,440	107	69
2017	211	Full	Wet	5,554	**13,160**	2,860	5	15,517	1,730	2,481	1,646	124	80
2018	212	Full	Dry	7,452	**10,011**	2,169	7	13,409	1,695	2,493	1,838	125	81
2019	212	Full	Wet	7,148	**8,058**	1,794	7	11,009	1,718	2,493	1,596	116	75
			Minimum	3,331	**8,058**	349	1	11,009	1,332	2,058	1,307	105	68
			Maximum	10,171	**27,458**	3,569	11	26,851	3,609	2,563	1,849	127	82
			Wet Year Average	6,494	**17,943**	1,634	6	19,655	2,474	2,304	1,460	112	72
			Dry Year Average	7,229	**19,135**	1,439	6	20,895	2,561	2,470	1,683	120	78
			Overall Average	6,935	**18,658**	1,517	6	20,399	2,526	2,404	1,594	117	76

Table J-8. Overall Annual Calendar Year (January to December) Water Budget Results for Northern OID Service Area, 2005 to 2019.

				Inflows (af)					Outflows (af)										
Year	Number of Days	USBR Allotment	Hydrologic Year Type	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 Precipi-tation	Change in Stor-age (af)
2005	181	Full	Wet	95,814	1,152	26,029	11,507	0	0	2,788	1,908	26,851	14,570	16,624	10,389	1,685	45,426	20,127	-5,864
2006	175	Full	Wet	98,887	728	21,507	14,169	0	0	2,495	2,152	21,070	14,087	21,436	6,316	1,680	52,247	15,082	-1,273
2007	214	Partial	Dry	116,202	3,460	16,087	16,223	0	1,093	2,997	2,298	19,905	17,226	30,352	2,726	1,962	61,707	11,859	942
2008	205	Partial	Dry	105,146	7,892	17,461	16,684	0	3,630	2,876	4,275	18,482	16,501	23,004	4,826	1,958	63,617	11,872	-228
2009	200	Full	Dry	100,354	7,461	17,207	16,064	0	0	2,754	2,382	20,716	16,099	15,970	3,190	1,899	64,952	12,306	818
2010	205	Full	Wet	91,109	2,968	35,486	12,970	0	0	2,390	1,745	20,917	16,501	12,769	8,873	1,810	52,462	18,499	6,568
2011	192	Full	Wet	95,814	1,224	21,331	12,764	0	0	2,324	2,028	22,568	15,455	14,415	7,580	1,715	52,343	19,581	-6,877
2012	218	Full	Dry	96,857	2,614	25,096	17,489	0	0	2,383	863	24,703	17,548	8,821	4,834	1,967	61,937	11,820	7,180
2013	214	Partial	Dry	102,690	4,535	7,921	17,798	0	0	2,550	234	23,170	17,226	10,545	3,174	2,031	69,648	10,467	-6,100
2014	208	Partial	Dry	83,206	8,674	26,355	27,403	0	0	1,988	217	22,504	16,743	8,431	4,904	1,966	69,772	11,147	7,965
2015	207	Partial	Dry	69,331	6,978	18,246	43,697	0	0	2,430	1,066	25,652	16,662	7,668	4,293	1,834	65,796	13,556	-705
2016	213	Full	Dry	80,685	1,292	36,179	30,619	0	0	2,430	1,345	19,517	17,145	15,293	11,918	1,718	58,773	19,327	1,309
2017	211	Full	Wet	81,151	961	32,345	34,635	0	0	1,771	1,932	15,517	16,984	12,594	12,778	1,780	69,073	22,870	-6,208
2018	212	Full	Dry	91,449	1,123	27,716	31,268	0	0	1,768	2,991	13,409	17,041	21,850	4,856	1,790	67,223	14,903	5,728
2019	212	Full	Wet	88,934	555	34,334	29,625	0	0	1,862	4,012	11,009	17,020	20,236	8,514	1,659	65,167	21,840	2,130
			Minimum	69,331	555	7,921	11,507	0	0	1,768	217	11,009	14,087	7,668	2,726	1,659	45,426	10,467	-6,877
			Maximum	116,202	8,674	36,179	43,697	0	3,630	2,997	4,275	26,851	17,548	30,352	12,778	2,031	69,772	22,870	7,965
			Wet Year Average	91,951	1,265	28,505	19,279	0	0	2,272	2,296	19,655	15,770	16,346	9,075	1,721	56,120	19,667	-1,921
			Dry Year Average	93,991	4,892	21,363	24,138	0	525	2,464	1,741	20,895	16,910	15,770	4,969	1,903	64,825	13,029	1,879
			Overall Average	93,175	3,441	24,220	22,194	0	315	2,387	1,963	20,399	16,454	16,000	6,611	1,830	61,343	15,684	359

Table J-9. Distribution System Annual Calendar Year (January to December) Water Budget Results for Southern OID Service Area, 2005 to 2019.

Year	Irrigation Season Number of Days	USBR Allotment	Hydro-logic Year Type	Inflows (ac-ft): System Inflows	District Groundwater Pumping	District Drainwater Reuse	Precipi-tation	District Tail-water Reuse	Recycled to Distribution System	Outflows (ac-ft): 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	128,053	905	6,989	31	205	2,097	0	0	4,042	678	788	8,787	11,558	**112,427**
2006	175	Full	Wet	127,315	799	6,513	18	200	2,097	0	0	3,356	676	786	11,106	11,174	**109,843**
2007	214	Partial	Dry	145,983	4,045	6,927	49	243	2,097	1,092	0	3,365	789	917	11,085	13,665	**129,523**
2008	205	Partial	Dry	139,464	6,971	7,546	6	245	2,097	3,630	0	4,108	788	915	7,239	13,090	**130,188**
2009	200	Full	Dry	134,211	8,228	6,115	34	260	2,097	0	0	3,307	764	888	7,374	12,771	**125,841**
2010	205	Full	Wet	125,848	2,715	4,811	73	234	2,097	0	0	2,828	728	846	8,404	13,090	**109,881**
2011	192	Full	Wet	123,340	1,087	4,478	56	256	2,097	0	0	4,312	690	802	7,817	12,260	**105,434**
2012	218	Full	Dry	136,077	4,020	4,988	83	297	2,097	0	0	2,803	791	920	6,140	13,920	**122,988**
2013	214	Partial	Dry	142,930	5,577	5,650	27	297	2,097	0	0	0	817	950	6,408	13,665	**134,739**
2014	208	Partial	Dry	117,026	9,624	3,816	37	131	2,097	0	0	0	791	919	6,688	13,282	**111,051**
2015	207	Partial	Dry	95,657	5,612	2,005	37	119	2,097	0	0	841	738	858	4,334	13,218	**85,538**
2016	213	Full	Dry	112,455	2,285	2,718	49	123	2,097	0	0	1,232	691	803	5,435	13,601	**97,965**
2017	211	Full	Wet	114,825	1,490	2,248	38	231	2,097	0	3	579	599	928	4,752	13,473	**100,592**
2018	212	Full	Dry	117,898	1,751	1,922	52	258	2,097	0	3	870	603	935	6,058	13,537	**101,971**
2019	212	Full	Wet	112,276	1,132	1,790	49	214	2,097	0	0	756	556	862	6,754	13,433	**95,195**
			Minimum	95,657	799	1,790	6	119	2,097	0	0	0	556	786	4,334	11,174	**85,538**
			Maximum	145,983	9,624	7,546	83	297	2,097	3,630	3	4,312	817	950	11,106	13,920	**134,739**
			Wet Year Average	121,943	1,354	4,471	44	223	2,097	0	1	2,645	655	835	7,937	12,498	**105,562**
			Dry Year Average	126,856	5,346	4,632	42	219	2,097	525	0	1,836	753	901	6,751	13,416	**115,534**
			Overall Average	124,890	3,749	4,568	43	221	2,097	315	0	2,160	713	874	7,226	13,049	**111,545**

Table J-10. Farmed Lands Annual Calendar Year (January to December) Water Budget Results for Southern OID Service Area, 2005 to 2019.

