OAKDALE IRRIGATION DISTRICT

AGRICULTURAL WATER MANAGEMENT PLAN

March 2026

Prepared by
Davids Engineering, Inc.

OAKDALE IRRIGATION DISTRICT

2025 AGRICULTURAL WATER MANAGEMENT PLAN

By

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March 2026

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. The 2020 Plan was submitted and adopted in 2021.

In preparing the 2025 Plan, OID and its technical consultant have relied on guidance provided in DWR's Guidebook to Assist Agricultural Water Suppliers to Prepare a 2025 Agricultural Water Management Plan (Guidebook), which had a public draft version released in July 2025 and the final version in September 2025. Other primary resources used to develop this 2025 update were OID's 2020 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.

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Cross Reference Table of Oakdale Irrigation District's 2025 Agricultural Water Management Plan to Relevant Sections of the California Water Code

AWMP Section	Guidebook Location	Description	Water Code Section (or as identified)
Preface, 1.2, 3.2	1.4	AWMP Required?	10820, 10608.12
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, 2026 update	10820 (a)
Preface, 2	1.4 A.2	AWMP submitted to DWR no later than 30 days after adoption; AWMP submitted electronically	10820(a)(2)(B)
Preface	1.4 B	5-year cycle update	10820 (a)
N/A	1.4 B	New agricultural water supplier after December 31, 2012 – AWMP prepared and adopted within 1 year	10820 (b
N/A	1.6, 5	USBR water management/conservation plan:	10828(a)
N/A	1.6, 5.1	Adopted and submitted to USBR within the previous four years	10828(a)(1)
N/A	1.6, 5.1	The USBR has accepted the water management/conservation plan as adequate	10828(a)(2)
N/A	1.4 B	UWMP or participation in area wide, regional, watershed, or basin wide water management planning: does the plan meet requirements of SB X7-7 2.8	10829
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

AWMP Section	Guidebook Location	Description	Water Code Section (or as identified)
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
N/A	3.1 B.2	Privately-owned supplier: was equivalent notice within its service area and reasonably equivalent opportunity that would otherwise be afforded through a public hearing process provided?	10841
2	3.1 C.1	After hearing/equivalent notice, was the plan adopted as prepared or as modified during or after the hearing?	10841
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)

AWMP Section	Guidebook Location	Description	Water Code Section (or as identified)
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, Attachments C and 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)
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, 5.7.3	3.5 A.4	Drainage from the water supplier’s service area.	10826(b)(6)

AWMP Section	Guidebook Location	Description	Water Code Section (or as identified)
4.3	3.5 B	Description of the quality of agricultural waters supplier's 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	Annual water budget based on the quantification of all inflow and outflow components for the service area.	10826(c)
5.9	3.7 C	Identify water management objectives based on water budget to improve water system efficiency	10826(f)
5.10	3.8 D	Quantify the efficiency of agricultural water use	10826(h)
6	3.9	Analysis of climate change effect on future water supplies	10826(d)
7	4	Water use efficiency information required pursuant to § 10608.48.	10826(e)
7	4.1	Implement efficient water management practices (EWMPs)	10608.48(a)
7.2, Attachment A	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)
7.3	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)

AWMP Section	Guidebook Location	Description	Water Code Section (or as identified)
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)
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 A	6 C	Description of water measurement BPP	CCR §597.4(e)(2)
Attachment A	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))

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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
COC	Constituent of Concern
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
MCL	Maximum Contaminant Level
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
SMCL	Secondary Maximum Contaminant Level
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
TDS	Total Dissolved Solids
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 2020 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 2015 to 2024 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, the 2025 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.

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 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

[2] Although the water budgets in the body of the report are presented for the period from 2015 to 2024, detailed water budget results dating back to 2005 are available in Attachment F.

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 into 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 $116 million has 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.

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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. New hires who will be DSOs or in related positions complete a multi-day training at the ITRC on canal operations, water measurement principles, and SCADA equipment and operations. 5. Implementation of Storm water ordering and delivery management software. 6. Implementation of a QA/QC process to review delivery measurement volumes prior to billing, which occurs two times throughout the irrigation season. 7. Development and implementation of a Water Measurement Plan for customer deliveries (Attachment A); implementation is currently about 96% complete (75,645 acres of the total 78,558 acres).	1. Continue to dedicate annual budget line-item for turnout replacement and continue replacement of turnouts requiring corrective actions. 2. Continue training of newly hired DSOs and those in related positions on canal operations, water measurement, and SCADA. 3. Continue implementation of Water Measurement Plan (Attachment A).
10608.48.b(2)	Adopt a pricing structure for water customers based at least in part on quantity delivered.	Being Implemented	1. Completed a rate study to determine rates required to cover cost of service, conducted Proposition 218 rate update, and established a rate structure based in part on volume of water delivered in 2014 that was implemented in 2015. 2. Completed another rate study to evaluate rate updates in early 2025 and a Proposition 218 process for rate updates. 3. Use volumetric billing for out-of-district water sales and future annexations. 4. 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.

Water Code Reference No.	EWMP	Implementation Status	Implemented Activities	Planned Activities
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.
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 two 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 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. Constructed Robert Van Lier Reservoir in 2001 and constructed the North Side Regulating Reservoir in 2010. 2. Concrete lined approximately 3.3 miles of South Main Canal and tunnels in 2010. 3. Concrete lined 106 miles of canals, including approximately 0.7 miles of the North Main Canal in 2024. 4. Repaired 0.55 miles of deteriorating concrete lining in 2019 and 0.47 miles in 2023. 5. Replaced over 100 miles of canals with buried pipeline, including roughly one mile between 2016 and 2019. 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. Completed repair and improvement projects on the North Main Canal Tunnels 3 and 4, and South Main Canal Tunnel 8 to increase lined area, decrease maintenance and reduce seepage. 8. Invested $80.5 million in main canal and tunnel improvements, canal and lateral rehabilitation, and pipeline replacement since 2006 ($26.3 million since 2020). 9. 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. 5. Complete Canyon Tunnel Project, which began construction in late 2025 and is scheduled to be completed over three years. This project reduces seepage, decreases maintenance, and bypasses a 2-mile section of high hazard section of canal. 6. Complete Phase 1 of the Paulsell Lateral Expansion Project, which is currently under construction and anticipated to be completed in Spring 2026. The Paulsell Lateral Expansion Project will expand the existing distribution system and increase flexibility through TCC automation to improve surface water deliveries to in and out-of-district customers and will result in increased direct and in-lieu groundwater recharge. 7. Evaluate expansion of Robert Van Lier Reservoir.

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 $20.8 million in flow control and measurement improvements including TCC, $6.4 million in construction of the north side regulating reservoir and nearly $3.6 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 23,000 acres in 2012 to approximately 45,700 acres (70% of District) in 2024. 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 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. 7. New hires who will be DSOs or in related positions complete a multi-day training at the ITRC on canal operations, water measurement principles, and SCADA equipment and operations.	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. 6. Continue training of newly hired DSOs and those in related positions on canal operations, water measurement, and SCADA.
10608.48.c(7)	Construct and operate supplier spill and tailwater recovery systems	Being Implemented	1. Two drainwater recovery systems supplement irrigation to 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 an average of approximately 3,600 af per year between 2015 and 2024. 4. Interception and reuse of an average of approximately 1,900 af per year of tailwater entering the OID distribution system between 2015 and 2024, 5. Gravity flow and lift pumping of approximately 16,400 af per year to the neighboring districts of MID, SSJID, and CSJWCD between 2015 and 2024. 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 $2.3 million in outflow management and reclamation projects since 2006. 8. New hires who will be DSOs or in related positions complete a multi-day training at the ITRC on canal operations, water measurement principles, and SCADA equipment and operations.	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 (including full TCC implementation on Paulsell Lateral as part of Paulsell Lateral Expansion Project). 5. Continue training of newly hired DSOs and those in related positions on canal operations, water measurement, and SCADA.

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. 4. OID is delivering surface water to the City of Oakdale for irrigation of two city parks, which were previously dependent on groundwater pumping. 5. OID has maintained and enhanced groundwater production capability, investing nearly $1.5 million since 2006. 6. In recent years, OID has continued operating its distribution system further into October, allowing 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. 7. OID makes district pumps available for frost protection outside of the irrigation season when surface water is not available. 8. 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. 9. OID has achieved in-lieu groundwater recharge through annexation of 10,500 acres since 2006. 10. Updated Surface Water Shortage Policy to allow in-district surface water and private groundwater transfers between customers in a Level Two water shortages.	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 evaluating delivery of surface water to the City of Oakdale for irrigation of city parks, which are dependent on groundwater (apart from two currently receiving surface water). 5. Continue to implement WRP groundwater well, reclamation, and outflow management projects. 6. Complete Phase 1 of the Paulsell Lateral Expansion Project, which is currently under construction and anticipated to be complete in Spring 2026. The Paulsell Lateral Expansion Project will expand the existing distribution system and increase flexibility through TCC automation to improve surface water deliveries to in and out-of-district customers, and will result in increased direct and in-lieu groundwater recharge. 7. Continue with next phases of District-wide TCC implementation (including full TCC implementation on Paulsell Lateral as part of Paulsell Lateral Expansion Project). 8. 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. 9. Review and revise Surface Water Shortage Policy as needed to provide flexibility to customers and increase planned conjunctive use of surface water and groundwater.
10608.48.c(9)	Automate canal control structures	Being Implemented	1. Automated outlets to the regulating reservoirs. 2. Installed and automated 137 headgates, lateral control structures, turnouts and boundary out flow sites for flow, level, and position control since 2006. 68 of these sites operate in downstream control and fully automate over 34 miles of canals. 3. Installed an additional 204 flow monitoring devices on headgates, lateral control structures, turnouts, pumps and boundary out flow sites since 2006. 4. OID has invested more than $20.8 million in flow control and measurement structure projects since 2006 (and nearly $0.8 million since 2019). 5. New hires who will be DSOs or in related positions complete a multi-day training at the ITRC on canal operations, water measurement principles, and SCADA equipment and operations.	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 (including full TCC implementation on Paulsell Lateral as part of Paulsell Lateral Expansion Project). 3. Continue to implement other WRP flow control and measurement structure projects. 4. Continue training of newly hired DSOs and those in related positions on canal operations, water measurement, and SCADA.
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.

Water Code Reference No.	EWMP	Implementation Status	Implemented Activities	Planned Activities
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 agricultural relevant 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. Continued discussions for voluntary transfers of water that facilitate greater water supply flexibility and storage and continued 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.
10608.48.c(14)	Evaluate and improve the efficiencies of the supplier's pumps.	Being Implemented	1. Regular testing and evaluation of approximately 77 pumps at 69 pump stations 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.

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1. Introduction

The Oakdale Irrigation District (OID or District) 2025 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 2020 AWMP adopted by the Board of Directors in March 2021.

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[3] 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 2024, approximately 57% of the irrigated lands in the district were permanent crops (49% almonds), while forage crops accounted for about 36%. 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 low-frequency schedules. These activities are described in greater detail in Section 8 of this AWMP.

Figure 1-2. OID Water Resources Plan.

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

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, 2026 for the 2025 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 4/1/2021 (and subsequent updates every five years thereafter) 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.

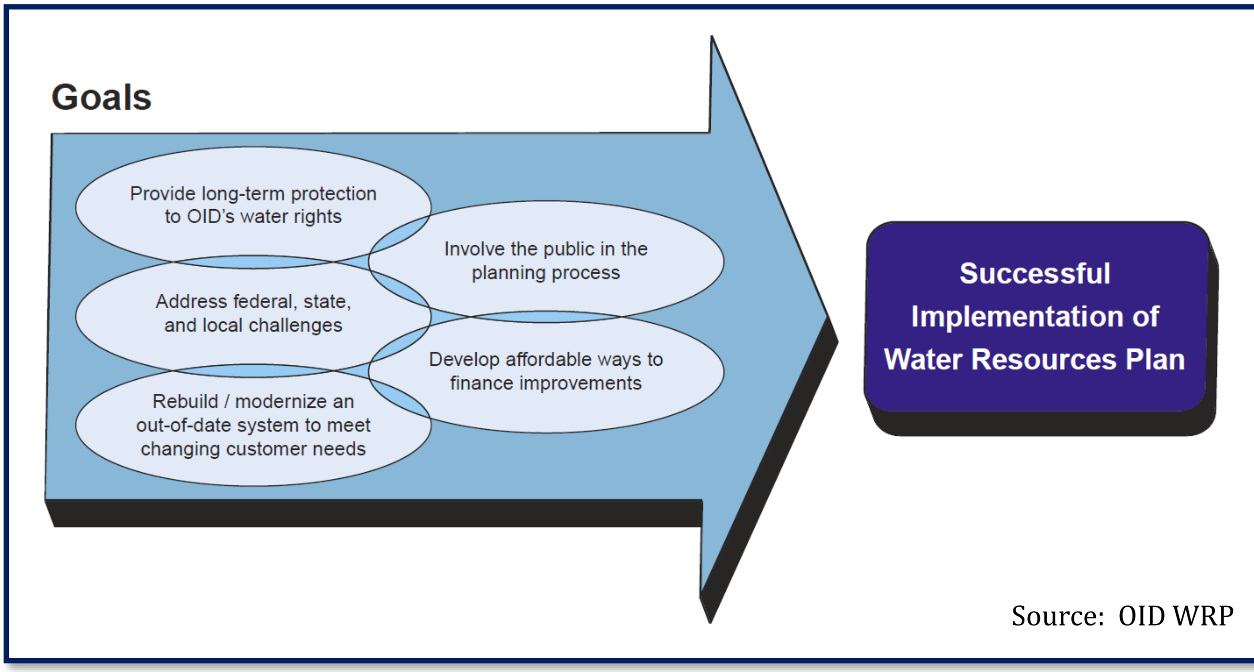

Figure 1-3. Goals of the OID Water Resources Plan.

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.

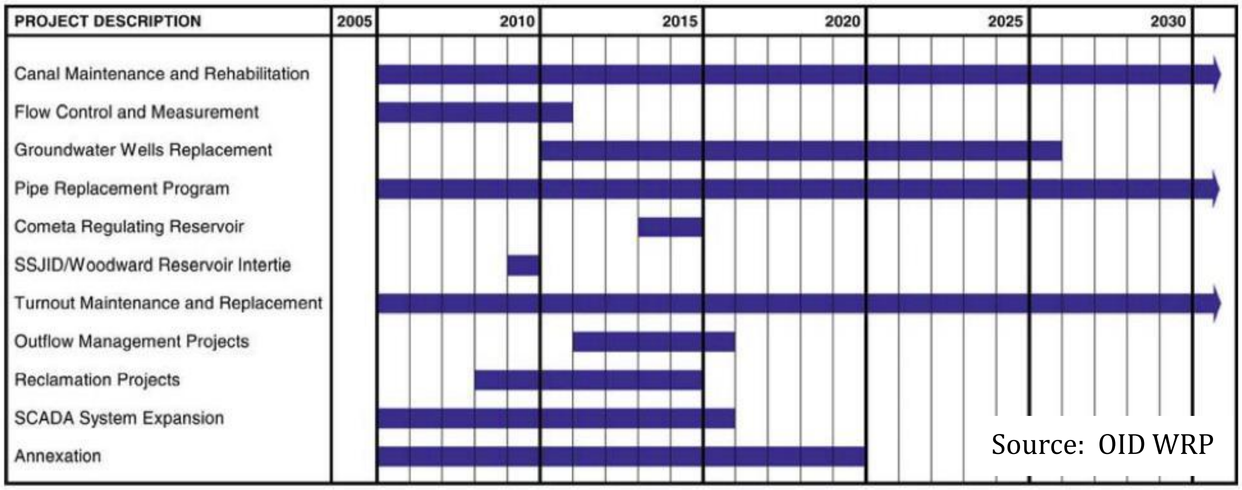

Figure 1-4. OID WRP Implementation Schedule.

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 into 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. To date, over $116 million has been dedicated to projects in OID associated 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.
- **2020 Agricultural Water Management Plan.** OID prepared and adopted a substantial update of its 2015 AWMP in 2020. The updated AWMP was developed to meet the requirements of the California Water Code, as modified by AB 1668, 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[4] in 2005 (Bookman-Edmonston 2005). The purposes of the association is to evaluate groundwater supply; promote coordinated groundwater management planning; develop a hydrologic

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

groundwater model of the subbasin; determine the need for additional or improved extraction, storage, delivery, conservation, and recharge facilities; and to provide information to guide the management, preservation, protection, and enhancement of groundwater quality and quantity in the subbasin. The goal of the IRGMP is to conjunctively manage water supplies to ensure a reliable, long-term water supply to meet beneficial uses by agricultural, industrial, and municipal users while protecting the environment. The District adopted the plan by resolution on August 2nd, 2005. 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 has developed, revised, and implemented a single Groundwater Sustainability Plan (GSP) under SGMA to ensure the long-term sustainability of groundwater resources across the entire Modesto Subbasin. OID was actively involved in these activities and in coordination and planning for the development and implementation of the Modesto Subbasin GSP. The GSP was initially completed in January 2022, revised in July 2024, and subsequently approved by DWR in February 2025.
- **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. The GSP was revised in 2022 and approved by DWR in March 2023. Most recently, the first Periodic Evaluation and amended GSP was adopted by each of the 17 GSAs and submitted to DWR in January 2025.
- **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 (sjdeltawatershed.org).** The District is a member of the San Joaquin County and 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, and the Sand Bar power generation facility on the Stanislaus River. The reservoirs are operated for irrigation water supply, power generation, and provide other subordinate benefits for recreation and associated water activities in the upper basin.
- **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.

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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 and AB 1668. 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 planned for February 3, 2026;
- Notification of OID's intent to update its AWMP via letters to required agencies and a notice in the Oakdale Leader planned for February 11 and 18, 2026;
- Posting of the draft Plan on the District's web page on January 30, 2026;
- Approval and adoption of the final Agricultural Water Management Plan at a regularly scheduled Board of Directors meeting planned for March 3, 2026;
- Submittal of the final Agricultural Water Management Plan to DWR through the online portal within 30 days of approval and adoption.

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 E.

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.

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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, Construction and Maintenance Manager, Agricultural (Ag) Water Operations Manager, and the Water Resources Manager/District Engineer report to the General Manager. Currently, there are 82 full-time District employees with 26 employees under the Construction and Maintenance Manager (including construction and maintenance staff along with pesticide staff), 28 employees under the Ag Water Operations Manager, 14 employees under the Chief Financial Offer (including finance, Information Technology, SCADA and Fleet Warehouse staff) and six under the Water Resources Manager/District Engineer (including engineering and water utilities staff). Additionally, there is a Safety Coordinator, Human Resource Manager and Executive Assistant/Clerk to the Board that 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.

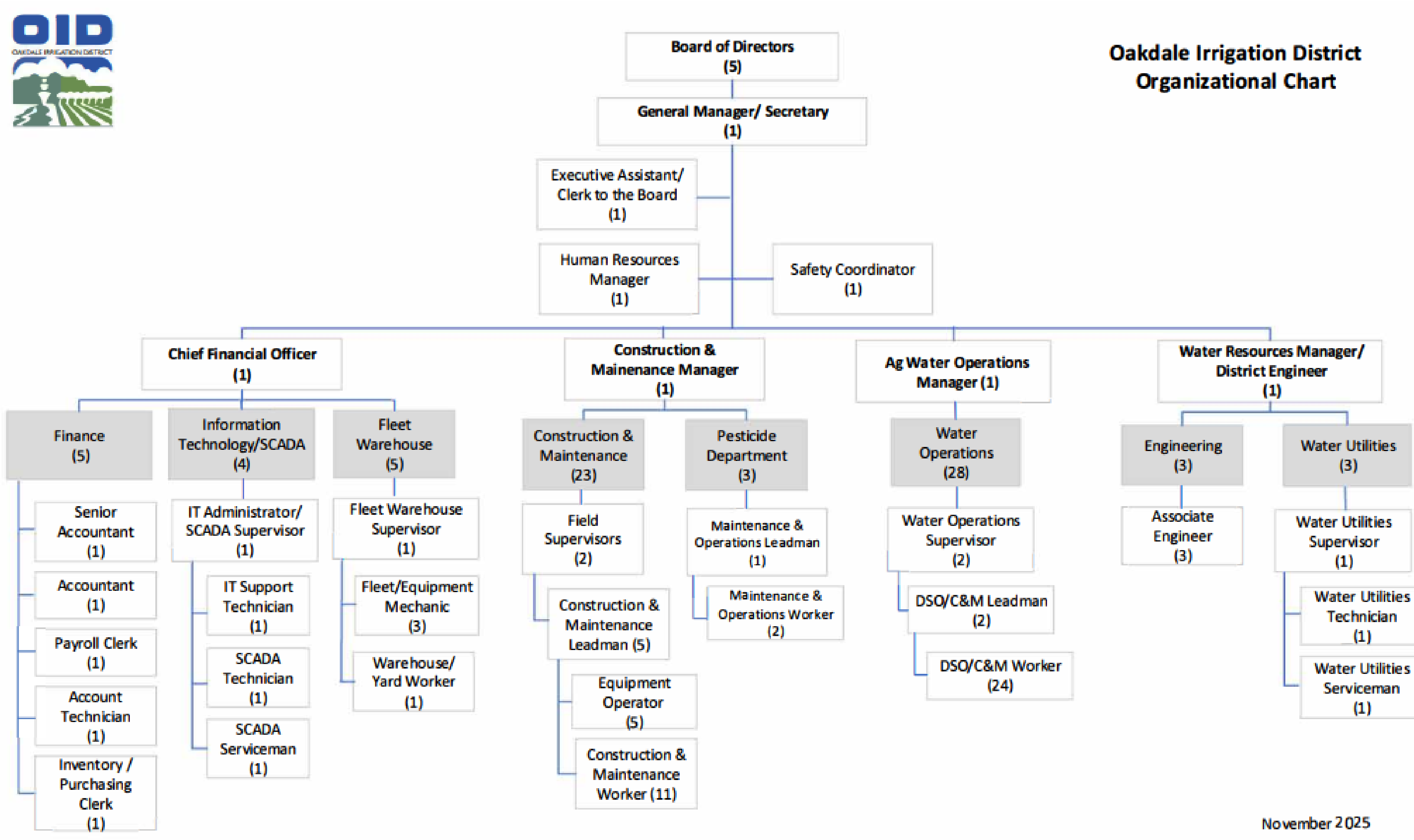

Figure 3-1. OID Organizational Chart.

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.

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[5], of which 70,244 acres were assessed an irrigation charge in 2024.

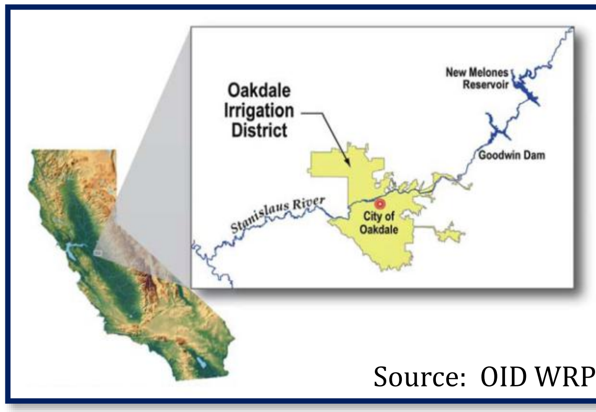

Figure 3-2. Location of OID.

3.3 OID Distribution and Drainage Systems

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. 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 at the Joint Main Division which is operated by the Tri-Dam Project. OID also schedules water 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 OID controls the headgate remotely. The North Main Canal and Frymire Lateral serve approximately 28,438 acres, or 40% of OID's assessed acreage.

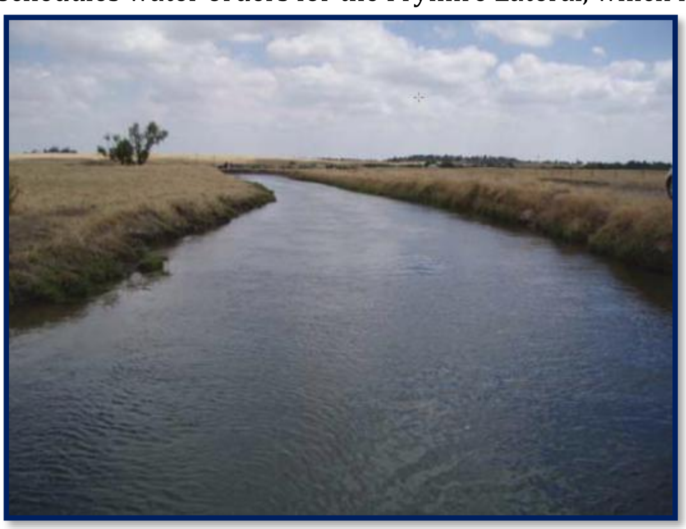

Figure 3-3. North Main Canal.

The South Main Canal serves the remaining 41,806 acres, or 60%, of OID's assessed acreage. The South Main emerges from the Stanislaus River canyon roughly a mile upstream of the Community of Knight's Ferry, runs due south for about two miles, and

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

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).

Figure 3-4. North Side Regulating Reservoir.

Water is delivered to landowners through approximately 2,232 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. In late 2023, OID received a SGMA Implementation Grant Award for Phase 1 of the Paulsell Lateral Expansion Project (ESJGA 2024). Upon completion of Phase 1, the project will increase the flow capacity of approximately 6 miles of open ditch from 30 to 180 cubic feet per second to facilitate direct and in-lieu groundwater recharge for landowners both within and outside of the OID service area. As of early 2025, two tunnel rehabilitations along Paulsell Lateral were completed and the remainder of the first 6 miles are currently under construction at the time of writing and expected to be completed by early 2026. Beyond the Paulsell Lateral Expansion Project, OID is continually implementing both small and large-scale projects to improve and maintain its distribution system.

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

- Completion in 2001 of the Robert Van Lier Regulating Reservoir near the terminus of the South Main Canal and completion in 2010 of the North Side Regulating Reservoir near the terminus of the North Main Canal enables flow changes to be made more readily than before. The reservoirs are operated to increase delivery flexibility to water users while also reducing operational spillage by better matching diversion and delivery volumes.

Additionally, the reservoirs provide for steadier flow to downstream laterals, improving the steadiness of farm deliveries and enabling on-farm water management improvements. Reservoir storage fluctuates daily with the objective of operating within the middle one third of the capacity. The District plans to evaluate potential expansion of the Robert Van Lier Regulating Reservoir in the near future to further improve operations and flexibility.

- 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 34 miles 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 40 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 three 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 needs 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.

The District is currently divided into eight Distribution System Operator (DSO) divisions, with four to the north of the Stanislaus River and four to the south of the River. The divisions operate under the supervision of the Water Operations Supervisors as directed by the Ag 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 also available to assist wherever needed). DSOs work 7 days on, 7 days off, 12 hours per shift. Tables 3-1a and 3-1b below show the number of irrigated acres and number of parcels by division, based on data from the 2024 irrigation season.

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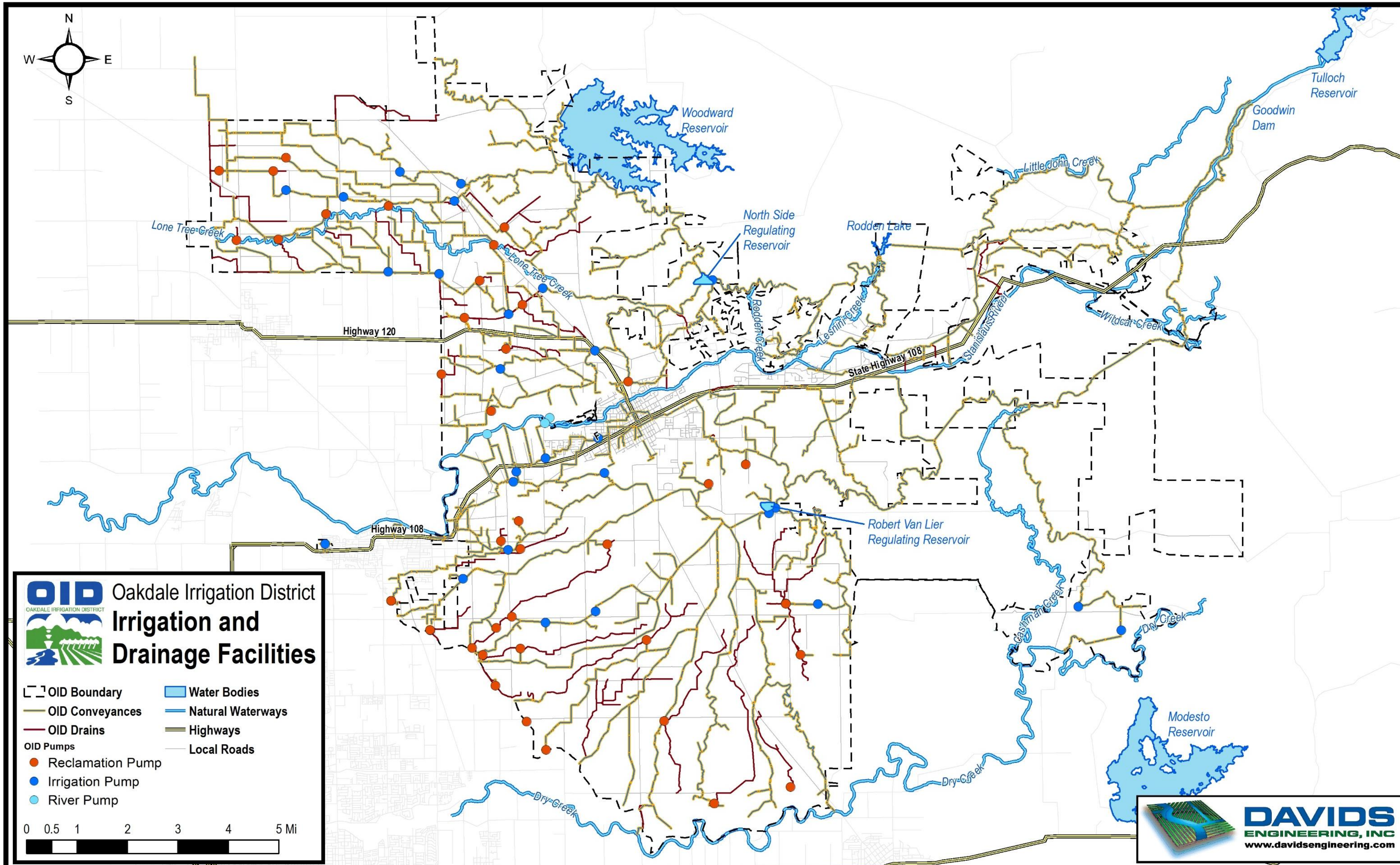

Figure 3-5. Oakdale Irrigation District Irrigation and Drainage Facilities.

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

Statistic	Division 1	Division 2	Division 3	Division 4
Total Area (acres)	13,612	16,030	7,870	4,293
No. of Parcels*	303	365	383	468
Avg. Parcel Size (acres)	45	44	21	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)	8,201	5,159	4,634	10,444
No. of Parcels	353	415	359	420
Avg. Parcel Size (acres)	23	12	13	25

Division size ranges from 4,293 acres to 16,030 acres and average 8,781 acres. The number of parcels ranges from 303 to 468 and average 383 per division. The average parcel size ranges from 9 to 45 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 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 arranged with 4 hours of 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 flow rate. As part of the modernization process and recent transition to volumetric billing, OID implemented the Storm water delivery management software[6] 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 their division will need on a daily basis and requesting that amount from the main canal tender. (Note: Division 1 and Division 5 DSOs act as main canal tenders 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 decreasing their flow rate by 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 or Ag Water Operations Manager. The Water Operations Supervisors or Ag 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, for rotational deliveries, to whom to pass the water to when their turn is complete. The mobile phones are transferred between the day shift and night shift DSOs so that customers have only one number to call per division, any time, day or night. Customers typically call to request schedule changes, or to report unusual conditions, such as delivery interruption. If triggered, SCADA alarms are also transmitted to DSOs via text messaging.

In addition, an emergency phone is carried by the Ag 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 a roving DSO. During the non-irrigation season, a Water Operations Supervisor or the Ag 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

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

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 for production of pasture and forage crops.

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

Soil Map Unit	% 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	
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

Soil Map Unit	% 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	
Peters-Pentz Complex	5%	foothills & hills	15 and 50 percent	colluvium and/or residuum derived from water-reworked basic tuff	1.9 inches in top five feet	Well drained	moderately low	bedrock at 12 to 22 inches	none within soil profile	0 - 12 inches: 12 - 22 inches: 22 - 79 inches:	silt loam 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	% 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	
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: 12 - 36 inches: 36 - 60 inches:	sandy loam sandy clay loam 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 57°F in December and January to nearly 94°F in July (Table 3-3). Mean daily minimum temperatures range from 37°F in January to about 60°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 13.9 inches, with 11.7 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 78%, which is indicative of an irrigated area and exceeds 90% between November and April. Minimum relative humidity ranges between approximately 31% during the summer and roughly 66% during the wet winter months.

Average wind speed is lowest in November (3.7 miles per hour, mph) and highest in the summer (5.9 mph in June and July).

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

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 September 2023. 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 (www.oakdaleirrigation.com/water-operations).

Table 3-3. Mean Daily Weather Parameters by Month at Oakdale CIMIS Station (January 2005 through December 2024).

Month	Total ET_o (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	3.8	46.1	37.0	57.0	85.3	66.4	96.7	4.2
February	2.1	1.9	49.5	38.1	62.5	76.9	53.1	95.4	4.6
March	3.5	2.0	53.4	41.3	66.6	74.8	50.2	94.9	4.9
April	5.0	1.2	58.1	44.5	72.5	68.3	44.3	92.9	5.2
May	6.8	0.5	64.7	49.8	80.3	59.9	37.3	88.3	5.4
June	8.0	0.1	71.8	55.5	88.3	53.5	32.8	82.8	5.9
July	8.6	0.0	76.4	60.1	93.7	50.7	31.2	78.3	5.9
August	7.4	0.0	74.4	58.9	91.2	54.1	33.4	81.4	5.6
September	5.5	0.1	70.2	55.4	86.9	56.6	33.9	83.5	4.8
October	3.6	0.5	62.1	48.4	78.5	61.8	37.2	87.4	4.2
November	1.8	1.1	51.9	40.0	66.1	75.6	50.3	94.1	3.7
December	1.1	2.8	46.2	37.2	56.7	83.6	63.9	96.1	4.3
Annual	54.6	13.9	60.7	47.4	75.4	66.5	44.1	89.1	4.9

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 A (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 periodic 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. New hires who will be DSOs or in related positions are provided with a multi-day training at the Irrigation Training and Research Center (ITRC) on canal operations, water measurement principles, and SCADA equipment and operations. Prior to the start of each irrigation season, DSOs are also provided an in-house 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 A.

System spillage and on-farm tailwater are collected by a system of drains, both private and District, 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 2024, OID has established reliable flow measurement at 13 operational spillage sites and 14 drain outflow sites since that time. The monitored operational spillage and drain outflow sites represent approximately 68% 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 (Figure 5-9). 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. 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. The volumetric cost increases with usage encouraging efficient on-farm water management. During the 2025 irrigation season, the fixed (per-acre) rate was $34.23 (with a minimum of $68.46 per parcel), and the volumetric rates were as follows:

- $3.92 per af for usage from 0 to 3 af/ac
- $7.81 per af for usage from 3.01 to 5 af/ac
- $10.37 per af for usage from 5.01 to 7 af/ac
- $12.99 per af for usage from 7.01 to 8 af/ac
- $25.89 per af for usage greater than 8.01 af/ac

Additionally, OID's water rate allows for a drought surcharge of $7.75 per acre to be applied in years that a drought is declared, subject to the discretion of the BOD.

In early 2025, OID completed another rate study to evaluate the need for rate updates. On August 5, 2025, the BOD approved the Notice of Public Hearing as part of the Proposition 218 process for proposed updated fixed and volumetric water service rates. The new rates were ultimately adopted on October 7, 2025 and will be implemented in the 2026 irrigation season. The fixed (per-acre) rate during the 2026 irrigation season will be $36.63 (with a minimum of $73.26 per parcel). The drought surcharge was also increased to $8.29 per acre if a drought is declared. Under the new rate structure, the five tiers of volumetric rates were consolidated down to three tiers as follows:

- $4.19 per af for usage from 0 to 4 af/ac
- $11.10 per af for usage from 4.01 to 6 af/ac
- $27.71 per af for usage greater than 6.01 af/ac

An increase up to 10% per year until 2030 can be applied to each component of the rate subject to the discretion of the BOD.

Prior to the 2023 irrigation season, Out-of-District Surface Irrigation Agreements were annual contracts for the delivery of OID surface water which had to be approved by the BOD each year before the start of the irrigation season. In 2023, OID started the first year of the 10-Year Out-of-District Water Sale Program (OOD Program). Through the OOD Program, over 10,000 irrigated acres are enrolled to have the opportunity to receive surplus surface water from OID in years when it is determined to be available. The OOD Program term is 10-years with the option to extend an additional 10-years at OID's sole discretion upon request by the participants. Each year, OID makes a determination on the availability of any "surplus" surface irrigation water for the OOD Program. There is no guarantee that Out-of-District water will be available every year and the water is provided at a premium rate ($212.18 in 2025) with a 3% annual escalator. In years which surplus surface water is available for the OOD Program, participants are required to submit a nonrefundable payment for a minimum of 1.5 acre-feet per irrigated acre prior to the receipt of any surplus water. The Out-of-District water rate is assessed volumetrically (per acre-foot) and provided only if a District-acceptable measuring device has been installed. Several conditions must also be met prior to the receipt of Out-of-District water, including but not limited to a required minimum on-farm irrigation efficiency of seventy (70) percent and assurance that no tailwater will leave the property. For additional information describing the conditions for receipt of Out-of-District service, refer to the 10-Year Out-of-District Water Sale Agreement included as Attachment B.

Additionally, the pricing structure for Tier II lands annexed into OID are based at least in part on quantity delivered and assessed through volumetric measurement at the delivery point. During the 2025 irrigation season, the volumetric charge for water delivery to these lands was $59.04 per af. In 2026, this rate will increase to $59.31 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 D 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) in 2015 AWMPs describing actions and measures taken to manage water demand during drought. In 2018, with the passage of AB 1668, 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 C of this AWMP. The DMP builds upon OID's Surface Water Shortage Policy (Attachment D), 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 the components recommended by DWR in its 2025 AWMP Guidebook (DWR 2025a). 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 also includes a summary of the 2012-2016 and 2020-2022 droughts.

Please refer to Attachments C and D 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 (www.oakdaleirrigation.com).

Refer to the following rules related to prohibitions on wasteful use of water: 3.2.1.2, 3.3.2.1, 4.1.1 – 4.1.3, 4.2.1, 4.2.2, 5.1.3, 5.2.2.2, 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, 2.2.3, 3.3.2.7, 3.4.1, 4.2.3, 5.2.3.5.

The rules cited above may not be exhaustive. The complete OID Rules and Regulations are available on the OID website (www.oakdaleirrigation.com/water-operations).

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 OID. The District's use of water is based on pre-1914 adjudicated and post-1914 appropriative rights that are shared with its sister district, the SSJID. After the construction of New Melones Reservoir by the U. S. Bureau of Reclamation (USBR), OID and SSJID 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 regulating reservoir. The role of Rodden Dam was complemented by addition of 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 adds 300 acre-feet to the available 150 acre-feet that Rodden Lake provides for the north side of the District.

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 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. Tulloch, 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, OID and the SSJID entered into a 1972 Stipulation and Agreement, whereby the two Districts' water rights were converted to an allotment agreement between the USBR and the districts for 654,000 af per year. In 1988, the Districts renegotiated the 1972 Stipulation and Agreement with the USBR. In the 1988 Agreement, the Districts receive the first inflow to New Melones up to 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 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 Districts' 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, OID 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.

An updated exceedance-probability analysis was conducted using OID's entitlement from 2004 to 2024 to evaluate potential changes in recent water supply reliability relative to historical water supply reliability. Although this 21-year dataset is substantially shorter than the 82-year period evaluated previously, the resulting exceedance probabilities are generally consistent across both periods. Between 2004 and 2024, OID received 300,000 af in 17 out of the 21 years (81% of the period), which is comparable to the 78% likelihood of full supply from the prior analysis. The lowest annual inflow during this period was approximately 211,000 af (observed in 2015), which is higher than the minimum supply of approximately 190,000 af estimated in the Water Resources Plan to be available in nearly all years (99% exceedance), further indicating general consistency between these two periods and no observable change in water supply reliability in recent years.

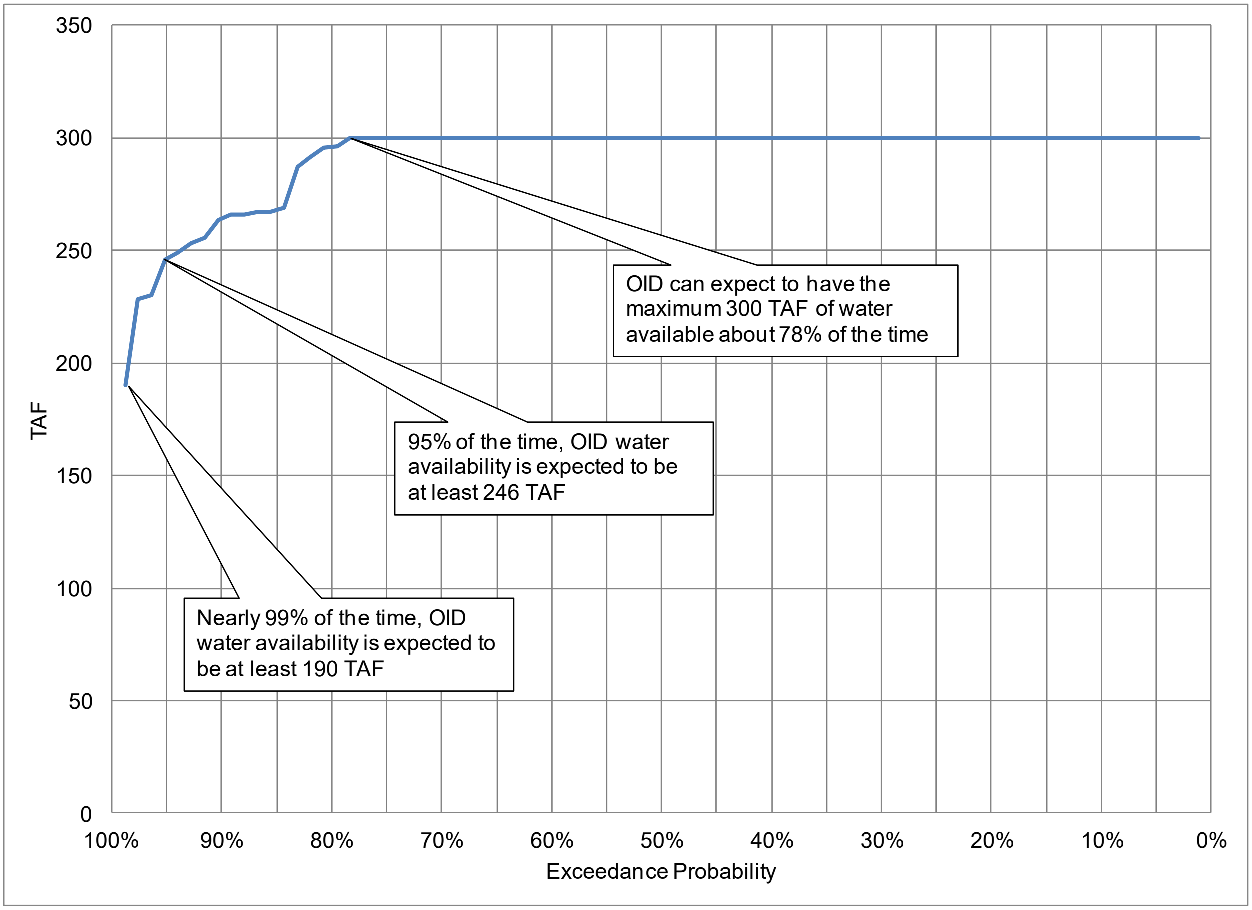

Figure 4-3. Exceedance Probability of OID Stanislaus River Water Supply (based on Supply available from 1922 to 2003).

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, an average rate of approximately 0.5 feet per year (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. Additionally, groundwater elevations and trends vary throughout the Modesto Subbasin, although rates of decline and total declines generally increase moving from west to east within the Subbasin. The groundwater levels in the western Subbasin were relatively low in the early 1990s but increased after 1995 when the City of Modesto began to receive treated surface water and reduced groundwater pumping. Since the mid-2000s, groundwater levels have continued to decline in other areas of the Subbasin, especially in the Eastern Principal Aquifer (over which OID is located), with a long-term rate of decline of up to about 2.7 feet per year and up to about 6.0 feet per year during drought (STRGBA 2024). Based on review of eight representative monitoring wells within OID's service area within the Subbasin, the average rate of groundwater level decline over the past 10 years was a lesser rate of about 2.0 feet per year. For these eight wells, the average rate of decline over the past 10 years for the two wells within the Paulsell area were a higher rate of 4.7 feet per year and the other six wells were a lower rate of 1.0 feet per year. However, the Paulsell Lateral Expansion Project (Phase 1 under construction at time of writing) will increase direct and in-lieu recharge in the Paulsell area (see Sections 3.3 and 7.4.5).

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 approximately 1.3 feet per year; based on 10 selected wells distributed throughout the subbasin, the recent average decline from 1996 through 2015 was roughly 0.5 feet per year (ESJGA 2024). Groundwater elevations and trends also vary throughout the Eastern San Joaquin Subbasin. Most notably, there is a large pumping depression in the center of the Subbasin, to the east of the City of Stockton. Recent groundwater elevation contours show subsurface flow towards this pumping depression occurring from all surrounding areas (ESJGA 2025). 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.

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.

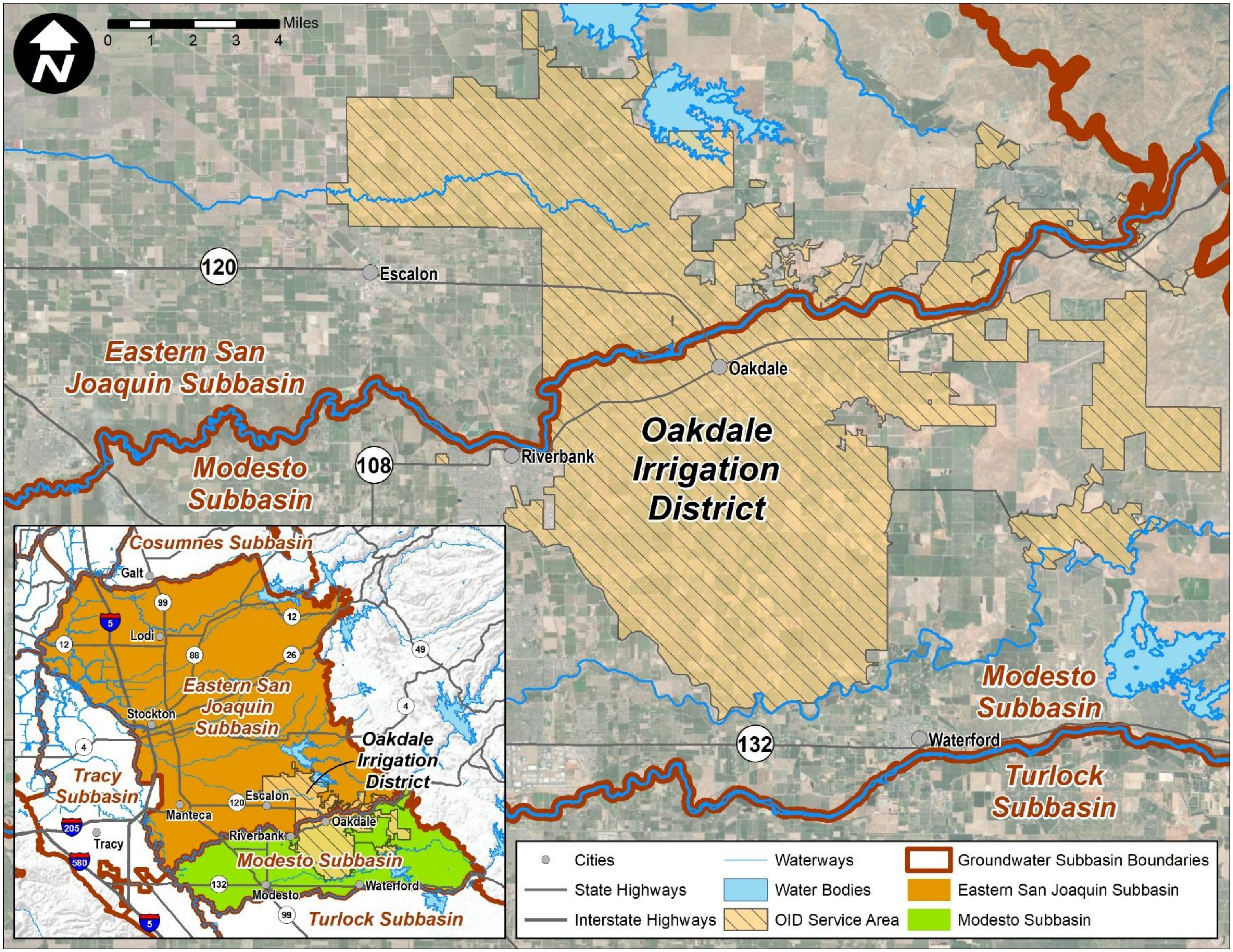

Figure 4-4. Groundwater Basins Underlying OID and Surrounding Areas.

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 details, the IRGMP is available on https://elibrary.ferc.gov/eLibrary/search.

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 with County of Tuolumne GSA under SGMA to ensure the long-term sustainability of groundwater resources within the Modesto Groundwater Subbasin. The STRGBA and Tuolumne GSAs, with active involvement of OID, successfully developed and adopted the Modesto Subbasin GSP, which was approved by DWR in 2024. The GSP is currently being implemented across the subbasin. The Modesto Subbasin GSP is available on STRGBA website (www.strgba.org).

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 ESJGWA, with active involvement of OID, successfully developed and adopted the ESJ Subbasin GSP, which was approved by DWR in 2023. The GSP is currently being implemented across the subbasin, including within the OID GSA boundary. The ESJ Subbasin GSP is available on ESJGSA website (www.esjgroundwater.org).

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. In the summer of 2025, the CASGEM online system began moving to the SGMA Portal (sgma.water.ca.gov/portal) to streamline groundwater elevation data management and reporting processes by consolidating data submission into one location.

The District has 25 deep wells (Figure 4-5) with a combined output of approximately 107 cfs and a theoretical maximum annual production capacity of approximately 45,393 af based on a 220-day irrigation season. Actual annual production is substantially lower and ranged between approximately 1,500 and 2,300 af between 2020 and 2024, with an annual average of 1,900 af. Additionally, OID has reduced its groundwater pumping since SGMA was introduced in 2014. The 10-year annual pumping averages for the 2005-2014 and 2015-2024 periods were approximately 8,500 and 3,300 af, respectively. Annual groundwater pumping volumes by OID in each subbasin are available in Attachment F. All deep well pumps are equipped with flowmeters and volumes are directly measured.

Figure 4-5. OID Deep Well.

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)

As part of the production well evaluations, pump efficiency tests were completed for all OID and MID deep well pumps. 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. Whenever a pump is pulled for inspection, a well video is also taken to document the condition of the casing and perforations, any change in depth and to identify any maintenance needs. 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 a National Pollutant Discharge Elimination System (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 220-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.

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

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.

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 rivers and drains in the area;
- 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 2025 water year (ESJWQC 2024), the ESJWQC conducts monthly water quality monitoring at core sites to assess a number of field parameters, including nutrients, pathogens, pesticides, metals, and toxicity. Sediment monitoring occurs twice a year. 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 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 2025 water year (SJCDWQC 2024), the SJCDWQC conducts monthly water quality monitoring at core sites to assess a number of field parameters, including nutrients, pathogens, pesticides, metals, and toxicity. Sediment monitoring occurs twice a year. 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. 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), which was most recently revised and updated in June 2017 (ESJWQC 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 (COCs) 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, GSAs are not responsible for water quality monitoring and improvement, but they need to ensure that groundwater management activities do not result in degradation of groundwater quality. In the Eastern San Joaquin Subbasin, groundwater is tested for total dissolved solids (TDS) and chloride in additional to field parameters such as pH, electrical conductivity, and temperature (ESJGA 2024). Per the GSP, the thresholds for these COCs are set according to the California drinking water Maximum Contaminant Level (MCL) or Secondary Maximum Contaminant Level (SMCL). A threshold of 1,000 mg/L TDS for degraded water quality was set for the Subbasin, although the areas of concern and monitoring wells are all to the west and northwest of the OID service area. As described in the GSP, cities, water/irrigation districts, Cal Water, and San Joaquin County monitor and report these COCs in their representative monitoring wells.

In the Modesto Subbasin, the COCs were identified based on review of historical data from 1994 to 2019 (STRGBA, 2024). The COCs most likely to affect groundwater quality include agricultural pollutants (nitrate, salts, and pesticides), natural geogenic sources (arsenic, boron, radionuclides), and volatile organic compounds (tetrachloroethene). The thresholds for these COCs in this Subbasin were also set according to the California MCL and SMCL. Based on the review, the COCs in Western Upper Principal Aquifer generally exceeded the MCL or SMCL more frequently than in Western Lower Principal Aquifer and Eastern Principal Aquifer. SWRCB monitors and reports these COCs in the representative monitoring wells for each Principal Aquifer. OID tracks groundwater quality in both Subbasins under SGMA as a GSA and is engaged in monitoring and/or coordination related to groundwater quality with other GSAs as necessary and beneficial.

Finally, as described previously, OID also 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 per the 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 in the sections 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 2015 to 2024 is presented[7]. 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 2020 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).

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

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

[7] Detailed water budget results are also available in Attachment F. As described in Section 5, the annual results for 2015-2024 are presented for the calendar year from January to December. In Attachment F, the results are also presented on a water year basis, per the requirements of CWC §10826(c) and presented for the full twenty-year period from 2005-2024 for which results are available to provide more historical context. Furthermore, in Attachment F, water budget results are also subdivided into distinct water budgets for the portion of OID to the north of the Stanislaus River in the Eastern San Joaquin Subbasin and the portion of OID to the south of Stanislaus River in the Modesto Subbasin.

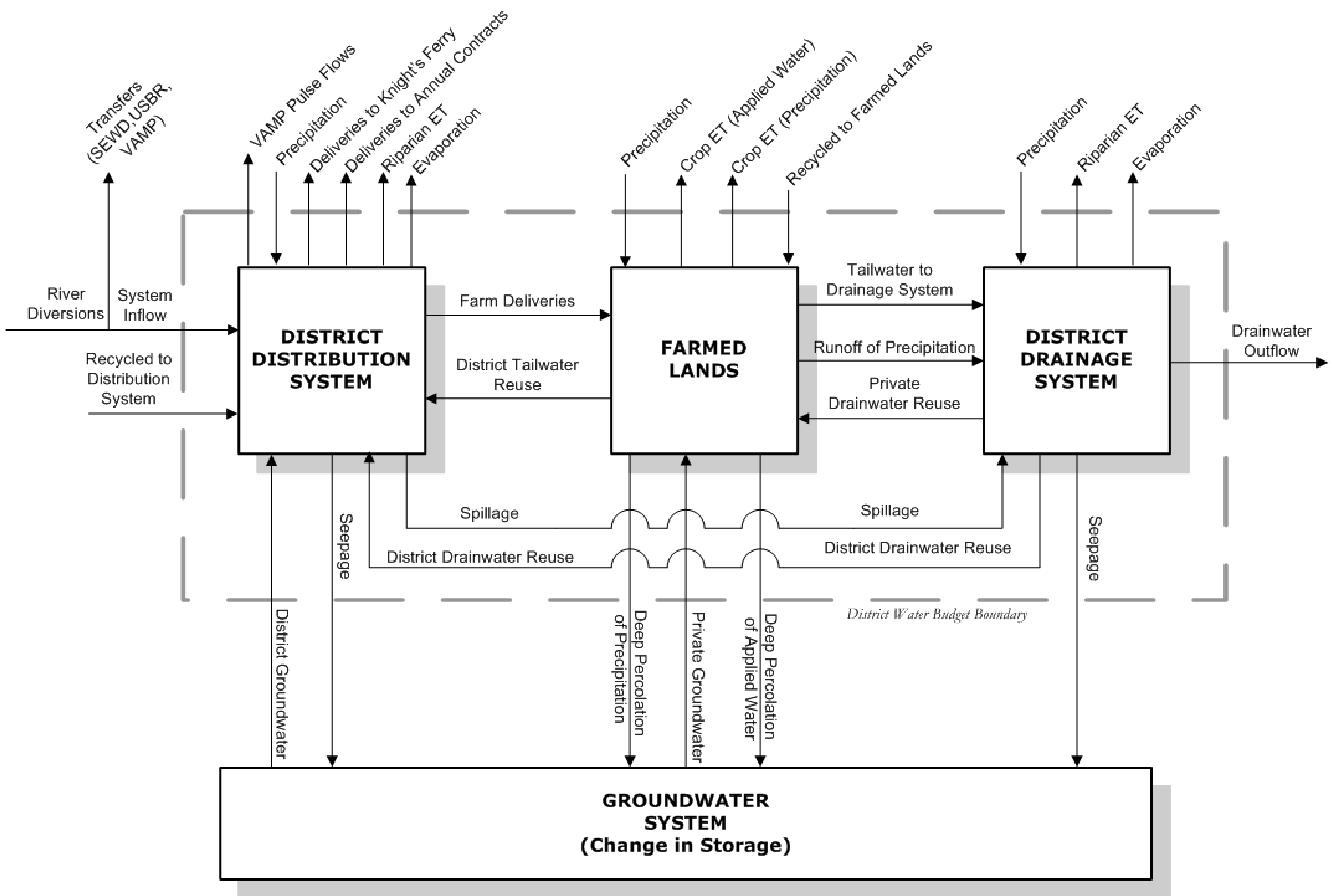

Figure 5-1. OID Water Budget Structure.

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 was not readily available during the early years of the full water budget period of record. 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 since 2015.

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 potentially 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.

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[8], the

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

supporting data used to determine it, and the estimated uncertainty, expressed as a percentage. As indicated, with the exception of deep percolation of applied water, estimated uncertainties vary by flow path from 5% to 50% of the estimated value. Uncertainties are generally less for measured flow paths and greater for calculated flow paths. The estimated uncertainty of each closure term, calculated based on the concept of propagation of random errors as described above, is also shown.

As indicated, the estimated uncertainty in farm deliveries is 9%. This uncertainty is relatively small due to the relatively low uncertainty in system inflows from the Stanislaus River, which represents the largest flow path in the distribution system budget. The estimated uncertainty in deep percolation of applied water is over 92%. 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 30%, 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 [9], 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 Stanislaus River and subsequent 1988 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 (see Section 4.2). During the 2015 to 2024 period, partial allotments were received in 2015 and 2021, with full allotments in all other years. In 2015, for the first time in its history, OID had to implement and enforce water allocations for its water users due to the reduction in OID's allotment.

[9] 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.

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

Account-ing Center	Flow path Type	Flow Path	Source	Supporting Data	2015-2024 Average Value (af)	Estimated Uncertainty (%)
Distribution System	Inflows	System Inflows	Measurement	TriDam report, OID river pump flows	213,300	5%
		OID Groundwater Pumping	Measurement	OID deep well pump discharge measurements	3,100	5%
		OID Drainwater Reuse	Measurement	OID reclamation pump discharge measurements	3,600	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	1,900	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**	**174,500**	**9%**
		Deliveries to Annual Contracts	Measurement	OID operational data	4,200	10%
		Deliveries to Knights Ferry	Measurement	OID operational data	2,000	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	1,200	20%
		Canal Seepage	Calculation	NRCS soils data, published seepage rates by soil type, estimated wetted area, estimated wetted duration	29,100	35%
		Operational Spillage	Calculation	OID operational spill measurements, estimated area represented by measurement sites	11,300	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 private groundwater use based on field-scale review of cropping, water source, OID surface water use, review of WRP, recent annexations, and average crop-specific OID ET_{aw} and CCUF	57,300	20%
		Private Drainwater Reuse	Calculation	OID list of properties irrigated via gravity with drainwater only, average ET_{aw} and CCUF	3,300	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	70,000	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	168,900	10%
		Tailwater to Drainage System	See Below			

Account-ing Center	Flow path Type	Flow Path	Source	Supporting Data	2015-2024 Average Value (af)	Estimated Uncertainty (%)
		Deep Percolation of Applied Water	**Closure (Farmed Lands)**	**Difference of total inflows and measured/estimated outflows for Farmed Lands accounting center applied water budget**	**31,000**	**88%**
		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	43,200	10%
		Deep Percolation of Precipitation	Calculation	IDC analysis, NRCS soils characteristics, CIMIS precipitation data	21,700	25%
		Runoff of Precipitation	Calculation	IDC analysis, CIMIS precipitation data, NRCS curve number method	6,100	30%
Drainage System	Inflows	**Tailwater to Drainage System**	**Closure (Drainage System)**	**Difference of total inflows and measured/estimated outflows for Drainage System accounting center**	**34,600**	**30%**
Drainage System	Inflows	Operational Spillage	See Above			
Drainage System	Inflows	Runoff of Precipitation	See Above			
Drainage System	Inflows	Precipitation	Calculation	Quality-controlled precipitation from Oakdale CIMIS station, estimated drain surface area	10	15%
Drainage System	Outflows	Drainwater Outflow	Calculation	OID boundary outflow measurements, estimated area represented by measurement sites	38,000	25%
Drainage System	Outflows	Drain Seepage	Calculation	NRCS soils data, published seepage rates by soil type, estimated wetted area, estimated wetted duration	6,500	35%
Drainage System	Outflows	OID Drainwater Reuse	See Above			
Drainage System	Outflows	Private Drainwater Reuse	See Above			
Drainage System	Outflows	Drain Evaporation	Calculation	CIMIS reference ET, estimated evaporation coefficient, estimated wetted surface area	300	20%
Drainage System	Outflows	Drain Riparian ET	Calculation	CIMIS reference ET, estimated crop coefficient, estimated riparian area	200	20%

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 2015 to 2024 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 hydrologic 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 2015 and 2024 were assigned to wet year types and six years were assigned to dry year types. The wet years of 2017, 2019, 2023, and 2024 each had a full allotment and precipitation greater than the average of 13.7 inches. Irrigation season ET_o tended to be lower for the wet years, averaging approximately 45.7 inches. The dry years of 2015 and 2021 had partial allotments, while all other years between 2016 and 2024 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 (including three consecutive years with a partial allotment: 2013-2015); 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 10.2 inches. The dry years also tended to exhibit higher ET_o with an average of approximately 47.0 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 5-2. 2015 to 2024 OID Allotment, Water Year Precipitation, and Irrigation Season ET_o, and Hydrologic Year Type.

Year	Irrigation		Number of Days	Surface Water Allotment	Precipitation, in	ET_o, in	Hydrologic Year Type
	Start	End					
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	22.5	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
2020	01-Mar	26-Oct	605	Full	9.6	49.0	Dry
2021	03-Mar	25-Oct	237	Partial	7.2	48.8	Dry
2022	01-Mar	25-Oct	239	Full	7.5	47.1	Dry
2023	09-Apr	30-Oct	205	Full	22.9	40.6	Wet
2024	18-Mar	28-Oct	225	Full	15.5	45.4	Wet
				Wet Year Average	19.0	43.8	
				Dry Year Average	10.2	47.0	
				Overall Average	13.7	45.7	

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 [10]. 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

Figure 5-2. Pasture near Oakdale.

Agricultural irrigation is by far the dominant water use in OID. Between 2015 and 2024, there was an average of approximately 63,900 acres of crop land, including an average of roughly 1,800 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 21,900 acres and double-cropped summer corn and winter grain (primarily oats) was grown on an average of 7,000 acres. Both of these crops are associated with the area's extensive livestock and dairy operations, and together accounted for an average of 44% 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 33,500 acres or 53% of the total cropped area. Almond acreage increased nearly two-fold between 2015 and 2024, from 17,500 acres to 31,300 acres; in 2017, it surpassed pasture acreage to become the most common crop grown in OID. Rice acreage has seen a dramatic 89% reduction from 2,600 acres to 300 acres between 2015 and 2024. During this period, rice was grown on an average of 700 acres or 1% of the cropped area.

The WRP identified annexation of approximately 4,250 acres within the OID sphere of influence as part of the preferred alternative for implementation. 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 2024, OID has annexed over 10,500 acres, surpassing WRP goals. The crop area associated with annexations is reflected in

[10] 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.

the OID crop acreages presented in Table 5-3 and Figure 5-3[11] with the most noticeable annexation over the last 10 years being roughly 1,150 acres between 2015 and 2016.

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[12]) 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 (described below). 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 2016 METRIC irrigation season ET_a for the OID service area is shown in Figure 5-4.

While METRIC is a widely accepted method for estimating ET_a, OID funded a study to review METRIC estimates in direct comparison to ground-based ET_a quantification methods, explore alternative remote-sensing techniques, and improve overall understanding of and confidence in ET_a estimates (OID, 2023). The study was initiated in 2016 with the objective of comparing ET_a accuracy and consistency by crop between two ground-based methods (Eddy Covariance and Tule Systems) and three remote sensing models (METRIC, Simplified Surface Energy Balance [SSEB], and Combined NDVI and Root Zone Water Balance Models). The study concluded that METRIC ET_a estimates aligned most closely with the Eddy Covariance method data and recommended using crop coefficients derived from the 2016 METRIC model to calculate ET_a for developing District water budgets (OID, 2023).

Table 5-3. OID Crop Acreages, 2015 to 2024.

Crop	Crop Acreage by Year										Average
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
Pasture	*26,981*	*24,438*	*22,816*	*20,919*	*20,458*	*20,082*	*19,049*	*18,631*	*18,119*	*17,464*	*20,896*
Oats and Corn	*8,103*	*8,523*	*8,569*	*7,042*	*6,924*	*6,787*	*6,337*	*6,220*	*5,977*	*5,852*	*7,033*
Almonds	*17,503*	*22,774*	*24,348*	*27,647*	*28,658*	*28,970*	*30,511*	*31,347*	*31,489*	*31,264*	*27,451*
Walnuts	*3,427*	*4,636*	*4,895*	*4,918*	*5,134*	*5,279*	*5,244*	*5,257*	*5,178*	*5,120*	*4,909*
Rice	*2,556*	*1,313*	*723*	*350*	*350*	*334*	*272*	*321*	*292*	*292*	*680*
Other	*1,039*	*1,040*	*1,036*	*534*	*1,160*	*1,307*	*1,384*	*1,394*	*1,399*	*1,493*	*1,179*
Idle	*845*	*948*	*1,528*	*1,405*	*1,965*	*2,120*	*2,206*	*1,804*	*2,491*	*2,442*	*1,775*
Total Cropped	*59,610*	*62,724*	*62,386*	*61,410*	*62,683*	*62,759*	*62,797*	*63,170*	*62,452*	*61,484*	*62,148*
Total w/Idle	*60,455*	*63,672*	*63,915*	*62,814*	*64,648*	*64,880*	*65,003*	*64,974*	*64,943*	*63,927*	*63,923*

[11] 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 been decreased by 7.5 percent to estimate irrigated acres for purpose of preparation of this AWMP.
[12] Note that actual ET, or ET_a, is equivalent to crop ET, or ET, for purposes of this AWMP. In some instances, ET represents optimal growing conditions due to the manner in which it is estimated and may be greater than ET_a.

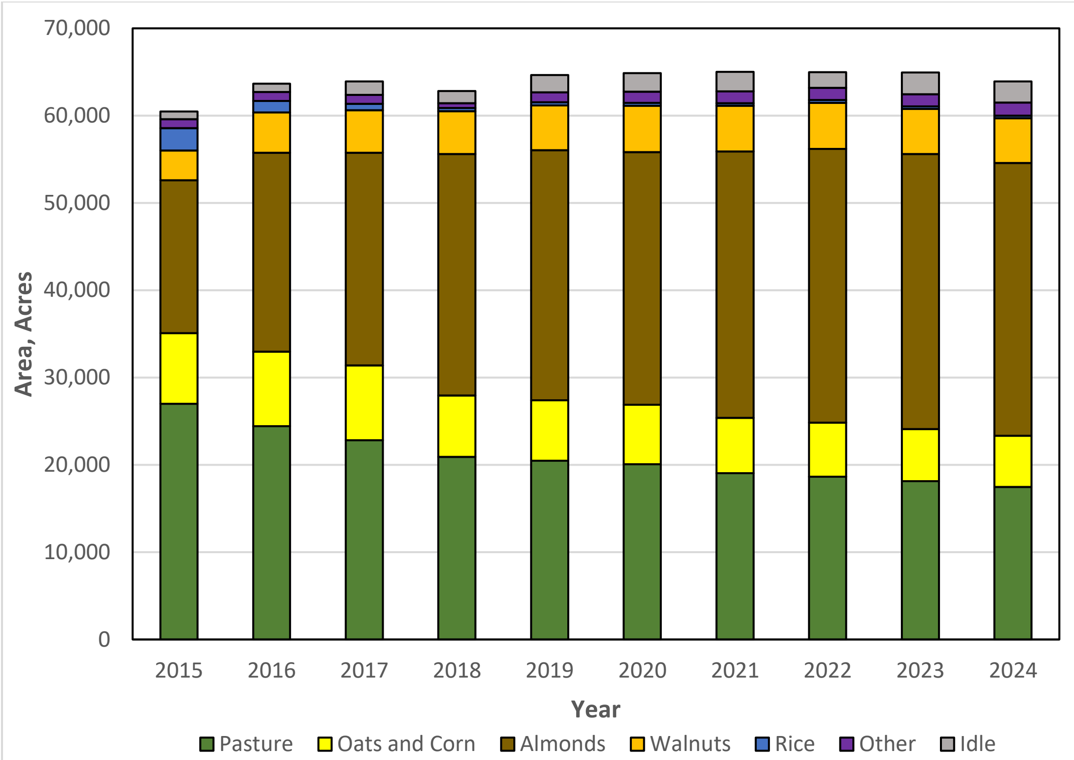

Figure 5-3. OID Cropping, 2015 to 2024.

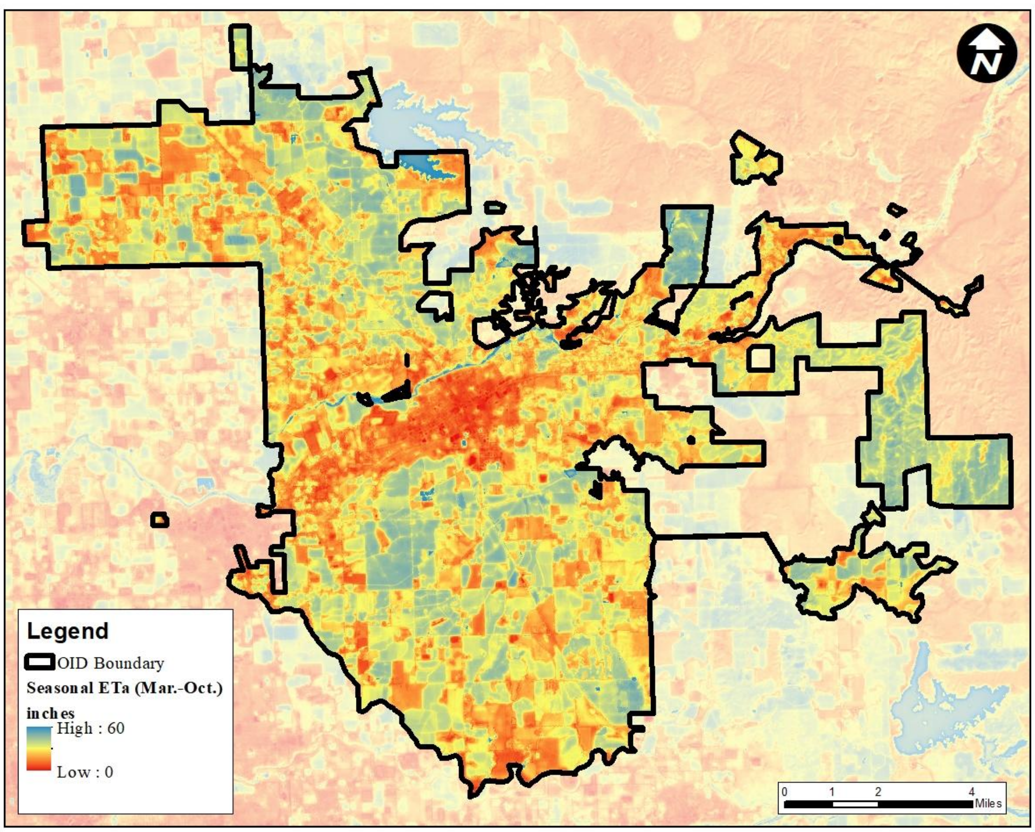

Figure 5-4. OID Spatially Distributed Seasonal Actual ET from METRIC, 2016 Irrigation Season.

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.

As part of the 2025 AWMP update, OID also funded another study utilizing newly available OpenET [13] data to calculate and refine crop coefficients for double-cropped summer corn and winter grain (primarily oats). Spatial ET_a values from OpenET and ET_o values (reference ET) from Spatial CIMIS [14] between 2020 and 2024 were used to calculate crop coefficients of delineated double-cropped parcels. OID continues to evaluate and incorporate newly available data related to ET and ET_a, such as OpenET, into its water management and accounting, as opportunities arise.

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 31.5 inches of total crop ET for 'other' (e.g., grapes, strawberries, cherries, vegetables) to approximately 51.2 inches for rice (Table 5-4) [15]. ET_{aw} ranges from approximately 24.4 inches for other to 41.9 inches for rice. OID's two major crops are pasture and almonds. Average total crop ET for pasture is 41.2 inches with approximately 32.6 inches derived from applied irrigation water and average total crop ET for almonds is 41.4 inches with approximately 32.9 inches derived from applied irrigation water. As an area-weighted average (excluding idle), total crop ET in OID is 41.1 inches, with approximately 32.7 inches derived from applied irrigation water. The remainder of the crop ET is derived from precipitation, as described previously.

[13] OpenET derives ET_a on a 30-m grid using multiple well-established, satellite-driven models on remote-sensing and ancillary data, such as satellite-based datasets from Landsat and Sentinel-2.
[14] Spatial CIMIS derives ET_o on a 2-km grid using the ASCE-version of Penman-Monteith equation with satellite-derived solar radiation (Geostationary Operational Environmental Satellite) and interpolated CIMIS ground station measurements of air temperature, humidity, and wind speed.
[15] Crop ET values are presented in Table 5-4 on a calendar year basis to capture total ET, ET_{aw}, and ET_{pr} within OID. The vast majority of ET 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.

Table 5-4. Average Acreages and Annual Evapotranspiration Rates for OID Crops, 2015-2024.

Crop	Average Acres	Average Evapotranspiration (in)		
		ET	ET_{aw}	ET_{pr}
Pasture	20,896	41.2	32.6	8.6
Oats and Corn	7,033	38.7	31.3	7.4
Almonds	27,451	41.4	32.9	8.6
Walnuts	4,909	43.4	34.5	8.9
Rice	680	51.2	41.9	9.3
Other	1,179	31.5	24.4	7.1
Idle	1,775	6.9	0.0	6.9
Totals excl. Idle	62,148	41.1	32.7	8.5

ET 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 2015 to 2024 period, wet year ET averaged approximately 41.4 inches while dry year ET averaged approximately 40.9 inches. Wet year ET_{aw} averaged approximately 30.5 inches while dry year ET_{aw} averaged approximately 34.1 inches.

Additional information describing crop ET over time is included in Section 5.7. Annual crop ET varied between approximately 193,000 af and 226,000 af during the 2015 to 2024 period, with an average annual volume of 212,000 af. Approximately 169,000 af were derived from applied irrigation water (80%) and 43,000 af were derived from precipitation (20%).

Other agronomic uses of applied water in OID include pre-irrigation of corn and oats, 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. Also, OID along with SSJID, through the Tri Dam Project, have continued to invest in fishery studies, habitat surveys, predatory monitoring, in-migration and out-migration fish counts, etc. on the Stanislaus River each year. 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[16].

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[17]	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.

5.5.4 Municipal and Industrial

The District currently provides domestic water from District-owned groundwater wells for 473 service connections within the rural water system (RWS) it owns and operates. OID also serves as the trustee of five separate improvement districts (IDs) with a total of 290 service connections.

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

Water is provided in four of these five IDs from deep wells that are individually owned by each improvement district. One of the IDs is now provided water through a single point of connection to the City of Oakdale's water system that was constructed in 2020. OID staff monitors the water quality in both the RWS and improvement districts as required by state and local law.

The homes within the RWS 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 and improvement districts is summarized in Table 5-6. A map of rural water system and improvement districts is provided in Figure 5-6.

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 providing surface water for irrigation to two City parks totaling 17 acres that were previously dependent on groundwater and is evaluating delivery of surface water for irrigation of additional City parks.

Table 5-6. Annual Use of Domestic Water for OID Rural Water System and Improvement Districts, 2015-2024.

Year	Rural Water System (af)	Improvement Districts (af)
2015	470	394
2016	458	421
2017	516	478
2018	540	557
2019	533	469 [18]
2020	582	553
2021	591	456
2022	623	475
2023	518	418
2024	598	473
Average	543	469

[18] Potential issues were identified for three flowmeters in August and September of 2019 that impacted data quality. The nine-year average for remaining years between 2015 and 2024 was used to estimate the 2019 volume.

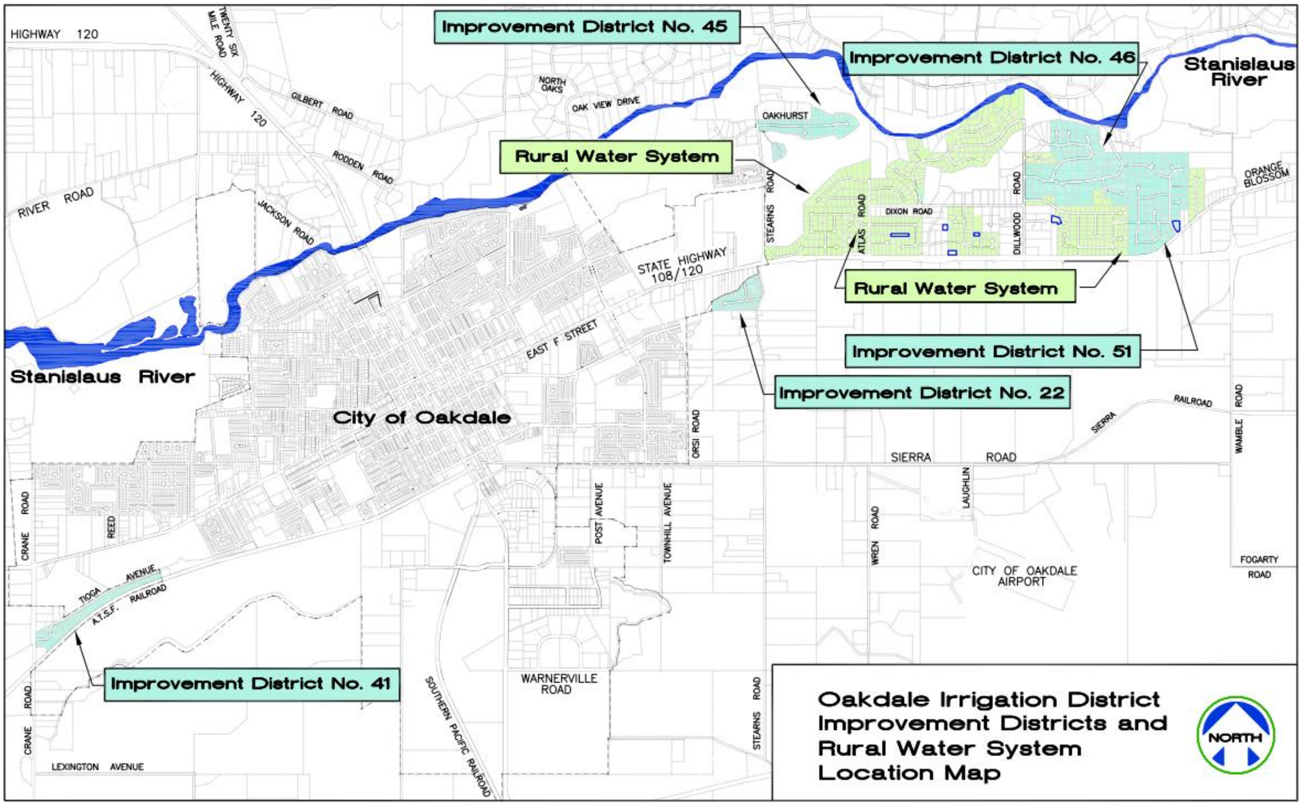

Figure 5-6. OID Improvement Districts and Rural Water Systems.

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 Eastern 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 2015 to 2024 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.

Total recharge between 2015 and 2024 ranged from approximately 62,000 af to 115,000 af per year, or from 1.0 af to 1.8 af per cropped acre per year. As expected, average total recharge was higher in wet years than in dry years. Overall, on average, total recharge was estimated to be approximately 88,000 ac-ft per year (1.4 af/ac-yr), with approximately 35% of recharge originating from deep percolation of applied water, 33% of recharge originating from canal seepage, 25% of recharge originating from deep percolation of precipitation and 7% of recharge originating as seepage from drains.

Table 5-7. OID Total Groundwater Recharge, 2015 to 2024.

Year	USBR Allot-ment	Hydro-logic Year Type	Canal Seepage (af)	Drain Seepage (af)	Deep Percolation of Applied Water (af)	Deep Percolation of Precipitation (af)	Total Recharge	
							(af)	(af/ac)
2015	Partial	Dry	27,446	6,135	15,535	12,583	61,699	1.0
2016	Full	Dry	28,242	6,313	37,345	29,994	101,894	1.6
2017	Full	Wet	27,977	6,254	17,285	33,051	84,567	1.4
2018	Full	Dry	28,085	6,283	15,534	13,818	63,719	1.0
2019	Full	Wet	27,961	6,283	33,909	22,812	90,965	1.5
2020	Full	Dry	31,654	7,113	41,079	12,096	91,942	1.5
2021	Full	Dry	31,259	7,024	39,733	12,436	90,452	1.4
2022	Full	Dry	31,522	7,084	48,914	11,998	99,518	1.6
2023	Full	Wet	27,038	6,076	42,415	39,785	115,314	1.8
2024	Full	Wet	29,650	6,669	18,601	28,442	83,362	1.4
Wet Year Average			28,157	6,321	28,052	31,023	93,552	1.5
Dry Year Average			29,701	6,659	33,023	15,487	84,871	1.4
Overall Average			29,083	6,523	31,035	21,702	88,343	1.4

Under SGMA, there is an increasing focus on groundwater management (including groundwater recharge activities) as GSPs are implemented. OID utilized the water budget results to quantify groundwater recharge on an annual water year basis occurring from the use of surface water; these results are available in Attachment G. They are quantified separately for the portion of OID to the north of the Stanislaus River, which is within the Eastern San Joaquin Subbasin, and for the portion of OID to the south of the Stanislaus River, which is within the Modesto Subbasin.

Groundwater recharge net of groundwater pumping[19] for the entire OID service area was calculated by subtracting measured OID and estimated 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 since the construction of New Melones Reservoir in 1979. 2015 was an extremely dry year, the third subsequent year with a partial allotment from New Melones Reservoir in accordance with the 1988 Agreement and the fourth subsequent dry year. Excluding 2015, net recharge varied from approximately 3,000 af to 68,000 af per year between 2015 and 2024, or from 0.1 af to approximately 1.1 af per cropped acre per year. On average, net recharge was estimated to be approximately 26,000 af per year (0.4 af/ac-yr).

[19] 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, 2015 to 2024.

Year	Surface Water Allotment	Hydrologic Year Type	Total Recharge (af)	Groundwater Pumping (af)	Net Recharge	
					(af)	(af/ac)
2015	Partial	Dry	61,699	90,516	-28,818	-0.5
2016	Full	Dry	101,894	60,424	41,470	0.7
2017	Full	Wet	84,567	65,613	18,955	0.3
2018	Full	Dry	63,719	60,307	3,413	0.1
2019	Full	Wet	90,965	55,243	35,723	0.6
2020	Full	Dry	91,942	61,247	30,695	0.5
2021	Partial	Dry	90,452	70,477	19,975	0.3
2022	Full	Dry	99,518	64,403	35,115	0.6
2023	Full	Wet	115,314	47,261	68,053	1.1
2024	Full	Wet	83,362	50,120	33,242	0.5
Wet Year Average			93,552	54,559	38,993	0.6
Dry Year Average			84,871	67,896	16,975	0.3
Overall Average			88,343	62,561	25,782	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 from New Melones Reservoir. Net wet year groundwater recharge averaged approximately 39,000 af between 2015 and 2024, while net dry year recharge averaged approximately 17,000 af.

5.5.6 Transfers and Exchanges and Releases

Voluntary water transfers and water sales provide a basis for funding improvements to the OID distribution system under the District's WRP. OID uses this funding mechanism to minimize water rate increases to OID customers that would otherwise be needed to accomplish this same purpose. OID has participated in numerous water transfers and sales in the past and continues to seek opportunities for mutually beneficial temporary water transfer and sale 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 over 289,000 af to four different recipients, including the Bank, Stockton East Water District (SEWD), the USBR, and VAMP. Water transferred to SEWD is predominantly for municipal and industrial use, but has also been provided on occasion for agricultural irrigation purposes. 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 have been 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.

OID has continued water transfers in recent years. From 2015 to 2024, transfers included SEWD, San Luis & Delta-Mendota Water Authority, DWR, and Banta-Carbona Irrigation District as shown in Table 5-9. Over this period, the District has transferred approximately 103,000 af, or an average of 10,300 af per year.

Table 5-9. OID Water Transfers, 2015 to 2024.

Year	Annual Transfer Volume, acre-feet					
	SEWD	**USBR**	**San Luis & Delta-Mendota Water Authority**	**DWR**	**Banta-Carbona Irrigation District**	**Total**
2015	0	0	5,750	5,750	0	11,500
2016	0	0	25,250	25,250	0	50,500
2017	0	0	0	0	0	0
2018	0	0	15,655	15,655	0	31,310
2019	0	0	0	0	0	0
2020	650	0	0	0	0	650
2021	501	0	0	0	0	501
2022	6,910	0	0	0	0	6,910
2023	600	0	0	0	75	675
2024	0	0	0	0	0	0
Totals	9,161	0	46,655	46,655	75	102,546

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 40 reclamation pumps (Figure 5-8) located along these drains that are operated during the irrigation season to capture and reuse drainwater or 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 2015 and 2024 is summarized in Table 5-10. The volume of water pumped for reuse by MID and SSJID is included in volumes summarized in Section 5.6.2.

Figure 5-8. Reclamation Pump.

Table 5-10. Reclamation Pumping within OID, 2015 to 2024.

Year	Surface Water Allotment	Hydrologic Year Type	Reclamation Pumping (ac-ft)		
			OID	Private	Total
2015	Partial	Dry	3,337	3,235	6,572
2016	Full	Dry	4,413	2,752	7,165
2017	Full	Wet	3,978	3,187	7,166
2018	Full	Dry	3,616	3,577	7,193
2019	Full	Wet	3,508	3,093	6,601
2020	Full	Dry	3,613	3,521	7,134
2021	Partial	Dry	3,848	3,932	7,780
2022	Full	Dry	2,947	3,820	6,767
2023	Full	Wet	3,300	2,984	6,284
2024	Full	Wet	3,020	3,294	6,314
Wet Year Average			3,452	3,140	6,591
Dry Year Average			3,629	3,473	7,102
Overall Average			3,558	3,340	6,898

Between 2015 and 2024, OID reclamation pumping varied between approximately 2,900 af and 4,400 af per year with an average of 3,600 af per year, and private reclamation pumping varied between 2,800 af and 3,900 af per year with an average of 3,300 af per year. Total reclamation pumping within OID varied from 6,300 af to 7,800 af per year with an average of 6,900 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 3,100 af between 2015 and 2024, while dry year reclamation averaged approximately 3,500 af.

OID and private reclamation pumping has decreased in last ten years relative to the ten years prior (i.e., 2005 to 2014). This is due to a more inconsistent supply of water and reduced overall volume of water available in drains for reclamation in recent years, which is influenced by both increased operational efficiency by OID (as described in the subsequent section) and increased on-farm efficiency by growers within OID (e.g., transition from flood to micro-irrigation).

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 13 operational spillage sites and 14 drain outflow sites. The outflow sites represent more than 30% of the total boundary outflows from OID and the 13 operational spillage sites represent more than 30% of the total operational spillage from the OID distribution system. The District plans to continue to maintain and increase the number of operational spill and boundary outflow sites measured over time.

More recently, a detailed analysis was 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 available 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 2015 to 2024 are summarized in Table 5-11. Annual boundary outflows ranged from approximately 34,000 af to 44,000 af, with an average of 38,000 af. It should be noted that these volumes exclude unmeasured intercepted stormwater through the district conveyance and drainage system in the winter months. Intercepted stormwater is not accounted for within the water budget, as winter storm flows do not directly pertain to OID’s water management activities.

Table 5-11. OID Annual Boundary Outflows, 2015 to 2024.

Year	Surface Water Allotment	Hydrologic Year Type	Annual Drainwater Outflow (af)
2016	Full	Dry	39,911
2017	Full	Wet	42,107
2018	Full	Dry	43,682
2019	Full	Wet	34,073
2020	Full	Dry	34,545
2021	Partial	Dry	37,366
2022	Full	Dry	39,021
2023	Full	Wet	34,165
2024	Full	Wet	34,693
		Wet Year Average	36,260
		Dry Year Average	39,165
		Overall Average	38,003

Based on the period from 2015 to 2024, annual 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 boundary outflows by increasing operational efficiency and reducing operational spillage are progressing.

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 annual boundary outflow volume.

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.

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.
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 of 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.

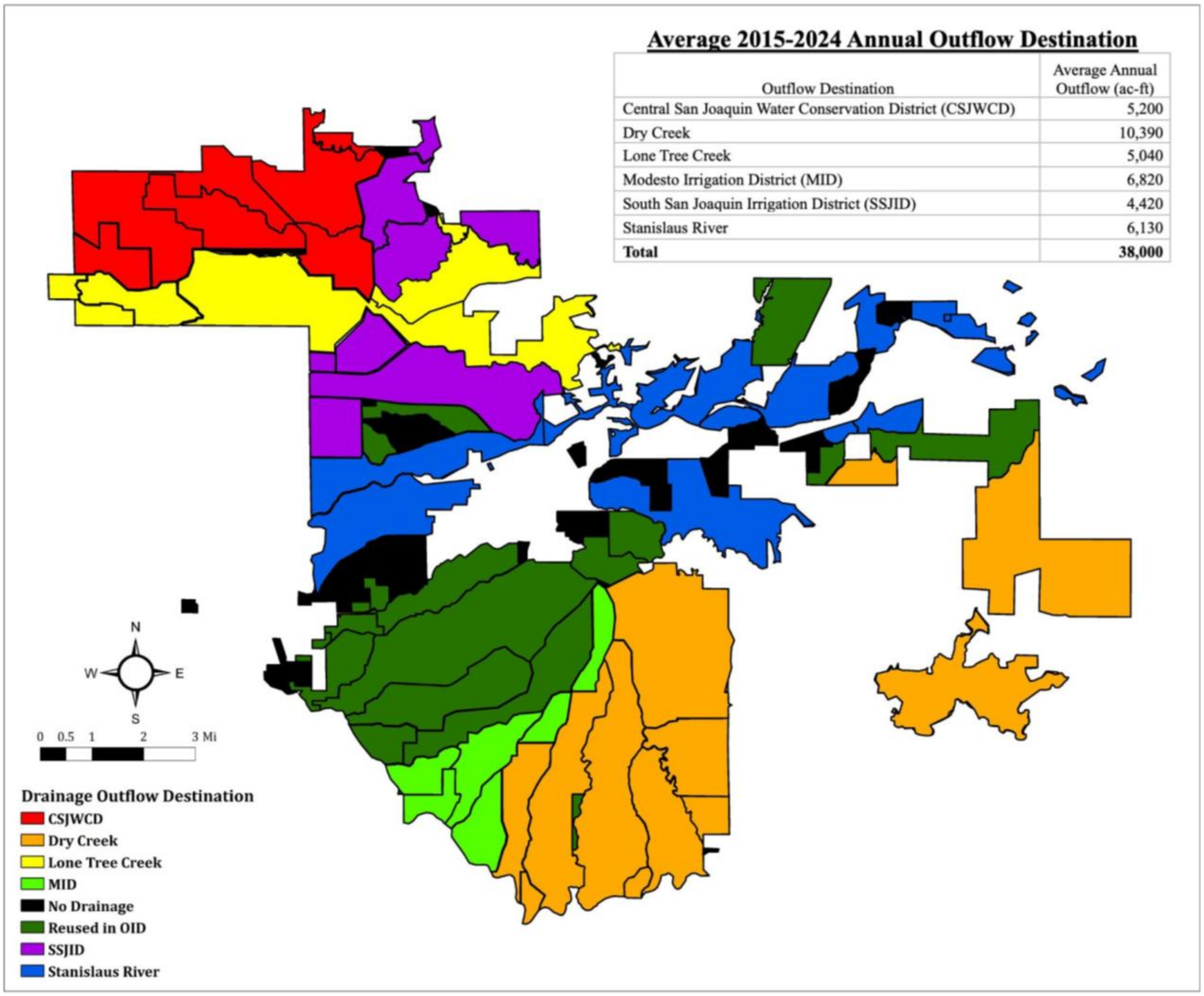

Figure 5-9. OID Drainage Watersheds, Outflow Destinations, and Average Annual Boundary Outflow Volume[20].

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).

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

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) [21]. 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 systems 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. Similarly, precipitation, evaporation, riparian evapotranspiration, and seepage occurring within the distribution and drainage systems during the winter months are also not included in the water budget, since the only water present in these systems during these months originated as precipitation and does not directly pertain to OID's water management activities. If quantified, these flow paths would be expected to have minimal impact on the overall water budget, since the direct precipitation into these areas is small and winter storm flows generally flow through the systems. In the future, depending on data availability and District priorities, these flow paths may be incorporated into future water budget updates.

5.7.1 Distribution System Water Budget

Over the 2015 to 2024 period, the District's distribution system total inflows from Goodwin Dam [22] ranged from 165,000 af to 252,000 af with an overall average for the ten-year period of 215,000 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 213,000 af and 217,000 af, respectively. Although they are roughly equivalent here (i.e., within 10,000 af), system inflows were greater in dry years due to the fact that less precipitation was available to support crop water demands in OID and evaporative demands tend to be greater in dry years. As a result, additional irrigation deliveries were needed to maintain crop production. However, this trend can be counteracted by a partial allotment, which will result in reduced system inflows during certain dry years (e.g., 2015).

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 1,300 af to 12,600 af between 2015 and 2024 with a wet year average of 1,700 af and a dry year average of 4,100 af. The overall average for the ten-year period was 3,100 af. The District groundwater

[21] Water budget results on a water year basis (October through September) are also available in Attachment F.

[22] 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.

pumping decreased drastically from 12,600 af in 2015 to 3,600 af in 2016 and continued to decrease gradually to 1,300 af in 2024. This decrease in pumping can be attributed to distribution system improvements including but not limited to canal automation. Additional pumping in 2015 (a dry year) 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 due to significant reduction in OID's allotment. In other dry years (2016, 2018, 2020, 2021, and 2022) when surface water supply remained available, minimal additional pumping was needed to meet the water demand.

OID drainwater reuse ranged from 2,900 af to 4,400 af between 2015 and 2024 with a wet year average of 3,500 af and a dry year average of 3,600 af. The overall average for the ten-year period of the water budget was 3,600 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. As described previously, drainwater reuse between 2015 to 2024 was lower than reuse between 2005 and 2014 due to multiple factors, including both increased operational efficiency by OID and increased on-farm efficiency by growers within OID.

OID tailwater reuse is a minor flow path that has been quite steady over time, varying between 1,400 af and 2,300 af between 2015 and 2024 with an average of approximately 1,900 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 2015 and 2024. The estimated contribution of direct precipitation to the OID water supply is very small, ranging from about 30 af to 150 af between 2015 and 2024, with an average of 80 af.

Overall, OID groundwater pumping, drainwater reuse, tailwater reuse, and recycled water reuse represent a total supply of approximately 12,000 af in dry years (5% of average dry year supply) and 9,300 af in wet years (4% 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 2015 and 2024 with an average of 0.81. The DF has been similar in wet and dry years.

Table 5-13. OID Distribution System Annual Calendar Year (January to December) Water Budget Results, 2015 to 2024.

				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 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)**
2015	207	Partial	Dry	164,988	12,590	3,337	75	2,108	2,097	0	2,430	1,908	1,124	1,742	7,665	27,446	142,881
2016	213	Full	Dry	193,139	3,577	4,413	100	1,382	2,103	0	2,430	2,577	1,053	1,631	9,563	28,242	159,218
2017	211	Full	Wet	195,975	2,451	3,978	77	1,898	2,097	0	1,775	2,512	1,217	1,886	9,397	27,977	161,713
2018	212	Full	Dry	209,347	2,874	3,616	106	1,754	2,097	0	1,771	3,860	1,225	1,897	12,596	28,085	170,359
2019	212	Full	Wet	211,607	1,686	3,508	99	1,895	2,097	0	1,862	4,768	1,132	1,754	12,989	27,961	170,427
2020	240	Full	Dry	237,154	1,495	3,613	151	1,500	2,103	0	2,080	5,925	1,185	1,836	12,677	31,654	190,660
2021	237	Partial	Dry	245,560	2,333	3,848	35	1,887	2,097	0	2,144	4,450	1,274	1,974	12,021	31,259	202,639
2022	239	Full	Dry	251,882	1,639	2,947	39	1,929	2,097	0	2,096	1,721	1,229	1,905	10,410	31,522	211,650
2023	205	Full	Wet	214,346	1,363	3,300	34	2,050	2,097	0	1,688	5,948	1,060	1,641	10,605	27,038	175,210
2024	225	Full	Wet	230,741	1,309	3,020	107	2,310	2,103	0	1,648	7,953	1,182	1,836	11,621	29,650	185,698
			Minimum	164,988	1,309	2,947	34	1,382	2,097	0	1,648	1,721	1,053	1,631	7,665	27,038	142,881
			Maximum	251,882	12,590	4,413	151	2,310	2,103	0	2,430	7,953	1,274	1,974	12,989	31,654	211,650
			Wet Year Average	213,167	1,702	3,451	79	2,038	2,099	0	1,743	5,295	1,148	1,779	11,153	28,156	173,262
			Dry Year Average	217,012	4,085	3,629	84	1,760	2,099	0	2,158	3,407	1,182	1,831	10,822	29,701	179,568
			Overall Average	215,474	3,132	3,558	82	1,871	2,099	0	1,992	4,162	1,168	1,810	10,954	29,083	177,045

Table 5-14. OID Farmed Lands Annual Calendar Year (January to December) Water Budget Results, 2015 to 2024.