Year	Irriga-tion Season Num-ber of Days	USBR Allot-ment	Hydro-logic Year Type	Applied Water Budget: Inflows (af): OID Farm Deliveries	Private Drain-water Reuse	Private Ground-water Pumping	Recycled to Farm Lands	Outflows (af): Crop ET of Applied Water	Tailwater to Drainage System	District Tail-water Reuse	**Deep Percolation of Applied Water (Closure)**	Change in Storage (af)	Crop Consump-tive Use Fraction (CCUF)	Precipitation Budget: Inflows (af): Precipi-tation	Outflows (af): Crop ET of Precipi-tation	Runoff of Precipi-tation	Deep Percolation of Precipi-tation	**Change in Storage (Closure, af)**
2005	181	Full	Wet	112,427	2,240	4,455	1,168	63,594	26,648	205	**29,842**	0	0.53	38,902	29,823	2,753	15,319	**-8,994**
2006	175	Full	Wet	109,843	2,454	5,486	1,168	73,574	23,511	200	**21,665**	0	0.62	32,153	22,078	2,734	9,376	**-2,034**
2007	214	Partial	Dry	129,523	2,848	6,264	1,168	82,159	28,447	243	**28,953**	0	0.59	21,694	15,764	827	3,888	**1,215**
2008	205	Partial	Dry	130,188	2,971	6,472	1,168	84,848	28,944	245	**26,761**	0	0.60	23,622	15,844	1,578	6,514	**-314**
2009	200	Full	Dry	125,841	2,804	6,227	1,168	81,158	30,219	260	**24,403**	0	0.60	22,280	15,539	1,419	4,286	**1,037**
2010	205	Full	Wet	109,881	2,333	5,020	1,168	66,220	27,809	234	**24,139**	0	0.56	46,630	23,832	2,652	11,644	**8,501**
2011	192	Full	Wet	105,434	2,434	4,919	1,168	65,991	30,544	256	**17,163**	0	0.58	28,408	25,535	1,825	10,043	**-8,995**
2012	218	Full	Dry	122,988	2,801	3,978	1,168	80,846	36,417	297	**13,375**	0	0.62	33,720	15,590	1,995	6,539	**9,597**
2013	214	Partial	Dry	134,739	3,086	6,873	1,168	91,209	34,985	297	**19,374**	0	0.63	10,647	13,906	603	4,299	**-8,161**
2014	208	Partial	Dry	111,051	2,892	18,463	1,168	100,712	18,731	131	**14,000**	0	0.75	39,097	16,277	3,978	7,122	**11,720**
2015	207	Partial	Dry	85,538	2,800	32,133	1,168	96,934	17,219	119	**7,367**	0	0.80	27,491	20,024	1,940	6,683	**-1,156**
2016	213	Full	Dry	97,965	2,406	24,125	1,168	85,893	18,326	123	**21,321**	0	0.68	53,443	28,278	5,744	17,478	**1,943**
2017	211	Full	Wet	100,592	2,751	26,429	1,168	100,090	25,896	231	**4,723**	0	0.76	47,753	33,266	4,698	18,802	**-9,014**
2018	212	Full	Dry	101,971	3,071	24,067	1,168	106,327	30,005	258	**-6,312**	0	0.82	41,127	22,051	3,180	7,314	**8,581**
2019	212	Full	Wet	95,195	2,667	21,834	1,168	95,428	22,009	214	**3,213**	0	0.79	49,711	31,505	2,655	12,456	**3,096**
			Minimum	85,538	2,240	3,978	1,168	63,594	17,219	119	**-6,312**	0	0.53	10,647	13,906	603	3,888	**-9,014**
			Maximum	134,739	3,086	32,133	1,168	106,327	36,417	297	**29,842**	0	0.82	53,443	33,266	5,744	18,802	**11,720**
			Wet Year Average	105,562	2,480	11,357	1,168	77,483	26,070	223	**16,791**	0	0.64	40,593	27,673	2,886	12,940	**-2,907**
			Dry Year Average	115,534	2,853	14,289	1,168	90,010	27,033	219	**16,583**	0	0.68	30,347	18,142	2,363	7,125	**2,718**
			Overall Average	111,545	2,704	13,116	1,168	84,999	26,647	221	**16,666**	0	0.66	34,445	21,954	2,572	9,451	**468**

Table J-11. Drainage System Annual Calendar Year (January to December) Water Budget Results for Southern OID Service Area, 2005 to 2019.

				Inflows (af)				Outflows (af)					
Year	Number of Days	USBR Allotment	Hydrologic Year Type	Operational Spillage	**Tailwater to Drainage System (Closure)**	Runoff of Precipitation	Precipitation	Drainwater Outflow	District Drainwater Reuse	Seepage	Private Drainwater Reuse	Evaporation	Riparian ET
2005	181	Full	Wet	8,787	**26,648**	2,753	6	25,466	6,989	3,236	2,240	160	103
2006	175	Full	Wet	11,106	**23,511**	2,734	4	24,996	6,513	3,129	2,454	160	103
2007	214	Partial	Dry	11,085	**28,447**	827	10	26,460	6,927	3,827	2,848	187	120
2008	205	Partial	Dry	7,239	**28,944**	1,578	1	23,273	7,546	3,666	2,971	186	120
2009	200	Full	Dry	7,374	**30,219**	1,419	7	26,226	6,115	3,576	2,804	181	117
2010	205	Full	Wet	8,404	**27,809**	2,652	15	27,788	4,811	3,666	2,333	172	111
2011	192	Full	Wet	7,817	**30,544**	1,825	11	29,584	4,478	3,433	2,434	163	105
2012	218	Full	Dry	6,140	**36,417**	1,995	17	32,574	4,988	3,898	2,801	187	121
2013	214	Partial	Dry	6,408	**34,985**	603	5	29,121	5,650	3,827	3,086	193	125
2014	208	Partial	Dry	6,688	**18,731**	3,978	8	18,669	3,816	3,719	2,892	187	121
2015	207	Partial	Dry	4,334	**17,219**	1,940	8	14,707	2,005	3,701	2,800	174	113
2016	213	Full	Dry	5,435	**18,326**	5,744	10	20,314	2,718	3,809	2,406	163	105
2017	211	Full	Wet	4,752	**25,896**	4,698	8	26,271	2,248	3,773	2,751	189	122
2018	212	Full	Dry	6,058	**30,005**	3,180	11	30,158	1,922	3,791	3,071	190	123
2019	212	Full	Wet	6,754	**22,009**	2,655	10	22,890	1,790	3,791	2,667	177	114
Minimum				4,334	**17,219**	603	1	14,707	1,790	3,129	2,240	160	103
Maximum				11,106	**36,417**	5,744	17	32,574	7,546	3,898	3,086	193	125
Wet Year Average				7,937	**26,070**	2,886	9	26,166	4,471	3,505	2,480	170	110
Dry Year Average				6,751	**27,033**	2,363	8	24,611	4,632	3,757	2,853	183	118
Overall Average				7,226	**26,647**	2,572	9	25,233	4,568	3,656	2,704	178	115

Table J-12. Overall Annual Calendar Year (January to December) Water Budget Results for Southern OID Service Area, 2005 to 2019.