				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	Tail-water to Drainage System	District Tail-water Reuse	**Deep Percolation of Applied Water (Closure)**	Change in Storage (af)	Crop Consump-tive Use Fraction (CCUF)	Precipitation	Crop ET of Precipi-tation	Runoff of Precipi-tation	Deep Percolation of Precipi-tation	**Change in Storage (Closure, af)**
2015	207	Partial	Dry	142,881	3,235	75,830	1,168	162,498	42,973	2,108	15,535	0	0.73	46,095	34,556	2,995	12,583	-4,038
2016	213	Full	Dry	159,218	2,752	54,744	1,168	144,228	34,926	1,382	37,345	0	0.66	89,868	48,619	9,329	29,994	1,925
2017	211	Full	Wet	161,713	3,187	61,065	1,168	168,896	39,054	1,898	17,285	0	0.74	80,104	56,721	7,579	33,051	-17,247
2018	212	Full	Dry	170,359	3,577	55,336	1,168	173,432	39,719	1,754	15,534	0	0.75	68,782	37,817	5,345	13,818	11,802
2019	212	Full	Wet	170,427	3,093	51,459	1,168	160,369	29,973	1,895	33,909	0	0.71	83,989	53,962	4,461	22,812	2,753
2020	240	Full	Dry	190,660	3,521	57,649	1,168	177,411	33,008	1,500	41,079	0	0.70	37,468	34,177	3,586	12,096	-12,391
2021	237	Partial	Dry	202,639	3,932	66,047	1,168	198,222	33,944	1,887	39,733	0	0.72	63,270	27,688	6,742	12,436	16,404
2022	239	Full	Dry	211,650	3,820	60,666	1,168	192,775	33,686	1,929	48,914	0	0.70	56,744	26,282	9,292	11,998	9,171
2023	205	Full	Wet	175,210	2,984	43,801	1,168	149,166	29,531	2,050	42,415	0	0.67	89,892	60,254	6,833	39,785	-16,980
2024	225	Full	Wet	185,698	3,294	46,709	1,168	162,010	32,088	2,310	40,460	0	0.68	84,277	51,527	4,454	28,442	-146
			Minimum	142,881	2,752	43,801	1,168	144,228	29,531	1,382	15,534	0	0.66	37,468	26,282	2,995	11,998	-17,247
			Maximum	211,650	3,932	75,830	1,168	198,222	42,973	2,310	48,914	0	0.75	89,892	60,254	9,329	39,785	16,404
			Wet Year Average	173,262	3,140	50,758	1,168	160,111	32,662	2,038	33,517	0	0.70	84,565	55,616	5,832	31,023	-7,905
			Dry Year Average	179,568	3,473	61,712	1,168	174,761	36,376	1,760	33,023	0	0.71	60,371	34,857	6,215	15,487	3,812
			Overall Average	177,045	3,340	57,331	1,168	168,901	34,890	1,871	33,221	0	0.71	70,049	43,160	6,061	21,702	-875

Table 5-15. OID Drainage System Annual Calendar Year (January to December) Water Budget Results, 2015 to 2024.

Year	Number of Days	USBR Allotment	Hydro-logic Year Type	Inflows (af) Operational Spillage	Precipitation	Runoff of Precipitation	**Tailwater to Drainage System (Closure)**	Outflows (af) Drainwater Outflow	District Drainwater Reuse	Seepage	Private Drain-water Reuse	Evapo-ration	Riparian ET
2015	207	Partial	Dry	7,665	13	2,995	42,973	40,462	3,337	6,135	3,235	289	187
2016	213	Full	Dry	9,563	17	9,329	34,926	39,911	4,413	6,313	2,752	271	175
2017	211	Full	Wet	9,397	13	7,579	39,054	42,107	3,978	6,254	3,187	313	202
2018	212	Full	Dry	12,596	18	5,345	39,719	43,682	3,616	6,283	3,577	315	204
2019	212	Full	Wet	12,989	17	4,461	29,973	34,073	3,508	6,283	3,093	293	189
2020	240	Full	Dry	12,677	25	3,586	33,008	34,545	3,613	7,113	3,521	306	198
2021	237	Partial	Dry	12,021	6	6,742	33,944	37,366	3,848	7,024	3,932	330	213
2022	239	Full	Dry	10,410	6	9,292	33,686	39,021	2,947	7,084	3,820	318	205
2023	205	Full	Wet	10,605	6	6,833	29,531	34,165	3,300	6,076	2,984	274	177
2024	225	Full	Wet	11,621	18	4,454	32,088	34,693	3,020	6,669	3,294	307	198
Minimum				7,665	6	2,995	29,531	34,073	2,947	6,076	2,752	271	175
Maximum				12,989	25	9,329	42,973	43,682	4,413	7,113	3,932	330	213
Wet Year Average				11,153	13	5,832	32,662	36,260	3,451	6,320	3,140	297	191
Dry Year Average				10,822	14	6,215	36,376	39,165	3,629	6,659	3,473	305	197
Overall Average				10,954	14	6,061	34,890	38,003	3,558	6,523	3,340	302	195

Table 5-16. OID Overall Water District Annual Calendar Year (January to December) Water Budget Results, 2015 to 2024.

Year	Num-ber of Days	USBR Allotment	Hydrologic Year Type	Inflows (af) System Inflows	District Ground-water Pumping	Precipi-tation	Private Ground-water Pumping	OID and Private Recycled	Outflows (af) 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 Precip-itation	Riparian ET and Evapo-ration	Crop ET of Applied Water	Crop ET of Precipi-tation	Change in Stor-age (af)
2015	207	Partial	Dry	164,988	12,590	46,183	75,830	3,265	0	2,430	1,908	40,462	33,582	15,535	12,583	3,342	162,498	34,556	-4,038
2016	213	Full	Dry	193,139	3,577	89,984	54,744	3,270	0	2,430	2,577	39,911	34,555	37,345	29,994	3,130	144,228	48,619	1,925
2017	211	Full	Wet	195,975	2,451	80,194	61,065	3,265	0	1,775	2,512	42,107	34,231	17,285	33,051	3,618	168,896	56,721	-17,247
2018	212	Full	Dry	209,347	2,874	68,905	55,336	3,265	0	1,771	3,860	43,682	34,369	15,534	13,818	3,641	173,432	37,817	11,802
2019	212	Full	Wet	211,607	1,686	84,104	51,459	3,265	0	1,862	4,768	34,073	34,245	33,909	22,812	3,368	160,369	53,962	2,753
2020	240	Full	Dry	237,154	1,495	37,644	57,649	3,270	0	2,080	5,925	34,545	38,767	41,079	12,096	3,525	177,411	34,177	-12,391
2021	237	Partial	Dry	245,560	2,333	63,311	66,047	3,265	0	2,144	4,450	37,366	38,283	39,733	12,436	3,790	198,222	27,688	16,404
2022	239	Full	Dry	251,882	1,639	56,789	60,666	3,265	0	2,096	1,721	39,021	38,606	48,914	11,998	3,657	192,775	26,282	9,171
2023	205	Full	Wet	214,346	1,363	89,932	43,801	3,265	0	1,688	5,948	34,165	33,114	42,415	39,785	3,152	149,166	60,254	-16,980
2024	225	Full	Wet	230,741	1,309	84,401	46,709	3,270	0	1,648	7,953	34,693	36,318	40,460	28,442	3,523	162,010	51,527	-146
Minimum				164,988	1,309	37,644	43,801	3,265	0	1,648	1,721	34,073	33,114	15,534	11,998	3,130	144,228	26,282	-17,247
Maximum				251,882	12,590	89,984	75,830	3,270	0	2,430	7,953	43,682	38,767	48,914	39,785	3,790	198,222	60,254	16,404
Wet Year Average				213,167	1,702	84,658	50,758	3,266	0	1,743	5,295	36,260	34,477	33,517	31,023	3,415	160,111	55,616	-7,905
Dry Year Average				217,012	4,085	60,469	61,712	3,267	0	2,158	3,407	39,165	36,360	33,023	15,487	3,514	174,761	34,857	3,812
Overall Average				215,474	3,132	70,145	57,331	3,266	0	1,992	4,162	38,003	35,607	33,221	21,702	3,475	168,901	43,160	-875

Losses from the distribution system at the water supplier scale includes 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 2015 and 2024, seepage ranged between 27,000 and 31,700 af with an average of 29,000 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 2,900 af to 4,400 af between 2015 and 2024 with a wet year average of 3,500 af and a dry year average of 3,600 af. The overall average for the ten-year period of the water budget was 3,600 af.

Losses from operational spill ranged from 7,700 af to 13,000 af between 2015 and 2024 with a wet year average of 11,200 af and a dry year average of 10,800 af. The overall average for the ten-year period of the water budget was 11,000 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 reservoir 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 2015 and 2024, evaporation losses varied from 1,600 af to 2,000 af, with an average of 1,800 af in losses per year. Riparian ET losses are similar; between 2015 and 2024, riparian ET losses varied from 1,100 af to 1,300 af, with an average of 1,200 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 total deliveries and other recoverable flows (operational spillage and seepage) to total irrigation supply. Over the period from 2015 to 2024, 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 boundary-scale.

5.7.2 Farmed Lands Water Budget

Over the 2015 to 2024 period, OID farm deliveries ranged from 143,000 af to 212,000 af for the irrigation season with a wet year average of 173,000 af and a dry year average of 180,000 af. The overall average for the ten-year period was 177,000 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.

The second largest source of inflow after farm deliveries is precipitation, which ranged from 37,000 af to 90,000 af between 2015 and 2024. The dry and wet year averages were 60,000 af and 85,000 af, respectively. As expected, precipitation provided a higher percentage of the total farmed lands water supply in wet years (average of 27%) than dry years (average of 20%).

Other sources of water supplied to farmed lands 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 44,000 af to 76,000 af between 2015 and 2024 with a wet year average of 51,000 af and a dry year average of 62,000 af. The overall average for the ten-year period was 57,000 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 ten-year period, which included two distinct droughts (the end of the 2012-2016 drought and the 2020-2022 drought, with six dry years overall), also shows a trend of increasing private groundwater pumping in comparison to the prior ten-year period within OID. Part of this increase can be attributed to the annexation of lands that were previously out-of-district and thus not included in private groundwater pumping estimates in the prior ten-year period estimates. Furthermore, surface water has been provided to these lands since annexation, but landowner construction of private infrastructure to utilize surface water from OID is a substantial private investment that requires time, planning, and finances to complete that can attribute to their reliance on groundwater pumping until infrastructure to utilize surface water can be installed and financed. Over time, landowners have continued to make the necessary improvements to utilize more surface water, which is expected to reduce private groundwater pumping in these areas.

Private drainwater reuse ranged from 2,800 af to 3,900 af between 2015 and 2024 with a wet year average of 3,100 af and a dry year average of 3,500 af. The overall average for the ten-year period of the water budget was 3,300 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 66,000 af in dry years (27% of total applied water supply) and 55,000 af in wet years (24% of total applied water supply).

The primary uses of irrigation (or applied water) and precipitation in farmed lands are to meet crop consumptive demand (ET) and any other agronomic on-farm water needs. The portions of crop ET met by precipitation (ET_{pr}) and applied water (ET_{aw}) were calculated separately and summarized individually. Between 2015 and 2024, ET ranged from 193,000 af to 226,000 af with an average of 212,000 af. The average ET was higher in wet years (216,000 af) than in dry years (210,000 af) because the increase in ET_{pr} exceeded the decrease in ET_{aw}. Overall, ET_{aw} accounted for 80% of the ET for the entire ten-year period, contributing 74% in wet years and 83% in dry years.

By comparing total applied water for irrigation 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 ET_{aw} by total applied water. For OID, the CCUF ranged from 0.66 to 0.75 between 2015 and 2024 with an average of 0.71. The CCUF is comparable in dry years and wet years, averaging 0.71 and 0.70; respectively.

Losses from the applied water budget portion of the farmed lands accounting center 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. Losses from the precipitation budget portion of the farmed lands accounting center are similar, with runoff and deep percolation of precipitation both being recoverable flows.

Between 2015 and 2024, tailwater to the drainage system ranged between 30,000 and 43,000 af with an average of 35,000 af. Tailwater to the distribution system ranged from 1,400 af to 2,300 af with an average of 1,900 af. Precipitation runoff ranged from 3,000 af to 9,300 af, averaging 6,000 af.

Deep percolation of applied water and precipitation varied from 28,000 af to 82,000 af between 2015 and 2024 with an average of 55,000 af. Deep percolation volumes are greater in wet years than dry years, averaging 65,000 af and 49,000 af, respectively. The higher deep percolation volumes in wet years are attributed to the larger increase in deep percolation of precipitation compared to the smaller decrease in deep percolation of applied water. Over the ten-year period, deep percolation of precipitation accounted for an average of 40% of total deep percolation. The contribution of deep percolation of precipitation decreased to an average of 32% in dry years and increased to an average of 48% in wet years. 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.

5.7.3 Drainage System Water Budget

Between 2015 and 2024, the largest inflow to the District's drainage system is tailwater outflow from farmed lands, accounting for approximately 67% of the total inflows. The tailwater ranged from 30,000 af to 43,000 af, with a ten-year average of 35,000 af. During this period, operational spillage is the second largest inflow, which ranged from 7,700 af to 13,000 af, with an average of 11,000 af.

Although the OID drainage system did not receive significant inflows from direct precipitation, the precipitation runoff from farmed lands contributed between 3,000 af and 9,300 af of inflow to the drainage system. The precipitation runoff averaged of 6,000 af annually over the ten-year period.

Drainwater outflow is the largest outflow from the District's drainage system, contributing to approximately 73% of the outflows. Annual drainwater outflow ranged from 34,000 af to 44,000 af, with a ten-year average of 38,000 af, with destinations described previously in Section 5.6.2.

District and private drainwater reuses are comparable, accounting for 7% and 6% of the total drainage system outflows, respectively. District drainwater reuse provides supplemental water supply in the District's distribution system, while private drainwater reuse is directly used on farmed lands. Between 2015 and 2024, the ten-year averages of District and private drainwater reuse were 3,600 af and 3,300 af, respectively.

Seepage from the District's drainage system averaged 6,500 af annually over the ten-year period, accounting for 13% of total outflows. Seepage rates are relatively consistent between the wet and dry years. The other minor losses of the drainage system are evaporation and riparian evapotranspiration, which accounted for less than 1% of the total annual outflows.

5.7.4 Overall District Water Budget

Over the 2015 to 2024 period, the District diverted between 165,000 af and 252,000 af of system inflows from Goodwin Dam. The wet year average was 213,000 af and dry year average was 217,000 af with an overall average of 215,000 af over the ten-year period. The system surface water inflows accounted for 62% of the District's total inflows and thus made up the majority of the water supply for the District.

Precipitation accounted for 20% of the inflows into the District, with a ten-year average of 70,000 af between 2015 and 2024. The average precipitation inflow during wet years and dry years were 85,000 af and 60,000 af, respectively. The lowest precipitation year was 2020, with 38,000 af, followed by two additional dry years in 2021 and 2022. During this three-year dry period, the District increased its system surface water inflows by an average of 14%, partially to offset reduced precipitation inflows and provide additional surface water to growers for irrigation.

Private groundwater pumping accounted for 16% of OID's total inflows and ranged between 44,000 af and 76,000 af between 2015 and 2024. The wet year average was 51,000 af and dry year average was 62,000 af, with a ten-year average of 57,000 af. Groundwater pumping by growers accounted for 18% of District's total inflows in dry years to meet higher crop consumptive demand. In wet years, private pumping only accounted for 14% of the total inflows.

The other minor inflows are District groundwater pumping and recycled water, which each accounted for less than 1% of the total inflows. District groundwater pumping was higher during dry years (4,000 af) than during wet years (1,700 af) over the ten-year period. Since 2015, the District has significantly reduced its groundwater dependency. The District groundwater pumping was reduced from 12,600 af in 2015 to 3,600 af in 2016 and has remained below 2,900 af since

2016. As an irrigation district, the primary uses of applied water and precipitation are to meet the crop consumptive demand or evapotranspiration. With a ten-year average of 212,000 af between 2015 and 2024, crop total ET accounted for around 61% of the District's outflows. Overall, crop ET demand met by applied water (ET_{aw}) and precipitation (ET_{pr}) accounted for 80% and 20% of the total ET, respectively. Over the ten-year period, ET_{aw} ranged from 144,000 af to 198,000 af with an overall average of 169,000 af. The wet year average of ET_{aw} was 160,000 af and dry year average was 175,000 af . The ET_{aw} was lower in wet years because a higher proportion (26%) of the ET is met by ET_{pr}. Over the ten-year period, crop ET_{pr} ranged from 26,000 af to 60,000 af, with wet and dry year averages of 56,000 af and 35,000 af, respectively.

Deep percolation is the second largest outflow from the District, which accounted for approximately 15% of the total outflow over the ten-year period. Deep percolation of applied water and precipitation from farmed lands are considered recoverable flows as they contribute to recharge of the groundwater system. Deep percolation of applied water ranged from 16,000 af to 49,000 af with a wet year average of 34,000 af and dry year average of 33,000 af. Deep percolation of precipitation ranged from 12,000 af to 40,000 af with a wet year average of 31,000 af and dry year average of 15,000 af. Deep percolation of precipitation was higher during the wet years due to higher precipitation.

Similar to deep percolation from farmed lands, canal and drain seepage are considered recoverable flows as they contribute to groundwater recharge. Between 2015 and 2024, seepage ranged from 33,000 af to 39,000 af, with a ten-year average of 36,000 af or 10% of total outflows.

Drainwater outflows accounted for 11% of the total outflows, ranging from 34,000 af to 44,000 af with a ten-year average of 38,000 af. The other minor outflows from the District are deliveries to Knights Ferry, deliveries to out of district annual contracts, and riparian ET and evaporation, which each accounted for approximately 1% of the total outflows.

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% of the unimpaired flows from February 1 through June 30 for anadromous fish and salinity control in the Delta.

In July 2025, the State Water Board released a revised draft of the Bay-Delta Plan, in which flow objectives to maintain 40% unimpaired flow for fish and wildlife benefits and salinity control for agricultural benefits remain unchanged. The impacts of Phase 1 of the Bay-Delta Plan on OID and its growers has the potential to be significant in some years.

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.

A total of 17 GSAs were formed within the Eastern San Joaquin Subbasin to comply with SGMA. The Oakdale Irrigation District GSA includes the area within the OID's boundaries north of the Stanislaus River. 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 contributes to the development of, and any amendments to, the Eastern San Joaquin GSP. The first GSP was submitted to DWR in January 2020, but DWR determined that the GSP was incomplete in January 2022. A revised GSP was subsequently submitted in July 2022 and approved by DWR in July 2023. Most recently, the first Periodic Evaluation and amended GSP was adopted by each of the 17 GSAs and submitted to DWR in January 2025. The OID GSA remains actively engaged in GSP implementation, monitoring, and reporting efforts in the Eastern San Joaquin Subbasin.

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 boundaries south of the Stanislaus River. The STRGBA GSA developed and adopted a single GSP in January 2022 for the Modesto Subbasin. In January 2024, DWR determined that the GSP was incomplete. A revised GSP was submitted in July 2024 and subsequently approved by DWR in February 2025. OID remains actively engaged in GSP implementation, monitoring, and reporting efforts in the Modesto Subbasin.

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 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 surface water and groundwater are conjunctively managed. Projects and management actions continue to be developed and implemented to adaptively manage groundwater in the Eastern San Joaquin and Modesto Subbasin GSPs with the goal of achieving long-term groundwater sustainability. These actions have the potential to impact 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 and encouraging use of surface water supplies. 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 new volumetric rate structure starting in the 2026 water season includes three 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 requires 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 10,500 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 water rate increases 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 $116 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 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 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 2015 through 2024.

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}). Examples of 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:

- Pre-irrigation of corn and oats occurs at the beginning and end of each season, 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 measured at the Oakdale CIMIS station 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 primarily almonds 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 estimated private and measured District groundwater pumping volumes. 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 is 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 . Total recoverable flows are presented in Table 5-17. In Section 5.10.2, the recoverable flow paths of seepage and operational spillage are used in a calculation to determine the District-scale Water Management Fraction (WMF) through the ratio of total crop consumptive use of applied water (ET_{aw}) and recoverable flows to total water supply.

Table 5-17. OID Water Use Efficiency Components

Year	Water Use Efficiency Components (af)			
	Crop Consumptive Use of Applied Water	Agronomic Water Use	Environmental Water Use	Recoverable Flows
2015	162,498	6,747	0	90,832
2016	144,228	6,956	0	107,373
2017	168,896	7,977	0	90,241
2018	173,432	7,700	0	93,748
2019	160,369	7,621	0	104,280
2020	177,411	7,360	0	118,633
2021	198,222	6,912	0	115,193
2022	192,775	10,373	0	121,020
2023	149,166	6,941	0	110,456
2024	162,010	4,831	0	94,636
Average	168,901	7,342	0	104,641

5.10.2 Water Use Efficiency Fraction

The water use efficiency fraction most applicable to OID is the water management fraction (WMF), which is calculated here at the District boundary scale. 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 below. It is calculated by comparing the crop 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 2015 to 2024 below in Table 5-18. During this period, the WMF was consistently between 0.98 and 0.99. 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 and drainage systems.

Table 5-18. OID Boundary Water Management Fraction.

Year	Crop Consumptive Use of Applied Water (af)	Recoverable Flows (af)	Total Water Supply (af)	Water Management Fraction
2015	162,498	90,832	256,672	0.987
2016	144,228	107,373	254,731	0.988
2017	168,896	90,241	262,755	0.986
2018	173,432	93,748	270,821	0.987
2019	160,369	104,280	268,017	0.987
2020	177,411	118,633	299,569	0.988
2021	198,222	115,193	317,205	0.988
2022	192,775	121,020	317,453	0.988
2023	149,166	110,456	262,775	0.988
2024	162,010	94,636	260,169	0.986
Average	168,901	104,641	277,017	0.987

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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 these water resources for the maximum benefit of the OID 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 to water supply, water quality, and 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. Also, Section 6.6 includes a list of additional sources of information related to climate change that have been compiled and reviewed and could be used for water resources planning.

Although not described below, the GSPs for the East San Joaquin and Modesto subbasins also include an evaluation of the potential effects of climate change through projected future water budgets that include the northern and southern portions of OID, respectively. 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, with a focus on groundwater sustainability.

6.2.1.1 Hydrology

In this AWMP, the potential effects 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 [23], along with projected changes to Stanislaus River hydrology through 2100.

Historical full natural flows along the Stanislaus River are available through the California Data Exchange Center (CDEC) and are summarized for the period from 1900 to 2024.

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 [24] 4.5, in which emissions peak around 2040 and then decline thereafter (a scenario of more moderate climate change impacts), 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 (a scenario of more extreme climate change impacts). 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 [25]-2024. Historical temperature and ET_o data in an agricultural setting are reported by the Modesto CIMIS station (#71; 1987-2024), located in the vicinity of OID. The Oakdale CIMIS station (#194; November 2004-2024) also reports historical temperature and ET_o data in an agricultural setting within the

[23] Unimpaired Stanislaus River flows at Goodwin Dam are considered analogous to inflows to New Melones Reservoir for purposes of this analysis.
[24] RCPs, or representative concentration pathways, represent different possible future greenhouse gas emissions and concentrations.
[25] Incomplete precipitation data from NOAA weather station #49073 are available at beginning in 1893, though the generally complete data record begins in 1927. There are still some data gaps in more recent years; these are filled with precipitation data for the same location from the Parameter-elevation Regressions on Independent Slopes Model (PRISM). More information on PRISM (including data access) is available at: https://prism.oregonstate.edu/

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.

Potential effects of climate change on precipitation, temperature, ET_o, and 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" (WWCRA; USBR, 2015) and updated values for precipitation and temperature are evaluated based on results from a study update by USBR (USBR, 2021a and 2021b). The WWCRA and reported projections for the region including OID are described further in Section 6.2.2.

6.2.2 Summary of Potential Climate Change Effects

6.2.2.1 Changes in Timing of Runoff

Climate change has the potential to affect timing of runoff from the Upper Stanislaus River Watershed through the timing, frequency, and intensity of precipitation events, the percentage of total precipitation that occurs as rainfall or snowfall, and the timing of snowmelt and subsequent runoff. The timing of runoff in turn impacts the irrigation water supply of OID.

6.2.2.1.1 Historical 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 historical data for unimpaired runoff (full natural flow) in the Stanislaus River between 1900 and 2024 shows a decreasing trend in the percent of total water year (October-September) runoff occurring between April-July (Figure 6-1). This suggests that more runoff is occurring outside of the irrigation season during the fall-winter period due to either more precipitation occurring as rain instead of snow, greater snowmelt occurring during the fall-winter months over time, or both.

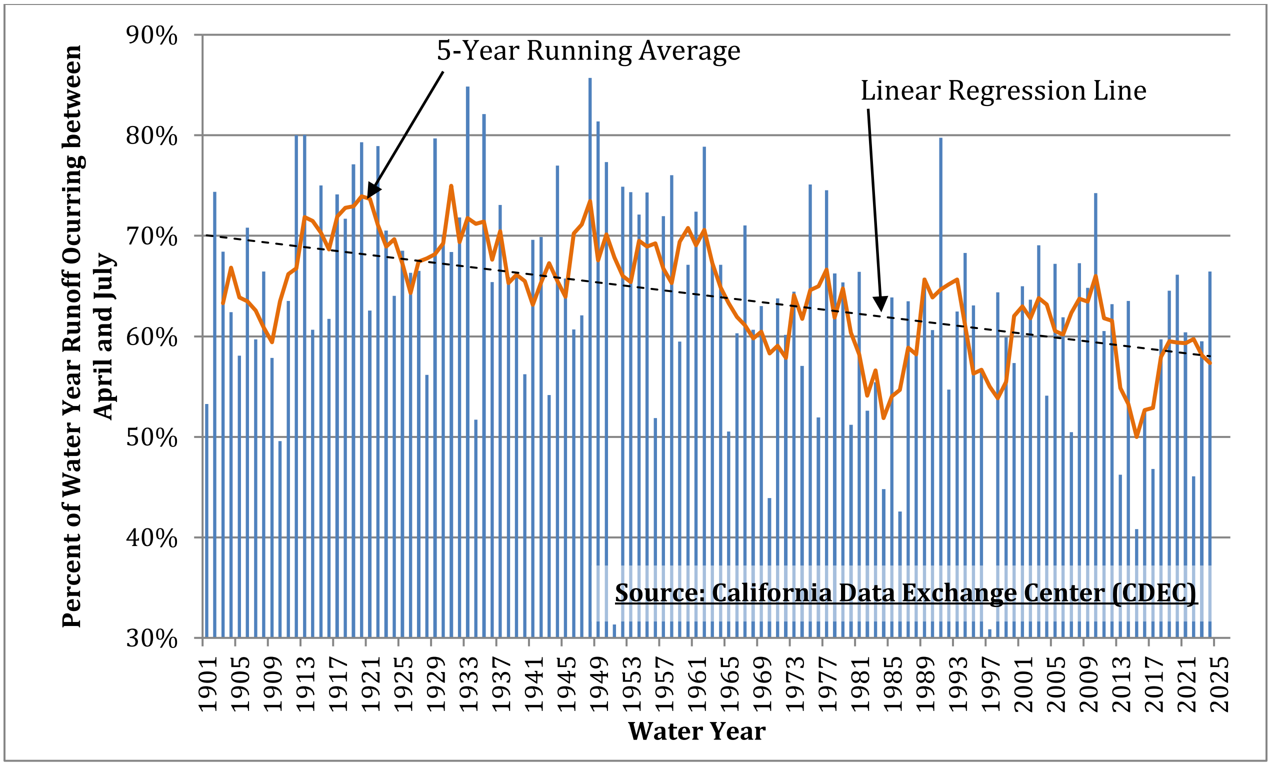

Figure 6-1. Annual April through July Unimpaired Runoff for Stanislaus River at New Melones Reservoir, 1901 – 2024.

6.2.2.1.2 Projected Changes in Timing of Runoff

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 projections vary from year-to-year and decade-to-decade, a decreasing trend is observed over the full projection period through 2100. 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 through 2100.

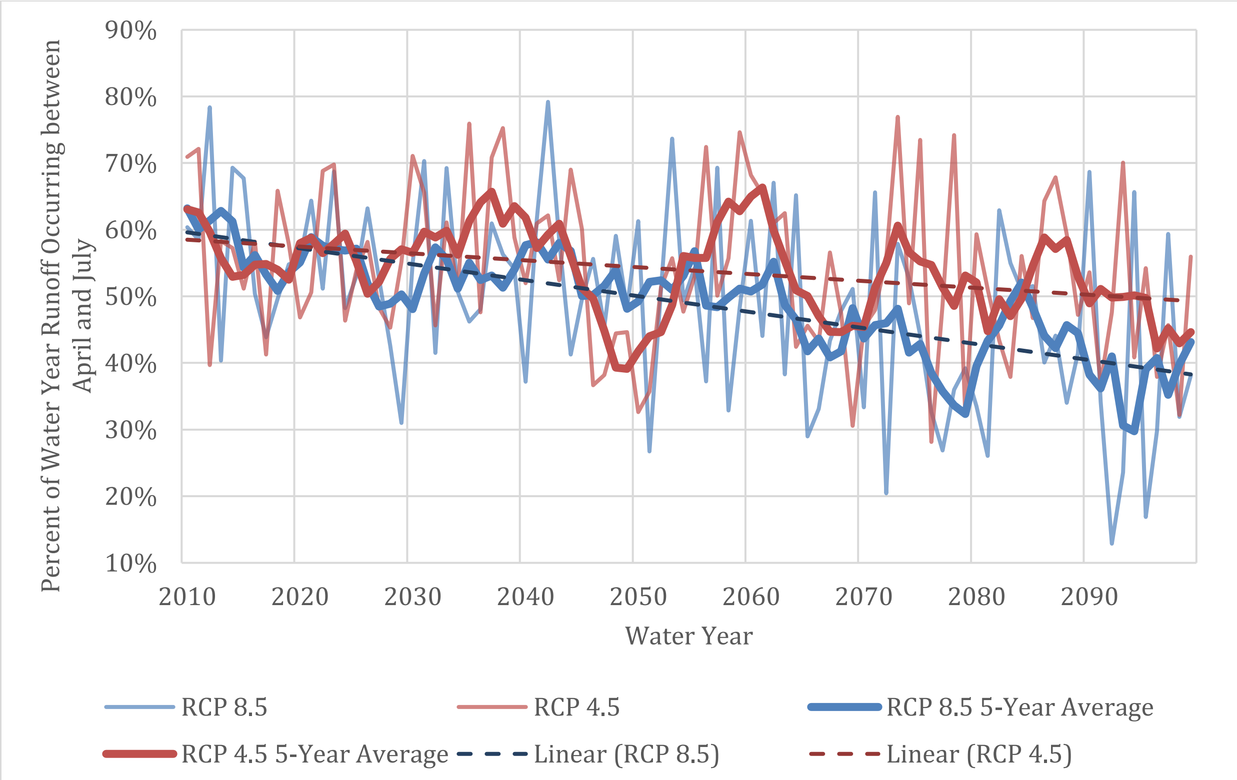

Figure 6-2. Projected Annual April through July Unimpaired Runoff for Stanislaus River under Two Climate Change Scenarios (Pierce et al. 2018).

6.2.2.2 Changes in Total Runoff

In addition to timing of runoff, climate change also has the potential to affect total runoff and resulting irrigation water supply of OID.

6.2.2.2.1 Historical Changes in Total Runoff

Based on available historical data for unimpaired runoff (full natural flow) in the Stanislaus River between 1901 and 2024, total water year runoff does not appear to have decreased substantially over the last 125 years. However, projections reported by USBR suggest that total runoff could decrease through 2100(Gangopadhyay and Pruitt 2011), as shown in Figure 6-3. The figure shows the 5th percentile, median, and 95th percentile projected annual Stanislaus River runoff at New Melones Reservoir for the period from 2010 to 2100 based on 112 separate hydrologic projections, and the linear regression line on the median runoff depicts a noticeable decrease over the 21st century.

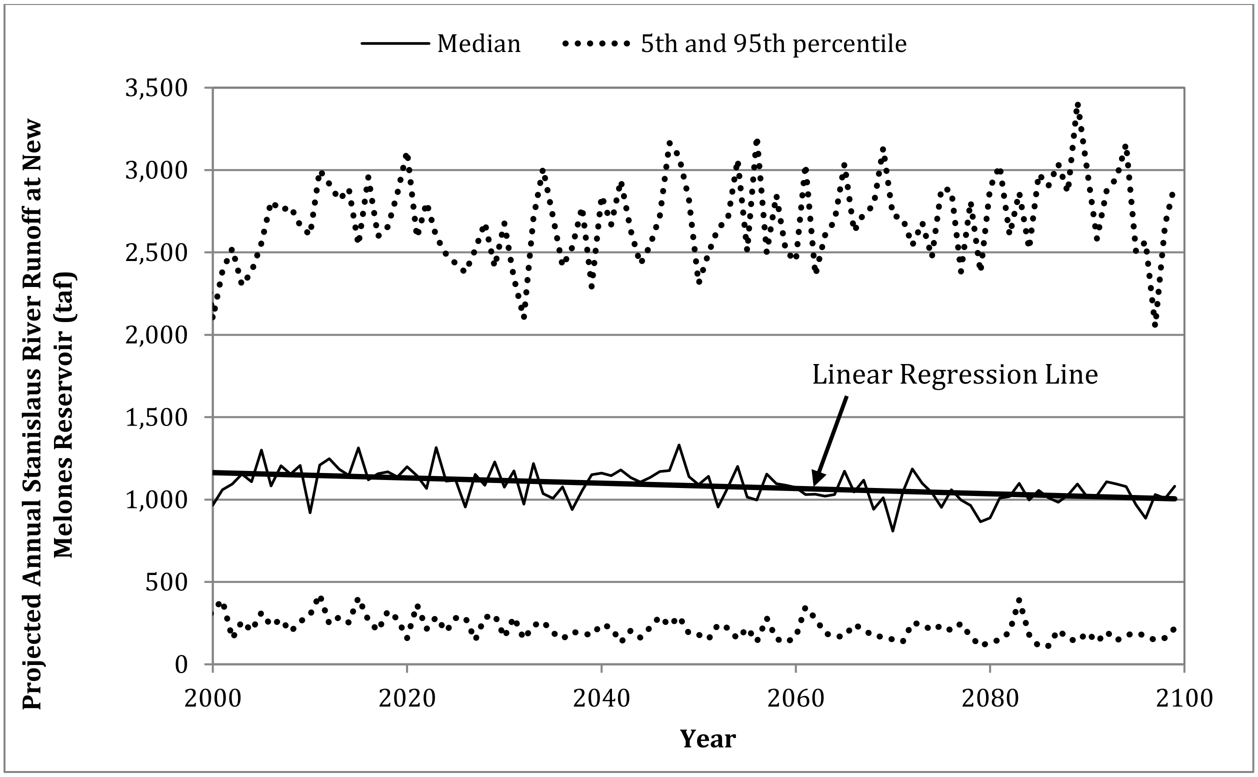

Figure 6-3. Annual Stanislaus River Runoff at New Melones Reservoir Based on 112 Hydrologic Projections (Gangopadhyay and Pruitt 2011).

6.2.2.2.2 Projected Changes in Total Runoff

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 projected 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 projected 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 projected 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 projected mean water year runoff than the 2010s, four have a projected mean water year runoff between 90% and 100% of the 2010s, and three have a projected 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.

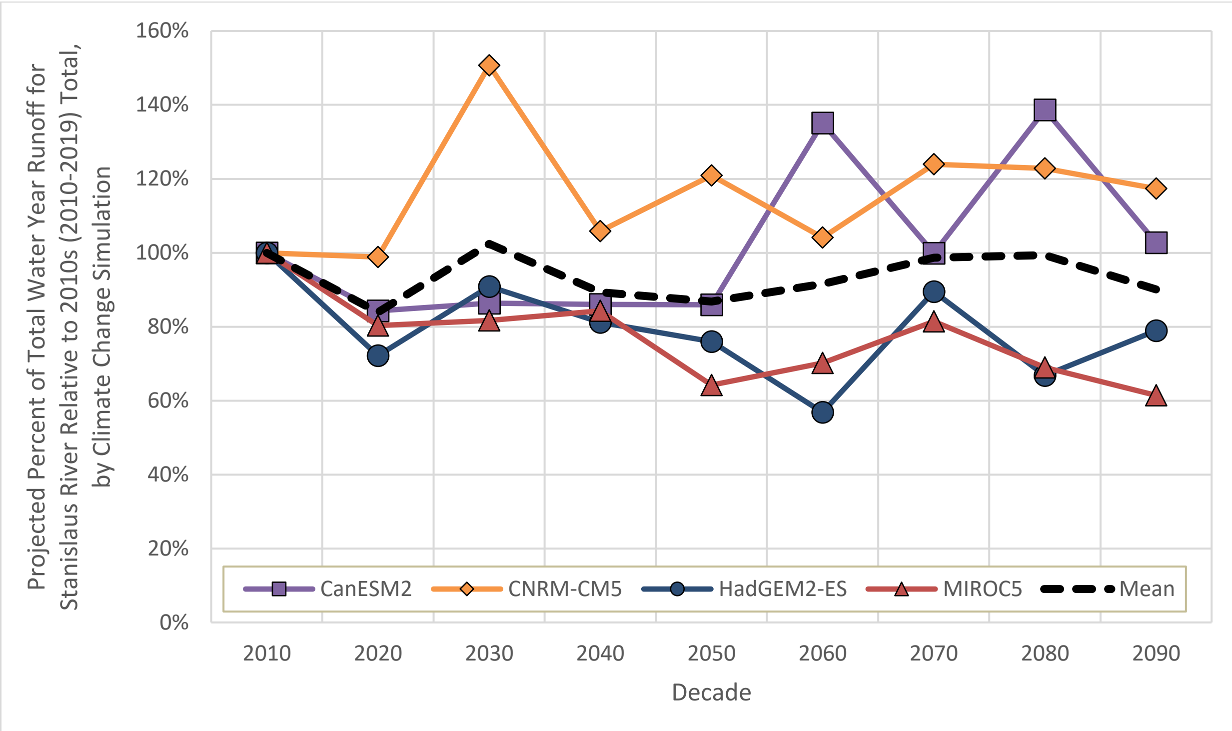

Figure 6-4. Average Projected Total Water Year Runoff in the Stanislaus River, by Decade and Climate Change Simulation and averaged across Climate Change Scenarios RCP 8.5 and RCP 4.5 (Pierce et al. 2018).

6.2.2.3 Changes in Precipitation, Temperature, and Evapotranspiration

Climate change has the potential to affect crop evapotranspiration (ET) and resulting irrigation water demands within OID. Changes in precipitation, temperature, and atmospheric CO_2 each affect ET and net irrigation water requirements (NIWR).

6.2.2.3.1 Historical Changes in Precipitation, Temperature, and Evapotranspiration

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[26] from the mean annual precipitation, are shown in Figure 6-5. Between water years

[26] 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.

1928 and 2024, 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) 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, 2012-2015, and 2020-2022, are seen as generally falling at the end of extended drier periods and end with the beginning of a significantly wetter period.

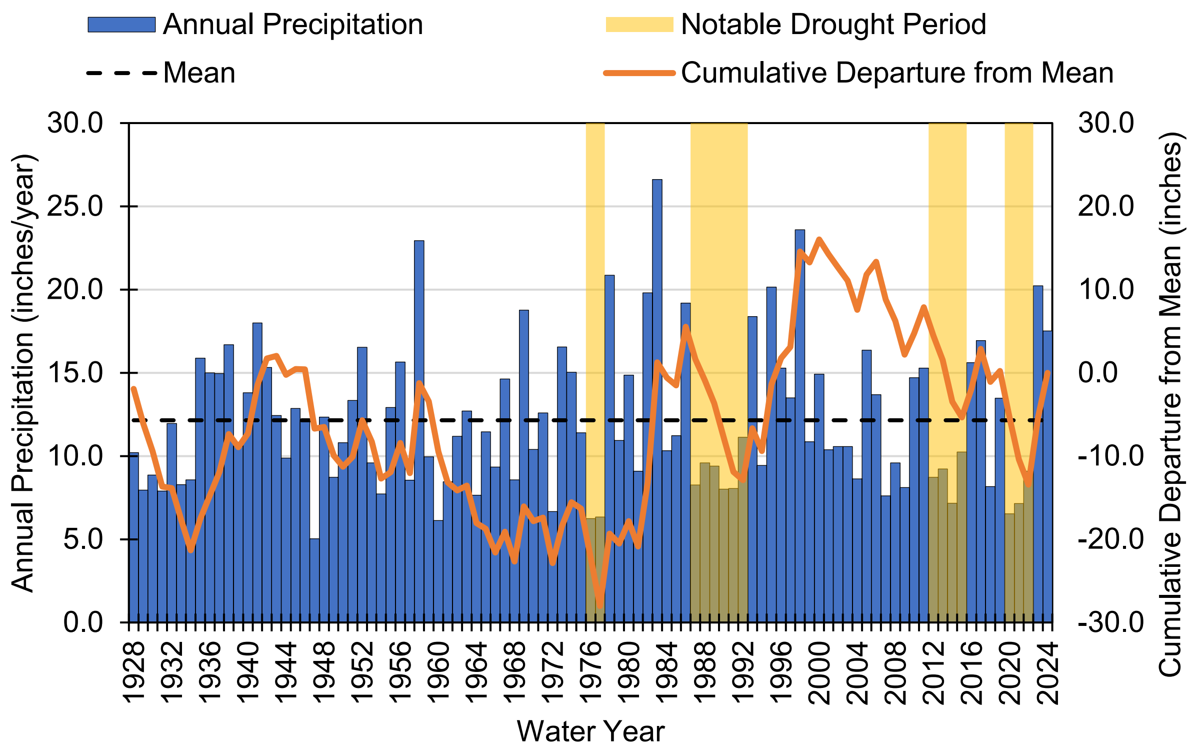

Figure 6-5. Historical Annual Precipitation, Cumulative Departure from the Mean Annual Precipitation and Notable Periods of Recent Drought.

Figure 6-6 shows the mean daily temperatures for each year 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 2024, the average daily air temperatures averaged 58.9°F, while the maximum and minimum daily temperatures averaged 73.5°F and 45.0°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 0.6°F lower compared to the 1988-2024 averages. Between water years 2015 and 2024 – the most recent 10 years of available data – average temperatures increased by about 1.5°F, with an average daily air temperature of 60.4°F, and with maximum and minimum daily temperatures averaging 75.4°F and 46.5°F, respectively.

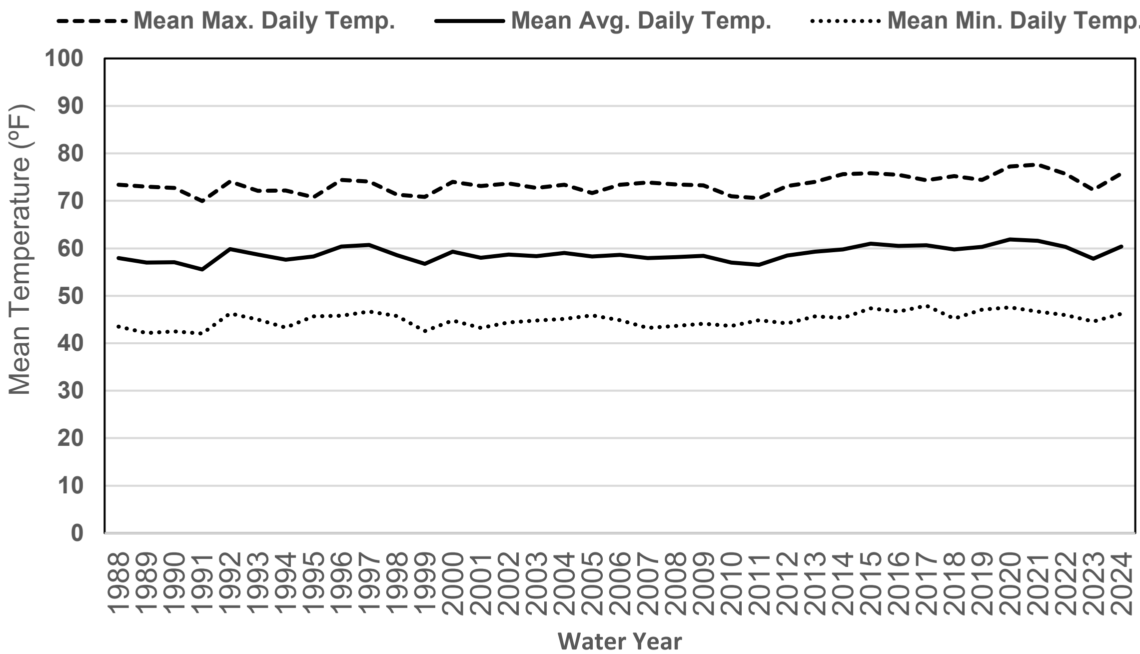

Figure 6-6. Historical Mean Daily Temperatures at the Modesto CIMIS Station.

Figure 6-7 shows the annual ET_o rate reported at the Modesto CIMIS station near OID. Between water years 1988 and 2024, the average annual ET_o was 53.4 inches per year, ranging from a high of 59.4 inches in 2021 to a low of 45.8 inches in 2005. The total ET_o in every water year since 2012, except for 2023[27], has been at or above the average ET_o between 1988 to 2024, suggesting that ET_o rates may be increasing over time.

[27] Multiple factors influence evapotranspiration demand and rates. However, a major factor is temperature. In 2023, mean daily temperatures were noticeably lower than in prior years and in the subsequent year of 2024. This can be observed in Figure 6-6.

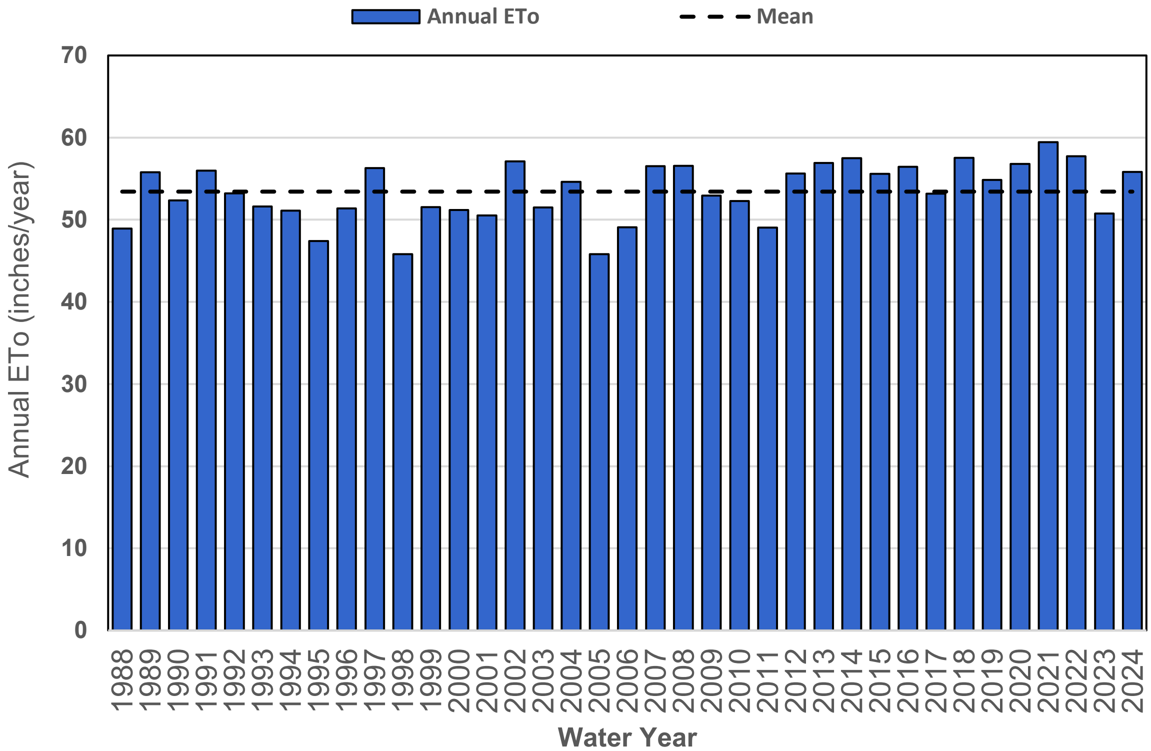

Figure 6-7. Historical Annual Reference ET at the Modesto CIMIS Station.

6.2.2.3.2 Projected Changes in Precipitation, Temperature, and Evapotranspiration

Projected climate parameters are summarized from analyses reported by USBR in the WWCRA (USBR, 2015) using GCM results. GCMs are considered a standard for climate change analyses and have been used to project future climate change and impacts to crop water demands. USBR's WWCRA was completed in 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 WWCRA uses future climate change projections from GCMs to calculate potential 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 effects of climate change on precipitation, temperature, ET_o, and crop ET, while climate change impacts to NIWR are described in Section 6.4, below.