				Inflows (af)					Outflows (af)										
Year	Number of Days	USBR Allotment	Hydrologic Year Type	System Inflows	District Groundwater Pumping	Precipitation	Private Groundwater Pumping	OID and Private Recycled	Transfers (VAMP Pulse Flows)	Deliveries to Knights Ferry	Deliveries to Annual Contracts	Drainwater 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	Change in Storage (af)
2005	181	Full	Wet	128,053	905	38,939	4,455	3,265	0	0	4,042	25,466	14,794	29,842	15,319	1,729	63,594	29,823	-8,994
2006	175	Full	Wet	127,315	799	32,175	5,486	3,265	0	0	3,356	24,996	14,304	21,665	9,376	1,725	73,574	22,078	-2,034
2007	214	Partial	Dry	145,983	4,045	21,753	6,264	3,265	0	0	3,365	26,460	17,491	28,953	3,888	2,014	82,159	15,764	1,215
2008	205	Partial	Dry	139,464	6,971	23,628	6,472	3,265	0	0	4,108	23,273	16,756	26,761	6,514	2,009	84,848	15,844	-314
2009	200	Full	Dry	134,211	8,228	22,321	6,227	3,265	0	0	3,307	26,226	16,347	24,403	4,286	1,949	81,158	15,539	1,037
2010	205	Full	Wet	125,848	2,715	46,718	5,020	3,265	0	0	2,828	27,788	16,756	24,139	11,644	1,857	66,220	23,832	8,501
2011	192	Full	Wet	123,340	1,087	28,476	4,919	3,265	0	0	4,312	29,584	15,693	17,163	10,043	1,760	65,991	25,535	-8,995
2012	218	Full	Dry	136,077	4,020	33,820	3,978	3,265	0	0	2,803	32,574	17,818	13,375	6,539	2,019	80,846	15,590	9,597
2013	214	Partial	Dry	142,930	5,577	10,680	6,873	3,265	0	0	0	29,121	17,491	19,374	4,299	2,085	91,209	13,906	-8,161
2014	208	Partial	Dry	117,026	9,624	39,142	18,463	3,265	0	0	0	18,669	17,001	14,000	7,122	2,018	100,712	16,277	11,720
2015	207	Partial	Dry	95,657	5,612	27,536	32,133	3,265	0	0	841	14,707	16,919	7,367	6,683	1,883	96,934	20,024	-1,156
2016	213	Full	Dry	112,455	2,285	53,502	24,125	3,265	0	0	1,232	20,314	17,410	21,321	17,478	1,763	85,893	28,278	1,943
2017	211	Full	Wet	114,825	1,490	47,798	26,429	3,265	0	3	579	26,271	17,246	4,723	18,802	1,838	100,090	33,266	-9,014
2018	212	Full	Dry	117,898	1,751	41,189	24,067	3,265	0	3	870	30,158	17,328	-6,312	7,314	1,851	106,327	22,051	8,581
2019	212	Full	Wet	112,276	1,132	49,770	21,834	3,265	0	0	756	22,890	17,224	3,213	12,456	1,709	95,428	31,505	3,096
Minimum				95,657	799	10,680	3,978	3,265	0	0	0	14,707	14,304	-6,312	3,888	1,709	63,594	13,906	-9,014
Maximum				145,983	9,624	53,502	32,133	3,265	0	3	4,312	32,574	17,818	29,842	18,802	2,085	106,327	33,266	11,720
Wet Year Average				121,943	1,354	40,646	11,357	3,265	0	1	2,645	26,166	16,003	16,791	12,940	1,770	77,483	27,673	-2,907
Dry Year Average				126,856	5,346	30,397	14,289	3,265	0	0	1,836	24,611	17,174	16,583	7,125	1,955	90,010	18,142	2,718
Overall Average				124,890	3,749	34,496	13,116	3,265	0	0	2,160	25,233	16,705	16,666	9,451	1,881	84,999	21,954	468

Table J-13. OID Distribution System Annual Water Year (October to September) Water Budget Results, 2006 to 2019.

Year	Irrigation Season Number of Days	USBR Allotment	Hydro-logic Year Type	Inflows (ac-ft)						Outflows (ac-ft)							
				System Inflows	District Ground-water Pumping	District Drain-water Reuse	Precipi-tation	District Tailwater 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)**
2006	175	Full	Wet	228,570	1,522	9,227	30	1,999	2,097	0	2,517	5,597	1,393	1,619	17,647	23,336	**191,335**
2007	214	Partial	Dry	259,535	7,211	9,852	70	1,892	2,097	2,185	2,963	5,633	1,588	1,845	19,253	27,977	**221,399**
2008	205	Partial	Dry	249,193	14,661	11,421	41	1,801	2,097	7,260	2,929	8,376	1,610	1,871	15,897	27,844	**220,684**
2009	200	Full	Dry	232,445	15,608	9,583	77	1,930	2,097	0	2,737	5,722	1,555	1,807	14,356	26,518	**209,045**
2010	205	Full	Wet	216,227	6,173	7,831	142	1,881	2,097	0	2,384	4,591	1,461	1,698	14,270	26,518	**183,430**
2011	192	Full	Wet	222,281	2,360	7,570	82	2,034	2,097	0	2,363	6,343	1,421	1,652	16,488	25,855	**182,303**
2012	218	Full	Dry	230,950	6,575	7,979	206	2,080	2,097	0	2,361	3,742	1,604	1,864	15,868	29,170	**195,279**
2013	214	Partial	Dry	246,472	10,063	7,660	55	1,935	2,097	0	2,560	381	1,658	1,926	16,834	28,375	**216,549**
2014	208	Partial	Dry	201,360	17,713	6,742	76	1,646	2,097	0	2,084	217	1,598	1,856	14,254	27,579	**182,046**
2015	207	Partial	Dry	168,693	13,339	3,622	71	2,199	2,097	0	2,122	1,905	1,512	1,757	7,783	27,446	**147,496**
2016	213	Full	Dry	184,633	3,547	3,968	77	1,440	2,097	0	2,430	2,447	1,359	1,579	8,817	25,988	**153,141**
2017	211	Full	Wet	193,732	2,472	4,232	100	2,027	2,097	0	1,848	2,283	1,210	1,838	9,947	27,977	**159,557**
2018	212	Full	Dry	208,602	2,917	3,556	111	2,270	2,097	0	1,696	3,901	1,227	1,902	13,052	28,221	**169,555**
2019	212	Full	Wet	206,275	1,701	3,440	99	2,121	2,097	0	1,880	4,302	1,128	1,748	13,234	27,581	**165,859**
			Minimum	168,693	1,522	3,440	30	1,440	2,097	0	1,696	217	1,128	1,579	7,783	23,336	**147,496**
			Maximum	259,535	17,713	11,421	206	2,270	2,097	7,260	2,963	8,376	1,658	1,926	19,253	29,170	**221,399**
			Wet Year Average	213,417	2,846	6,460	91	2,012	2,097	0	2,198	4,623	1,323	1,711	14,317	26,253	**176,497**
			Dry Year Average	220,209	10,182	7,154	87	1,910	2,097	1,049	2,431	3,592	1,523	1,823	14,013	27,680	**190,577**
			Overall Average	217,783	7,562	6,906	88	1,947	2,097	675	2,348	3,960	1,452	1,783	14,121	27,170	**185,548**

Table J-14. OID Farmed Lands Annual Water Year (October to September) Water Budget Results, 2006 to 2019.