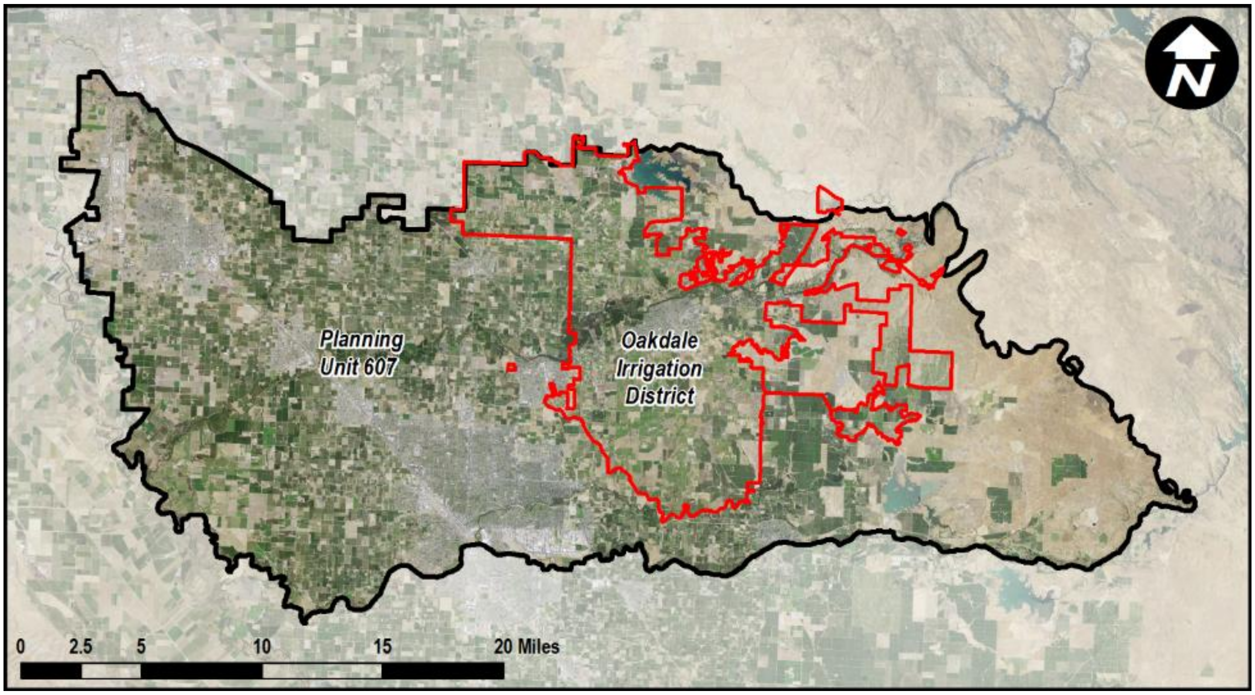

Figure 6-8. Planning Unit 607 and Oakdale Irrigation District Boundary.

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. ET_o was calculated based on climate projections for each of the five modeled climate scenarios using the FAO-56 approach. The GCM output climate parameters used in these calculations were limited to daily maximum and minimum temperature and daily precipitation. Other climate parameters needed to estimate ET_o, 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 ET is projected to increase in areas where perennial crops are grown and smaller increases are projected in areas where annual crops are grown.

Five different climate change scenarios were developed as part of the WWCRA based on available GCM climate projections 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 2020s (2010-2039), 2050s (2040-2069) and 2080s (2070-2099).

Average air temperature in PU607 (including OID) 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 WWCRA. Projected temperature increases range from 1.2 to 2.5 deg. F during the 2020s period, 2.6 to 4.4 deg. F during the 2050s period, and 3.8 to 6.6 deg. F during the 2080s period.

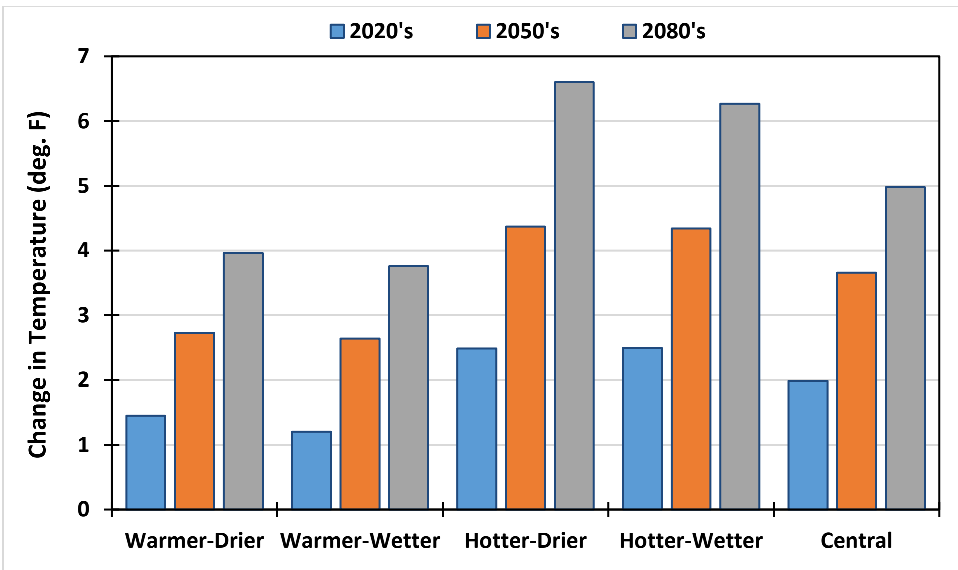

Figure 6-9. WWCRA Projected Temperature Change (USBR, 2015).

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 percentage changes are shown in reference to current precipitation at the time of the WWCRA. Under wetter conditions, precipitation is predicted to increase by 3.9 to 9.5 percent between the 2020s and the 2080s, while under drier conditions precipitation is predicted to decrease by 8.8 to 15.7 percent between the 2020s and the 2080s. The central tendency results in a predicted slight decrease in precipitation of 2.0 to 3.8 percent between the 2020s and the 2080s.

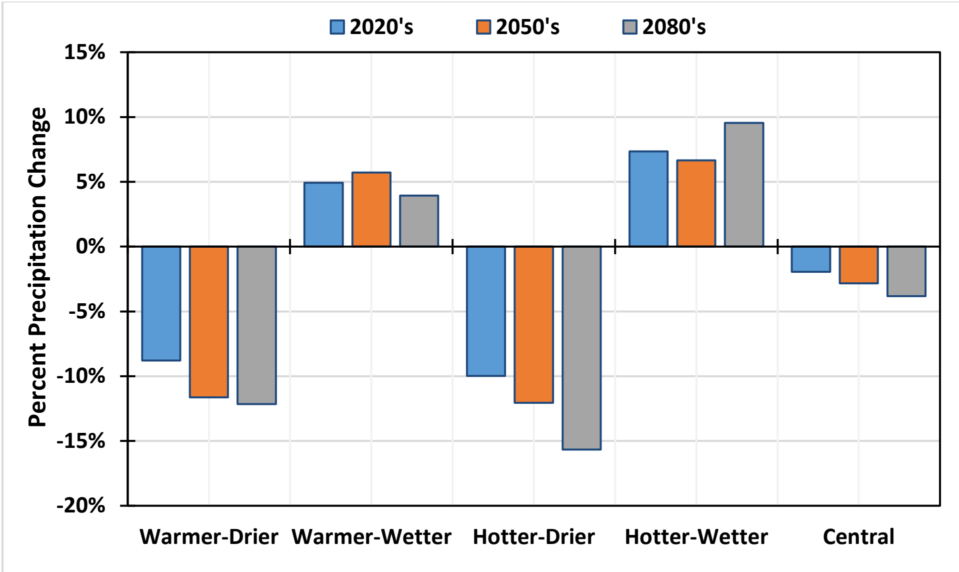

Figure 6-10. WWCRA Projected Precipitation Change (USBR 2015).

Using the projected temperature and precipitation results, the WWCRA developed estimates of projected reference ET (ET_o) and crop 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 WWCRA. Increases in both ET_o and crop ET are projected. Projected ET_o increases range from 1.7 to 3.6 percent during the 2020s period, 3.7 to 6.1 percent during the 2050s period, and 5.1 to 9.2 percent during the 2080s period. Projected crop ET increases range from 0.7 to 1.4 percent during the 2020s period, 1.3 to 2.1 percent during the 2050s period, and 1.7 to 2.6 percent during the 2080s period. ET_o is expected to increase significantly more than crop ET due to changes in phenology of annual crops, as discussed in the following paragraph.

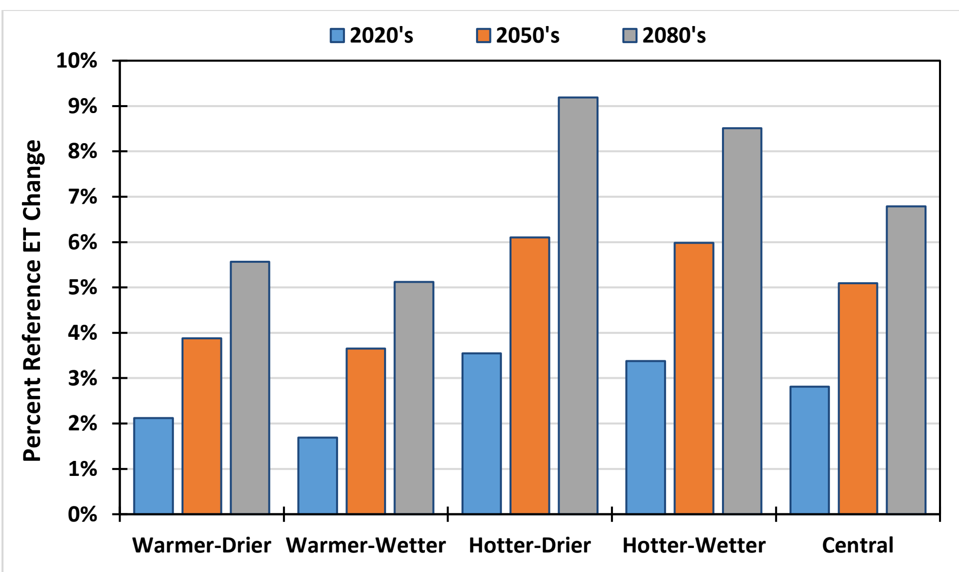

Figure 6-11. WWCRA Projected Reference ET Change (USBR, 2015).

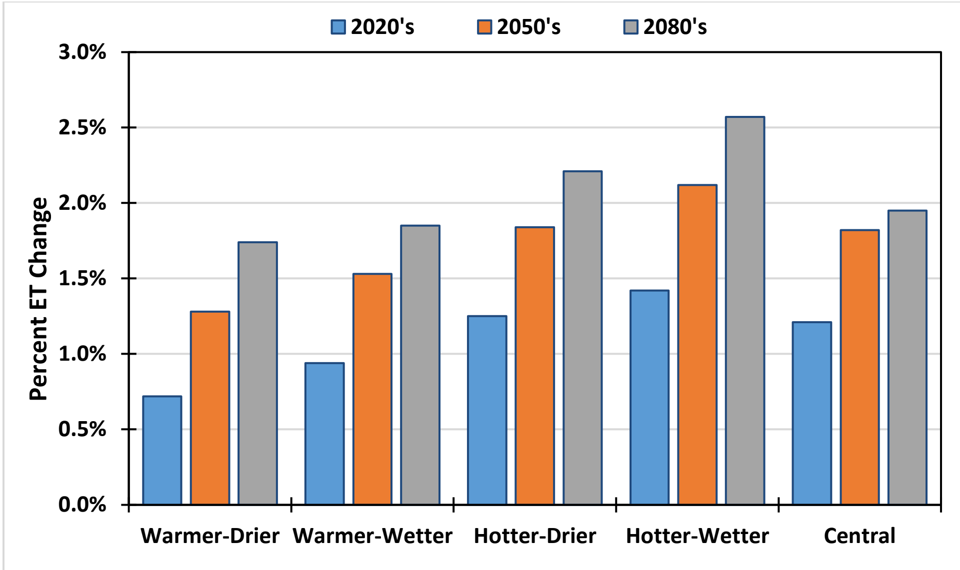

Figure 6-12. WWCRA Projected Crop ET Change Assuming Non-Static Phenology (USBR, 2015).

Projected crop 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 to crop ET with non-static phenology than when static phenology is assumed. If static crop phenology is assumed, percent changes in crop ET are similar to projected changes in ET_o. ET_o is expected to increase significantly more due to projected temperature increases.

6.2.2.3.3 Updated Datasets Related to Temperature and Precipitation

USBR updated the WWCRA: Irrigation Demand and Reservoir Evaporation Projects in 2021 (USBR 2021a). However, projected changes in temperature, precipitation, ET, and NIWR were not updated and the update continued to use the same CMIP3 model results as the previous 2015 WWCRA (USBR 2015). These results are summarized in Sections 6.2.2.3 and 6.4.

CMIP5 is an updated version of the CMIP3 model that the 2015 and 2021 WWCRA studies relied on (CMIP5 is described in more detail below). CMIP5 model results became available during the 2021 WWCRA update but were not incorporated due to time and budget constraints. However, USBR's Water Reliability in the West – 2021 SECURE Water Act Report (USBR 2021b) utilized CMIP5 model results and included projections for temperature and precipitation across the Western U.S. These data are reviewed and evaluated below, primarily for consistency and alignment with CMIP3 model results presented previously. Although the 2021 SECURE Water Act Report did not include any direct information on NIWR, NIWR is influenced by temperature and precipitation, so the comparison of CMIP3 and CMIP5 results also inform the projected NIWR estimates (see Section 6.4).

The CMIP5 model updated the CMIP3 model, incorporating several important methodologies and assumptions. One update was for the scenarios simulated in these models: CMIP3 uses Special Report on Emissions Scenarios (SRES), while CMIP5 uses Representative Concentration Pathways

(RCPs). Briefly, SRES scenarios consist of three scenarios (B1, A1B, and A2 representing low, middle, and high) of possible future greenhouse gas (GHG) emissions based on varying social, economic, technological, and demographic developments (Sun et al., 2015). In the WWCRA, these three SRES scenarios were combined with output from 16 models and other simulation factors to simulate a total of 112 projections, which were then recategorized into five scenarios (warm-dry, warm-wet, hot-dry, hot-wet and central tendency), as presented in Section 6.2.2.3. In contrast, RCP scenarios (RCPs 2.6, 4.5, 6.0, and 8.5 representing a range from low to high) are based on GHG concentration trajectories selected and defined by total radiative forcing (a cumulative measure of human emissions of GHGs). For the 2021 SECURE Water Act Report and results presented below, the model results from these RCP scenarios were not further processed or recategorized.

Another update between CMIP3 and CMIP5 is that CMIP3 only applies the Bias Correction and Spatial Disaggregation (BCSD) downscaling approach, whereas CMIP5 also applies an additional Localized Constructed Analogs (LOCA) downscaling approach to improve spatial resolution. Additional information on the differences and similarities between these models is provided in Sun et al. (2015).

In CMIP5, the projected changes (relative to a 1970-1999 baseline) in precipitation and temperature in the RCP 4.5 and RCP 8.5 scenarios (which were described in Section 6.2.1.1) for the 2050s future period are summarized at the Hydrologic Unit Code[28] (HUC)–8 watershed scale. OID's service area extends across portions of three HUC-8 watersheds (Rock Creek-French Camp Slough, Upper Stanislaus, and Upper Tuolumne watersheds), as shown in Figure 6-13. Additionally, OID receives all of its surface water from the Stanislaus River, which originates in the Upper Stanislaus HUC-8 watershed. Therefore, the following materials are summarized for the average of these three watersheds, as well as inclusion of results specific to the Upper Stanislaus.

[28] Hydrologic Unit Code (HUC) is a hierarchical numerical system developed by the United States Geological Survey to identify U.S. watersheds, with up to 12 digits representing progressively smaller hydrologic units from regions to subwatersheds. More information is available at: https://nas.er.usgs.gov/hucs.aspx

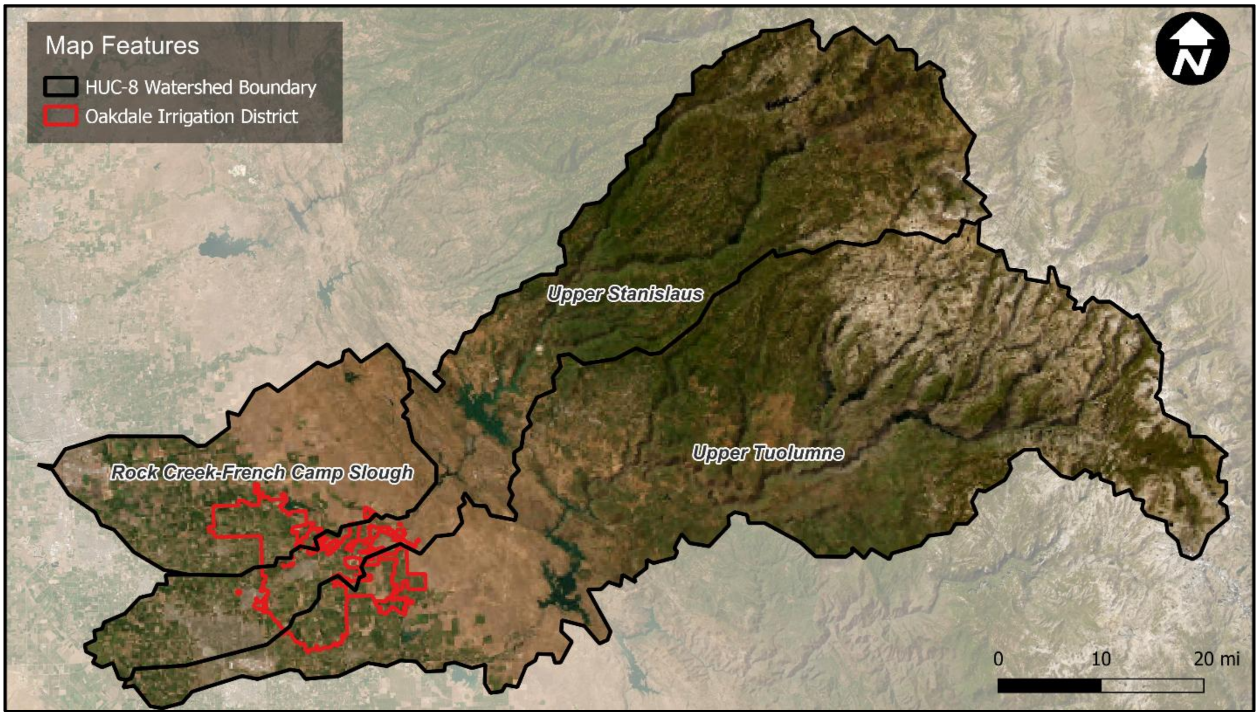

Figure 6-13. HUC-8 watersheds and Oakdale Irrigation District Boundary.

Based on the average of the three watersheds, air temperature is projected to increase by 3.8 and 5.0 deg. F, respectively, in the RCP 4.5 and RCP 8.5 scenarios by the 2050s. In the Upper Stanislaus watershed, projected air temperature changes increases are similar but slightly higher at 3.9 and 5.1 deg. F, respectively, in the RCP 4.5 and RCP 8.5 scenarios. Higher temperatures within OID's service area would impact and increase ET demands, while higher temperatures in the Upper Stanislaus watershed would impact snowpack, snowmelt and runoff timing, and ET demands, potentially impacting OID's water supply.

In contrast, average precipitation is projected to decrease by 1.7% and 0.8%, respectively, in the RCP 4.5 and RCP 8.5 scenarios. The Upper Stanislaus watershed is also projected to receive less precipitation with 1.6% and 0.6% decrease in precipitation in the RCP 4.5 and RCP 8.5 scenarios, respectively. Decreased precipitation within OID's service area and the Upper Stanislaus watershed has the potential to decrease available water supply for OID.

Overall, the projected trends of increasing air temperature and decreasing precipitation in the CMIP5 model results are similar to the CMIP3 model results (Figures 6-14 and 6-15). The projected temperature increases and precipitation decreases are most closely aligned with the "Hotter" scenarios and "Central" scenario from CMIP3, respectively. These trends indicate a potential decrease in water supply and increase in water demand, which could subsequently lead to a potential increase in NIWR, as described in Sections 6.3 and 6.4.

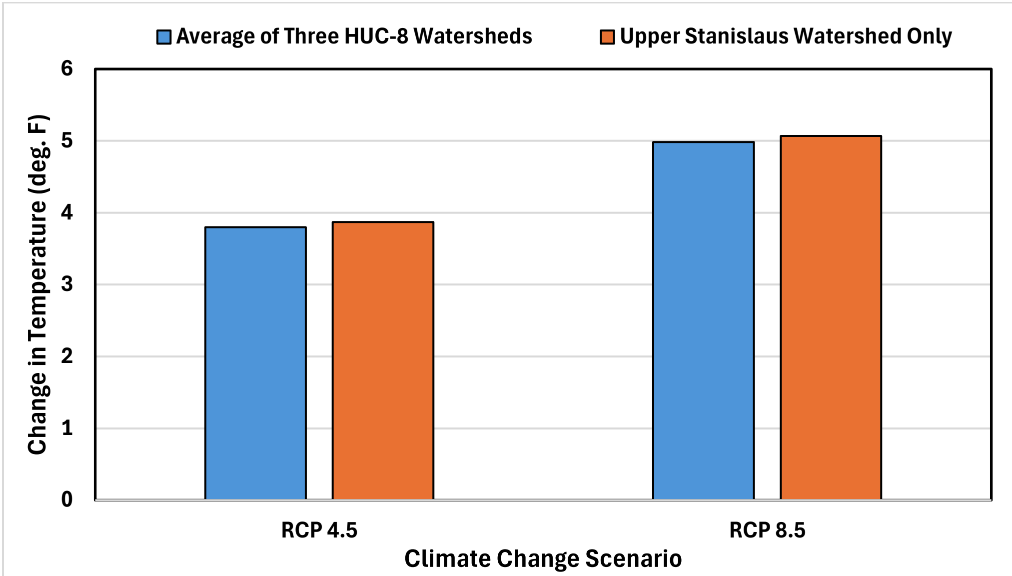

Figure 6-14. CMIP5 Projected Temperature Change by 2050s (USBR, 2021b).

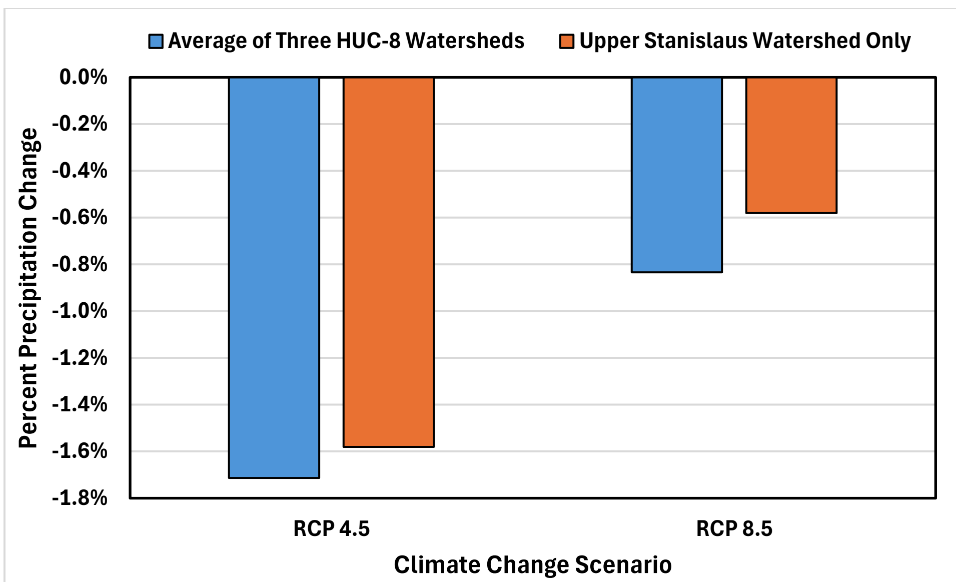

Figure 6-15. CMIP5 Projected Precipitation Change by 2050s (USBR, 2021b).

6.3 Potential Impacts on Water Supply and Quality

The shift in runoff to the fall-winter period (Section 6.2.2.1) and projected reduction in total runoff (Section 6.2.2.2) 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 with regard to 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 (GSCRWCC 2021), WWCRA (USBR 2015), SECURE Water Act Report (USBR 2021b), and other sources, climate change has the potential to cause more frequent, more severe, and longer duration droughts in the future. With changing rainfall patterns, groundwater basins may experience less natural recharge in the long term. However, GSP implementation under SGMA also includes 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 OID 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 of these impact net irrigation water requirements (NIWR), which are expected to increase for all climate scenarios presented, as shown in Figure 6-16. Projected NIWR increases range from 1.5 to 3.2 percent during the 2020s period, 1.8 to 4.7 percent during the 2050s period, and 2.2 to 5.4 percent during the 2080s period. Projected NIWR are based on non-static crop phenology for annual crops (as described in Section 6.2.2.3).

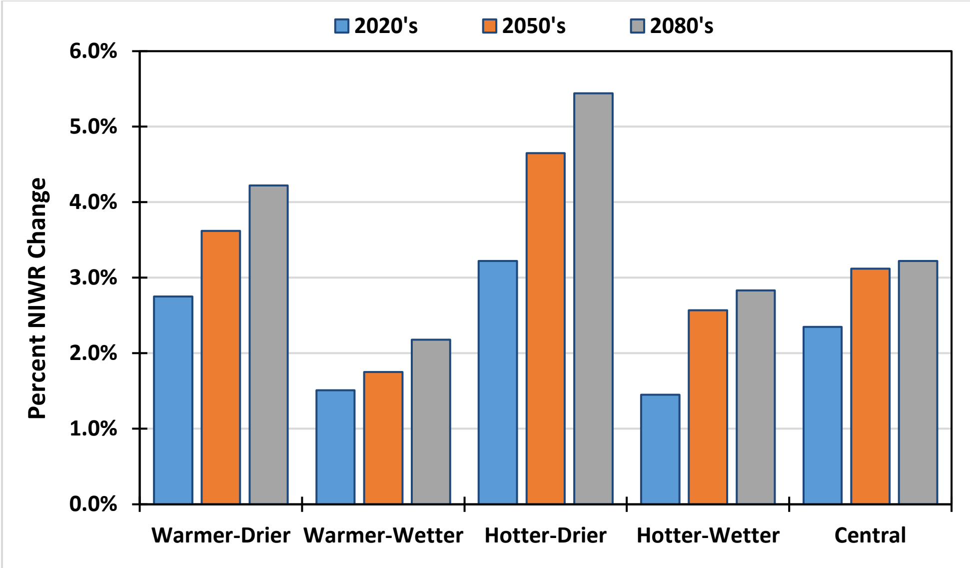

Figure 6-16. WWCRA Projected Net Irrigation Water Requirement Change Assuming Non-Static Phenology.

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, USBR 2021a).

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 remain 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 OID, 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, ET_o), 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.

OID's planning for mitigation of potential climate change impacts and development of strategies predates the development of its original AWMP in 2012. Several strategies for agricultural water providers and other water resources entities to mitigate climate change impacts were previously identified (DWR 2008, CDM 2011). These strategies include those identified as part of the California Water Plan published in 2009 and updated in 2013, 2018, and 2023 (DWR 2010a, 2014, 2019, and 2023), 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, 2019, and 2023)	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 continually 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.
	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 continued work with Fishbio and River Partners to ensure native habitat establishment and revegetation. Also, OID, through the Tri Dam Project, invests 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.

Source	Strategy	Status
California Climate Adaptation Strategy (CNRA 2009, 2021)	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, 2021)	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 "Preserve, upgrade, and increase monitoring, data analysis, and management."
	Improve resource stewardship	Described above under "Practice resource stewardship."
	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 is continuing 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:

- Safeguarding California Plan: 2018 Update, California's Climate Adaptation Strategy. California Natural Resources Agency. January 2018. (CNRA 2018)

- California's Climate Adaptation Strategy 2021 Update. California Natural Resources Agency. January 2021. (CNRA, 2021)
- Climate Change Characterization and Analysis in California Water Resources Planning Studies. California Department of Water Resources Final Report. December 2010. (DWR 2010)
- Perspectives and Guidance for Climate Change Analysis. August 2015. California Department of Water Resources Climate Change Technical Advisory Group. (DWR-CCTAG, 2015)
- Resource Guide: DWR-Provided Climate Change Data and Guidance for Use During Groundwater Sustainability Plan Development. July 2018. (DWR 2018a)
- Climate Action Plan—Phase 1: Greenhouse Gas Emissions Reduction Plan. California Department of Water Resources. January 2024. (DWR 2024)
- Climate Action Plan—Phase 2: Climate Change Analysis Guidance. California Department of Water Resources. September 2018. (DWR 2018b)
- Climate Action Plan—Phase 3: Climate Change Adaptation Plan. California Department of Water Resources. July 2020. (DWR 2020)
- California Water Plan Update 2023. December 2023. (DWR 2023)
- U.S. Bureau of Reclamation (Reclamation). 2021. West-Wide Climate Risk Assessments: Irrigation Demand and Reservoir Evaporation Projections. (USBR 2021a)
- Water Reliability in the West – 2021 SECURE Water Act Report. January 2021. (USBR 2021b)
- Sacramento and San Joaquin Rivers Basins. SECURE Water Act Section 9503(c) Report to Congress. March 2021. (USBR 2021c)
- 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)
- California Adaptation Planning Guide: Planning for Adaptive Communities. California Emergency Management Agency and California Natural Resources Agency. July 2012 (Cal EMA & CNRA 2012)
- Indicators of Climate Change in California. Fourth Edition. Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. November 2022. (Cal EPA 2022)
- 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)
- San Joaquin Valley Summary Report, Preview. California's Fourth Climate Change Assessment. 2022. Available at: https://climateassessment.ca.gov/regions/.
- Eastern San Joaquin Integrated Regional Water Management Plan 2020 Addendum. Eastern San Joaquin County Groundwater Basin Authority. February 2021. (ESJ IRWMP 2021)
- Eastern San Joaquin Groundwater Subbasin Groundwater Sustainability Plan. Eastern San Joaquin Groundwater Authority. November 2024. Available at: www.esjgroundwater.org.
- Cal-Adapt website tools, data, and resources for exploring California's climate change research and developing adaption plans. Available at www.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.

The two mandatory EWMPs for all agricultural water suppliers are (1) measurement of the volume of water delivered to customers with sufficient accuracy for aggregate reporting and (2) 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 A 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 2,232 turnouts; since the adoption of OID's 2020 AWMP, the number of turnouts needing corrective action has decreased from 296 to 166. The turnouts in compliance serve 96% of acreage within OID and by continuing with OID's planned implementation approach (as described in Attachment A) this percentage will continue to improve. OID's Delivery Measurement Plan is included as Attachment A.

Additionally, OID provides a multi-day training for new hires who will be DSOs or in related operational positions that includes an overview of water measurement principles and training on water measurement procedures. This training is described in more detail in Section 7.4.6.

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. OID recently completed another rate study in early 2025 to evaluate rate updates. A Proposition 218 process was conducted to approve and adopt rate updates which will be implemented for the 2026 irrigation season. The new rates continue to include a structure based in part on volume of water delivered.

A drought surcharge, applied on a per-acre basis, can also 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.

Additionally, related to this EWMP, the 10-Year Out-of-District Water Sale Program was approved on February 7, 2023. A total of over 10,000 irrigated acres are enrolled for the delivery of OID surface water in years when a determination is made that “surplus” surface water is available. 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 tailwater will leave the property. For additional information describing the 10-Year Out-of-District Water Sale Program, refer to the 10-Year Out-of-District Water Sale Agreement included in Attachment B. Finally, the pricing structure for existing and proposed Tier II annexations into OID is 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.

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

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

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

7.4.2 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. District actions include 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 two 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. Since the early stages of WRP implementation in 2006, OID has invested $53.6 million in main canal and tunnel improvements, $11.7 million in canal and lateral rehabilitation, and $15.1 million in pipeline replacement. A total of $18.1 million, $4.2 million, and $4.1 million have been invested in these projects, respectively, since 2019. These projects reduce seepage in aging canals and pipelines that would otherwise occur, as well as providing maintenance and operational benefits. During the past five years, repair and improvement projects on the North Main Canal Tunnels 3 and 4 and the South Main Canal Tunnel 8 were completed. The District has determined that installation of 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.

The District is also currently completing construction on two large infrastructure improvement projects: the Canyon Tunnel Project and the Paulsell Lateral Expansion Project. The Canyon Tunnel Project is a collaborative effort between OID and SSJID that will bypass a risk-prone two-mile reach on the Joint Main Canal through construction of a new tunnel to convey water diverted from the Stanislaus River at Goodwin Dam. This project will ensure long-term reliability, decrease maintenance, and increase safety. The Canyon Tunnel Project began construction in 2025 and is expected to be completed over the following three years. The Paulsell Lateral Expansion Project will increase the capacity of the existing distribution system and increase operational flexibility to improve surface water deliveries to in and out-of-district customers, resulting in increased direct and in-lieu groundwater recharge. The current capacity of the Paulsell Lateral at the headgate is 30 cfs; the Project will increase the capacity up to a maximum of 180 cfs and the 10-mile long Paulsell Lateral is proposed to be improved to accommodate the increased capacity and improve deliveries to existing and new customers. The Paulsell Lateral Expansion Project began construction in 2024 and the first phase (+/-6 miles) of construction is expected to be completed by Spring 2026 and operational during the 2026 irrigation season.

In addition to lining and pipeline conversion, the District completed the Robert Van Lier Regulating Reservoir in 2001, the North Side Regulating Reservoir in 2010, and the District is currently evaluating expansion of Robert Van Lier Regulating Reservoir. 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 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. Also, the Paulsell Lateral Expansion Project, described above, is proposed to include TCC implementation along the entire length of the Paulsell Lateral.

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 approximately 45,700 acres (70% of the District) between 2012 and 2024. A majority of these land conversion projects have involved 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.

OID also provides training for new hires who will be DSOs or in related operational positions. New hires attend a multi-day training course at the Irrigation Training and Research Center (ITRC) located in San Luis Obispo, California. The course provides an overview of topics and important concepts, as well as hands-on training, related to canal operations, water measurement principles, and SCADA equipment and operations. The course supports DSOs in providing maximum flexibility to growers for water ordering and delivery, within operational limits.

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 $20.8 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 $20.8 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 $3.6 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 3,600 af per year between 2015 and 2024 (Section 5.6.1),
- Interception and reuse of approximately 1,900 af per year of tailwater entering the OID distribution system between 2015 and 2024 (Section 5.7.1),
- Gravity flow and lift pumping of approximately 16,400 af per year to the neighboring districts of MID, SSJID, and CSJWCD between 2015 and 2024 (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 $2.3 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 5,200 af of tailwater and spillage annually. Also, as described above in Section 7.4.6, newly hired DSOs or those in related operational positions complete a multi-day training at the ITRC that is relevant to the monitoring, operations, and maintenance of spill and tailwater recovery systems. Lastly, spillage and tailwater leaving OID and not recaptured by neighboring districts are available for beneficial use by other downstream water users.

OID has also 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. 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 maintenance, rehabilitation and replacement of OID's existing groundwater pumping facilities, implementation of outflow management projects to increase effective surface water supply, implementation of infrastructure improvement projects to increase use of available surface water supplies (such as the Paulsell Lateral Expansion Project, described previously in Section 7.4.5), maintenance of 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 10,500 acres of lands formerly reliant solely on groundwater for irrigation since 2006. Due to the actions completed in implementing this EWMP, in recent years, the District has observed decreases in acreage within OID that solely rely on privately pumped groundwater for irrigation supplies. 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 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. To date, OID has implemented TCC on over 34 miles of laterals within the District, and the Paulsell Lateral Expansion Project, described in Section 7.4.5, will include TCC implementation across the entire length of the Paulsell Lateral.

Additionally, OID recently began delivery of surface water to the City of Oakdale for the irrigation of two city parks, which were previously dependent on groundwater. The District and the City of Oakdale are continuing to evaluate the delivery of surface water to additional city parks as well.

Finally, OID is enhancing groundwater production capability within the District to augment surface water supplies through replacement 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 $1.5 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. Since 2006, OID has installed and automated 137 headgates, inline lateral control structures, turnouts, and boundary outflow sites for flow, level, and position control. Allowing for automation and remote monitoring of 43 headgates, 77 inline lateral control structures, eight turnouts, one pump, and one boundary outflow facility. Additionally, 80 of these operate within the TCC system to automate 34 miles of canals. OID has also installed 204 flow monitoring facilities equipped with remote monitoring. These facilities consist of 18 headgates, 17 inline lateral structures, 146 turnouts, 17 boundary outflow facilities and five 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 $20.8 million in flow control and measurement structure projects since 2006 and nearly $0.8 million since 2019. Additionally, as described above in Section 7.4.6, newly hired DSOs or those in related operational positions complete a multi-day training at the ITRC that is relevant to the canal operations and automation.

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. To date, OID has implemented TCC on over 34 miles of laterals within the District, and the Paulsell Lateral Expansion Project, described in Section 7.4.5, is proposed to include TCC implementation along the entire length of the Paulsell Lateral. It is estimated that the remaining effort has the potential to further reduce operational spillage and will require the installation or rehabilitation of over 125 canal structures and installation of over 165 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 on the OID website (www.oakdaleirrigation.com).

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 Ag 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 website links and in periodic newsletters (Figure 7-2) mailed to customers.

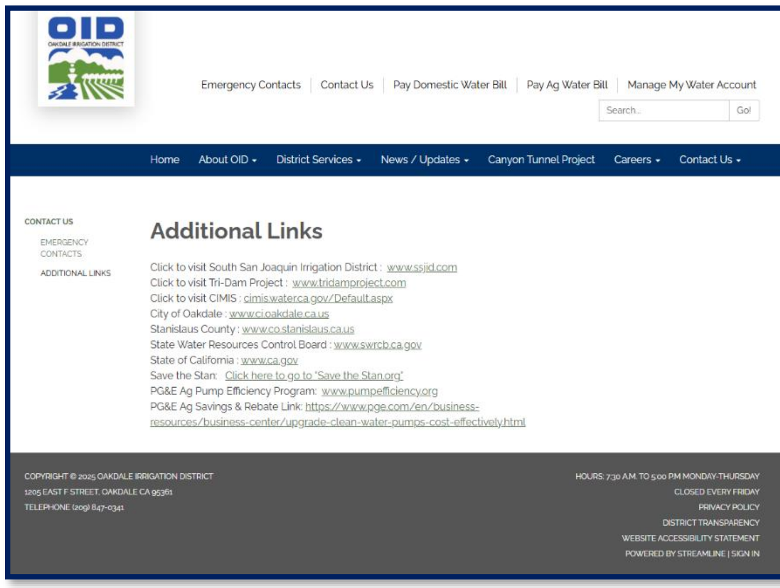

Figure 7-1. OID Website with Link to CIMIS.

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).


OAKDALE IRRIGATION DISTRICT

NEWSLETTER

SPRING/SUMMER 2025 ISSUE

WHAT'S INSIDE THIS ISSUE?

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OID'S DEDICATED DITCHTENDERS

SUSTAINABLE ENERGY, SUSTAINABLE SAVINGS: OID BEGINS SOLAR CONSTRUCTION

The Oakdale Irrigation District Board of Directors approved a contract to install a solar system to save the District an estimated total of $6,000,000 over the next 30 years.

The project will be located on District-owned property adjacent to OID's North Side Regulating Reservoir. The project includes the installation of a 500 KW photovoltaic solar system to offset a portion of the District's energy usage across approximately 50 PG&E service meters at various locations throughout the District.

Construction of the project began this May and will be completed in August 2025. With an estimated average energy savings of $200,000 per year, the return on investment is projected to be just over 4 years. The lifespan of the project is 30 years with an anticipated savings of more than $6,000,000.

WORKING TOGETHER FOR WATER: OID PARTICIPATES IN REGIONAL GROUNDWATER PLANNING EFFORTS

In our recent newsletter, we highlighted the ongoing efforts to develop a Dry Well Mitigation Plan and a Demand Management Plan (collectively, "Plans") for inclusion in our Groundwater Sustainability Plans (GSPs). These efforts are part of a broader mandate from the State of California under the Sustainable Groundwater Management Act (SGMA), which requires local Groundwater Sustainability Agencies (GSAs) to prepare and implement plans to ensure long-term groundwater sustainability.

While the Oakdale Irrigation District is actively engaged in this collaborative, public process, these Plans are being drafted and coordinated by the GSAs for the two subbasins in which OID operates – Eastern San Joaquin Groundwater Subbasin (ESJ) and the Modesto Subbasin. Once completed, the plans will be submitted in the GSPs to the California Department of Water Resources (DWR) for review and approval.

As a reminder, having DWR-approved GSPs is essential for maintaining local control over how groundwater is managed. The GSAs are responsible for ensuring that these Plans comply with SGMA requirements, including strategies to reduce groundwater demand when and where necessary to reach sustainability and to mitigate the impact of dry wells caused by excessive pumping.

OID is one of several local agencies working in partnership with the GSAs to support this important regional planning effort. Community involvement is a vital part of the process, and we encourage all stakeholders to participate. To learn more about these Plans, find details on upcoming public meetings, or provide input directly to the GSA's, please visit STRGBA.org and ESJgroundwater.org.

Your engagement is essential to ensuring new groundwater management policies reflect the needs of all users and promote long-term sustainability for our region.

CANAL SAFETY STARTS AT HOME: TIPS EVERY FAMILY SHOULD KNOW

At the Oakdale Irrigation District (OID), community safety is our top priority. As the weather warms up, ensuring canal safety becomes crucial. Each year, just as we have for generations, OID fills its irrigation canals

★OID IN THE COMMUNITY★

Oakdale Irrigation District is proud to support our local FFA students as they prepare their agricultural projects for the Stanislaus County Fair. We believe in investing in the next generation of farmers, ranchers, and ag leaders, and we're honored to contribute to their success and growth. Good luck to all the students—we can't wait to see your hard work on display!

Figure 7-2. Excerpt from Spring/Summer 2025 Issue of OID Pipeline Newsletter.

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.

Lastly, as described previously, the District updated their Surface Water Shortage Policy to allow in-district surface water and private groundwater transfers between in-district customers during Level Two water shortages.

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 approximately 77 pumps at 69 pump stations within the OID boundaries. These pumps include:

1. 25 deep wells to supplement surface water deliveries, one of which is equipped with a VFD (conjunctive use EWMP),
2. 40 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 VFD booster pump (Clavey), and
4. 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 completed, which allowed OID to identify energy losses or electrical issues occurring within the pumps' electrical components and take corrective action.

OID has budgeted $14 million under its WRP for maintenance and ongoing development of groundwater production to supplement surface water supplies and increase flexibility for water users. Since 2006 OID has spent $1.5 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.

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 for 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	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. New hires who will be DSOs or in related positions complete a multi-day training at the ITRC on canal operations, water measurement principles, and SCADA equipment and operations. 5. Implementation of Storm water ordering and delivery management software. 6. Implementation of a QA/QC process to review delivery measurement volumes prior to billing, which occurs two times throughout the irrigation season. 7. Development and implementation of a Water Measurement Plan for customer deliveries (Attachment A); implementation is currently about 96% complete (75,645 acres of the total 78,558 acres).	1. Continue to dedicate annual budget line-item for turnout replacement and continue replacement of turnouts requiring corrective actions. 2. Continue training of newly hired DSOs and those in related positions on canal operations, water measurement, and SCADA. 3. Continue implementation of Water Measurement Plan (Attachment A).
10608.48.b(2)	Adopt a pricing structure for water customers based at least in part on quantity delivered.	Being Implemented	1. Completed a rate study to determine rates required to cover cost of service, conducted Proposition 218 rate update, and established a rate structure based in part on volume of water delivered in 2014 that was implemented in 2015. 2. Completed another rate study to evaluate rate updates in early 2025, and a Proposition 218 process for rate updates. 3. Use volumetric billing for out-of-district water sales and future annexations. 4. 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 two 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 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. Constructed Robert Van Lier Reservoir in 2001 and constructed the North Side Regulating Reservoir in 2010. 2. Concrete lined approximately 3.3 miles of South Main Canal and tunnels in 2010. 3. Concrete lined 106 miles of canals, including approximately 0.7 miles of the North Main Canal in 2024. 4. Repaired 0.55 miles of deteriorating concrete lining in 2019 and 0.47 miles in 2023. 5. Replaced over 100 miles of canals with buried pipeline, including roughly one mile between 2016 and 2019. 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. Completed repair and improvement projects on the North Main Canal Tunnels 3 and 4, and South Main Canal Tunnel 8 to increase lined area, decrease maintenance and reduce seepage. 8. Invested $80.5 million in main canal and tunnel improvements, canal and lateral rehabilitation, and pipeline replacement since 2006 ($26.3 million since 2020). 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. 5. Complete Canyon Tunnel Project, which began construction in late 2025 and is scheduled to be completed over three years. This project reduces seepage, decreases maintenance, and bypasses a 2-mile section of high hazard section of canal. 6. Complete Phase 1 of the Paulsell Lateral Expansion Project, which is currently under construction and anticipated to be completed in Spring 2026. The Paulsell Lateral Expansion Project will expand the existing distribution system and increase flexibility through TCC automation to improve surface water deliveries to in and out-of-district customers and will result in increased direct and in-lieu groundwater recharge. 7. Evaluate expansion of Robert Van Lier Reservoir.

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 $20.8 million in flow control and measurement improvements including TCC, $6.4 million in construction of the north side regulating reservoir and nearly $3.6 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 23,000 acres in 2012 to approximately 45,700 acres (70% of District) in 2024. 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 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. 7. New hires who will be DSOs or in related positions complete a multi-day training at the ITRC on canal operations, water measurement principles, and SCADA equipment and operations.	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. 6. Continue training of newly hired DSOs and those in related positions on canal operations, water measurement, and SCADA.
10608.48.c(7)	Construct and operate supplier spill and tailwater recovery systems	Being Implemented	1. Two drainwater recovery systems supplement irrigation to 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 an average of approximately 3,600 af per year between 2015 and 2024. 4. Interception and reuse of an average of approximately 1,900 af per year of tailwater entering the OID distribution system between 2015 and 2024, 5. Gravity flow and lift pumping of approximately 16,400 af per year to the neighboring districts of MID, SSJID, and CSJWCD between 2015 and 2024. 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 $2.3 million in outflow management and reclamation projects since 2006. 8. New hires who will be DSOs or in related positions complete a multi-day training at the ITRC on canal operations, water measurement principles, and SCADA equipment and operations.	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 (including full TCC implementation on Paulsell Lateral as part of Paulsell Lateral Expansion Project). 5. Continue training of newly hired DSOs and those in related positions on canal operations, water measurement, and SCADA.

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. 4. OID is delivering surface water to the City of Oakdale for irrigation of two city parks, which were previously dependent on groundwater pumping. 5. 6. OID has maintained and enhanced groundwater production capability, investing nearly $1.5 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. 10. OID has achieved in-lieu groundwater recharge through annexation of 10,500 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 evaluating delivery of surface water to the City of Oakdale for irrigation of city parks, which are dependent on groundwater (apart from two currently receiving surface water). 5. Continue to implement WRP groundwater well, reclamation, and outflow management projects. 6. Complete Phase 1 of the Paulsell Lateral Expansion Project, which is currently under construction and anticipated to be complete in Spring 2026. The Paulsell Lateral Expansion Project will expand the existing distribution system and increase flexibility through TCC automation to improve surface water deliveries to in and out-of-district customers and will result in increased direct and in-lieu groundwater recharge. 7. Continue with next phases of District-wide TCC implementation (including full TCC implementation on Paulsell Lateral as part of Paulsell Lateral Expansion Project). 8. 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. 9. Review and revise Surface Water Shortage Policy as needed to provide flexibility to customers and increase planned conjunctive use of surface water and groundwater.
10608.48.c(9)	Automate canal control structures	Being Implemented	1. Automated inlets and outlets to the regulating reservoirs. 2. Installed and automated 137 headgates, lateral control structures, turnouts and boundary out flow sites for flow, level, and position control since 2006. 68 of these sites operate in downstream control and fully automate over 34 miles of canals. 3. Installed an additional 204 flow monitoring devices on headgates, lateral control structures, turnouts, pumps and boundary out flow sites since 2006. 4. OID has invested more than $20.8 million in flow control and measurement structure projects since 2006 (and nearly $0.8 million since 2019). 5. New hires who will be DSOs or in related positions complete a multi-day training at the ITRC on canal operations, water measurement principles, and SCADA equipment and operations.	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 (including full TCC implementation on Paulsell Lateral as part of Paulsell Lateral Expansion Project). 3. Continue to implement other WRP flow control and measurement structure projects. 4. Continue training of newly hired DSOs and those in related positions on canal operations, water measurement, and SCADA.
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.

Water Code Reference No.	EWMP	Implementation Status	Implemented Activities	Planned Activities
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 agricultural relevant 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. Continued discussions for voluntary transfers of water that facilitate greater water supply flexibility and storage and continued 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.
10608.48.c(14)	Evaluate and improve the efficiencies of the supplier's pumps.	Being Implemented	1. Regular testing and evaluation of approximately 77 pumps at 69 pump stations 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.

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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 maintaining 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[29] 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 budgets 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.

[29] 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 by 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, along with the continuing implementation of approximately $17 million total 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 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 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 by 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.