Year	Irriga-tion Season Number of Days	USBR Allotment	Hydro-logic Year Type	Applied Water Budget										Precipitation Budget				
				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	Tailwater 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)**
2006	175	Full	Wet	191,335	3,829	19,514	1,168	125,573	43,597	1,999	**44,677**	0	0.58	57,286	36,329	4,209	16,238	**510**
2007	214	Partial	Dry	221,399	4,466	22,645	1,168	144,307	47,855	1,892	**55,623**	0	0.58	34,598	26,366	960	6,189	**1,083**
2008	205	Partial	Dry	220,684	4,628	22,725	1,168	146,424	45,588	1,801	**55,393**	0	0.59	44,937	29,724	3,114	11,650	**449**
2009	200	Full	Dry	209,045	4,508	22,882	1,168	148,669	52,453	1,930	**34,550**	0	0.63	37,157	26,894	648	7,152	**2,464**
2010	205	Full	Wet	183,430	3,703	18,198	1,168	120,498	45,264	1,881	**38,855**	0	0.58	64,964	41,252	4,534	17,172	**2,006**
2011	192	Full	Wet	182,303	3,778	17,161	1,168	115,592	50,054	2,034	**36,729**	0	0.57	72,722	45,607	3,650	21,107	**2,357**
2012	218	Full	Dry	195,279	4,547	21,705	1,168	143,403	59,409	2,080	**17,807**	0	0.64	38,674	28,337	1,666	8,374	**298**
2013	214	Partial	Dry	216,549	4,782	23,469	1,168	154,567	54,156	1,935	**35,309**	0	0.63	42,239	25,484	2,674	11,076	**3,004**
2014	208	Partial	Dry	182,046	4,679	43,046	1,168	170,699	39,926	1,646	**18,667**	0	0.74	35,063	25,058	1,797	6,571	**1,636**
2015	207	Partial	Dry	147,496	4,474	72,221	1,168	162,128	44,174	2,199	**16,857**	0	0.72	56,587	33,365	6,845	14,637	**1,741**
2016	213	Full	Dry	153,141	3,977	58,225	1,168	149,347	35,185	1,440	**30,539**	0	0.69	82,874	46,306	7,730	28,069	**769**
2017	211	Full	Wet	159,557	4,224	59,498	1,168	162,080	37,654	2,027	**22,685**	0	0.72	103,851	59,389	9,875	34,756	**-170**
2018	212	Full	Dry	169,555	4,857	57,235	1,168	175,932	39,490	2,270	**15,122**	0	0.76	51,365	36,023	3,233	10,309	**1,799**
2019	212	Full	Wet	165,859	4,274	51,674	1,168	158,967	32,070	2,121	**29,817**	0	0.71	80,477	53,202	4,556	19,848	**2,870**
			Minimum	147,496	3,703	17,161	1,168	115,592	32,070	1,440	**15,122**	0	0.57	34,598	25,058	648	6,189	**-170**
			Maximum	221,399	4,857	72,221	1,168	175,932	59,409	2,270	**55,623**	0	0.76	103,851	59,389	9,875	34,756	**3,004**
			Wet Year Average	176,497	3,961	33,209	1,168	136,542	41,728	2,012	**34,553**	0	0.63	75,860	47,156	5,365	21,824	**1,515**
			Dry Year Average	190,577	4,546	38,239	1,168	155,053	46,471	1,910	**31,096**	0	0.66	47,055	30,840	3,185	11,559	**1,471**
			Overall Average	185,548	4,338	36,443	1,168	148,442	44,777	1,947	**32,331**	0	0.65	57,342	36,667	3,964	15,225	**1,487**

Table J-15. OID Drainage System Annual Water Year (October to September) Water Budget Results, 2006 to 2019.

				Inflows (af)				Outflows (af)					
Year	Number of Days	USBR Allotment	Hydro-logic Year Type	Operational Spillage	**Tailwater to Drainage System (Closure)**	Runoff of Precipitation	Precipitation	Drain-water Outflow	District Drain-water Reuse	Seepage	Private Drain-water Reuse	Evaporation	Riparian ET
2006	175	Full	Wet	17,647	**43,597**	4,209	5	46,744	9,227	5,216	3,829	269	173
2007	214	Partial	Dry	19,253	**47,855**	960	12	47,003	9,852	6,254	4,466	306	198
2008	205	Partial	Dry	15,897	**45,588**	3,114	7	41,822	11,421	6,224	4,628	311	201
2009	200	Full	Dry	14,356	**52,453**	648	13	46,957	9,583	5,928	4,508	300	194
2010	205	Full	Wet	14,270	**45,264**	4,534	24	46,165	7,831	5,928	3,703	282	182
2011	192	Full	Wet	16,488	**50,054**	3,650	14	52,626	7,570	5,780	3,778	274	177
2012	218	Full	Dry	15,868	**59,409**	1,666	34	57,421	7,979	6,521	4,547	309	200
2013	214	Partial	Dry	16,834	**54,156**	2,674	9	54,362	7,660	6,343	4,782	320	206
2014	208	Partial	Dry	14,254	**39,926**	1,797	13	37,898	6,742	6,165	4,679	308	199
2015	207	Partial	Dry	7,783	**44,174**	6,845	12	44,103	3,622	6,135	4,474	292	188
2016	213	Full	Dry	8,817	**35,185**	7,730	13	37,560	3,968	5,809	3,977	262	169
2017	211	Full	Wet	9,947	**37,654**	9,875	17	42,280	4,232	6,254	4,224	305	197
2018	212	Full	Dry	13,052	**39,490**	3,233	18	40,548	3,556	6,313	4,857	316	204
2019	212	Full	Wet	13,234	**32,070**	4,556	17	35,489	3,440	6,195	4,274	292	188
			Minimum	7,783	**32,070**	648	5	35,489	3,440	5,216	3,703	262	169
			Maximum	19,253	**59,409**	9,875	34	57,421	11,421	6,521	4,857	320	206
			Wet Year Average	14,317	**41,728**	5,365	15	44,661	6,460	5,874	3,961	284	184
			Dry Year Average	14,013	**46,471**	3,185	14	45,297	7,154	6,188	4,546	303	195
			Overall Average	14,121	**44,777**	3,964	15	45,070	6,906	6,076	4,338	296	191

Table J-16. OID Overall Water District Annual Water Year (October to September) Water Budget Results, 2006 to 2019.

				Inflows (af)					Outflows (af)										
Year	Num-ber of Days	USBR Allotment	Hydro-logic Year Type	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 Precipi-tation	Change in Stor-age (af)
2006	175	Full	Wet	228,570	1,522	57,321	19,514	3,265	0	2,517	5,597	46,744	28,553	44,677	16,238	3,454	125,573	36,329	510
2007	214	Partial	Dry	259,535	7,211	34,680	22,645	3,265	2,185	2,963	5,633	47,003	34,231	55,623	6,189	3,937	144,307	26,366	1,083
2008	205	Partial	Dry	249,193	14,661	44,985	22,725	3,265	7,260	2,929	8,376	41,822	34,068	55,393	11,650	3,993	146,424	29,724	449
2009	200	Full	Dry	232,445	15,608	37,246	22,882	3,265	0	2,737	5,722	46,957	32,446	34,550	7,152	3,856	148,669	26,894	2,464
2010	205	Full	Wet	216,227	6,173	65,130	18,198	3,265	0	2,384	4,591	46,165	32,446	38,855	17,172	3,622	120,498	41,252	2,006
2011	192	Full	Wet	222,281	2,360	72,818	17,161	3,265	0	2,363	6,343	52,626	31,635	36,729	21,107	3,524	115,592	45,607	2,357
2012	218	Full	Dry	230,950	6,575	38,915	21,705	3,265	0	2,361	3,742	57,421	35,691	17,807	8,374	3,977	143,403	28,337	298
2013	214	Partial	Dry	246,472	10,063	42,303	23,469	3,265	0	2,560	381	54,362	34,717	35,309	11,076	4,110	154,567	25,484	3,004
2014	208	Partial	Dry	201,360	17,713	35,152	43,046	3,265	0	2,084	217	37,898	33,744	18,667	6,571	3,961	170,699	25,058	1,636
2015	207	Partial	Dry	168,693	13,339	56,670	72,221	3,265	0	2,122	1,905	44,103	33,582	16,857	14,637	3,748	162,128	33,365	1,741
2016	213	Full	Dry	184,633	3,547	82,964	58,225	3,265	0	2,430	2,447	37,560	31,797	30,539	28,069	3,369	149,347	46,306	769
2017	211	Full	Wet	193,732	2,472	103,967	59,498	3,265	0	1,848	2,283	42,280	34,231	22,685	34,756	3,551	162,080	59,389	-170
2018	212	Full	Dry	208,602	2,917	51,494	57,235	3,265	0	1,696	3,901	40,548	34,534	15,122	10,309	3,649	175,932	36,023	1,799
2019	212	Full	Wet	206,275	1,701	80,592	51,674	3,265	0	1,880	4,302	35,489	33,775	29,817	19,848	3,356	158,967	53,202	2,870
			Minimum	168,693	1,522	34,680	17,161	3,265	0	1,696	217	35,489	28,553	15,122	6,189	3,356	115,592	25,058	-170
			Maximum	259,535	17,713	103,967	72,221	3,265	7,260	2,963	8,376	57,421	35,691	55,623	34,756	4,110	175,932	59,389	3,004
			Wet Year Average	213,417	2,846	75,966	33,209	3,265	0	2,198	4,623	44,661	32,128	34,553	21,824	3,502	136,542	47,156	1,515
			Dry Year Average	220,209	10,182	47,156	38,239	3,265	1,049	2,431	3,592	45,297	33,868	31,096	11,559	3,844	155,053	30,840	1,471
			Overall Average	217,783	7,562	57,445	36,443	3,265	675	2,348	3,960	45,070	33,246	32,331	15,225	3,722	148,442	36,667	1,487

Table J-17. Distribution System Annual Water Year (October to September) Water Budget Results for Northern OID Service Area, 2006 to 2019.

				Inflows (ac-ft)						Outflows (ac-ft)							
Year	Irrigation Season Number of Days	USBR Allotment	Hydro-logic Year Type	System Inflows	District Ground-water Pumping	District Drain-water Reuse	Precipi-tation	District Tailwater 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)**
2006	175	Full	Wet	99,320	756	2,558	15	1,796	0	0	2,517	2,152	707	822	6,684	12,098	**79,466**
2007	214	Partial	Dry	115,371	3,330	3,077	36	1,652	0	1,093	2,963	2,291	806	937	8,230	14,504	**93,735**
2008	205	Partial	Dry	107,161	7,804	3,676	21	1,552	0	3,630	2,929	4,239	818	950	8,105	14,435	**88,738**
2009	200	Full	Dry	99,287	7,376	3,543	39	1,673	0	0	2,737	2,418	790	917	6,982	13,748	**84,327**
2010	205	Full	Wet	91,156	3,206	2,951	72	1,648	0	0	2,384	1,768	742	862	6,315	13,748	**73,216**
2011	192	Full	Wet	96,917	1,214	3,026	42	1,775	0	0	2,363	2,042	722	839	8,023	13,404	**75,581**
2012	218	Full	Dry	96,122	2,640	3,083	105	1,786	0	0	2,361	901	814	946	9,756	15,122	**73,837**
2013	214	Partial	Dry	103,079	4,571	2,019	28	1,636	0	0	2,560	263	842	978	10,314	14,710	**81,666**
2014	208	Partial	Dry	83,701	8,288	2,795	39	1,510	0	0	2,084	217	811	942	7,628	14,297	**70,353**
2015	207	Partial	Dry	70,924	7,364	1,422	36	2,078	0	0	2,122	1,063	768	892	3,429	14,229	**59,321**
2016	213	Full	Dry	77,288	1,317	1,524	39	1,321	0	0	2,430	1,311	690	802	3,603	13,473	**59,181**
2017	211	Full	Wet	80,653	958	1,822	51	1,806	0	0	1,844	1,797	614	933	5,325	14,504	**60,273**
2018	212	Full	Dry	90,171	1,127	1,692	56	2,013	0	0	1,693	2,927	623	965	7,092	14,620	**67,141**
2019	212	Full	Wet	91,327	558	1,684	50	1,887	0	0	1,880	3,628	574	889	6,880	14,325	**67,331**
			Minimum	70,924	558	1,422	15	1,321	0	0	1,693	217	574	802	3,429	12,098	**59,181**
			Maximum	115,371	8,288	3,676	105	2,078	0	3,630	2,963	4,239	842	978	10,314	15,122	**93,735**
			Wet Year Average	91,875	1,338	2,408	46	1,783	0	0	2,198	2,277	672	869	6,645	13,616	**71,173**
			Dry Year Average	93,678	4,869	2,537	44	1,691	0	525	2,431	1,737	773	925	7,238	14,349	**75,366**
			Overall Average	93,034	3,608	2,491	45	1,724	0	337	2,348	1,930	737	905	7,026	14,087	**73,869**

Table J-18. Farmed Lands Annual Water Year (October to September) Water Budget Results for Northern OID Service Area, 2006 to 2019.