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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.

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 2020). Future WUE improvements are estimated for five years in the future (2030) relative to 2025 and for ten years in the future (2035) relative to 2025. 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.

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Table 7-5. Applicability of EWMPs to WUE Improvement Categories.[1]

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.

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	Modest	
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 A, 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	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	
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	Modest	Modest
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 (2020).
5. WUE Improvements expected in 2030 (five years in the future) and 2035 (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.

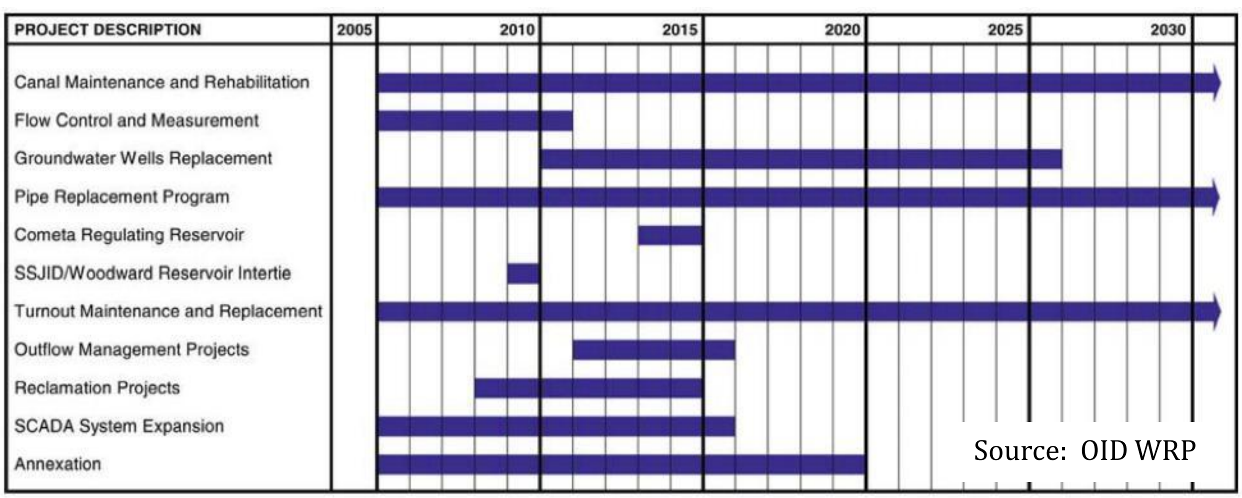

Figure 8-1. OID WRP Implementation Schedule.

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 2024, OID completed roughly 1,100 individual capital improvement projects, including over 280 projects since the 2020 AWMP update. In Table 8-1, the number of projects implemented by improvement category is presented for the period from 2006 to 2019, each year between 2020 and 2024, and the overall total from 2006 to 2024. Costs associated with WRP projects to date total more than $116 million, with more than $29.1 million in improvements completed since the 2020 AWMP update. Total costs by improvement category between 2006 and 2019 are summarized in Table 8-2, along with the total cost of projects implemented each year since then. To view the complete WRP visit www.oidwaterresources.org.

Cumulative implementation costs by improvement category (other than main canal and tunnel improvements) from 2006 to 2024 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. These increased 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. In 2020, the implementation costs decreased due to the COVID-19 pandemic but have since steadily increased to $10.9 million in 2024. 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 2024 totaling more than $1 million have included canal maintenance and rehabilitation ($11.7 million), flow control and measurement structures ($20.8 million), pipeline replacement ($15.1 million), turnout maintenance and replacement ($3.6 million), reclamation projects ($1.5 million), main canal and tunnel improvements ($53.7 million), the North Side regulating reservoir [30] ($6.4 million), and miscellaneous in-system improvements ($1.5 million).

[30] The North Side regulating reservoir is the same as the Cometa Regulating Reservoir shown in Figure 8-1.

Table 8-1. OID WRP Number of Projects Initiated by Year, 2006 to 2024.

Improvement Category	Number of Projects by Year Started						Total
	2006 to 2019	2020	2021	2022	2023	2024	
Canal Maintenance and Rehabilitation	44	8	9	11	7	9	88
Flow Control and Measurement	141	1	5	3	1	8	159
Groundwater Well Replacement, Construction, or Rehabilitation	17	0	4	4	1	2	28
Pipeline Replacement	93	12	27	33	16	20	201
Turnout Maintenance and Replacement	414	13	18	14	17	10	486
Outflow Management Projects	18	0	0	3	3	0	24
Reclamation Projects	22	1	1	1	0	0	25
Main Canals and Tunnels Improvement Projects	28	1	2	1	2	4	38
North Side Regulating Reservoirs	3	0	0	0	0	1	4
Miscellaneous In-System Improvements	40	0	2	0	0	1	43
Total	820	36	68	70	47	55	1,096

Table 8-2. OID WRP Project Costs by Project Initiation Year, 2006 to 2024 (Millions).

Improvement Category	Total Project Costs by Year Started						Total
	2006 to 2019	2020	2021	2022	2023	2024	
Canal Maintenance and Rehabilitation	$7.54	$0.19	$0.48	$0.07	$3.21	$0.21	$11.70
Flow Control and Measurement	$19.97	$0.03	$0.24	$0.10	$0.05	$0.37	$20.76
Groundwater Well Replacement, Construction, or Rehabilitation	$0.97	$-	$0.23	$0.17	$0.02	$0.10	$1.50
Pipeline Replacement	$11.06	$0.09	$1.43	$1.83	$0.35	$0.38	$15.13
Turnout Maintenance and Replacement	$2.57	$0.19	$0.30	$0.23	$0.21	$0.14	$3.64
Outflow Management Projects	$0.76	$-	$-	$0.01	$0.01	$-	$0.78
Reclamation Projects	$1.41	$0.02	$0.02	$0.03	$-	$-	$1.48
Main Canals and Tunnels Improvement Projects	$35.56	$0.41	$2.17	$2.03	$4.04	$9.45	$53.66
North Side Regulating Reservoirs	$6.32	$-	$-	$-	$-	$0.07	$6.39
Miscellaneous In-System Improvements	$1.27	$-	$0.03	$-	$-	$0.21	$1.50
Total	$87.44	$0.93	$4.90	$4.47	$7.90	$10.92	$116.56

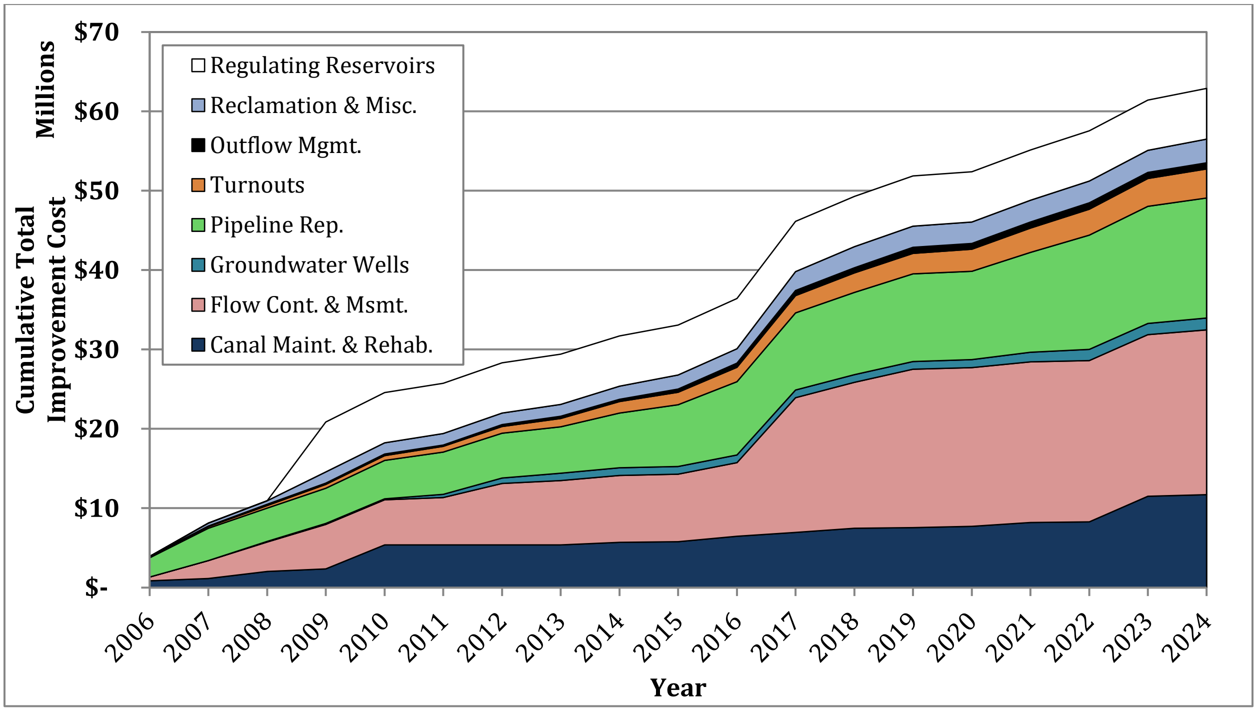

Figure 8-2. OID WRP Cumulative Stacked Implementation Costs by Improvement Category. Cumulative Implementation Costs by Individual Category are shown on Table 8-2.

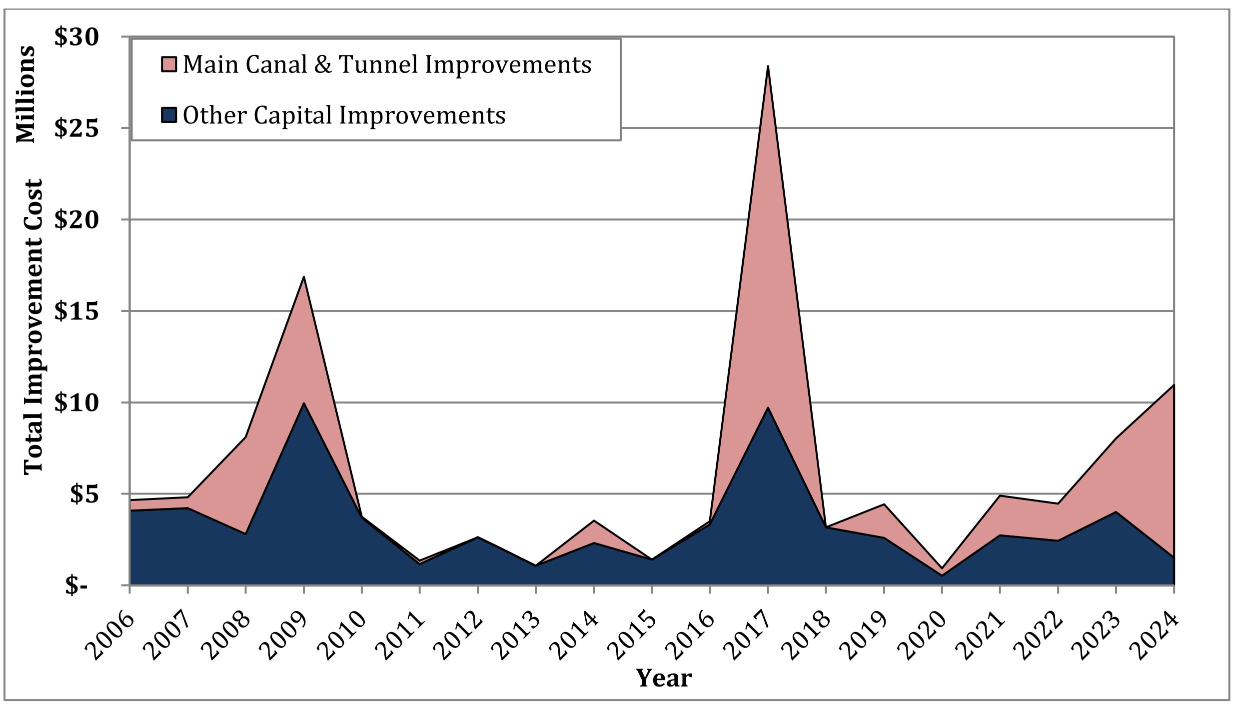

Figure 8-3. OID WRP Stacked Annual Implementation for Main Canal and Tunnel Improvements as Compared to Other Capital Improvement Projects. Cumulative Implementation Costs for Main Canal and Tunnel Improvements are shown on Table 8-2.

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 identified 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 2024, OID has annexed over 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 137 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 137 sites, 80 of them are TCC sites for the fully automated operation of 34 miles of canals. The balance consists of 43 headgates, 77 inline lateral control structures, eight turnouts, one pump, and one boundary outflow site. In addition to these automated distribution sites and facilities, OID has installed 204 flow measurement devices equipped with radios and antennas to allow for remote monitoring via OID's SCADA system. These facilities consist of 18 headgates, 17 inline lateral structures, 146 turnouts, 17 boundary outflow facilities and five 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 nearly $20.8 million in flow control and measurement projects since 2006 and nearly $0.8 million since 2019.

In addition to the implemented WRP actions, the District is also heavily investing in two large canal maintenance and rehabilitation projects: the Paulsell Lateral Expansion Project and the Canyon Tunnel Project.

The Paulsell Lateral Expansion Project will expand the existing distribution system and increase flexibility through TCC automation to improve surface water deliveries to in and out of district customers, resulting in increased direct and in-lieu groundwater recharge. The current capacity of the Paulsell Lateral at the headgate is 30 cfs; the Project will increase the capacity to a maximum of 180 cfs. Phase 1 of the Paulsell Lateral Expansion Project began construction in 2024 and is expected to be completed by Spring 2026 and operational during the 2026 irrigation season.

The Canyon Tunnel Project is a collaborative effort between OID and SSJID that will bypass a risk-prone two-mile reach on the Joint Main Canal through construction of a new tunnel to direct diverted water through; this project will reduce seepage, decrease maintenance, and increase safety. The Canyon Tunnel Project began construction in 2025 and is expected to be completed over the following three years.

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 Future WRP Implementation

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 more of the city’s parks.

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.			✓							

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. Between 2025 and 2030, implementation costs are expected to increase again, largely influenced by Phase 1 of the Paulsell Lateral Expansion and Canyon Tunnel Projects. 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 expenditure on turnout replacement in the years since the passage of SBx7-7 has nearly doubled compared to the years prior to SBx7-7, from $117,000 per year to $212,000. OID is currently on track to be compliant with SBx7-7 and associated regulations in regards to farm gate delivery measurement by 2030. 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.

As previously described in Section 8.3, Phase 1 of the Paulsell Lateral Expansion Project and Canyon Tunnel Project are expected to be completed in 2026 and 2028, respectively. The Paulsell Lateral Expansion Project will increase the capacity of surface water deliveries and improve level of service through flow control and automated control structures. The Canyon Tunnel Project falls under the Main Canals and Tunnels Improvements category and will reduce seepage, decrease maintenance, and improve safety.

Beyond these two major infrastructure projects, the District also plans to evaluate the expansion of Robert Van Lier Regulating Reservoir. This reservoir serves as a buffer to meet excess downstream demands or store surplus water, which improves delivery flexibility to water users while also reducing operational spillage by better matching diversion and delivery volumes. Although the expansion is not explicitly part of the WRP, this project aligns with WRP goals and objectives. It would provide additional operational flexibility and water storage capacity to increase surface water usage and water use efficiency within OID.

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10. Supplemental Information

The following attachments are included as part of this AWMP:

- Attachment A: Oakdale Irrigation District Water Measurement Plan
- Attachment B: 10-Year Out-of-District Water Sale Agreement
- Attachment C: Drought Management Plan
- Attachment D: Oakdale Irrigation District Surface Water Shortage Policy
- Attachment E: Public Participation
- Attachment F: Annual Water Budget Results
- Attachment G: Groundwater Recharge of Applied Surface Water

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Attachment A: 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, and (6) STD-4-03.

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.

Turnouts with Metering Devices

OID has also been installing flow measurement devices on turnouts for operational improvements, increased measurement accuracy, and/or as the most economical solution to achieve measurement compliance. The flow measurement devices that are currently in use are manufactured by Rubicon, McCrometer, and Krohne. OID has continued to utilize three flow measurement devices manufactured by Rubicon which include the SlipMeter, FlumeMeter, and Flumegate. Rubicon SlipMeters and FlumeMeters use Sonaray ultrasonic array flow measurement technology. However, unlike the SlipMeter, the FlumeMeter does not have the added electronic gate actuation for remote flow, level and position control. Both of these flow measurement devices are bolted directly 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 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). Rubicon's FlumeGate is an automated over-flow gate that combines flow measurement and gate controls like the SlipMeter. The FlumeGate uses ultrasonic sensors to measure the water level upstream and downstream of the gate along with the gates position to compute a flow measurement. This device has been tested in the laboratory and certified to be accurate to ±2.5 percent flow rate accuracy (Rubicon Water, 2023). Lastly, the meters manufactured by McCrometer and Krohne come with a calibration certificate (See Attachments A-1 through A-5) 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. OID follows the manufacturer's specifications when installing these meters to ensure accuracy of the meter is within the ±5 percent requirement for new measurement devices. All of the flow measurement devices discussed in this section are well within the accuracy standard of ±5% for new measurement devices. These devices are also equipped with a totalizer and are typically integrated into OID's SCADA system.

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[31] 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 2023. 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 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 measurements 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 OID's last point of control from the District Facility or at other appropriate locations that meet the requirements set forth in the Regulation and that the DSO will measure and maintain documentation of flow rates, delivered volume, and other pertinent irrigation event statistics as determined by the Ag 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

[31] "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))

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 340 SCADA sites, which includes a total of 154 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 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, retrofitting 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 313. This increase in turnouts can be attributed to several factors including annexed acreage into the District, OID's 10-Year Out-of-District Water Sale Program, in-district acreage connecting to OID to decrease their reliance on groundwater, and OID's continuous review of its inventory of turnouts. Since 2015, corrective action has been completed on 310 turnouts, with 166 turnouts still in need of corrective action. A comparison between the current turnout inventory and the 2015 turnout inventory is summarized below in Table A-1.

While OID currently has 2,232 turnouts (Table A-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. 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.

Of the total 2,232 turnouts, 184 turnouts are not actively used and 449 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 2,101 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, 1,601 of the 2,232 total turnouts are subject to the Regulation. Although DWR does not require delivery measurement for the 449 turnouts providing water, over 210 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 A-2 below shows the total number of acres associated with a turnout type, if not measurable, or associated with a type of measurement if the delivery point is considered measurable.

A total of 96.3% of the 78,558 acres lands serviced by OID, including lands out-of-district, are delivered water through 2,066 turnouts that are either compliant or not subject to the Regulation. The remaining 3.7% of the serviced land, or 2,913 acres, are all in-district acreage that are subject to the Regulation and delivered water through 166 unmeasurable turnouts. All unmeasurable turnouts listed in Table A-1 will be modified or replaced with the most appropriate application for measurement that meets the accuracy standards of the Regulation.

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

Turnout Type	**2015 AWMP**		**Current Inventory**	
	Quantity	**Percent of Turnouts**	**Quantity**[32]	**Percent of Turnouts**
Compliant Turnouts and Turnouts Not Subject to the Regulation				
Metergates	1,332	69%	1,417	64%
Constant-Head Orifices	100	5%	102	5%
SlipMeters/FlumeMeters	11	1%	47	2%
Flumegate	0	0%	1	0.04%
Krohne OPTIFLUX 2000	0	0%	117	5%
McCrometer Meter	0	0%	4	0.18%
Valves on OID Pipeline	0	0%	180	8%
Y/Ws (Inline Gates)	0	0%	148	7%
Other	0	0%	50	2%
Subtotal	*1,443*	*75%*	*2,066*	*93%*
Non-Compliant Turnouts, Corrective Action Needed				
Slide Gate	0	0%	15	1%
Valves on OID Pipeline	269	14%	87	4%
Y/Ws (Inline Gates)	146	8%	30	1%
Other	61	3%	34	2%
Subtotal	*476*	*25%*	*166*	*7%*
Total	***1,919***	***100%***	***2,232***	***100%***

[32] 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.

Table A-2. Turnouts or Meter Type and Associated Acreage by Meter Type

Turnout or Meter Type	Gross Acreage Served	Percentage of Total District Acreage	Accuracy	Accuracy Source
Turnouts Not Subject to the Regulation				
Canal Gates	1,114	1%	N/A	N/A
Valves on OID Pipeline	394	1%	N/A	N/A
Y/Ws (Inline Gates)	657	1%	N/A	N/A
Other	234	0%	N/A	N/A
Subtotal	2,399	3.1%		
Measurable Turnouts Compliant with Regulation				
Metergates	39,379	50%	+/- 5%	ITRC (2016)
Constant-Head Orifices	6,170	8%	+/- 3%	USBR (2001)
SlipMeters/FlumeMeters	15,224	19%	+/- 2.5%	Judge (2011)
Flumegate	692	1%	+/- 2.5%	Manly Hydraulic Laboratory (2005)
Krohne OPTIFLUX 2000	11,602	15%	+/- 2.0%	Krohne Group (2024)
McCrometer Meter	180	0%	+/- 2.0%	McCrometer (2024)
Subtotal	73,246	93.2%		
Non-Measurable Turnouts Subject to the Regulation, Corrective Action Needed				
Canal Gate	169	0%	N/A	N/A
Valves on OID Pipeline	1,298	1.7%	N/A	N/A
Y/Ws (Inline Gates)	706	0.9%	N/A	N/A
Other	739	0.9%	N/A	N/A
Subtotal	2,913	3.7%		
Total	***78,558****	***99.9%****		

**There are 48 acres of District land (less than 0.1%) that have no turnouts and are not currently utilizing OID water.*

***The total acreage includes both in-district and out-of-district acres.*

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 424 turnouts totaling $2,212,000. 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 $150,000 to $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 2024 was over $221,000 per year, on an average of 42 turnouts per year, and at an average cost of approximately $5,300 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 $117 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 2030. 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.

Oakdale Irrigation District Corrective Action Implementation Summary		
Total Oakdale Irrigation District (OID) Turnouts	2,232	
Oakdale Irrigation District (OID) Turnouts subject to Regulation	1,601	
Unmeasurable Turnouts	166	
Average Turnout Modification/Replacement Cost	$6,000	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 (2030 Completion)	5	years
Total Estimated Cost of Corrective Action Plan Implementation	$996,000	

Attachments

Attachment A-1: Krohne Calibration Certificate

Attachments A-2 and A-3: McCrometer Calibration Certificate (x2)

Attachment A-4: McCrometer Mc Mag 3000 Flow Meter Specification Sheet 30121-41 Rev. 2.3 – Page 5 and 6

Attachment A-5: Krohne OPTIFLUX 2000: Technical Datasheet R13 – Page 16

Attachment A-1: Krohne Calibration Certificate

KROHNE
PO Box 56
ZIP Code 06835-080
Embu SP BR

KROHNE

CALIBRATION CERTIFICATE

Nr.2301-57927-04/13

Tag	
Type	: OPTIFLUX KC 2000F
DN	: US STANDARD 300mm/ 12"
Conection	: FLANGE / ASME 150 lbs RF
Teste Pressure	: 30 Bar
Liner	: Hardrubber
Electrode Construction	: Standard
Electrode Material	: HC22
Protection Class	: ~~IP67~~ IP68 MODIFIED
ISO Class	: H
Serial Number	: C23500410

GK: value 3,9167 (f=1/6)
GKL: value 7,8322 (f=1/6)

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 160µS/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%) 500m³/h

Flow range in %	Deviation in %
96	0,09
45	-0,08
24	0,00

EMBU,11/01/2023

Attachment A-2: McCrometer Calibration CertificateAttachment

Calibration Report

McCROMETER

Serial Number: AG19-0444

Test Number: AG19-0444

Converter Serial Number: McMag3000

Model: G312-8

Calibration Date: 5/17/2019

Report Date: 5/17/2019

Sold To: OAKDALE IRRIGATION DISTRICT

Description: 12" MCMAG 3000

Notes:

Customer I.D.: 11.688 in
297 mm

KA: 1.9305
KZ: -46

Any difference between the customer specified application dimension and test pipe dimension is accounted for by the flow converter.
The reported velocities shown on this report indicate actual meter performance and are independent of the inside diameter used in the calibration.

Calibration Report

	Velocity (m/s) min	Velocity (m/s) max	PLBF Accuracy (as % of reading)
1	0.31	0.51	101.08
2	0.51	0.70	100.29
3	0.70	0.90	100.04
4	0.90	1.10	100.01
5	1.10	1.30	100.07
6	1.30	1.50	100.19
7	1.50	1.70	100.36
8	1.70	1.90	100.54
9	1.90	2.09	100.75
10	2.09	2.29	100.97

KL Values

KL00:	029680031
KL01:	060910064
KL02:	092950097
KL03:	128296130
KL04:	159410163
KL05:	195000195
KL06:	000000000
KL07:	000000000
KL08:	000000000
KL09:	000000000
KL10:	000000000
KL11:	000000000

Approved By: [signature]
Luis Leon
ID#: 266234

Test Fluid: Water

Instrumentation Traceability Kit Number: V0200

Standard Used: Secondary

Test Data

	Water Temperature (°C)	Test Time (seconds)	Air Temperature (°C)	Barometric Pressure (kPa)	Relative Humidity (%)	Viscosity (cP)	Average Rate of Flow (m3/sec)	Test Pipe Inside Diameter (in)
1	29.0	59.044	19.4	95.92	47	1	0.17369	12.240
2	29.0	32.613	19.4	95.92	47	1	0.12706	12.240
3	29.0	32.303	19.4	95.92	47	1	0.09504	12.240
4	29.0	58.741	19.4	95.92	47	1	0.06288	12.240
5	28.9	76.364	19.4	95.92	47	1	0.02354	12.240

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: www.mccrometer.com
Hours: 8am – 4:30pm PST, Monday - Friday

Serial Number: AG19-0444

Attachment A-3: McCrometer Calibration Certificate

WATER SPECIALTIES
PROPELLER METER

CERTIFIED TEST REPORT

CUSTOMER: AMERINE SYSTEMS
MODEL NO: ML04-10
METER SERIAL NO: 20063673

CONFIGURATION

METER INSIDE DIAMETER: 10.22
DIAL: GAL X 1000 2000 GPM
GEARS: 23 / 33
TOTALIZER GEARS: 24L / 36L
ACTUAL METER INDEX: 0.6212
TEST FACILITY: Volumetric

As Calibrated

CALIBRATION DATA

	FLOW RATE GPM	% ACCURACY
1	1929.82	100.98
2	942.29	100.94
3	331.18	98.08

TEST DATE: 6/3/2025

CERTIFIED BY: Robert Galusha ID#: 176785 PRINT DATE: 6/4/2025

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

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Version 1.0 (3/9/2007)

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Attachment A-4: McCrometer Mc Mag 3000 Flow Meter Specification Sheet 30121-41 Rev. 2.3 (Page 5)

Specification Sheet
Mc Mag3000 Flow Meter

Flow Meter Specifications

Physical Specifications

Measurement Method	Volumetric flow in filled flow conduits 4" to 12" utilizing saddle installed sensor. Flow indication in English Standard or Metric units
Directionality	Single direction
Pipe Sizes	4", 6", 8", 10", 12"
Body Style	Saddle mount
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
Power	**Battery:** Standard: three 3.6V lithium-thionyl chloride (Li-SOCl2) D size batteries with two AA backup batteries **AC Power:** 100-240VAC **DC Power:** Linear power supply 10-35VDC, 2.4W
Electrical Connections	• Optional shielded cable for 10-32VDC/4-20 mA output • Optional shielded cable for pulse out
Outputs	**Digital output:** Digital pulse (open collector) output for volumetric - Two isolated digital pulse (open collector) outputs for volumetric - AMI output **Analog output:** 4-20mA: Galvanically Isolated, 16 Bit resolution. All power configurations (including battery). Note: 9-30 VDC loop power required (not supplied via converter)

Performance and Operational Specifications

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
IP Rating	IP68 (submersible sensor)
Pressure Range	150 psi (10.3 bar) working pressure
Empty Pipe Detection	Hardware/software, conductivity-based (optional)
Accuracy	• Standard: +/- 2% of measured value ±0.006 ft/s (±0.0018 m/s) • Optional: +/- 1% of measured value ±0.006 ft/s (±0.0018 m/s)
Conductivity	Minimum conductivity of 50µS/cm. For lower conductive fluid consult factory.
Battery Life	Five-year expected battery life, five-year battery warranty
Pipe Run Requirements	3D Upstream / 1D Downstream

McCROMETER Page 5 30121-41 Rev. 2.3 | 20MAR2024

Attachment A-4: McCrometer Mc Mag 3000 Flow Meter Specification Sheet 30121-41 Rev. 2.3 (Page 6)

Mc Mag3000

Specification Sheet
Mc Mag3000 Flow Meter

Flow Meter Specifications

Display and Measurement

Display	• 2-Line LCD display (no backlight) • 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) • Opening lid activates display		
Digits	5 Rate, 9 Total		
Units	Gallons per minute Million gallons per day Cubic feet per second Megaliters per day Liters per second Cubic meters per hour Liters per minute Gallons per hour	Imperial gallons per minute Miner's inch (9G) Miner's inch (11.22G) Acre-feet per day Kiloliters per hour Liters per hour Cubic meters per minute	Cubic feet per minute Barrels per minute (55G) Barrels per hour (55G) Barrels per day (55G) Barrels per minute (42G) Barrels per hour (42G) Barrels per day (42G)
Unit Rate Scales	seconds, minutes, hours, days		

Other Specifications

Options and Accessories	• Data Logger - included as standard with five years of data storage at default (12hr) interval. (Cable sold separately) • Bidirectional • Epoxy coated carbon steel flanged spool piece • AC, DC, and battery powered with battery backup powered available • Remote mount (25' cable length only) • Annual verification / calibration • Stainless Steel ID tag
Warranty	**Meter:** 5-year standard warranty **Battery:** 5-year warranty **Liner:** Lifetime guarantee

McCROMETER

Attachment A-5: Krohne OPTIFLUX 2000: Technical Datasheet R13 – Page 16

2.2 Legal metrology

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

2.2.1 OIML R49

The OPTIFLUX 2300 has a certificate of conformity with the international recommendation OIML R49-1. The certificate has been issued by NMi (Dutch board of weight and measures).

The OIML R49 -1 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.

The following accuracy can be met in all installation orientations (horizontal, vertical or diagonal) and with flow profile sensitivity class 0DN / 0DN (0 x DN upstream and 0 x DN downstream).

- 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.

$Q1 = Q3 / R$

$Q2 = Q1 * 1.6$

$Q3 = Q1 * R$

$Q4 = Q3 * 1.25$

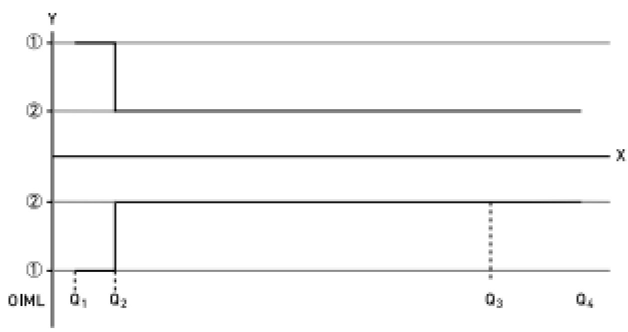

Figure 2-1: ISO flow rates added to figure as comparison towards OIML
X: Flow rate
Y [%]: Maximum measuring error

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

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Attachment B: 10-Year Out of District Water Sale Agreement

10-YEAR OUT-OF-DISTRICT WATER SALE AGREEMENT
BY AND BETWEEN
OAKDALE IRRIGATION DISTRICT
AND
____

This Agreement is entered into this _____ day of ___________ 2023, by Oakdale Irrigation District ("OID" or "District") and _____________ ("Landowner"). The District and Landowner are collectively referred to hereafter as "parties."

The parties agree as follows:

RECITALS

WHEREAS, District operates under and by virtue of Division 11 of the California Water Code; and

WHEREAS, Landowner owns planted and irrigated agricultural property outside of OID's service area boundary, as identified in Exhibit A; and

WHEREAS, Landowner has applied for the OID 10-Year Out-of-District Water Sale Program ("Program"); and

WHEREAS, the District is the owner of certain water rights to the waters of the Stanislaus River, including pre-1914 appropriative water rights; and

WHEREAS, due to ongoing conservation practices and improvements in facilities by the District, the water to be sold to the Landowner by this Agreement, ("**water**") is surplus to the current needs of the landowners and water users of the District in accordance with California Water Code section 22259; and

WHEREAS, the quantity and quality of groundwater within the Modesto Subbasin and the Eastern San Joaquin Groundwater Subbasin underlying the Landowner and District is threatened and without the sale of the water to Landowner under this Agreement, the Landowner will pump groundwater for irrigation; and

WHEREAS, by this Agreement, the parties intend to facilitate a sale of conserved water when available during 2023-2032 by District to Landowner,

NOW, THEREFORE, the District and Landowner, agree on the terms and conditions attached hereto this Agreement as Exhibit B, as well as the following:

1. **NOTICES:** All notices that are required, either expressly or by implication, to be given by any party to the other under this Agreement shall be delivered, mailed or emailed, addressed as follows:

Oakdale Irrigation District
1205 East "F" Street
Oakdale, CA 95361
Attn: Water Operations Manager/District Engineer
email: ethorburn@oakdaleirrigation.com

Landowner

Notice shall be deemed given (a) two calendar days following mailing via regular or certified mail, return receipt requested, (b) one business day after deposit with any one-day delivery service assuring "next day" delivery, (c) upon actual receipt of notice, or (d) upon transmission, if by email, whichever is earlier. The parties shall promptly give written notice to each other of any change of address, and mailing or shipment to the addresses stated herein shall be deemed sufficient unless written notification of a change of address has been received.

2. LESSEE NOTIFICATION: If Landowner wishes to include their Lessee, if applicable, on notifications and correspondence (excluding invoices) from the District, they may specify the contact information of said Lessee. Check here if Landowner wishes to include their Lessee on notifications and correspondence: ☐

Lessee Address:

Phone:

email:

If Landowner wishes for Lessee to receive invoices, a standard District form is required. Invoices will only be sent to one address. Check here if invoicing to Lessee is desired: ☐

3. CEQA MITIGATION MEASURES DURING CONSTRUCTION: If construction of a new OID delivery point and private conveyance facilities is required for Landowner to utilize surface water from OID, Landowner will be responsible for notifying OID a minimum of two weeks prior to any construction on private property such that OID can inspect and confirm that mitigation measures identified in the Mitigated Negative Declaration prepared for this Program are adhered to, as applicable.

Check here if any new construction is required: ☐

4. **ENTIRE AGREEMENT:** This Agreement constitutes the entire Agreement between the parties, and supersedes any oral agreement, statement or promise relating to the subject matter of the Agreement. No other agreement, statement, or promise made to any party, or to any employee, officer, or agent of a party to this Agreement, or to any other person, that is not in writing and signed by all parties to this Agreement shall be binding upon them. Any amendment, including oral modifications, must be reduced to writing and signed by all parties to be effective.

5. **EFFECTIVE DATE:** The effective date of this Agreement shall be the date first above written which shall be the date this Agreement is signed by both parties, or if signed on different dates, the latter of the two dates.

OAKDALE IRRIGATION DISTRICT

By____________________________
Scot Moody, General Manager

Dated:_________________________

LANDOWNER

By____________________________
, Landowner of
APNs:

Dated:__________________________

EXHIBIT A

Property Site Map

EXHIBIT B

TERMS AND CONDITIONS FOR IRRIGATION OF LANDS OUTSIDE OAKDALE IRRIGATION DISTRICT BOUNDARIES DURING THE 10-YEAR OUT-OF-DISTRICT WATER SALE PROGRAM

Approved February 7, 2023

Program Description

A. Provide a method for eligible lands to contract with Oakdale Irrigation District (OID or District) for out-of-district water service for 10-years (Program) to put OID's surplus water to beneficial use and avoid the need for annual out-of-district water sales contracts.

B. The Program will be limited to lands that are already irrigated (Ref. 3c.) and can receive OID water from existing and proposed temporary or permanent delivery facilities (Ref. 7 a. and 7 b.).

C. Program enrollment is limited to parcels for which applications were received prior to the September 2, 2022 deadline. To the extent that the foregoing parcels are not interested in Program participation, OID may, at its sole discretion allow other eligible parcels to participate in the Program.

Terms and Conditions

1. Process: Landowners who wish to enroll in the Program must sign the Program Agreement by March 31, 2023. **Approval of an application and/or Program participation does not create any other or future rights of applicant to receive water from OID or be considered for annexation into OID. OID may, at its sole discretion, consider water service and annexations in the future.**

2. Conditions: Landowners must sign and agree to abide by these Terms and Conditions for the Program. OID may terminate Program participation for any failure to comply with these Terms and Conditions that is not cured within 30 days of written notice.

3. Eligible Lands:

   a) APNs: 010-027-005 & 010-027-007 (Orange Blossom Park) and Fringe Parcels need not apply or participate in the Program to receive out-of-district water.

   b) Lands outside the OID sphere of influence are eligible only upon request and approval by OID's Board of Directors. At OID's discretion, applications that include requests for lands partially or completely outside the OID Sphere of Influence may be required to be accompanied by written confirmation that another district/agency's services will not be impacted or infringed upon by the receipt of water from OID.

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c) The area within the real property proposed for out-of-district water service must have been irrigated as of August 31, 2018, with access to a water source other than OID surplus water. Any OID surplus water provided through participation in the Program shall be used as a supplemental water source.

d) OID will not consider any out-of-district water deliveries to lands whose conveyance relies on the use of the Stanislaus River, Cashman Creek or the South San Joaquin Irrigation District Main Canal.

e) Landowner acknowledges that all applicant lands and proposed improvement projects are subject to environmental review by the District, its consultant(s), and/or the State. Avoidance and/or minimization measures may be identified through completion of the necessary environmental permitting for certain projects with an increased potential for environmental impacts.

4. Available Water:

a) Out-of-district lands enrolled in the Program will be provided surplus water under OID's pre-1914 water right. Availability of pre-1914 water is limited to the diversion of the unimpaired/full natural flow occurring in the Stanislaus River at Goodwin Dam. Based on unimpaired/full natural flow and OID water use in average years, OID anticipates having pre-1914 water available through August in most years for out-of-District use. However, availability will vary from month-to-month and year-to-year with out-of-district demand and hydrology.

b) Water year forecasts on availability of water in the Stanislaus River are provided in the second week of February, March, April and May by the California Department of Water Resources in their Bulletin 120 Report. The report can be found online https://cdec.water.ca.gov/snow/bulletin120.

c) OID generally makes a surplus water determination in March of each year. That decision will be based on hydrologic conditions and publicly discussed at a meeting of the OID Board of Directors. Water made available to the Program will be predetermined pursuant to OID's Guiding Principles for Surplus Water and Service Expansion.

d) **Landowners in the Program shall be required to purchase a minimum quantity of 1.5 acre-feet per irrigated acre each year of the Program when and if OID declares surplus water available (Minimum Quantity) subject to OID water availability and delivery.** Irrigated acreage will be confirmed by OID. In years when the hydrology indicates no surplus water is available or out-of-district deliveries are otherwise curtailed or suspended prior to the end of August, no Minimum Quantity is required to be purchased and a refund or credit will be provided for any out-of-district water already paid for and not delivered that year. The only exception to this minimum purchase requirement are fringe parcels in accordance with the Fringe Parcels Water Allocation Policy adopted by Resolution No. 2017-07 on January 18, 2017. Fringe Parcels will have no upfront minimum purchase requirement.

e) Landowners acknowledge and agree that the ability of the District to deliver water during certain periods is limited by capacity constraints in the District's North and South Main Canals and in various OID laterals emanating from those canals. In-district constituents will not be impacted by out-of-district water conveyance and delivery.

f) The District estimates that up to 25,000 acre-feet of surplus water will be delivered annually to out-of-district lands via existing OID facilities without impacting in-district constituents. The District shall endeavor to deliver as much surface water as possible to out-of-district lands participating in this Program during the irrigation season recognizing limitations in 4a, 4c and 4e above. OID agrees that to the extent surplus water is available, Program participants shall be entitled to 25,000 acre-feet of available surplus surface water on Program lands. Delivery of water under the April 1, 2022 Water Transfer Agreement between OID, the South San Joaquin Irrigation District (SSJID), and the Chicken Ranch Rancheria of Me-Wuk Indians of California takes precedence over water provided to the Program. However, the Program shall have priority over other future surplus water transfers OID may pursue in the future.

g) Upon written request from the landowner and prior approval by OID, the Minimum Water Purchase requirement may be waived for a period not to exceed one year to accommodate orchard or vineyard removal and replanting. Replanted orchards or vineyards will be provided the following alternative Minimum Purchase schedule, valid only during the 2 years after replanting has occurred:

- Year One: Fallowing/land prep occurs; minimum Water Purchase waived
- Year Two: 0.5 acre-feet per irrigated acre
- Year Three: 1.0 acre-feet per irrigated acre

In the third year after replanting has occurred, the Minimum Water Purchase will return to 1.5 acre-feet per irrigated acre. In the event that a portion of an orchard or vineyard is replanted, only the replanted irrigated will be subject to the schedule above.

5. CEQA Compliance:

a) A California Environmental Quality Act (CEQA) analysis for the Program is required to be performed by OID prior to implementation.

b) Program Landowners shall pay for the CEQA analysis. A deposit of $10 per irrigated acre was due at the time of OID acceptance of the Program application. Monies received will be applied first to the costs of the CEQA analysis for the Program. Upon completion of the CEQA analysis, the balance of any remaining funds will be refunded to the Landowner or, at the Landowner's request, may be credited toward subsequent Water Charges. Any CEQA analysis costs in excess of the monies received will be invoiced to the Landowners on a per acre basis. OID staff time costs related to biological field review and monitoring will be invoiced directly to the Landowner of the property on which the biological field review/monitoring occurs.

c) If the legality of the Program is challenged, the OID Board may, in its discretion, choose not to defend the Program, and/or choose to terminate the Program.

d) Construction related to the Program performed either by OID or the Landowner, shall not commence until the CEQA analysis has been completed.

e) Program Landowners acknowledge that the use and selection of biologists and environmental consultants, as well as the CEQA document preparation, will be at the District's discretion. However, with OID's approval, Landowner's may opt to select their own qualified biologist to conduct the biological field review.

f) Landowners agree to allow biological field review and/or monitoring by qualified biologists to occur on their property at their expense if deemed necessary by OID or its consultants for the CEQA analysis with prior notice. Biologists will be accompanied by OID staff on Landowner property during the initial field review(s). In certain circumstances where there is an increased potential for environmental impacts, mitigation or avoidance measures may be required by OID or the biologist to be incorporated into project construction. Failure of a Landowner to comply with these measures may at the District's discretion result in removal from the Program.

6. Price and Payment:

a) The term of the initial Program will be 10 years commencing upon the start of the 2023 irrigation season as early as March 1, 2023 and ending as late as September 30, 2032.

b) A minimum of 2 years prior to the conclusion of the 10-year period (September 30, 2030), Landowner(s) will have the option to exercise a Program extension for an additional 10 years at OID's sole discretion. Landowner notification to OID to exercise the first option for renewal will be required in writing prior to September 30, 2030 (year 8 of 10).

c) The price for water (Water Charge) will be $200 per acre foot during year 1

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of 10 and will increase 3% each year thereafter.

d) Landowners will be invoiced for the Minimum Quantity once the estimated surplus water volume, if any, is determined each year. Landowners shall submit a nonrefundable payment upfront for the Minimum Quantity prior to the receipt of any surplus water in any Program year. Any surplus water supplied above the minimum water usage will be charged at the per acre foot Water Charge and will be subsequently invoiced. Landowners will not be refunded for any water shortages as a result of the limitations in 4a and 4e above.

e) Unpaid balances, should they occur, shall be considered delinquent 31 days after invoicing. Termination from the Program may occur at the District's discretion as a result of delinquent payments. Additionally, all unpaid balances shall accrue interest and penalties as set forth in the OID Rules and Regulations.

7. Turn-outs:

a) Lands to be irrigated must be able to receive water from existing OID conveyance facilities. Landowners may add turn-outs to existing OID or private conveyance facilities provided the Landowner (1) obtains permission from OID; (2) pays all costs for construction and future maintenance of the diversion facility and appurtenances; and (3) obtains all applicable permits and approvals. Construction of new turnouts will be performed in accordance with OID's Irrigation and Drainage Infrastructure Installation Policy.

b) Installation of new "temporary" private turn-out facilities located within District's rights-of-way for the purpose of the diversion of surplus water shall be so installed with the approval of OID's District Engineer. Such installations shall not impede the District's on-going operations and maintenance programs. "Temporary" turnouts may be utilized only until a permanent turnout is installed as specified in 7c and 7d below.

c) Landowners without a permanent private turn-out facility must submit an OID Structure Review Application by along with the applicable processing fee no later than May 1, 2023 following the required CEQA approval. Upon OID's completion of the private turn-out structure design and construction cost estimate, the landowner will be required to submit a deposit for construction within 30-days of the date of the OID invoice.

d) Once installation of a permanent turnout is completed, the landowner will be invoiced for the Minimum Quantity during the next full irrigation season. If construction of the permanent turnout is completed during the irrigation season, no Minimum Quantity will be required to be purchased during that irrigation season.

e) Should the landowner wish to be billed by volume (per acre-foot), a flow measurement device integrated into OID's SCADA system, approved by the OID Water Operations Manager and accessible to OID employees must be installed within the OID right-of-way at the landowner's expense. If there is no such device, at the discretion and determination of the Water Operations Manager, water usage may be determined using crop specific evapotranspiration (ET) data and applying a 70% irrigation application efficiency during the time period which water was delivered.

f) OID maintains the first right of refusal to complete the design, construction and future maintenance or replacement of any new permanent private out-of-district turn-out facility, flow meter, slide gate and SCADA appurtenances within OID's right-of-way at the landowner's expense.

8. Other Conditions:

a) Surplus water purchased/delivered under the Program may not be re-sold.

b) Surplus water purchased/delivered may not be used to expand irrigated acreage.

c) An on-farm irrigation efficiency of seventy (70) percent or greater is required. At OID's request, Landowners 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 Landowner(s) to prove that a seventy (70) percent, or better, on-farm irrigation efficiency will be maintained.

d) Landowner(s) shall ensure no agricultural tail water will leaves the property during use of surplus water made available under this Program.

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

f) Any unauthorized private facilities or private facilities found to impede OID's operations and maintenance will be removed by the Landowner(s) or by the District at the Landowner's expense. The Landowner shall be held liable and responsible for the costs to repair any damage to OID facilities caused by the Landowner(s) or the Landowner(s) operations.

g) Landowner(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 may at the District's discretion result in cessation of water delivery by the District and removal from the Program.

h) At OID's request, Landowner(s) must provide proof of membership in the appropriate Water Quality Coalition.

i) 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 Program lands.

j) The District is under no future obligation beyond the term of this agreement to deliver surplus water to any diversion or service structures or facilities on behalf of the Program lands.

k) This Agreement coincides with the parcel(s) enrolled and may be transferred to a new landowner upon written approval from OID. Additional acreage may not be added during ownership transfer.

l) Landowner may terminate Agreement by providing written notice to OID. If terminated prior to Year 10, the parcel(s) may not be re-enrolled within the 10-Year term.

m) Upon termination of this Agreement, the Landowner(s) agrees upon OID request to remove, or pay all costs incurred with removing, those facilities to OID's satisfaction within the OID Right-of-Way that were installed to serve the Landowner but are no longer needed for water deliveries as determined by the District.

n) Landowner(s) agree to provide direct vehicle ingress and egress to the Districts' agents during the term of this Agreement for those lands participating in the Program. Unless in an emergency situation, OID agrees to notify the Landowner prior to accessing those lands participating in the Program.

9. Hold Harmless: Landowner(s) hereby acknowledges that the District sells surplus 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.

K:\Ag Water Department\Eric Thorburn\Water Ops Dept\Out of District Water & Delivery Tracking Sheet\2022 10-Yr Program\Final Terms - OID 10 year Program_2-7-23.docx

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Attachment C: 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 2025 DMP includes the components required by CWC 10826.2 and recommended by DWR in its 2025 AWMP Guidebook for inclusion (DWR 2025). Additionally, it provides a reflection on and evaluation of the 2012-2016 and 2020-2022 droughts.

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's 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 annual water year inflow to New Melones Reservoir as stipulated in the 1988 agreement with Reclamation. 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, OID and SSJID are jointly allocated 600,000 af; when inflow is less than 600,000 af, the available shared 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.

OID has also monitored groundwater levels twice per year within its service area since 2005, long before the passage of the Sustainable Groundwater Management Act (SGMA) in 2014, However, under SGMA, OID is also now actively involved in Groundwater Sustainability Plan (GSP) implementation, along with monitoring and reporting, for both the Eastern San Joaquin and Modesto Subbasins. The monitoring and reporting efforts include Annual Reports on hydrologic conditions, groundwater levels, and groundwater use that provide information about water supply availability and any impacts that may occur during drought.

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 Reclamation. This allows for improved understanding of potential future drought conditions and severity as well as additional information on drought planning and response that can be utilized by OID.