				Applied Water Budget										Precipitation Budget				
				Inflows (af)				Outflows (af)						Inflows (af)	Outflows (af)			
Year	Irriga-tion Season Number of Days	USBR Allotment	Hydro-logic Year Type	OID Farm Deliveries	Private Drain-water Reuse	Private Ground-water Pumping	Recycled to Farm Lands	Crop ET of Applied Water	Tailwater 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)**
2006	175	Full	Wet	79,466	1,395	14,068	0	52,156	19,884	1,796	**21,093**	0	0.55	22,946	14,744	1,396	6,535	**272**
2007	214	Partial	Dry	93,735	1,626	16,330	0	61,599	19,200	1,652	**29,240**	0	0.55	14,394	11,222	341	2,563	**268**
2008	205	Partial	Dry	88,738	1,689	16,392	0	62,733	16,868	1,552	**25,665**	0	0.59	19,095	12,750	1,193	4,965	**187**
2009	200	Full	Dry	84,327	1,639	16,473	0	65,731	21,237	1,673	**13,798**	0	0.64	16,048	11,846	226	3,026	**950**
2010	205	Full	Wet	73,216	1,353	13,123	0	53,329	18,732	1,648	**13,982**	0	0.61	28,087	18,078	1,671	7,441	**897**
2011	192	Full	Wet	75,581	1,411	12,379	0	51,186	20,165	1,775	**16,245**	0	0.57	31,241	19,815	1,270	9,082	**1,073**
2012	218	Full	Dry	73,837	1,705	17,422	0	62,316	22,350	1,786	**6,512**	0	0.67	16,485	12,215	599	3,493	**177**
2013	214	Partial	Dry	81,666	1,791	17,180	0	66,945	19,152	1,636	**12,903**	0	0.67	17,981	10,943	996	4,750	**1,293**
2014	208	Partial	Dry	70,353	1,753	26,253	0	70,500	20,307	1,510	**6,043**	0	0.72	14,212	10,200	641	2,632	**739**
2015	207	Partial	Dry	59,321	1,674	41,718	0	65,668	26,851	2,078	**8,116**	0	0.64	22,679	13,482	2,507	5,899	**790**
2016	213	Full	Dry	59,181	1,489	32,703	0	60,549	17,285	1,321	**14,217**	0	0.65	33,305	18,786	2,922	11,314	**284**
2017	211	Full	Wet	60,273	1,580	33,662	0	66,059	12,613	1,806	**15,036**	0	0.69	41,897	24,219	3,754	14,063	**-139**
2018	212	Full	Dry	67,141	1,819	32,297	0	68,681	11,015	2,013	**19,548**	0	0.68	20,662	14,509	1,302	4,102	**750**
2019	212	Full	Wet	67,331	1,599	29,646	0	64,057	8,684	1,887	**23,948**	0	0.65	32,697	21,770	1,845	8,047	**1,036**
			Minimum	59,181	1,353	12,379	0	51,186	8,684	1,321	**6,043**	0	0.55	14,212	10,200	226	2,563	**-139**
			Maximum	93,735	1,819	41,718	0	70,500	26,851	2,078	**29,240**	0	0.72	41,897	24,219	3,754	14,063	**1,293**
			Wet Year Average	71,173	1,467	20,576	0	57,357	16,016	1,783	**18,061**	0	0.61	31,374	19,725	1,987	9,034	**628**
			Dry Year Average	75,366	1,687	24,085	0	64,969	19,363	1,691	**15,116**	0	0.64	19,429	12,884	1,192	4,749	**604**
			Overall Average	73,869	1,609	22,832	0	62,250	18,167	1,724	**16,168**	0	0.63	23,695	15,327	1,476	6,279	**613**

Table J-19. Drainage System Annual Water Year (October to September) Water Budget Results for Northern OID Service Area, 2006 to 2019.

				Inflows (af)				Outflows (af)					
Year	Number of Days	USBR Allotment	Hydrologic Year Type	Operational Spillage	**Tailwater to Drainage System (Closure)**	Runoff of Precipitation	Precipitation	Drainwater Outflow	District Drainwater Reuse	Seepage	Private Drainwater Reuse	Evaporation	Riparian ET
2006	175	Full	Wet	6,684	**19,884**	1,396	2	21,768	2,558	2,069	1,395	107	69
2007	214	Partial	Dry	8,230	**19,200**	341	5	20,392	3,077	2,481	1,626	122	78
2008	205	Partial	Dry	8,105	**16,868**	1,193	3	18,133	3,676	2,469	1,689	123	80
2009	200	Full	Dry	6,982	**21,237**	226	5	20,720	3,543	2,352	1,639	119	77
2010	205	Full	Wet	6,315	**18,732**	1,671	9	19,889	2,951	2,352	1,353	112	72
2011	192	Full	Wet	8,023	**20,165**	1,270	5	22,556	3,026	2,293	1,411	109	70
2012	218	Full	Dry	9,756	**22,350**	599	14	25,142	3,083	2,587	1,705	123	79
2013	214	Partial	Dry	10,314	**19,152**	996	4	23,930	2,019	2,516	1,791	127	82
2014	208	Partial	Dry	7,628	**20,307**	641	5	21,386	2,795	2,446	1,753	122	79
2015	207	Partial	Dry	3,429	**26,851**	2,507	5	27,072	1,422	2,434	1,674	116	75
2016	213	Full	Dry	3,603	**17,285**	2,922	5	18,327	1,524	2,304	1,489	104	67
2017	211	Full	Wet	5,325	**12,613**	3,754	7	15,616	1,822	2,481	1,580	121	78
2018	212	Full	Dry	7,092	**11,015**	1,302	7	13,195	1,692	2,504	1,819	125	81
2019	212	Full	Wet	6,880	**8,684**	1,845	7	11,485	1,684	2,457	1,599	116	75
			Minimum	3,429	**8,684**	226	2	11,485	1,422	2,069	1,353	104	67
			Maximum	10,314	**26,851**	3,754	14	27,072	3,676	2,587	1,819	127	82
			Wet Year Average	6,645	**16,016**	1,987	6	18,263	2,408	2,330	1,467	113	73
			Dry Year Average	7,238	**19,363**	1,192	6	20,922	2,537	2,455	1,687	120	78
			Overall Average	7,026	**18,167**	1,476	6	19,972	2,491	2,410	1,609	117	76

Table J-20. Overall Annual Water Year (October to September) Water Budget Results for Northern OID Service Area, 2006 to 2019.

				Inflows (af)					Outflows (af)										
Year	Number of Days	USBR Allotment	Hydrologic Year Type	System Inflows	District Groundwater Pumping	Precipitation	Private Groundwater Pumping	OID and Private Recycled	Transfers (VAMP Pulse Flows)	Deliveries to Knights Ferry	Deliveries to Annual Contracts	Drainwater 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	Change in Storage (af)
2006	175	Full	Wet	99,320	756	22,963	14,068	0	0	2,517	2,152	21,768	14,167	21,093	6,535	1,705	52,156	14,744	272
2007	214	Partial	Dry	115,371	3,330	14,434	16,330	0	1,093	2,963	2,291	20,392	16,984	29,240	2,563	1,943	61,599	11,222	268
2008	205	Partial	Dry	107,161	7,804	19,118	16,392	0	3,630	2,929	4,239	18,133	16,904	25,665	4,965	1,970	62,733	12,750	187
2009	200	Full	Dry	99,287	7,376	16,092	16,473	0	0	2,737	2,418	20,720	16,099	13,798	3,026	1,903	65,731	11,846	950
2010	205	Full	Wet	91,156	3,206	28,169	13,123	0	0	2,384	1,768	19,889	16,099	13,982	7,441	1,788	53,329	18,078	897
2011	192	Full	Wet	96,917	1,214	31,288	12,379	0	0	2,363	2,042	22,556	15,697	16,245	9,082	1,739	51,186	19,815	1,073
2012	218	Full	Dry	96,122	2,640	16,603	17,422	0	0	2,361	901	25,142	17,709	6,512	3,493	1,962	62,316	12,215	177
2013	214	Partial	Dry	103,079	4,571	18,013	17,180	0	0	2,560	263	23,930	17,226	12,903	4,750	2,028	66,945	10,943	1,293
2014	208	Partial	Dry	83,701	8,288	14,255	26,253	0	0	2,084	217	21,386	16,743	6,043	2,632	1,955	70,500	10,200	739
2015	207	Partial	Dry	70,924	7,364	22,719	41,718	0	0	2,122	1,063	27,072	16,662	8,116	5,899	1,850	65,668	13,482	790
2016	213	Full	Dry	77,288	1,317	33,349	32,703	0	0	2,430	1,311	18,327	15,777	14,217	11,314	1,663	60,549	18,786	284
2017	211	Full	Wet	80,653	958	41,954	33,662	0	0	1,844	1,797	15,616	16,984	15,036	14,063	1,747	66,059	24,219	-139
2018	212	Full	Dry	90,171	1,127	20,726	32,297	0	0	1,693	2,927	13,195	17,124	19,548	4,102	1,794	68,681	14,509	750
2019	212	Full	Wet	91,327	558	32,754	29,646	0	0	1,880	3,628	11,485	16,782	23,948	8,047	1,653	64,057	21,770	1,036
			Minimum	70,924	558	14,255	12,379	0	0	1,693	217	11,485	14,167	6,043	2,563	1,653	51,186	10,200	-139
			Maximum	115,371	8,288	41,954	41,718	0	3,630	2,963	4,239	27,072	17,709	29,240	14,063	2,028	70,500	24,219	1,293
			Wet Year Average	91,875	1,338	31,426	20,576	0	0	2,198	2,277	18,263	15,946	18,061	9,034	1,726	57,357	19,725	628
			Dry Year Average	93,678	4,869	19,479	24,085	0	525	2,431	1,737	20,922	16,803	15,116	4,749	1,896	64,969	12,884	604
			Overall Average	93,034	3,608	23,746	22,832	0	337	2,348	1,930	19,972	16,497	16,168	6,279	1,836	62,250	15,327	613