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 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. In the past 20 years (which OID has completed a water budget for: 2005 through 2024), they have received a full allocation in 16 years (80%). A partial allocation was received in 2013 through 2015 and in 2021. 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 32,600 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 approximately 45,400 af, although actual annual production between 2020 and 2024 ranged from approximately 1,300 to 2,300 af with an average of 1,600 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 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. As this trend continues, this relatively inflexible demand presents 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 measures to further increase operational efficiency and conserve available water supplies. Highlights of OID activities to increase operational efficiency include the following:

- In 2010, OID completed the new Northside Regulating Reservoir, allowing for the capture and regulation of substantial amounts of diverted water that may have otherwise been spilled. OID is also currently evaluating expansion of the Robert Van Lier reservoir, which was originally constructed in 2001.
- In 2011 Total Channel Control (TCC) was fully implemented on the Claribel and Cometa laterals, essentially eliminating operational spillage on these laterals. In the time since the 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 details.
- 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. OID continues to expand its SCADA system to

provide operators with additional remote monitoring data and operational control of system flows and water levels at strategic locations in real time. Additionally, new DSO hires or related positions complete a multi-day training at the ITRC on canal operations, water measurement principles, and SCADA equipment and operations.

- In 2014, a 30 percent reduction in surface water outflows was achieved during a time of drought as a result of progress in prior years and extraordinary actions. This was largely influenced by installation of measurement and monitoring equipment at surface water outflow sites, as well as integration into the SCADA system to make outflow data readily available. OID has continued working to increase water use efficiency and reduce surface water outflows in the time since.
- 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 this.

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 and ongoing 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.

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. 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.

One additional action to promote drought resiliency, which has been implemented in the past and 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 Surface Water Shortage Policy), through several actions, which may include the following:

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

These actions are summarized in the remainder of this section.

Outreach and Incentives. OID regularly provides educational resources and conducts outreach activities to support efficient water management by its water 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 drought efforts from the 2012-2016 drought include the attached Farmer to Farmer Transfer Program Application Agreement (Attachment C.1) and Temporary Permit for Conveyance Channel Use (Attachment C.2). These materials are made available to water users at the front office. Several special newsletters and Board of Directors press releases were also sent by mail to OID's constituents and were made available on the OID website.

Water Allocation Program. Under the extraordinary water shortage conditions of 2015, OID for the first time in its history, 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 conservation efforts by OID 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 a 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 (12-day rotations in full supply years), consistent with the increased evaporative demand and crop water requirements during this time in the summer. As the evaporative demand of the crops drops later in the summer, the District again lengthens the rotation intervals.

It is anticipated that this action will continue in the future. However, 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 Rules and Regulations , available on OID's website (www.oakdaleirrigation.com/water-operations), 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 from $500 to $1,500. For a second offense, the fine was increased from $750 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 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 DMP, 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 Surface Water Shortage Policy identifies three levels of shortage based on available surface water supplies from New Melones. In response to the 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:

1. Establishment of a water allocation to each assessed acre
2. Allocation reductions or suspensions starting with lower priority users
3. Modified District groundwater pumping operations
4. Extended delivery rotations
5. Limiting irrigation water usage to agricultural purposes only
6. Enhanced enforcement of tailwater policies
7. Increased water theft enforcement and penalties
8. Increased outreach and communications strategies
9. Monthly supply assessments and allocation adjustments (as warranted)
10. Conveyance agreements to permit use of OID facilities for movement of groundwater from private wells
11. Facilitation of a farmer-to-farmer water allocation transfer program

The Surface Water Shortage Policy is included as Attachment D to the 2025 AWMP.

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

As described above and in the Surface Water Shortage Policy (2025 AWMP Attachment D), there are three levels of water shortage identified based on the District's allocation under the 1988 Agreement 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 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 request 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 DMP 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 the evaluation of the impacts of drought and the effectiveness of the DMP and Policy; it also provides opportunities to revise the DMP and improve drought management within the District. To this end, the Evaluation of Recent Droughts section below includes a review of recent droughts and their impacts to OID, focusing on the 2012-2016 drought.

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 drought efforts from the 2012-2016 drought include the attached Farmer-to-Farmer Transfer Program Application Agreement (Attachment C.1) and Temporary Permit for Conveyance Channel (Attachment C.2). These materials are made available to water users at the front office. Several special newsletters and Board of Directors press releases were sent by mail to OID constituents and were also made available on the OID website.

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 Water Advisory Committee to further coordinate, plan and manage water related 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 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 Recent Droughts

The sections below provide a review and evaluation of recent periods of drought, including review of impacts to water supplies and water demands. It includes a review of the 2012 to 2016 and 2020 to 2022 droughts, but is primarily focused on the 2012 to 2016 drought, which was the more severe of the two recent droughts.

2012 to 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 represents 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 C.1). Although water supplies from New Melones were reduced in 2013 as a result of insufficient inflows under the 1988 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.

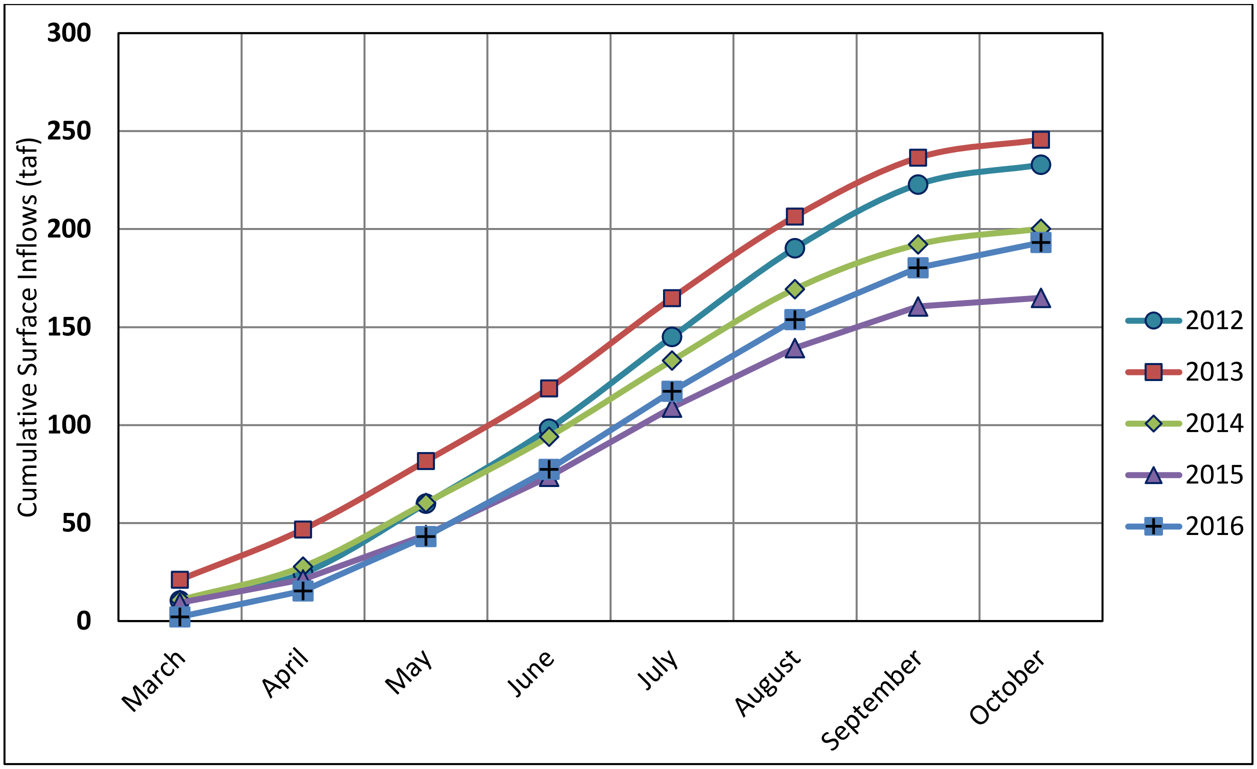

Figure C.1. OID Cumulative March to October Surface Inflows, 2012-2016.

OID total district pumping was lowest during 2012 and 2016 at slightly more than six and less than four taf (Figure C.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.

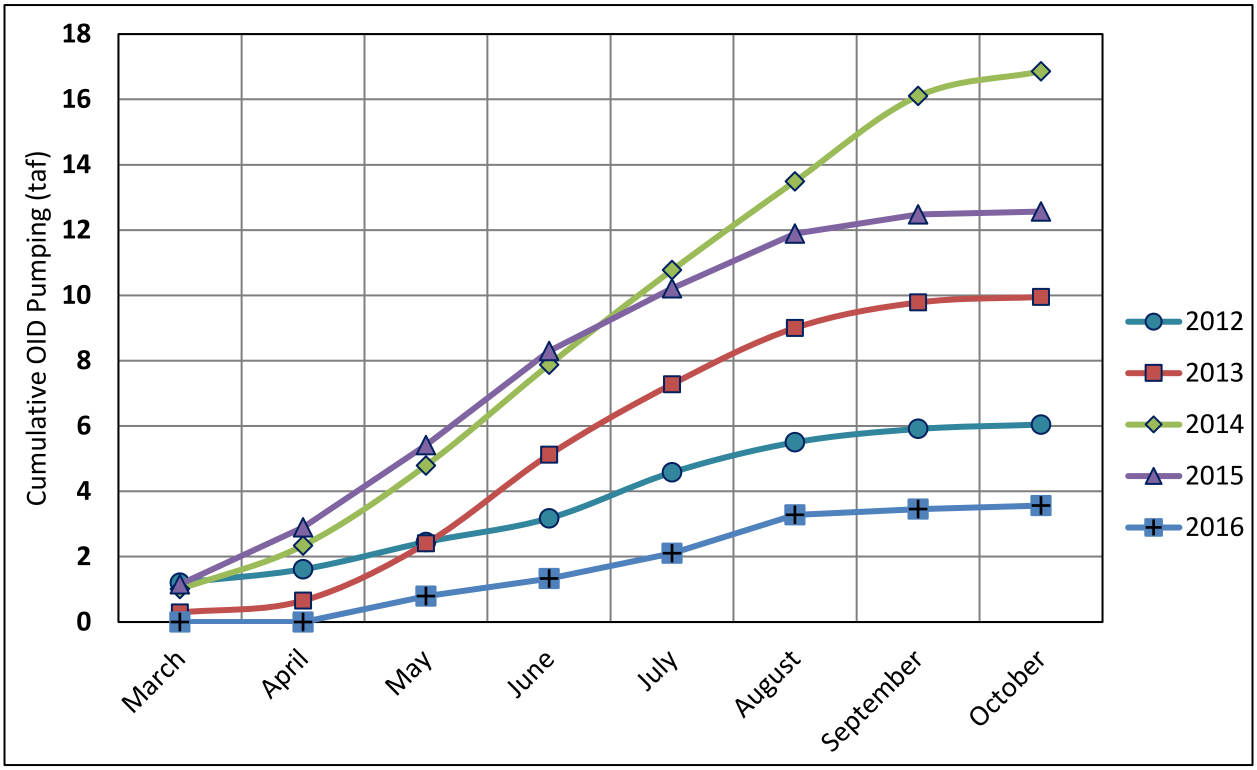

Figure C.2. Cumulative March to October District Groundwater Pumping, 2012-2016.

Private pumping within OID's service area was approximately 20 taf in 2012 and 2013 (Figure C.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 that were previously out-of-district and thus not included in private groundwater estimates in 2012 and 2013 rather than additional pumping on historical OID lands. These annexed lands will use surface water when available, but continued to use primarily groundwater in 2014 due to the drought conditions. The annexed lands, which lie to the east of the historical OID service area, received half their anticipated allotment (7,500 af rather than 15,000 af) in 2014. In 2015, private pumping increased to approximately 70 taf. This number is reflective of increased private groundwater pumping to supplement 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 C.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.

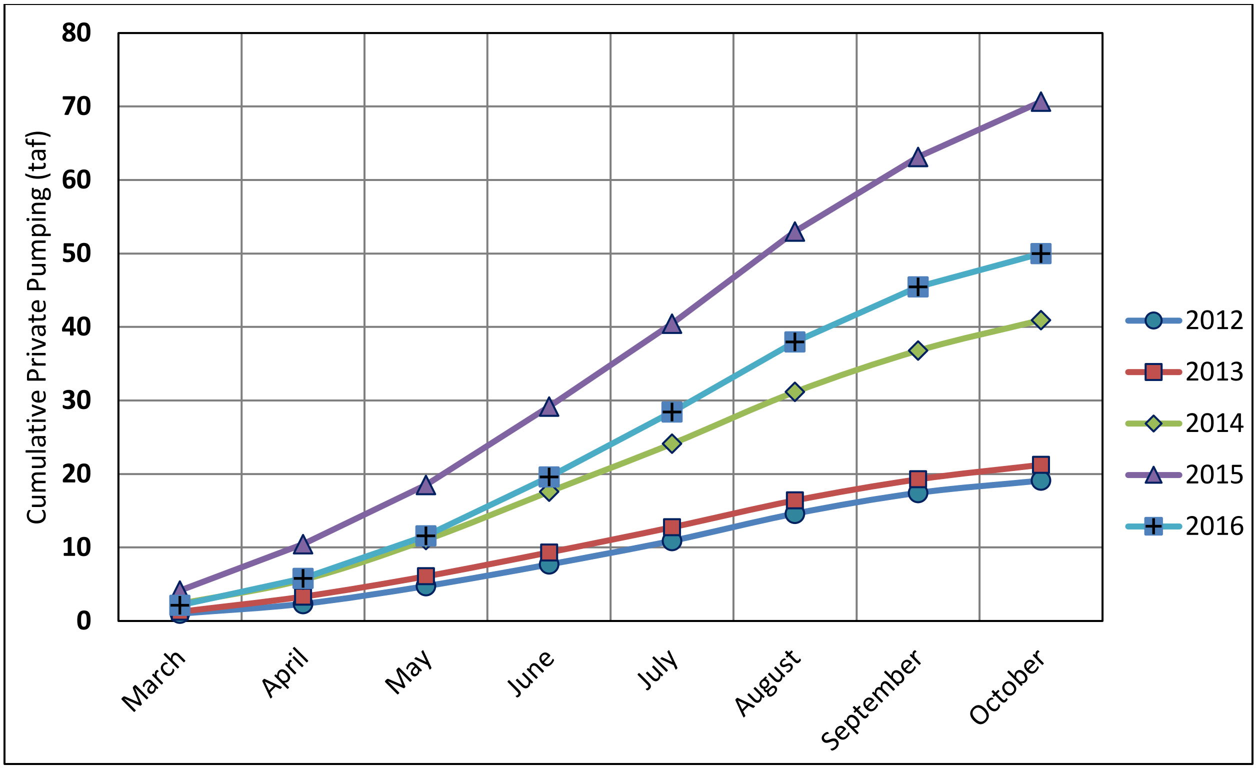

Figure C.3. Cumulative March to October Private Groundwater Pumping, 2012-2016.

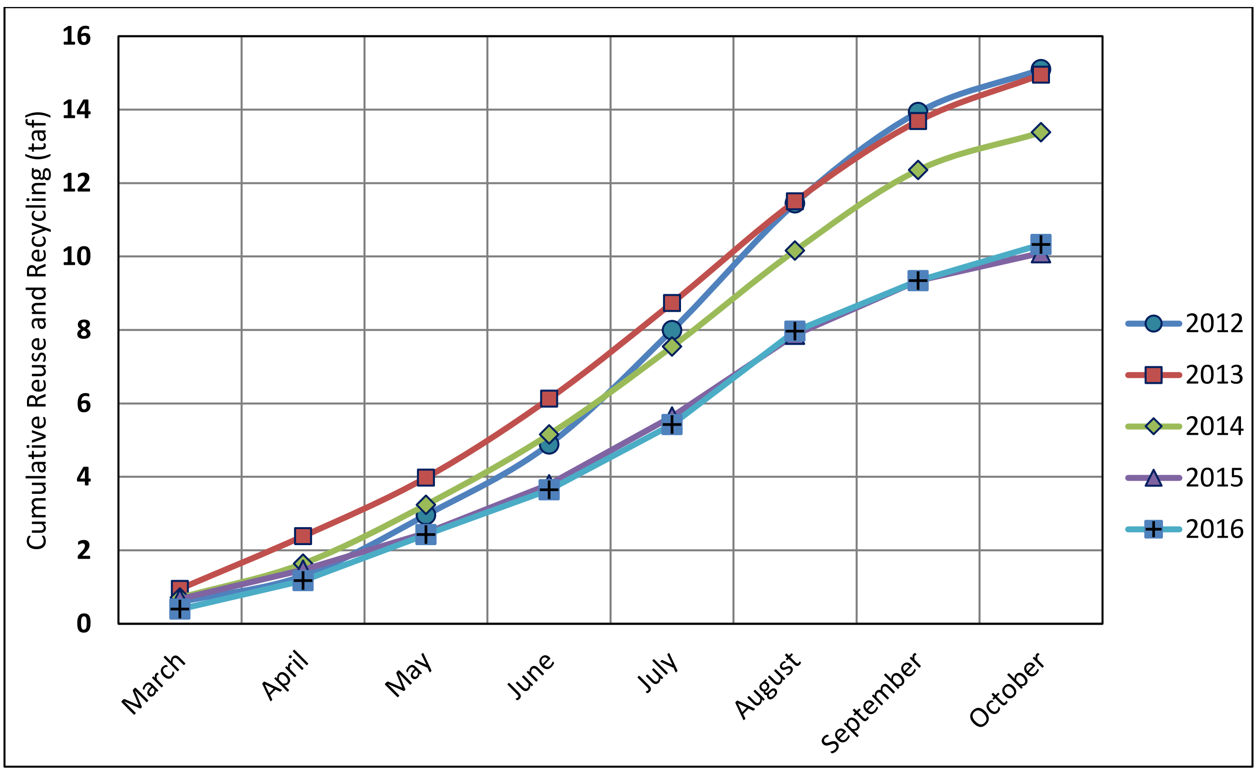

Figure C.4. Cumulative March to October Reuse and Recycling, 2012-2016.

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 C.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.

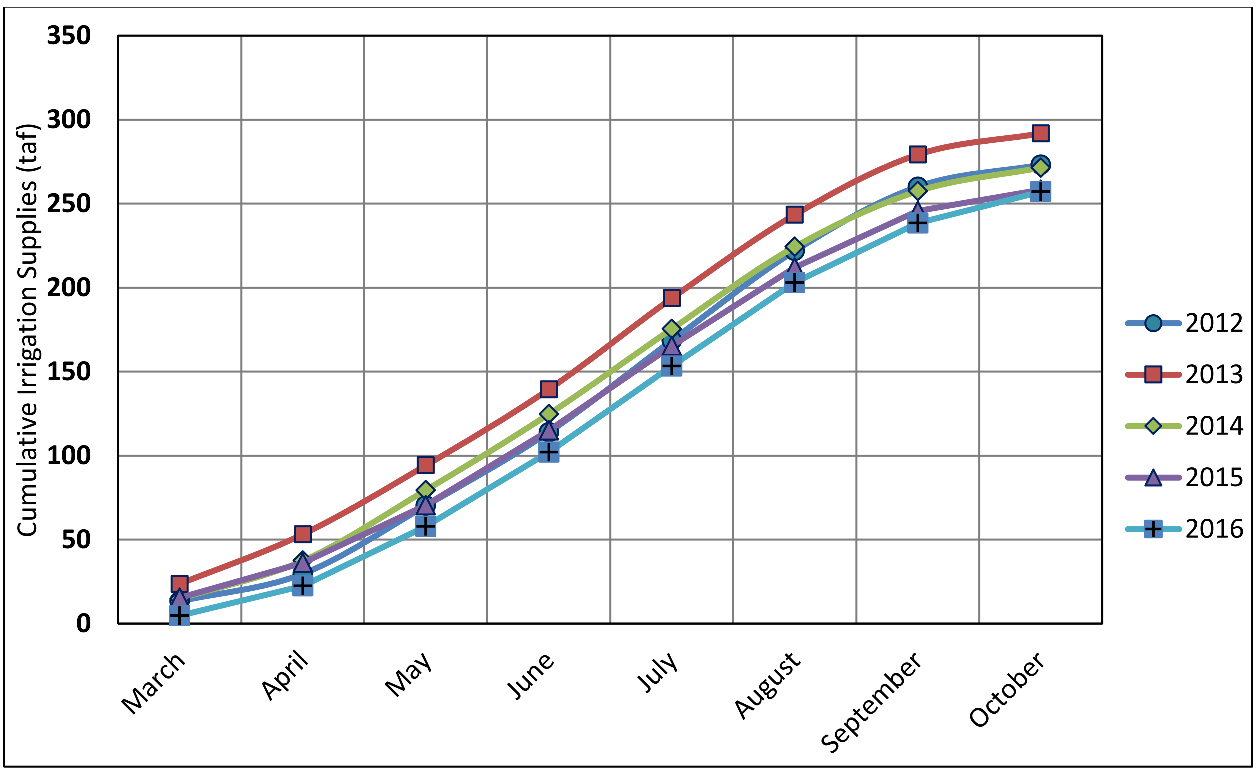

Figure C.5. Cumulative March to October Total Irrigation Supplies, 2012-2016.

Water Demand Impacts

To illustrate impacts to water demands during drought, demands 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 represents 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 C.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 lowest 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 C.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 C.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.

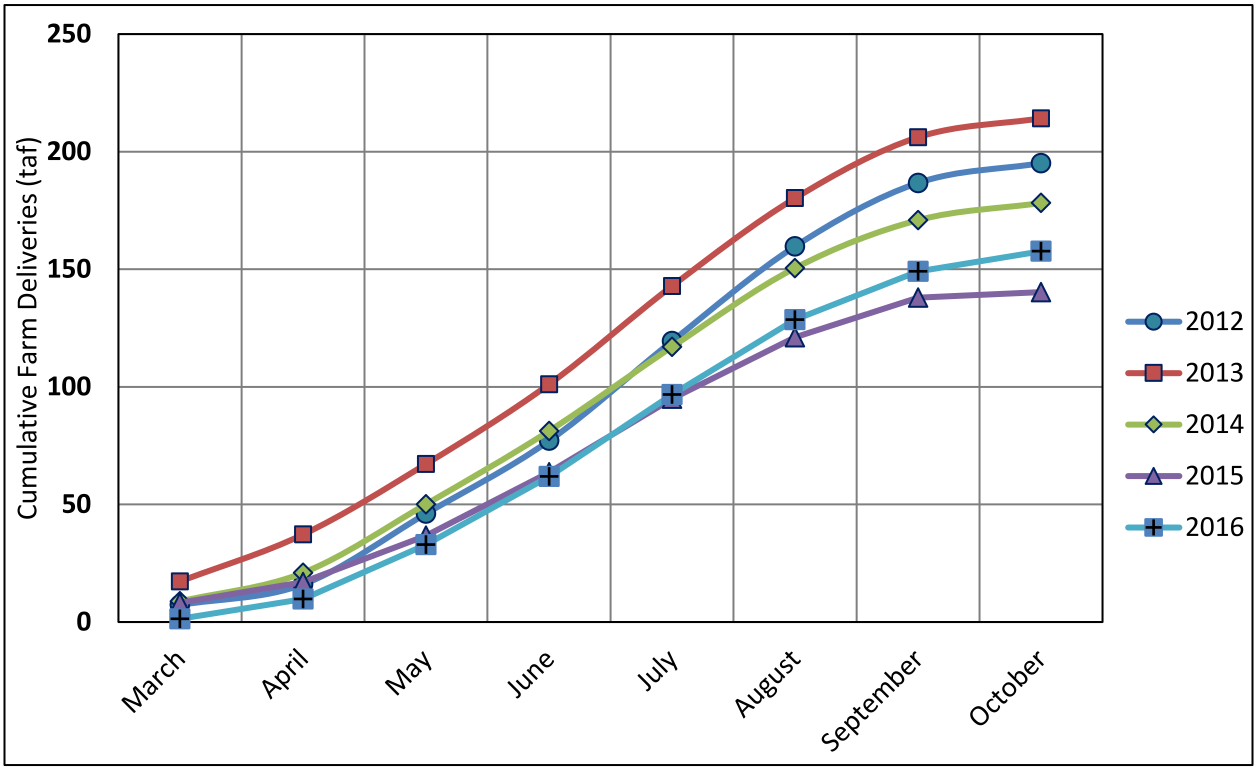

Figure C.6. Cumulative March to October Farm Deliveries, 2012-2016.

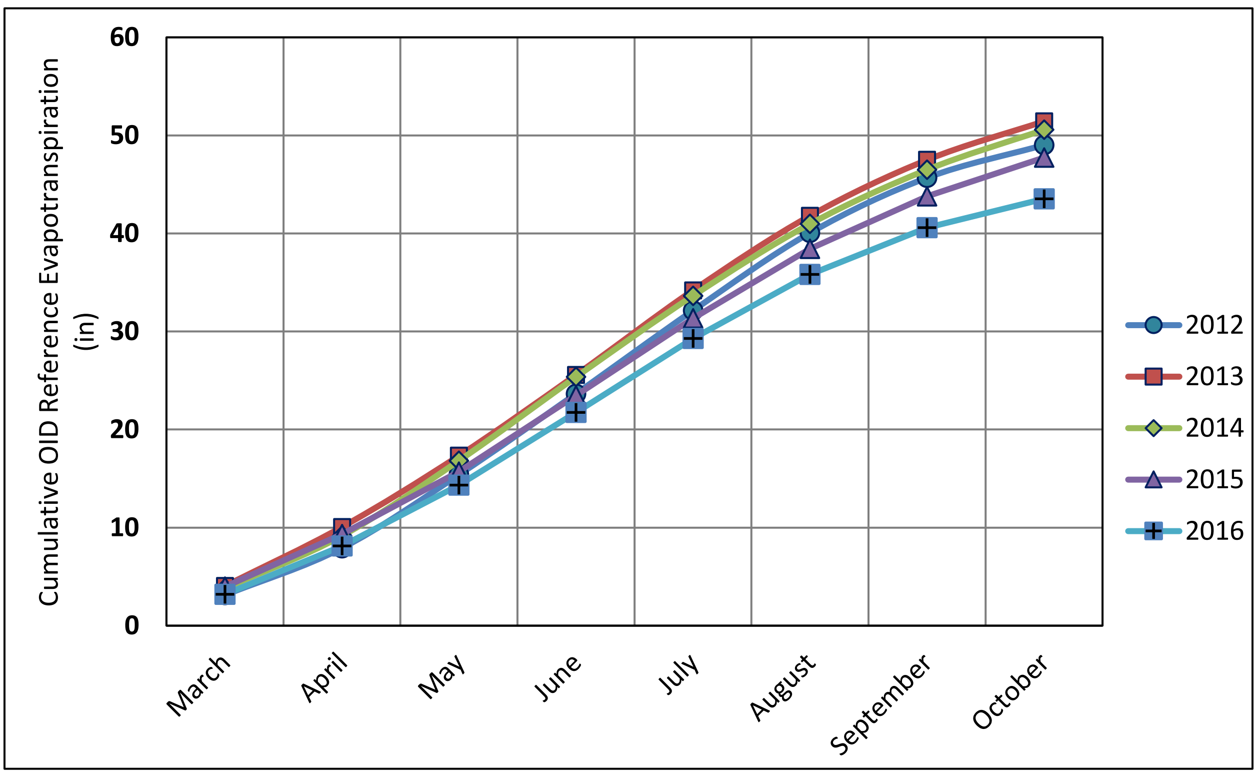

Figure C.7. Cumulative March to October Reference Evapotranspiration, 2012-2016.

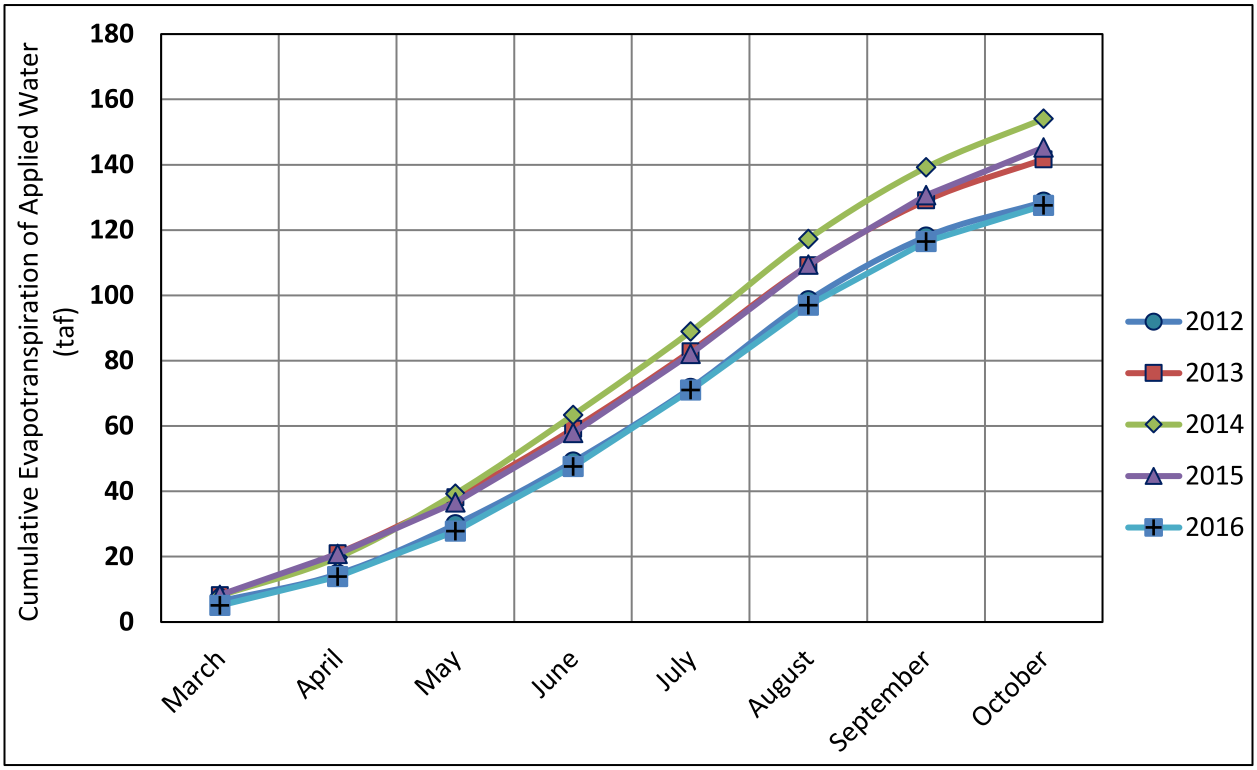

Figure C.8. Cumulative March to October Crop Evapotranspiration of Applied Water, 2012-2016.

2020 to 2022 Drought

Within the state of California, the period from 2020 to 2022 included some of the driest years on record. This period of drought impacted different areas across the state in different ways and with different levels of severity, dependent on local conditions, but by Fall 2022, nearly 100% of the State was experiencing moderate to severe drought (NIDIS, 2022). The most severe, exceptional drought was experienced in the southern San Joaquin Valley and Tulare Basin to the south of OID in the Central Valley.

In 2021, OID's surface water supplies from New Melones were reduced by 18% (from 300 taf to 245 taf) due to insufficient inflows under the 1988 Agreement. In response to the reduction, OID increased communication and outreach to growers, closely monitored water use efficiency and surface water outflows within its service area, closely monitored drought conditions and water supply availability beyond its service area, and supplemented 5 taf of water supply from the District's conservation account during this period. As a result of OID's drought responses and management activities, the District was not required to implement some of the drought response and mitigation actions that it did during the 2012 to 2016 drought (such as declaring a water shortage, implementing an allocation on water users within OID, or increasing District groundwater pumping). 2021 was the only year during this drought period where OID's surface water supplies were reduced.

References

Department of Water Resources (DWR). 2025. A Guidebook to Assist Agricultural Water Suppliers to Prepare a 2025 Agricultural Water Management Plan. California Department of Water Resources.

National Integrated Drought Information System (NIDIS). 2022. California-Nevada Drought Status Update for October 18, 2022. Available at: www.drought.gov/drought-status-updates/california-nevada-drought-status-update-10-18-22

Attachments

C.1. Farmer to Farmer Transfer Program Application Agreement

C.2. Temporary Permit for Conveyance Channel

C.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.*

C.2. Temporary Permit for Conveyance Channel Use

NOTE:
Pursuant to District policy these rates increase annually on January 1st of each year.

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. **Applications and payments dropped through the door will be processed as time permits with in-person customers having priority. Applications without payments or fully executed agreement will not be accepted and processed until payment is received.**

☐ 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:	$265.00 per application
Out-of-District Landowner:	$530.00 per application

OAKDALE IRRIGATION DISTRICT

Approved: ___________________________

LANDOWNER SIGNATURE

____

Exhibit A

2025 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. <u>Nature of Right Conferred</u>. 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. <u>Hold Harmless</u>. 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. <u>Third Party Indemnification</u>. 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

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

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Attachment D: 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.

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. <u>LEVELS OF SURFACE WATER SHORTAGES AND OID'S RESPONSE</u>

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. <u>Level One</u> – 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.

B. Level Two – 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. Level Three – 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. TAIL WATER DISCHARGE POLICY & SUBSEQUENT FINES

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.

4. <u>WATER ALLOCATION PROGRAM</u>

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. <u>FARMER TO FARMER TRANSFER PROGRAM</u>:

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 E: Public Participation

- OID Board of Directors Agenda, March 3, 2026
- Notices of Intent to Prepare and Adopt an AWMP to City of Oakdale, Stanislaus County, and San Joaquin County, January 30, 2026
- Oakdale Leader Notice of Publication, February 11 and 18, 2026
- Resolution of Adoption, March 3, 2026

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OID Board of Directors Agenda, March 3, 2026

AGENDA
OAKDALE IRRIGATION DISTRICT
BOARD OF DIRECTORS
REGULAR MEETING
MARCH 3, 2026

A complete copy of the Agenda packet will be available on the Oakdale Irrigation District website https://www.oakdaleirrigation.com/.

If you would like to join the meeting virtually instead of in person, please see the below options:

- To join the meeting via teleconference, CLICK HERE or go to https://www.oakdaleirrigation.com/ and select "View Meetings Online".

- To participate in the meeting via telephone, dial in at 1 (669) 900-9128, Access Code: 358-572-1867 #, the message will ask for a participant ID, just press # again. If you experience technical difficulties, please contact our IT Systems Administrator Michael Ballinger at (209) 896-6887.

Public comments may be submitted in advance via email to smoody@oakdaleirrigation.com no later than 4:30 p.m. on the day before the meeting. If you wish to make public comments during the live teleconference, you may alert the Board President at the time public comments are called for. Pursuant to Government Code section 54954.3(b)(1), public comment on an Agenda Item is limited to five (5) minutes.

CALL TO ORDER: 9:00 a.m. – District Boardroom
1205 East F Street, Oakdale, California

PLEDGE OF ALLEGIANCE

ROLL CALL: Brad DeBoer, Jacob DeBoer, Herman Doornenbal, Tom Orvis, and Ed Tobias

ADDITION OR DELETION OF AGENDA ITEMS

ACTION TO TAKE VARIOUS ITEMS OUT OF SEQUENCE

PUBLIC COMMENT: The Board of Directors welcomes participation in its 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.

Because matters being discussed are not on the agenda there should be no expectation of discussion or comment by the Board except to properly refer the matter for review or action as appropriate. Matters concerning District operations or responsibilities can be addressed prior to Board meetings by contacting District Management or Directors. In this manner, your concerns can be addressed expeditiously.

The Oakdale Irrigation District Board pledges to be respectful, truthful, knowledgeable, productive and unified in conducting the people's business. The Board believes in conducting its business using respectful and civil dialogue and would request that the public conduct itself in a similar fashion in their presentations. Disrespectful and threatening behavior will not be tolerated.

It is not required, but speakers may provide their name and address. Public Comments will be limited to five minutes per speaker.

OID Board Meeting
Agenda
March 3, 2026
Page 2

PUBLIC HEARING

1. Receive Public Comment Regarding the Draft 2025 Water Management Plan for Board Consideration. Take Possible Action to Approve the 2025 Water Management Plan

   a. Public Hearing

   b. Take Possible Action to Approve the 2025 Water Management Plan

CONSENT CALENDAR

2. Approve the Board of Directors' Minutes of the Regular Meeting of February 3, 2026

3. Approve Oakdale Irrigation District's Statement of Obligations

4. Approve OID Improvement Districts' Statement of Obligations

5. Approve the Treasurer's Report as of January 31, 2026

ACTION CALENDAR

6. Review and Take Possible Action to Authorize Submittal of Oakdale Irrigation District's Grant Application for the Federal Fiscal Year 2024 State & Local Cybersecurity Grant Program (FFY2024 SLCGP)

7. Review and Take Possible Action to Adopt a Resolution Approving Water Availability for the 10-Year Out-Of-District Water Sale Program During the 2026 Irrigation Season

8. Review and Take Possible Action to Approve Resolution Finding the Agreement to Purchase Water Released by the Oakdale Irrigation District and the South San Joaquin Irrigation District for Diversion and Use by the San Luis and Delta Mendota Water Authority and the California Department of Water Resources Categorically Exempt Under the California Environmental Quality Act (CEQA)(To be Addressed After Closed Session)

COMMUNICATIONS

9. Directors' Comments/Suggestions

10. Committee Reports

11. General Manager's Report on the Status of OID Activities

12. Water Counsel Report

CLOSED SESSION

13. CONFERENCE WITH LEGAL COUNSEL – ANTICIPATED LITIGATION
    Pursuant to Government Code §54956.9(d)(2)
    One (1) matter

14. CONFERENCE WITH LEGAL COUNSEL – EXISTING LITIGATION
    Pursuant to Government Code §54956.9(d)(1)
    Two (2) cases

OID Board Meeting
Agenda
March 3, 2026
Page 3

a. San Joaquin Tributaries Authority, et al v. California State Water Resources Control Board
County of Sacramento Superior Court
Case No. JCCP 5013

b. Threfall Ranch LP v. Oakdale Irrigation District, et al
Superior Court of Stanislaus County
Case No. CV-24-006033

15. CONFERENCE WITH REAL PROPERTY NEGOTIATORS
Pursuant to Government Code §54956.8
One (1) case

a. Property: Water
Agency Negotiator: General Manager, Water Counsel
Negotiating Parties: California Department of Water Resources, U.S. Bureau of Reclamation, San Luis Delta Mendota Water Authority, South San Joaquin Irrigation District, and Oakdale Irrigation District
Under Negotiation: Price, Terms and Conditions

16. POTENTIAL LITIGATION
Pursuant to Government Code §54956.9(d)(4)
Two (2) cases

17. PERSONNEL MATTER
Pursuant to Government Code §54957(b)(1)

ADJOURNMENT

- The next Regular Board Meeting of the **Oakdale Irrigation District Board of Directors** is scheduled for **Tuesday, April 7, 2026, at 9:00 a.m.** in the boardroom at 1205 East F Street, Oakdale, CA.
- The next Joint Board Meeting of the **South San Joaquin** and **Oakdale Irrigation Districts** serving the **Tri-Dam Project** and **Tri-Dam Power Authority** and other joint business matters is scheduled for **Thursday, March 19, 2026, at 9:00 a.m.** in the boardroom at the office of 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 Executive Assistant at (209) 840-5502.

ADA Compliance Statement: In compliance with the American Disability Act, if you need special assistance to participate in this meeting, please contact the Executive Assistant at (209) 840-5502. Notification 48 hours prior to the meeting will enable the District to make reasonable arrangements to ensure accessibility to this meeting.

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Notices of Intent to Prepare and Adopt an AWMP to City of Oakdale, Stanislaus County, and San Joaquin County, January 30, 2026

January 30, 2026

City of Oakdale
Community Development Department
455 S. Fifth Avenue
Oakdale, CA 95361

Re: Draft 2025 OID AWMP Public Review and Comment

Dear Community Development Department:

Please be advised that the Oakdale Irrigation District (OID) has prepared a Draft 2025 Agricultural Water Management Plan (AWMP or Draft Plan) in accordance with the requirements of the Water Conservation Bill of 2009 (SBx7-7) and the Water Management Planning Bill 1668 (AB 1668). This AWMP updates OID's previous 2020 AWMP. The Draft Plan is now available for review on the Oakdale Irrigation District website (www.oakdaleirrigation.com) and/or purchase at the OID office. The OID Board of Directors will hold a public hearing on March 3, 2026 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. Alternatively, the public hearing will be accessible telephonically or electronically to all members of the public who wish to participate and provide public comment on the Draft Plan. To join the public hearing via telephone, please call 1-669-900-9128, access code 358-572-1867#. To join the public hearing via teleconference go to https://www.oakdaleirrigation.com/view-meetings-online and click on the "View Online" link under the Regular/Special Board Meeting section. 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 Resources Manager/District Engineer

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

January 30, 2026

San Joaquin County
Community Development Department
1810 E. Hazelton Avenue
Stockton, CA 95205

Re: Draft 2025 OID AWMP Public Review and Comment

Dear Community Development Department:

Please be advised that the Oakdale Irrigation District (OID) has prepared a Draft 2025 Agricultural Water Management Plan (AWMP or Draft Plan) in accordance with the requirements of the Water Conservation Bill of 2009 (SBx7-7) and the Water Management Planning Bill 1668 (AB 1668). This AWMP updates OID's previous 2020 AWMP. The Draft Plan is now available for review on the Oakdale Irrigation District website (www.oakdaleirrigation.com) and/or purchase at the OID office. The OID Board of Directors will hold a public hearing on March 3, 2026 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. Alternatively, the public hearing will be accessible telephonically or electronically to all members of the public who wish to participate and provide public comment on the Draft Plan. To join the public hearing via telephone, please call 1-669-900-9128, access code 358-572-1867#. To join the public hearing via teleconference go to https://www.oakdaleirrigation.com/view-meetings-online and click on the "View Online" link under the Regular/Special Board Meeting section. 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 Resources Manager/District Engineer

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

January 30, 2026

Stanislaus County
Environmental Review Committee
1010 – 10th Street, Suite 3400
Modesto, CA 95354

Re: Draft 2025 OID AWMP Public Review and Comment

Dear Community Development Department:

Please be advised that the Oakdale Irrigation District (OID) has prepared a Draft 2025 Agricultural Water Management Plan (AWMP or Draft Plan) in accordance with the requirements of the Water Conservation Bill of 2009 (SBx7-7) and the Water Management Planning Bill 1668 (AB 1668). This AWMP updates OID's previous 2020 AWMP. The Draft Plan is now available for review on the Oakdale Irrigation District website (www.oakdaleirrigation.com) and/or purchase at the OID office. The OID Board of Directors will hold a public hearing on March 3, 2026 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. Alternatively, the public hearing will be accessible telephonically or electronically to all members of the public who wish to participate and provide public comment on the Draft Plan. To join the public hearing via telephone, please call 1-669-900-9128, access code 358-572-1867#. To join the public hearing via teleconference go to https://www.oakdaleirrigation.com/view-meetings-online and click on the "View Online" link under the Regular/Special Board Meeting section. 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 Resources Manager/District Engineer

cc: Administration Files
Board of Directors (5)

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

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Oakdale Leader Notice of Publication, February 11 and 18, 2026

When recorded mail to:

OAKDALE IRRIGATION DISTRICT
1205 EAST F STREET
OAKDALE, CA 95361

This space is for the County Clerk's Filing Stamp

PROOF OF PUBLICATION
(2015.5 C. C. P.)

STATE OF CALIFORNIA,

County of Stanislaus,

Proof of Publication of
PUBLIC NOTICE

SEE ATTACHED-

I am a citizen of the United States and a resident of the county aforesaid; I am over the age of twenty-one years, and not a party to or interested in the above entitled matter. I am the principal clerk of THE OAKDALE LEADER, 603 W F Street, Oakdale, California, a newspaper of general circulation, published in Oakdale, California in the City of Oakdale, County of Stanislaus, and which newspaper has been adjudged a newspaper of general circulation, by the Superior Court of the County of Stanislaus, State of California. That the notice, of which the annexed is a printed copy (set in type not smaller than nonpareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

Feb.11, 18, 2026

I certify or declare under penalty of perjury that the foregoing is true and correct.

Dated at Oakdale,

This 18th day of February, 2026

Michelle Kendig
Signature

PUBLIC NOTICE

Notice is hereby given that the Oakdale Irrigation District (OID) has prepared a Draft 2025 Agricultural Water Management Plan (AWMP or Draft Plan) in accordance with the requirements of the Water Conservation Bill of 2009 (SBx7-7) and the Water Management Planning Bill 1668 (AB 1668). This AWMP updates OID's previous 2020 AWMP. The Draft Plan is now available for review on the Oakdale Irrigation District website (www.oakdaleirrigation.com) and/or purchase at the OID office. The OID Board of Directors will hold a public hearing on March 3, 2026 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. Alternatively, the public hearing will be accessible telephonically or electronically to all members of the public who wish to participate and provide public comment on the Draft Plan. To join the public hearing via telephone, please call 1-669-900-9128, access code 358- 572-1867#. To join the public hearing via teleconference go to https://www.oakdaleirrigation.com/view-meetings-online and click on the "View Online" link under the Regular/Special Board Meeting section. 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.

Resolution of Adoption, March 3, 2026

OAKDALE IRRIGATION DISTRICT
RESOLUTION NO. 2026-06

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 providing water to 10,000 or more irrigated acres to update its Agricultural Water Management Plan on or before April 1, 2021, and thereafter on or before April 1 in years ending in six and one; 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 10826 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 3, 2026 hearing in accordance with Government Code Section 6066 by published notice in the Oakdale Leader, 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 2, 2021 meeting of the District's Board of Directors; and

WHEREAS, the District held a public hearing at the March 3, 2026, 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 2025 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;

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 Doornenbal, seconded by Director J. DeBoer, and duly submitted to the Board for its consideration, the above-titled Resolution was adopted this 3rd day of March 2026.

OAKDALE IRRIGATION DISTRICT

Thomas D. Orvis, President
Board of Directors

Scot A. Moody
General Manager/Secretary

Attachment F: 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 2015 through 2024 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 attachment, the following annual water budget results are provided:

- **Tables F-1 through F-4:** Annual calendar year (January through December) water budget results from 2005 through 2024 for the entire OID Service Area
- **Tables F-5 through F-8:** Annual calendar year (January through December) water budget results from 2005 through 2024 for the northern OID Service Area
- **Tables F-9 through F-12:** Annual calendar year (January through December) water budget results from 2005 through 2024 for the southern OID Service Area
- **Tables F-13 through F-16:** Annual water year (October through September) water budget results from 2006[33] through 2024 for the entire OID Service Area
- **Tables F-17 through F-20:** Annual water year (October through September) water budget results from 2006 through 2024 for the northern OID Service Area
- **Tables F-21 through F-24:** Annual water year (October through September) water budget results from 2006 through 2024 for the southern OID Service Area

[33] 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.

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Table F-1. OID Distribution System Annual Calendar Year (January to December) Water Budget Results, 2005 to 2024.

				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	2,687	2,097	0	2,788	5,950	1,033	1,600	13,495	23,999	**191,974**
2006	175	Full	Wet	226,202	1,527	8,956	37	1,924	2,097	0	2,495	5,508	1,030	1,596	17,549	23,204	**189,361**
2007	214	Partial	Dry	262,185	7,505	10,100	99	1,785	2,097	0	2,997	5,663	1,203	1,863	18,965	28,375	**224,704**
2008	205	Partial	Dry	244,610	14,862	11,155	11	1,831	2,103	0	2,876	8,384	1,200	1,859	13,617	27,181	**219,455**
2009	200	Full	Dry	234,565	15,689	9,669	69	1,948	2,097	0	2,754	5,689	1,164	1,803	12,931	26,518	**213,178**
2010	205	Full	Wet	216,957	5,683	7,729	148	1,789	2,097	0	2,390	4,573	1,109	1,718	14,621	27,181	**182,810**
2011	192	Full	Wet	219,154	2,311	7,430	114	1,782	2,097	0	2,324	6,340	1,051	1,628	15,540	25,458	**180,546**
2012	218	Full	Dry	232,934	6,634	8,219	168	1,858	2,103	0	2,383	3,666	1,206	1,868	15,593	28,905	**198,297**
2013	214	Partial	Dry	245,621	10,112	7,705	55	1,687	2,097	0	2,550	234	1,245	1,929	16,003	28,375	**216,941**
2014	208	Partial	Dry	200,233	18,298	6,518	76	1,580	2,097	0	1,988	217	1,205	1,867	13,734	27,579	**182,211**
2015	207	Partial	Dry	164,988	12,590	3,337	75	2,108	2,097	0	2,430	1,908	1,124	1,742	7,665	27,446	**142,881**
2016	213	Full	Dry	193,139	3,577	4,413	100	1,382	2,103	0	2,430	2,577	1,053	1,631	9,563	28,242	**159,218**
2017	211	Full	Wet	195,975	2,451	3,978	77	1,898	2,097	0	1,775	2,512	1,217	1,886	9,397	27,977	**161,713**
2018	212	Full	Dry	209,347	2,874	3,616	106	1,754	2,097	0	1,771	3,860	1,225	1,897	12,596	28,085	**170,359**
2019	212	Full	Wet	211,607	1,686	3,508	99	1,895	2,097	0	1,862	4,768	1,132	1,754	12,989	27,961	**170,427**
2020	240	Full	Dry	237,154	1,495	3,613	151	1,500	2,103	0	2,080	5,925	1,185	1,836	12,677	31,654	**190,660**
2021	237	Partial	Dry	245,560	2,333	3,848	35	1,887	2,097	0	2,144	4,450	1,274	1,974	12,021	31,259	**202,639**
2022	239	Full	Dry	251,882	1,639	2,947	39	1,929	2,097	0	2,096	1,721	1,229	1,905	10,410	31,522	**211,650**
2023	205	Full	Wet	214,346	1,363	3,300	34	2,050	2,097	0	1,688	5,948	1,060	1,641	10,605	27,038	**175,210**
2024	225	Full	Wet	230,741	1,309	3,020	107	2,310	2,103	0	1,648	7,953	1,182	1,836	11,621	29,650	**185,698**
Minimum				164,988	1,309	2,947	11	1,382	2,097	0	1,648	217	1,030	1,596	7,665	23,204	**142,881**
Maximum				262,185	18,298	11,155	168	2,687	2,103	0	2,997	8,384	1,274	1,974	18,965	31,654	**224,704**
Wet Year Average				217,356	2,298	5,999	85	2,042	2,098	0	2,121	5,444	1,102	1,708	13,227	26,558	**179,717**
Dry Year Average				226,852	8,134	6,262	82	1,771	2,099	0	2,375	3,691	1,193	1,848	12,981	28,762	**194,349**
Overall Average				223,053	5,800	6,156	83	1,879	2,099	0	2,273	4,392	1,156	1,792	13,080	27,880	**188,497**

Table F-2. OID Farmed Lands Annual Calendar Year (January to December) Water Budget Results, 2005 to 2024.