Table J-21. Distribution System Annual Water Year (October to September) Water Budget Results for Southern OID Service Area, 2006 to 2019.

Year	Irrigation Season Number of Days	USBR Allotment	Hydro-logic Year Type	Inflows (ac-ft)						Outflows (ac-ft)							
				System Inflows	District Ground-water Pumping	District Drain-water Reuse	Precipi-tation	District Tailwater 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)**
2006	175	Full	Wet	129,249	766	6,670	15	203	2,097	0	0	3,445	686	797	10,963	11,238	**111,870**
2007	214	Partial	Dry	144,164	3,881	6,775	34	240	2,097	1,092	0	3,341	782	908	11,023	13,473	**127,664**
2008	205	Partial	Dry	142,032	6,857	7,745	20	249	2,097	3,630	0	4,137	793	921	7,792	13,409	**131,947**
2009	200	Full	Dry	133,158	8,233	6,040	38	257	2,097	0	0	3,304	766	890	7,374	12,771	**124,718**
2010	205	Full	Wet	125,071	2,966	4,880	70	233	2,097	0	0	2,823	719	836	7,955	12,771	**110,214**
2011	192	Full	Wet	125,364	1,147	4,545	41	259	2,097	0	0	4,301	700	813	8,465	12,452	**106,721**
2012	218	Full	Dry	134,828	3,935	4,896	102	294	2,097	0	0	2,841	790	917	6,112	14,048	**121,442**
2013	214	Partial	Dry	143,393	5,492	5,641	27	299	2,097	0	0	118	816	948	6,519	13,665	**134,883**
2014	208	Partial	Dry	117,659	9,424	3,947	37	137	2,097	0	0	0	787	914	6,626	13,282	**111,693**
2015	207	Partial	Dry	97,769	5,975	2,200	35	121	2,097	0	0	841	744	865	4,353	13,218	**88,175**
2016	213	Full	Dry	107,345	2,230	2,444	38	118	2,097	0	0	1,136	669	777	5,214	12,515	**93,960**
2017	211	Full	Wet	113,079	1,514	2,410	49	221	2,097	0	3	486	596	905	4,622	13,473	**99,285**
2018	212	Full	Dry	118,431	1,790	1,864	55	257	2,097	0	3	974	605	937	5,960	13,601	**102,414**
2019	212	Full	Wet	114,948	1,143	1,757	49	233	2,097	0	0	674	555	859	6,355	13,256	**98,528**
			Minimum	97,769	766	1,757	15	118	2,097	0	0	0	555	777	4,353	11,238	**88,175**
			Maximum	144,164	9,424	7,745	102	299	2,097	3,630	3	4,301	816	948	11,023	14,048	**134,883**
			Wet Year Average	121,542	1,507	4,052	45	230	2,097	0	1	2,346	651	842	7,672	12,638	**105,324**
			Dry Year Average	126,531	5,313	4,617	43	219	2,097	525	0	1,855	750	898	6,775	13,331	**115,211**
			Overall Average	124,749	3,954	4,415	43	223	2,097	337	0	2,030	715	878	7,095	13,084	**111,680**

Table J-22. Farmed Lands Annual Water Year (October to September) Water Budget Results for Southern OID Service Area, 2006 to 2019.

Year	Irriga-tion Season Num-ber of Days	USBR Allotment	Hydro-logic Year Type	Applied Water Budget										Precipitation Budget				
				Inflows (af)				Outflows (af)					Crop Consump-tive Use Fraction (CCUF)	Inflows (af)	Outflows (af)			**Change in Storage (Closure, 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)		Precipitation	Crop ET of Precipi-tation	Runoff of Precipi-tation	Deep Percolation of Precipi-tation	
2006	175	Full	Wet	111,870	2,434	5,446	1,168	73,416	23,714	203	**23,584**	0	0.61	34,340	21,585	2,813	9,704	**239**
2007	214	Partial	Dry	127,664	2,841	6,315	1,168	82,708	28,655	240	**26,383**	0	0.60	20,204	15,144	619	3,627	**816**
2008	205	Partial	Dry	131,947	2,940	6,333	1,168	83,691	28,720	249	**29,727**	0	0.59	25,842	16,975	1,921	6,685	**262**
2009	200	Full	Dry	124,718	2,869	6,409	1,168	82,938	31,216	257	**20,752**	0	0.61	21,109	15,047	422	4,126	**1,514**
2010	205	Full	Wet	110,214	2,350	5,075	1,168	67,169	26,531	233	**24,873**	0	0.57	36,876	23,174	2,863	9,730	**1,109**
2011	192	Full	Wet	106,721	2,368	4,781	1,168	64,407	29,889	259	**20,484**	0	0.56	41,481	25,792	2,380	12,025	**1,285**
2012	218	Full	Dry	121,442	2,843	4,283	1,168	81,088	37,059	294	**11,295**	0	0.63	22,190	16,122	1,067	4,881	**121**
2013	214	Partial	Dry	134,883	2,991	6,289	1,168	87,622	35,004	299	**22,406**	0	0.60	24,257	14,541	1,678	6,327	**1,711**
2014	208	Partial	Dry	111,693	2,925	16,793	1,168	100,199	19,619	137	**12,625**	0	0.76	20,852	14,858	1,157	3,939	**897**
2015	207	Partial	Dry	88,175	2,800	30,503	1,168	96,461	17,323	121	**8,741**	0	0.79	33,909	19,883	4,338	8,737	**950**
2016	213	Full	Dry	93,960	2,488	25,522	1,168	88,799	17,899	118	**16,321**	0	0.72	49,569	27,520	4,808	16,755	**485**
2017	211	Full	Wet	99,285	2,644	25,836	1,168	96,021	25,041	221	**7,650**	0	0.74	61,954	35,170	6,122	20,693	**-31**
2018	212	Full	Dry	102,414	3,038	24,937	1,168	107,250	28,475	257	**-4,426**	0	0.82	30,703	21,515	1,932	6,207	**1,049**
2019	212	Full	Wet	98,528	2,675	22,028	1,168	94,910	23,386	233	**5,869**	0	0.76	47,780	31,432	2,712	11,801	**1,834**
			Minimum	88,175	2,350	4,283	1,168	64,407	17,323	118	**-4,426**	0	0.56	20,204	14,541	422	3,627	**-31**
			Maximum	134,883	3,038	30,503	1,168	107,250	37,059	299	**29,727**	0	0.82	61,954	35,170	6,122	20,693	**1,834**
			Wet Year Average	105,324	2,494	12,633	1,168	79,185	25,712	230	**16,492**	0	0.65	44,486	27,431	3,378	12,791	**887**
			Dry Year Average	115,211	2,859	14,154	1,168	90,084	27,108	219	**15,980**	0	0.68	27,626	17,956	1,993	6,809	**867**
			Overall Average	111,680	2,729	13,611	1,168	86,191	26,609	223	**16,163**	0	0.67	33,648	21,340	2,488	8,946	**874**