				Applied Water Budget										Precipitation Budget				
				Inflows (af)				Outflows (af)						Inflows (af)	Outflows (af)			
Year	Irrigation Season Number of Days	USBR Allotment	Hydrologic Year Type	OID Farm Deliveries	Private Drainwater Reuse	Private Groundwater Pumping	Recycled to Farm Lands	Crop ET of Applied Water	Tailwater to Drainage System	District Tailwater Reuse	**Deep Percolation of Applied Water (Closure)**	Change in Storage (af)	Crop Consumptive Use Fraction (CCUF)	Precipitation	Crop ET of Precipitation	Runoff of Precipitation	Deep Percolation of Precipitation	**Change in Storage (Closure, af)**
2005	181	Full	Wet	191,974	3,156	15,962	1,168	105,847	53,772	2,687	**49,954**	0	0.50	64,895	53,907	4,110	28,228	**-21,350**
2006	175	Full	Wet	189,361	3,848	19,655	1,168	125,320	42,842	1,924	**43,946**	0	0.59	53,656	38,526	4,096	16,725	**-5,690**
2007	214	Partial	Dry	224,704	4,504	22,488	1,168	144,394	47,483	1,785	**59,202**	0	0.57	37,724	27,850	1,357	7,942	**574**
2008	205	Partial	Dry	219,455	4,613	23,157	1,168	147,824	47,924	1,831	**50,813**	0	0.60	41,076	29,079	2,563	12,105	**-2,672**
2009	200	Full	Dry	213,178	4,414	22,290	1,168	146,394	52,243	1,948	**40,465**	0	0.61	39,448	28,565	2,260	8,848	**-225**
2010	205	Full	Wet	182,810	3,569	17,990	1,168	117,721	47,853	1,789	**38,174**	0	0.57	82,032	43,723	4,057	20,053	**14,198**
2011	192	Full	Wet	180,546	2,772	17,683	1,168	117,910	50,177	1,782	**32,300**	0	0.58	49,674	46,605	2,814	19,281	**-19,026**
2012	218	Full	Dry	198,297	3,252	21,467	1,168	142,854	57,044	1,858	**22,429**	0	0.64	58,720	28,758	3,130	11,909	**14,924**
2013	214	Partial	Dry	216,941	3,690	24,671	1,168	161,385	53,654	1,687	**29,744**	0	0.65	18,537	26,111	980	9,168	**-17,722**
2014	208	Partial	Dry	182,211	3,439	45,866	1,168	170,997	37,836	1,580	**22,270**	0	0.73	65,408	28,145	6,266	13,021	**17,976**
2015	207	Partial	Dry	142,881	3,235	75,830	1,168	162,498	42,973	2,108	**15,535**	0	0.73	46,095	34,556	2,995	12,583	**-4,038**
2016	213	Full	Dry	159,218	2,752	54,744	1,168	144,228	34,926	1,382	**37,345**	0	0.66	89,868	48,619	9,329	29,994	**1,925**
2017	211	Full	Wet	161,713	3,187	61,065	1,168	168,896	39,054	1,898	**17,285**	0	0.74	80,104	56,721	7,579	33,051	**-17,247**
2018	212	Full	Dry	170,359	3,577	55,336	1,168	173,432	39,719	1,754	**15,534**	0	0.75	68,782	37,817	5,345	13,818	**11,802**
2019	212	Full	Wet	170,427	3,093	51,459	1,168	160,369	29,973	1,895	**33,909**	0	0.71	83,989	53,962	4,461	22,812	**2,753**
2020	240	Full	Dry	190,660	3,521	57,649	1,168	177,411	33,008	1,500	**41,079**	0	0.70	37,468	34,177	3,586	12,096	**-12,391**
2021	237	Partial	Dry	202,639	3,932	66,047	1,168	198,222	33,944	1,887	**39,733**	0	0.72	63,270	27,688	6,742	12,436	**16,404**
2022	239	Full	Dry	211,650	3,820	60,666	1,168	192,775	33,686	1,929	**48,914**	0	0.70	56,744	26,282	9,292	11,998	**9,171**
2023	205	Full	Wet	175,210	2,984	43,801	1,168	149,166	29,531	2,050	**42,415**	0	0.67	89,892	60,254	6,833	39,785	**-16,980**
2024	225	Full	Wet	185,698	3,294	46,709	1,168	162,010	32,088	2,310	**40,460**	0	0.68	84,277	51,527	4,454	28,442	**-146**
			Minimum	142,881	2,752	15,962	1,168	105,847	29,531	1,382	**15,534**	0	0.50	18,537	26,111	980	7,942	**-21,350**
			Maximum	224,704	4,613	75,830	1,168	198,222	57,044	2,687	**59,202**	0	0.75	89,892	60,254	9,329	39,785	**17,976**
			Wet Year Average	179,717	3,238	34,290	1,168	138,405	40,661	2,042	**37,305**	0	0.63	73,565	50,653	4,800	26,047	**-7,936**
			Dry Year Average	194,349	3,729	44,184	1,168	163,534	42,870	1,771	**35,255**	0	0.67	51,928	31,471	4,487	12,993	**2,977**
			Overall Average	188,497	3,533	40,227	1,168	153,483	41,987	1,879	**36,075**	0	0.66	60,583	39,144	4,612	18,215	**-1,388**

Table F-3. OID Drainage System Annual Calendar Year (January to December) Water Budget Results, 2005 to 2024.

Year	Number of Days	USBR Allotment	Hydrologic Year Type	Inflows (af)				Outflows (af)					
				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	13,495	**53,772**	4,110	10	52,362	10,068	5,365	3,156	266	171
2006	175	Full	Wet	17,549	**42,842**	4,096	6	46,066	8,956	5,187	3,848	265	171
2007	214	Partial	Dry	18,965	**47,483**	1,357	17	46,367	10,100	6,343	4,504	309	200
2008	205	Partial	Dry	13,617	**47,924**	2,563	2	41,755	11,155	6,076	4,613	309	199
2009	200	Full	Dry	12,931	**52,243**	2,260	12	46,942	9,669	5,928	4,414	299	193
2010	205	Full	Wet	14,621	**47,853**	4,057	25	48,712	7,729	6,076	3,569	285	184
2011	192	Full	Wet	15,540	**50,177**	2,814	19	52,213	7,430	5,691	2,772	270	174
2012	218	Full	Dry	15,593	**57,044**	3,130	28	57,351	8,219	6,461	3,252	310	200
2013	214	Partial	Dry	16,003	**53,654**	980	9	52,382	7,705	6,343	3,690	320	207
2014	208	Partial	Dry	13,734	**37,836**	6,266	13	41,217	6,518	6,165	3,439	310	200
2015	207	Partial	Dry	7,665	**42,973**	2,995	13	40,462	3,337	6,135	3,235	289	187
2016	213	Full	Dry	9,563	**34,926**	9,329	17	39,911	4,413	6,313	2,752	271	175
2017	211	Full	Wet	9,397	**39,054**	7,579	13	42,107	3,978	6,254	3,187	313	202
2018	212	Full	Dry	12,596	**39,719**	5,345	18	43,682	3,616	6,283	3,577	315	204
2019	212	Full	Wet	12,989	**29,973**	4,461	17	34,073	3,508	6,283	3,093	293	189
2020	240	Full	Dry	12,677	**33,008**	3,586	25	34,545	3,613	7,113	3,521	306	198
2021	237	Partial	Dry	12,021	**33,944**	6,742	6	37,366	3,848	7,024	3,932	330	213
2022	239	Full	Dry	10,410	**33,686**	9,292	6	39,021	2,947	7,084	3,820	318	205
2023	205	Full	Wet	10,605	**29,531**	6,833	6	34,165	3,300	6,076	2,984	274	177
2024	225	Full	Wet	11,621	**32,088**	4,454	18	34,693	3,020	6,669	3,294	307	198
			Minimum	7,665	**29,531**	980	2	34,073	2,947	5,187	2,752	265	171
			Maximum	18,965	**57,044**	9,329	28	57,351	11,155	7,113	4,613	330	213
			Wet Year Average	13,227	**40,661**	4,800	14	43,049	5,999	5,950	3,238	284	183
			Dry Year Average	12,981	**42,870**	4,487	14	43,417	6,262	6,439	3,729	307	198
			Overall Average	13,080	**41,987**	4,612	14	43,270	6,156	6,243	3,533	298	192

Table F-4. OID Overall Water District Annual Calendar Year (January to December) Water Budget Results, 2005 to 2024.

				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	223,867	2,057	64,968	15,962	3,265	0	2,788	5,950	52,362	29,364	49,954	28,228	3,070	105,847	53,907	-21,350
2006	175	Full	Wet	226,202	1,527	53,700	19,655	3,265	0	2,495	5,508	46,066	28,390	43,946	16,725	3,062	125,320	38,526	-5,690
2007	214	Partial	Dry	262,185	7,505	37,840	22,488	3,265	0	2,997	5,663	46,367	34,717	59,202	7,942	3,575	144,394	27,850	574
2008	205	Partial	Dry	244,610	14,862	41,089	23,157	3,270	0	2,876	8,384	41,755	33,257	50,813	12,105	3,567	147,824	29,079	-2,672
2009	200	Full	Dry	234,565	15,689	39,529	22,290	3,265	0	2,754	5,689	46,942	32,446	40,465	8,848	3,460	146,394	28,565	-225
2010	205	Full	Wet	216,957	5,683	82,204	17,990	3,265	0	2,390	4,573	48,712	33,257	38,174	20,053	3,297	117,721	43,723	14,198
2011	192	Full	Wet	219,154	2,311	49,807	17,683	3,265	0	2,324	6,340	52,213	31,148	32,300	19,281	3,124	117,910	46,605	-19,026
2012	218	Full	Dry	232,934	6,634	58,916	21,467	3,270	0	2,383	3,666	57,351	35,366	22,429	11,909	3,584	142,854	28,758	14,924
2013	214	Partial	Dry	245,621	10,112	18,601	24,671	3,265	0	2,550	234	52,382	34,717	29,744	9,168	3,701	161,385	26,111	-17,722
2014	208	Partial	Dry	200,233	18,298	65,497	45,866	3,265	0	1,988	217	41,217	33,744	22,270	13,021	3,583	170,997	28,145	17,976
2015	207	Partial	Dry	164,988	12,590	46,183	75,830	3,265	0	2,430	1,908	40,462	33,582	15,535	12,583	3,342	162,498	34,556	-4,038
2016	213	Full	Dry	193,139	3,577	89,984	54,744	3,270	0	2,430	2,577	39,911	34,555	37,345	29,994	3,130	144,228	48,619	1,925
2017	211	Full	Wet	195,975	2,451	80,194	61,065	3,265	0	1,775	2,512	42,107	34,231	17,285	33,051	3,618	168,896	56,721	-17,247
2018	212	Full	Dry	209,347	2,874	68,905	55,336	3,265	0	1,771	3,860	43,682	34,369	15,534	13,818	3,641	173,432	37,817	11,802
2019	212	Full	Wet	211,607	1,686	84,104	51,459	3,265	0	1,862	4,768	34,073	34,245	33,909	22,812	3,368	160,369	53,962	2,753
2020	240	Full	Dry	237,154	1,495	37,644	57,649	3,270	0	2,080	5,925	34,545	38,767	41,079	12,096	3,525	177,411	34,177	-12,391
2021	237	Partial	Dry	245,560	2,333	63,311	66,047	3,265	0	2,144	4,450	37,366	38,283	39,733	12,436	3,790	198,222	27,688	16,404
2022	239	Full	Dry	251,882	1,639	56,789	60,666	3,265	0	2,096	1,721	39,021	38,606	48,914	11,998	3,657	192,775	26,282	9,171
2023	205	Full	Wet	214,346	1,363	89,932	43,801	3,265	0	1,688	5,948	34,165	33,114	42,415	39,785	3,152	149,166	60,254	-16,980
2024	225	Full	Wet	230,741	1,309	84,401	46,709	3,270	0	1,648	7,953	34,693	36,318	40,460	28,442	3,523	162,010	51,527	-146
Minimum				164,988	1,309	18,601	15,962	3,265	0	1,648	217	34,073	28,390	15,534	7,942	3,062	105,847	26,111	-21,350
Maximum				262,185	18,298	89,984	75,830	3,270	0	2,997	8,384	57,351	38,767	59,202	39,785	3,790	198,222	60,254	17,976
Wet Year Average				217,356	2,298	73,664	34,290	3,265	0	2,121	5,444	43,049	32,508	37,305	26,047	3,277	138,405	50,653	-7,936
Dry Year Average				226,852	8,134	52,024	44,184	3,267	0	2,375	3,691	43,417	35,201	35,255	12,993	3,546	163,534	31,471	2,977
Overall Average				223,053	5,800	60,680	40,227	3,266	0	2,273	4,392	43,270	34,124	36,075	18,215	3,438	153,483	39,144	-1,388

Table F-5. Distribution System Annual Calendar Year (January to December) Water Budget Results for Northern OID Service Area, 2005 to 2024.

Year	Irrigation Season Number of Days	USBR Allotment	Hydro-logic Year Type	Inflows (ac-ft)						Outflows (ac-ft)							
				System Inflows	District Groundwater Pumping	District Drainwater 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)**
2005	181	Full	Wet	95,814	1,152	3,080	32	2,502	0	0	2,788	1,908	524	812	4,709	12,441	**79,397**
2006	175	Full	Wet	98,887	728	2,443	19	1,833	0	0	2,495	2,152	523	810	6,443	12,029	**79,458**
2007	214	Partial	Dry	116,202	3,460	3,172	51	1,695	0	1,093	2,997	2,298	611	946	7,880	14,710	**95,138**
2008	205	Partial	Dry	105,146	7,892	3,609	6	1,657	0	3,630	2,876	4,275	609	944	6,374	14,091	**89,139**
2009	200	Full	Dry	100,354	7,461	3,554	35	1,829	0	0	2,754	2,382	591	916	5,557	13,748	**87,287**
2010	205	Full	Wet	91,109	2,968	2,918	75	1,692	0	0	2,390	1,745	563	872	6,302	14,091	**72,799**
2011	192	Full	Wet	95,814	1,224	2,952	58	1,708	0	0	2,324	2,028	534	827	7,723	13,198	**75,122**
2012	218	Full	Dry	96,857	2,614	3,232	85	1,742	0	0	2,383	863	612	948	9,448	14,985	**75,290**
2013	214	Partial	Dry	102,690	4,535	2,055	28	1,572	0	0	2,550	234	632	979	9,595	14,710	**82,180**
2014	208	Partial	Dry	83,207	8,674	2,703	39	1,469	0	0	1,988	217	612	948	7,046	14,297	**70,982**
2015	207	Partial	Dry	69,331	6,978	1,332	38	2,002	0	0	2,430	1,066	571	884	3,331	14,229	**57,171**
2016	213	Full	Dry	80,685	1,292	1,694	51	1,305	0	0	2,430	1,345	535	828	3,627	14,641	**61,621**
2017	211	Full	Wet	81,151	961	1,730	39	1,734	0	0	1,771	1,932	618	957	5,554	14,504	**60,280**
2018	212	Full	Dry	91,449	1,123	1,695	54	1,536	0	0	1,768	2,991	621	963	7,452	14,548	**67,514**
2019	212	Full	Wet	93,639	555	1,718	50	1,755	0	0	1,862	4,012	576	892	7,148	14,528	**68,701**
2020	240	Full	Dry	104,668	764	2,133	77	1,354	0	0	2,072	5,237	603	933	8,134	16,447	**75,571**
2021	237	Partial	Dry	102,238	1,438	2,413	18	1,742	0	0	2,137	3,639	648	1,004	8,047	16,241	**76,134**
2022	239	Full	Dry	101,262	936	1,896	20	1,812	0	0	2,086	1,448	625	969	6,442	16,378	**77,977**
2023	205	Full	Wet	89,467	656	1,764	17	1,944	0	0	1,686	4,783	539	835	7,354	14,048	**64,604**
2024	225	Full	Wet	95,286	439	1,791	54	2,184	0	0	1,645	6,497	600	934	7,589	15,393	**67,096**
			Minimum	69,331	439	1,332	6	1,305	0	0	1,645	217	523	810	3,331	12,029	**57,171**
			Maximum	116,202	8,674	3,609	85	2,502	0	0	2,997	6,497	648	1,004	9,595	16,447	**95,138**
			Wet Year Average	92,646	1,085	2,300	43	1,919	0	0	2,120	3,132	560	867	6,603	13,779	**70,932**
			Dry Year Average	96,174	3,931	2,457	42	1,643	0	0	2,373	2,166	606	939	6,911	14,919	**76,334**
			Overall Average	94,763	2,793	2,394	42	1,753	0	0	2,272	2,553	587	910	6,788	14,463	**74,173**

Table F-6. Farmed Lands Annual Calendar Year (January to December) Water Budget Results for Northern OID Service Area, 2005 to 2024.

				Applied Water Budget										Precipitation Budget				
				Inflows (af)				Outflows (af)						Inflows (af)	Outflows (af)			
Year	Irrigation Season Number of Days	USBR Allotment	Hydrologic Year Type	OID Farm Deliveries	Private Drainwater Reuse	Private Groundwater Pumping	Recycled to Farm Lands	Crop ET of Applied Water	Tailwater to Drainage System	District Tailwater Reuse	**Deep Percolation of Applied Water (Closure)**	Change in Storage (af)	Crop Consumptive Use Fraction (CCUF)	Precipitation	Crop ET of Precipitation	Runoff of Precipitation	Deep Percolation of Precipitation	**Change in Storage (Closure, af)**
2005	181	Full	Wet	79,397	1,152	11,507	0	44,001	27,334	2,502	**18,218**	0	0.48	25,994	21,909	1,349	11,396	**-8,661**
2006	175	Full	Wet	79,458	1,401	14,169	0	51,937	19,336	1,833	**21,922**	0	0.55	21,492	15,721	1,364	6,683	**-2,276**
2007	214	Partial	Dry	95,138	1,641	16,223	0	61,908	19,038	1,695	**30,362**	0	0.55	16,030	11,966	512	3,318	**234**
2008	205	Partial	Dry	89,139	1,679	16,684	0	63,319	19,020	1,657	**23,507**	0	0.59	17,454	12,480	986	5,159	**-1,171**
2009	200	Full	Dry	87,287	1,607	16,064	0	65,084	22,014	1,829	**16,030**	0	0.62	17,168	12,577	848	3,804	**-62**
2010	205	Full	Wet	72,799	1,300	12,970	0	52,008	19,979	1,692	**13,389**	0	0.60	35,401	19,149	1,444	8,685	**6,124**
2011	192	Full	Wet	75,122	377	12,764	0	52,182	19,676	1,708	**14,697**	0	0.59	21,266	20,264	984	8,254	**-8,236**
2012	218	Full	Dry	75,290	455	17,489	0	62,003	20,612	1,742	**8,877**	0	0.67	25,000	12,398	1,158	5,053	**6,391**
2013	214	Partial	Dry	82,180	516	17,798	0	69,839	18,601	1,572	**10,483**	0	0.69	7,890	11,231	357	3,899	**-7,597**
2014	208	Partial	Dry	70,982	481	27,403	0	69,972	19,035	1,469	**8,390**	0	0.71	26,311	11,474	2,293	5,239	**7,305**
2015	207	Partial	Dry	57,171	449	43,697	0	65,658	25,767	2,002	**7,890**	0	0.65	18,363	14,002	1,056	4,973	**-1,667**
2016	213	Full	Dry	61,621	383	30,619	0	58,539	17,144	1,305	**15,635**	0	0.63	36,244	19,796	3,574	12,144	**731**
2017	211	Full	Wet	60,280	445	34,635	0	68,962	12,040	1,734	**12,624**	0	0.72	32,321	23,109	2,868	13,371	**-7,027**
2018	212	Full	Dry	67,514	502	31,268	0	74,123	8,669	1,536	**14,956**	0	0.75	27,655	15,250	2,167	5,562	**4,676**
2019	212	Full	Wet	68,701	422	29,625	0	65,080	6,886	1,755	**25,026**	0	0.66	34,278	22,090	1,799	9,289	**1,100**
2020	240	Full	Dry	75,571	462	31,722	0	71,854	9,565	1,354	**24,982**	0	0.67	15,227	13,903	1,426	4,944	**-5,045**
2021	237	Partial	Dry	76,134	520	36,691	0	80,271	10,684	1,742	**20,647**	0	0.71	25,725	11,266	2,699	5,117	**6,643**
2022	239	Full	Dry	77,977	503	34,041	0	78,316	14,370	1,812	**18,023**	0	0.70	23,064	10,689	3,674	4,911	**3,790**
2023	205	Full	Wet	64,604	389	24,901	0	60,543	11,534	1,944	**15,873**	0	0.67	36,501	24,489	2,703	16,305	**-6,995**
2024	225	Full	Wet	67,096	434	27,200	0	65,771	11,605	2,184	**15,170**	0	0.69	33,929	20,766	1,707	11,516	**-60**
			Minimum	57,171	377	11,507	0	44,001	6,886	1,305	**7,890**	0	0	7,890	10,689	357	3,318	**-8,661**
			Maximum	95,138	1,679	43,697	0	80,271	27,334	2,502	**30,362**	0	1	36,501	24,489	3,674	16,305	**7,305**
			Wet Year Average	70,932	740	20,971	0	57,560	16,049	1,919	**17,115**	0	1	30,148	20,937	1,777	10,687	**-3,254**
			Dry Year Average	76,334	766	26,642	0	68,407	17,043	1,643	**16,648**	0	1	21,344	13,086	1,729	5,343	**1,186**
			Overall Average	74,173	756	24,374	0	64,068	16,646	1,753	**16,835**	0	1	24,866	16,226	1,748	7,481	**-590**

Table F-7. Drainage System Annual Calendar Year (January to December) Water Budget Results for Northern OID Service Area, 2005 to 2024.

				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	4,709	**27,334**	1,349	4	26,863	3,080	2,128	1,152	105	68
2006	175	Full	Wet	6,443	**19,336**	1,364	2	21,070	2,443	2,058	1,401	105	68
2007	214	Partial	Dry	7,880	**19,038**	512	7	19,905	3,172	2,516	1,641	123	79
2008	205	Partial	Dry	6,374	**19,020**	986	1	18,482	3,609	2,410	1,679	122	79
2009	200	Full	Dry	5,557	**22,014**	848	5	20,716	3,554	2,352	1,607	119	77
2010	205	Full	Wet	6,302	**19,979**	1,444	10	20,919	2,918	2,410	1,300	113	73
2011	192	Full	Wet	7,723	**19,676**	984	8	22,627	2,952	2,257	377	107	69
2012	218	Full	Dry	9,448	**20,612**	1,158	11	24,776	3,232	2,563	455	123	79
2013	214	Partial	Dry	9,595	**18,601**	357	4	23,260	2,055	2,516	516	127	82
2014	208	Partial	Dry	7,046	**19,035**	2,293	5	22,548	2,703	2,446	481	123	79
2015	207	Partial	Dry	3,331	**25,767**	1,056	5	25,755	1,332	2,434	449	115	74
2016	213	Full	Dry	3,627	**17,144**	3,574	7	19,593	1,694	2,504	383	107	69
2017	211	Full	Wet	5,554	**12,040**	2,868	5	15,606	1,730	2,481	445	124	80
2018	212	Full	Dry	7,452	**8,669**	2,167	7	13,400	1,695	2,493	502	125	81
2019	212	Full	Wet	7,148	**6,886**	1,799	7	11,016	1,718	2,493	422	116	75
2020	240	Full	Dry	8,134	**9,565**	1,426	10	13,517	2,133	2,822	462	122	78
2021	237	Partial	Dry	8,047	**10,684**	2,699	2	15,498	2,413	2,787	520	131	84
2022	239	Full	Dry	6,442	**14,370**	3,674	3	19,072	1,896	2,810	503	126	81
2023	205	Full	Wet	7,354	**11,534**	2,703	2	16,851	1,764	2,410	389	109	70
2024	225	Full	Wet	7,589	**11,605**	1,707	7	15,837	1,791	2,645	434	122	79
			Minimum	3,331	**6,886**	357	1	11,016	1,332	2,058	377	105	68
			Maximum	9,595	**27,334**	3,674	11	26,863	3,609	2,822	1,679	131	84
			Wet Year Average	6,603	**16,049**	1,777	6	18,849	2,300	2,360	740	113	73
			Dry Year Average	6,911	**17,043**	1,729	5	19,710	2,457	2,554	766	122	79
			Overall Average	6,788	**16,646**	1,748	5	19,366	2,394	2,477	756	118	76

Table F-8. Overall Annual Calendar Year (January to December) Water Budget Results for Northern OID Service Area, 2005 to 2024.

				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	95,814	1,152	26,029	11,507	0	0	2,788	1,908	26,863	14,570	18,218	11,396	1,510	44,001	21,909	-8,661
2006	175	Full	Wet	98,887	728	21,513	14,169	0	0	2,495	2,152	21,070	14,087	21,922	6,683	1,506	51,937	15,721	-2,276
2007	214	Partial	Dry	116,202	3,460	16,087	16,223	0	0	2,997	2,298	19,905	17,226	30,362	3,318	1,759	61,908	11,966	234
2008	205	Partial	Dry	105,146	7,892	17,461	16,684	0	0	2,876	4,275	18,482	16,501	23,507	5,159	1,755	63,319	12,480	-1,171
2009	200	Full	Dry	100,354	7,461	17,207	16,064	0	0	2,754	2,382	20,716	16,099	16,030	3,804	1,702	65,084	12,577	-62
2010	205	Full	Wet	91,109	2,968	35,486	12,970	0	0	2,390	1,745	20,919	16,501	13,389	8,685	1,622	52,008	19,149	6,124
2011	192	Full	Wet	95,814	1,224	21,331	12,764	0	0	2,324	2,028	22,627	15,455	14,697	8,254	1,537	52,182	20,264	-8,236
2012	218	Full	Dry	96,857	2,614	25,096	17,489	0	0	2,383	863	24,776	17,548	8,877	5,053	1,763	62,003	12,398	6,391
2013	214	Partial	Dry	102,690	4,535	7,921	17,798	0	0	2,550	234	23,260	17,226	10,483	3,899	1,820	69,839	11,231	-7,597
2014	208	Partial	Dry	83,207	8,674	26,355	27,403	0	0	1,988	217	22,548	16,743	8,390	5,239	1,762	69,972	11,474	7,305
2015	207	Partial	Dry	69,331	6,978	18,406	43,697	0	0	2,430	1,066	25,755	16,662	7,890	4,973	1,644	65,658	14,002	-1,667
2016	213	Full	Dry	80,685	1,292	36,301	30,619	0	0	2,430	1,345	19,593	17,145	15,635	12,144	1,540	58,539	19,796	731
2017	211	Full	Wet	81,151	961	32,365	34,635	0	0	1,771	1,932	15,606	16,984	12,624	13,371	1,780	68,962	23,109	-7,027
2018	212	Full	Dry	91,449	1,123	27,716	31,268	0	0	1,768	2,991	13,400	17,041	14,956	5,562	1,790	74,123	15,250	4,676
2019	212	Full	Wet	93,639	555	34,334	29,625	0	0	1,862	4,012	11,016	17,020	25,026	9,289	1,659	65,080	22,090	1,100
2020	240	Full	Dry	104,668	764	15,314	31,722	0	0	2,072	5,237	13,517	19,268	24,982	4,944	1,736	71,854	13,903	-5,045
2021	237	Partial	Dry	102,238	1,438	25,745	36,691	0	0	2,137	3,639	15,498	19,028	20,647	5,117	1,867	80,271	11,266	6,643
2022	239	Full	Dry	101,262	936	23,086	34,041	0	0	2,086	1,448	19,072	19,188	18,023	4,911	1,802	78,316	10,689	3,790
2023	205	Full	Wet	89,467	656	36,521	24,901	0	0	1,686	4,783	16,851	16,458	15,873	16,305	1,553	60,543	24,489	-6,995
2024	225	Full	Wet	95,286	439	33,990	27,200	0	0	1,645	6,497	15,837	18,038	15,170	11,516	1,734	65,771	20,766	-60
			Minimum	69,331	439	7,921	11,507	0	0	1,645	217	11,016	14,087	7,890	3,318	1,506	44,001	10,689	-8,661
			Maximum	116,202	8,674	36,521	43,697	0	0	2,997	6,497	26,863	19,268	30,362	16,305	1,867	80,271	24,489	7,305
			Wet Year Average	92,646	1,085	30,196	20,971	0	0	2,120	3,132	18,849	16,139	17,115	10,687	1,612	57,560	20,937	-3,254
			Dry Year Average	96,174	3,931	21,391	26,642	0	0	2,373	2,166	19,710	17,473	16,648	5,343	1,745	68,407	13,086	1,186
			Overall Average	94,763	2,793	24,913	24,374	0	0	2,272	2,553	19,366	16,940	16,835	7,481	1,692	64,068	16,226	-590

Table F-9. Distribution System Annual Calendar Year (January to December) Water Budget Results for Southern OID Service Area, 2005 to 2024.

Year	Irrigation Season Number of Days	USBR Allotment	Hydro-logic Year Type	Inflows (ac-ft)						Outflows (ac-ft)							
				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	128,053	905	6,989	31	185	2,097	0	0	4,042	508	788	8,787	11,558	**112,577**
2006	175	Full	Wet	127,315	799	6,513	18	91	2,097	0	0	3,356	507	786	11,106	11,174	**109,904**
2007	214	Partial	Dry	145,983	4,045	6,927	49	90	2,097	0	0	3,365	592	917	11,085	13,665	**129,567**
2008	205	Partial	Dry	139,464	6,971	7,546	6	175	2,103	0	0	4,108	591	915	7,244	13,090	**130,316**
2009	200	Full	Dry	134,211	8,228	6,115	34	119	2,097	0	0	3,307	573	888	7,374	12,771	**125,891**
2010	205	Full	Wet	125,848	2,715	4,811	73	97	2,097	0	0	2,828	546	846	8,319	13,090	**110,011**
2011	192	Full	Wet	123,340	1,087	4,478	56	73	2,097	0	0	4,312	517	802	7,817	12,260	**105,424**
2012	218	Full	Dry	136,077	4,020	4,988	83	117	2,103	0	0	2,803	594	920	6,145	13,920	**123,007**
2013	214	Partial	Dry	142,930	5,577	5,650	27	115	2,097	0	0	0	613	950	6,408	13,665	**134,761**
2014	208	Partial	Dry	117,026	9,624	3,816	37	112	2,097	0	0	0	593	919	6,688	13,282	**111,229**
2015	207	Partial	Dry	95,657	5,612	2,005	37	106	2,097	0	0	841	554	858	4,334	13,218	**85,710**
2016	213	Full	Dry	112,455	2,285	2,718	49	77	2,103	0	0	1,232	518	803	5,936	13,601	**97,597**
2017	211	Full	Wet	114,825	1,490	2,248	38	164	2,097	0	3	579	599	928	3,843	13,473	**101,434**
2018	212	Full	Dry	117,898	1,751	1,922	52	218	2,097	0	3	870	603	935	5,144	13,537	**102,845**
2019	212	Full	Wet	117,968	1,132	1,790	49	140	2,097	0	0	756	556	862	5,841	13,433	**101,726**
2020	240	Full	Dry	132,486	731	1,479	74	145	2,103	0	7	687	582	902	4,543	15,208	**115,089**
2021	237	Partial	Dry	143,322	895	1,435	17	145	2,097	0	6	811	626	970	3,975	15,017	**126,506**
2022	239	Full	Dry	150,621	703	1,051	19	116	2,097	0	10	273	604	936	3,968	15,144	**133,673**
2023	205	Full	Wet	124,879	707	1,535	17	106	2,097	0	2	1,165	521	807	3,251	12,990	**110,606**
2024	225	Full	Wet	135,455	870	1,228	52	126	2,103	0	3	1,456	582	902	4,032	14,257	**118,601**
Minimum				95,657	703	1,051	6	73	2,097	0	0	0	507	786	3,251	11,174	**85,710**
Maximum				150,621	9,624	7,546	83	218	2,103	0	10	4,312	626	970	11,106	15,208	**134,761**
Wet Year Average				124,710	1,213	3,699	42	123	2,098	0	1	2,312	542	840	6,625	12,779	**108,785**
Dry Year Average				130,677	4,203	3,804	40	128	2,099	0	2	1,525	587	909	6,070	13,843	**118,016**
Overall Average				128,291	3,007	3,762	41	126	2,099	0	2	1,840	569	882	6,292	13,418	**114,324**

Table F-10. Farmed Lands Annual Calendar Year (January to December) Water Budget Results for Southern OID Service Area, 2005 to 2024.

				Applied Water Budget										Precipitation Budget				
				Inflows (af)				Outflows (af)						Inflows (af)	Outflows (af)			
Year	Irrigation Season Number of Days	USBR Allotment	Hydrologic Year Type	OID Farm Deliveries	Private Drainwater Reuse	Private Groundwater Pumping	Recycled to Farm Lands	Crop ET of Applied Water	Tailwater to Drainage System	District Tailwater Reuse	**Deep Percolation of Applied Water (Closure)**	Change in Storage (af)	Crop Consumptive Use Fraction (CCUF)	Precipitation	Crop ET of Precipitation	Runoff of Precipitation	Deep Percolation of Precipitation	**Change in Storage (Closure, af)**
2005	181	Full	Wet	112,577	2,005	4,455	1,168	61,846	26,438	185	**31,736**	0	0.51	38,902	31,997	2,761	16,832	**-12,689**
2006	175	Full	Wet	109,904	2,446	5,486	1,168	73,383	23,505	91	**22,023**	0	0.62	32,165	22,806	2,732	10,041	**-3,414**
2007	214	Partial	Dry	129,567	2,863	6,264	1,168	82,486	28,445	90	**28,840**	0	0.59	21,694	15,884	845	4,624	**340**
2008	205	Partial	Dry	130,316	2,934	6,472	1,168	84,506	28,904	175	**27,306**	0	0.60	23,622	16,598	1,577	6,947	**-1,501**
2009	200	Full	Dry	125,891	2,807	6,227	1,168	81,310	30,229	119	**24,435**	0	0.60	22,280	15,988	1,411	5,044	**-163**
2010	205	Full	Wet	110,011	2,268	5,020	1,168	65,713	27,874	97	**24,784**	0	0.55	46,630	24,575	2,613	11,368	**8,074**
2011	192	Full	Wet	105,424	2,396	4,919	1,168	65,728	30,501	73	**17,603**	0	0.58	28,408	26,341	1,830	11,027	**-10,790**
2012	218	Full	Dry	123,007	2,797	3,978	1,168	80,850	36,432	117	**13,552**	0	0.62	33,720	16,359	1,972	6,856	**8,532**
2013	214	Partial	Dry	134,761	3,174	6,873	1,168	91,546	35,053	115	**19,261**	0	0.63	10,647	14,880	623	5,269	**-10,124**
2014	208	Partial	Dry	111,229	2,958	18,463	1,168	101,025	18,801	112	**13,881**	0	0.75	39,097	16,671	3,973	7,782	**10,670**
2015	207	Partial	Dry	85,710	2,786	32,133	1,168	96,840	17,206	106	**7,645**	0	0.80	27,732	20,554	1,939	7,610	**-2,371**
2016	213	Full	Dry	97,597	2,369	24,125	1,168	85,689	17,782	77	**21,710**	0	0.68	53,623	28,823	5,755	17,850	**1,195**
2017	211	Full	Wet	101,434	2,743	26,429	1,168	99,935	27,014	164	**4,661**	0	0.76	47,783	33,612	4,711	19,680	**-10,220**
2018	212	Full	Dry	102,845	3,075	24,067	1,168	99,309	31,050	218	**578**	0	0.76	41,126	22,567	3,178	8,256	**7,126**
2019	212	Full	Wet	101,726	2,672	21,834	1,168	95,290	23,087	140	**8,883**	0	0.75	49,711	31,872	2,662	13,523	**1,654**
2020	240	Full	Dry	115,089	3,059	25,927	1,168	105,557	23,444	145	**16,097**	0	0.73	22,241	20,274	2,160	7,152	**-7,345**
2021	237	Partial	Dry	126,506	3,413	29,356	1,168	117,951	23,260	145	**19,086**	0	0.74	37,545	16,422	4,043	7,320	**9,760**
2022	239	Full	Dry	133,673	3,317	26,625	1,168	114,459	19,316	116	**30,891**	0	0.69	33,680	15,593	5,618	7,088	**5,381**
2023	205	Full	Wet	110,606	2,595	18,900	1,168	88,624	17,997	106	**26,541**	0	0.67	53,391	35,765	4,130	23,481	**-9,984**
2024	225	Full	Wet	118,601	2,860	19,508	1,168	96,239	20,483	126	**25,289**	0	0.68	50,348	30,761	2,747	16,926	**-86**
Minimum				85,710	2,005	3,978	1,168	61,846	17,206	73	**578**	0	0.51	10,647	14,880	623	4,624	**-12,689**
Maximum				134,761	3,413	32,133	1,168	117,951	36,432	218	**31,736**	0	0.80	53,623	35,765	5,755	23,481	**10,670**
Wet Year Average				108,785	2,498	13,319	1,168	80,845	24,612	123	**20,190**	0	0.64	43,417	29,716	3,023	15,360	**-4,682**
Dry Year Average				118,016	2,963	17,543	1,168	95,127	25,827	128	**18,607**	0	0.68	30,584	18,385	2,758	7,650	**1,792**
Overall Average				114,324	2,777	15,853	1,168	89,414	25,341	126	**19,240**	0	0.66	35,717	22,917	2,864	10,734	**-798**

Table F-11. Drainage System Annual Calendar Year (January to December) Water Budget Results for Southern OID Service Area, 2005 to 2024.

Year	Number of Days	USBR Allotment	Hydrologic Year Type	Inflows (af)				Outflows (af)					
				Operational Spillage	**Tailwater to Drainage System (Closure)**	Runoff of Precipi-tation	Precipitation	Drainwater Outflow	District Drain-water Reuse	Seepage	Private Drainwater Reuse	Evapo-ration	Riparian ET
2005	181	Full	Wet	8,787	**26,438**	2,761	6	25,499	6,989	3,236	2,005	160	103
2006	175	Full	Wet	11,106	**23,505**	2,732	4	24,996	6,513	3,129	2,446	160	103
2007	214	Partial	Dry	11,085	**28,445**	845	10	26,462	6,927	3,827	2,863	187	120
2008	205	Partial	Dry	7,244	**28,904**	1,577	1	23,273	7,546	3,666	2,934	186	120
2009	200	Full	Dry	7,374	**30,229**	1,411	7	26,226	6,115	3,576	2,807	181	117
2010	205	Full	Wet	8,319	**27,874**	2,613	15	27,793	4,811	3,666	2,268	172	111
2011	192	Full	Wet	7,817	**30,501**	1,830	11	29,585	4,478	3,433	2,396	163	105
2012	218	Full	Dry	6,145	**36,432**	1,972	17	32,574	4,988	3,898	2,797	187	121
2013	214	Partial	Dry	6,408	**35,053**	623	5	29,121	5,650	3,827	3,174	193	125
2014	208	Partial	Dry	6,688	**18,801**	3,973	8	18,669	3,816	3,719	2,958	187	121
2015	207	Partial	Dry	4,334	**17,206**	1,939	8	14,707	2,005	3,701	2,786	174	113
2016	213	Full	Dry	5,936	**17,782**	5,755	10	20,318	2,718	3,809	2,369	163	105
2017	211	Full	Wet	3,843	**27,014**	4,711	8	26,501	2,248	3,773	2,743	189	122
2018	212	Full	Dry	5,144	**31,050**	3,178	11	30,282	1,922	3,791	3,075	190	123
2019	212	Full	Wet	5,841	**23,087**	2,662	10	23,057	1,790	3,791	2,672	177	114
2020	240	Full	Dry	4,543	**23,444**	2,160	15	21,027	1,479	4,291	3,059	185	119
2021	237	Partial	Dry	3,975	**23,260**	4,043	4	21,868	1,435	4,238	3,413	199	128
2022	239	Full	Dry	3,968	**19,316**	5,618	4	19,949	1,051	4,274	3,317	192	124
2023	205	Full	Wet	3,251	**17,997**	4,130	3	17,314	1,535	3,666	2,595	165	107
2024	225	Full	Wet	4,032	**20,483**	2,747	11	18,856	1,228	4,023	2,860	185	119
			Minimum	3,251	**17,206**	623	1	14,707	1,051	3,129	2,005	160	103
			Maximum	11,106	**36,432**	5,755	17	32,574	7,546	4,291	3,413	199	128
			Wet Year Average	6,625	**24,612**	3,023	9	24,200	3,699	3,590	2,498	171	111
			Dry Year Average	6,070	**25,827**	2,758	8	23,706	3,804	3,885	2,963	185	120
			Overall Average	6,292	**25,341**	2,864	8	23,904	3,762	3,767	2,777	180	116

Table F-12. Overall Annual Calendar Year (January to December) Water Budget Results for Southern OID Service Area, 2005 to 2024.

				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	25,499	14,794	31,736	16,832	1,560	61,846	31,997	-12,689
2006	175	Full	Wet	127,315	799	32,187	5,486	3,265	0	0	3,356	24,996	14,304	22,023	10,041	1,556	73,383	22,806	-3,414
2007	214	Partial	Dry	145,983	4,045	21,753	6,264	3,265	0	0	3,365	26,462	17,491	28,840	4,624	1,817	82,486	15,884	340
2008	205	Partial	Dry	139,464	6,971	23,628	6,472	3,270	0	0	4,108	23,273	16,756	27,306	6,947	1,812	84,506	16,598	-1,501
2009	200	Full	Dry	134,211	8,228	22,321	6,227	3,265	0	0	3,307	26,226	16,347	24,435	5,044	1,758	81,310	15,988	-163
2010	205	Full	Wet	125,848	2,715	46,718	5,020	3,265	0	0	2,828	27,793	16,756	24,784	11,368	1,675	65,713	24,575	8,074
2011	192	Full	Wet	123,340	1,087	28,476	4,919	3,265	0	0	4,312	29,585	15,693	17,603	11,027	1,587	65,728	26,341	-10,790
2012	218	Full	Dry	136,077	4,020	33,820	3,978	3,270	0	0	2,803	32,574	17,818	13,552	6,856	1,821	80,850	16,359	8,532
2013	214	Partial	Dry	142,930	5,577	10,680	6,873	3,265	0	0	0	29,121	17,491	19,261	5,269	1,880	91,546	14,880	-10,124
2014	208	Partial	Dry	117,026	9,624	39,142	18,463	3,265	0	0	0	18,669	17,001	13,881	7,782	1,820	101,025	16,671	10,670
2015	207	Partial	Dry	95,657	5,612	27,777	32,133	3,265	0	0	841	14,707	16,919	7,645	7,610	1,698	96,840	20,554	-2,371
2016	213	Full	Dry	112,455	2,285	53,682	24,125	3,270	0	0	1,232	20,318	17,410	21,710	17,850	1,590	85,689	28,823	1,195
2017	211	Full	Wet	114,825	1,490	47,829	26,429	3,265	0	3	579	26,501	17,246	4,661	19,680	1,838	99,935	33,612	-10,220
2018	212	Full	Dry	117,898	1,751	41,189	24,067	3,265	0	3	870	30,282	17,328	578	8,256	1,851	99,309	22,567	7,126
2019	212	Full	Wet	117,968	1,132	49,770	21,834	3,265	0	0	756	23,057	17,224	8,883	13,523	1,709	95,290	31,872	1,654
2020	240	Full	Dry	132,486	731	22,330	25,927	3,270	0	7	687	21,027	19,499	16,097	7,152	1,788	105,557	20,274	-7,345
2021	237	Partial	Dry	143,322	895	37,566	29,356	3,265	0	6	811	21,868	19,255	19,086	7,320	1,923	117,951	16,422	9,760
2022	239	Full	Dry	150,621	703	33,703	26,625	3,265	0	10	273	19,949	19,418	30,891	7,088	1,856	114,459	15,593	5,381
2023	205	Full	Wet	124,879	707	53,411	18,900	3,265	0	2	1,165	17,314	16,655	26,541	23,481	1,599	88,624	35,765	-9,984
2024	225	Full	Wet	135,455	870	50,411	19,508	3,270	0	3	1,456	18,856	18,280	25,289	16,926	1,789	96,239	30,761	-86
Minimum				95,657	703	10,680	3,978	3,265	0	0	0	14,707	14,304	578	4,624	1,556	61,846	14,880	-12,689
Maximum				150,621	9,624	53,682	32,133	3,270	0	10	4,312	32,574	19,499	31,736	23,481	1,923	117,951	35,765	10,670
Wet Year Average				124,710	1,213	43,467	13,319	3,265	0	1	2,312	24,200	16,369	20,190	15,360	1,664	80,845	29,716	-4,682
Dry Year Average				130,677	4,203	30,633	17,543	3,267	0	2	1,525	23,706	17,728	18,607	7,650	1,801	95,127	18,385	1,792
Overall Average				128,291	3,007	35,767	15,853	3,266	0	2	1,840	23,904	17,184	19,240	10,734	1,747	89,414	22,917	-798

Table F-13. OID Distribution System Annual Water Year (October to September) Water Budget Results, 2006 to 2024.

				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	228,570	1,522	9,227	30	1,979	2,097	0	2,517	5,597	1,045	1,619	17,248	23,336	**192,062**
2007	214	Partial	Dry	259,535	7,211	9,852	70	1,791	2,097	0	2,963	5,633	1,191	1,845	18,862	27,977	**222,085**
2008	205	Partial	Dry	249,193	14,661	11,421	41	1,855	2,103	0	2,929	8,376	1,208	1,871	14,323	27,844	**222,721**
2009	200	Full	Dry	232,445	15,608	9,583	77	1,920	2,097	0	2,737	5,723	1,166	1,807	12,931	26,518	**210,849**
2010	205	Full	Wet	216,227	6,173	7,831	142	1,788	2,097	0	2,384	4,591	1,096	1,698	14,070	26,518	**183,902**
2011	192	Full	Wet	222,281	2,360	7,570	82	1,807	2,097	0	2,363	6,343	1,066	1,652	16,221	25,855	**182,699**
2012	218	Full	Dry	230,950	6,575	7,979	206	1,842	2,103	0	2,361	3,742	1,203	1,864	15,591	29,170	**195,725**
2013	214	Partial	Dry	246,472	10,063	7,660	55	1,705	2,097	0	2,560	381	1,243	1,926	16,083	28,375	**217,483**
2014	208	Partial	Dry	201,360	17,713	6,742	76	1,580	2,097	0	2,084	217	1,198	1,856	13,800	27,579	**182,833**
2015	207	Partial	Dry	168,694	13,339	3,622	71	2,117	2,097	0	2,122	1,905	1,134	1,757	7,681	27,446	**147,895**
2016	213	Full	Dry	184,633	3,547	3,968	77	1,348	2,103	0	2,430	2,447	1,019	1,579	9,186	25,988	**153,027**
2017	211	Full	Wet	193,732	2,472	4,232	100	1,852	2,097	0	1,848	2,283	1,187	1,838	9,210	27,977	**160,142**
2018	212	Full	Dry	208,602	2,917	3,556	111	1,756	2,097	0	1,696	3,901	1,227	1,902	12,134	28,221	**169,959**
2019	212	Full	Wet	206,275	1,701	3,440	99	1,841	2,097	0	1,880	4,302	1,128	1,748	12,334	27,581	**166,480**
2020	240	Full	Dry	238,824	1,477	3,743	151	1,570	2,103	0	2,117	6,188	1,206	1,869	13,328	32,050	**191,110**
2021	237	Partial	Dry	250,108	2,377	3,723	35	1,890	2,097	0	2,115	4,982	1,283	1,988	12,130	31,390	**206,341**
2022	239	Full	Dry	246,589	1,594	3,091	39	1,893	2,097	0	2,140	1,721	1,218	1,888	10,271	31,522	**206,543**
2023	205	Full	Wet	218,947	1,356	3,405	28	2,060	2,097	0	1,660	5,948	1,054	1,632	10,800	26,378	**180,420**
2024	225	Full	Wet	224,561	1,330	2,864	113	2,238	2,103	0	1,704	7,953	1,179	1,832	11,459	29,917	**179,166**
Minimum				168,694	1,330	2,864	28	1,348	2,097	0	1,660	217	1,019	1,579	7,681	23,336	**147,895**
Maximum				259,535	17,713	11,421	206	2,238	2,103	0	2,963	8,376	1,283	1,988	18,862	32,050	**222,721**
Wet Year Average				215,799	2,416	5,510	85	1,938	2,098	0	2,051	5,288	1,108	1,717	13,049	26,795	**177,839**
Dry Year Average				226,450	8,090	6,245	84	1,772	2,099	0	2,354	3,768	1,191	1,846	13,027	28,673	**193,881**
Overall Average				222,526	6,000	5,974	84	1,833	2,099	0	2,243	4,328	1,161	1,798	13,035	27,981	**187,971**

Table F-14. OID Farmed Lands Annual Water Year (October to September) Water Budget Results, 2006 to 2024.