Table J-23. Drainage System Annual Water Year (October to September) Water Budget Results for Southern OID Service Area, 2006 to 2019.

				Inflows (af)				Outflows (af)					
Year	Number of Days	USBR Allotment	Hydrologic Year Type	Operational Spillage	**Tailwater to Drainage System (Closure)**	Runoff of Precipi-tation	Precipitation	Drain-water Outflow	District Drain-water Reuse	Seepage	Private Drain-water Reuse	Evaporation	Riparian ET
2006	175	Full	Wet	10,963	**23,714**	2,813	3	24,976	6,670	3,147	2,434	162	105
2007	214	Partial	Dry	11,023	**28,655**	619	7	26,611	6,775	3,773	2,841	185	119
2008	205	Partial	Dry	7,792	**28,720**	1,921	4	23,689	7,745	3,755	2,940	187	121
2009	200	Full	Dry	7,374	**31,216**	422	8	26,237	6,040	3,576	2,869	181	117
2010	205	Full	Wet	7,955	**26,531**	2,863	14	26,276	4,880	3,576	2,350	170	110
2011	192	Full	Wet	8,465	**29,889**	2,380	8	30,070	4,545	3,487	2,368	165	107
2012	218	Full	Dry	6,112	**37,059**	1,067	21	32,279	4,896	3,934	2,843	187	120
2013	214	Partial	Dry	6,519	**35,004**	1,678	5	30,431	5,641	3,827	2,991	193	125
2014	208	Partial	Dry	6,626	**19,619**	1,157	8	16,511	3,947	3,719	2,925	186	120
2015	207	Partial	Dry	4,353	**17,323**	4,338	7	17,031	2,200	3,701	2,800	176	114
2016	213	Full	Dry	5,214	**17,899**	4,808	8	19,233	2,444	3,505	2,488	158	102
2017	211	Full	Wet	4,622	**25,041**	6,122	10	26,664	2,410	3,773	2,644	184	119
2018	212	Full	Dry	5,960	**28,475**	1,932	11	27,354	1,864	3,809	3,038	191	123
2019	212	Full	Wet	6,355	**23,386**	2,712	10	24,004	1,757	3,737	2,675	176	114
			Minimum	4,353	**17,323**	422	3	16,511	1,757	3,147	2,350	158	102
			Maximum	11,023	**37,059**	6,122	21	32,279	7,745	3,934	3,038	193	125
			Wet Year Average	7,672	**25,712**	3,378	9	26,398	4,052	3,544	2,494	172	111
			Dry Year Average	6,775	**27,108**	1,993	9	24,375	4,617	3,733	2,859	183	118
			Overall Average	7,095	**26,609**	2,488	9	25,098	4,415	3,666	2,729	179	115

Table J-24. Overall Annual Water Year (October to September) Water Budget Results for Southern OID Service Area, 2006 to 2019.

				Inflows (af)					Outflows (af)										
Year	Num-ber of Days	USBR Allotment	Hydro-logic Year Type	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 Precipi-tation	Change in Stor-age (af)
2006	175	Full	Wet	129,249	766	34,358	5,446	3,265	0	0	3,445	24,976	14,385	23,584	9,704	1,750	73,416	21,585	239
2007	214	Partial	Dry	144,164	3,881	20,246	6,315	3,265	1,092	0	3,341	26,611	17,246	26,383	3,627	1,994	82,708	15,144	816
2008	205	Partial	Dry	142,032	6,857	25,866	6,333	3,265	3,630	0	4,137	23,689	17,164	29,727	6,685	2,022	83,691	16,975	262
2009	200	Full	Dry	133,158	8,233	21,154	6,409	3,265	0	0	3,304	26,237	16,347	20,752	4,126	1,953	82,938	15,047	1,514
2010	205	Full	Wet	125,071	2,966	36,961	5,075	3,265	0	0	2,823	26,276	16,347	24,873	9,730	1,835	67,169	23,174	1,109
2011	192	Full	Wet	125,364	1,147	41,530	4,781	3,265	0	0	4,301	30,070	15,938	20,484	12,025	1,785	64,407	25,792	1,285
2012	218	Full	Dry	134,828	3,935	22,312	4,283	3,265	0	0	2,841	32,279	17,982	11,295	4,881	2,014	81,088	16,122	121
2013	214	Partial	Dry	143,393	5,492	24,290	6,289	3,265	0	0	118	30,431	17,491	22,406	6,327	2,082	87,622	14,541	1,711
2014	208	Partial	Dry	117,659	9,424	20,897	16,793	3,265	0	0	0	16,511	17,001	12,625	3,939	2,006	100,199	14,858	897
2015	207	Partial	Dry	97,769	5,975	33,951	30,503	3,265	0	0	841	17,031	16,919	8,741	8,737	1,898	96,461	19,883	950
2016	213	Full	Dry	107,345	2,230	49,615	25,522	3,265	0	0	1,136	19,233	16,020	16,321	16,755	1,706	88,799	27,520	485
2017	211	Full	Wet	113,079	1,514	62,013	25,836	3,265	0	3	486	26,664	17,246	7,650	20,693	1,804	96,021	35,170	-31
2018	212	Full	Dry	118,431	1,790	30,769	24,937	3,265	0	3	974	27,354	17,410	-4,426	6,207	1,855	107,250	21,515	1,049
2019	212	Full	Wet	114,948	1,143	47,838	22,028	3,265	0	0	674	24,004	16,993	5,869	11,801	1,703	94,910	31,432	1,834
			Minimum	97,769	766	20,246	4,283	3,265	0	0	0	16,511	14,385	-4,426	3,627	1,703	64,407	14,541	-31
			Maximum	144,164	9,424	62,013	30,503	3,265	3,630	3	4,301	32,279	17,982	29,727	20,693	2,082	107,250	35,170	1,834
			Wet Year Average	121,542	1,507	44,540	12,633	3,265	0	1	2,346	26,398	16,182	16,492	12,791	1,775	79,185	27,431	887
			Dry Year Average	126,531	5,313	27,678	14,154	3,265	525	0	1,855	24,375	17,065	15,980	6,809	1,948	90,084	17,956	867
			Overall Average	124,749	3,954	33,700	13,611	3,265	337	0	2,030	25,098	16,749	16,163	8,946	1,886	86,191	21,340	874