				Applied Water Budget										Precipitation Budget				
				Inflows (af)				Outflows (af)						Inflows (af)	Outflows (af)			
Year	Irrigation Season Number of Days	USBR Allotment	Hydrologic Year Type	OID Farm Deliveries	Private Drainwater Reuse	Private Groundwater Pumping	Recycled to Farm Lands	Crop ET of Applied Water	Tailwater to Drainage System	District Tailwater Reuse	**Deep Percolation of Applied Water (Closure)**	Change in Storage (af)	Crop Consumptive Use Fraction (CCUF)	Precipitation	Crop ET of Precipitation	Runoff of Precipitation	Deep Percolation of Precipitation	**Change in Storage (Closure, af)**
2006	175	Full	Wet	192,062	3,796	19,514	1,168	124,963	44,021	1,979	**45,578**	0	0.58	57,243	38,163	4,152	16,912	**-1,984**
2007	214	Partial	Dry	222,085	4,525	22,645	1,168	144,710	48,263	1,791	**55,658**	0	0.58	34,660	27,054	1,002	7,875	**-1,270**
2008	205	Partial	Dry	222,721	4,547	22,725	1,168	145,990	47,073	1,855	**56,243**	0	0.58	44,937	30,415	3,123	12,343	**-944**
2009	200	Full	Dry	210,849	4,508	22,882	1,168	148,583	53,869	1,920	**35,035**	0	0.62	37,156	27,658	657	8,560	**281**
2010	205	Full	Wet	183,902	3,626	18,198	1,168	119,964	45,430	1,788	**39,711**	0	0.58	64,964	42,702	4,490	17,500	**271**
2011	192	Full	Wet	182,699	2,801	17,161	1,168	114,828	49,428	1,807	**37,765**	0	0.56	72,722	46,983	3,632	21,774	**332**
2012	218	Full	Dry	195,725	3,305	21,705	1,168	143,594	58,469	1,842	**17,997**	0	0.65	38,674	29,668	1,650	9,470	**-2,114**
2013	214	Partial	Dry	217,483	3,515	23,469	1,168	154,884	53,729	1,705	**35,317**	0	0.63	42,238	26,959	2,671	12,163	**446**
2014	208	Partial	Dry	182,833	3,549	43,046	1,168	171,464	39,330	1,580	**18,223**	0	0.74	35,063	26,268	1,817	8,254	**-1,276**
2015	207	Partial	Dry	147,895	3,234	72,221	1,168	161,925	43,081	2,117	**17,394**	0	0.72	56,901	34,404	6,839	15,952	**-295**
2016	213	Full	Dry	153,027	2,852	58,225	1,168	148,978	33,827	1,348	**31,118**	0	0.69	83,028	47,254	7,688	28,819	**-734**
2017	211	Full	Wet	160,142	3,076	59,498	1,168	162,161	37,497	1,852	**22,373**	0	0.72	104,139	59,576	9,943	35,444	**-825**
2018	212	Full	Dry	169,959	3,544	57,235	1,168	175,802	39,235	1,756	**15,112**	0	0.76	51,365	36,959	3,243	12,312	**-1,149**
2019	212	Full	Wet	166,480	3,099	51,674	1,168	158,733	31,930	1,841	**29,917**	0	0.71	80,477	53,689	4,547	21,581	**659**
2020	240	Full	Dry	191,110	3,521	55,737	1,168	177,043	32,503	1,570	**40,420**	0	0.70	54,994	36,074	5,623	14,984	**-1,687**
2021	237	Partial	Dry	206,341	4,016	65,472	1,168	203,078	34,524	1,890	**37,504**	0	0.73	38,820	27,476	3,484	8,880	**-1,020**
2022	239	Full	Dry	206,543	3,794	61,212	1,168	190,311	34,599	1,893	**45,914**	0	0.70	40,841	24,871	3,405	12,091	**474**
2023	205	Full	Wet	180,420	2,936	45,723	1,168	147,744	28,401	2,060	**52,040**	0	0.64	124,065	60,122	15,674	42,665	**5,604**
2024	225	Full	Wet	179,166	3,286	46,427	1,168	162,156	30,852	2,238	**34,799**	0	0.70	82,937	52,536	4,261	28,603	**-2,463**
Minimum				147,895	2,801	17,161	1,168	114,828	28,401	1,348	**15,112**	0	0.56	34,660	24,871	657	7,875	**-2,463**
Maximum				222,721	4,547	72,221	1,168	203,078	58,469	2,238	**56,243**	0	0.76	124,065	60,122	15,674	42,665	**5,604**
Wet Year Average				177,839	3,231	36,885	1,168	141,507	38,223	1,938	**37,455**	0	0.64	83,792	50,539	6,671	26,354	**228**
Dry Year Average				193,881	3,742	43,881	1,168	163,863	43,208	1,772	**33,828**	0	0.68	46,556	31,255	3,434	12,642	**-774**
Overall Average				187,971	3,554	41,303	1,168	155,627	41,372	1,833	**35,164**	0	0.66	60,275	38,360	4,626	17,694	**-405**

Table F-15. OID Drainage System Annual Water Year (October to September) Water Budget Results, 2006 to 2024.

Year	Number of Days	USBR Allotment	Hydrologic Year Type	Inflows (af)				Outflows (af)					
				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
2006	175	Full	Wet	17,248	**44,021**	4,152	5	46,744	9,227	5,216	3,796	269	173
2007	214	Partial	Dry	18,862	**48,263**	1,002	12	47,003	9,852	6,254	4,525	306	198
2008	205	Partial	Dry	14,323	**47,073**	3,123	7	41,823	11,421	6,224	4,547	311	201
2009	200	Full	Dry	12,931	**53,869**	657	13	46,957	9,583	5,928	4,508	300	194
2010	205	Full	Wet	14,070	**45,430**	4,490	24	46,165	7,831	5,928	3,626	282	182
2011	192	Full	Wet	16,221	**49,428**	3,632	14	52,692	7,570	5,780	2,801	274	177
2012	218	Full	Dry	15,591	**58,469**	1,650	34	57,430	7,979	6,521	3,305	309	200
2013	214	Partial	Dry	16,083	**53,729**	2,671	9	54,449	7,660	6,343	3,515	320	206
2014	208	Partial	Dry	13,800	**39,330**	1,817	13	37,996	6,742	6,165	3,549	308	199
2015	207	Partial	Dry	7,681	**43,081**	6,839	12	44,142	3,622	6,135	3,234	292	188
2016	213	Full	Dry	9,186	**33,827**	7,688	13	37,654	3,968	5,809	2,852	262	169
2017	211	Full	Wet	9,210	**37,497**	9,943	17	42,602	4,232	6,254	3,076	305	197
2018	212	Full	Dry	12,134	**39,235**	3,243	18	40,698	3,556	6,313	3,544	316	204
2019	212	Full	Wet	12,334	**31,930**	4,547	17	35,614	3,440	6,195	3,099	292	188
2020	240	Full	Dry	13,328	**32,503**	5,623	25	36,499	3,743	7,202	3,521	312	201
2021	237	Partial	Dry	12,130	**34,524**	3,484	6	34,805	3,723	7,054	4,016	332	214
2022	239	Full	Dry	10,271	**34,599**	3,405	6	33,793	3,091	7,084	3,794	315	203
2023	205	Full	Wet	10,800	**28,401**	15,674	5	42,164	3,405	5,928	2,936	273	176
2024	225	Full	Wet	11,459	**30,852**	4,261	19	33,211	2,864	6,728	3,286	306	197
			Minimum	7,681	**28,401**	657	5	33,211	2,864	5,216	2,801	262	169
			Maximum	18,862	**58,469**	15,674	34	57,430	11,421	7,202	4,547	332	214
			Wet Year Average	13,049	**38,223**	6,671	14	42,742	5,510	6,004	3,231	286	184
			Dry Year Average	13,027	**43,208**	3,434	14	42,771	6,245	6,419	3,742	307	198
			Overall Average	13,035	**41,372**	4,626	14	42,760	5,974	6,266	3,554	299	193

Table F-16. OID Overall Water District Annual Water Year (October to September) Water Budget Results, 2006 to 2024.

				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	228,570	1,522	57,277	19,514	3,265	0	2,517	5,597	46,744	28,553	45,578	16,912	3,106	124,963	38,163	-1,984
2007	214	Partial	Dry	259,535	7,211	34,742	22,645	3,265	0	2,963	5,633	47,003	34,231	55,658	7,875	3,540	144,710	27,054	-1,270
2008	205	Partial	Dry	249,193	14,661	44,985	22,725	3,270	0	2,929	8,376	41,823	34,068	56,243	12,343	3,590	145,990	30,415	-944
2009	200	Full	Dry	232,445	15,608	37,246	22,882	3,265	0	2,737	5,723	46,957	32,446	35,035	8,560	3,467	148,583	27,658	281
2010	205	Full	Wet	216,227	6,173	65,130	18,198	3,265	0	2,384	4,591	46,165	32,446	39,711	17,500	3,257	119,964	42,702	271
2011	192	Full	Wet	222,281	2,360	72,818	17,161	3,265	0	2,363	6,343	52,692	31,635	37,765	21,774	3,169	114,828	46,983	332
2012	218	Full	Dry	230,950	6,575	38,915	21,705	3,270	0	2,361	3,742	57,430	35,691	17,997	9,470	3,576	143,594	29,668	-2,114
2013	214	Partial	Dry	246,472	10,063	42,302	23,469	3,265	0	2,560	381	54,449	34,717	35,317	12,163	3,695	154,884	26,959	446
2014	208	Partial	Dry	201,360	17,713	35,152	43,046	3,265	0	2,084	217	37,996	33,744	18,223	8,254	3,562	171,464	26,268	-1,276
2015	207	Partial	Dry	168,694	13,339	56,983	72,221	3,265	0	2,122	1,905	44,142	33,582	17,394	15,952	3,370	161,925	34,404	-295
2016	213	Full	Dry	184,633	3,547	83,117	58,225	3,270	0	2,430	2,447	37,654	31,797	31,118	28,819	3,029	148,978	47,254	-734
2017	211	Full	Wet	193,732	2,472	104,255	59,498	3,265	0	1,848	2,283	42,602	34,231	22,373	35,444	3,527	162,161	59,576	-825
2018	212	Full	Dry	208,602	2,917	51,494	57,235	3,265	0	1,696	3,901	40,698	34,534	15,112	12,312	3,649	175,802	36,959	-1,149
2019	212	Full	Wet	206,275	1,701	80,592	51,674	3,265	0	1,880	4,302	35,614	33,775	29,917	21,581	3,356	158,733	53,689	659
2020	240	Full	Dry	238,824	1,477	55,170	55,737	3,270	0	2,117	6,188	36,499	39,252	40,420	14,984	3,589	177,043	36,074	-1,687
2021	237	Partial	Dry	250,108	2,377	38,861	65,472	3,265	0	2,115	4,982	34,805	38,444	37,504	8,880	3,816	203,078	27,476	-1,020
2022	239	Full	Dry	246,589	1,594	40,886	61,212	3,265	0	2,140	1,721	33,793	38,606	45,914	12,091	3,624	190,311	24,871	474
2023	205	Full	Wet	218,947	1,356	124,098	45,723	3,265	0	1,660	5,948	42,164	32,306	52,040	42,665	3,134	147,744	60,122	5,604
2024	225	Full	Wet	224,561	1,330	83,069	46,427	3,270	0	1,704	7,953	33,211	36,645	34,799	28,603	3,514	162,156	52,536	-2,463
			Minimum	168,694	1,330	34,742	17,161	3,265	0	1,660	217	33,211	28,553	15,112	7,875	3,029	114,828	24,871	-2,463
			Maximum	259,535	17,713	124,098	72,221	3,270	0	2,963	8,376	57,430	39,252	56,243	42,665	3,816	203,078	60,122	5,604
			Wet Year Average	215,799	2,416	83,891	36,885	3,265	0	2,051	5,288	42,742	32,799	37,455	26,354	3,295	141,507	50,539	228
			Dry Year Average	226,450	8,090	46,654	43,881	3,267	0	2,354	3,768	42,771	35,093	33,828	12,642	3,542	163,863	31,255	-774
			Overall Average	222,526	6,000	60,373	41,303	3,266	0	2,243	4,328	42,760	34,248	35,164	17,694	3,451	155,627	38,360	-405

Table F-17. Distribution System Annual Water Year (October to September) Water Budget Results for Northern OID Service Area, 2006 to 2024.

				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	1,881	0	0	2,517	2,152	530	822	6,285	12,098	**80,126**
2007	214	Partial	Dry	115,371	3,330	3,077	36	1,702	0	0	2,963	2,291	605	937	7,839	14,504	**94,377**
2008	205	Partial	Dry	107,161	7,804	3,676	21	1,682	0	0	2,929	4,239	613	950	6,527	14,435	**90,650**
2009	200	Full	Dry	99,287	7,376	3,543	39	1,801	0	0	2,737	2,419	592	917	5,557	13,748	**86,076**
2010	205	Full	Wet	91,156	3,206	2,951	72	1,692	0	0	2,384	1,768	556	862	6,158	13,748	**73,601**
2011	192	Full	Wet	96,917	1,214	3,026	42	1,732	0	0	2,363	2,042	541	839	7,799	13,404	**75,942**
2012	218	Full	Dry	96,122	2,640	3,083	105	1,728	0	0	2,361	901	611	946	9,475	15,122	**74,263**
2013	214	Partial	Dry	103,079	4,571	2,019	28	1,589	0	0	2,560	263	631	978	9,564	14,710	**82,580**
2014	208	Partial	Dry	83,701	8,288	2,795	39	1,468	0	0	2,084	217	608	942	7,174	14,297	**70,968**
2015	207	Partial	Dry	70,925	7,364	1,422	36	2,009	0	0	2,122	1,063	576	892	3,327	14,229	**59,547**
2016	213	Full	Dry	77,288	1,317	1,524	39	1,273	0	0	2,430	1,311	517	802	3,603	13,473	**59,305**
2017	211	Full	Wet	80,653	958	1,822	51	1,696	0	0	1,844	1,797	602	933	5,249	14,504	**60,250**
2018	212	Full	Dry	90,171	1,127	1,692	56	1,541	0	0	1,693	2,927	623	965	7,092	14,620	**66,669**
2019	212	Full	Wet	91,327	558	1,684	50	1,698	0	0	1,880	3,628	574	889	6,880	14,325	**67,142**
2020	240	Full	Dry	105,803	743	2,141	77	1,423	0	0	2,114	5,375	614	951	8,210	16,652	**76,271**
2021	237	Partial	Dry	104,164	1,456	2,363	18	1,741	0	0	2,109	4,129	652	1,011	8,157	16,310	**77,374**
2022	239	Full	Dry	99,606	900	1,969	20	1,777	0	0	2,129	1,448	620	960	6,440	16,378	**76,299**
2023	205	Full	Wet	91,244	675	1,825	14	1,952	0	0	1,656	4,783	536	830	7,316	13,706	**66,884**
2024	225	Full	Wet	92,679	439	1,652	58	2,117	0	0	1,702	6,497	598	931	7,552	15,533	**64,130**
			Minimum	70,925	439	1,422	14	1,273	0	0	1,656	217	517	802	3,327	12,098	**59,305**
			Maximum	115,371	8,288	3,676	105	2,117	0	0	2,963	6,497	652	1,011	9,564	16,652	**94,377**
			Wet Year Average	91,899	1,115	2,217	43	1,824	0	0	2,049	3,238	563	872	6,748	13,902	**69,725**
			Dry Year Average	96,057	3,910	2,442	43	1,645	0	0	2,352	2,215	605	938	6,914	14,873	**76,198**
			Overall Average	94,525	2,880	2,359	43	1,711	0	0	2,241	2,592	589	913	6,853	14,515	**73,813**

Table F-18. Farmed Lands Annual Water Year (October to September) Water Budget Results for Northern OID Service Area, 2006 to 2024.

				Applied Water Budget										Precipitation Budget				
				Inflows (af)				Outflows (af)						Inflows (af)	Outflows (af)			
Year	Irrigation Season Number of Days	USBR Allotment	Hydrologic 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 Precipitation	Runoff of Precipitation	Deep Percolation of Precipitation	**Change in Storage (Closure, af)**
2006	175	Full	Wet	80,126	1,383	14,068	0	51,870	20,281	1,881	21,545	0	0.54	22,928	15,571	1,385	6,766	**-793**
2007	214	Partial	Dry	94,377	1,648	16,330	0	61,682	19,602	1,702	29,370	0	0.55	14,418	11,538	352	3,260	**-733**
2008	205	Partial	Dry	90,650	1,656	16,392	0	62,524	18,410	1,682	26,083	0	0.58	19,095	13,061	1,197	5,259	**-422**
2009	200	Full	Dry	86,076	1,640	16,473	0	65,733	22,660	1,801	13,994	0	0.63	16,048	12,161	228	3,675	**-16**
2010	205	Full	Wet	73,601	1,322	13,123	0	53,034	18,873	1,692	14,448	0	0.60	28,087	18,736	1,657	7,569	**125**
2011	192	Full	Wet	75,942	495	12,379	0	50,821	19,540	1,732	16,724	0	0.57	31,241	20,446	1,266	9,355	**174**
2012	218	Full	Dry	74,263	461	17,422	0	62,509	21,402	1,728	6,507	0	0.68	16,485	12,786	593	3,976	**-871**
2013	214	Partial	Dry	82,580	494	17,180	0	67,057	18,692	1,589	12,915	0	0.67	17,981	11,591	996	5,213	**181**
2014	208	Partial	Dry	70,968	494	26,253	0	70,786	19,596	1,468	5,866	0	0.72	14,212	10,751	646	3,274	**-459**
2015	207	Partial	Dry	59,547	448	41,718	0	65,549	25,769	2,009	8,386	0	0.64	22,803	13,947	2,505	6,403	**-52**
2016	213	Full	Dry	59,305	398	32,703	0	60,346	16,305	1,273	14,482	0	0.65	33,367	19,228	2,905	11,628	**-395**
2017	211	Full	Wet	60,250	423	33,662	0	66,101	11,656	1,696	14,882	0	0.70	42,013	24,279	3,778	14,356	**-400**
2018	212	Full	Dry	66,669	503	32,297	0	74,551	9,693	1,541	13,684	0	0.75	20,662	14,886	1,305	4,934	**-464**
2019	212	Full	Wet	67,142	425	29,646	0	64,998	7,511	1,698	23,005	0	0.67	32,697	21,967	1,841	8,783	**106**
2020	240	Full	Dry	76,271	461	31,093	0	71,735	9,103	1,423	25,564	0	0.67	22,397	14,688	2,249	6,134	**-673**
2021	237	Partial	Dry	77,374	530	36,245	0	82,230	10,841	1,741	19,336	0	0.72	15,782	11,178	1,391	3,636	**-423**
2022	239	Full	Dry	76,299	499	34,328	0	77,280	14,336	1,777	17,732	0	0.70	16,605	10,106	1,365	4,974	**159**
2023	205	Full	Wet	66,884	384	25,964	0	59,948	11,158	1,952	20,173	0	0.64	50,398	24,446	6,198	17,477	**2,277**
2024	225	Full	Wet	64,130	432	26,919	0	65,882	10,765	2,117	12,718	0	0.72	33,447	21,195	1,638	11,591	**-977**
Minimum				59,305	384	12,379	0	50,821	7,511	1,273	5,866	0	0.54	14,212	10,106	228	3,260	**-977**
Maximum				94,377	1,656	41,718	0	82,230	25,769	2,117	29,370	0	0.75	50,398	24,446	6,198	17,477	**2,277**
Wet Year Average				69,725	695	22,252	0	58,950	14,255	1,824	17,642	0	0.64	34,402	20,948	2,537	10,843	**73**
Dry Year Average				76,198	769	26,536	0	68,498	17,201	1,645	16,160	0	0.66	19,155	12,994	1,311	5,197	**-347**
Overall Average				73,813	742	24,958	0	64,981	16,116	1,711	16,706	0	0.65	24,772	15,924	1,763	7,277	**-192**

Table F-19. Drainage System Annual Water Year (October to September) Water Budget Results for Northern OID Service Area, 2006 to 2024.

Year	Number of Days	USBR Allotment	Hydrologic Year Type	Inflows (af)				Outflows (af)					
				Operational Spillage	**Tailwater to Drainage System (Closure)**	Runoff of Precipi-tation	Precipitation	Drainwater Outflow	District Drain-water Reuse	Seepage	Private Drain-water Reuse	Evaporation	Riparian ET
2006	175	Full	Wet	6,285	**20,281**	1,385	2	21,768	2,558	2,069	1,383	107	69
2007	214	Partial	Dry	7,839	**19,602**	352	5	20,392	3,077	2,481	1,648	122	78
2008	205	Partial	Dry	6,527	**18,410**	1,197	3	18,133	3,676	2,469	1,656	123	80
2009	200	Full	Dry	5,557	**22,660**	228	5	20,720	3,543	2,352	1,640	119	77
2010	205	Full	Wet	6,158	**18,873**	1,657	9	19,889	2,951	2,352	1,322	112	72
2011	192	Full	Wet	7,799	**19,540**	1,266	5	22,618	3,026	2,293	495	109	70
2012	218	Full	Dry	9,475	**21,402**	593	14	25,151	3,083	2,587	461	123	79
2013	214	Partial	Dry	9,564	**18,692**	996	4	24,018	2,019	2,516	494	127	82
2014	208	Partial	Dry	7,174	**19,596**	646	5	21,485	2,795	2,446	494	122	79
2015	207	Partial	Dry	3,327	**25,769**	2,505	5	27,110	1,422	2,434	448	116	75
2016	213	Full	Dry	3,603	**16,305**	2,905	5	18,421	1,524	2,304	398	104	67
2017	211	Full	Wet	5,249	**11,656**	3,778	7	15,764	1,822	2,481	423	121	78
2018	212	Full	Dry	7,092	**9,693**	1,305	7	13,192	1,692	2,504	503	125	81
2019	212	Full	Wet	6,880	**7,511**	1,841	7	11,483	1,684	2,457	425	116	75
2020	240	Full	Dry	8,210	**9,103**	2,249	10	13,909	2,141	2,857	461	124	80
2021	237	Partial	Dry	8,157	**10,841**	1,391	2	14,484	2,363	2,798	530	132	85
2022	239	Full	Dry	6,440	**14,336**	1,365	3	16,660	1,969	2,810	499	125	81
2023	205	Full	Wet	7,316	**11,158**	6,198	2	19,936	1,825	2,352	384	108	70
2024	225	Full	Wet	7,552	**10,765**	1,638	7	15,009	1,652	2,669	432	121	78
			Minimum	3,327	**7,511**	228	2	11,483	1,422	2,069	384	104	67
			Maximum	9,564	**25,769**	6,198	14	27,110	3,676	2,857	1,656	132	85
			Wet Year Average	6,748	**14,255**	2,537	6	18,067	2,217	2,382	695	113	73
			Dry Year Average	6,914	**17,201**	1,311	6	19,473	2,442	2,547	769	122	79
			Overall Average	6,853	**16,116**	1,763	6	18,955	2,359	2,486	742	119	77

Table F-20. Overall Annual Water Year (October to September) Water Budget Results for Northern OID Service Area, 2006 to 2024.

				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	22,945	14,068	0	0	2,517	2,152	21,768	14,167	21,545	6,766	1,528	51,870	15,571	-793
2007	214	Partial	Dry	115,371	3,330	14,458	16,330	0	0	2,963	2,291	20,392	16,984	29,370	3,260	1,742	61,682	11,538	-733
2008	205	Partial	Dry	107,161	7,804	19,118	16,392	0	0	2,929	4,239	18,133	16,904	26,083	5,259	1,766	62,524	13,061	-422
2009	200	Full	Dry	99,287	7,376	16,092	16,473	0	0	2,737	2,419	20,720	16,099	13,994	3,675	1,706	65,733	12,161	-16
2010	205	Full	Wet	91,156	3,206	28,169	13,123	0	0	2,384	1,768	19,889	16,099	14,448	7,569	1,602	53,034	18,736	125
2011	192	Full	Wet	96,917	1,214	31,288	12,379	0	0	2,363	2,042	22,618	15,697	16,724	9,355	1,559	50,821	20,446	174
2012	218	Full	Dry	96,122	2,640	16,603	17,422	0	0	2,361	901	25,151	17,709	6,507	3,976	1,759	62,509	12,786	-871
2013	214	Partial	Dry	103,079	4,571	18,013	17,180	0	0	2,560	263	24,018	17,226	12,915	5,213	1,818	67,057	11,591	181
2014	208	Partial	Dry	83,701	8,288	14,255	26,253	0	0	2,084	217	21,485	16,743	5,866	3,274	1,752	70,786	10,751	-459
2015	207	Partial	Dry	70,925	7,364	22,844	41,718	0	0	2,122	1,063	27,110	16,662	8,386	6,403	1,658	65,549	13,947	-52
2016	213	Full	Dry	77,288	1,317	33,411	32,703	0	0	2,430	1,311	18,421	15,777	14,482	11,628	1,490	60,346	19,228	-395
2017	211	Full	Wet	80,653	958	42,070	33,662	0	0	1,844	1,797	15,764	16,984	14,882	14,356	1,735	66,101	24,279	-400
2018	212	Full	Dry	90,171	1,127	20,726	32,297	0	0	1,693	2,927	13,192	17,124	13,684	4,934	1,794	74,551	14,886	-464
2019	212	Full	Wet	91,327	558	32,754	29,646	0	0	1,880	3,628	11,483	16,782	23,005	8,783	1,653	64,998	21,967	106
2020	240	Full	Dry	105,803	743	22,484	31,093	0	0	2,114	5,375	13,909	19,509	25,564	6,134	1,768	71,735	14,688	-673
2021	237	Partial	Dry	104,164	1,456	15,802	36,245	0	0	2,109	4,129	14,484	19,108	19,336	3,636	1,880	82,230	11,178	-423
2022	239	Full	Dry	99,606	900	16,627	34,328	0	0	2,129	1,448	16,660	19,188	17,732	4,974	1,785	77,280	10,106	159
2023	205	Full	Wet	91,244	675	50,414	25,964	0	0	1,656	4,783	19,936	16,057	20,173	17,477	1,544	59,948	24,446	2,277
2024	225	Full	Wet	92,679	439	33,512	26,919	0	0	1,702	6,497	15,009	18,202	12,718	11,591	1,730	65,882	21,195	-977
			Minimum	70,925	439	14,255	12,379	0	0	1,656	217	11,483	14,167	5,866	3,260	1,490	50,821	10,106	-977
			Maximum	115,371	8,288	50,414	41,718	0	0	2,963	6,497	27,110	19,509	29,370	17,477	1,880	82,230	24,446	2,277
			Wet Year Average	91,899	1,115	34,450	22,252	0	0	2,049	3,238	18,067	16,284	17,642	10,843	1,621	58,950	20,948	73
			Dry Year Average	96,057	3,910	19,203	26,536	0	0	2,352	2,215	19,473	17,420	16,160	5,197	1,743	68,498	12,994	-347
			Overall Average	94,525	2,880	24,820	24,958	0	0	2,241	2,592	18,955	17,001	16,706	7,277	1,698	64,981	15,924	-192

Table F-21. Distribution System Annual Water Year (October to September) Water Budget Results for Southern OID Service Area, 2006 to 2024.

				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	129,249	766	6,670	15	98	2,097	0	0	3,445	514	797	10,963	11,238	**111,936**
2007	214	Partial	Dry	144,164	3,881	6,775	34	89	2,097	0	0	3,341	586	908	11,023	13,473	**127,708**
2008	205	Partial	Dry	142,032	6,857	7,745	20	173	2,103	0	0	4,137	595	921	7,796	13,409	**132,071**
2009	200	Full	Dry	133,158	8,233	6,040	38	120	2,097	0	0	3,303	574	890	7,374	12,771	**124,773**
2010	205	Full	Wet	125,071	2,966	4,880	70	97	2,097	0	0	2,823	539	836	7,912	12,771	**110,300**
2011	192	Full	Wet	125,364	1,147	4,545	41	76	2,097	0	0	4,301	525	813	8,422	12,452	**106,756**
2012	218	Full	Dry	134,828	3,935	4,896	102	115	2,103	0	0	2,841	592	917	6,116	14,048	**121,462**
2013	214	Partial	Dry	143,393	5,492	5,641	27	116	2,097	0	0	118	612	948	6,519	13,665	**134,903**
2014	208	Partial	Dry	117,659	9,424	3,947	37	111	2,097	0	0	0	590	914	6,626	13,282	**111,865**
2015	207	Partial	Dry	97,769	5,975	2,200	35	108	2,097	0	0	841	558	865	4,353	13,218	**88,348**
2016	213	Full	Dry	107,345	2,230	2,444	38	75	2,103	0	0	1,136	502	777	5,583	12,515	**93,721**
2017	211	Full	Wet	113,079	1,514	2,410	49	156	2,097	0	3	486	584	905	3,961	13,473	**99,892**
2018	212	Full	Dry	118,431	1,790	1,864	55	215	2,097	0	3	974	605	937	5,042	13,601	**103,290**
2019	212	Full	Wet	114,948	1,143	1,757	49	142	2,097	0	0	674	555	859	5,454	13,256	**99,338**
2020	240	Full	Dry	133,021	734	1,602	74	147	2,103	0	3	813	593	919	5,118	15,398	**114,839**
2021	237	Partial	Dry	145,944	920	1,359	17	149	2,097	0	6	853	630	977	3,973	15,081	**128,966**
2022	239	Full	Dry	146,982	694	1,122	19	116	2,097	0	11	273	599	928	3,830	15,144	**130,245**
2023	205	Full	Wet	127,703	681	1,580	14	108	2,097	0	5	1,165	518	802	3,484	12,673	**113,536**
2024	225	Full	Wet	131,882	891	1,211	56	122	2,103	0	2	1,456	581	900	3,907	14,384	**115,036**
			Minimum	97,769	681	1,122	14	75	2,097	0	0	0	502	777	3,484	11,238	**88,348**
			Maximum	146,982	9,424	7,745	102	215	2,103	0	11	4,301	630	977	11,023	15,398	**134,903**
			Wet Year Average	123,900	1,301	3,293	42	114	2,098	0	1	2,050	545	845	6,301	12,892	**108,113**
			Dry Year Average	130,394	4,180	3,803	41	128	2,099	0	2	1,553	586	908	6,113	13,800	**117,683**
			Overall Average	128,001	3,120	3,615	41	123	2,099	0	2	1,736	571	885	6,182	13,466	**114,157**

Table F-22. Farmed Lands Annual Water Year (October to September) Water Budget Results for Southern OID Service Area, 2006 to 2024.

				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 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	111,936	2,413	5,446	1,168	73,093	23,739	98	**24,032**	0	0.60	34,314	22,591	2,767	10,146	**-1,191**
2007	214	Partial	Dry	127,708	2,877	6,315	1,168	83,029	28,661	89	**26,289**	0	0.60	20,242	15,516	649	4,615	**-537**
2008	205	Partial	Dry	132,071	2,891	6,333	1,168	83,466	28,663	173	**30,160**	0	0.59	25,842	17,353	1,926	7,084	**-522**
2009	200	Full	Dry	124,773	2,869	6,409	1,168	82,849	31,209	120	**21,040**	0	0.61	21,108	15,497	429	4,885	**297**
2010	205	Full	Wet	110,300	2,304	5,075	1,168	66,930	26,557	97	**25,263**	0	0.56	36,876	23,966	2,833	9,931	**146**
2011	192	Full	Wet	106,756	2,306	4,781	1,168	64,007	29,888	76	**21,041**	0	0.56	41,481	26,538	2,366	12,419	**159**
2012	218	Full	Dry	121,462	2,844	4,283	1,168	81,085	37,067	115	**11,490**	0	0.62	22,189	16,882	1,057	5,494	**-1,243**
2013	214	Partial	Dry	134,903	3,021	6,289	1,168	87,827	35,037	116	**22,401**	0	0.60	24,257	15,368	1,675	6,950	**265**
2014	208	Partial	Dry	111,865	3,055	16,793	1,168	100,678	19,734	111	**12,357**	0	0.76	20,852	15,517	1,172	4,980	**-817**
2015	207	Partial	Dry	88,348	2,785	30,503	1,168	96,376	17,313	108	**9,008**	0	0.78	34,097	20,458	4,334	9,549	**-243**
2016	213	Full	Dry	93,721	2,454	25,522	1,168	88,631	17,522	75	**16,636**	0	0.72	49,661	28,026	4,783	17,191	**-338**
2017	211	Full	Wet	99,892	2,653	25,836	1,168	96,060	25,841	156	**7,491**	0	0.74	62,125	35,297	6,165	21,088	**-424**
2018	212	Full	Dry	103,290	3,041	24,937	1,168	101,251	29,541	215	**1,428**	0	0.76	30,703	22,073	1,938	7,378	**-685**
2019	212	Full	Wet	99,338	2,674	22,028	1,168	93,736	24,418	142	**6,911**	0	0.75	47,780	31,723	2,706	12,798	**553**
2020	240	Full	Dry	114,839	3,060	24,644	1,168	105,308	23,400	147	**14,856**	0	0.73	32,596	21,386	3,375	8,850	**-1,014**
2021	237	Partial	Dry	128,966	3,486	29,227	1,168	120,848	23,682	149	**18,168**	0	0.74	23,038	16,298	2,092	5,244	**-597**
2022	239	Full	Dry	130,245	3,295	26,884	1,168	113,031	20,263	116	**28,182**	0	0.70	24,236	14,764	2,040	7,117	**315**
2023	205	Full	Wet	113,536	2,552	19,759	1,168	87,797	17,244	108	**31,866**	0	0.64	73,668	35,676	9,477	25,188	**3,327**
2024	225	Full	Wet	115,036	2,853	19,507	1,168	96,274	20,087	122	**22,081**	0	0.69	49,490	31,341	2,623	17,012	**-1,487**
Minimum				88,348	2,304	4,283	1,168	64,007	17,244	75	**1,428**	0	0.56	20,242	14,764	429	4,615	**-1,487**
Maximum				134,903	3,486	30,503	1,168	120,848	37,067	215	**31,866**	0	0.78	73,668	35,676	9,477	25,188	**3,327**
Wet Year Average				108,113	2,537	14,633	1,168	82,557	23,968	114	**19,812**	0	0.65	49,391	29,590	4,134	15,512	**155**
Dry Year Average				117,683	2,973	17,345	1,168	95,365	26,008	128	**17,668**	0	0.69	27,402	18,262	2,122	7,445	**-427**
Overall Average				114,157	2,812	16,346	1,168	90,646	25,256	123	**18,458**	0	0.67	35,503	22,435	2,864	10,417	**-213**

Table F-23. Drainage System Annual Water Year (October to September) Water Budget Results for Southern OID Service Area, 2006 to 2024.

Year	Number of Days	USBR Allotment	Hydrologic Year Type	Inflows (af)				Outflows (af)					
				Operational Spillage	**Tailwater to Drainage System (Closure)**	Runoff of Precipi-tation	Precipitation	Drainwater Outflow	District Drain-water Reuse	Seepage	Private Drain-water Reuse	Evaporation	Riparian ET
2006	175	Full	Wet	10,963	**23,739**	2,767	3	24,976	6,670	3,147	2,413	162	105
2007	214	Partial	Dry	11,023	**28,661**	649	7	26,611	6,775	3,773	2,877	185	119
2008	205	Partial	Dry	7,796	**28,663**	1,926	4	23,691	7,745	3,755	2,891	187	121
2009	200	Full	Dry	7,374	**31,209**	429	8	26,237	6,040	3,576	2,869	181	117
2010	205	Full	Wet	7,912	**26,557**	2,833	14	26,276	4,880	3,576	2,304	170	110
2011	192	Full	Wet	8,422	**29,888**	2,366	8	30,075	4,545	3,487	2,306	165	107
2012	218	Full	Dry	6,116	**37,067**	1,057	21	32,280	4,896	3,934	2,844	187	120
2013	214	Partial	Dry	6,519	**35,037**	1,675	5	30,431	5,641	3,827	3,021	193	125
2014	208	Partial	Dry	6,626	**19,734**	1,172	8	16,511	3,947	3,719	3,055	186	120
2015	207	Partial	Dry	4,353	**17,313**	4,334	7	17,031	2,200	3,701	2,785	176	114
2016	213	Full	Dry	5,583	**17,522**	4,783	8	19,233	2,444	3,505	2,454	158	102
2017	211	Full	Wet	3,961	**25,841**	6,165	10	26,838	2,410	3,773	2,653	184	119
2018	212	Full	Dry	5,042	**29,541**	1,938	11	27,506	1,864	3,809	3,041	191	123
2019	212	Full	Wet	5,454	**24,418**	2,706	10	24,131	1,757	3,737	2,674	176	114
2020	240	Full	Dry	5,118	**23,400**	3,375	15	22,590	1,602	4,345	3,060	188	122
2021	237	Partial	Dry	3,973	**23,682**	2,092	4	20,321	1,359	4,256	3,486	200	129
2022	239	Full	Dry	3,830	**20,263**	2,040	4	17,134	1,122	4,274	3,295	190	123
2023	205	Full	Wet	3,484	**17,244**	9,477	3	22,228	1,580	3,576	2,552	164	106
2024	225	Full	Wet	3,907	**20,087**	2,623	11	18,202	1,211	4,059	2,853	184	119
			Minimum	3,484	**17,244**	429	3	16,511	1,122	3,147	2,304	158	102
			Maximum	11,023	**37,067**	9,477	21	32,280	7,745	4,345	3,486	200	129
			Wet Year Average	6,301	**23,968**	4,134	9	24,675	3,293	3,622	2,537	172	111
			Dry Year Average	6,113	**26,008**	2,122	8	23,298	3,803	3,873	2,973	185	120
			Overall Average	6,182	**25,256**	2,864	8	23,805	3,615	3,780	2,812	180	116

Table F-24. Overall Annual Water Year (October to September) Water Budget Results for Southern OID Service Area, 2006 to 2024.

				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	129,249	766	34,332	5,446	3,265	0	0	3,445	24,976	14,385	24,032	10,146	1,578	73,093	22,591	-1,191
2007	214	Partial	Dry	144,164	3,881	20,284	6,315	3,265	0	0	3,341	26,611	17,246	26,289	4,615	1,799	83,029	15,516	-537
2008	205	Partial	Dry	142,032	6,857	25,866	6,333	3,270	0	0	4,137	23,691	17,164	30,160	7,084	1,824	83,466	17,353	-522
2009	200	Full	Dry	133,158	8,233	21,154	6,409	3,265	0	0	3,303	26,237	16,347	21,040	4,885	1,762	82,849	15,497	297
2010	205	Full	Wet	125,071	2,966	36,961	5,075	3,265	0	0	2,823	26,276	16,347	25,263	9,931	1,655	66,930	23,966	146
2011	192	Full	Wet	125,364	1,147	41,530	4,781	3,265	0	0	4,301	30,075	15,938	21,041	12,419	1,610	64,007	26,538	159
2012	218	Full	Dry	134,828	3,935	22,312	4,283	3,270	0	0	2,841	32,280	17,982	11,490	5,494	1,817	81,085	16,882	-1,243
2013	214	Partial	Dry	143,393	5,492	24,290	6,289	3,265	0	0	118	30,431	17,491	22,401	6,950	1,878	87,827	15,368	265
2014	208	Partial	Dry	117,659	9,424	20,897	16,793	3,265	0	0	0	16,511	17,001	12,357	4,980	1,810	100,678	15,517	-817
2015	207	Partial	Dry	97,769	5,975	34,139	30,503	3,265	0	0	841	17,031	16,919	9,008	9,549	1,712	96,376	20,458	-243
2016	213	Full	Dry	107,345	2,230	49,707	25,522	3,270	0	0	1,136	19,233	16,020	16,636	17,191	1,539	88,631	28,026	-338
2017	211	Full	Wet	113,079	1,514	62,185	25,836	3,265	0	3	486	26,838	17,246	7,491	21,088	1,792	96,060	35,297	-424
2018	212	Full	Dry	118,431	1,790	30,769	24,937	3,265	0	3	974	27,506	17,410	1,428	7,378	1,855	101,251	22,073	-685
2019	212	Full	Wet	114,948	1,143	47,838	22,028	3,265	0	0	674	24,131	16,993	6,911	12,798	1,703	93,736	31,723	553
2020	240	Full	Dry	133,021	734	32,686	24,644	3,270	0	3	813	22,590	19,743	14,856	8,850	1,821	105,308	21,386	-1,014
2021	237	Partial	Dry	145,944	920	23,059	29,227	3,265	0	6	853	20,321	19,337	18,168	5,244	1,937	120,848	16,298	-597
2022	239	Full	Dry	146,982	694	24,259	26,884	3,265	0	11	273	17,134	19,418	28,182	7,117	1,839	113,031	14,764	315
2023	205	Full	Wet	127,703	681	73,684	19,759	3,265	0	5	1,165	22,228	16,249	31,866	25,188	1,590	87,797	35,676	3,327
2024	225	Full	Wet	131,882	891	49,557	19,507	3,270	0	2	1,456	18,202	18,443	22,081	17,012	1,785	96,274	31,341	-1,487
			Minimum	97,769	681	20,284	4,283	3,265	0	0	0	16,511	14,385	1,428	4,615	1,539	64,007	14,764	-1,487
			Maximum	146,982	9,424	73,684	30,503	3,270	0	11	4,301	32,280	19,743	31,866	25,188	1,937	120,848	35,676	3,327
			Wet Year Average	123,900	1,301	49,441	14,633	3,265	0	1	2,050	24,675	16,515	19,812	15,512	1,673	82,557	29,590	155
			Dry Year Average	130,394	4,180	27,452	17,345	3,267	0	2	1,553	23,298	17,673	17,668	7,445	1,799	95,365	18,262	-427
			Overall Average	128,001	3,120	35,553	16,346	3,266	0	2	1,736	23,805	17,246	18,458	10,417	1,753	90,646	22,435	-213

Attachment G: Groundwater Recharge from OID Surface Water

Introduction

Under SGMA, there is an increasing focus on groundwater management (including groundwater recharge activities) as GSPs are implemented. Due to this, OID utilized the results available from its detailed water budget to quantify groundwater recharge occurring from the use of surface water throughout their service area. The results are quantified separately for the portion of OID to the north of the Stanislaus River (OID North), which is within the Eastern San Joaquin Subbasin, and for the portion of OID to the south of the Stanislaus River (OID South), which is within the Modesto Subbasin. OID North is comprised of 28,438 acres (40% of OID's assessed acreage) while OID South is 41,806 acres (60% of OID's assessed acreage). Water year results were used in this calculation to align with other water accounting under SGMA, although calendar year results for the water budget were reported in the AWMP. Both water year and calendar year results are available in Attachment F of the AWMP.

As described in Section 5.5.5 of the AWMP, groundwater recharge within OID primarily occurs through passive seepage from the OID distribution and drainage systems and deep percolation of precipitation and applied irrigation water from OID farmed lands. Of these flow paths, deep percolation of precipitation is not directly influenced by OID and its surface water supplies and management while the others are.

Total estimated groundwater recharge from OID surface water was calculated as the sum of seepage from the distribution and drainage systems and the deep percolation of applied surface water. Seepage estimates from the distribution and drainage systems were directly available from the water budget. However, the deep percolation of applied water needed to be distributed between applied groundwater and applied surface water. In order to estimate this, the surface water applied to farmed lands was compared to total water supplies to calculate a representative surface water percentage. This percentage was then multiplied by the total deep percolation of applied water to estimate the deep percolation of applied surface water. The surface water applied to farmed lands included farm deliveries (i.e., surface water diverted from the Stanislaus River to farmed lands) and private drainwater reuse (i.e., water recovered from the drainage system, the majority of which originated as surface water and likely would not be present and recoverable without OID operations). Total water supplies included farm deliveries, private drainwater reuse, private groundwater pumping, and water recycled directly to farmed lands (which typically originated as groundwater pumping).

As described in Section 5 of the AWMP, the deep percolation of applied water is currently the closure term for the farmed lands. It was selected as the closure term because it is a relatively large flow path and difficult to estimate otherwise. As such, its volume was calculated to close the mass balance of the farmed lands water budget and includes uncertainties associated with quantification of all other farmed lands flow paths. In future water budget updates, deep percolation of applied water may potentially be estimated through refinements to OID's root zone water budget model.

Groundwater Recharge from OID Surface Water in OID North

Over the 19-year period from water year 2006 to 2024, estimated groundwater recharge from OID surface water ranged from 21,033 to 42,086 af (or 0.74 to 1.48 af/acre) in OID North. Wet and dry year averages were similar at 29,600 and 29,300 af, respectively. Although there is less deep percolation of applied surface water during dry years (due to reduced surface water availability), this is offset by increased seepage from the distribution and drainage systems caused by longer irrigation seasons in dry years.

In dry years, deep percolation of applied surface water averaged 11,900 af, which was less than the wet year average of 13,300 af. Conversely, in dry years, distribution system seepage averaged 14,900 af (vs. 13,900 af in wet years), and drainage system seepage averaged 2,600 af (vs. 2,400 af in wet years).

Table G-1. Total recharge of surface water for OID North, Water Years 2006 to 2024.

Year	Hydrologic Year Type	Deep Percolation of Surface Water (af)	Distribution System Seepage (af)	Drainage System Seepage (af)	Total Recharge of Surface Water (af)
2006	Wet	18,374	12,098	2,069	32,541
2007	Dry	25,101	14,504	2,481	42,086
2008	Dry	22,150	14,435	2,469	39,054
2009	Dry	11,781	13,748	2,352	27,881
2010	Wet	12,295	13,748	2,352	28,395
2011	Wet	14,393	13,404	2,293	30,090
2012	Dry	5,277	15,122	2,587	22,986
2013	Dry	10,702	14,710	2,516	27,928
2014	Dry	4,290	14,297	2,446	21,033
2015	Dry	4,946	14,229	2,434	21,609
2016	Dry	9,357	13,473	2,304	25,134
2017	Wet	9,572	14,504	2,481	26,557
2018	Dry	9,241	14,620	2,504	26,365
2019	Wet	15,989	14,325	2,457	32,771
2020	Dry	18,192	16,652	2,857	37,701
2021	Dry	13,196	16,310	2,798	32,304
2022	Dry	12,254	16,378	2,810	31,442
2023	Wet	14,555	13,706	2,352	30,613
2024	Wet	8,976	15,533	2,669	27,178
2006-2024 average		**12,392**	**14,516**	**2,486**	**29,393**
Wet year average		**13,274**	**13,903**	**2,382**	**29,558**
Dry year average		**11,897**	**14,873**	**2,547**	**29,316**

Groundwater Recharge from OID Surface Water in OID South

From water year 2006 to 2024, estimated groundwater recharge from OID surface water in OID South ranged between 18,600 and 45,700 af (or 0.44 to 1.09 af/acre). Wet and dry year averages were similar at 33,500 and 32,600 af, respectively. Similar to OID North, this was influenced by offsetting changes between the deep percolation of applied surface water in farmed lands and seepage in distribution and drainage canals.

Deep percolation of applied water during dry years was less, averaging 14,940 af compared to 16,900 af in wet years; this is caused by reduced surface water availability. In contrast, seepage volumes increased during dry years because of longer irrigation seasons. In dry years, distribution system seepage averaged 13,800 af (vs. 12,900 af in wet years), and drainage system seepage averaged 3,900 af (vs. 3,600 af in wet years).

Table G-2. Total recharge of surface water for OID South, Water Years 2006 to 2024.

Year	Hydrologic Year Type	Deep Percolation of Surface Water (af)	Distribution System Seepage (af)	Drainage System Seepage (af)	Total Recharge of Surface Water (af)
2006	Wet	22,718	11,238	3,147	37,103
2007	Dry	24,864	13,473	3,773	42,110
2008	Dry	28,572	13,409	3,755	45,736
2009	Dry	19,861	12,771	3,576	36,208
2010	Wet	23,936	12,771	3,576	40,283
2011	Wet	19,953	12,452	3,487	35,892
2012	Dry	11,007	14,048	3,934	28,989
2013	Dry	21,252	13,665	3,827	38,744
2014	Dry	10,687	13,282	3,719	27,688
2015	Dry	6,685	13,218	3,701	23,604
2016	Dry	13,022	12,515	3,505	29,042
2017	Wet	5,930	13,473	3,773	23,176
2018	Dry	1,147	13,601	3,809	18,557
2019	Wet	5,631	13,256	3,737	22,624
2020	Dry	12,188	15,398	4,345	31,931
2021	Dry	14,777	15,081	4,256	34,114
2022	Dry	23,290	15,144	4,274	42,708
2023	Wet	26,999	12,673	3,576	43,248
2024	Wet	18,786	14,384	4,059	37,229
2006-2024 average		**15,668**	**13,466**	**3,780**	**32,914**
Wet year average		**16,939**	**12,892**	**3,622**	**33,454**
Dry year average		**14,940**	**13,800**	**3,873**	**32,613**

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